This document was too large to scan as a whole document, therefore it required breaking into smaller sections.

Document number: SD-FF-CSWD-061

Section 1 **of** 2

Title: Sodium Storage Facility Ladder Logic Diagrams

Date: 6/12/97 **Revision:** A000

Originator: Jones DD
Co: BWHC

Recipient:
Co:

References: EDT-619594

Sodium Storage Facility Ladder Logic Diagrams

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U.S. Department of Energy Contract DE-AC06-96RL13200

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Key Words: Sodium, SSF, Trace Heat, PLC, Computer

Abstract: This document provides the computer technician or software engineer with a way to study the algorithms that are actually used by the SSF PLC.

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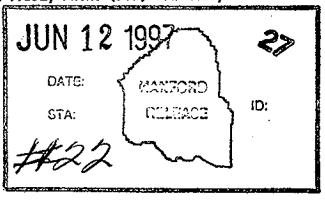


Bernie Wallace 6/12/97
Release Approval Date

Release Stamp

Approved for Public Release

```
Rung 2:0
*******************************************************************************
        First Rung for initializing heatup rate data for each PID
*****************************                 ***********************************
|                                                                      RUN
|                                                                   JUMPS OVER
|                                                                    STARTUP
|                                                                     CODE
| TMR_SU/DN
|   T4:60                                                                8
|----] [-------------------------------------------------------------(JMP)-----
|      DN
|   (2:2)

Rung 2:1
*******************************************************************************
                ** FIRST PASS CALL TO SUBROUTINE 3 **
         First Pass configures each channel of each T/C module
         MODULE # is the # of the slot where the module resides
*******************************************************************************

|
| FIRST_PASS
|    S:1                                                  +JSR---------------+
|----] [-------------------------------------------------+JUMP TO SUBROUTINE+--
|      15                                                 |SBR file number  3|
|                                                         +------------------+

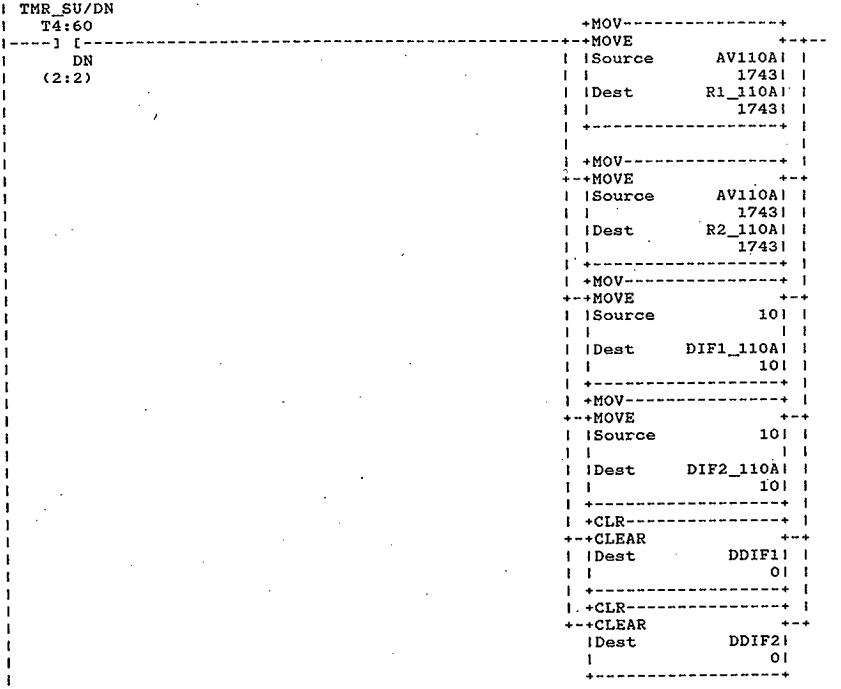
Rung 2:2

                setup timer used for initializing heatup rates
|                                                     +TON---------------+
|-----------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                     |Timer       TMR_SU+-(DN)
|                                                     |Time Base     0.01|
|                                                     |Preset         600|
|                                                     |Accum          601|
|                                                     +------------------+

Rung 2:3
*******************************************************************************
        JUMPS TO SECTION 1 IF DN_1 IS NOT LATCHED DN_1 GETS LATCHED WHEN THE
SECTION IS ENTERED
|                                                                      MD1
| TMR_SU/DN
|   T4:60                                                                1
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|   (2:2)
```

Rung 2:4

RATE CHECKING



Rung 2:5

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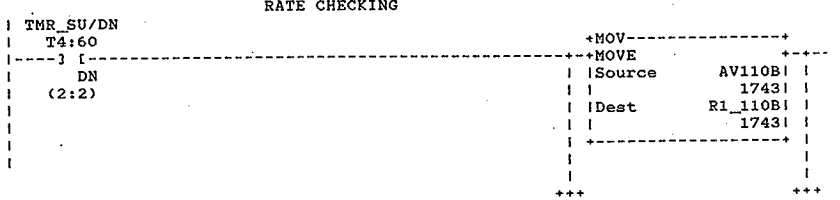
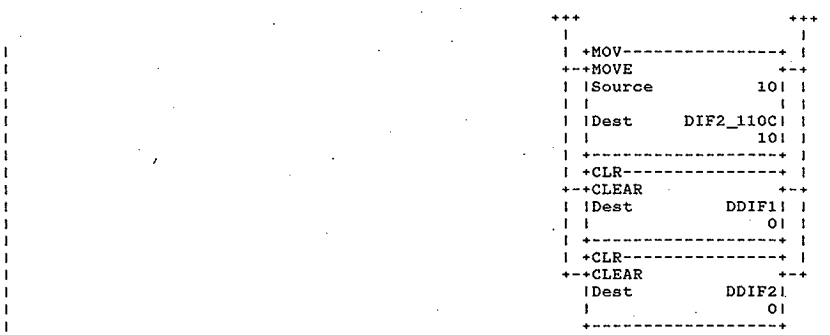


```
                                                         +++                  +++
                                                          |                    |
|                                                         | +MOV---------------+ |
|                                                         +-+MOVE            +-+
|                                                         | |Source    AV110B| |
|                                                         | |            1743| |
|                                                         | |Dest      R2_110B| |
|                                                         | |            1743| |
|                                                         | +----------------+ |
|                                                         | +MOV---------------+ |
|                                                         +-+MOVE            +-+
|                                                         | |Source        10| |
|                                                         | |               | |
|                                                         | |Dest   DIF1_110B| |
|                                                         | |              10| |
|                                                         | +----------------+ |
|                                                         | +MOV---------------+ |
|                                                         +-+MOVE            +-+
|                                                         | |Source        10| |
|                                                         | |               | |
|                                                         | |Dest   DIF2_110B| |
|                                                         | |              10| |
|                                                         | +----------------+ |
|                                                         | +CLR---------------+ |
|                                                         +-+CLEAR           +-+
|                                                         | |Dest       DDIF1| |
|                                                         | |               0| |
|                                                         | +----------------+ |
|                                                         | +CLR---------------+ |
|                                                         +-+CLEAR           +-+
|                                                           |Dest       DDIF2|
|                                                           |               0|
|                                                           +----------------+
```

Rung 2:6

RATE CHECKING

```
| TMR_SU/DN
|   T4:60                                                   +MOV---------------+
|----] [-------------------------------------------------+-+MOVE            +-+--
|      DN                                                 | |Source    AV110C| |
|    (2:2)                                                | |            1742| |
|                                                         | |Dest      R1_110C| |
|                                                         | |            1742| |
|                                                         | +----------------+ |
|                                                         |                    |
|                                                         | +MOV---------------+ |
|                                                         +-+MOVE            +-+
|                                                         | |Source    AV110C| |
|                                                         | |            1742| |
|                                                         | |Dest      R2_110C| |
|                                                         | |            1742| |
|                                                         | +----------------+ |
|                                                         | +MOV---------------+ |
|                                                         +-+MOVE            +-+
|                                                         | |Source        10| |
|                                                         | |               | |
|                                                         | |Dest   DIF1_110C| |
|                                                         | |              10| |
|                                                         | +----------------+ |
|                                                         |                    |
                                                         +++                  +++
```



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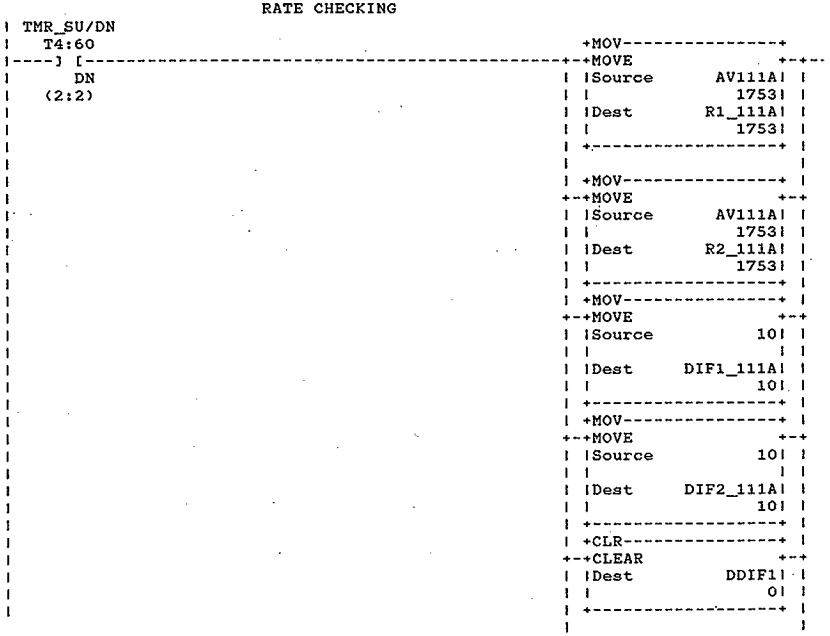

Rung 2:8

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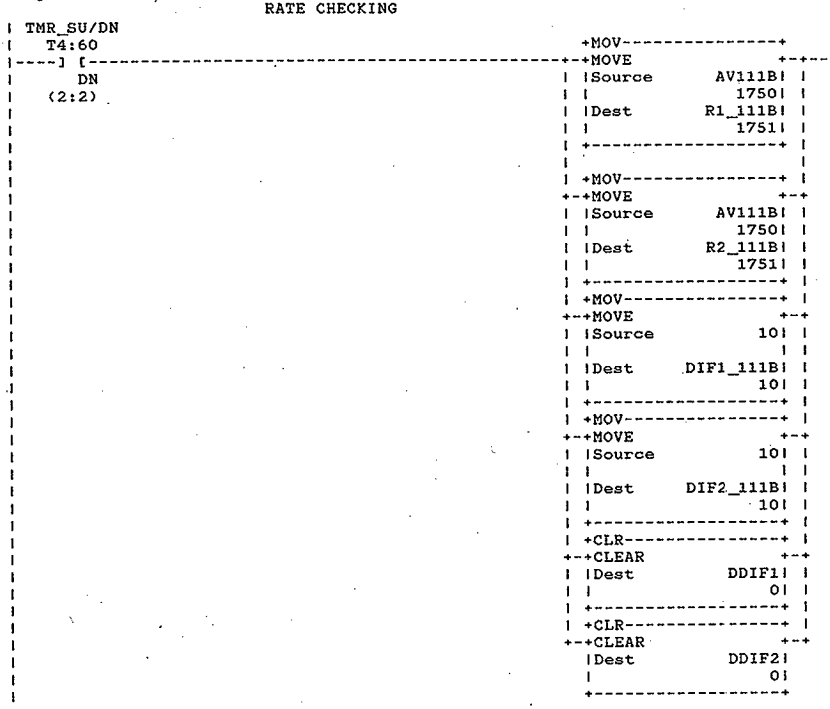

Rung 2:9

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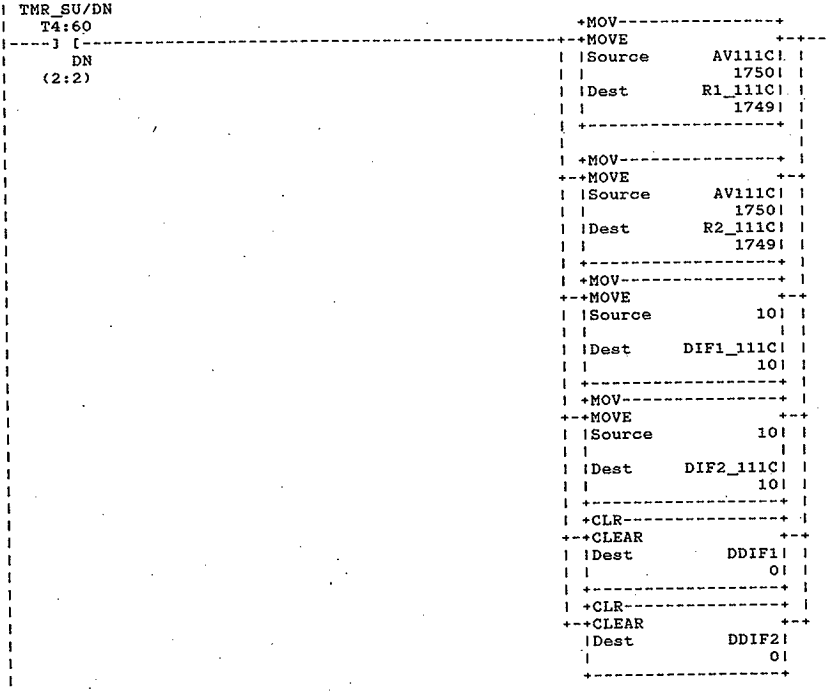

Rung 2:10

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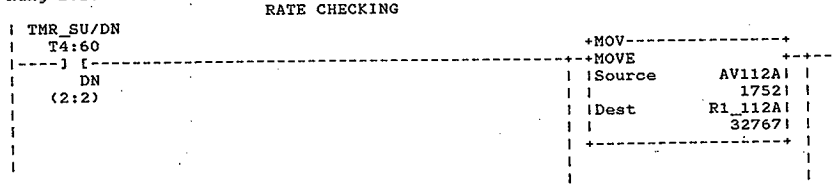

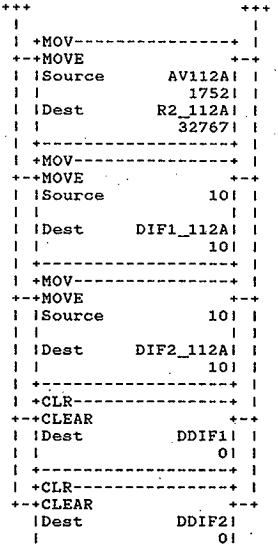

Rung 2:11

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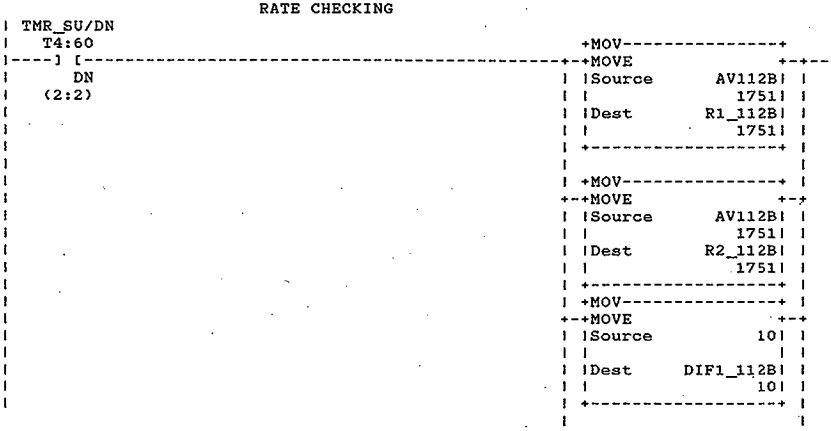

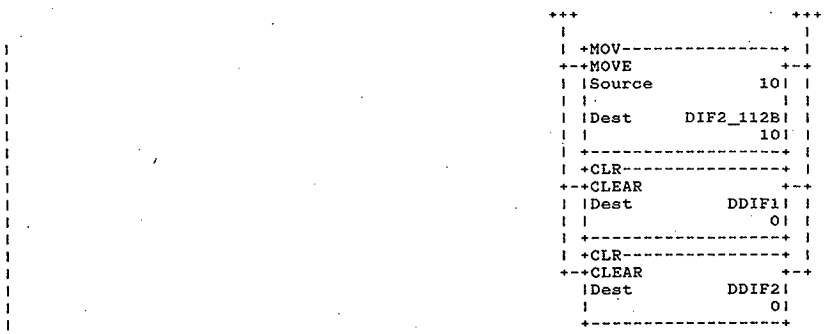

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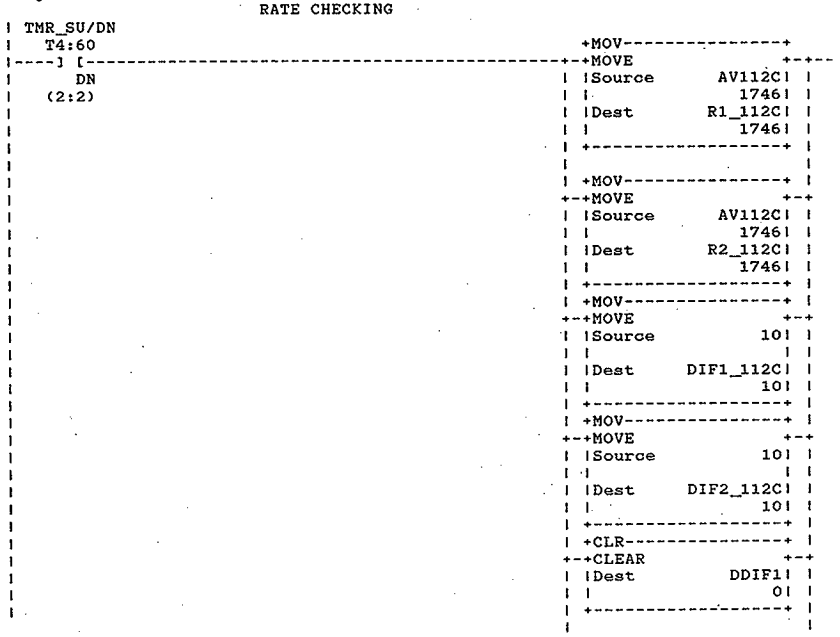

Rung 2:13

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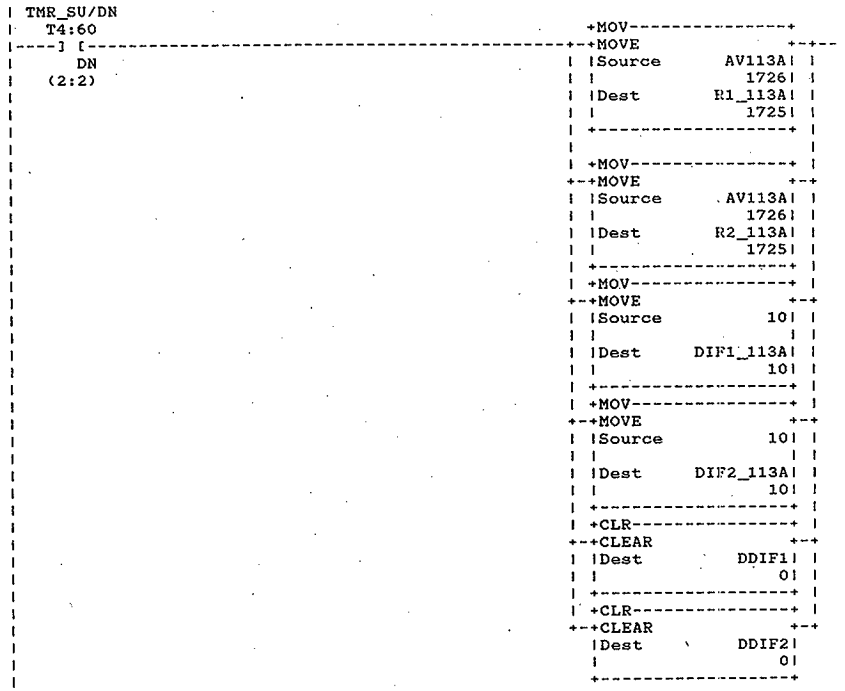

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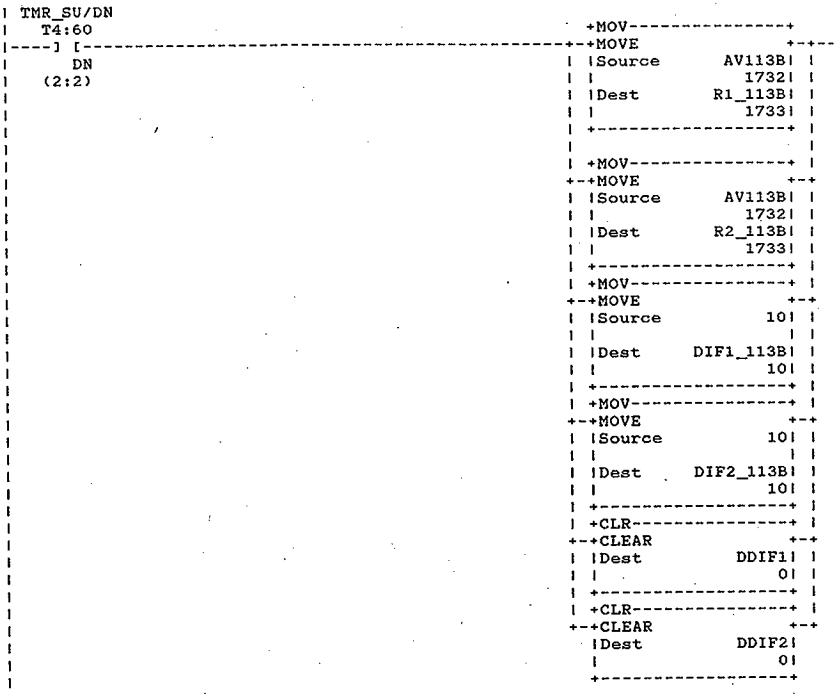

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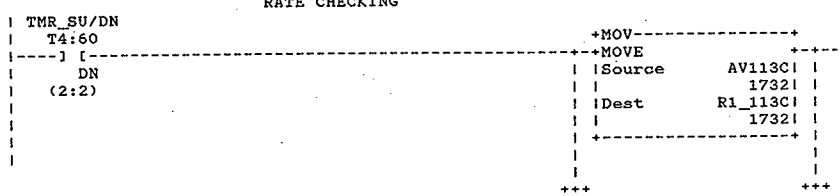

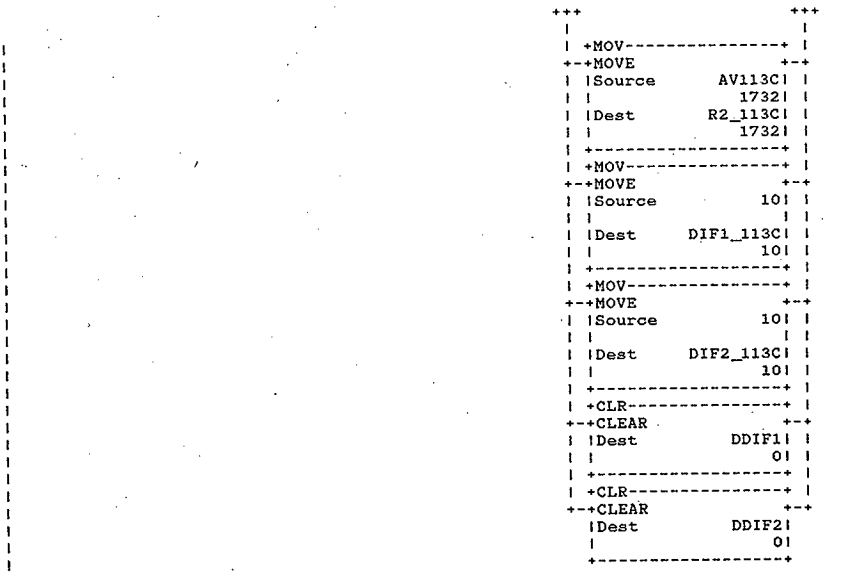

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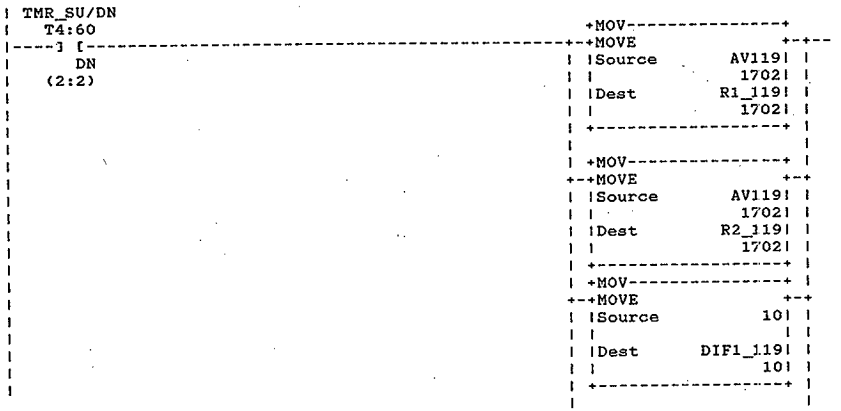

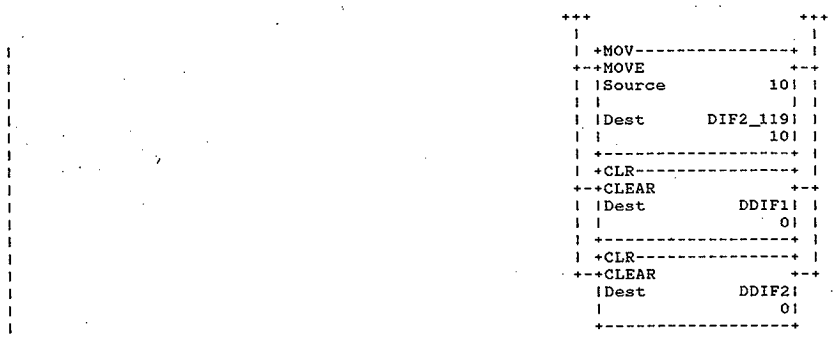

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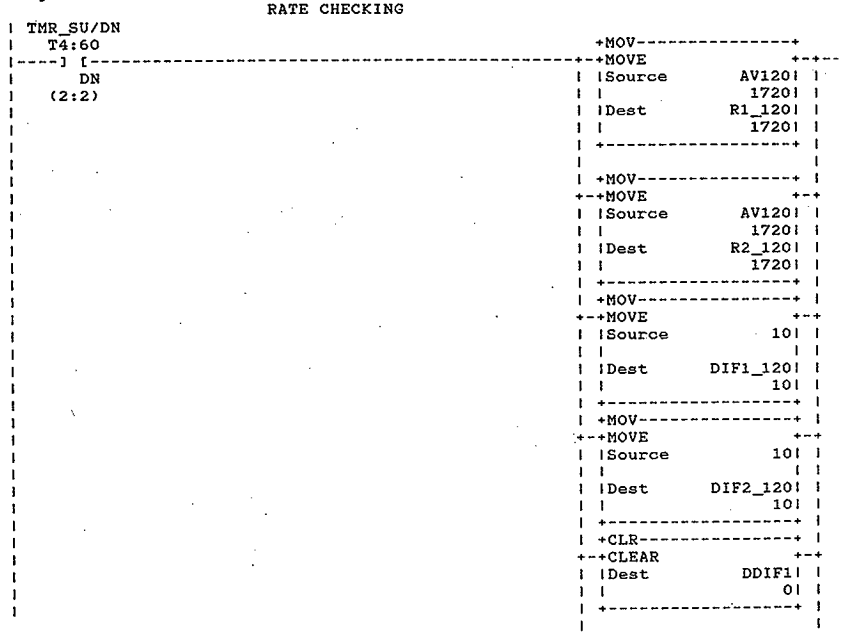

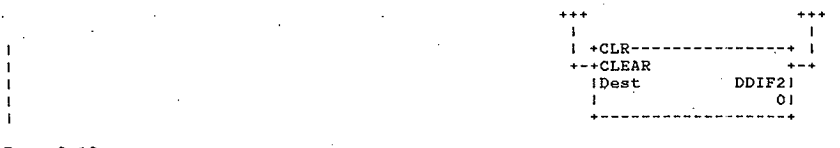

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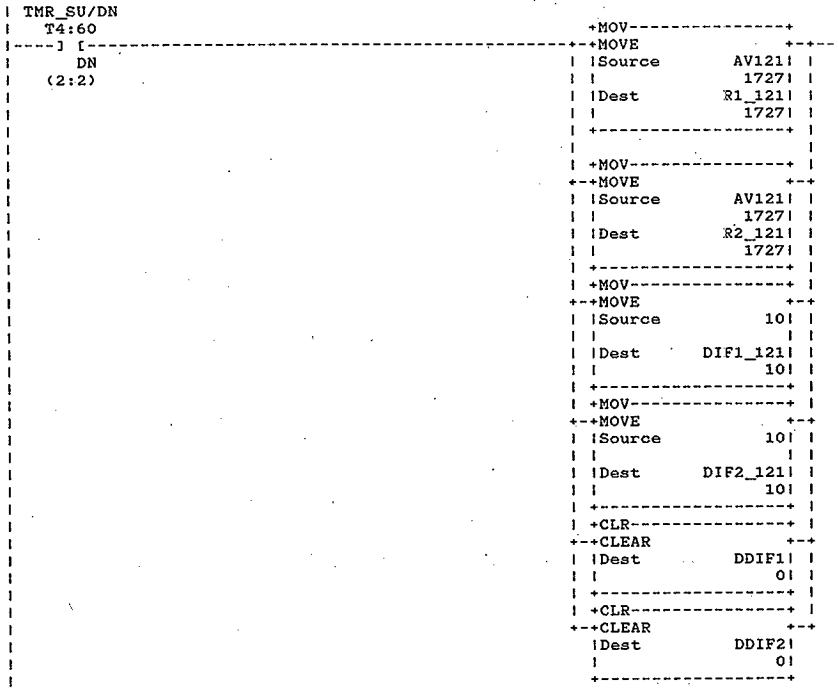

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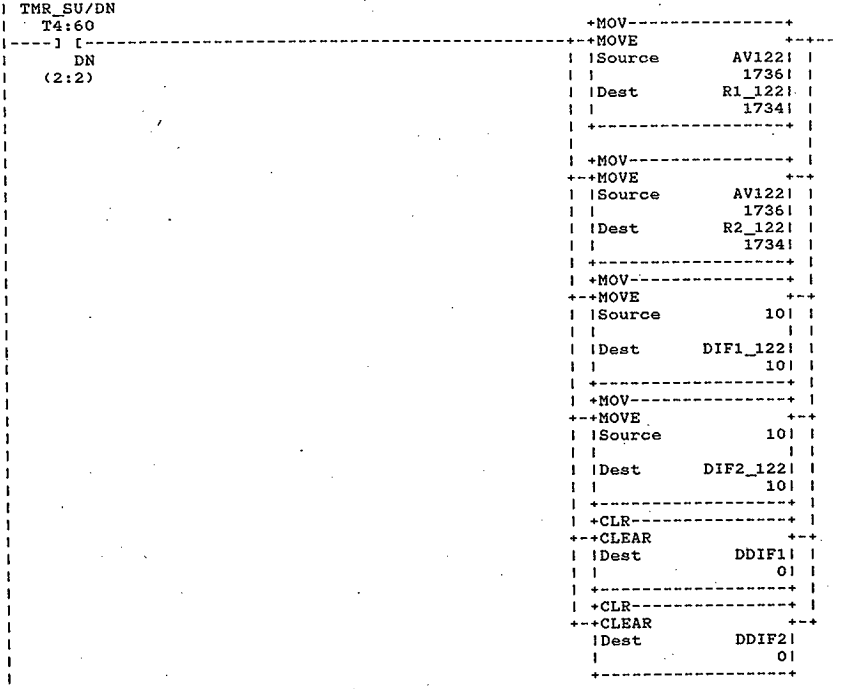

Rung 2:20

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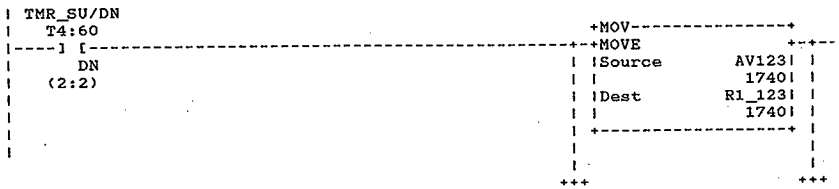

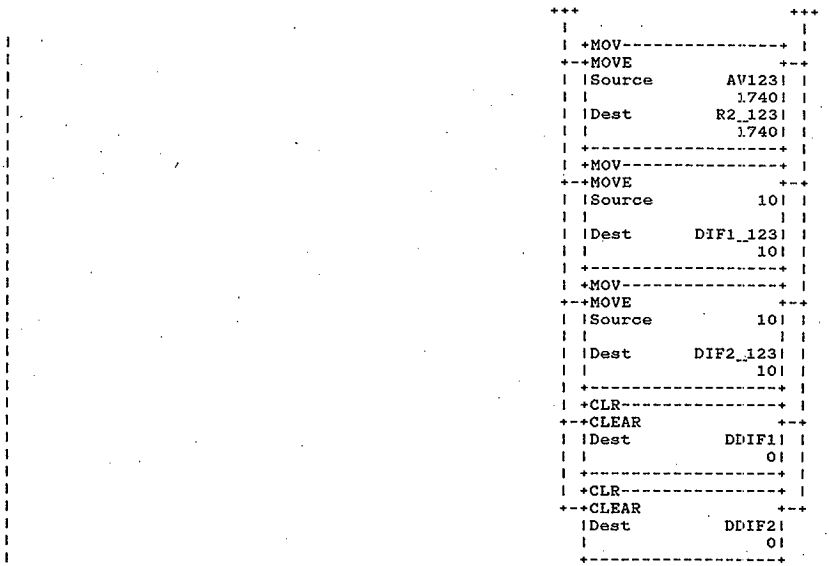

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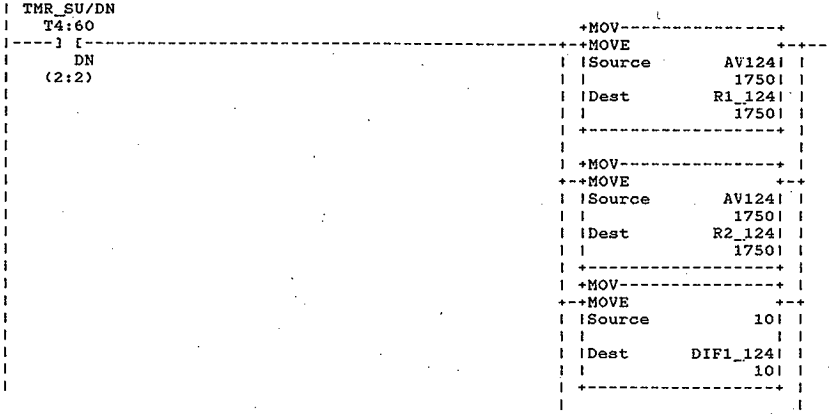

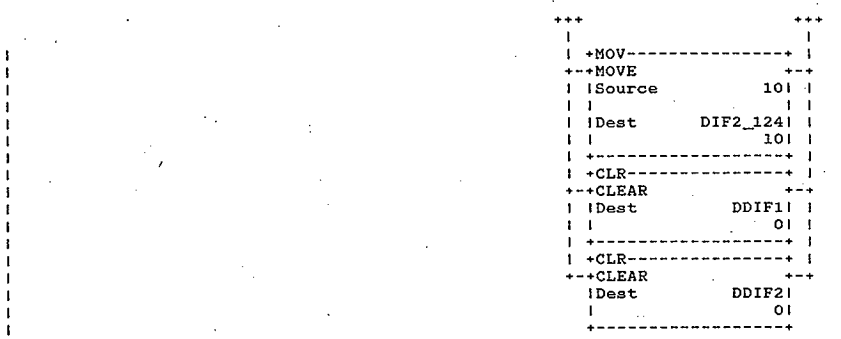

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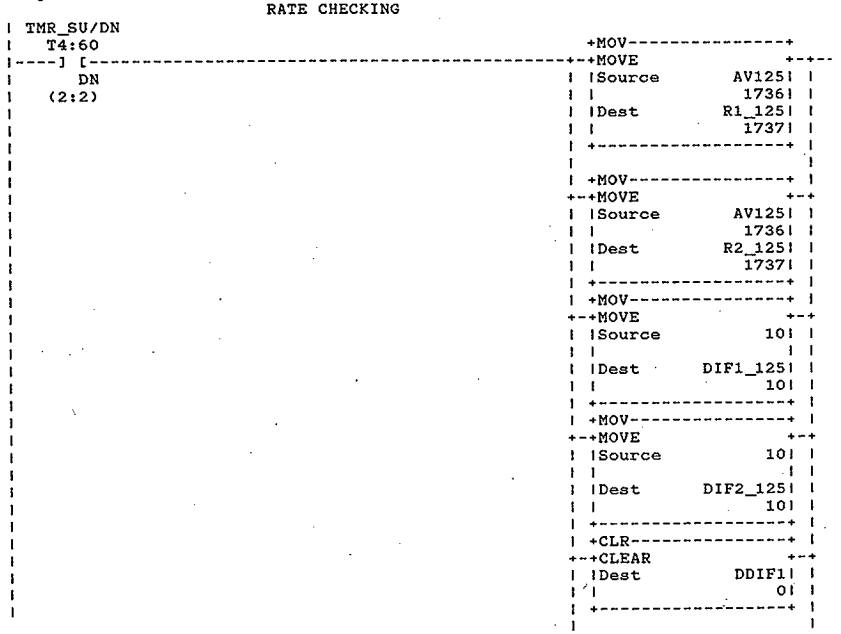

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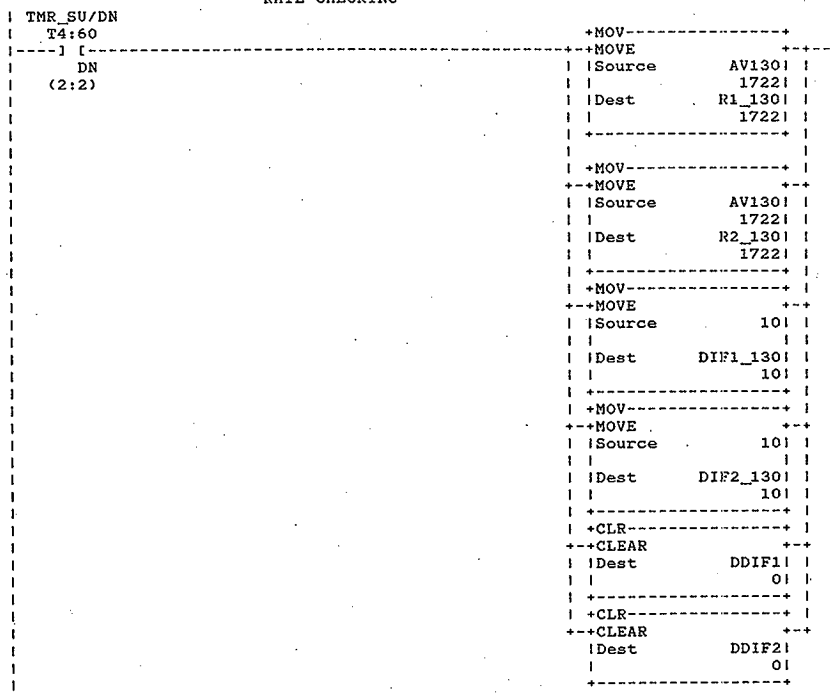

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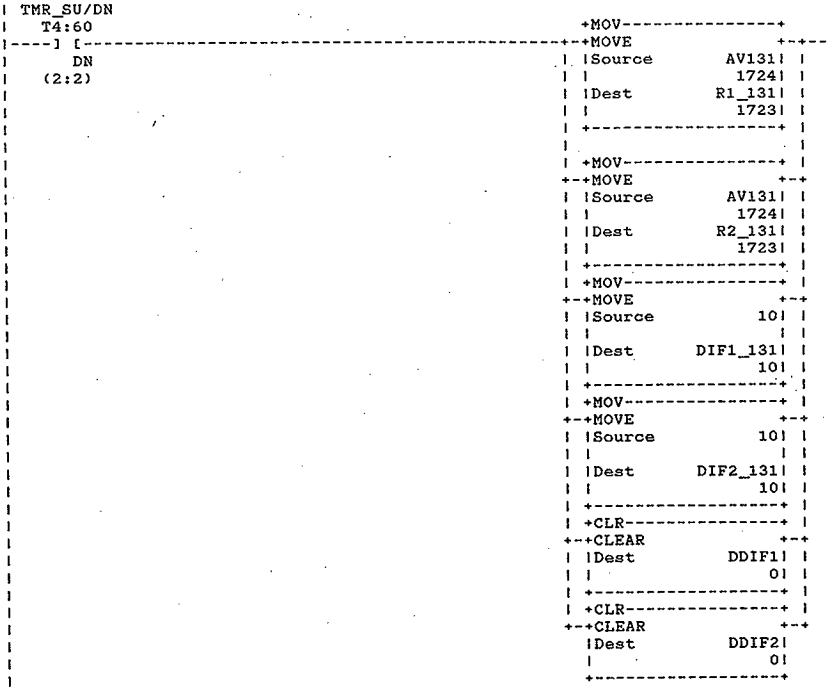

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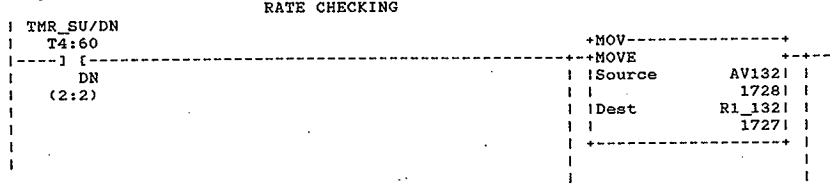

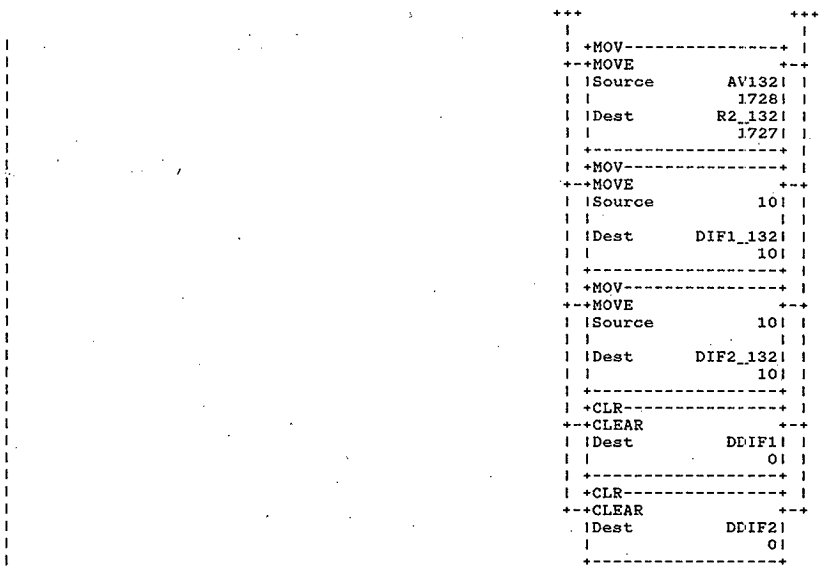

Rung 2:26

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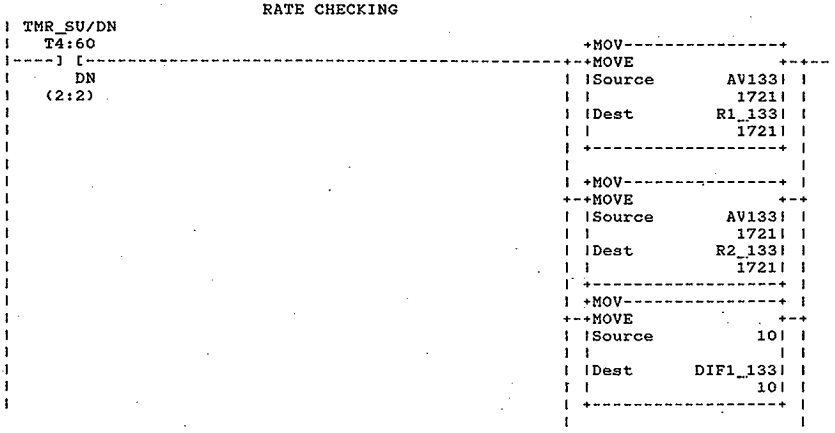

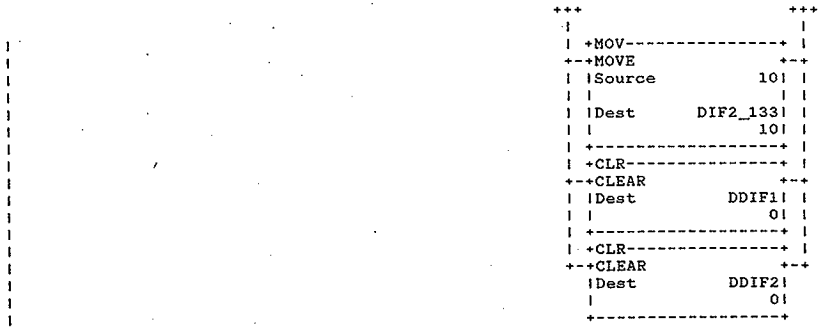

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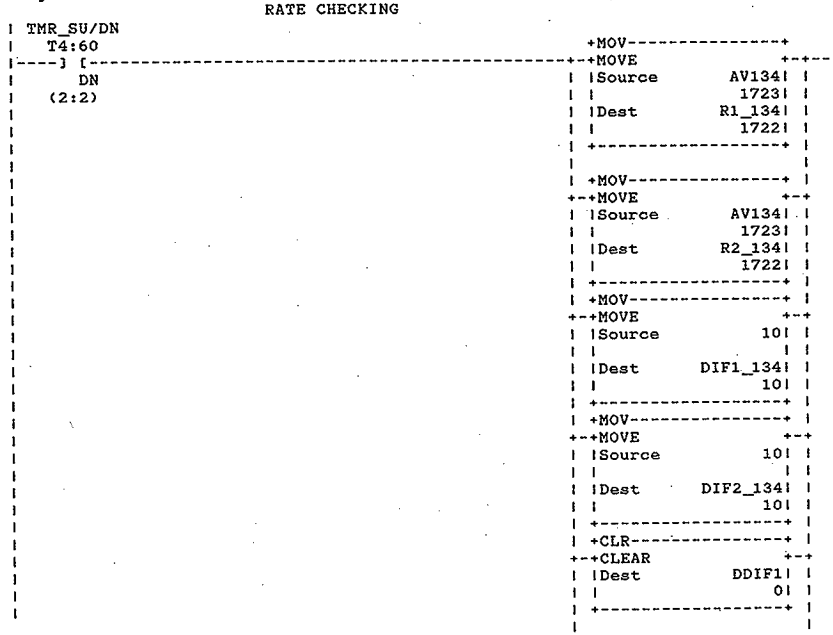

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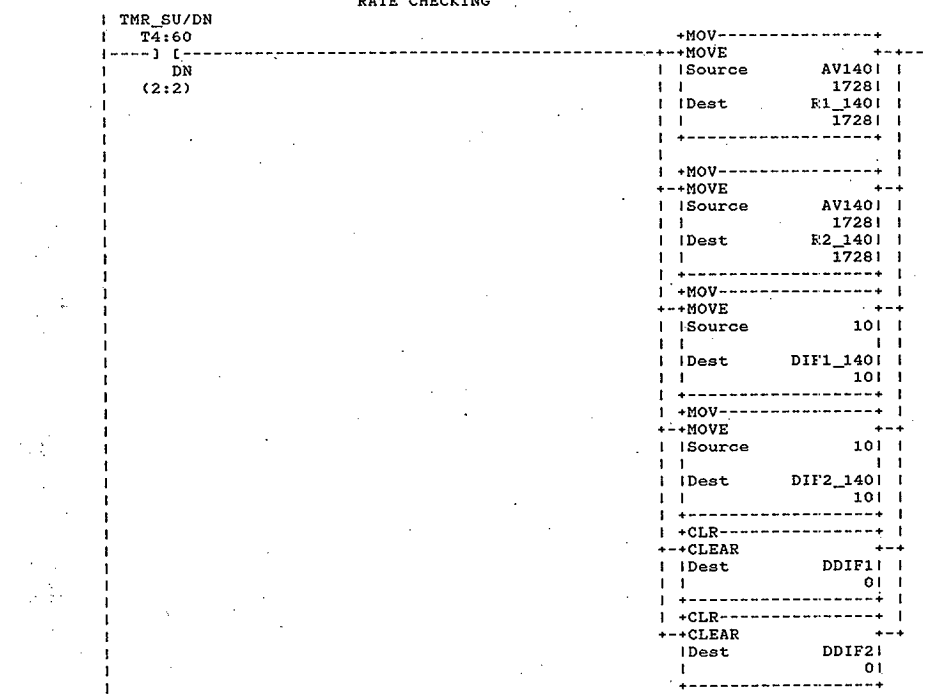

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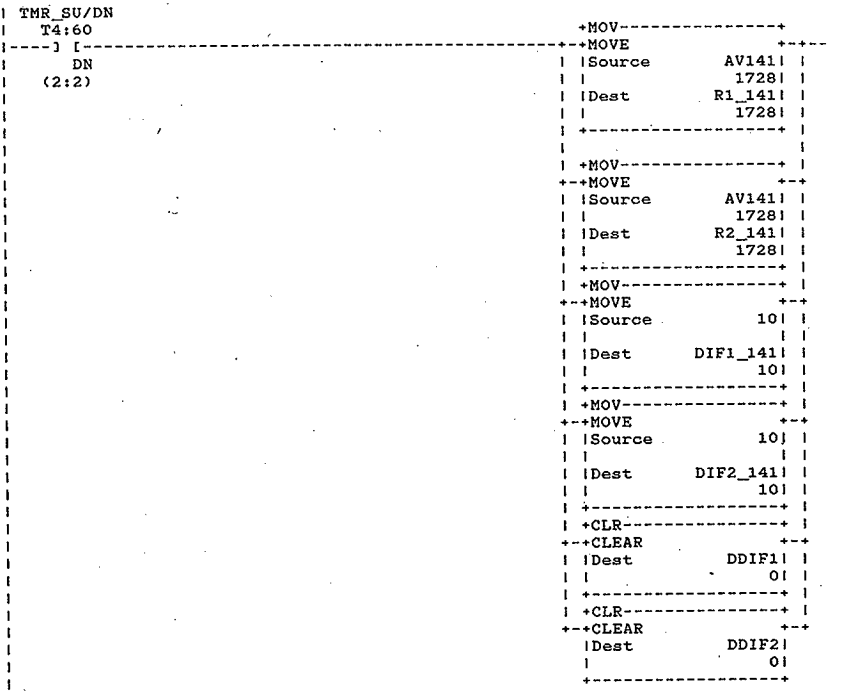

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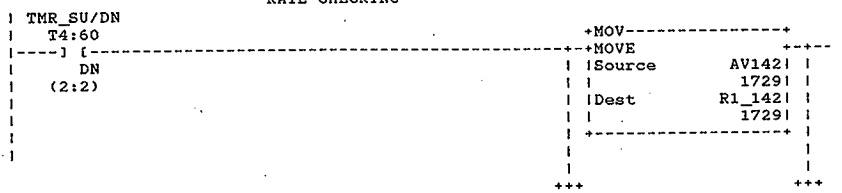
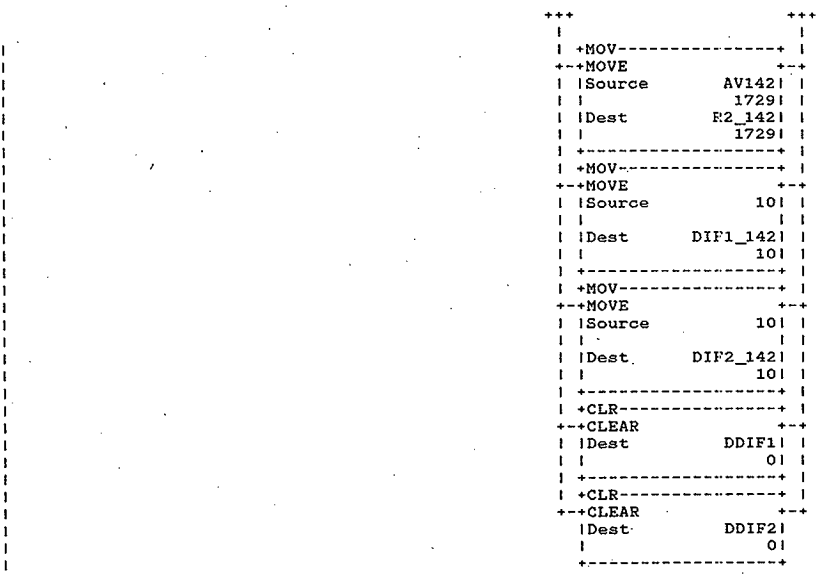
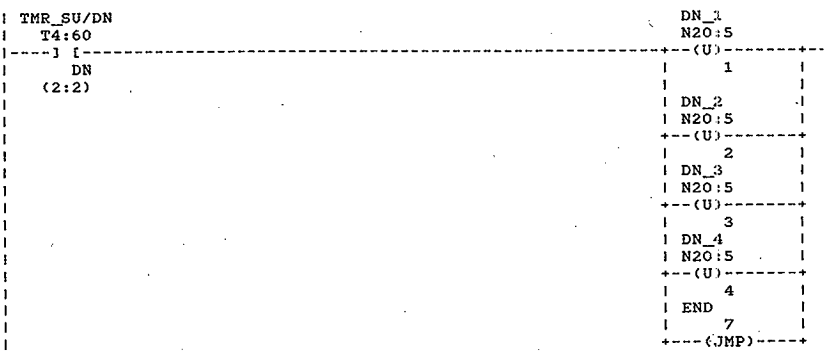
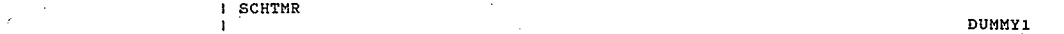



MOV
MOVE
Source AV142 1729
Dest R2_142 1729
MOV
MOVE
Source 10
Dest DIF1_142 10
MOV
MOVE
Source 10
Dest DIF2_142 10
CLR
CLEAR
Dest DDIF1 0
CLR
CLEAR
Dest DDIF2 0

Rung 2:31


TMR_SU/DN
T4:60
DN
(2:2)
DN_1
N20:5
(U)
1
DN_2
N20:5
(U)
2
DN_3
N20:5
(U)
3
DN_4
N20:5
(U)
4
END
7
(JMP)

Rung 2:32



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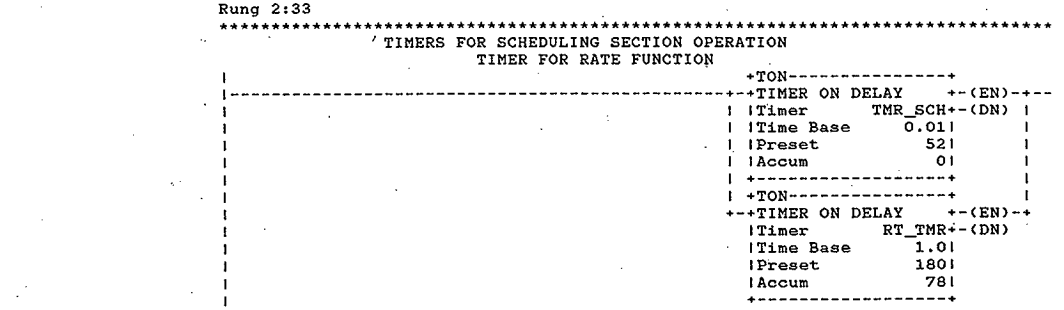
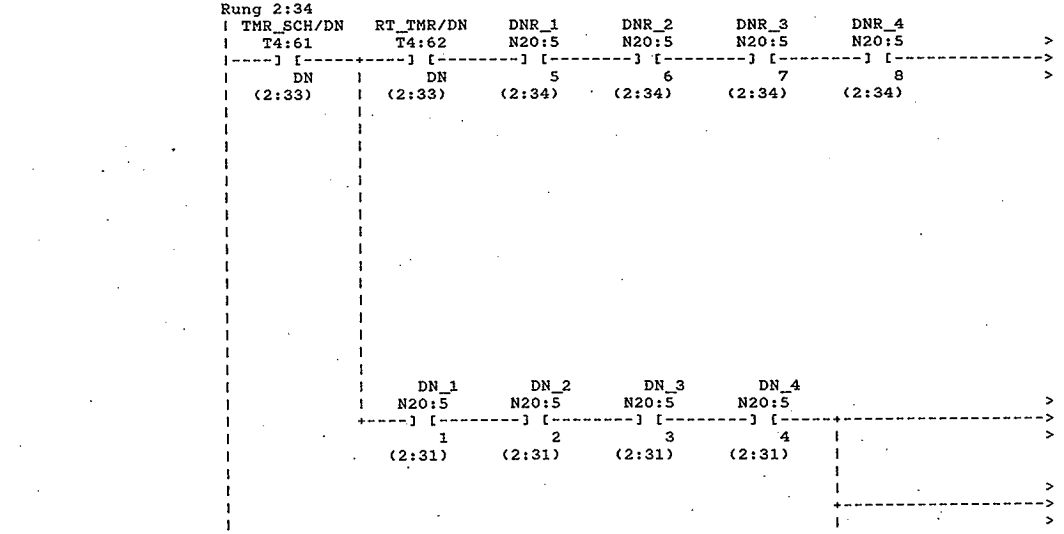
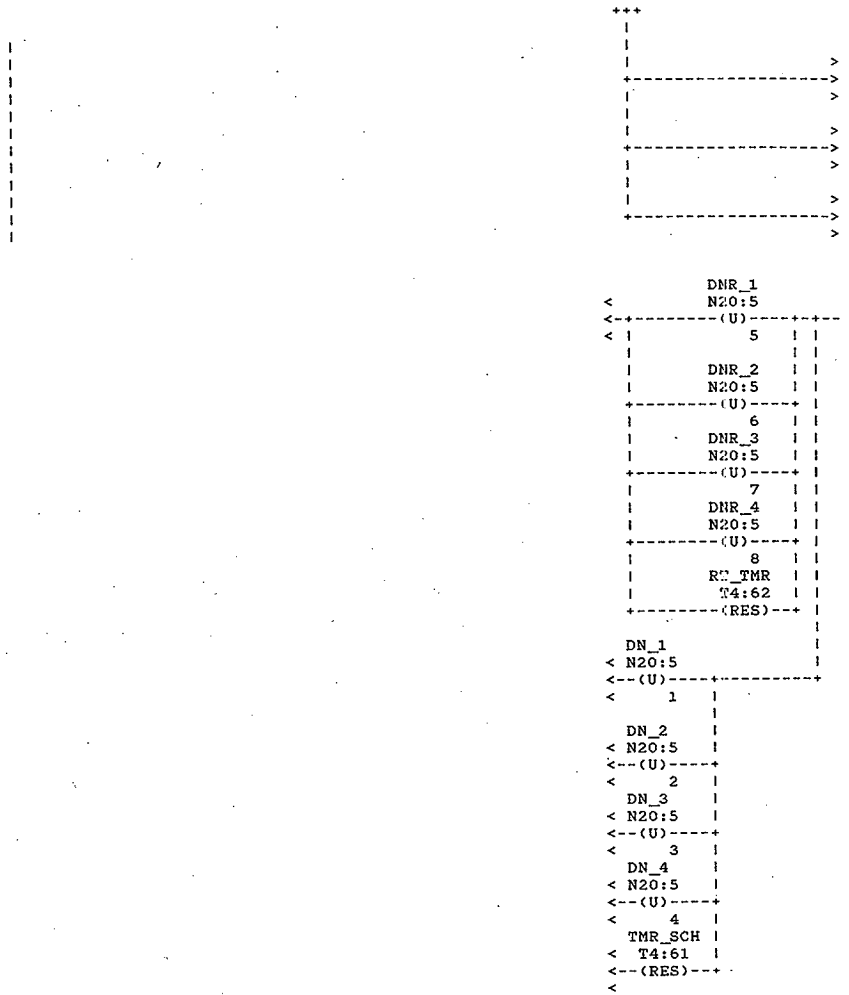


Rung 2:34




DNR_1
N20:5
(U)
5
DNR_2
N20:5
(U)
6
DNR_3
N20:5
(U)
7
DNR_4
N20:5
(U)
8
RST_TMR
T4:62
(RES)
DN_1
N20:5
(U)
1
DN_2
N20:5
(U)
2
DN_3
N20:5
(U)
3
DN_4
N20:5
(U)
4
TMR_SCH
T4:61
(RES)

```
Rung 2:35
*******************************************************************************
        JUMPS TO SECTION 1 IF DN_1 IS NOT LATCHED DN_1 GETS LATCHED WHEN THE
SECTION IS ENTERED
|                                                                      MD1
|                                 DN_1
| +GEQ--------------------+    N20:5                                     1
|-+GRTR THAN OR EQUAL      +----]/[-----------------------------------(JMP)-----
| |Source A    TMR_SCH.ACC|        1
| |                      0|   (2:31)
| |Source B             13|
| |                       |
| +-----------------------+
| T4:61.ACC - (2:33)

Rung 2:36
*******************************************************************************
        JUMPS TO SECTION 2 IF DN_2 IS NOT LATCHED DN_2 GETS LATCHED WHEN THE
SECTION IS ENTERED
|                                                                      MD2
|                                 DN_2
| +GEQ--------------------+    N20:5                                     2
|-+GRTR THAN OR EQUAL      +----]/[-----------------------------------(JMP)-----
| |Source A    TMR_SCH.ACC|        2
| |                      0|   (2:31)
| |Source B             26|
| |                       |
| +-----------------------+
| T4:61.ACC - (2:33)

Rung 2:37
*******************************************************************************
        JUMPS TO SECTION 3 IF DN_3 IS NOT LATCHED DN_3 GETS LATCHED WHEN THE
SECTION IS ENTERED
|                                                                      MD3
|                                 DN_3
| +GEQ--------------------+    N20:5                                     3
|-+GRTR THAN OR EQUAL      +----]/[-----------------------------------(JMP)-----
| |Source A    TMR_SCH.ACC|        3
| |                      0|   (2:31)
| |Source B             39|
| |                       |
| +-----------------------+
| T4:61.ACC - (2:33)

Rung 2:38
*******************************************************************************
        JUMPS TO SECTION 4 IF DN_4 IS NOT LATCHED DN_4 GETS LATCHED WHEN THE
SECTION IS ENTERED
|                                                                      MD4
|                                 DN_4
| +GEQ--------------------+    N20:5                                     4
|-+GRTR THAN OR EQUAL      +----]/[-----------------------------------(JMP)-----
| |Source A    TMR_SCH.ACC|        4
| |                      0|   (2:31)
| |Source B             52|
| |                       |
| +-----------------------+
| T4:61.ACC - (2:33)
```

```
Rung 2:39
|                                                                    NOT END
|                                                                        6
|-------------------------------------------------------------------(JMP)-----
|

Rung 2:40
*******************************************************************************
                                BEGIN SECTION 1
| MD1
|                                                                    DUMMY4
|     1                                                              N20:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                        3

Rung 2:41
|                                                                     DN_1
|                                                                     N20:5
|-------------------------------------------------------------------(L)---
|                                                                         1

Rung 2:42
  Read each T/C and store each T/C's value in its own memory register
|                                                          +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                          |Source A   TC110A1|
|                                                          |               742|
|                                                          |Source B      1000|
|                                                          |                  |
|                                                          |Dest        C110A1|
|                                                          |              1742|
|                                                          +------------------+

Rung 2:43
| +GRT---------------+                                     +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110A1|                                     |Source       16383|
| |              1742|                                     |                  |
| |Source B     16383|                                     |Dest        C110A1|
| |                  |                                     |              1742|
| +------------------+                                     +------------------+
| N7:1 - (2:42)

Rung 2:44
|                                                          +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                          |Source A   TC110A2|
|                                                          |               745|
|                                                          |Source B      1000|
|                                                          |                  |
|                                                          |Dest        C110A2|
|                                                          |              1745|
|                                                          +------------------+
```

```
Rung 2:45
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110A2|                                  |Source       16383|
| |              1745|                                  |                  |
| |Source B     16383|                                  |Dest        C110A2|
| |                  |                                  |              1745|
| +------------------+                                  +------------------+
| N7:2 - (2:44)

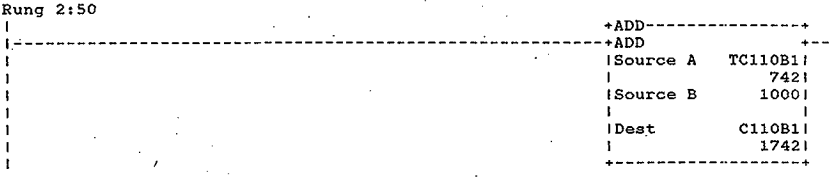
Rung 2:46
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC110A3|
|                                                       |               744|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C110A3|
|                                                       |              1744|
|                                                       +------------------+

Rung 2:47
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110A3|                                  |Source       16383|
| |              1744|                                  |                  |
| |Source B     16383|                                  |Dest        C110A3|
| |                  |                                  |              1744|
| +------------------+                                  +------------------+
| N7:3 - (2:46)

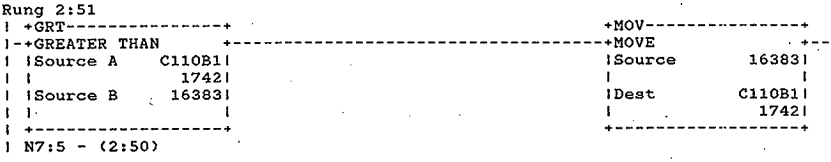
Rung 2:48
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC110A4|
|                                                       |               741|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C110A4|
|                                                       |              1741|
|                                                       +------------------+

Rung 2:49
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110A4|                                  |Source       16383|
| |              1741|                                  |                  |
| |Source B     16383|                                  |Dest        C110A4|
| |                  |                                  |              1741|
| +------------------+                                  +------------------+
| N7:4 - (2:48)
```

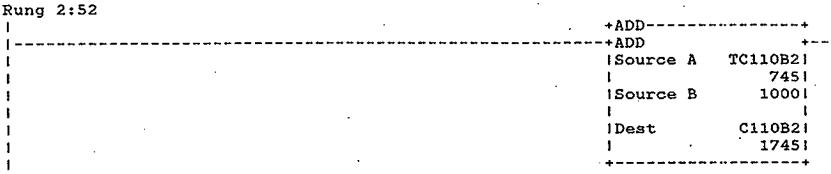
Rung 2:50



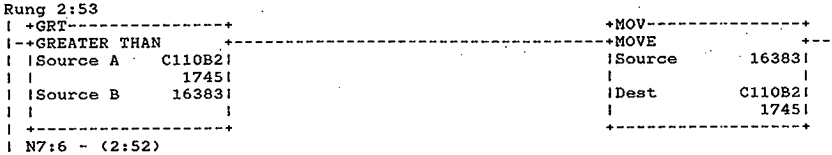
Rung 2:51



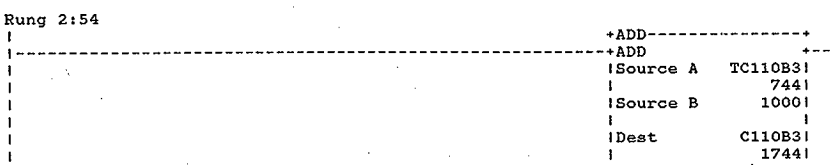
Rung 2:52



Rung 2:53



Rung 2:54



```
Rung 2:55
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110B3|                                  |Source       16383|
| |              1744|                                  |                  |
| |Source B     16383|                                  |Dest        C110B3|
| |                  |                                  |              1744|
| +------------------+                                  +------------------+
| N7:7 - (2:54)

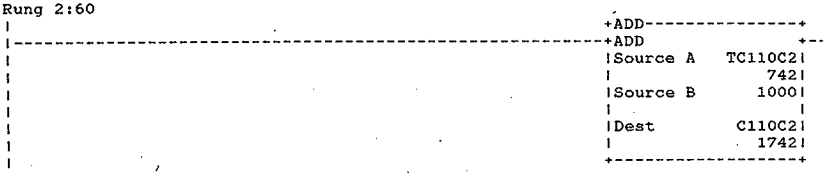
Rung 2:56
|                                                       +ADD---------------+
|-----------------------------------------------------+ADD               +--
|                                                       |Source A   TC110B4|
|                                                       |               740|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C110B4|
|                                                       |              1740|
|                                                       +------------------+

Rung 2:57
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110B4|                                  |Source       16383|
| |              1740|                                  |                  |
| |Source B     16383|                                  |Dest        C110B4|
| |                  |                                  |              1740|
| +------------------+                                  +------------------+
| N7:8 - (2:56)

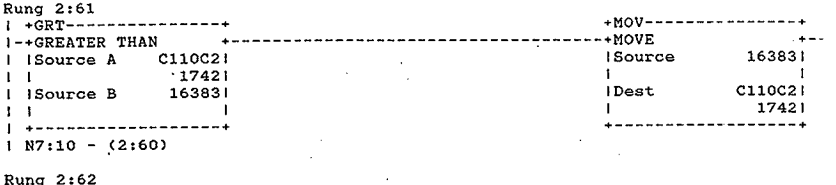
Rung 2:58
|                                                       +ADD---------------+
|-----------------------------------------------------+ADD               +--
|                                                       |Source A   TC110C1|
|                                                       |               740|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C110C1|
|                                                       |              1740|
|                                                       +------------------+

Rung 2:59
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110C1|                                  |Source       16383|
| |              1740|                                  |                  |
| |Source B     16383|                                  |Dest        C110C1|
| |                  |                                  |              1740|
| +------------------+                                  +------------------+
| N7:9 - (2:58)
```

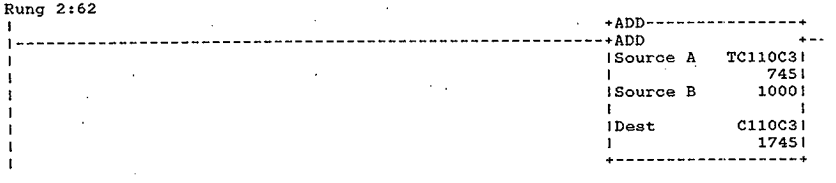
Rung 2:60



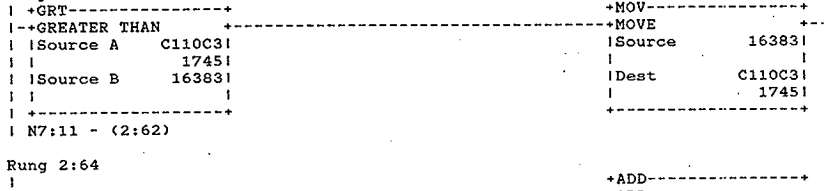
Rung 2:61



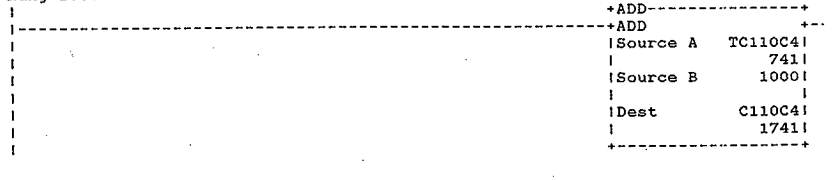
Rung 2:62



Rung 2:63



Rung 2:64



```
Rung 2:65
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C110C4|                                  |Source       16383|
| |              1741|                                  |                  |
| |Source B     16383|                                  |Dest        C110C4|
| |                  |                                  |              1741|
| +------------------+                                  +------------------+
| N7:12 - (2:64)

Rung 2:66
|                                                                T-3003
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC111A1|
|                                                       |               752|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C111A1|
|                                                       |              1752|
|                                                       +------------------+

Rung 2:67
|      T-3003                                                    T-3003
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C111A1|                                  |Source       16383|
| |              1752|                                  |                  |
| |Source B     16383|                                  |Dest        C111A1|
| |                  |                                  |              1752|
| +------------------+                                  +------------------+
| N7:13 - (2:66)

Rung 2:68
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC111A2|
|                                                       |               755|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C111A2|
|                                                       |              1755|
|                                                       +------------------+

Rung 2:69
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C111A2|                                  |Source       16383|
| |              1755|                                  |                  |
| |Source B     16383|                                  |Dest        C111A2|
| |                  |                                  |              1755|
| +------------------+                                  +------------------+
| N7:14 - (2:68)
```

```
Rung 2:70
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC111A3|
|                                                                  |               753|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C111A3|
|                                                                  |              1753|
|                                                                  +------------------+

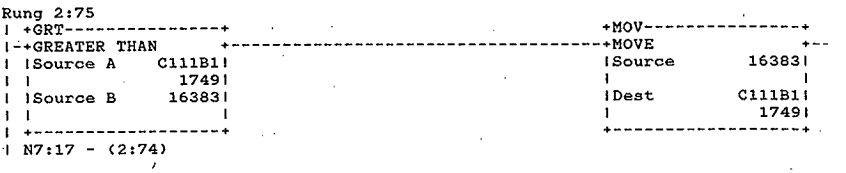
Rung 2:71
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C111A3|                                             |Source       16383|
| |              1753|                                             |                  |
| |Source B     16383|                                             |Dest        C111A3|
| |                  |                                             |              1753|
| +------------------+                                             +------------------+
| N7:15 - (2:70)

Rung 2:72
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC111A4|
|                                                                  |               750|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C111A4|
|                                                                  |              1750|
|                                                                  +------------------+

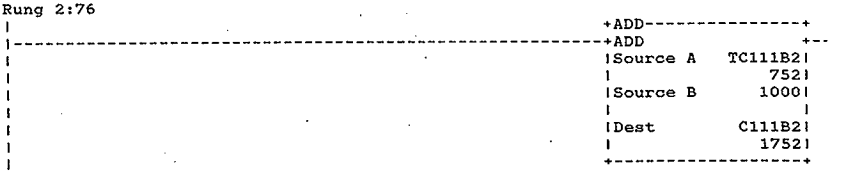
Rung 2:73
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C111A4|                                             |Source       16383|
| |              1750|                                             |                  |
| |Source B     16383|                                             |Dest        C111A4|
| |                  |                                             |              1750|
| +------------------+                                             +------------------+
| N7:16 - (2:72)

Rung 2:74
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC111B1|
|                                                                  |               749|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C111B1|
|                                                                  |              1749|
|                                                                  +------------------+
```

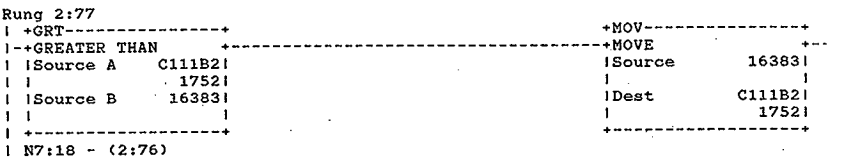
Rung 2:75



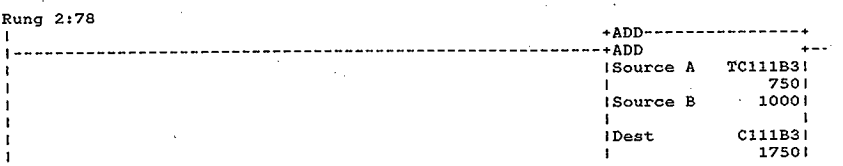
Rung 2:76



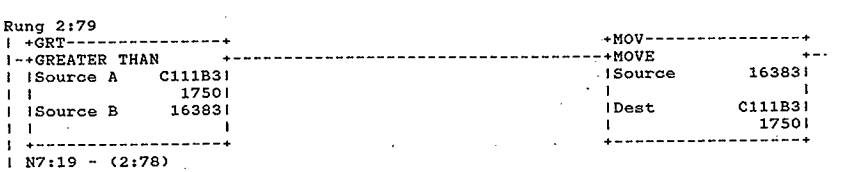
Rung 2:77



Rung 2:78



Rung 2:79



```
Rung 2:80
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD               +--
|                                                                |Source A   TC111B4|
|                                                                |               749|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C111B4|
|                                                                |              1749|
|                                                                +------------------+

Rung 2:81
| +GRT---------------+                                           +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C111B4|                                           |Source       16383|
| |              1749|                                           |                  |
| |Source B     16383|                                           |Dest        C111B4|
| |                  |                                           |              1749|
| +------------------+                                           +------------------+
| N7:20 - (2:80)

Rung 2:82
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD               +--
|                                                                |Source A   TC111C1|
|                                                                |               747|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C111C1|
|                                                                |              1747|
|                                                                +------------------+

Rung 2:83
| +GRT---------------+                                           +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C111C1|                                           |Source       16383|
| |              1747|                                           |                  |
| |Source B     16383|                                           |Dest        C111C1|
| |                  |                                           |              1747|
| +------------------+                                           +------------------+
| N7:21 - (2:82)

Rung 2:84
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD               +-
|                                                                |Source A   TC111C2|
|                                                                |               752|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C111C2|
|                                                                |              1752|
|                                                                +------------------+
```

```
Rung 2:85
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C111C2|                                  |Source       16383|
| |              1752|                                  |                  |
| |Source B     16383|                                  |Dest        C111C2|
| |                  |                                  |              1752|
| +------------------+                                  +------------------+
| N7:22 - (2:84)

Rung 2:86
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC111C3|
|                                                       |               749|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C111C3|
|                                                       |              1749|
|                                                       +------------------+

Rung 2:87
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C111C3|                                  |Source       16383|
| |              1749|                                  |                  |
| |Source B     16383|                                  |Dest        C111C3|
| |                  |                                  |              1749|
| +------------------+                                  +------------------+
| N7:23 - (2:86)

Rung 2:88
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC111C4|
|                                                       |               751|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C111C4|
|                                                       |              1751|
|                                                       +------------------+

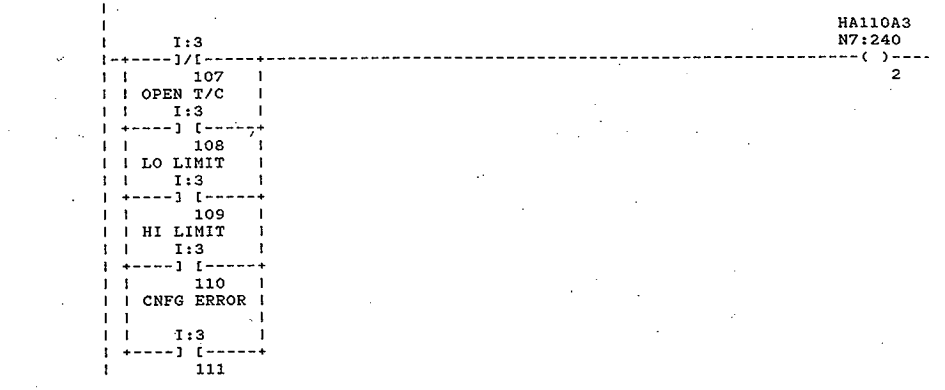
Rung 2:89
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C111C4|                                  |Source       16383|
| |              1751|                                  |                  |
| |Source B     16383|                                  |Dest        C111C4|
| |                  |                                  |              1751|
| +------------------+                                  +------------------+
| N7:24 - (2:88)
```

```
Rung 2:90
*******************************************************************************
        For each T/C read its STATUS BITS to detect T/C problems
                        HARDWARE ALARMS FOR TANK T-3002

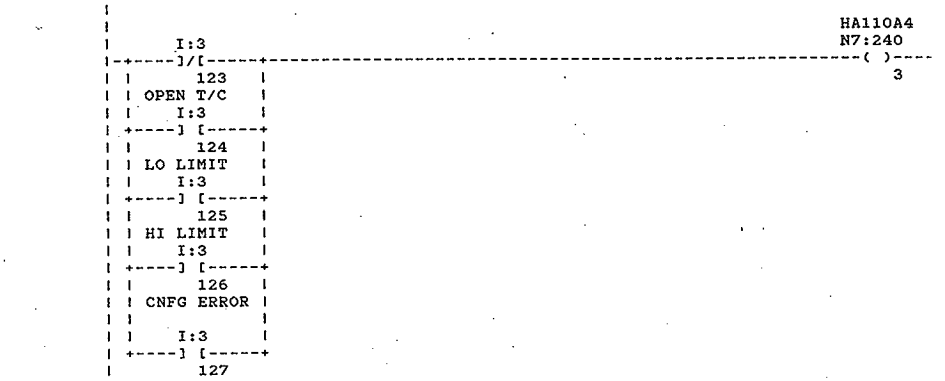
|   T/C ENABLE
|
|                                                                    HA110A1
|      I:3                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |      75    |                                                         0
| | OPEN T/C   |
| |    I:3     |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |    I:3     |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |    I:3     |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |            |
| |    I:3     |
| +----] [-----+
|        79

Rung 2:91
|
|
|
|   T/C ENABLE
|
|                                                                    HA110A2
|      I:3                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |      91    |                                                         1
| | OPEN T/C   |
| |    I:3     |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |    I:3     |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |    I:3     |
| +----] [-----+
| |      94    |
| | CNFG ERROR |
| |            |
| |    I:3     |
| +----] [-----+
|        95
```

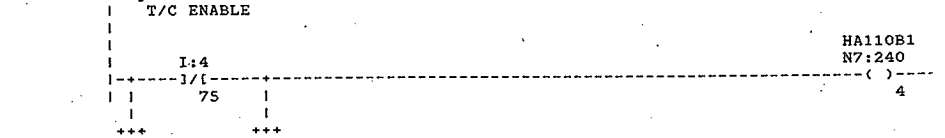
Rung 2:92



Rung 2:93



Rung 2:94



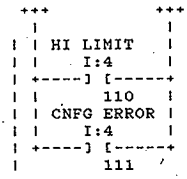
```
 +++          +++
  |            |
| | OPEN T/C   |
| |    I:4     |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |    I:4     |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |    I:4     |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |    I:4     |
| +----] [-----+
|        79
```

Rung 2:95

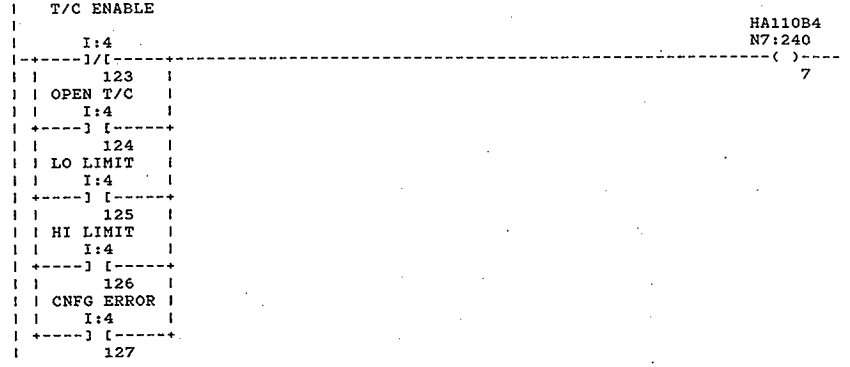
```
|   T/C ENABLE
|                                                                    HA110B2
|      I:4                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |      91    |                                                          5
| | OPEN T/C   |
| |    I:4     |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |    I:4     |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |    I:4     |
| +----] [-----+
| |      94    |
| | CNFG ERROR |
| |    I:4     |
| +----] [-----+
|        95
```

Rung 2:96

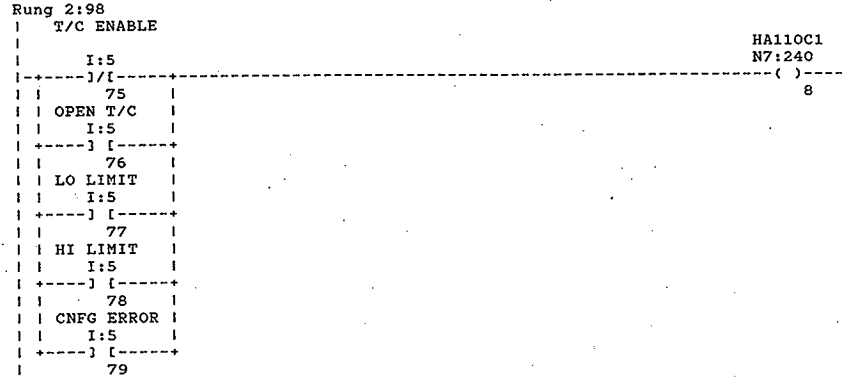
```
|   T/C ENABLE
|                                                                    HA110B3
|      I:4                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |      107   |                                                          6
| | OPEN T/C   |
| |    I:4     |
| +----] [-----+
| |      108   |
| | LO LIMIT   |
| |    I:4     |
| +----] [-----+
| |      109   |
  |            |
 +++          +++
```

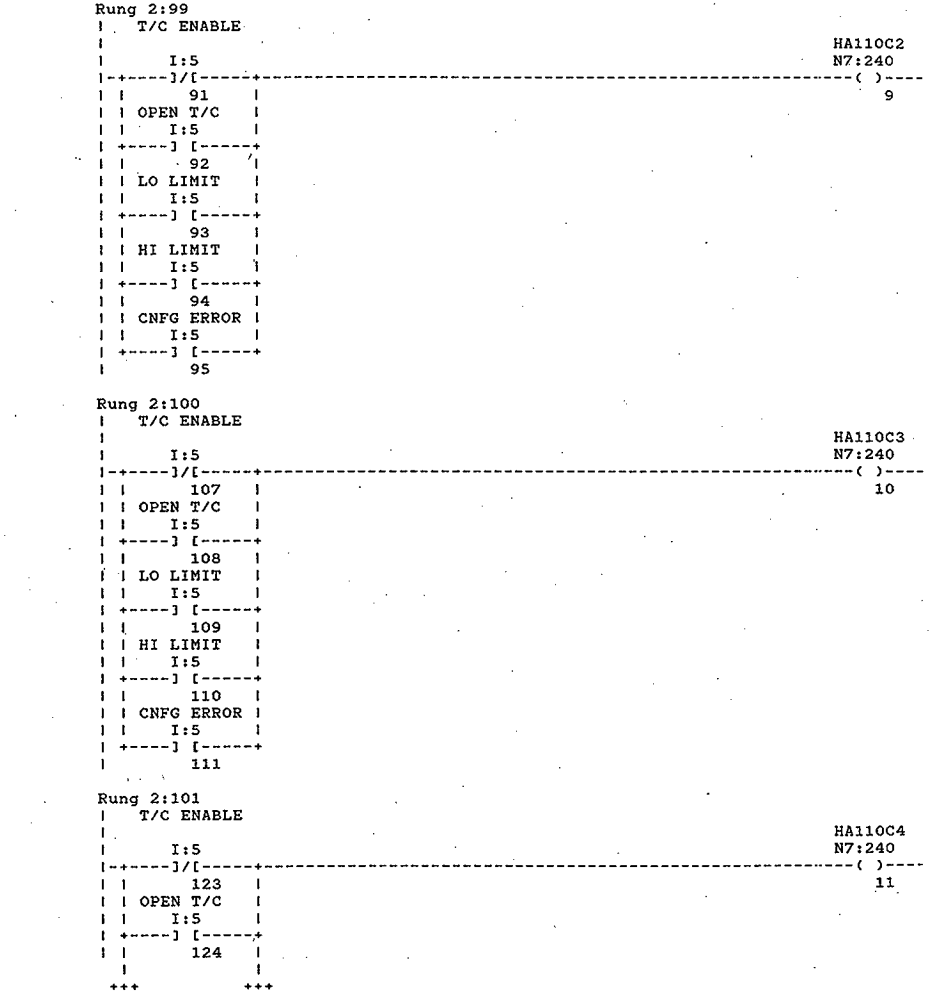


Rung 2:97



Rung 2:98




Rung 2:99
T/C ENABLE
I:5
91
OPEN T/C
I:5
92
LO LIMIT
I:5
93
HI LIMIT
I:5
94
CNFG ERROR
I:5
95
HA110C2
N7:240
9
Rung 2:100
T/C ENABLE
I:5
107
OPEN T/C
I:5
108
LO LIMIT
I:5
109
HI LIMIT
I:5
110
CNFG ERROR
I:5
111
HA110C3
N7:240
10
Rung 2:101
T/C ENABLE
I:5
123
OPEN T/C
I:5
124
HA110C4
N7:240
11

```
 +++          +++
  |            |
| | LO LIMIT   |
| |    I:5     |
| +----] [-----+
| |      125   |
| | HI LIMIT   |
| |    I:5     |
| +----] [-----+
| |      126   |
| | CNFG ERROR |
| |    I:5     |
| +----] [-----+
|        127
```

Rung 2:102

```
*******************************************************************************
        for each T/C read its STATUS BITS to detect T/C problems
                        HARDWARE ALARMS FOR TANK T-3003
|   T/C ENABLE
|                                                                    HA111A1
|      I:6                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |      75    |                                                        12
| | OPEN T/C   |
| |    I:6     |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |    I:6     |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |    I:6     |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |    I:6     |
| +----] [-----+
|        79
```

Rung 2:103

```
|   T/C ENABLE
|                                                                    HA111A2
|      I:6                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |      91    |                                                        13
| | OPEN T/C   |
| |    I:6     |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |    I:6     |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |    I:6     |
| +----] [-----+
| |      94    |
  |            |
 +++          +++
```

```
 +++           +++
  |             |
| | CNFG ERROR  |
| |    I:6      |
| +----] [------+
|        95
```

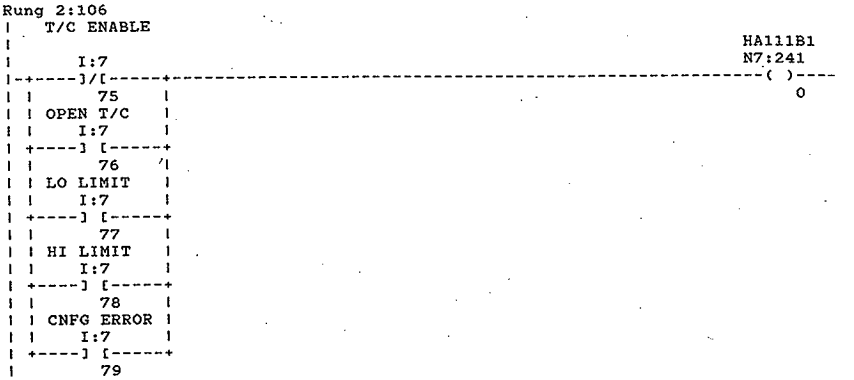
Rung 2:104

```
|   T/C ENABLE
|                                                                    HA111A3
|      I:6                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |       107   |                                                      14
| | OPEN T/C    |
| |    I:6      |
| +----] [-----+
| |       108   |
| | LO LIMIT    |
| |    I:6      |
| +----] [-----+
| |       109   |
| | HI LIMIT    |
| |    I:6      |
| +----] [-----+
| |       110   |
| | CNFG ERROR  |
| |    I:6      |
| +----] [-----+
|        111
```

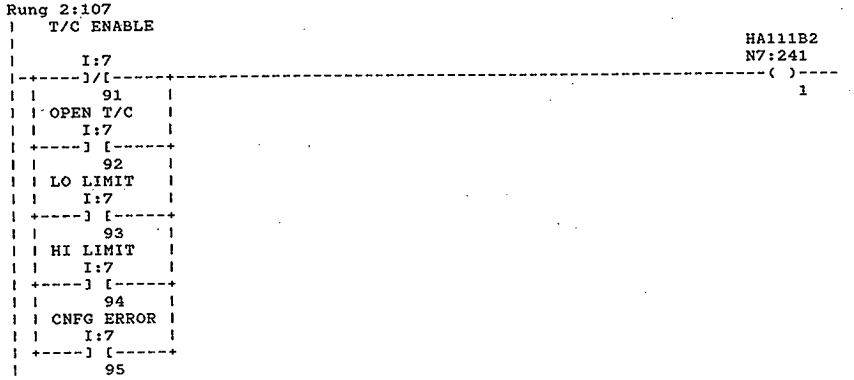
Rung 2:105

```
|   T/C ENABLE
|                                                                    HA111A4
|      I:6                                                           N7:240
|-+----]/[-----+-------------------------------------------------------( )----
| |       123   |                                                      15
| | OPEN T/C    |
| |    I:6      |
| +----] [-----+
| |       124   |
| | LO LIMIT    |
| |    I:6      |
| +----] [-----+
| |       125   |
| | HI LIMIT    |
| |    I:6      |
| +----] [-----+
| |       126   |
| | CNFG ERROR  |
| |    I:6      |
| +----] [-----+
|        127
```

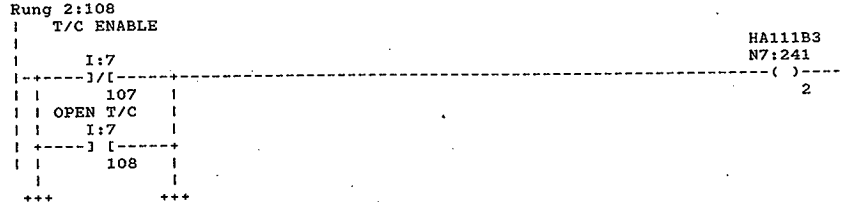
Rung 2:106

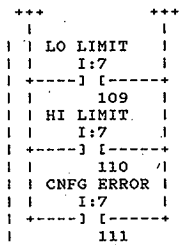


Rung 2:107

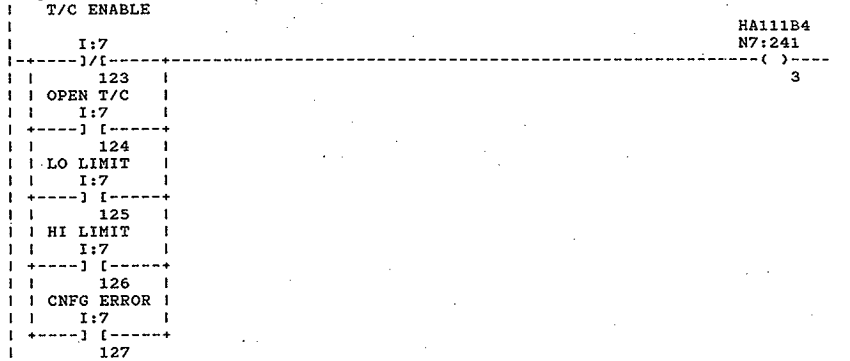


Rung 2:108

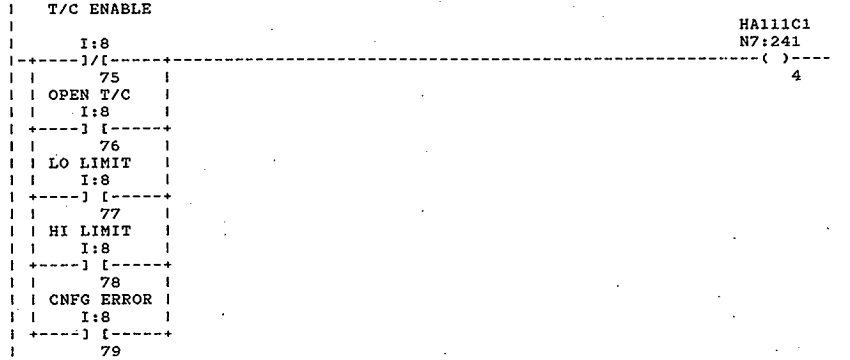




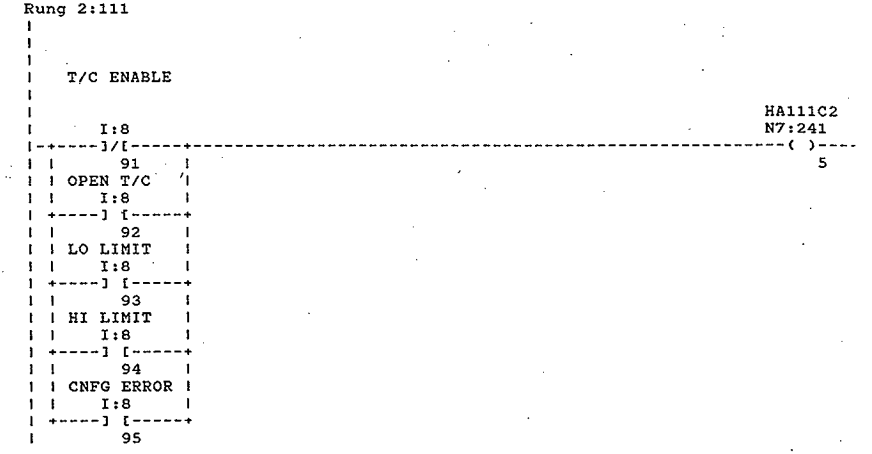
Rung 2:109



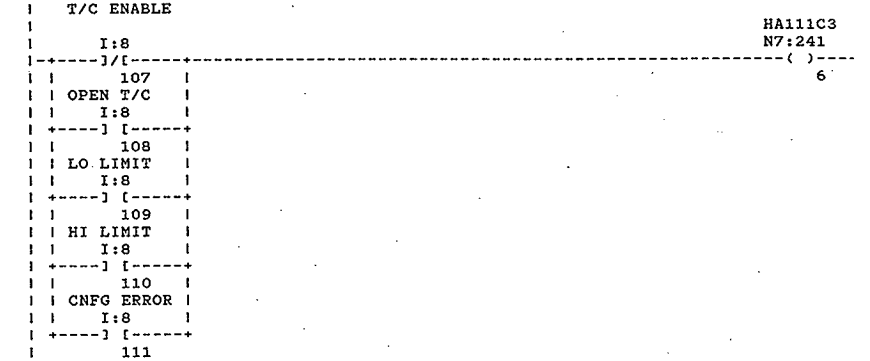
Rung 2:110



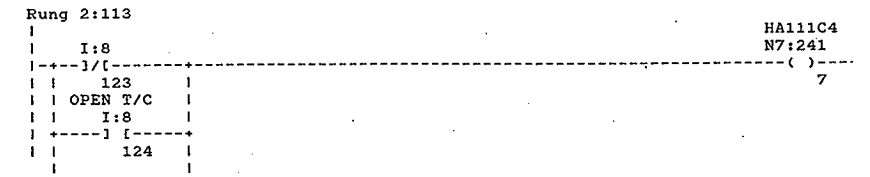
Rung 2:111

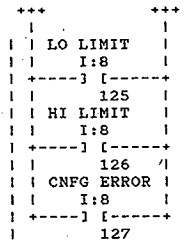


Rung 2:112



Rung 2:113





Rung 2:114

READ STATUS OF PRESSURE SWITCHES

PSH_3001 I:2 0 → PSH_1 N7:246 0

Rung 2:115

PSH_3002 I:2 1 → PSH_2 N7:246 1

Rung 2:116

PSH_3003 I:2 2 → PSH_3 N7:246 2

Rung 2:117

PSH_3004 I:2 3 → PSH_4 N7:246 3

Rung 2:118

SET DEVIATION SWITCH FOR SECTION_1 AND JUMP TO SECTION 1 AVERAGING ROUTINE

DEV_1 N20:6 (L) 1

AV1 13 (JMP)

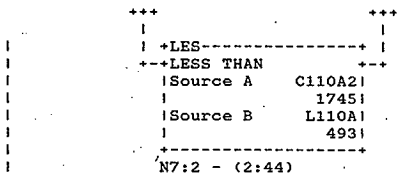
Rung 2:119

DEV1 9 [LBL] → DUMMY5 N20:7 4

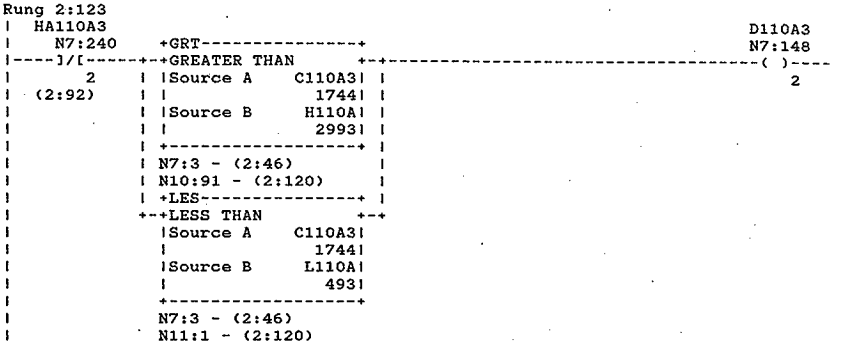
```
Rung 2:120
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV110A| |
|                                                       | |              1743| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H110A| |
|                                                       | |              2993| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV110A|
|                                                         |              1743|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L110A|
|                                                         |               493|
|                                                         +------------------+

Rung 2:121
|  HA110A1                                                                  D110A1
|    N7:240     +GRT---------------+                                        N7:148
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A    C110A1| |                                        0
|  (2:90)    | |              1742| |
|            | |Source B     H110A| |
|            | |              2993| |
|            | +------------------+ |
|            | N7:1 - (2:42)        |
|            | N10:91 - (2:120)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C110A1|
|              |              1742|
|              |Source B     L110A|
|              |               493|
|              +------------------+
|              N7:1 - (2:42)
|              N11:1 - (2:120)

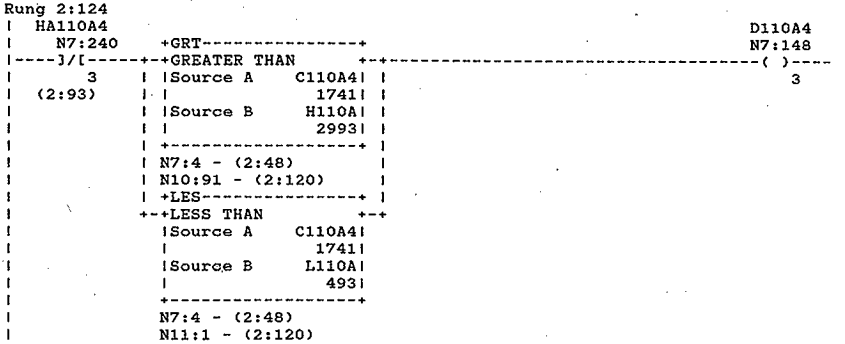
Rung 2:122
|  HA110A2                                                                  D110A2
|    N7:240     +GRT---------------+                                        N7:148
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       1    | |Source A    C110A2| |                                        1
|  (2:91)    | |              1745| |
|            | |Source B     H110A| |
|            | |              2993| |
|            | +------------------+ |
|            | N7:2 - (2:44)        |
|            | N10:91 - (2:120)     |
             |                      |
            +++                    +++
```



Rung 2:123

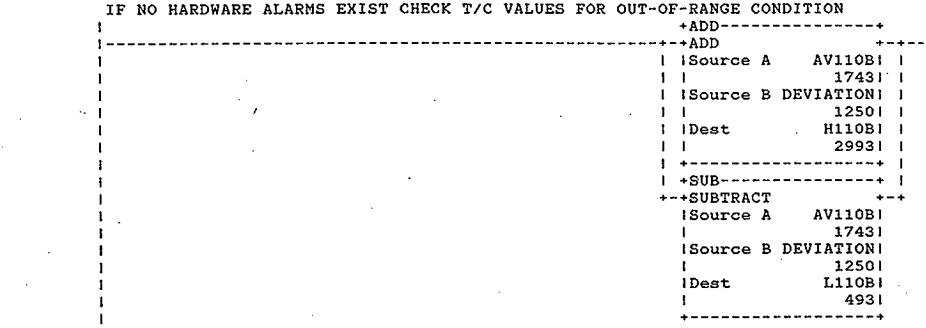


Rung 2:124

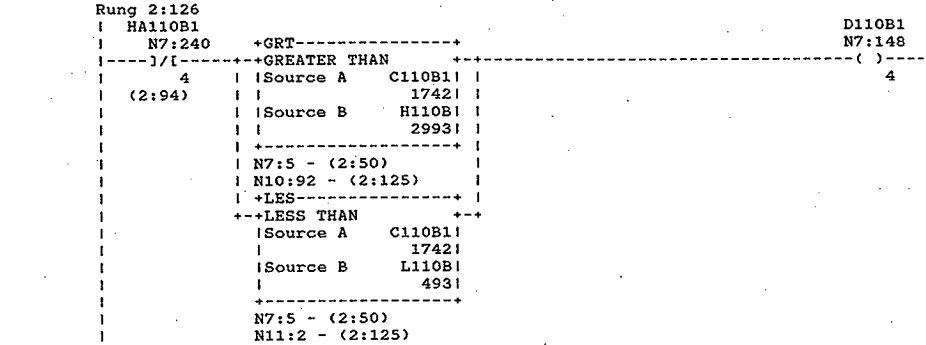


Rung 2:125

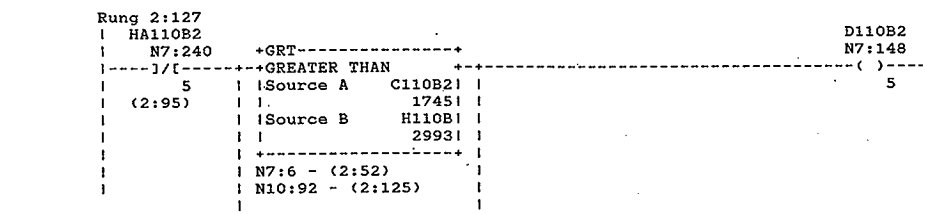
```
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```

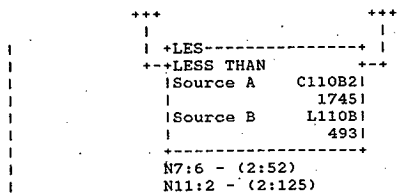


Rung 2:126

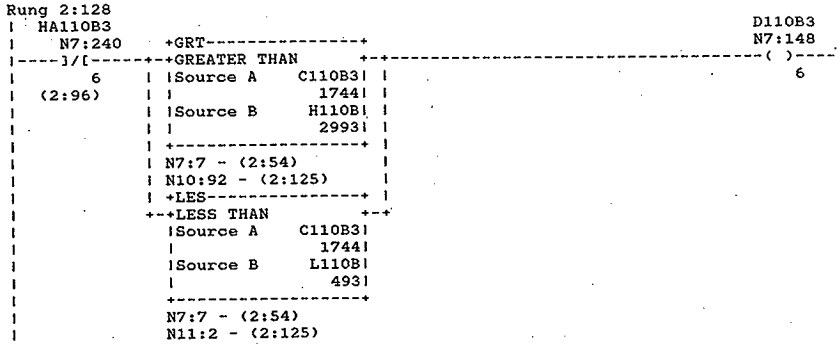


Rung 2:127

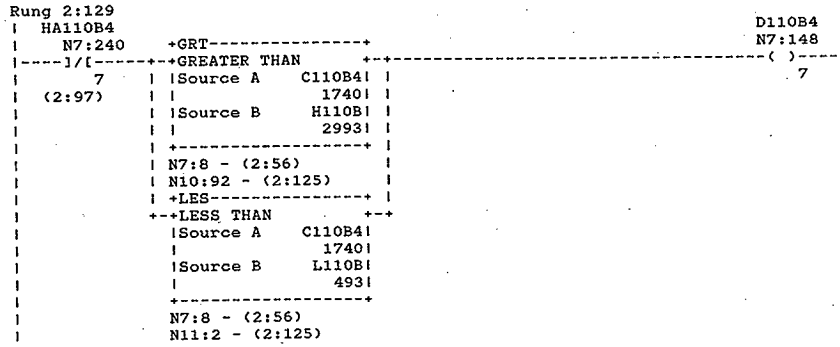




Rung 2:128

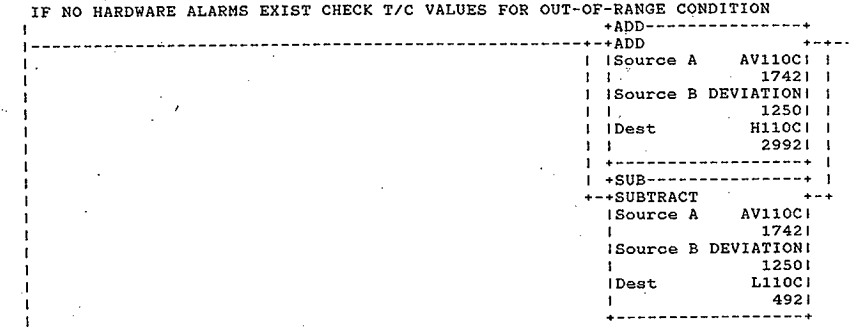


Rung 2:129

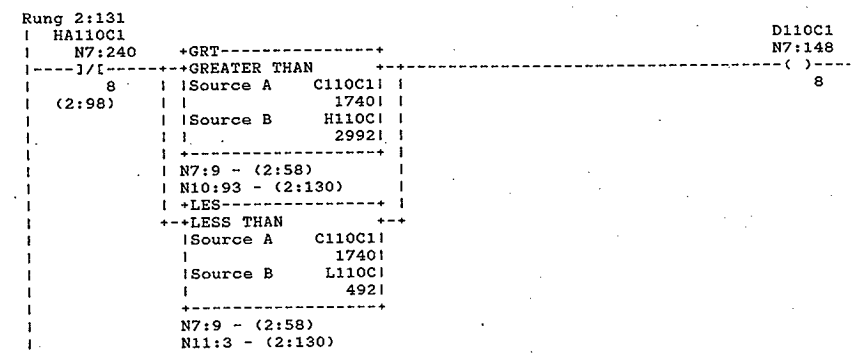


Rung 2:130

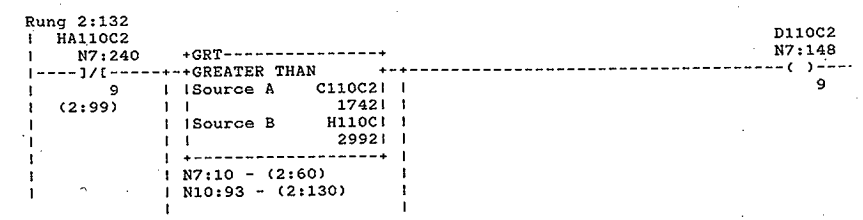
```
********************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```

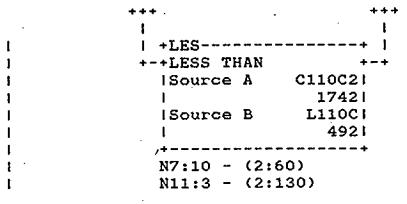


Rung 2:131

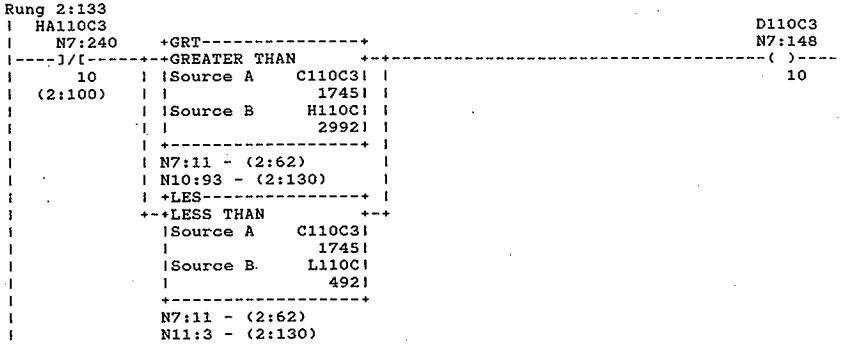


Rung 2:132

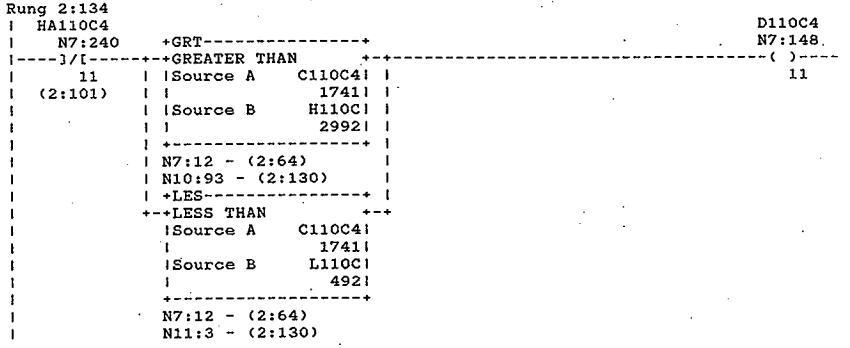




Rung 2:133



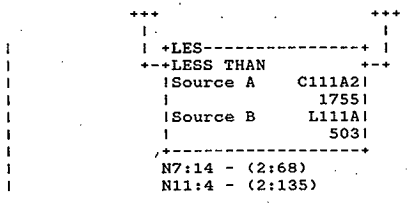
Rung 2:134



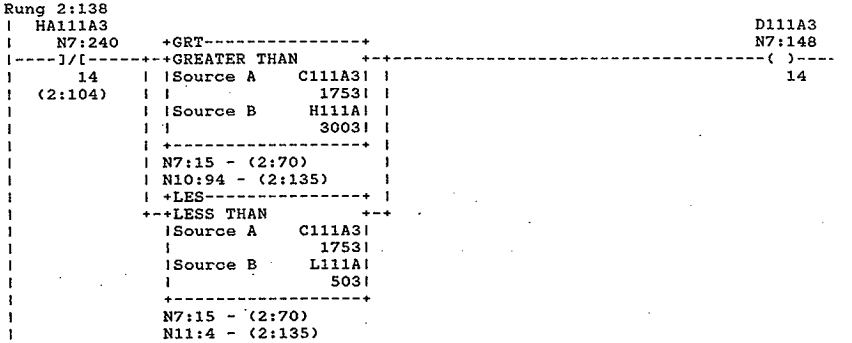
```
Rung 2:135
*******************************************************************************
       ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV111A| |
|                                                       | |              1753| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H111A| |
|                                                       | |              3003| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV111A|
|                                                         |              1753|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L111A|
|                                                         |               503|
|                                                         +------------------+

Rung 2:136
|                    T-3003
|  HA111A1                                                                D111A1
|    N7:240    +GRT---------------+                                       N7:148
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      12    | |Source A    C111A1| |                                      12
|  (2:102)   | |              1752| |
|            | |Source B     H111A| |
|            | |              3003| |
|            | +------------------+ |
|            | N7:13 - (2:66)       |
|            | N10:94 - (2:135)     |
|            |      T-3003          |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C111A1|
|              |              1752|
|              |Source B     L111A|
|              |               503|
|              +------------------+
|              N7:13 - (2:66)
|              N11:4 - (2:135)

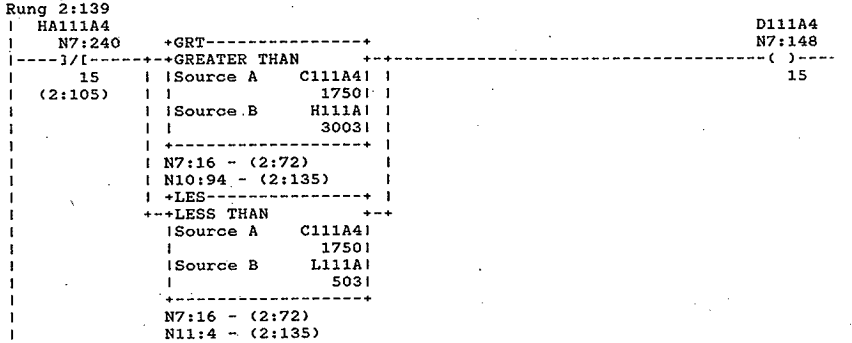
Rung 2:137
|  HA111A2                                                                D111A2
|    N7:240    +GRT---------------+                                       N7:148
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      13    | |Source A    C111A2| |                                      13
|  (2:103)   | |              1755| |
|            | |Source B     H111A| |
|            | |              3003| |
|            | +------------------+ |
|            | N7:14 - (2:68)       |
|            | N10:94 - (2:135)     |
|            |                      |
            +++                    +++
```



Rung 2:138



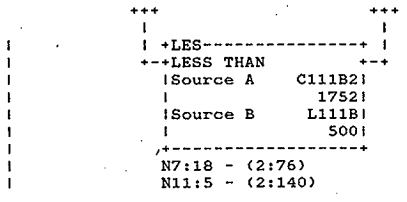
Rung 2:139



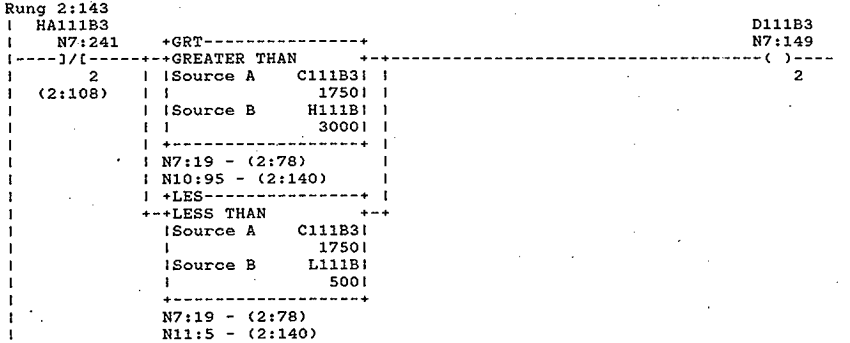
```
Rung 2:140
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+-
|                                                       | |Source A    AV111B| |
|                                                       | |              1750| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H111B| |
|                                                       | |              3000| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV111B|
|                                                         |              1750|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L111B|
|                                                         |               500|
|                                                         +------------------+

Rung 2:141
|  HA111B1                                                                  D111B1
|    N7:241     +GRT---------------+                                        N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A    C111B1| |                                        0
|  (2:106)   | |              1749| |
|            | |Source B     H111B| |
|            | |              3000| |
|            | +------------------+ |
|            | N7:17 - (2:74)       |
|            | N10:95 - (2:140)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C111B1|
|              |              1749|
|              |Source B     L111B|
|              |               500|
|              +------------------+
|              N7:17 - (2:74)
|              N11:5 - (2:140)

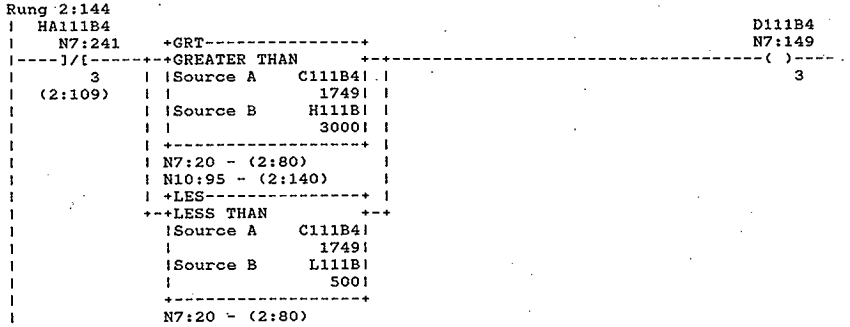
Rung 2:142
|  HA111B2                                                                  D111B2
|    N7:241     +GRT---------------+                                        N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       1    | |Source A    C111B2| |                                        1
|  (2:107)   | |              1752| |
|            | |Source B     H111B| |
|            | |              3000| |
|            | +------------------+ |
|            | N7:18 - (2:76)       |
|            | N10:95 - (2:140)     |
             |                      |
            +++                    +++
```



Rung 2:143



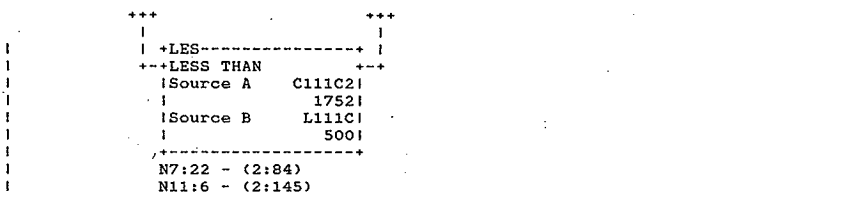
Rung 2:144



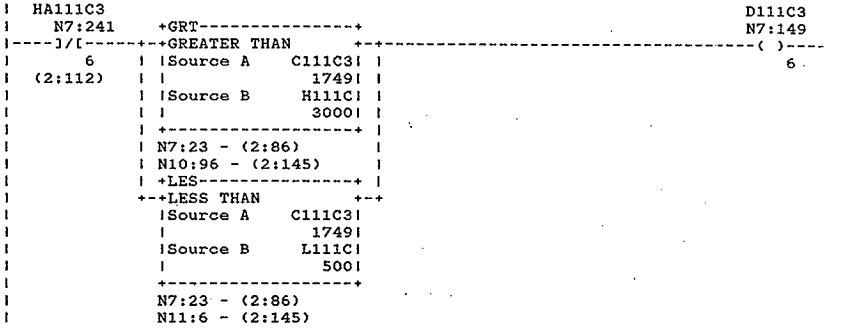
```
Rung 2:145
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV111C| |
|                                                       | |              1750| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H111C| |
|                                                       | |              3000| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV111C|
|                                                         |              1750|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L111C|
|                                                         |               500|
|                                                         +------------------+

Rung 2:146
|  HA111C1                                                                  D111C1
|    N7:241     +GRT---------------+                                        N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       4    | |Source A    C111C1| |                                        4
|  (2:110)   | |              1747| |
|            | |Source B     H111C| |
|            | |              3000| |
|            | +------------------+ |
|            | N7:21 - (2:82)       |
|            | N10:96 - (2:145)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C111C1|
|              |              1747|
|              |Source B     L111C|
|              |               500|
|              +------------------+
|              N7:21 - (2:82)
|              N11:6 - (2:145)

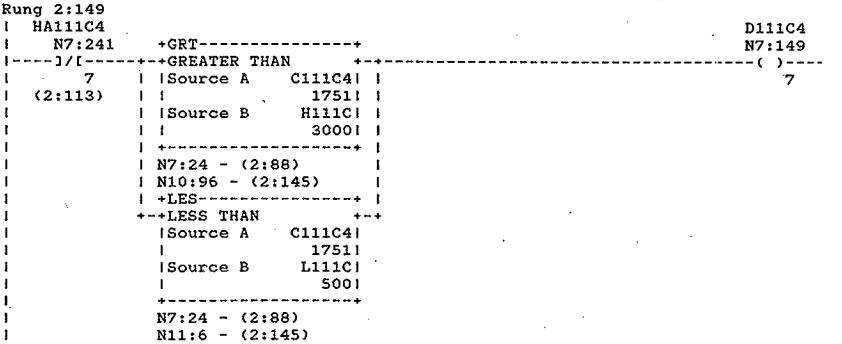
Rung 2:147
|  HA111C2                                                                  D111C2
|    N7:241     +GRT---------------+                                        N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       5    | |Source A    C111C2| |                                        5
|  (2:111)   | |              1752| |
|            | |Source B     H111C| |
|            | |              3000| |
|            | +------------------+ |
|            | N7:22 - (2:84)       |
|            | N10:96 - (2:145)     |
             |                      |
            +++                    +++
```



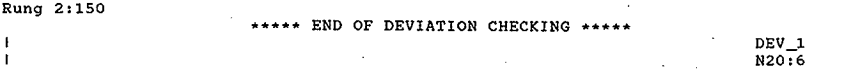
Rung 2:148



Rung 2:149



Rung 2:150



Rung 2:151

```
| AV1
|                                                                    DUMMY6
|      13                                                            N20:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                      5
```

Rung 2:152

```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
|                                                    +CLR----------------+
|----------------------------------------------------+-+CLEAR            +-+--
|                                                    | |Dest         COUNT| |
|                                                    | |                 4| |
|                                                    | +------------------+ |
|                                                    | +CLR----------------+ |
|                                                    +-+CLEAR            +-+
|                                                      |Dest          TOTAL|
|                                                      |           3472.000|
|                                                      +-------------------+
```

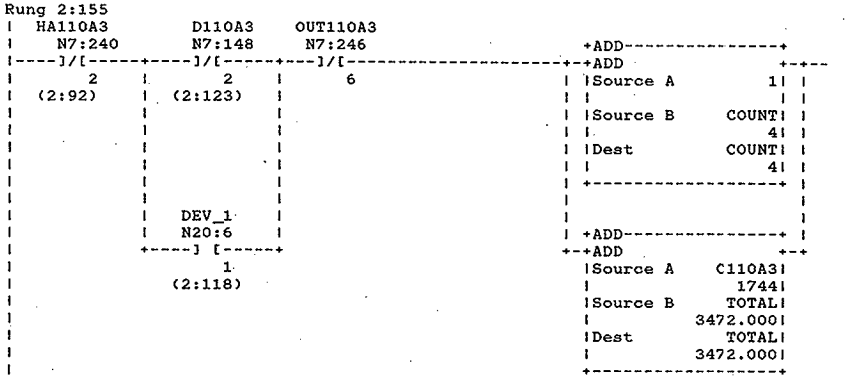
Rung 2:153

```
|  HA110A1        D110A1     OUT110A1
|    N7:240       N7:148      N7:246                   +ADD----------------+
|----]/[-----+----]/[-----+---]/[--------------------+-+ADD                +-+--
|       0    |       0    |      4                  | |Source A         1| |
|  (2:90)    |  (2:121)   |                         | |                  | |
|            |            |                         | |Source B     COUNT| |
|            |            |                         | |                 4| |
|            |            |                         | |Dest         COUNT| |
|            |            |                         | |                 4| |
|            |            |                         | +------------------+ |
|            |            |                         |                      |
|            |   DEV_1    |                         |                      |
|            |   N20:6    |                         | +ADD----------------+ |
|            +----] [-----+                         +-+ADD                +-+
|                  1                                  |Source A     C110A1|
|               (2:118)                               |                1742|
|                                                     |Source B      TOTAL|
|                                                     |           3472.000|
|                                                     |Dest          TOTAL|
|                                                     |           3472.000|
|                                                     +-------------------+
|
```

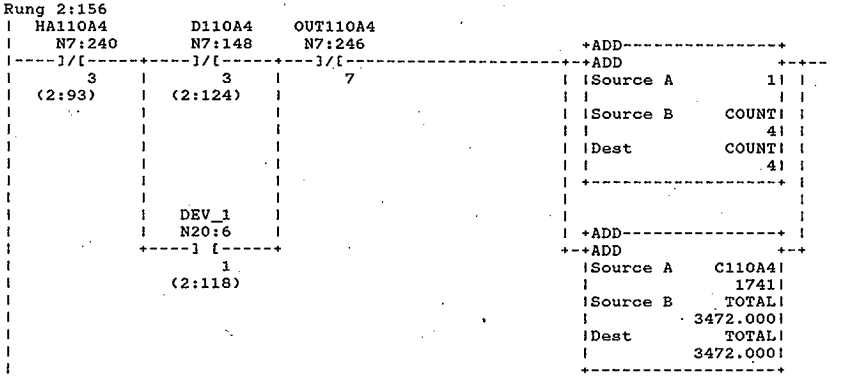
Rung 2:154

```
|  HA110A2        D110A2     OUT110A2
|    N7:240       N7:148      N7:246                   +ADD----------------+
|----]/[-----+----]/[-----+---]/[--------------------+-+ADD                +-+--
|       1    |       1    |      5                  | |Source A         1| |
|  (2:91)    |  (2:122)   |                         | |                  | |
|            |            |                         | |Source B     COUNT| |
|            |            |                         | |                 4| |
|            |            |                         | |Dest         COUNT| |
|            |            |                         | |                 4| |
|            |            |                         | +------------------+ |
|            |            |                         |                      |
|           +++          +++                       +++                    +++
```

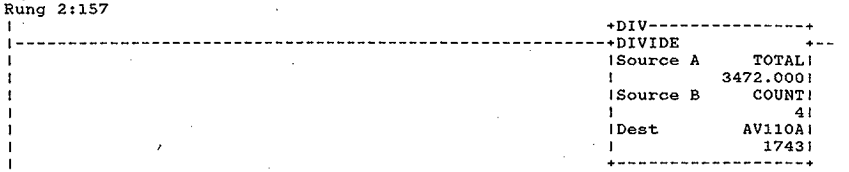
Rung 2:155



Rung 2:156

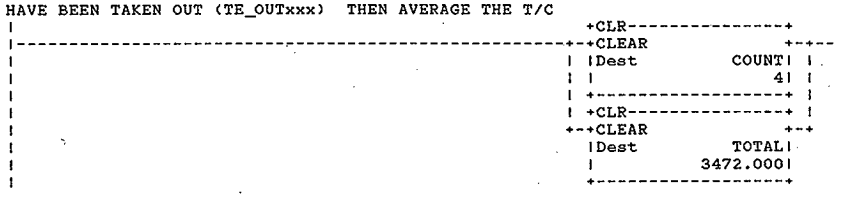


Rung 2:157

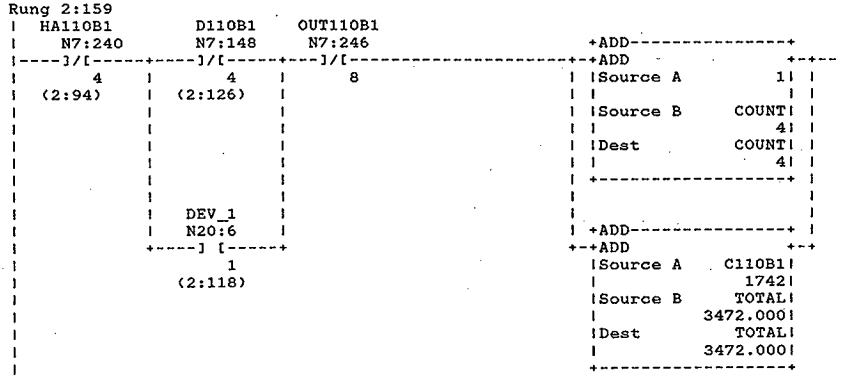


Rung 2:158

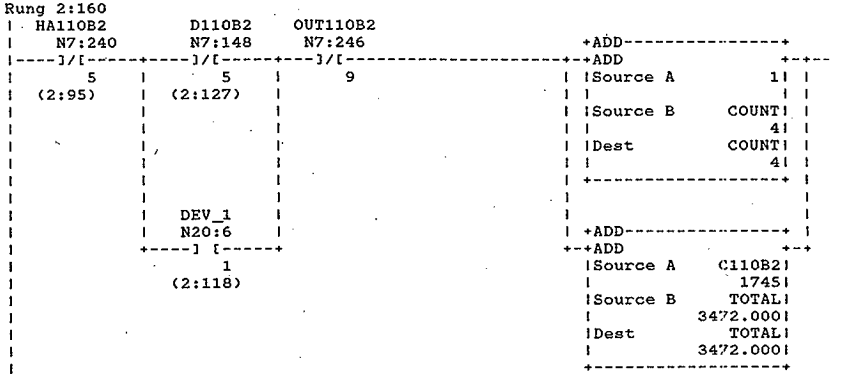
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



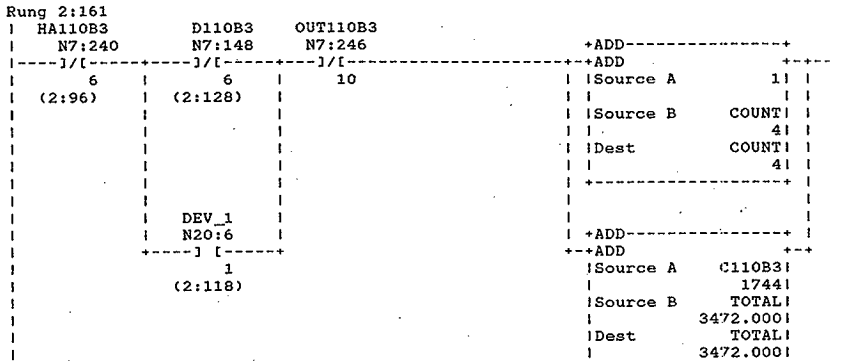
Rung 2:159



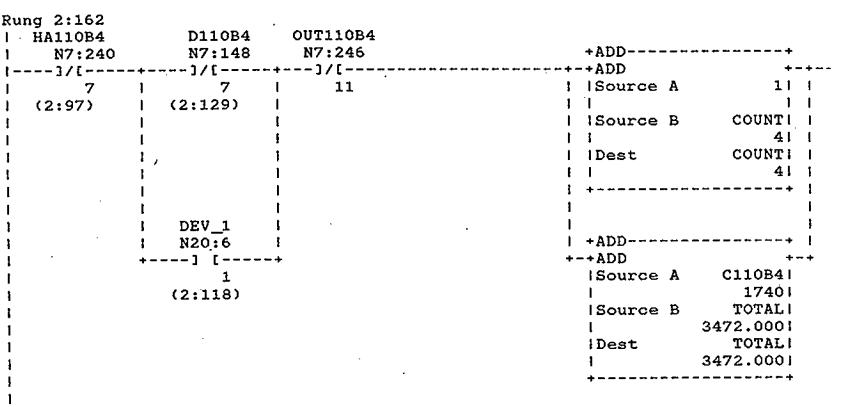
Rung 2:160



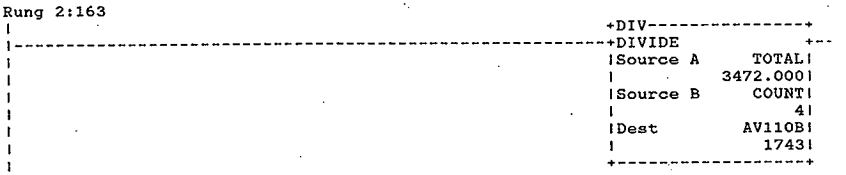
Rung 2:161



Rung 2:162

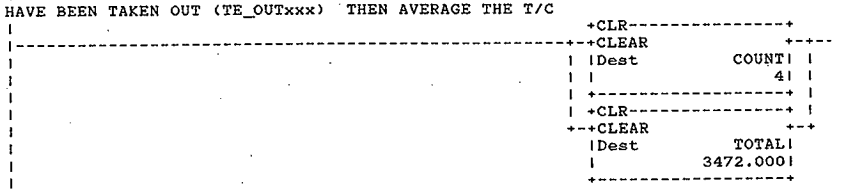


Rung 2:163

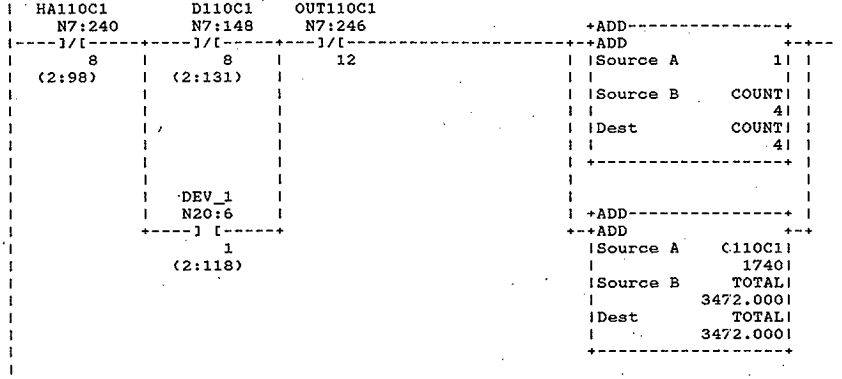


Rung 2:164

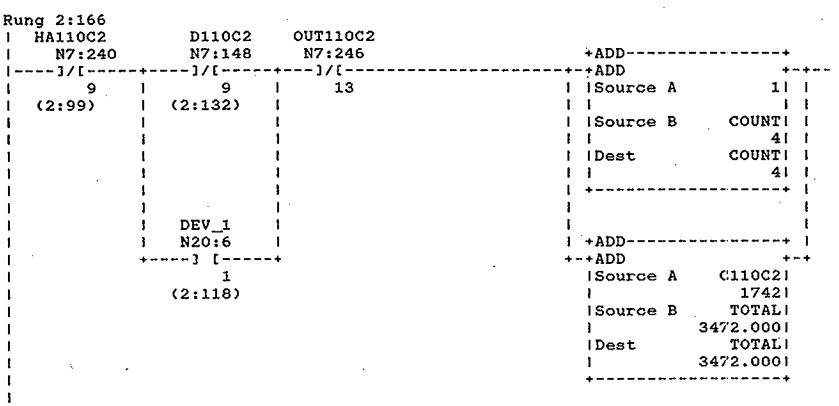
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```



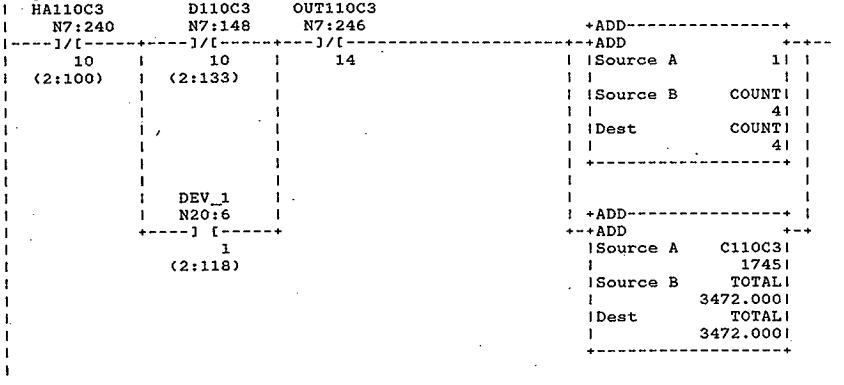
Rung 2:165



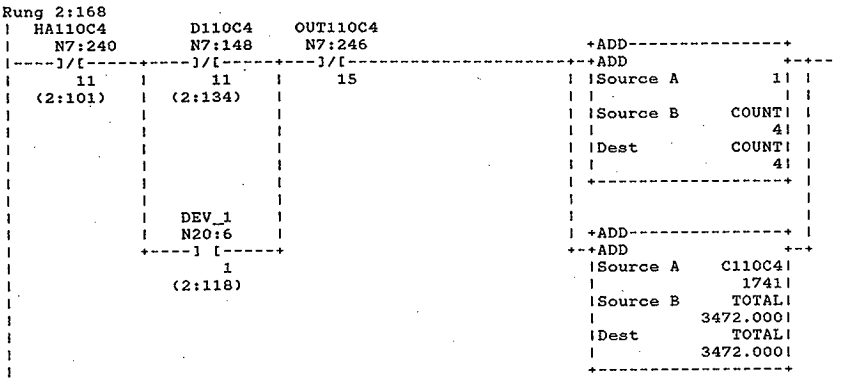
Rung 2:166



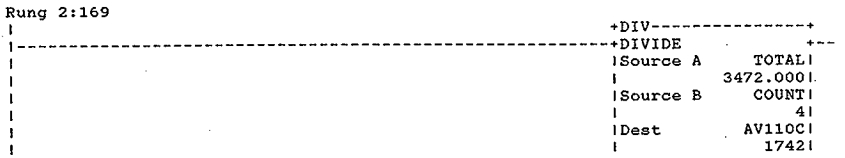
Rung 2:167



Rung 2:168

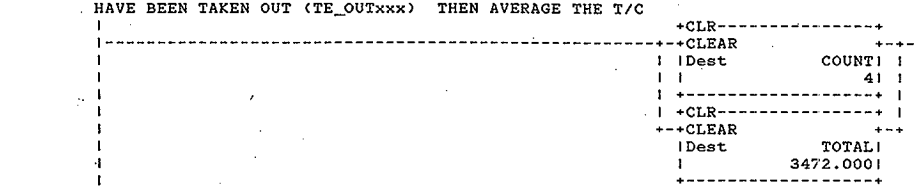


Rung 2:169

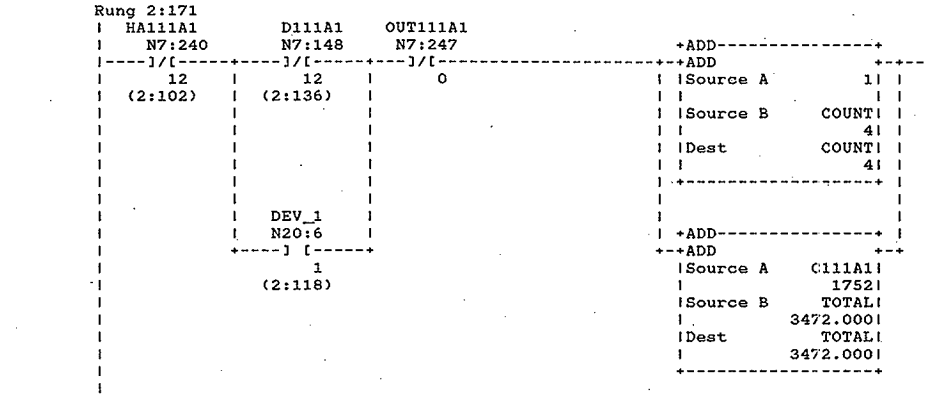


Rung 2:170

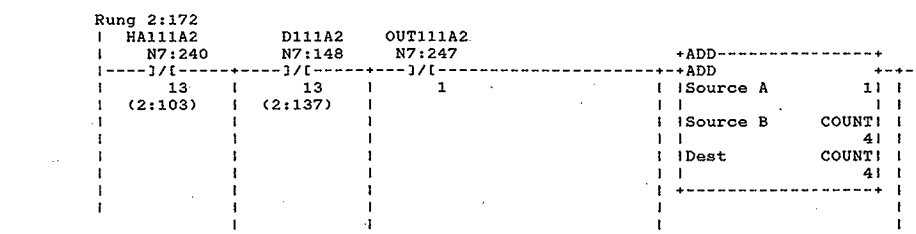
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



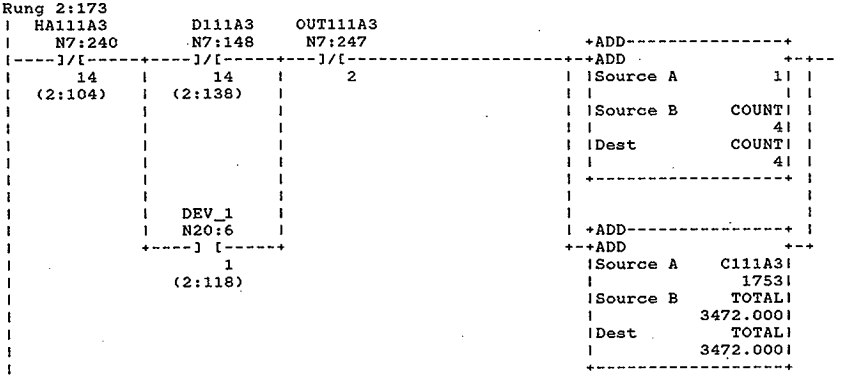
Rung 2:171



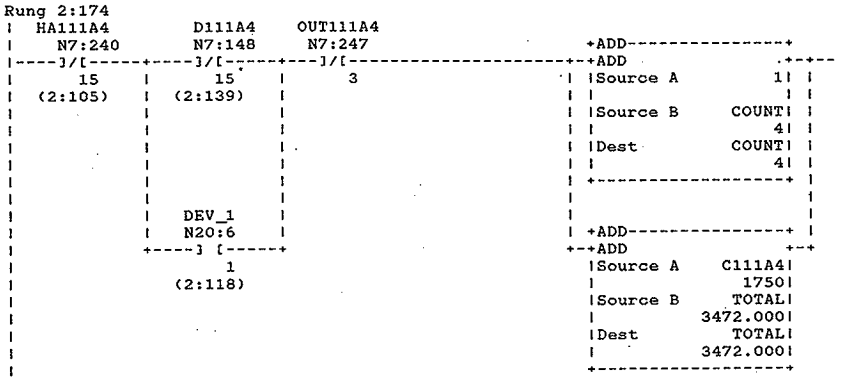
Rung 2:172



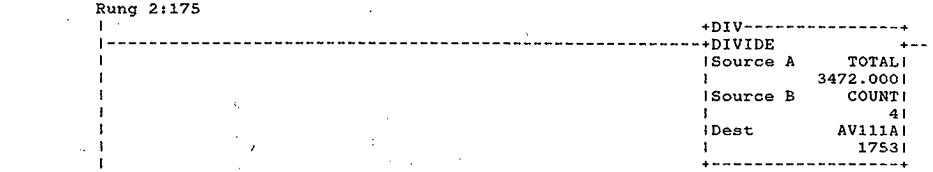
Rung 2:173



Rung 2:174

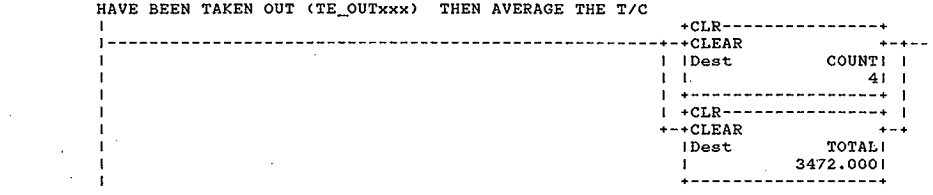


Rung 2:175

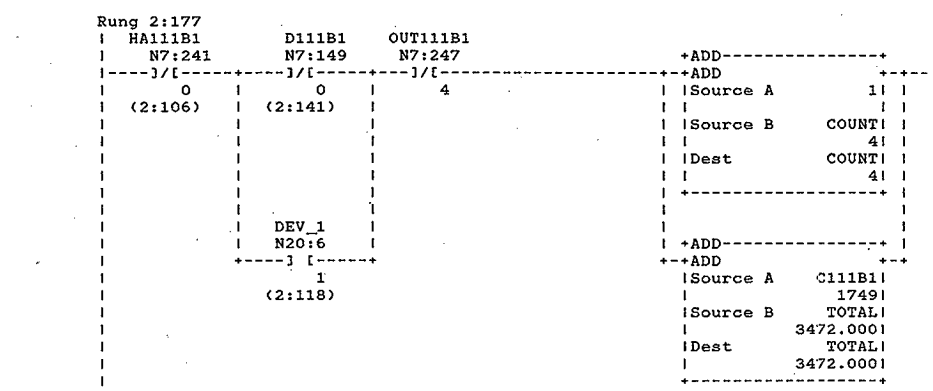


Rung 2:176

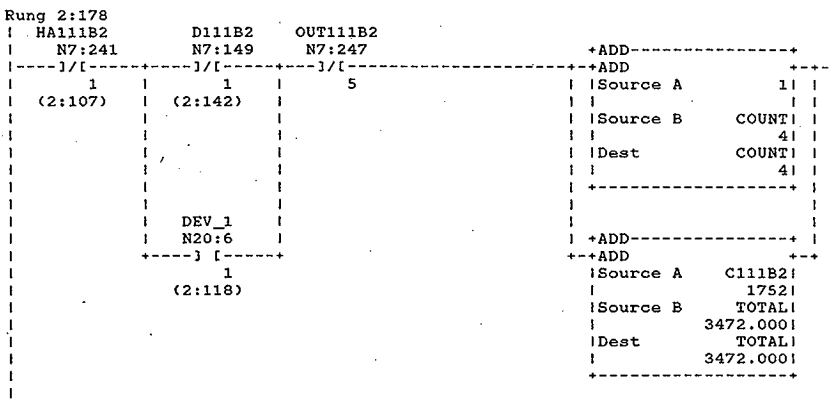
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



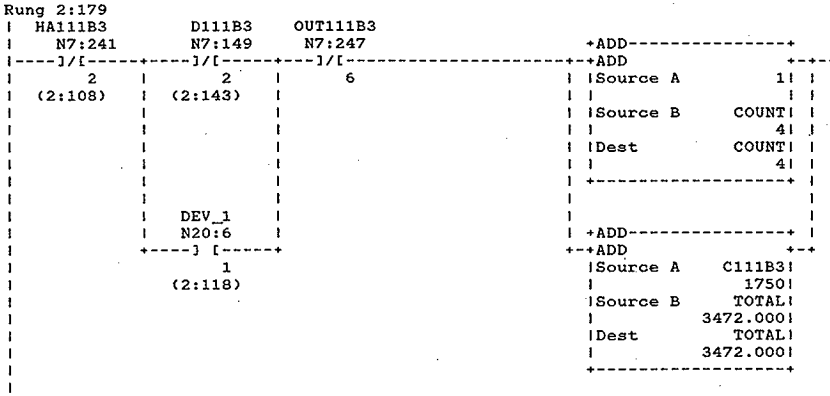
Rung 2:177



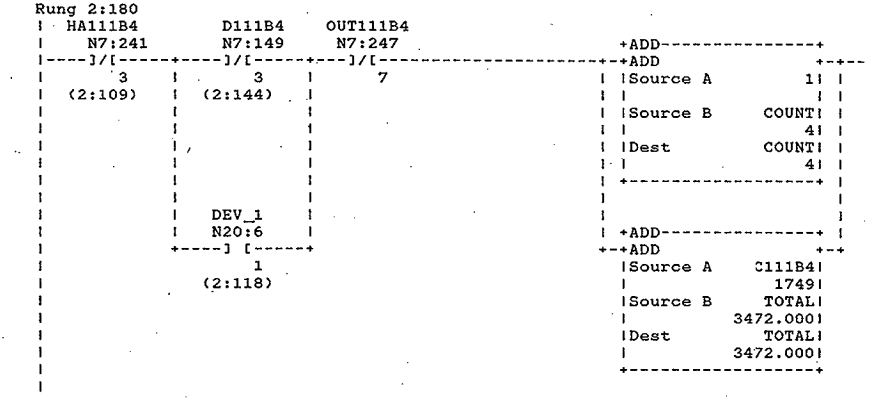
Rung 2:178



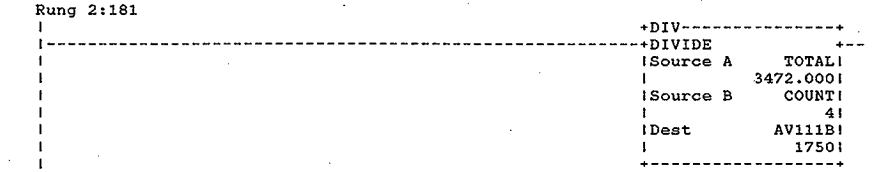
Rung 2:179



Rung 2:180

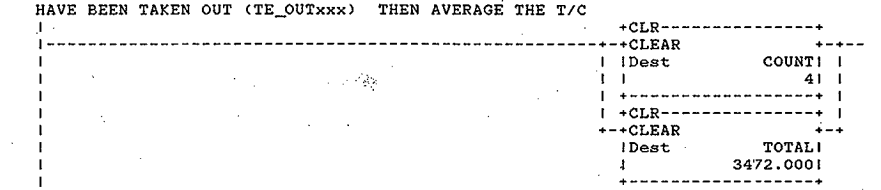


Rung 2:181

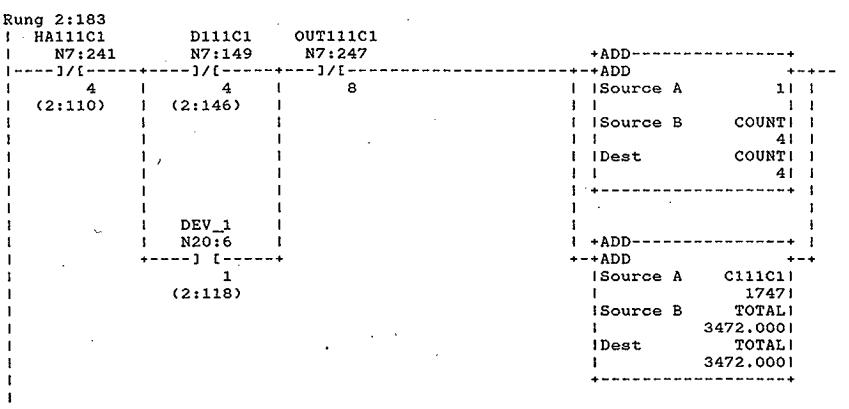


Rung 2:182

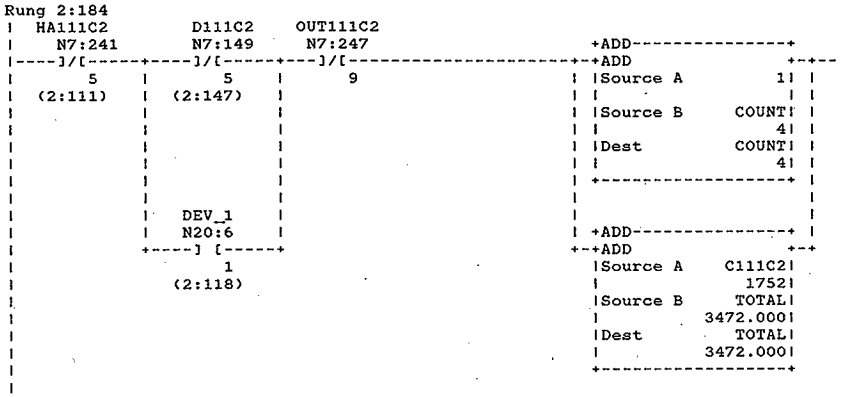
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```



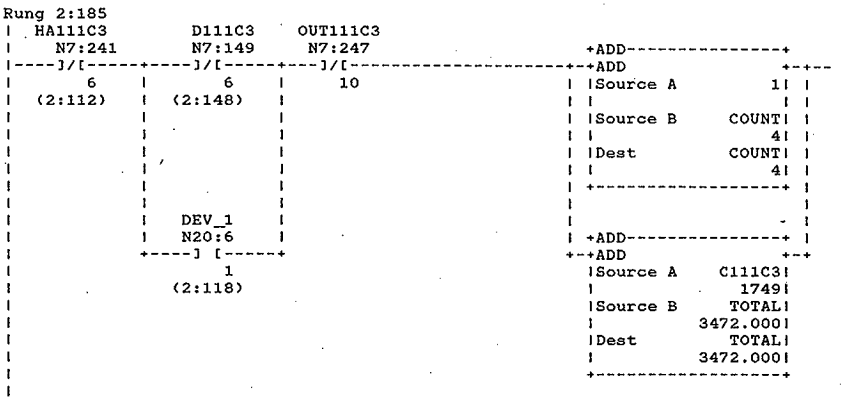
Rung 2:183



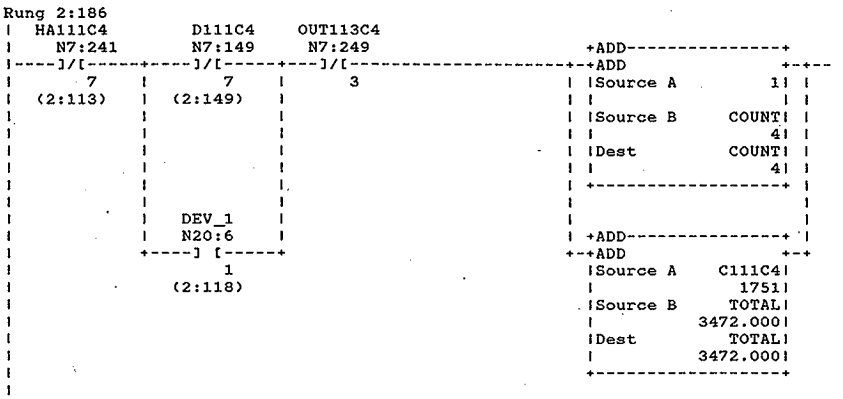
Rung 2:184



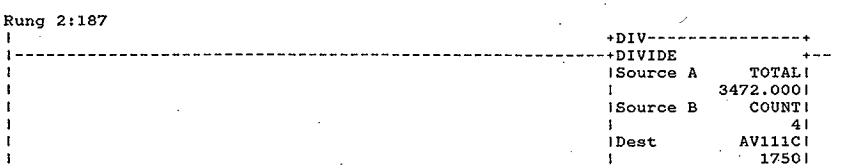
Rung 2:185



Rung 2:186



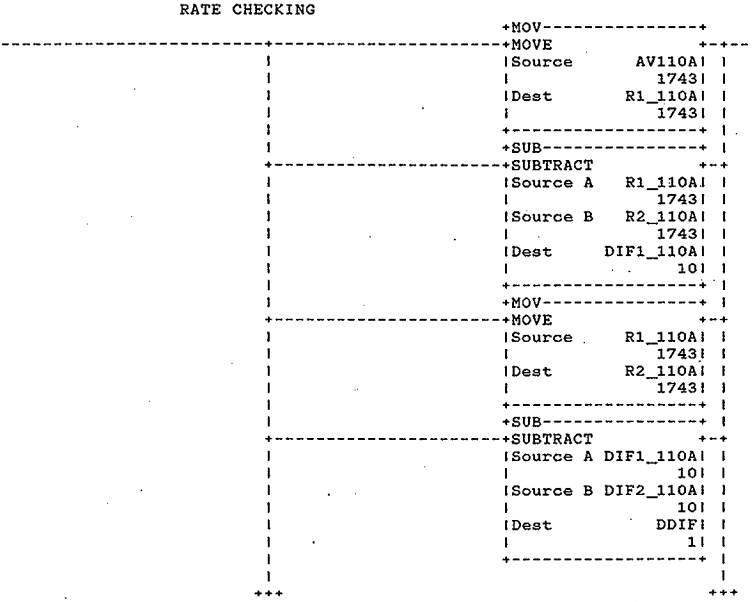
Rung 2:187

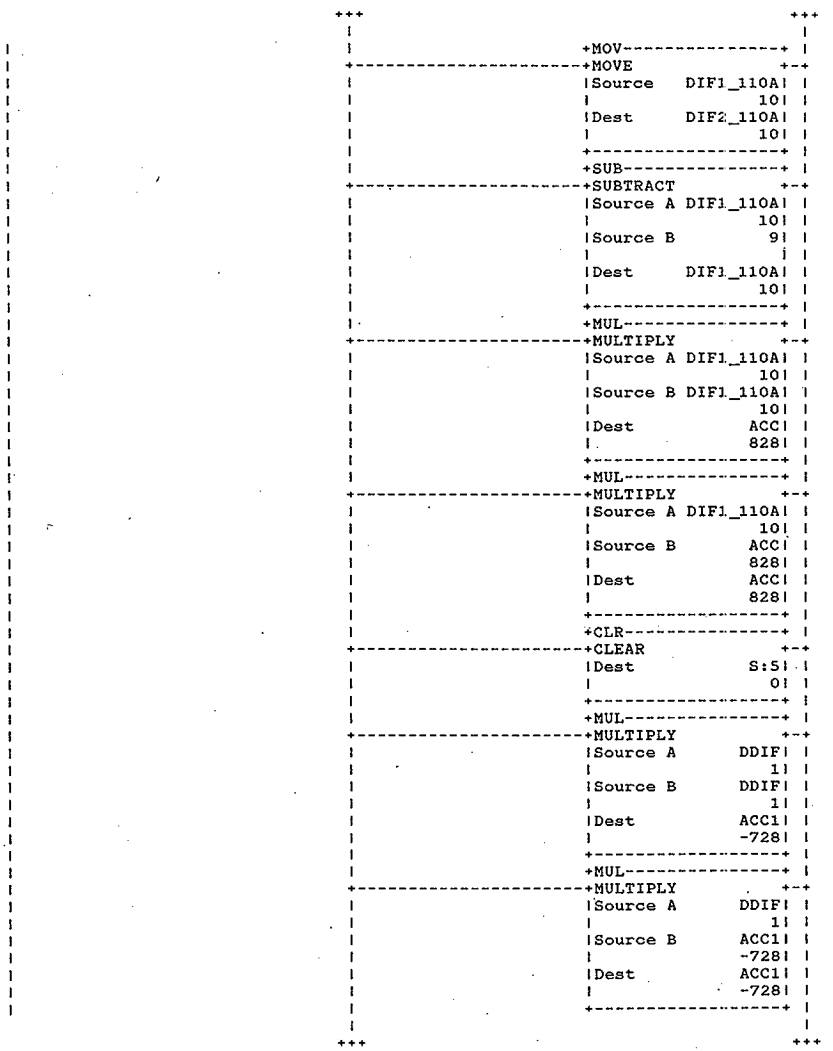


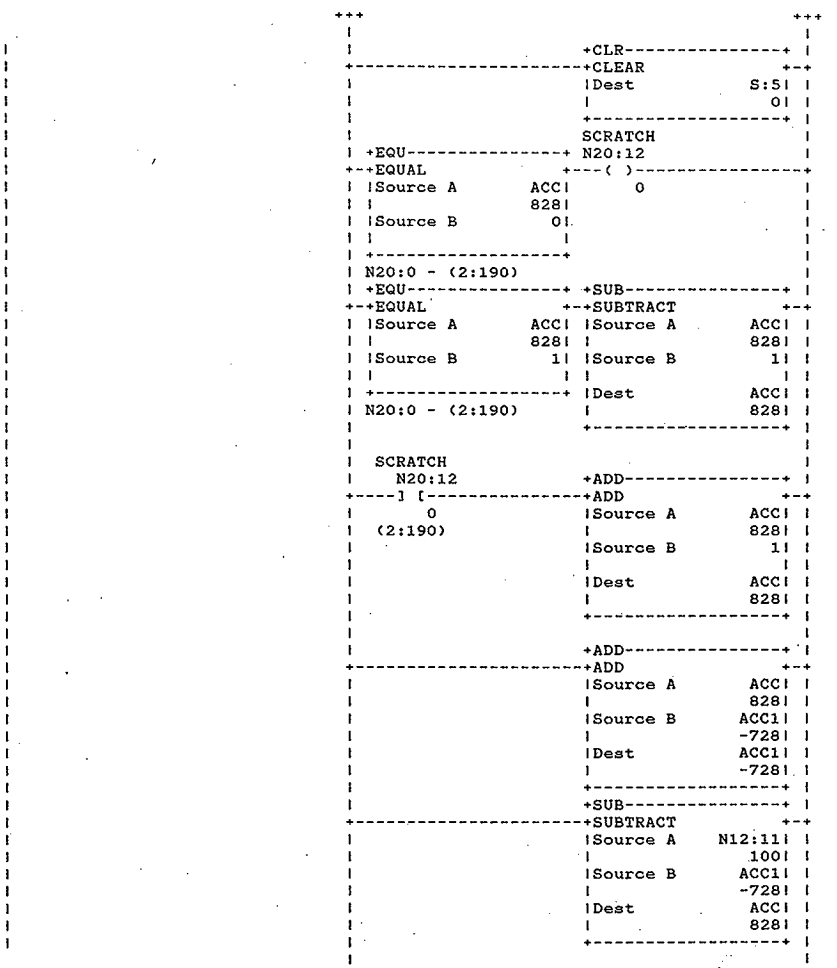
```
Rung 2:188
*******************************************************************************
IF DEVIATION SET FOR SECTION 1 THEN GO THERE AND CALCULATE DEVIATION
|                                                                   DEV1
|   DEV_1
|   N20:6                                                              9
|----] [-------------------------------------------------------------(JMP)-----
|       1
|  (2:118)

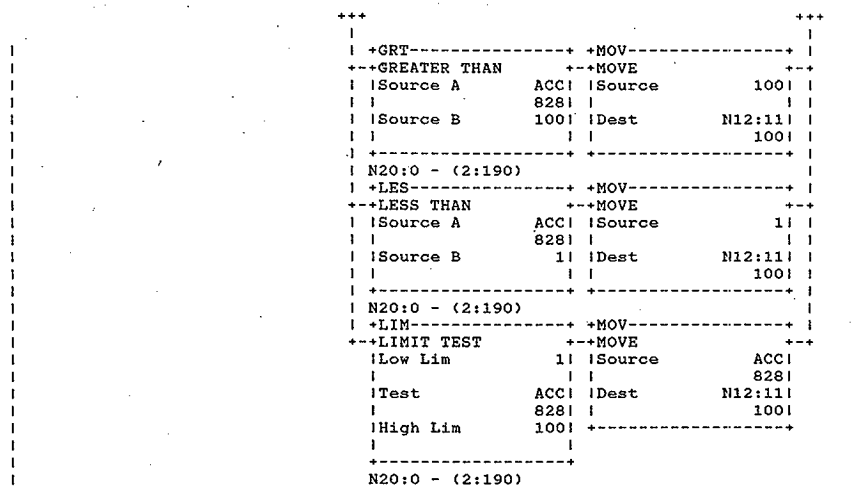
Rung 2:189
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                   PID110A
| RT_TMR/DN
|   T4:62                                                              17
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)

Rung 2:190
                          RATE CHECKING
|                                                  +MOV---------------+
|--------------------------------+-----------------+MOVE              +-+--
|                                |                 |Source      AV110A| |
|                                |                 |              1743| |
|                                |                 |Dest       R1_110A| |
|                                |                 |              1743| |
|                                |                 +------------------+ |
|                                |                 +SUB---------------+ |
|                                +-----------------+SUBTRACT          +-+
|                                |                 |Source A   R1_110A| |
|                                |                 |              1743| |
|                                |                 |Source B   R2_110A| |
|                                |                 |              1743| |
|                                |                 |Dest     DIF1_110A| |
|                                |                 |                10| |
|                                |                 +------------------+ |
|                                |                 +MOV---------------+ |
|                                +-----------------+MOVE              +-+
|                                |                 |Source     R1_110A| |
|                                |                 |              1743| |
|                                |                 |Dest       R2_110A| |
|                                |                 |              1743| |
|                                |                 +------------------+ |
|                                |                 +SUB---------------+ |
|                                +-----------------+SUBTRACT          +-+
|                                |                 |Source A DIF1_110A| |
|                                |                 |                10| |
|                                |                 |Source B DIF2_110A| |
|                                |                 |                10| |
|                                |                 |Dest          DDIF| |
|                                |                 |                 1| |
|                                |                 +------------------+ |
|                                |                                      |
                                +++                                    +++
```




MOV
MOVE
Source DIF1_110A
10
Dest DIF2_110A
10
SUB
SUBTRACT
Source A DIF1_110A
10
Source B
9
Dest DIF1_110A
10
MUL
MULTIPLY
Source A DIF1_110A
10
Source B DIF1_110A
10
Dest ACC
828
MUL
MULTIPLY
Source A DIF1_110A
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728

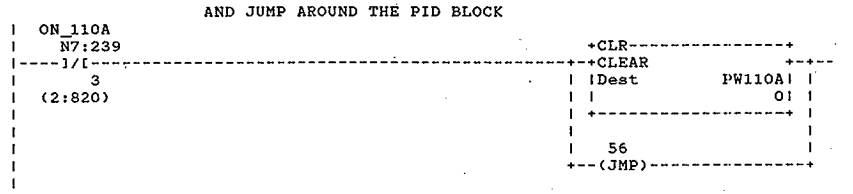

CLR
CLEAR
Dest S:5 0
SCRATCH
EQU
N20:12
EQUAL
Source A ACC 828
Source B 0
0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH
N20:12
0
(2:190)
ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728
SUB
SUBTRACT
Source A N12:11 100
Source B ACC1 -728
Dest ACC 828



Rung 2:191

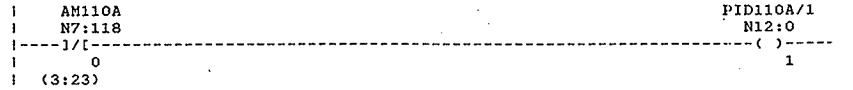
Rung 2:192

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:193

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



```
Rung 2:194
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                        +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                        |Source     SET110A|
|                                                        |              1779|
|                                                        |Dest     PIDSP110A|
|                                                        |              1779|
|                                                        +------------------+

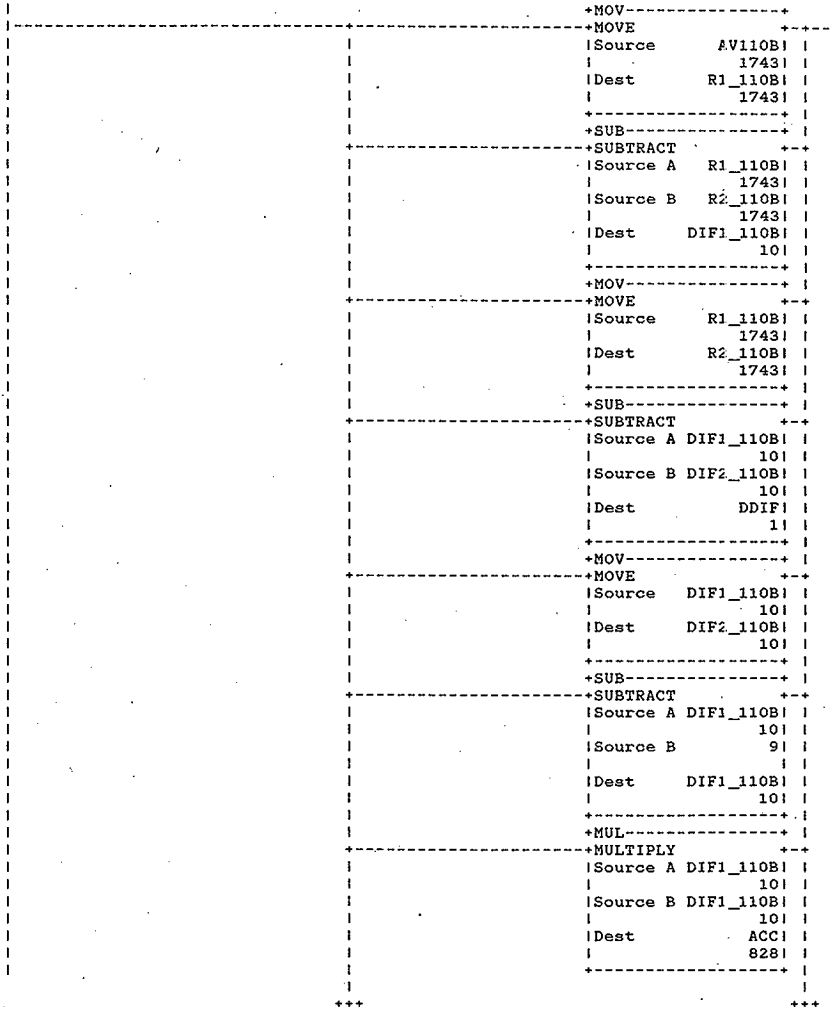
Rung 2:195
                        PID BLOCK OPERATION
|                                                  +PID--------------------+
|-------------------------------------------------+-+PID                   +-+--
|                                                 | |Control Block   PID110A| |
|                                                 | |Process Variable AV110A| |
|                                                 | |Control Variable CV110A| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 | +SCL---------------+      |
|                                                 +-+SCALE             +------+
|                                                 | |Source      CV110A|      |
|                                                 | |                 0|      |
|                                                 | |Rate [/10000]   15|      |
|                                                 | |                  |      |
|                                                 | |Offset           0|      |
|                                                 | |                  |      |
|                                                 | |Dest        PW110A|      |
|                                                 | |                 0|      |
|                                                 | +------------------+      |
|                                                 | +CLR---------------+      |
|                                                 +-+CLEAR             +------+
|                                                   |Dest           S:5|
|                                                   |                 0|
|                                                   +------------------+

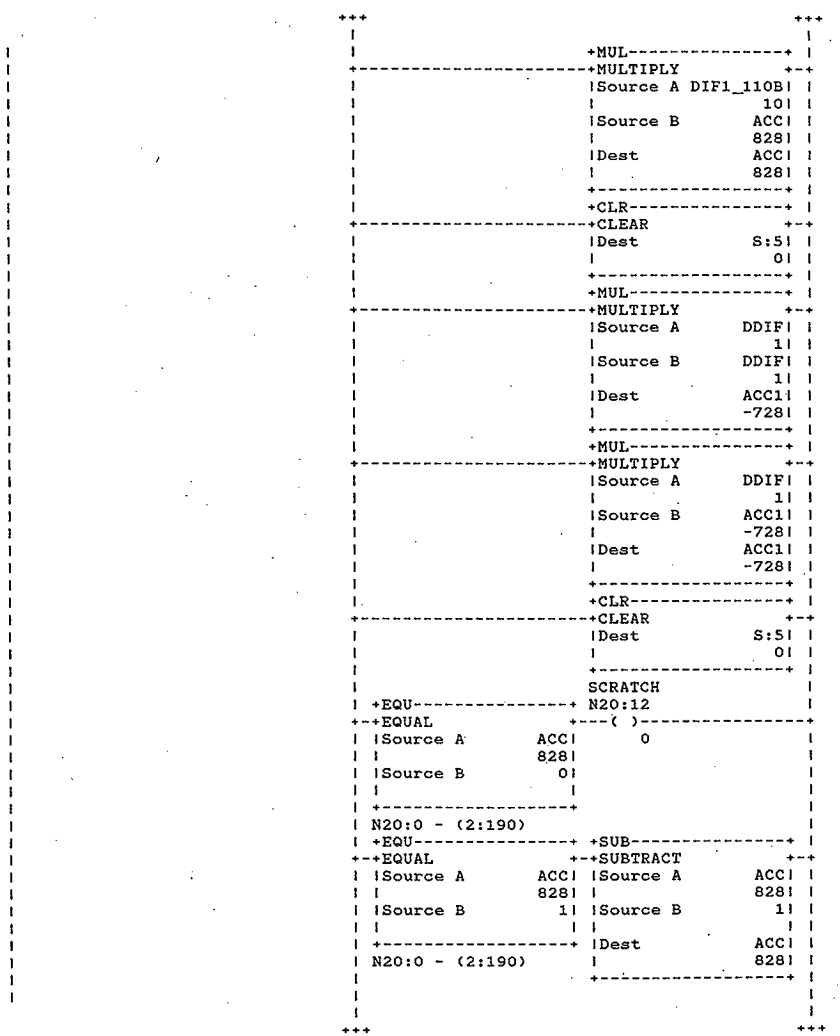
Rung 2:196
|   56                                                                  N20:9
|--[LBL]-----------------------------------------------------------------( )---
|                                                                         10

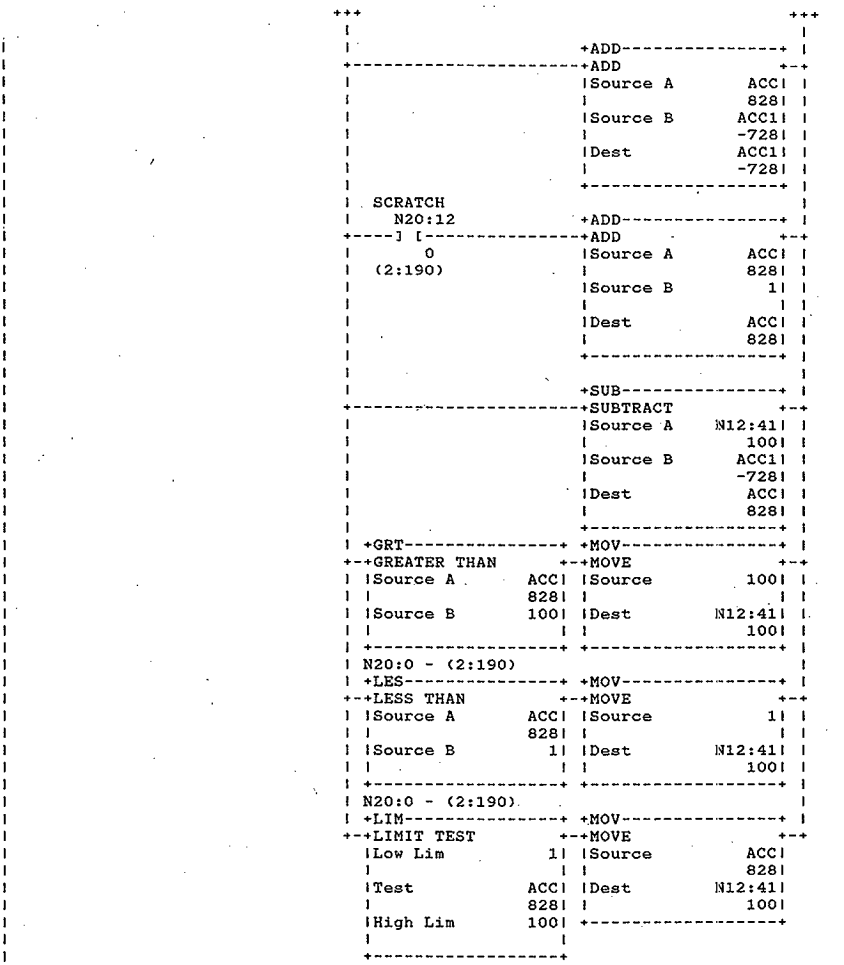
Rung 2:197
|                                                                  PID110B
| RT_TMR/DN
|   T4:62                                                                18
|----]/[-----------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

Rung 2:198

RATE CHECKING



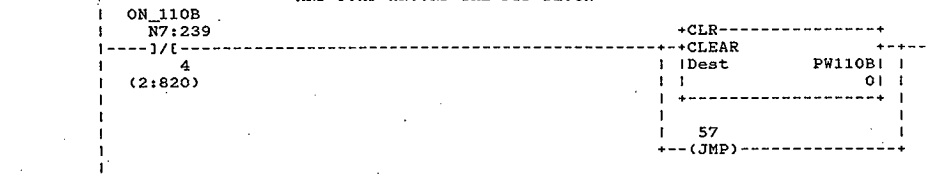

MUL
MULTIPLY
Source A DIF1_110B
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B 0
0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
+GRT
GREATER THAN
Source A
ACC
828
Source B
100
N20:0 - (2:190)
+LES
LESS THAN
Source A
ACC
828
Source B
1
N20:0 - (2:190)
+LIM
LIMIT TEST
Low Lim
1
Test
ACC
828
High Lim
100
N20:0 - (2:190)
+ADD
ADD
Source A
ACC
828
Source B
ACC1
-728
Dest
ACC1
-728
+ADD
ADD
Source A
ACC
828
Source B
1
Dest
ACC
828
+SUB
SUBTRACT
Source A
N12:41
100
Source B
ACC1
-728
Dest
ACC
828
+MOV
MOVE
Source
100
Dest
N12:41
100
+MOV
MOVE
Source
1
Dest
N12:41
100
+MOV
MOVE
Source
ACC
828
Dest
N12:41
100

Rung 2:199

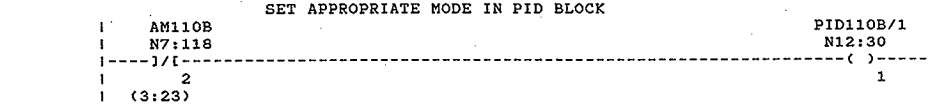
Rung 2:200

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



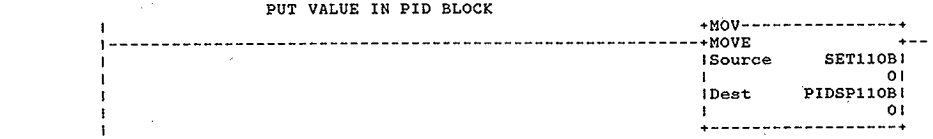
Rung 2:201

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

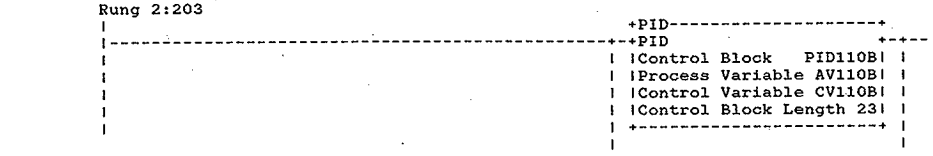


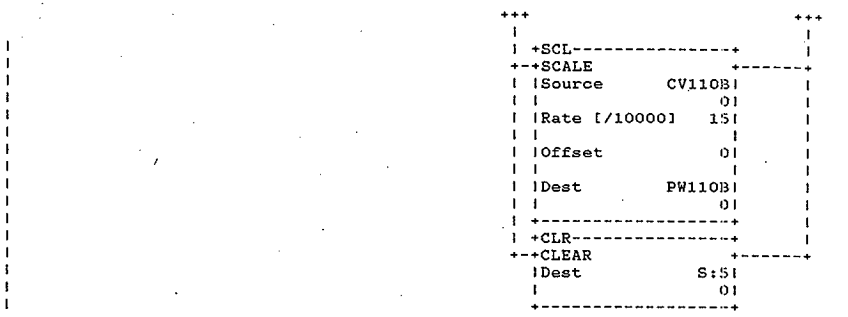
Rung 2:202

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

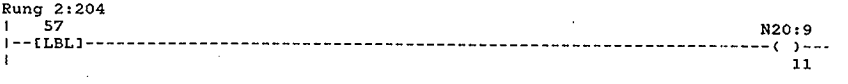


Rung 2:203

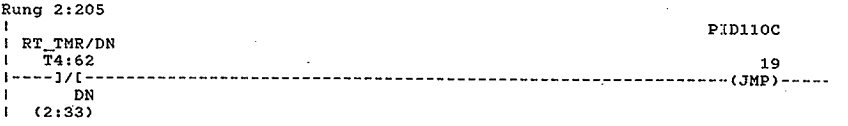




Rung 2:204

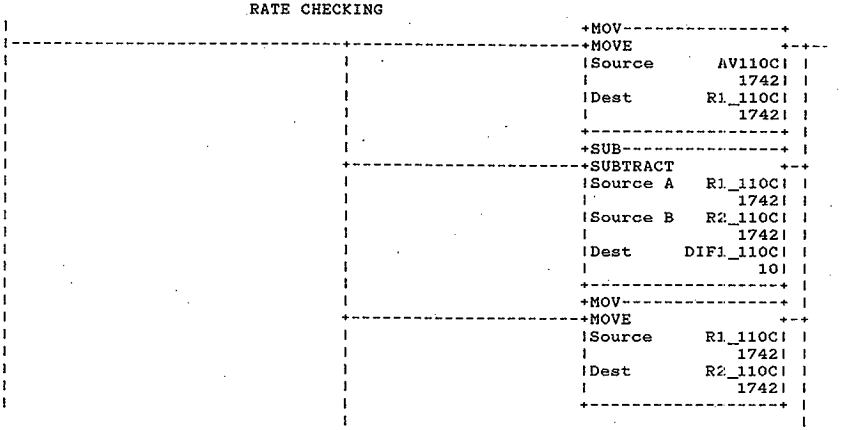


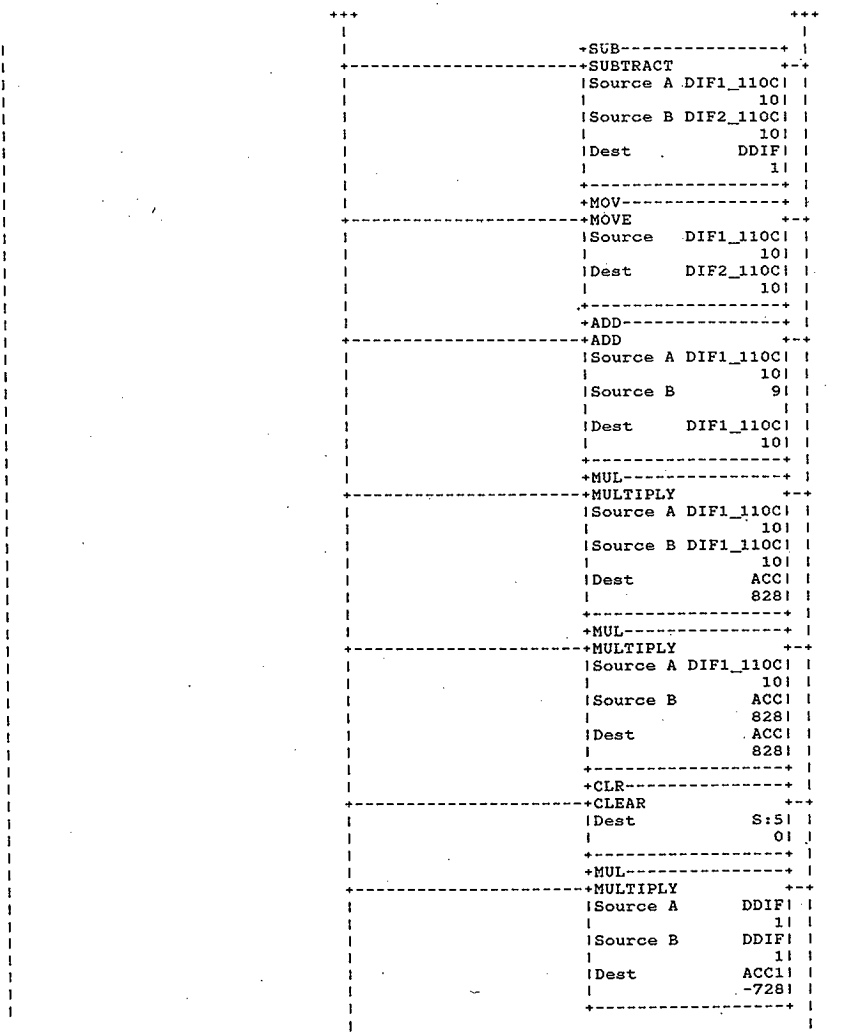
Rung 2:205

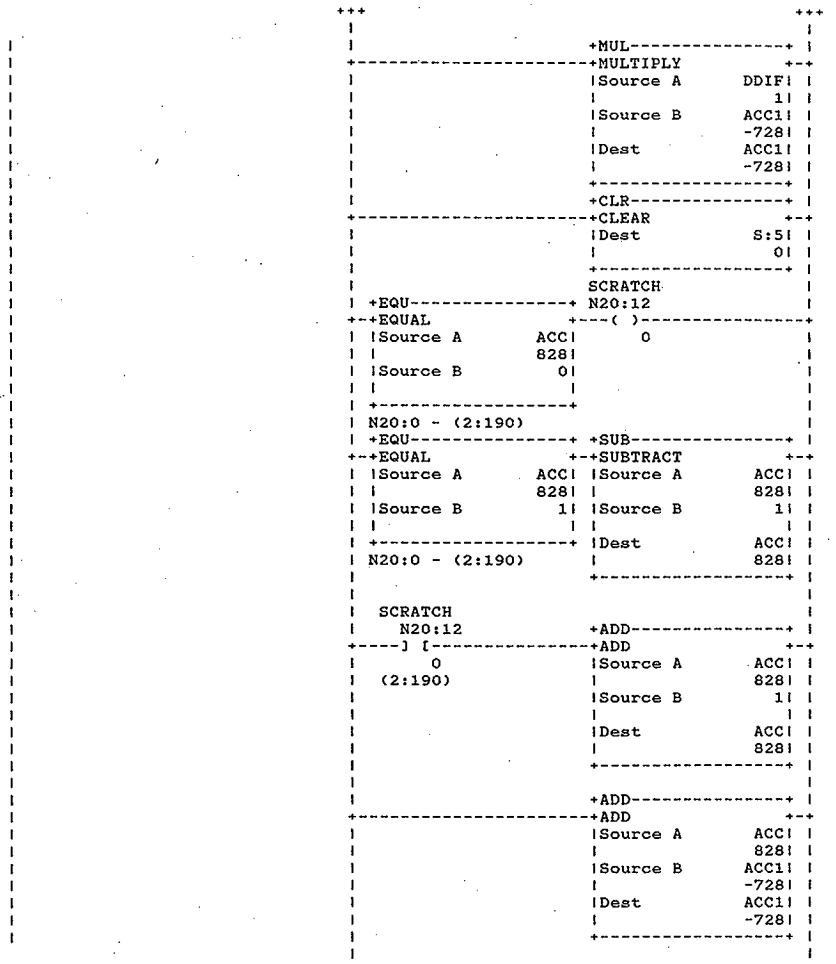


Rung 2:206

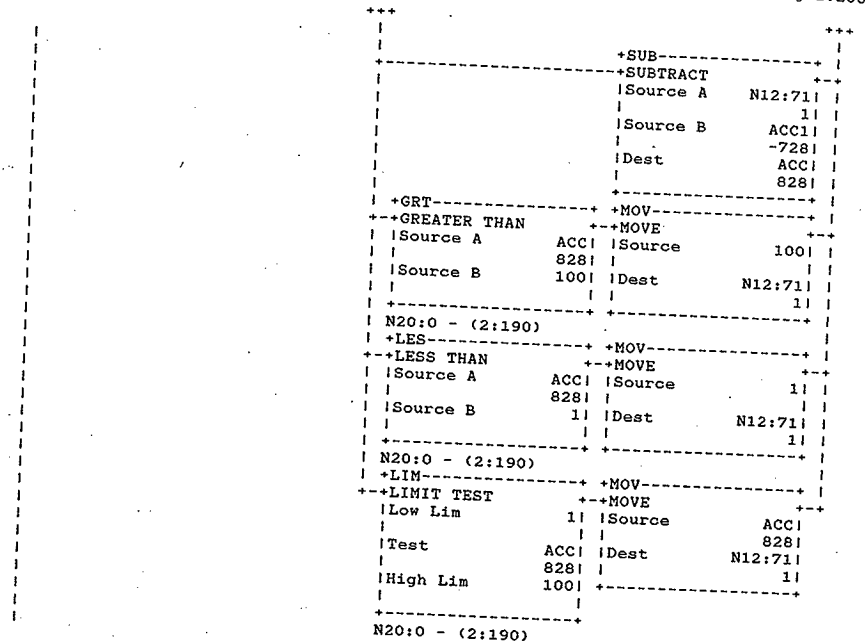
RATE CHECKING




SUB
SUBTRACT
Source A DIF1_110C 10
Source B DIF2_110C 10
Dest DDIF 1
MOV
MOVE
Source DIF1_110C 10
Dest DIF2_110C 10
ADD
ADD
Source A DIF1_110C 10
Source B 9
Dest DIF1_110C 10
MUL
MULTIPLY
Source A DIF1_110C 10
Source B DIF1_110C 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_110C 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728


+MUL
+MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
+CLEAR
Dest S:5 0
SCRATCH
N20:12
+EQU
+EQUAL
Source A ACC 828
Source B 0
O
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
+SUB
+SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH
N20:12
O
(2:190)
+ADD
+ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
+ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728

Rung 2:206



Rung 2:207

PID110C

19

[LBL]

DUMMY18
N20:8
( )
1

Rung 2:208

DETECT FROM SCADA PID ON/OF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK

ON_110C
N7:239
]/[
5
(2:820)

+CLR
CLEAR
Dest
PW110C
0

58
(JMP)

```
Rung 2:209
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM110C                                                          PID110C/1
|    N7:118                                                           N12:60
|----]/[-------------------------------------------------------------( )-----
|       4                                                                1
|  (3:23)

Rung 2:210
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                        +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                        |Source     SET110C|
|                                                        |                 0|
|                                                        |Dest     PIDSP110C|
|                                                        |                 0|
|                                                        +------------------+

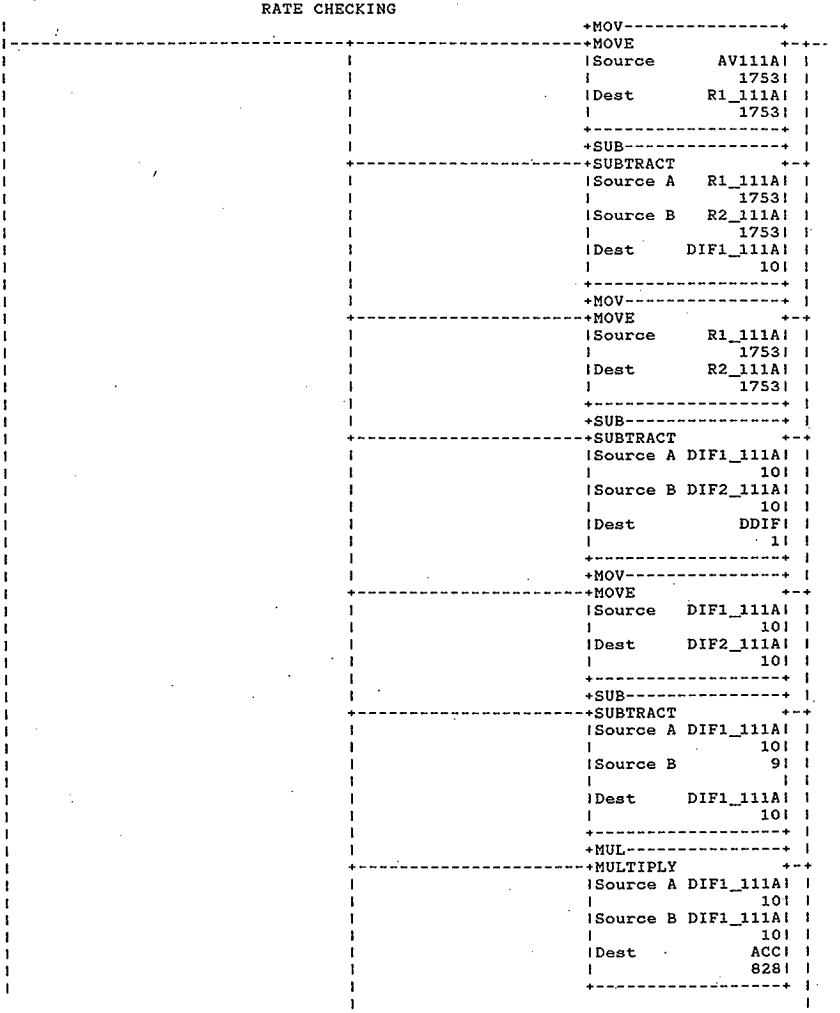
Rung 2:211
|                                                  +PID-------------------+
|-------------------------------------------------+-+PID                  +-+--
|                                                | |Control Block   PID110C| |
|                                                | |Process Variable AV110C| |
|                                                | |Control Variable CV110C| |
|                                                | |Control Block Length 23| |
|                                                | +----------------------+ |
|                                                | +SCL---------------+      |
|                                                +-+SCALE             +------+
|                                                | |Source      CV110C|      |
|                                                | |                 0|      |
|                                                | |Rate [/10000]   15|      |
|                                                | |                  |      |
|                                                | |Offset           0|      |
|                                                | |                  |      |
|                                                | |Dest        PW110C|      |
|                                                | |                 0|      |
|                                                | +------------------+      |
|                                                | +CLR---------------+      |
|                                                +-+CLEAR             +------+
|                                                  |Dest           S:5|
|                                                  |                 0|
|                                                  +------------------+

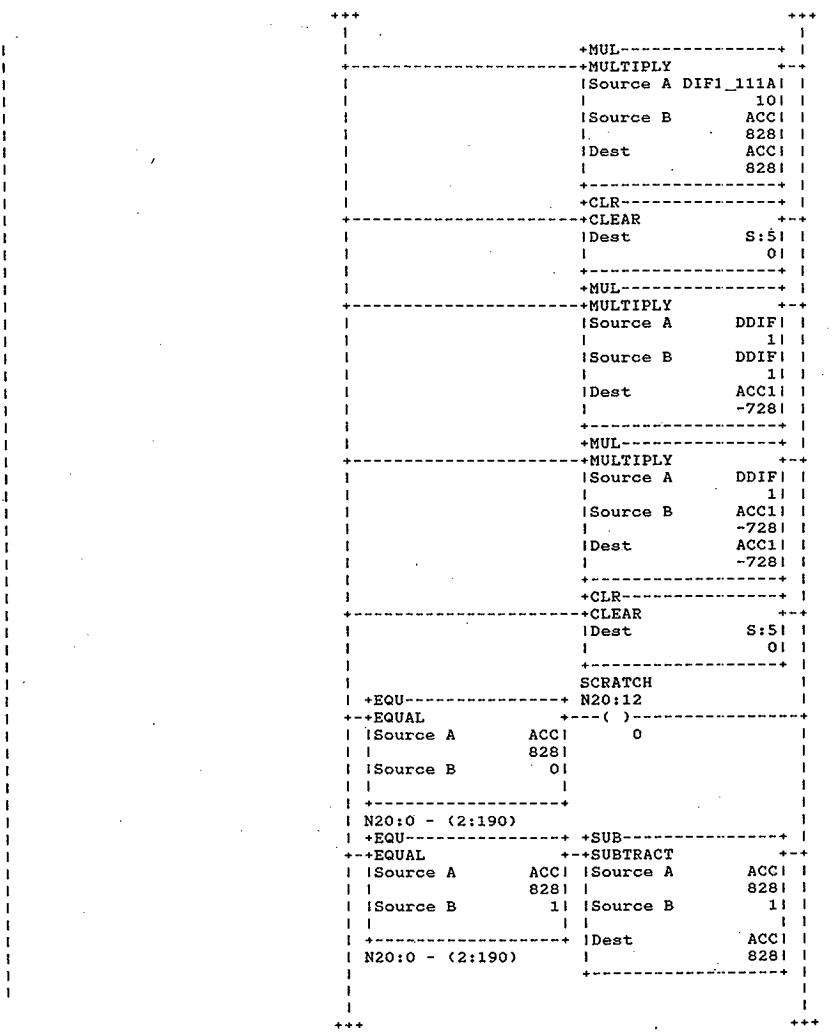
Rung 2:212
|   58                                                                N20:9
|--[LBL]-------------------------------------------------------------( )---
|                                                                        12

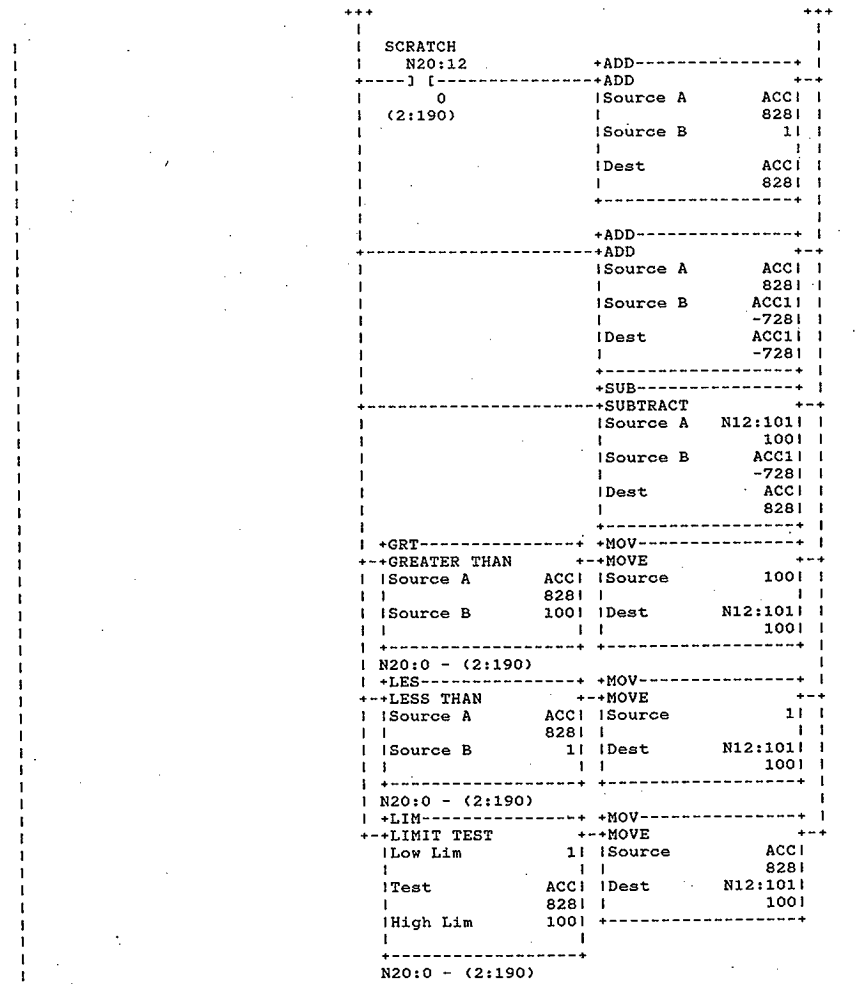
Rung 2:213
|                                                                  PID111A
| RT_TMR/DN
|   T4:62                                                              20
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

Rung 2:214

RATE CHECKING




+MUL
+MULTIPLY
Source A DIF1_111A
10
Source B ACC
828
Dest ACC
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
+MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
+CLR
+CLEAR
Dest S:5
0
SCRATCH
+EQU
N20:12
+EQUAL
Source A ACC
828
Source B
0
( )
0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC
828
Source B
1
N20:0 - (2:190)
+SUB
+SUBTRACT
Source A ACC
828
Source B
1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A ACC
828
Source B 1
Dest ACC
828
ADD
Source A ACC
828
Source B ACC1
-728
Dest ACC1
-728
SUB
SUBTRACT
Source A N12:101
100
Source B ACC1
-728
Dest ACC
828
GRT
GREATER THAN
Source A ACC
828
Source B 100
N20:0 - (2:190)
LES
LESS THAN
Source A ACC
828
Source B 1
N20:0 - (2:190)
LIM
LIMIT TEST
Low Lim 1
Test ACC
828
High Lim 100
N20:0 - (2:190)
MOV
MOVE
Source 100
Dest N12:101
100
MOV
MOVE
Source 1
Dest N12:101
100
MOV
MOVE
Source ACC
828
Dest N12:101
100

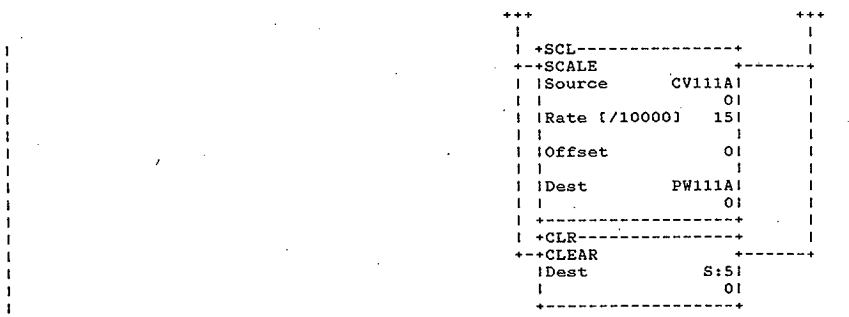
```
Rung 2:215
| PID111A
|                                                                    DUMMY19
|      20                                                             N20:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                        2

Rung 2:216
                 DETECT FROM SCADA PID ON/OFF
                          IF PID OFF
                 THEN ZERO PW FOR ZERO OUTPUT AT  SCR
                   AND JUMP AROUND THE PID BLOCK
|  ON_111A
|    N7:239                                                 +CLR---------------+
|----]/[---------------------------------------------------+-+CLEAR            +-+--
|       6                                                 | |Dest        PW111A| |
|  (2:822)                                                | |                0| |
|                                                         | +------------------+ |
|                                                         |                      |
|                                                         |   59                 |
|                                                         +--(JMP)---------------+
|

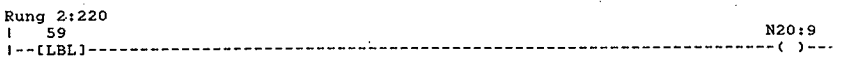
Rung 2:217
                 DETECT AUTO/MANUAL FROM SCADA
                 SET APPROPRIATE MODE IN PID BLOCK
|    AM111A                                                            PID111A/1
|    N7:118                                                             N12:90
|----]/[-------------------------------------------------------------( )-----
|       6                                                                  1
|  (3:23)

Rung 2:218
                 DETECT SETPOINT VALUE FROM SCADA
                 PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|---------------------------------------------------------+MOVE              +--
|                                                          |Source     SET111A|
|                                                          |                 0|
|                                                          |Dest     PIDSP111A|
|                                                          |                 0|
|                                                          +------------------+

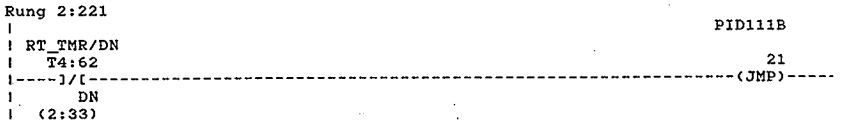
Rung 2:219
|                                                    +PID--------------------+
|-------------------------------------------------+-+PID                    +-+--
|                                                 | |Control Block   PID111A| |
|                                                 | |Process Variable AV111A| |
|                                                 | |Control Variable CV111A| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 |                           |
|                                                +++                         +++
```



Rung 2:220

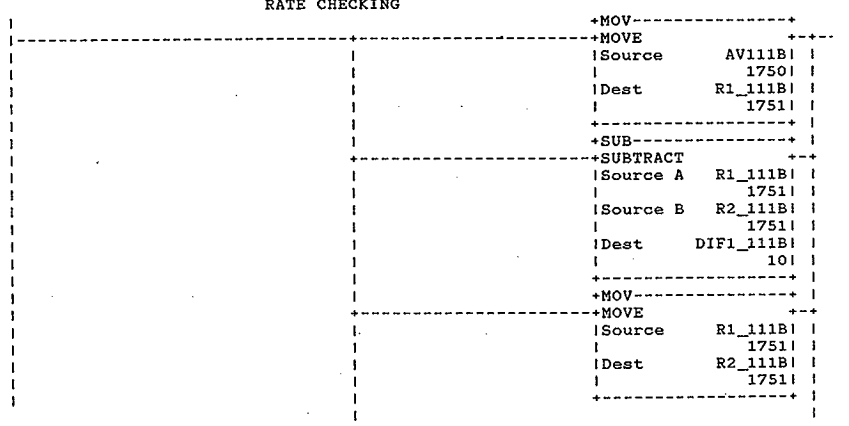


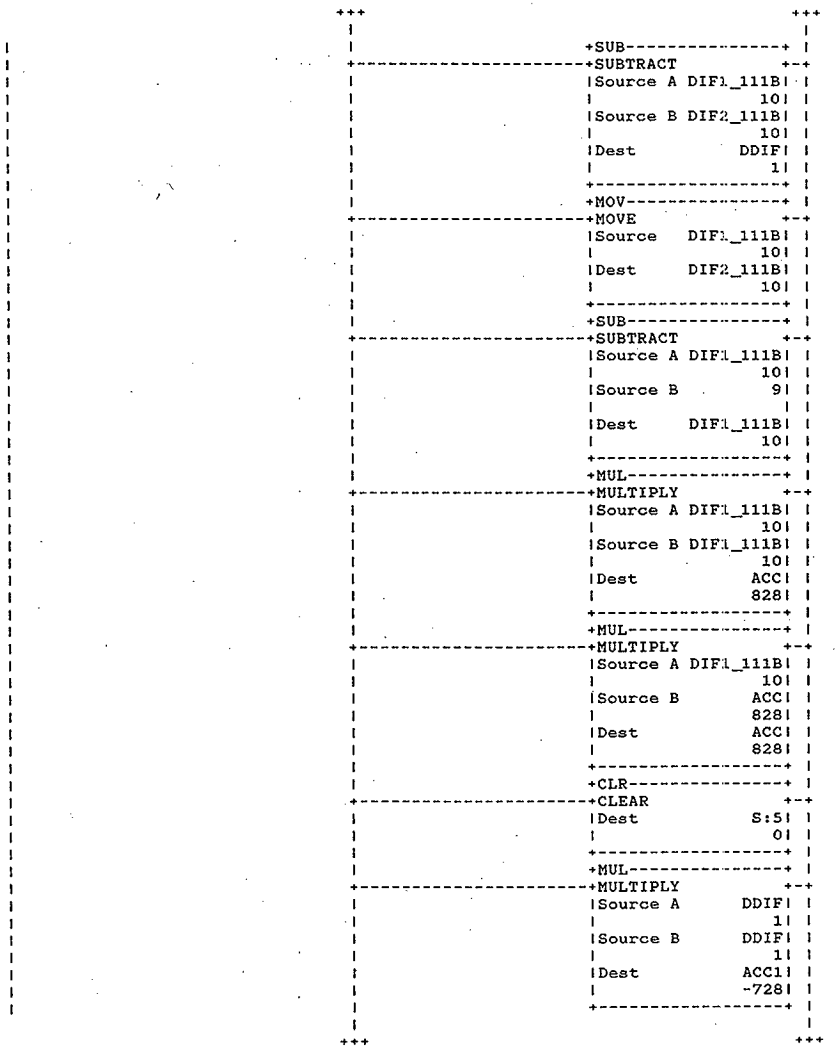
Rung 2:221

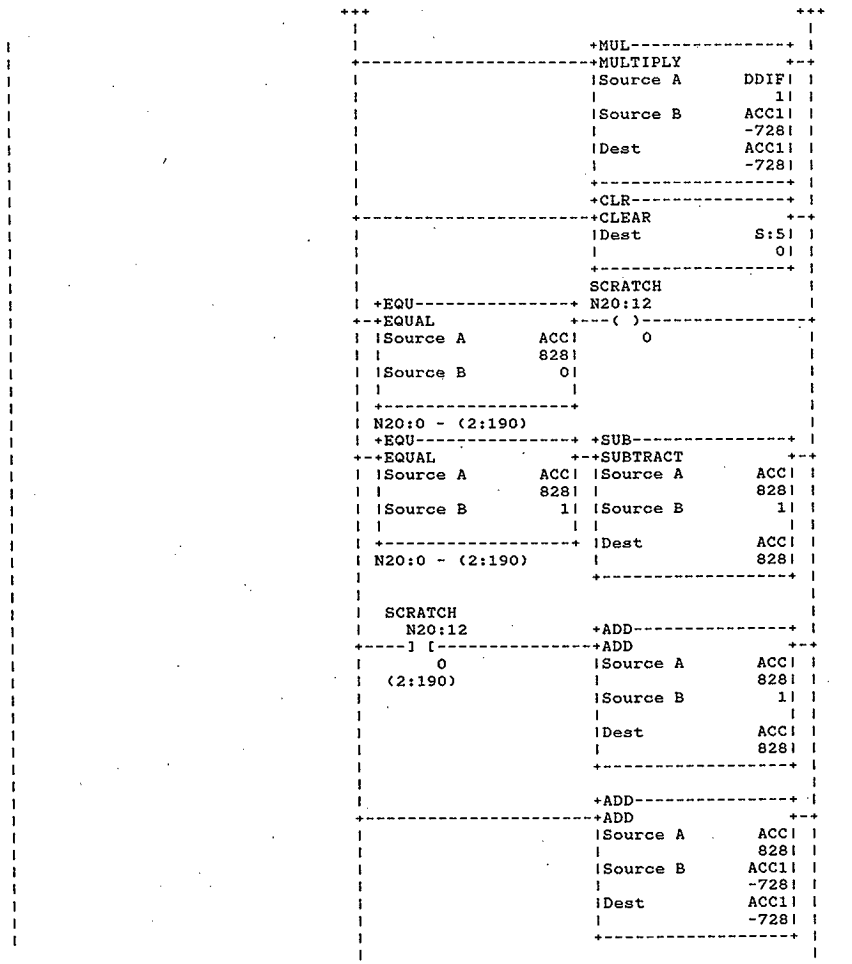


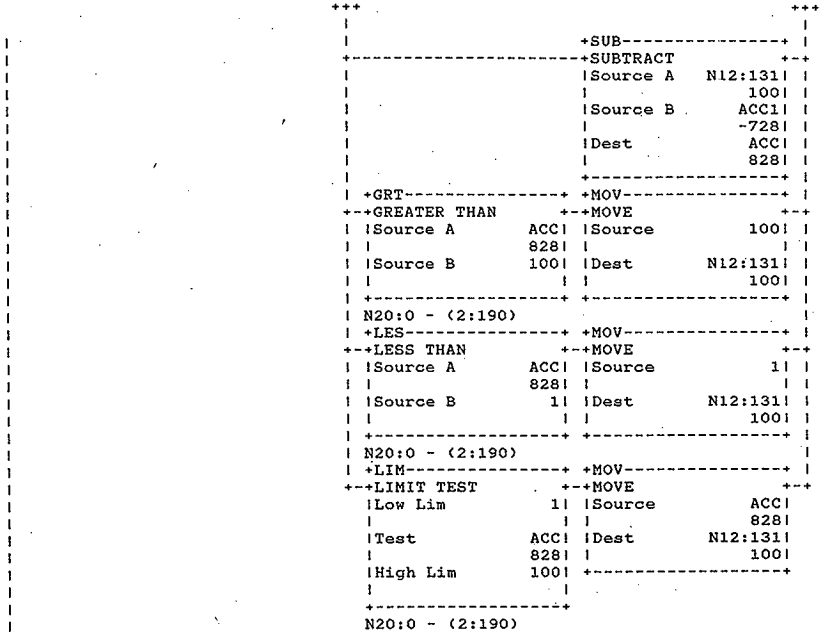
Rung 2:222

RATE CHECKING




+SUB
SUBTRACT
Source A DIF1_111B
10
Source B DIF2_111B
10
Dest DDIF
1
+MOV
MOVE
Source DIF2_111B
10
Dest DIF2_111B
10
+SUB
SUBTRACT
Source A DIF1_111B
10
Source B 9
Dest DIF1_111B
10
+MUL
MULTIPLY
Source A DIF1_111B
10
Source B DIF1_111B
10
Dest ACC
828
+MUL
MULTIPLY
Source A DIF1_111B
10
Source B ACC
828
Dest ACC
828
+CLR
CLEAR
Dest S:5
0
+MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC
-728

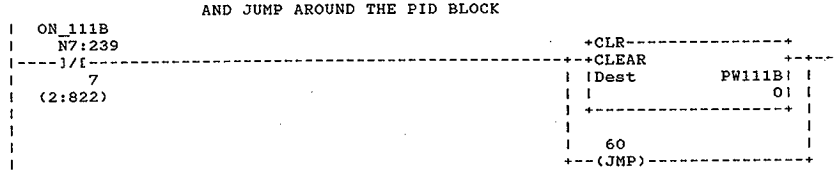

+MUL
+MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
+CLEAR
Dest S:5 0
SCRATCH N20:12
+EQU
+EQUAL
Source A ACC 828
Source B 0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
+SUB
+SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH N20:12
0
(2:190)
+ADD
+ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
+ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728



Rung 2:223

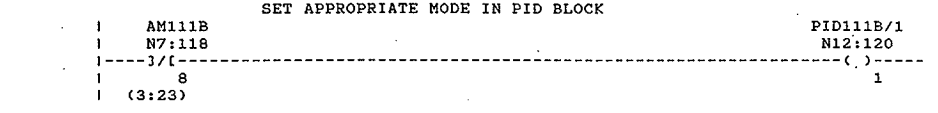
Rung 2:224

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



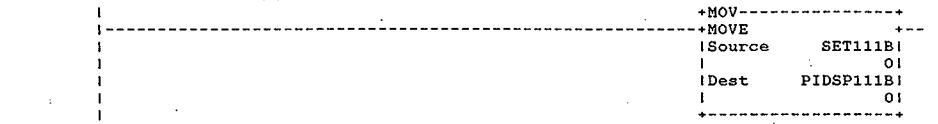
Rung 2:225

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

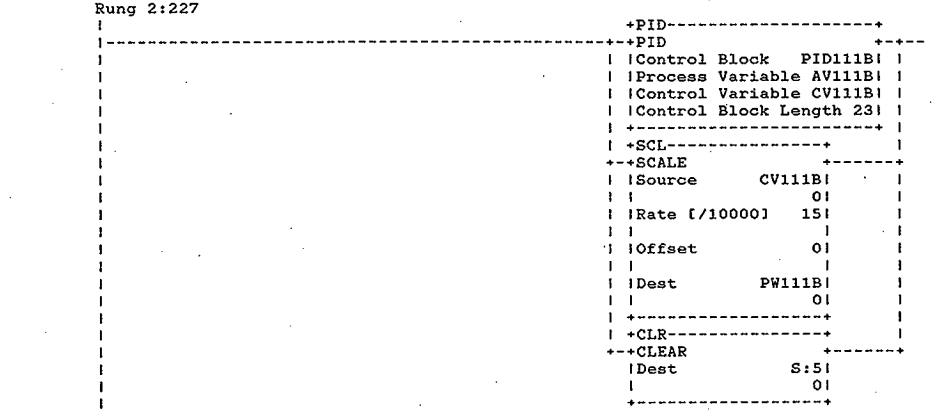


Rung 2:226

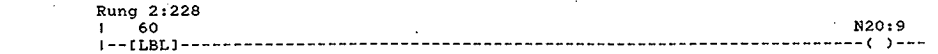
DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



Rung 2:227



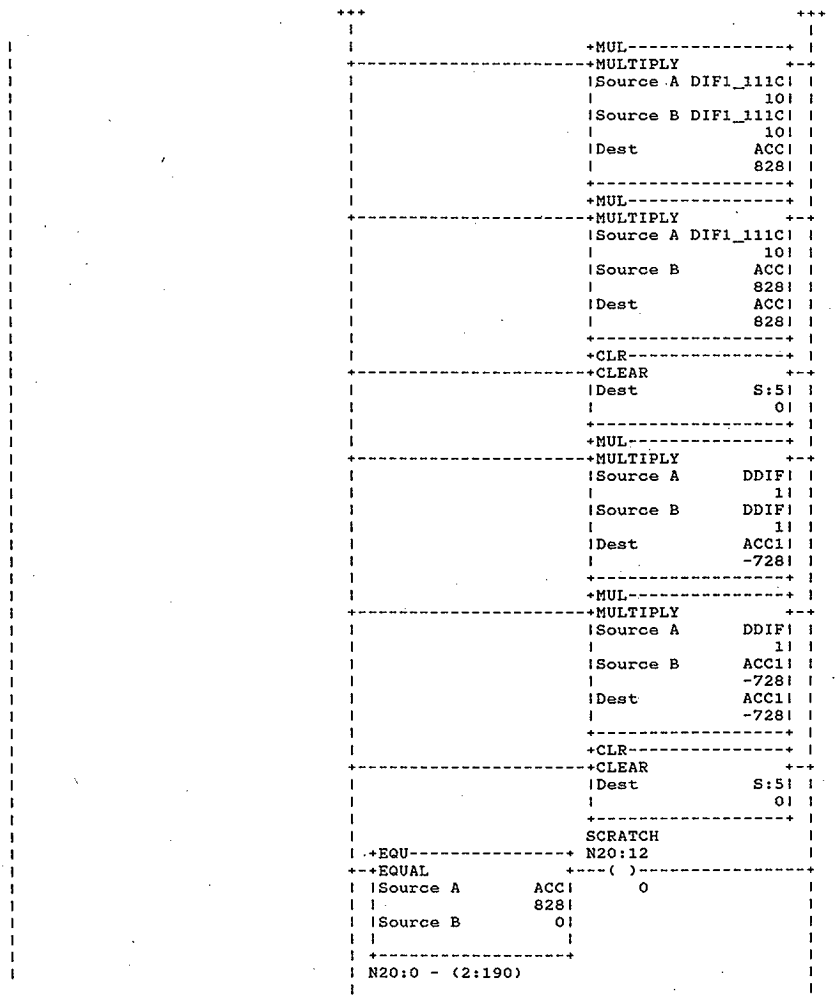
Rung 2:228

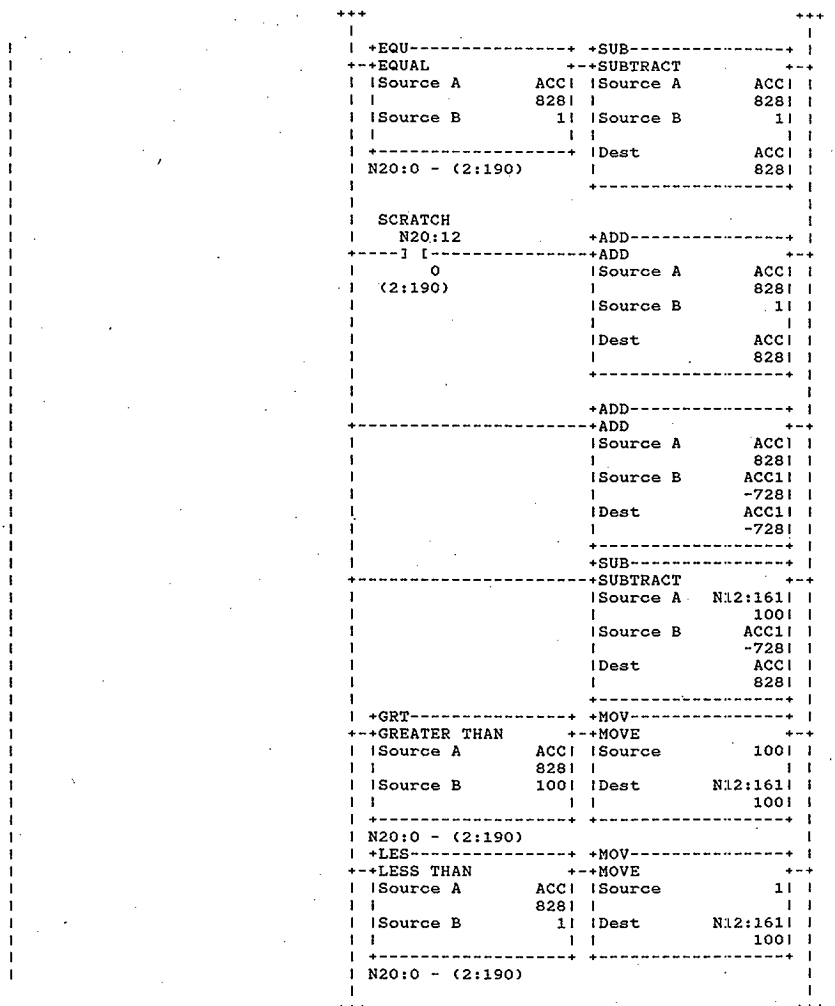


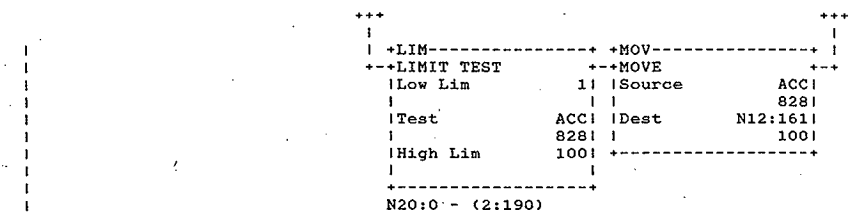
Rung 2:229

```
Rung 2:230
| RT_TMR/DN                                                                DNR_1
|   T4:62                                                                  N20:5
|----] [-------------------------------------------------------------------(L)---
|      DN                                                                     5
|  (2:33)

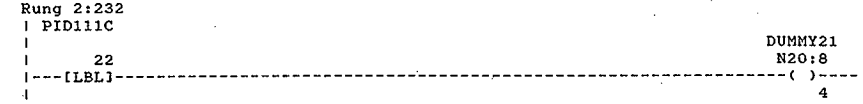
Rung 2:231
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+--
|                               |                      |Source      AV111C| |
|                               |                      |              1750| |
|                               |                      |Dest       R1_111C| |
|                               |                      |              1749| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A   R1_111C| |
|                               |                      |              1749| |
|                               |                      |Source B   R2_111C| |
|                               |                      |              1749| |
|                               |                      |Dest     DIF1_111C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source     R1_111C| |
|                               |                      |              1749| |
|                               |                      |Dest       R2_111C| |
|                               |                      |              1749| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A DIF1_111C| |
|                               |                      |                10| |
|                               |                      |Source B DIF2_111C| |
|                               |                      |                10| |
|                               |                      |Dest          DDIF| |
|                               |                      |                 1| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source   DIF1_111C| |
|                               |                      |                10| |
|                               |                      |Dest     DIF2_111C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A DIF1_111C| |
|                               |                      |                10| |
|                               |                      |Source B         9| |
|                               |                      |                  | |
|                               |                      |Dest     DIF1_111C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                                          |
                              +++                                        +++
```


MUL
MULTIPLY
Source A DIF1_111C 10
Source B DIF1_111C 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_111C 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728
MUL
MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
CLR
CLEAR
Dest S:5 0
SCRATCH
EQU
N20:12
EQUAL
( )
Source A ACC 828
Source B 0
0
N20:0 - (2:190)


EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
SCRATCH
N20:12
0
(2:190)
GRT
GREATER THAN
Source A ACC 828
Source B 100
N20:0 - (2:190)
LES
LESS THAN
Source A ACC 828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728
SUB
SUBTRACT
Source A N12:161 100
Source B ACC1 -728
Dest ACC 828
MOV
MOVE
Source 100
Dest N12:161 100
MOV
MOVE
Source 1
Dest N12:161 100

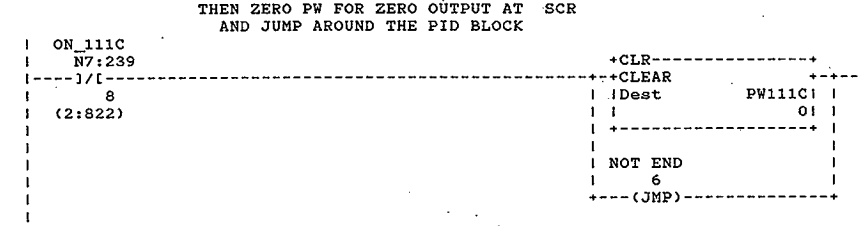


Rung 2:232



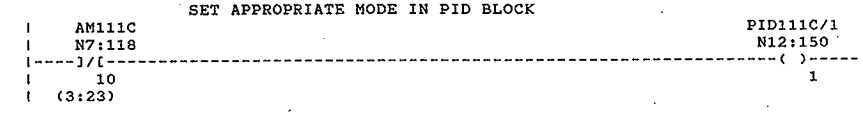
Rung 2:233

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:234

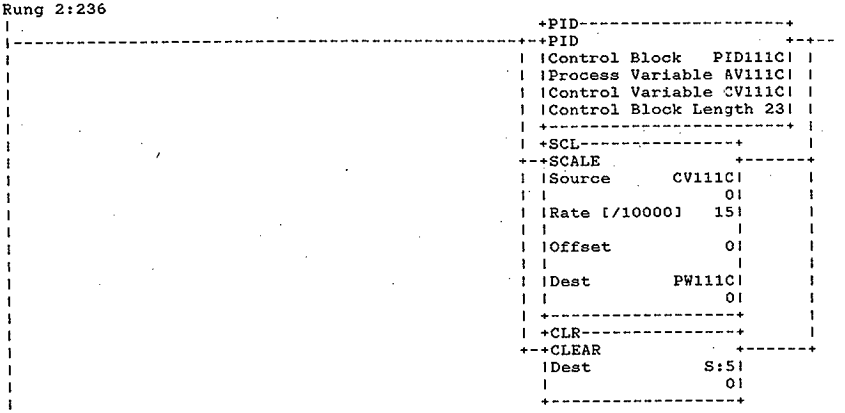
DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



Rung 2:235

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

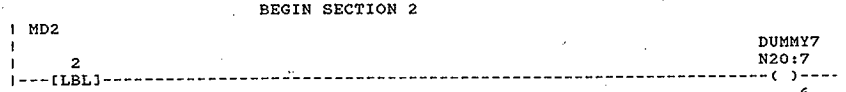
Rung 2:236



Rung 2:237

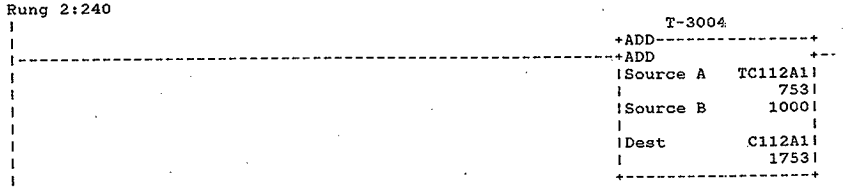
Rung 2:238

BEGIN SECTION 2



Rung 2:239

Rung 2:240



Rung 2:241

```
*******************************************************************************
       Read each T/C and store each T/C's value in its own memory register
|      T-3004                                                    T-3004
| +GRT---------------+                                       +MOV---------------+
|-+GREATER THAN      +---------------------------------------+MOVE              +---
| |Source A    C112A1|                                       |Source       16383|
| |              1753|                                       |                  |
| |Source B    16383|                                       |Dest         C112A1|
| |                  |                                       |               1753|
| +------------------+                                       +------------------+
| N7:25 - (2:240)
```

Rung 2:242

```
|                                                            +ADD---------------+
|------------------------------------------------------------+ADD               +---
|                                                            |Source A   TC112A2|
|                                                            |              754|
|                                                            |Source B     1000|
|                                                            |                  |
|                                                            |Dest         C112A2|
|                                                            |               1754|
|                                                            +------------------+
```

Rung 2:243

```
| +GRT---------------+                                       +MOV---------------+
|-+GREATER THAN      +---------------------------------------+MOVE              +---
| |Source A    C112A2|                                       |Source       16383|
| |              1754|                                       |                  |
| |Source B    16383|                                       |Dest         C112A2|
| |                  |                                       |               1754|
| +------------------+                                       +------------------+
| N7:26 - (2:242)
```

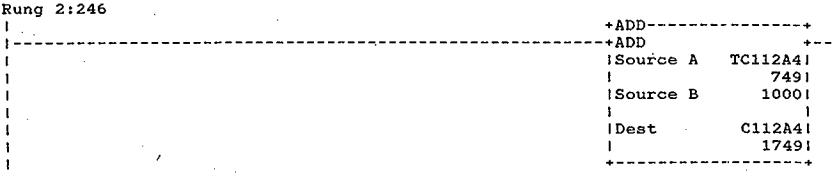
Rung 2:244

```
|                                                            +ADD---------------+
|------------------------------------------------------------+ADD               +---
|                                                            |Source A   TC112A3|
|                                                            |              752|
|                                                            |Source B     1000|
|                                                            |                  |
|                                                            |Dest         C112A3|
|                                                            |               1752|
|                                                            +------------------+
```

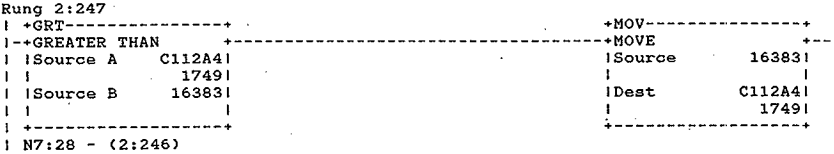
Rung 2:245

```
| +GRT---------------+                                       +MOV---------------+
|-+GREATER THAN      +---------------------------------------+MOVE              +---
| |Source A    C112A3|                                       |Source       16383|
| |              1752|                                       |                  |
| |Source B    16383|                                       |Dest         C112A3|
| |                  |                                       |               1752|
| +------------------+                                       +------------------+
| N7:27 - (2:244)
```

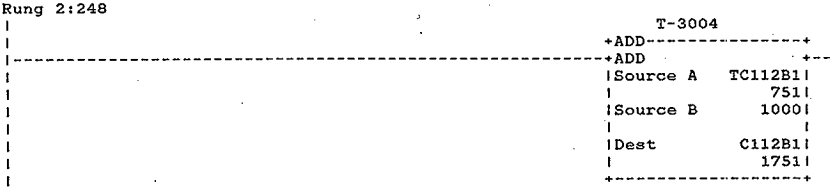
Rung 2:246



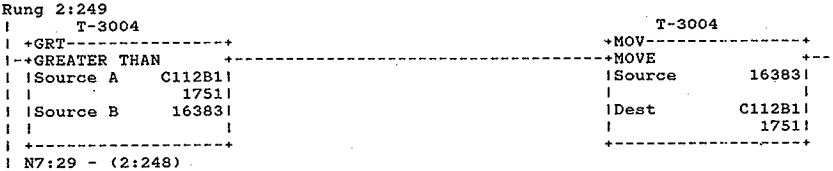
Rung 2:247



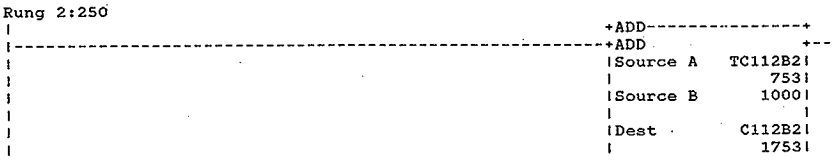
Rung 2:248



Rung 2:249



Rung 2:250



Rung 2:251

```
| +GRT----------------+                                  +MOV----------------+
|-+GREATER THAN       +----------------------------------+MOVE               +--
| |Source A     C112B2|                                  |Source       16383|
| |               1753|                                  |                  |
| |Source B     16383|                                  |Dest         C112B2|
| |                   |                                  |               1753|
| +-------------------+                                  +-------------------+
| N7:30 - (2:250)
```

Rung 2:252

```
|                                                        +ADD----------------+
|--------------------------------------------------------+ADD                +--
|                                                        |Source A    TC112B3|
|                                                        |               750|
|                                                        |Source B      1000|
|                                                        |                  |
|                                                        |Dest         C112B3|
|                                                        |               1750|
|                                                        +-------------------+
```

Rung 2:253

```
| +GRT----------------+                                  +MOV----------------+
|-+GREATER THAN       +----------------------------------+MOVE               +--
| |Source A     C112B3|                                  |Source       16383|
| |               1750|                                  |                  |
| |Source B     16383|                                  |Dest         C112B3|
| |                   |                                  |               1750|
| +-------------------+                                  +-------------------+
| N7:31 - (2:252)
```

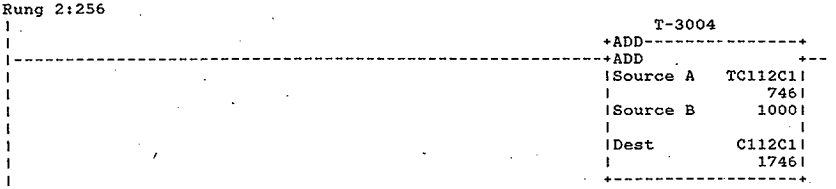
Rung 2:254

```
|                                                        +ADD----------------+
|--------------------------------------------------------+ADD                +--
|                                                        |Source A    TC112B4|
|                                                        |               748|
|                                                        |Source B      1000|
|                                                        |                  |
|                                                        |Dest         C112B4|
|                                                        |               1748|
|                                                        +-------------------+
```

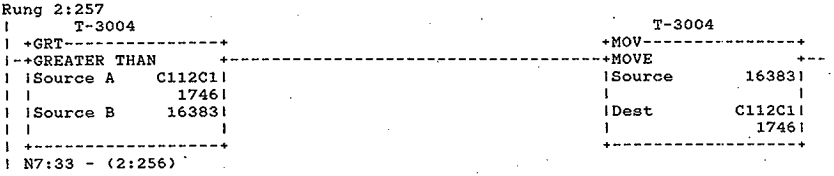
Rung 2:255

```
| +GRT----------------+                                  +MOV----------------+
|-+GREATER THAN       +----------------------------------+MOVE               +--
| |Source A     C112B4|                                  |Source       16383|
| |               1748|                                  |                  |
| |Source B     16383|                                  |Dest         C112B4|
| |                   |                                  |               1748|
| +-------------------+                                  +-------------------+
| N7:32 - (2:254)
```

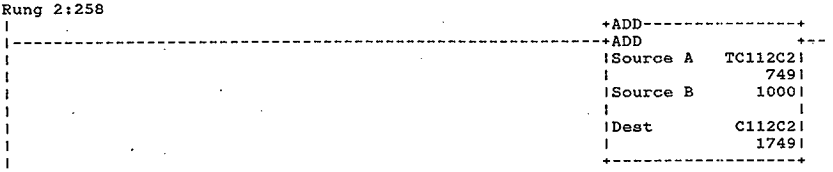
Rung 2:256



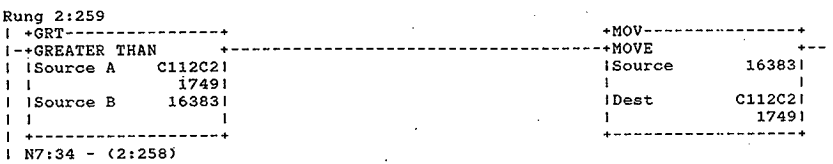
Rung 2:257



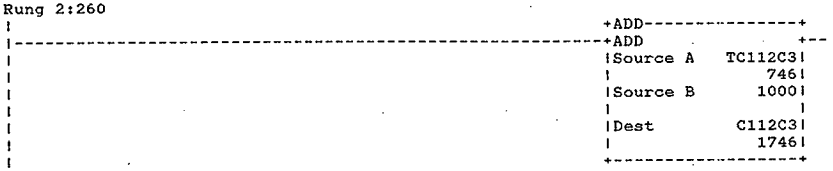
Rung 2:258



Rung 2:259



Rung 2:260



Rung 2:261

```
| +GRT----------------+                                  +MOV----------------+
|-+GREATER THAN       +----------------------------------+MOVE                +--
| |Source A     C112C3|                                  |Source        16383|
| |               1746|                                  |                   |
| |Source B     16383|                                  |Dest          C112C3|
| |                   |                                  |                1746|
| +-------------------+                                  +--------------------+
| N7:35 - (2:260)
```

Rung 2:262

```
|                                                        +ADD----------------+
|--------------------------------------------------------+ADD                +--
|                                                        |Source A    TC112C4|
|                                                        |                743|
|                                                        |Source B       1000|
|                                                        |                   |
|                                                        |Dest          C112C4|
|                                                        |                1743|
|                                                        +--------------------+
```

Rung 2:263

```
| +GRT----------------+                                  +MOV----------------+
|-+GREATER THAN       +----------------------------------+MOVE                +--
| |Source A     C112C4|                                  |Source        16383|
| |               1743|                                  |                   |
| |Source B     16383|                                  |Dest          C112C4|
| |                   |                                  |                1743|
| +-------------------+                                  +--------------------+
| N7:36 - (2:262)
```

Rung 2:264

```
|                                                              T-3001
|                                                        +ADD----------------+
|--------------------------------------------------------+ADD                +--
|                                                        |Source A    TC113A1|
|                                                        |                725|
|                                                        |Source B       1000|
|                                                        |                   |
|                                                        |Dest          C113A1|
|                                                        |                1725|
|                                                        +--------------------+
```

Rung 2:265

```
|      T-3001                                                  T-3001
| +GRT----------------+                                  +MOV----------------+
|-+GREATER THAN       +----------------------------------+MOVE                +--
| |Source A     C113A1|                                  |Source        16383|
| |               1725|                                  |                   |
| |Source B     16383|                                  |Dest          C113A1|
| |                   |                                  |                1725|
| +-------------------+                                  +--------------------+
| N7:37 - (2:264)
```

```
Rung 2:266
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC113A2|
|                                                                  |               727|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C113A2|
|                                                                  |              1727|
|                                                                  +------------------+

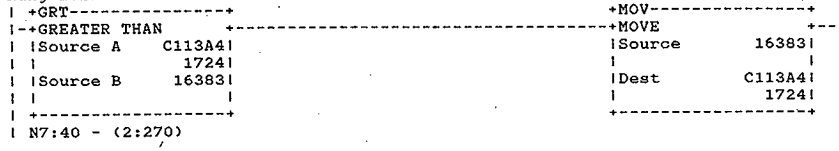
Rung 2:267
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------------+MOVE              +--
| |Source A    C113A2|                                             |Source       16383|
| |              1727|                                             |                  |
| |Source B     16383|                                             |Dest        C113A2|
| |                  |                                             |              1727|
| +------------------+                                             +------------------+
| N7:38 - (2:266)

Rung 2:268
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC113A3|
|                                                                  |               726|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C113A3|
|                                                                  |              1726|
|                                                                  +------------------+

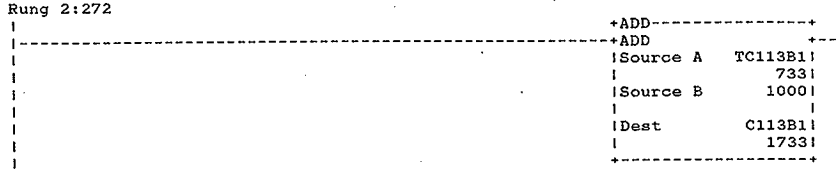
Rung 2:269
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------------+MOVE              +--
| |Source A    C113A3|                                             |Source       16383|
| |              1726|                                             |                  |
| |Source B     16383|                                             |Dest        C113A3|
| |                  |                                             |              1726|
| +------------------+                                             +------------------+
| N7:39 - (2:268)

Rung 2:270
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC113A4|
|                                                                  |               724|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C113A4|
|                                                                  |              1724|
|                                                                  +------------------+
```

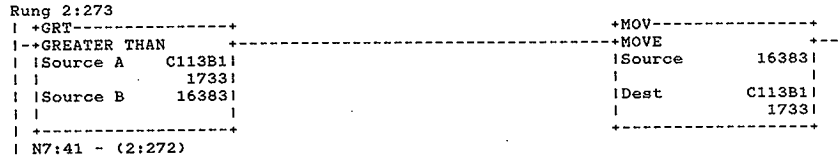
Rung 2:271



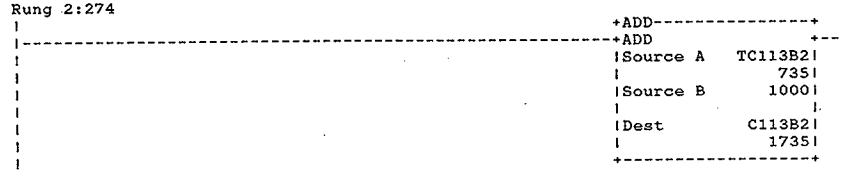
Rung 2:272



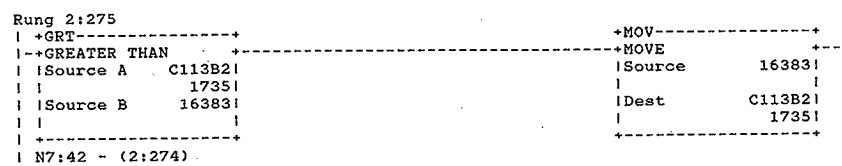
Rung 2:273



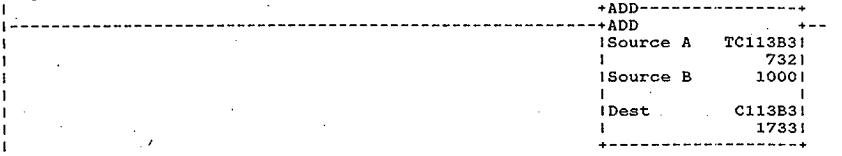
Rung 2:274



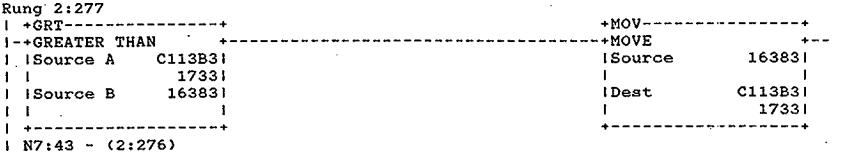
Rung 2:275



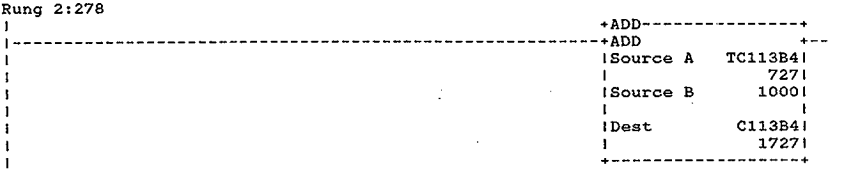
Rung 2:276



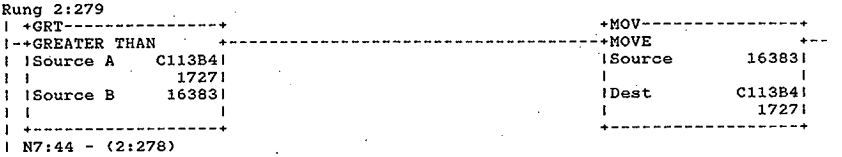
Rung 2:277



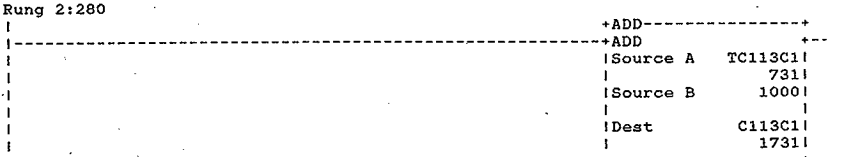
Rung 2:278



Rung 2:279



Rung 2:280



```
Rung 2:281
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C113C1|                                  |Source       16383|
| |               1731|                                  |                  |
| |Source B     16383|                                  |Dest        C113C1|
| |                  |                                  |              1731|
| +------------------+                                  +------------------+
| N7:45 - (2:280)

Rung 2:282
|                                                       +ADD---------------+
|-----------------------------------------------------------+ADD              +--
|                                                       |Source A   TC113C2|
|                                                       |               734|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C113C2|
|                                                       |              1734|
|                                                       +------------------+

Rung 2:283
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C113C2|                                  |Source       16383|
| |               1734|                                  |                  |
| |Source B     16383|                                  |Dest        C113C2|
| |                  |                                  |              1734|
| +------------------+                                  +------------------+
| N7:46 - (2:282)

Rung 2:284
|                                                       +ADD---------------+
|-----------------------------------------------------------+ADD              +--
|                                                       |Source A   TC113C3|
|                                                       |               732|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C113C3|
|                                                       |              1732|
|                                                       +------------------+

Rung 2:285
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C113C3|                                  |Source       16383|
| |               1732|                                  |                  |
| |Source B     16383|                                  |Dest        C113C3|
| |                  |                                  |              1732|
| +------------------+                                  +------------------+
| N7:47 - (2:284)
```

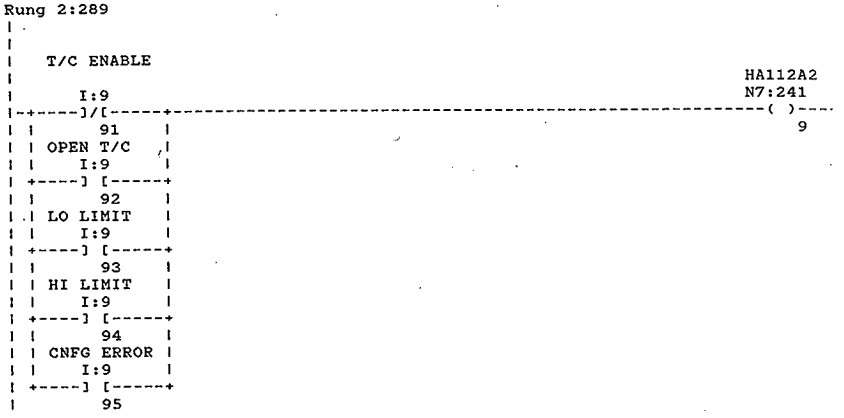
```
Rung 2:286
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD               +--
|                                                                |Source A   TC113C4|
|                                                                |               730|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C113C4|
|                                                                |              1730|
|                                                                +------------------+

Rung 2:287
| +GRT---------------+                                           +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C113C4|                                           |Source       16383|
| |              1730|                                           |                  |
| |Source B     16383|                                           |Dest        C113C4|
| |                  |                                           |              1730|
| +------------------+                                           +------------------+
| N7:48 - (2:286)

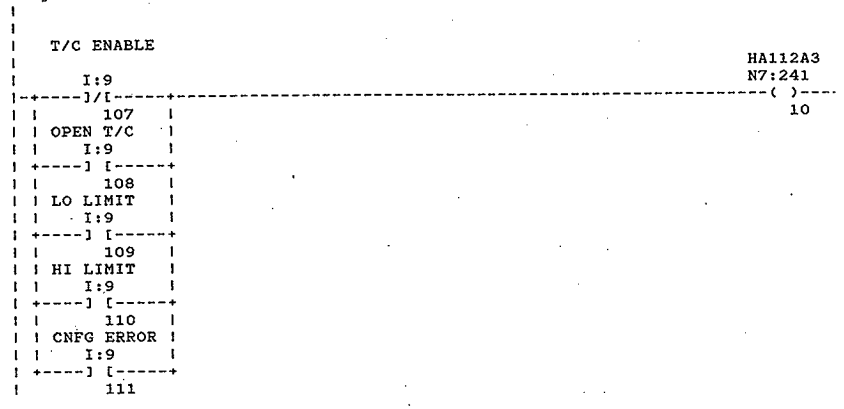
Rung 2:288
*******************************************************************************
        For each T/C read its STATUS BITS to detect T/C problems
                        HARDWARE ALARMS FOR TANK T-3002

|
|
|   T/C ENABLE
|                                                                                HA112A1
|      I:9                                                                       N7:241
|-+----]/[-----+-------------------------------------------------------------( )----
| |      75    |                                                                  8
| | OPEN T/C   |
| |    I:9     |
| +----] [-----+
| |      76    |
| |  I:9       |
| +--] [-------+
| |    77      |
| | HI LIMIT   |
| |    I:9     |
| +----] [-----+
| |      78    |
| |            |
| | CNFG ERROR |
| |            |
| |    I:9     |
| +----] [-----+
|        79
```

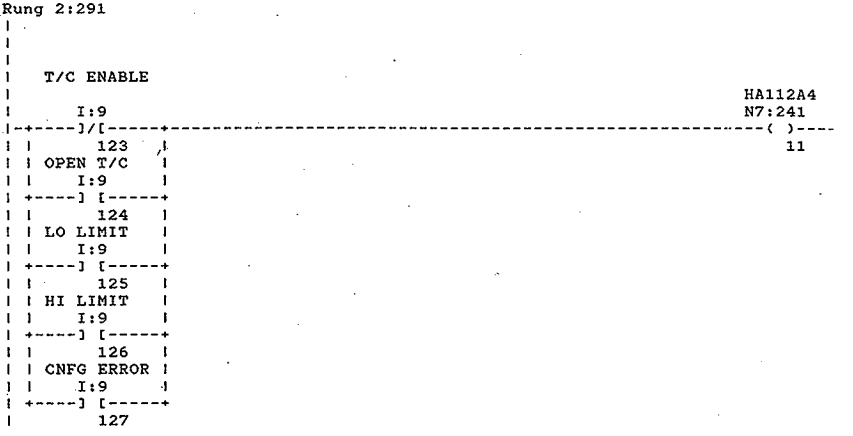
Rung 2:289



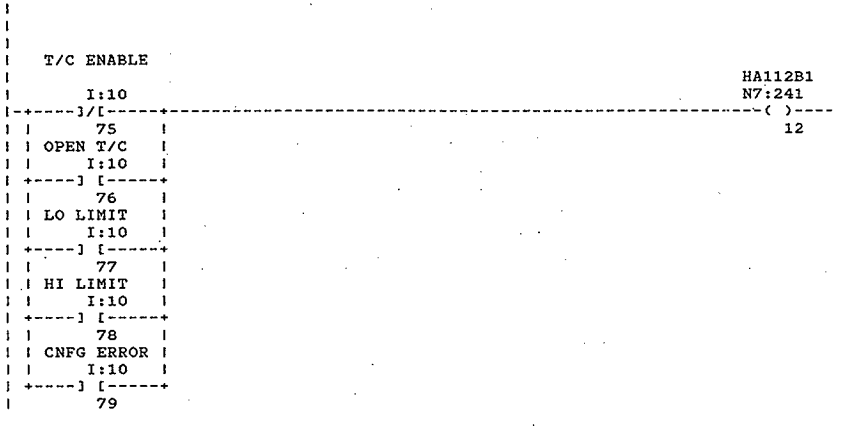
Rung 2:290



Rung 2:291



Rung 2:292



Rung 2:293

```
|
|
|
|   T/C ENABLE
|                                                                          HA112B2
|       I:10                                                               N7:241
|-+----]/[-----+-------------------------------------------------------------( )----
| |       91   |                                                              13
| | OPEN T/C   |
| |      I:10  |
| +----] [-----+
| |       92   |
| | LO LIMIT   |
| |      I:10  |
| +----] [-----+
| |       93   |
| | HI LIMIT   |
| |      I:10  |
| +----] [-----+
| |       94   |
| | CNFG ERROR |
| |      I:10  |
| +----] [-----+
|         95
```

Rung 2:294

```
|
|
|   T/C ENABLE
|                                                                          HA112B3
|       I:10                                                               N7:241
|-+----]/[-----+-------------------------------------------------------------( )----
| |       107  |                                                              14
| | OPEN T/C   |
| |      I:10  |
| +----] [-----+
| |       108  |
| | LO LIMIT   |
| |      I:10  |
| +----] [-----+
| |       109  |
| | HI LIMIT   |
| |      I:10  |
| +----] [-----+
| |       110  |
| | CNFG ERROR |
| |      I:10  |
| +----] [-----+
|         111
```

Rung 2:295

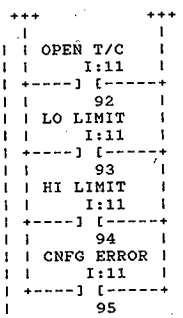
```
|
|
|   T/C ENABLE
|                                                                    HA112B4
|       I:10                                                         N7:241
|-+----]/[-----+-------------------------------------------------------( )----
| |       123   |                                                       15
| | OPEN T/C    |
| |      I:10   |
| +----] [-----+
| |       124   |
| | LO LIMIT    |
| |      I:10   |
| +----] [-----+
| |       125   |
| | HI LIMIT    |
| |      I:10   |
| +----] [-----+
| |       126   |
| | CNFG ERROR  |
| |      I:10   |
| +----] [-----+
|         127
```

Rung 2:296

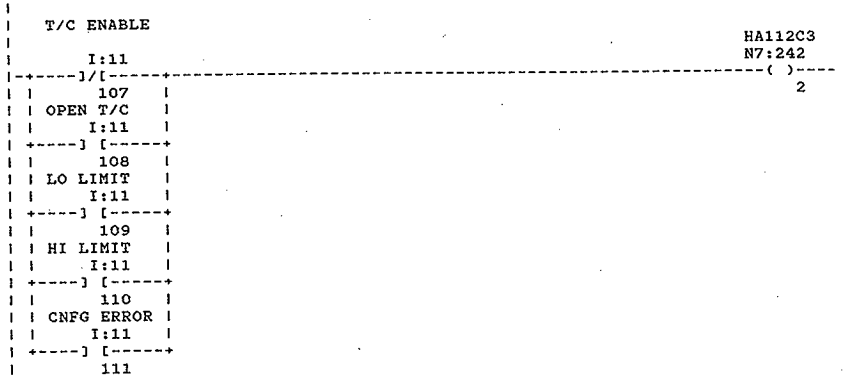
```
|
|
|   T/C ENABLE
|                                                                    HA112C1
|       I:11                                                         N7:242
|-+----]/[-----+-------------------------------------------------------( )----
| |       75    |                                                        0
| | OPEN T/C    |
| |      I:11   |
| +----] [-----+
| |       76    |
| | LO LIMIT    |
| |      I:11   |
| +----] [-----+
| |       77    |
| | HI LIMIT    |
| |      I:11   |
| +----] [-----+
| |       78    |
| | CNFG ERROR  |
| |      I:11   |
| +----] [-----+
|         79
```

Rung 2:297

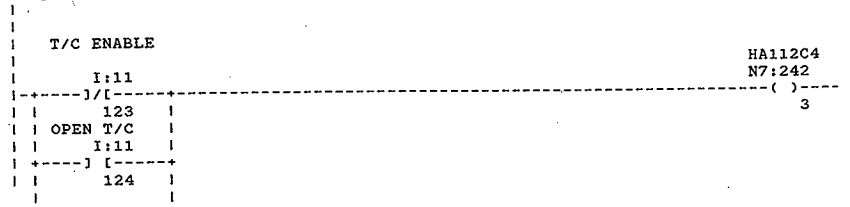
```
|
|
|   T/C ENABLE
|                                                                    HA112C2
|       I:11                                                         N7:242
|-+----]/[-----+-------------------------------------------------------( )----
| |       91    |                                                        1
  |             |
 +++           +++
```

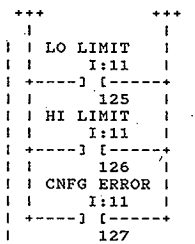


Rung 2:298



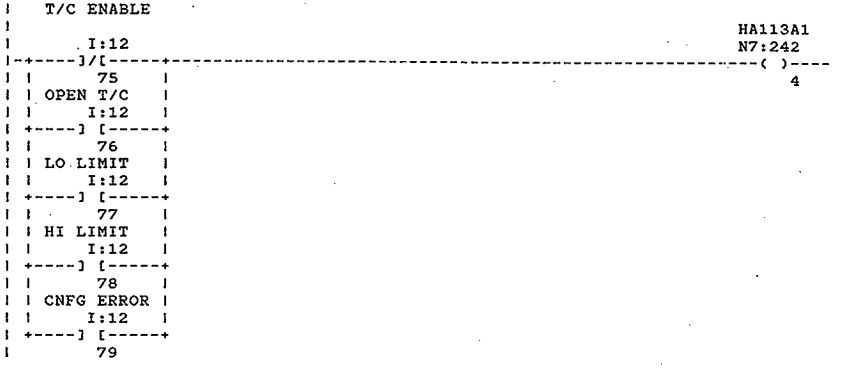
Rung 2:299



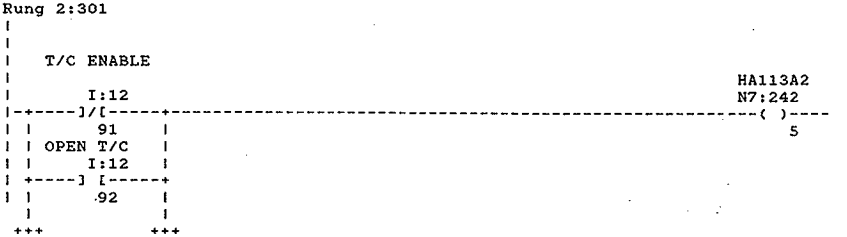


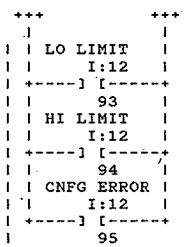
Rung 2:300

For each T/C read its STATUS BITS to detect T/C problems
HARDWARE ALARMS FOR TANK T-3002

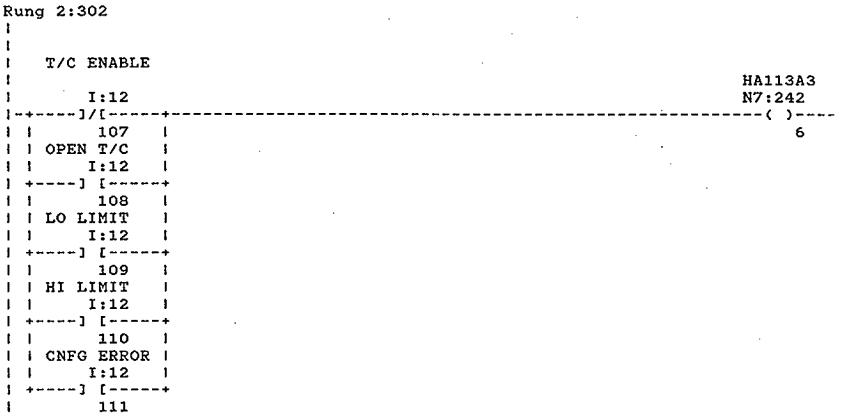


Rung 2:301

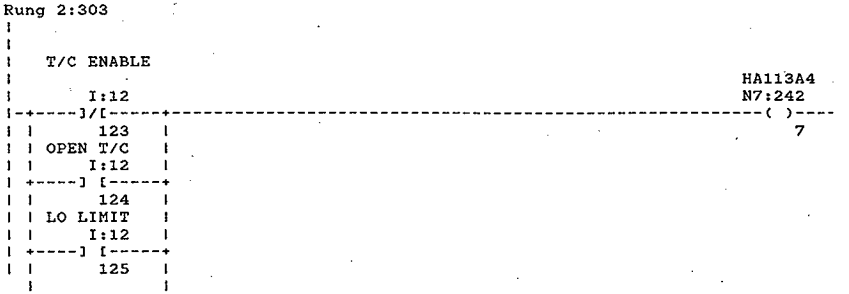


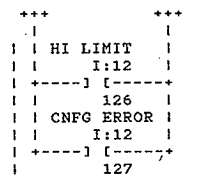


Rung 2:302

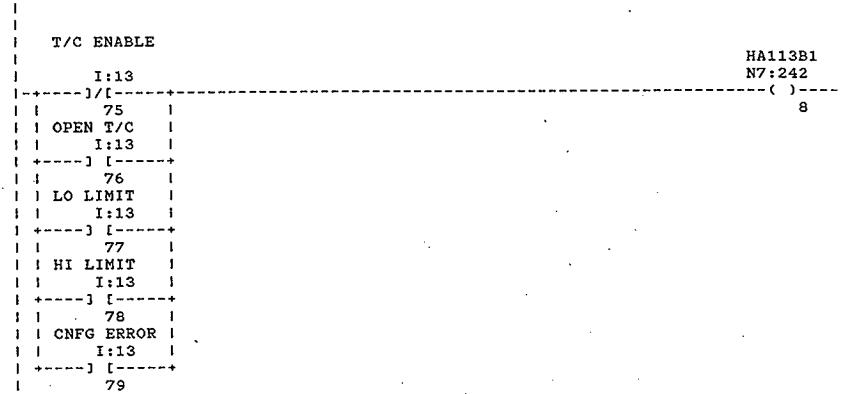


Rung 2:303

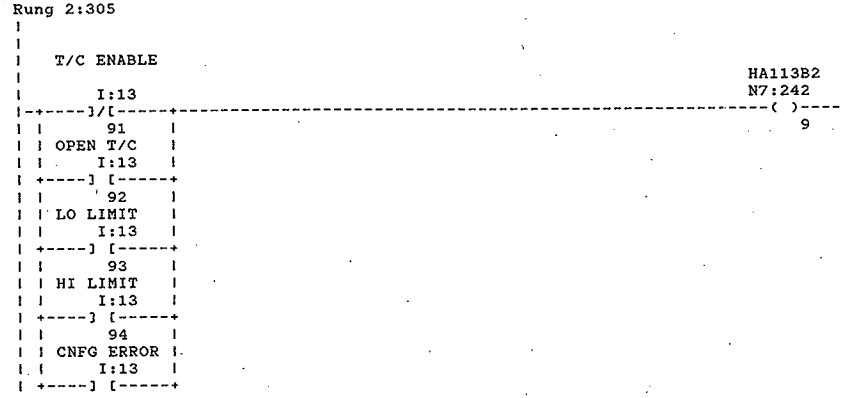


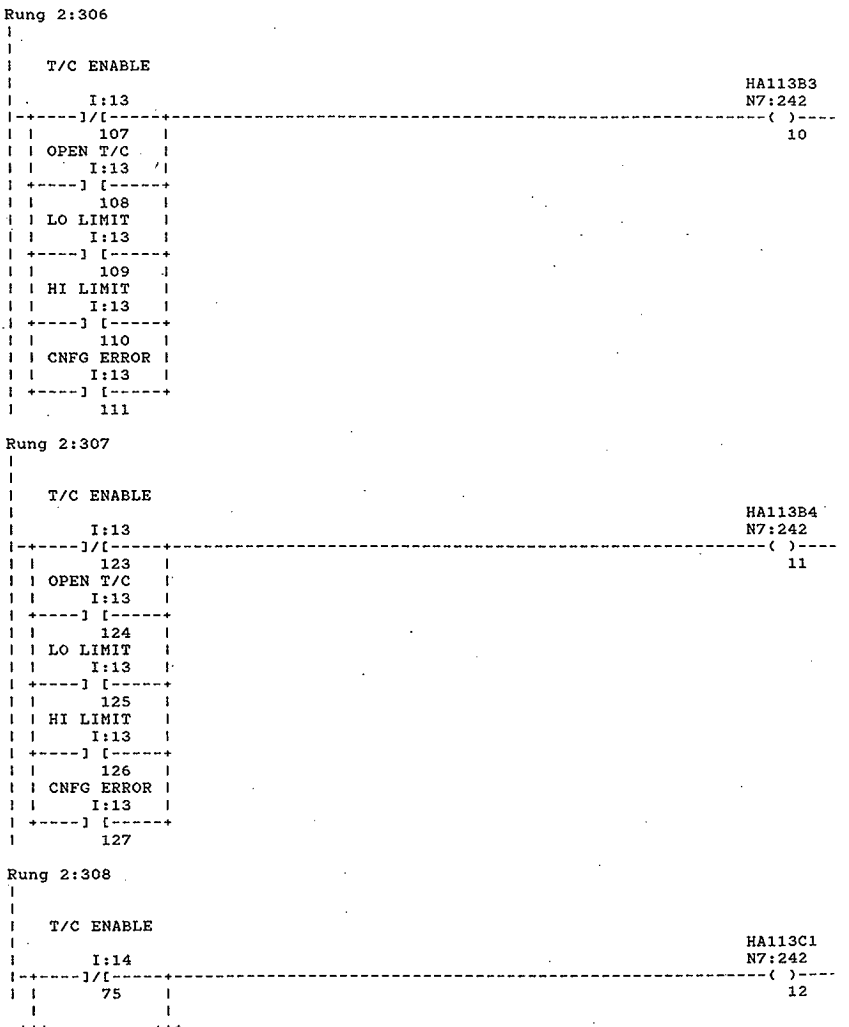


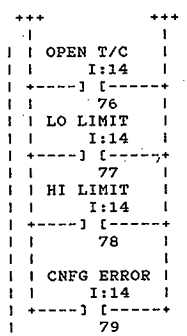
Rung 2:304



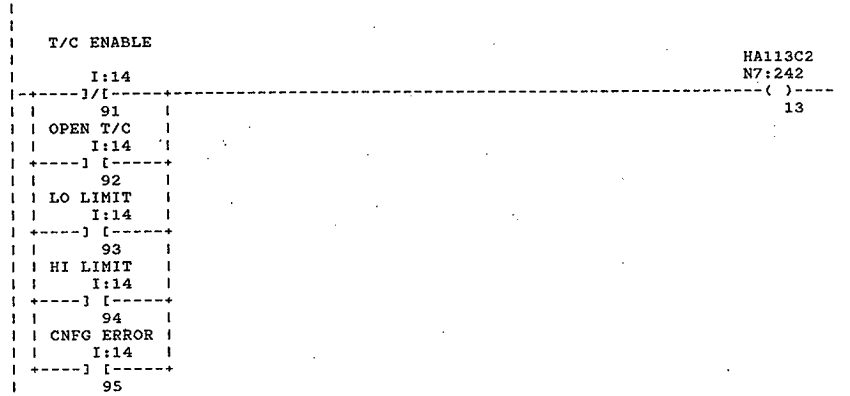
Rung 2:305



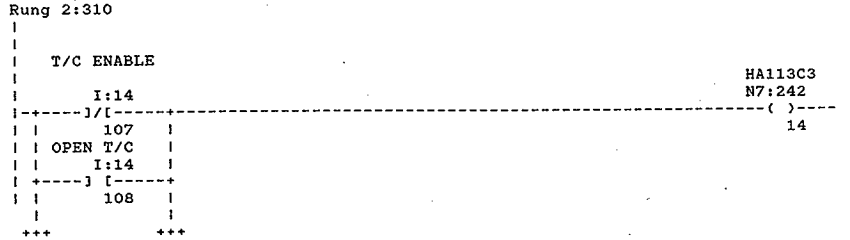

Rung 2:306
T/C ENABLE
I:13
107
OPEN T/C
I:13
108
LO LIMIT
I:13
109
HI LIMIT
I:13
110
CNFG ERROR
I:13
111
HA113B3
N7:242
10
Rung 2:307
T/C ENABLE
I:13
123
OPEN T/C
I:13
124
LO LIMIT
I:13
125
HI LIMIT
I:13
126
CNFG ERROR
I:13
127
HA113B4
N7:242
11
Rung 2:308
T/C ENABLE
I:14
75
HA113C1
N7:242
12

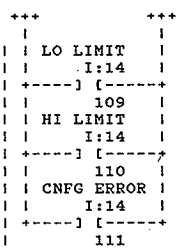


Rung 2:309

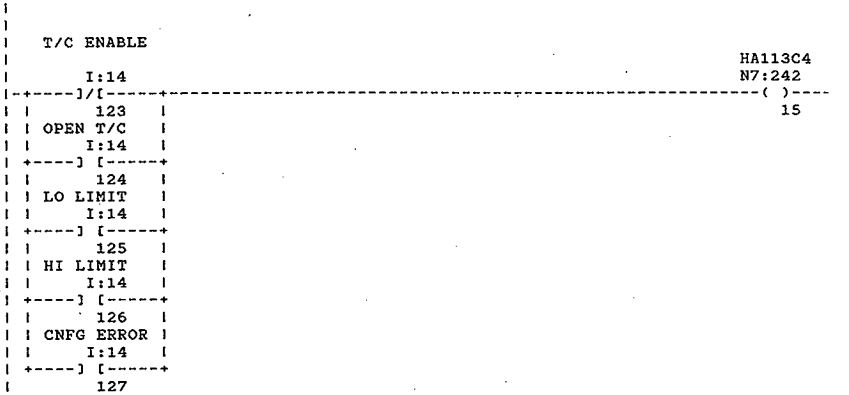


Rung 2:310

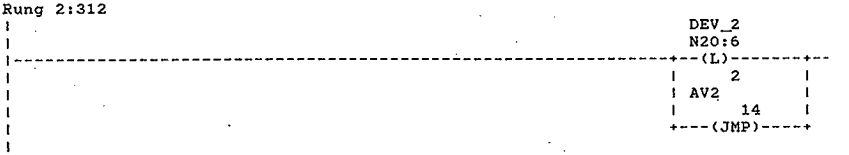




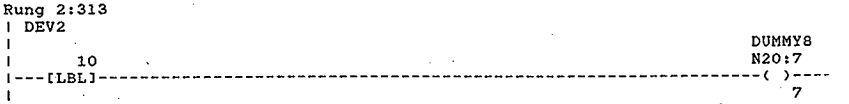
Rung 2:311



Rung 2:312



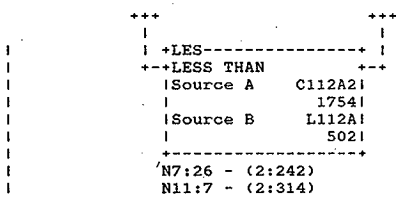
Rung 2:313



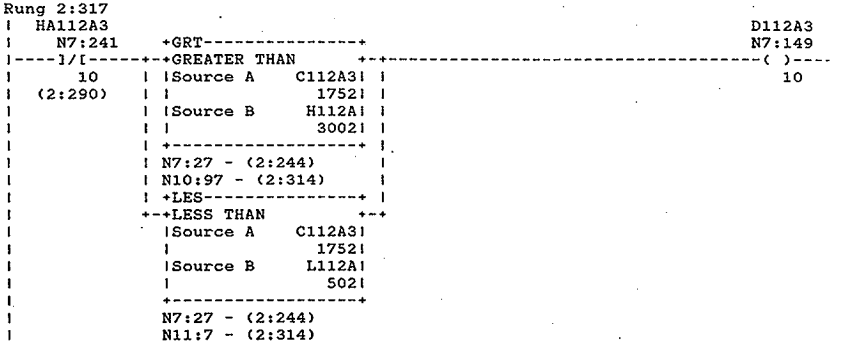
```
Rung 2:314
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD--------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A    AV112A| |
|                                                       | |              1752| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H112A| |
|                                                       | |              3002| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV112A|
|                                                         |              1752|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L112A|
|                                                         |               502|
|                                                         +------------------+

Rung 2:315
|                    T-3004
|  HA112A1                                                                D112A1
|    N7:241    +GRT---------------+                                       N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       8    | |Source A    C112A1| |                                        8
|  (2:288)   | |              1753| |
|            | |Source B     H112A| |
|            | |              3002| |
|            | +------------------+ |
|            | N7:25 - (2:240)      |
|            | N10:97 - (2:314)     |
|            |      T-3004          |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C112A1|
|              |              1753|
|              |Source B     L112A|
|              |               502|
|              +------------------+
|              N7:25 - (2:240)
|              N11:7 - (2:314)

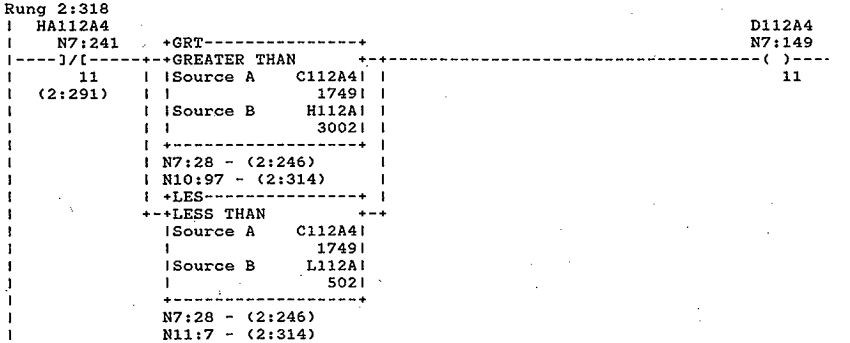
Rung 2:316
|  HA112A2                                                                D112A2
|    N7:241    +GRT---------------+                                       N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       9    | |Source A    C112A2| |                                        9
|  (2:289)   | |              1754| |
|            | |Source B     H112A| |
|            | |              3002| |
|            | +------------------+ |
|            | N7:26 - (2:242)      |
|            | N10:97 - (2:314)     |
|            |                      |
            +++                    +++
```



Rung 2:317



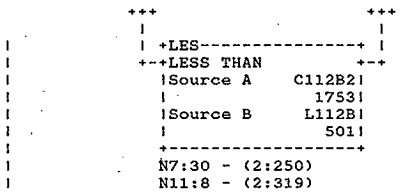
Rung 2:318



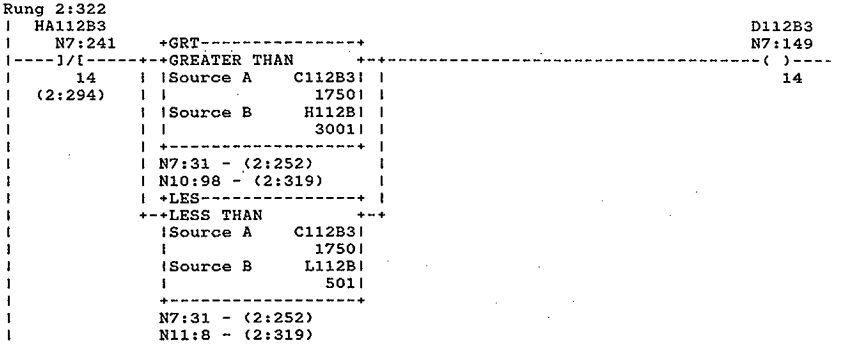
```
Rung 2:319
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV112B| |
|                                                       | |              1751| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H112B| |
|                                                       | |              3001| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV112B|
|                                                         |              1751|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L112B|
|                                                         |               501|
|                                                         +------------------+

Rung 2:320
|                    T-3004
|  HA112B1                                                                D112B1
|    N7:241    +GRT---------------+                                       N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      12    | |Source A    C112B1| |                                      12
|  (2:292)   | |              1751| |
|            | |Source B     H112B| |
|            | |              3001| |
|            | +------------------+ |
|            | N7:29 - (2:248)      |
|            | N10:98 - (2:319)     |
|            |      T-3004          |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C112B1|
|              |              1751|
|              |Source B     L112B|
|              |               501|
|              +------------------+
|              N7:29 - (2:248)
|              N11:8 - (2:319)

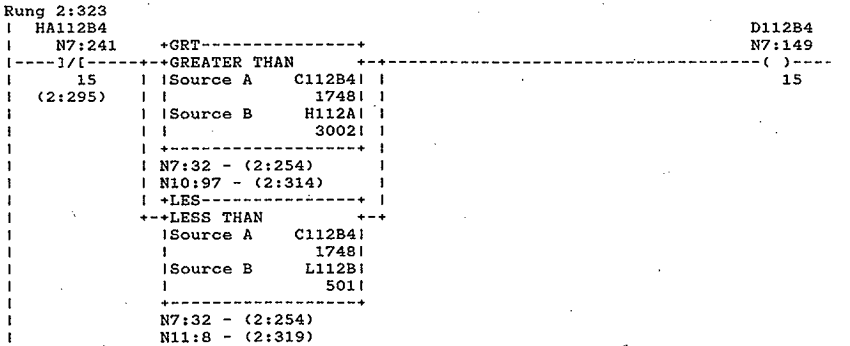
Rung 2:321
|  HA112B2                                                                D112B2
|    N7:241    +GRT---------------+                                       N7:149
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      13    | |Source A    C112B2| |                                      13
|  (2:293)   | |              1753| |
|            | |Source B     H112B| |
|            | |              3001| |
|            | +------------------+ |
|            | N7:30 - (2:250)      |
|            | N10:98 - (2:319)     |
|            |                      |
            +++                    +++
```



Rung 2:322



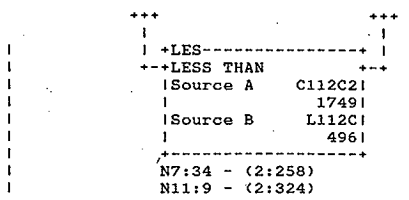
Rung 2:323



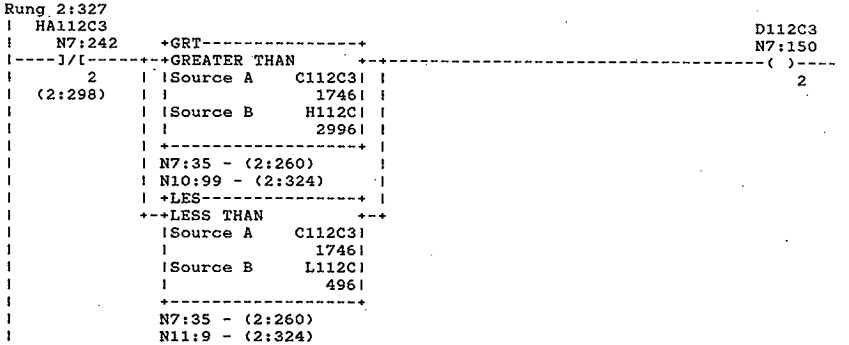
```
Rung 2:324
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV112C| |
|                                                       | |              1746| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H112C| |
|                                                       | |              2996| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV112C|
|                                                         |              1746|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L112C|
|                                                         |               496|
|                                                         +------------------+

Rung 2:325
|                    T-3004
|  HA112C1                                                                D112C1
|    N7:242    +GRT---------------+                                       N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A    C112C1| |                                       0
|  (2:296)   | |              1746| |
|            | |Source B     H112C| |
|            | |              2996| |
|            | +------------------+ |
|            | N7:33 - (2:256)      |
|            | N10:99 - (2:324)     |
|            |      T-3004          |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C112C1|
|              |              1746|
|              |Source B     L112C|
|              |               496|
|              +------------------+
|              N7:33 - (2:256)
|              N11:9 - (2:324)

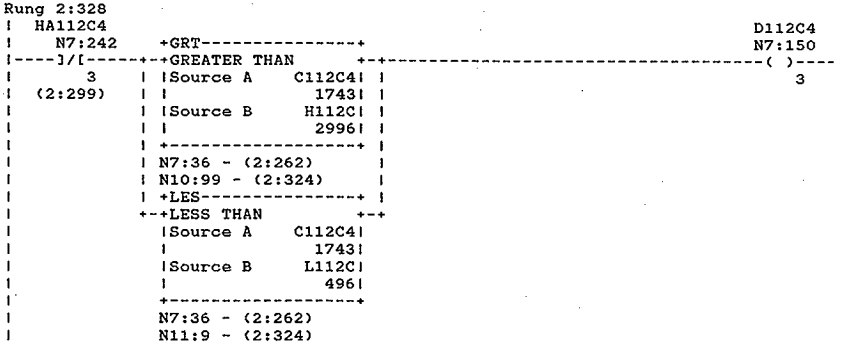
Rung 2:326
|  HA112C2                                                                D112C2
|    N7:242    +GRT---------------+                                       N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       1    | |Source A    C112C2| |                                       1
|  (2:297)   | |              1749| |
|            | |Source B     H112C| |
|            | |              2996| |
|            | +------------------+ |
|            | N7:34 - (2:258)      |
|            | N10:99 - (2:324)     |
|            |                      |
            +++                    +++
```



Rung 2:327



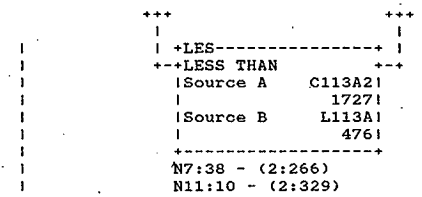
Rung 2:328



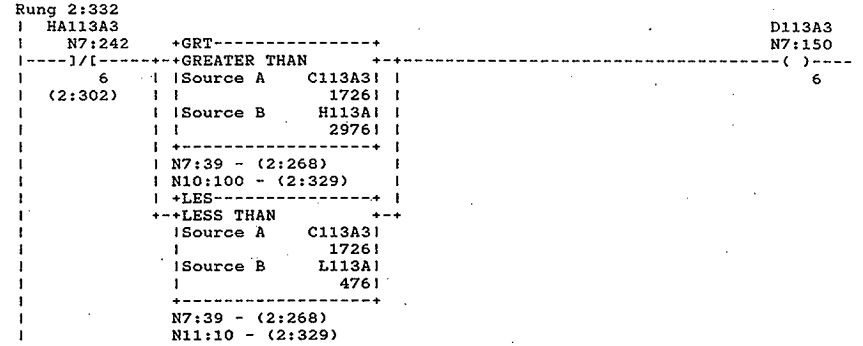
```
Rung 2:329
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV113A| |
|                                                       | |              1726| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H113A| |
|                                                       | |              2976| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV113A|
|                                                         |              1726|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L113A|
|                                                         |               476|
|                                                         +------------------+

Rung 2:330
|                    T-3001
|  HA113A1                                                                  D113A1
|    N7:242    +GRT---------------+                                         N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       4    | |Source A    C113A1| |                                        4
|  (2:300)   | |              1725| |
|            | |Source B     H113A| |
|            | |              2976| |
|            | +------------------+ |
|            | N7:37 - (2:264)      |
|            | N10:100 - (2:329)    |
|            |      T-3001          |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C113A1|
|              |              1725|
|              |Source B     L113A|
|              |               476|
|              +------------------+
|              N7:37 - (2:264)
|              N11:10 - (2:329)

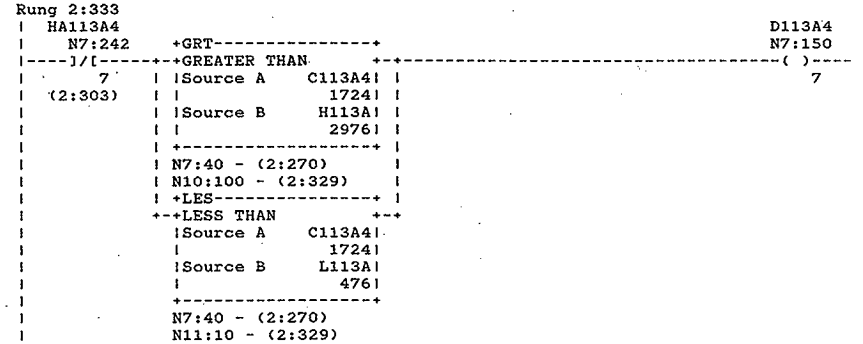
Rung 2:331
|  HA113A2                                                                  D113A2
|    N7:242    +GRT---------------+                                         N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       5    | |Source A    C113A2| |                                        5
|  (2:301)   | |              1727| |
|            | |Source B     H113A| |
|            | |              2976| |
|            | +------------------+ |
|            | N7:38 - (2:266)      |
|            | N10:100 - (2:329)    |
             |                      |
            +++                    +++
```



Rung 2:332



Rung 2:333



```
Rung 2:334
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV113B| |
|                                                       | |              1732| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H113B| |
|                                                       | |              2982| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV113B|
|                                                         |              1732|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L113B|
|                                                         |               482|
|                                                         +------------------+

Rung 2:335
|  HA113B1                                                                D113B1
|    N7:242    +GRT---------------+                                       N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       8    | |Source A    C113B1| |                                       8
|  (2:304)   | |              1733| |
|            | |Source B     H113B| |
|            | |              2982| |
|            | +------------------+ |
|            | N7:41 - (2:272)      |
|            | N10:101 - (2:334)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C113B1|
|              |              1733|
|              |Source B     L113B|
|              |               482|
|              +------------------+
|              N7:41 - (2:272)
|              N11:11 - (2:334)

Rung 2:336
|  HA113B2                                                                D113B2
|    N7:242    +GRT---------------+                                       N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       9    | |Source A    C113B2| |                                       9
|  (2:305)   | |              1735| |
|            | |Source B     H113B| |
|            | |              2982| |
|            | +------------------+ |
|            | N7:42 - (2:274)      |
|            | N10:101 - (2:334)    |
             |                      |
            +++                    +++
```

```
            +++                     +++
             |                       |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C113B2|
|              |               1735|
|              |Source B     L113B|
|              |                482|
|              +-------------------+
|              N7:42 - (2:274)
|              N11:11 - (2:334)

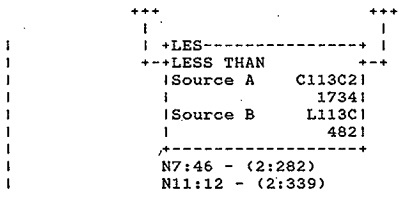
Rung 2:337
|  HA113B3                                                                  D113B3
|    N7:242    +GRT---------------+                                         N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      10    | |Source A    C113B3| |                                        10
|  (2:306)   | |               1733| |
|            | |Source B     H113B| |
|            | |               2982| |
|            | +-------------------+ |
|            | N7:43 - (2:276)       |
|            | N10:101 - (2:334)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C113B3|
|              |               1733|
|              |Source B     L113B|
|              |                482|
|              +-------------------+
|              N7:43 - (2:276)
|              N11:11 - (2:334)

Rung 2:338
|  HA113B4                                                                  D113B4
|    N7:242    +GRT---------------+                                         N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      11    | |Source A    C113B4| |                                        11
|  (2:307)   | |               1727| |
|            | |Source B     H113B| |
|            | |               2982| |
|            | +-------------------+ |
|            | N7:44 - (2:278)       |
|            | N10:101 - (2:334)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C113B4|
|              |               1727|
|              |Source B     L113B|
|              |                482|
|              +-------------------+
|              N7:44 - (2:278)
|              N11:11 - (2:334)
```

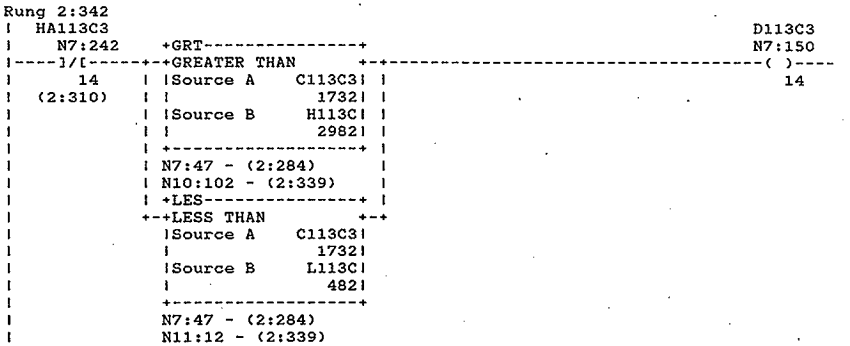
```
Rung 2:339
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV113C| |
|                                                       | |              1732| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H113C| |
|                                                       | |              2982| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV113C|
|                                                         |              1732|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L113C|
|                                                         |               482|
|                                                         +------------------+

Rung 2:340
|  HA113C1                                                                  D113C1
|    N7:242    +GRT---------------+                                         N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      12    | |Source A    C113C1| |                                        12
|  (2:308)   | |              1731| |
|            | |Source B     H113C| |
|            | |              2982| |
|            | +------------------+ |
|            | N7:45 - (2:280)      |
|            | N10:102 - (2:339)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C113C1|
|              |              1731|
|              |Source B     L113C|
|              |               482|
|              +------------------+
|              N7:45 - (2:280)
|              N11:12 - (2:339)

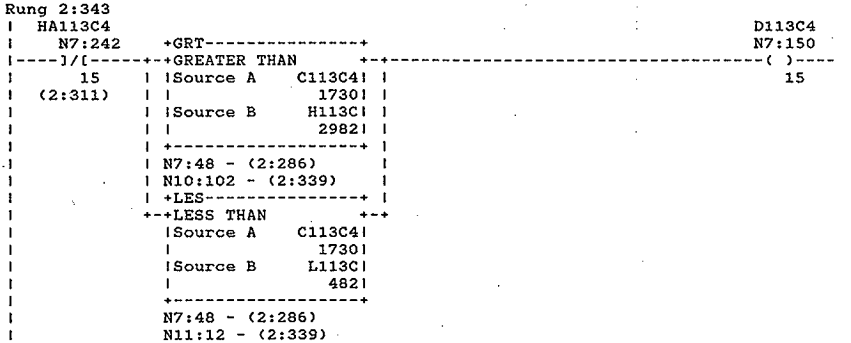
Rung 2:341
|  HA113C2                                                                  D113C2
|    N7:242    +GRT---------------+                                         N7:150
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      13    | |Source A    C113C2| |                                        13
|  (2:309)   | |              1734| |
|            | |Source B     H113C| |
|            | |              2982| |
|            | +------------------+ |
|            | N7:46 - (2:282)      |
|            | N10:102 - (2:339)    |
|            |                      |
           +++                     +++
```



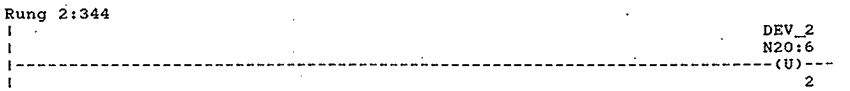
Rung 2:342



Rung 2:343

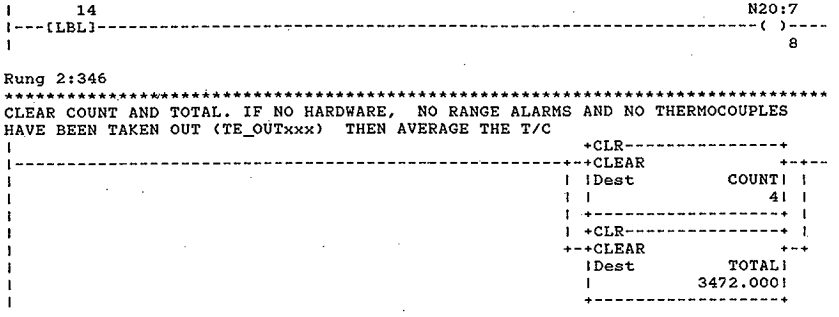


Rung 2:344

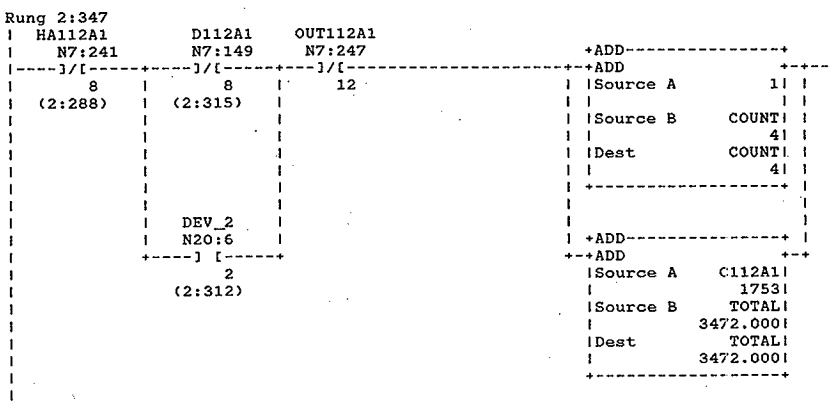


Rung 2:345

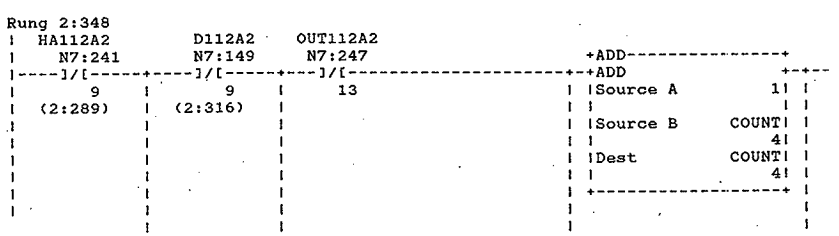
Rung 2:346



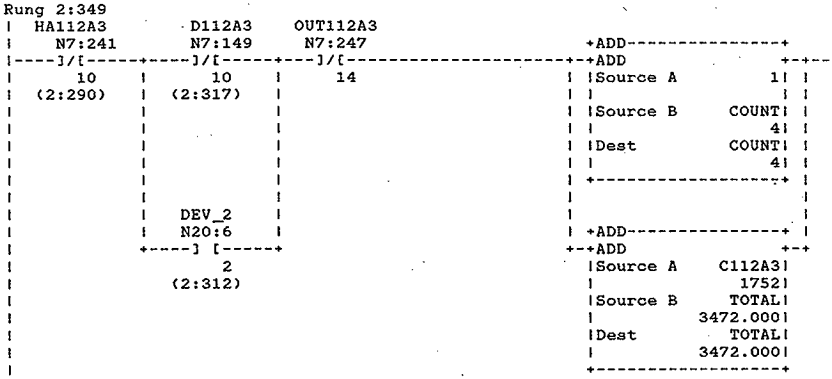
Rung 2:347



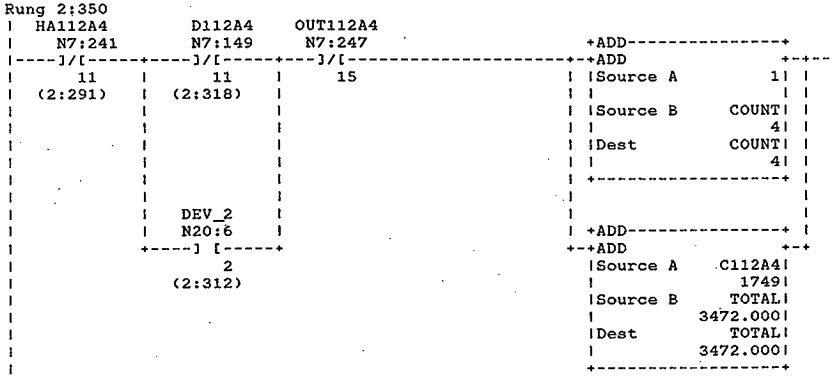
Rung 2:348



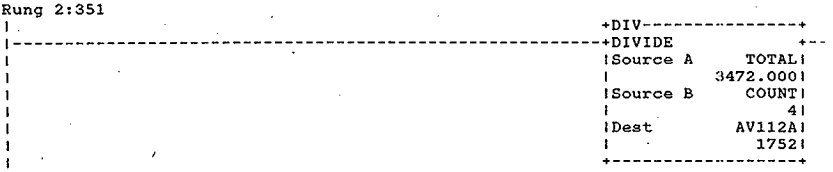
Rung 2:349



Rung 2:350

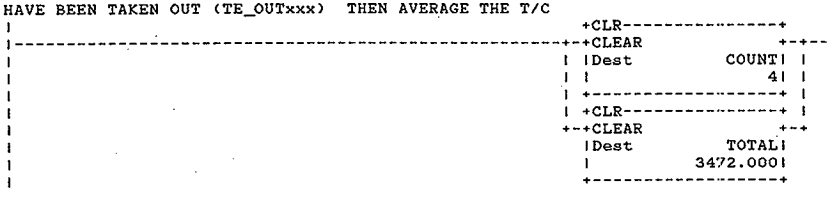


Rung 2:351

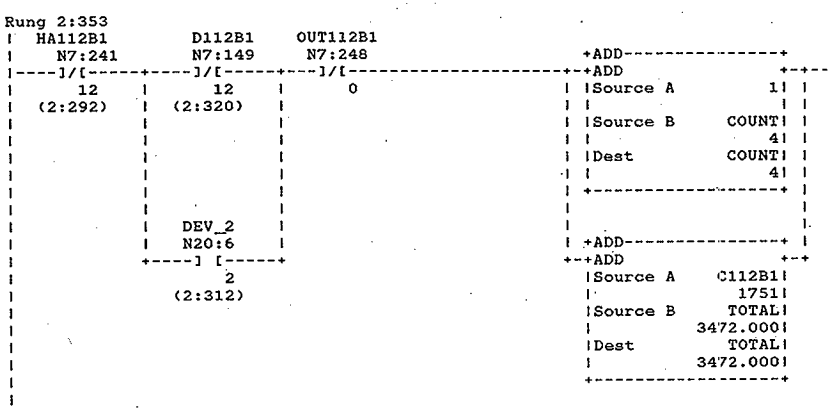


Rung 2:352

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



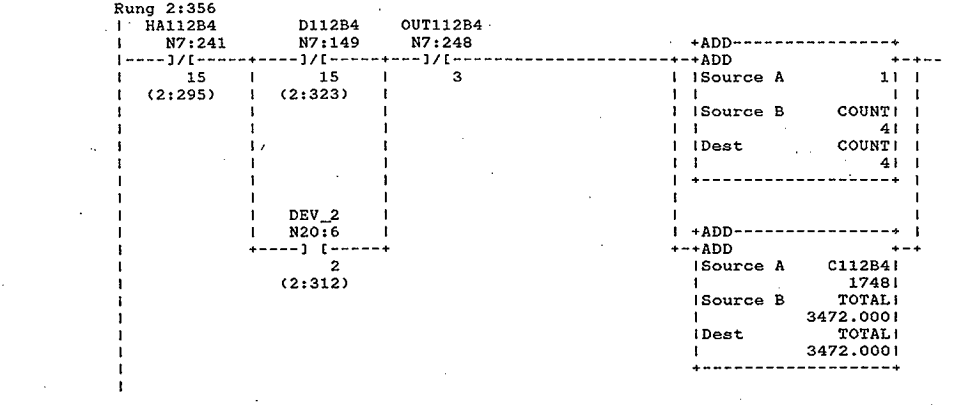
Rung 2:353



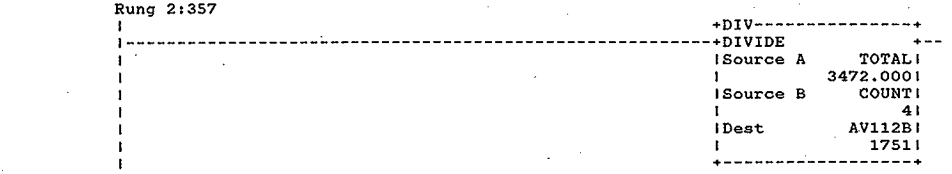
```
Rung 2:354
|  HA112B2        D112B2    OUT112B2
|    N7:241       N7:149     N7:248                          +ADD---------------+
|----]/[-----+----]/[-----+---]/[---------------------+-+ADD                +-+--
|      13    |      13    |      1                    | |Source A         1| |
|  (2:293)   |  (2:321)   |                           | |                  | |
|            |            |                           | |Source B     COUNT| |
|            |            |                           | |                 4| |
|            |            |                           | |Dest         COUNT| |
|            |            |                           | |                 4| |
|            |            |                           | +------------------+ |
|            |            |                           |                      |
|            |   DEV_2    |                           |                      |
|            |   N20:6    |                           | +ADD---------------+ |
|            +----] [-----+                           +-+ADD                +-+
|                   2                                  |Source A    C112B2|
|               (2:312)                                |              1753|
|                                                      |Source B     TOTAL|
|                                                      |          3472.000|
|                                                      |Dest         TOTAL|
|                                                      |          3472.000|
|                                                      +------------------+
|
```

```
Rung 2:355
|  HA112B3        D112B3    OUT112B3
|    N7:241       N7:149     N7:248                          +ADD---------------+
|----]/[-----+----]/[-----+---]/[---------------------+-+ADD                +-+--
|      14    |      14    |      2                    | |Source A         1| |
|  (2:294)   |  (2:322)   |                           | |                  | |
|            |            |                           | |Source B     COUNT| |
|            |            |                           | |                 4| |
|            |            |                           | |Dest         COUNT| |
|            |            |                           | |                 4| |
|            |            |                           | +------------------+ |
|            |            |                           |                      |
|            |   DEV_2    |                           |                      |
|            |   N20:6    |                           | +ADD---------------+ |
|            +----] [-----+                           +-+ADD                +-+
|                   2                                  |Source A    C112B3|
|               (2:312)                                |              1750|
|                                                      |Source B     TOTAL|
|                                                      |          3472.000|
|                                                      |Dest         TOTAL|
|                                                      |          3472.000|
|                                                      +------------------+
|
```

Rung 2:356

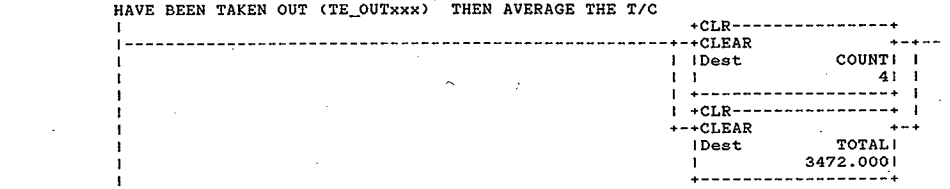


Rung 2:357

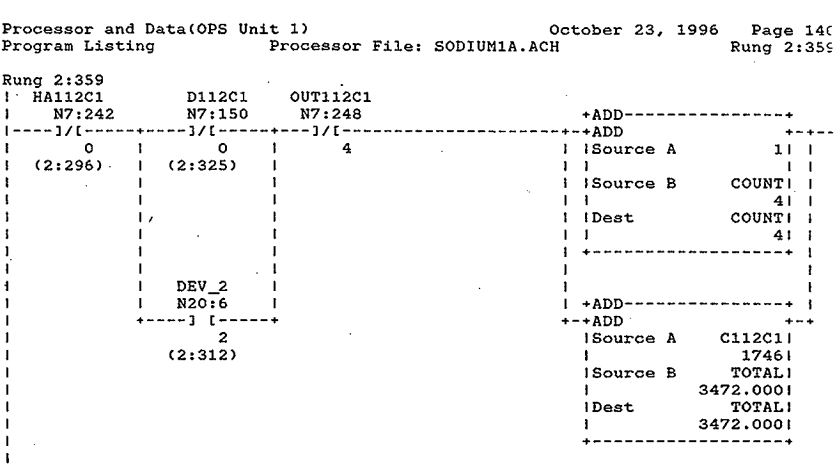


Rung 2:358

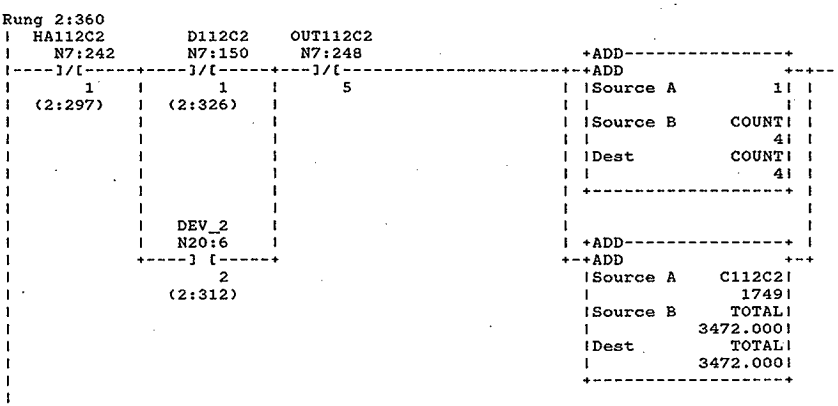
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



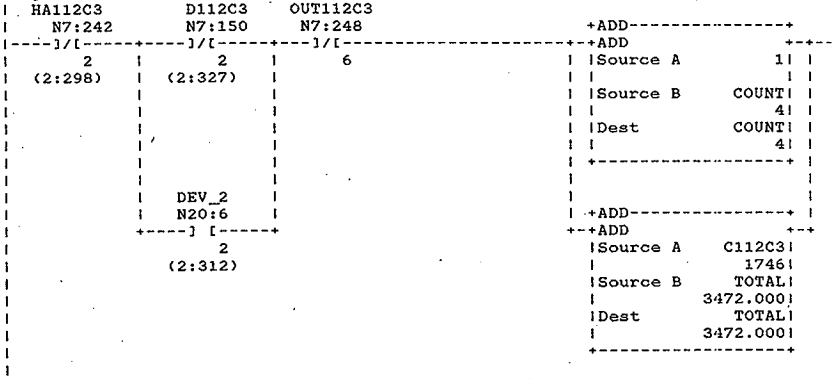
Rung 2:359



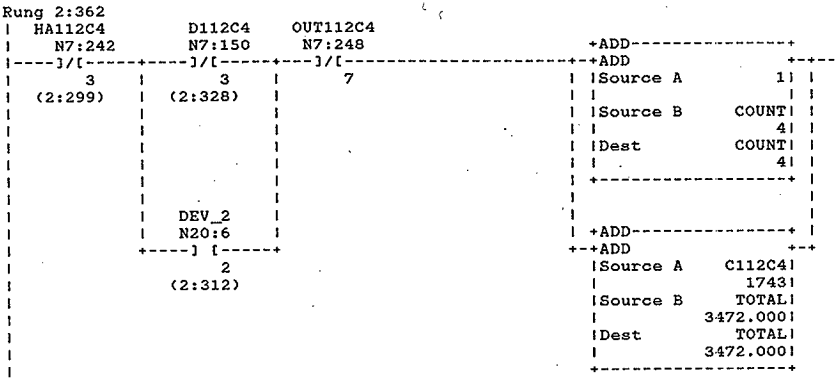
Rung 2:360



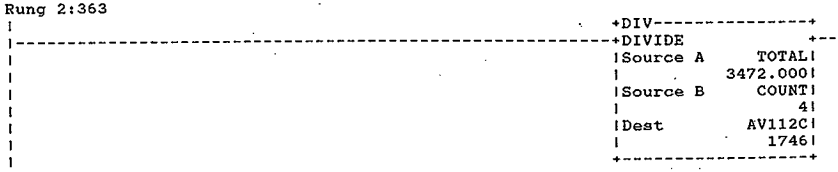
Rung 2:361



Rung 2:362

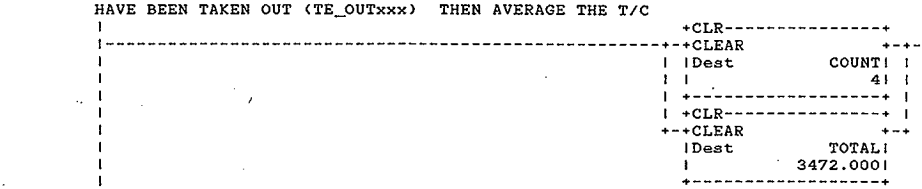


Rung 2:363

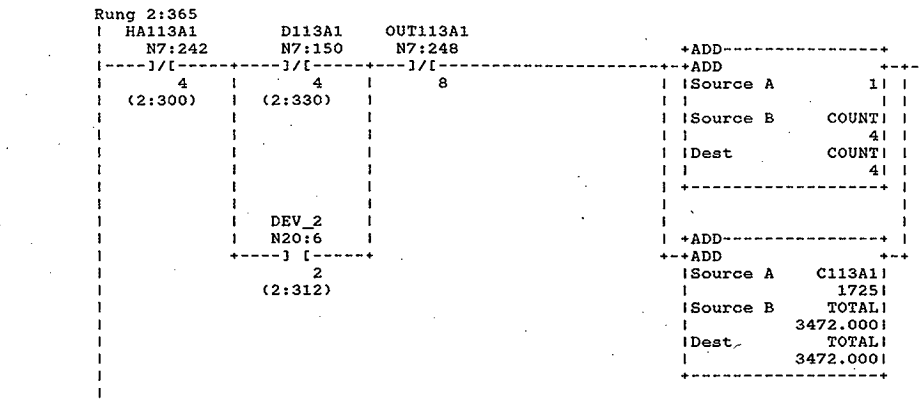


Rung 2:364

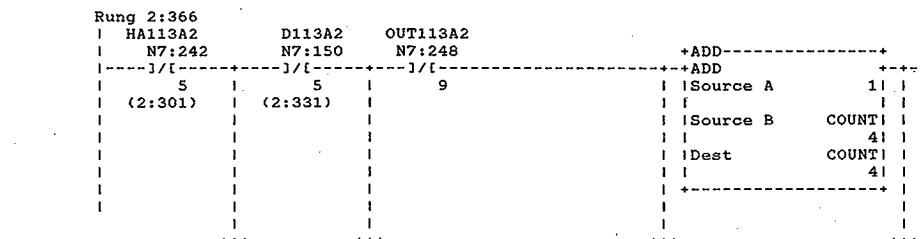
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



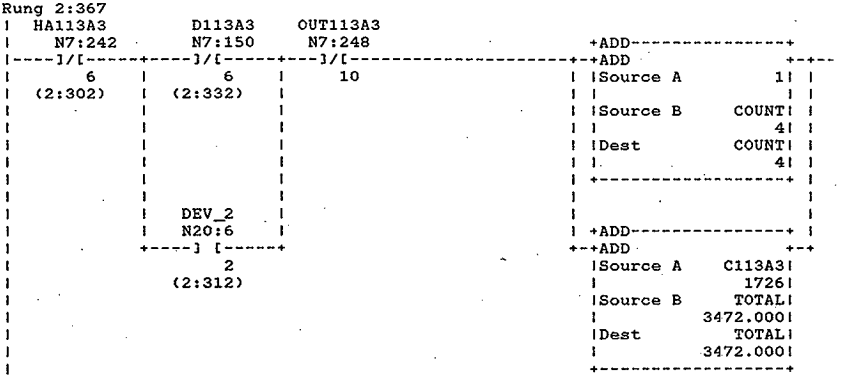
Rung 2:365



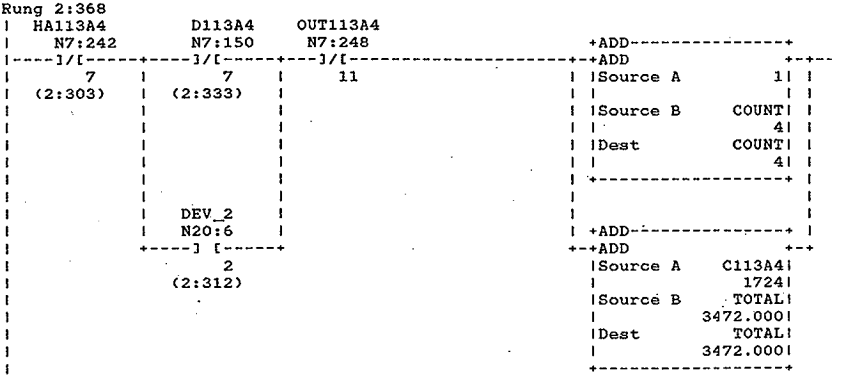
Rung 2:366



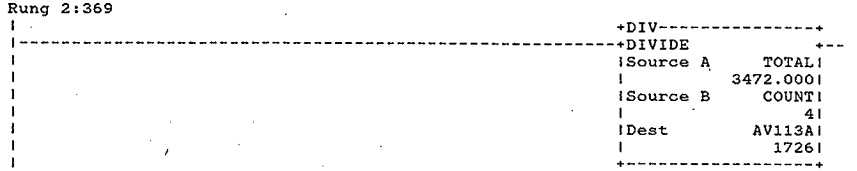
Rung 2:367



Rung 2:368

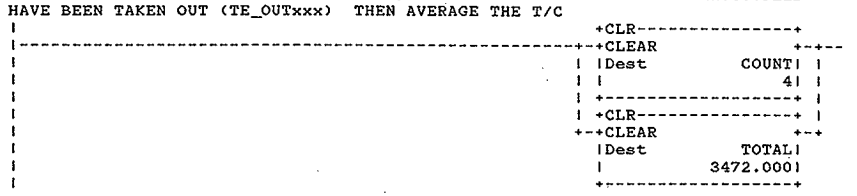


Rung 2:369

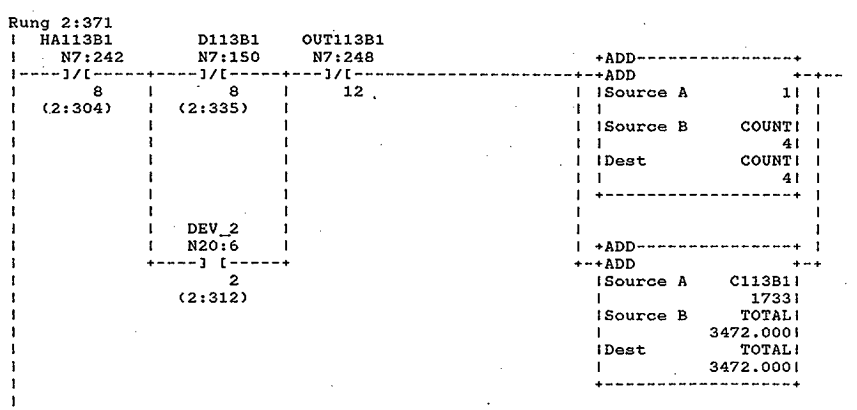


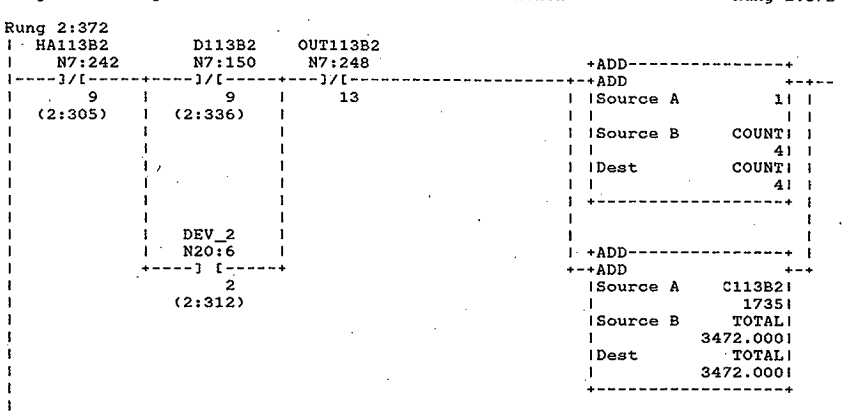
Rung 2:370

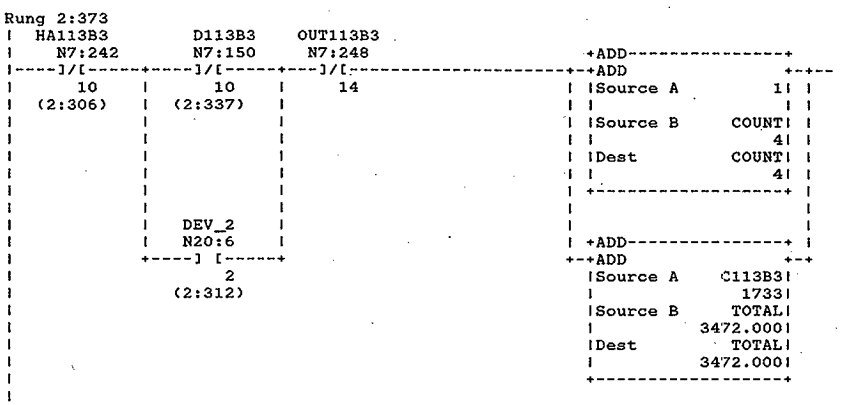
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



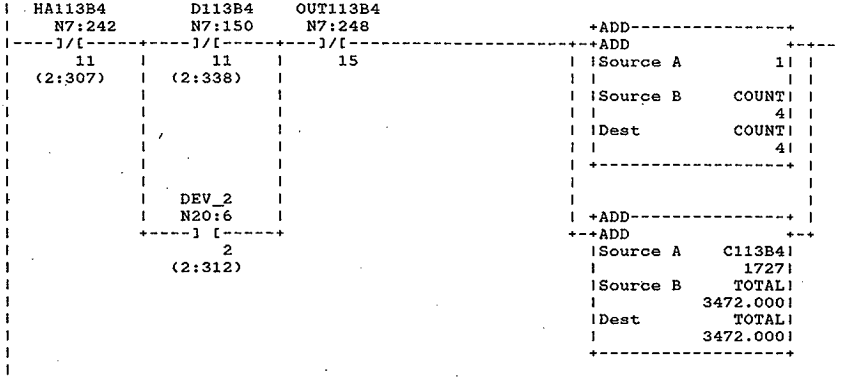
Rung 2:371



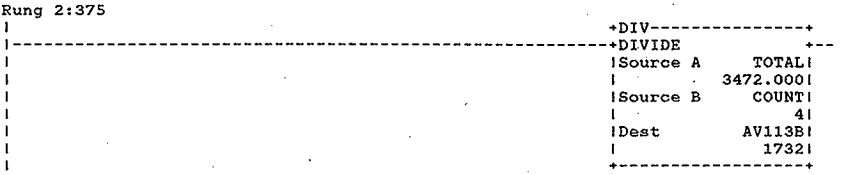

Rung 2:372
HA113B2
N7:242
9
(2:305)
D113B2
N7:150
9
(2:336)
DEV_2
N20:6
2
(2:312)
OUT113B2
N7:248
13
ADD
Source A 1
Source B COUNT 4
Dest COUNT 4
ADD
Source A C113B2 1735
Source B TOTAL 3472.000
Dest TOTAL 3472.000


Rung 2:373
HA113B3
N7:242
10
(2:306)
D113B3
N7:150
10
(2:337)
DEV_2
N20:6
2
(2:312)
OUT113B3
N7:248
14
ADD
Source A 1
Source B COUNT 4
Dest COUNT 4
ADD
Source A C113B3 1733
Source B TOTAL 3472.000
Dest TOTAL 3472.000

Rung 2:374

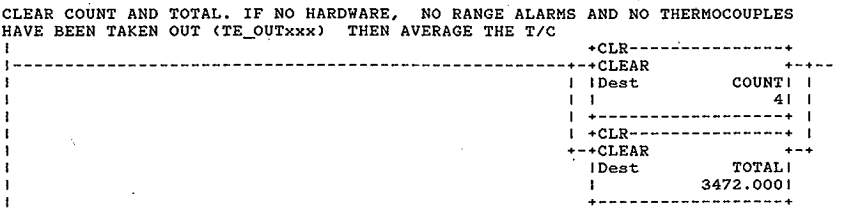


Rung 2:375

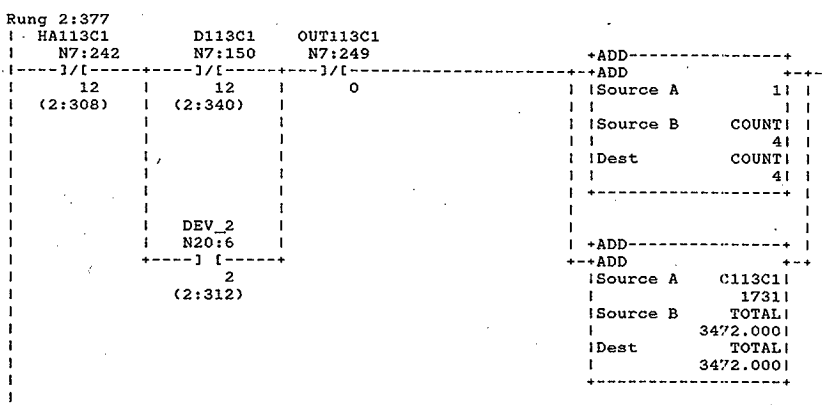


Rung 2:376

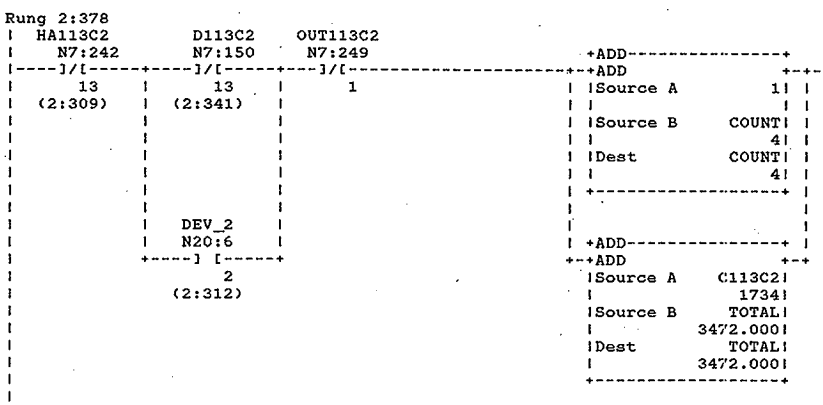
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```



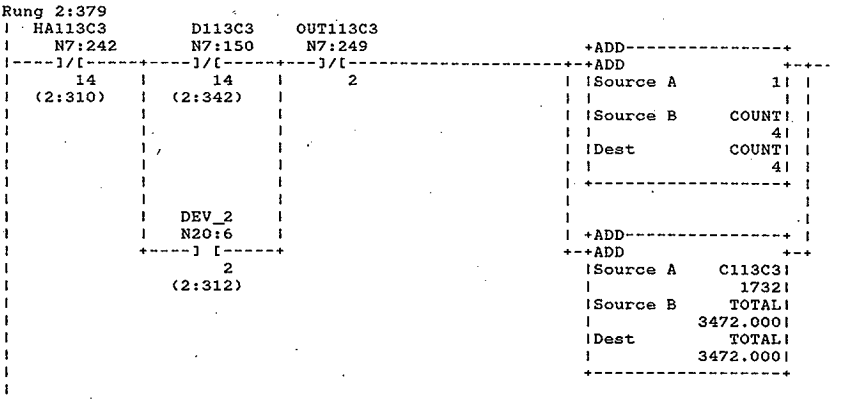
Rung 2:377



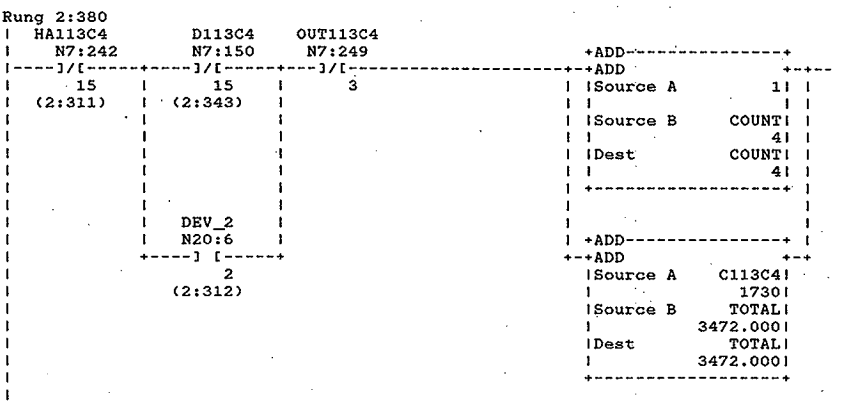
Rung 2:378



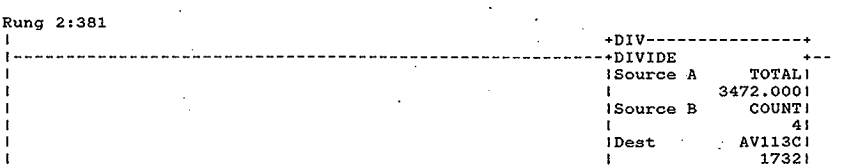
Rung 2:379



Rung 2:380



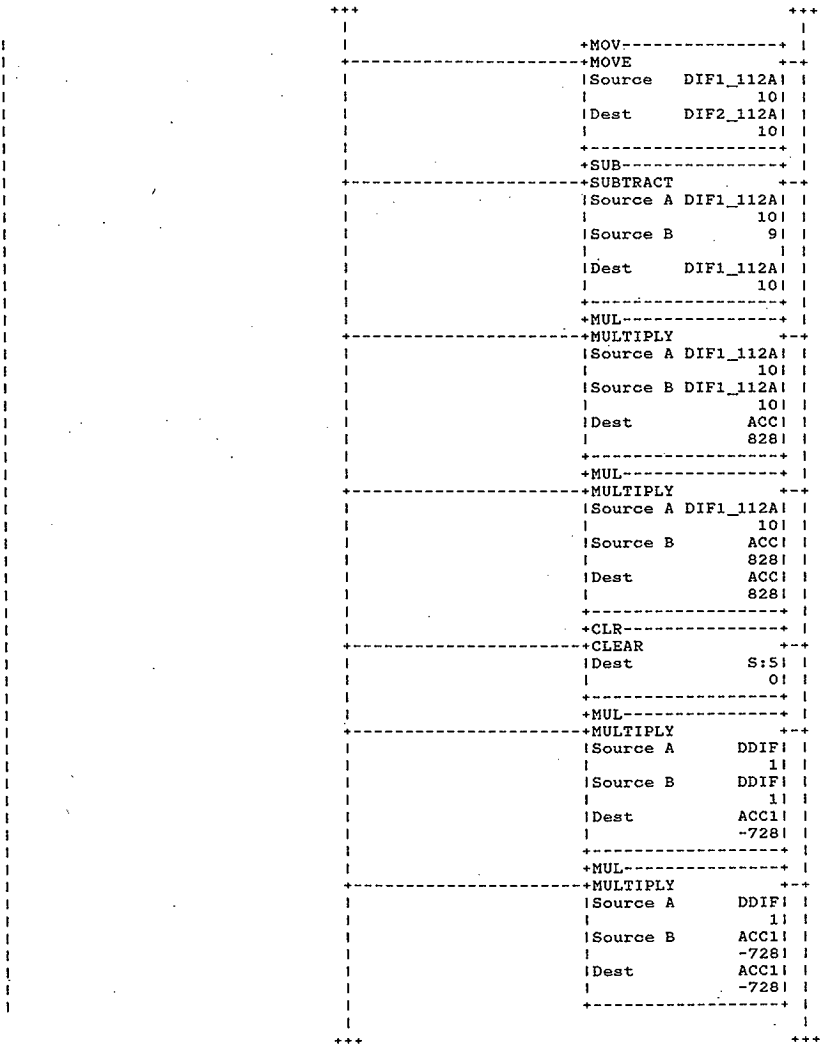
Rung 2:381

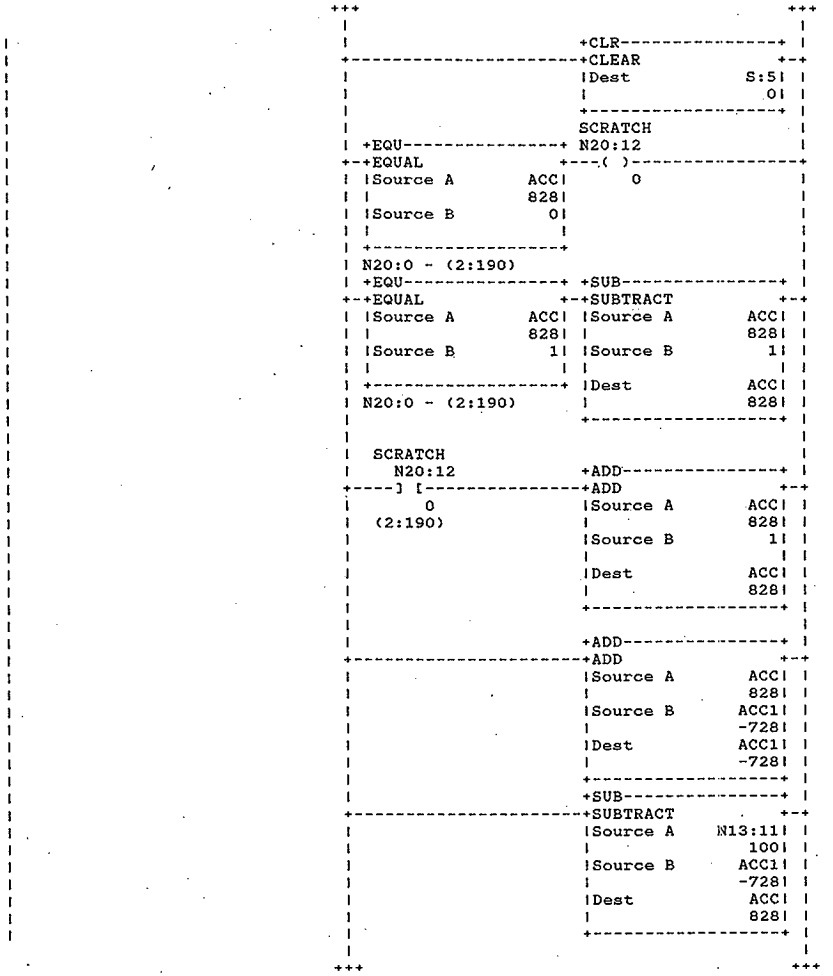


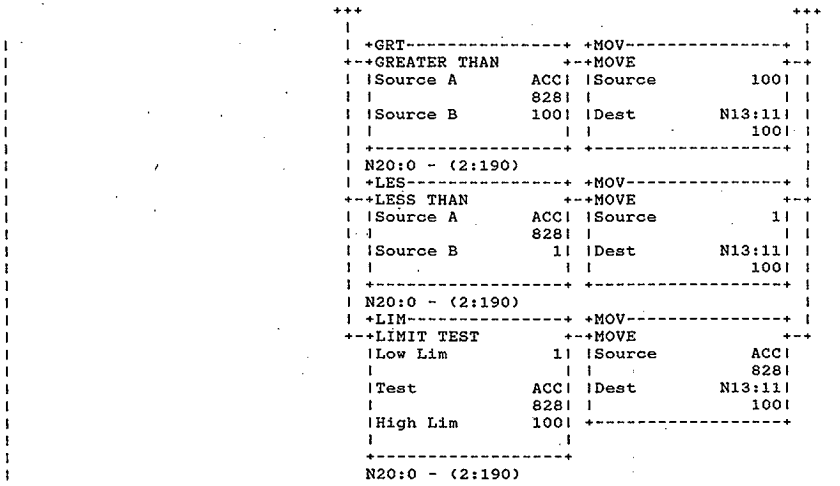
```
Rung 2:382
*******************************************************************************
IF DEVIATION SET FOR SECTION 2 THEN GO THERE AND CALCULATE DEVIATION
|                                                                    DEV2
|   DEV_2
|   N20:6                                                                10
|----] [-------------------------------------------------------------(JMP)-----
|       2
|  (2:312)

Rung 2:383
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                    PID112A
| RT_TMR/DN
|   T4:62                                                                23
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)

Rung 2:384
                          RATE CHECKING
|                                                  +MOV---------------+
|--------------------------------+-----------------+MOVE              +-+--
|                                |                 |Source      AV112A| |
|                                |                 |              1752| |
|                                |                 |Dest       R1_112A| |
|                                |                 |             32767| |
|                                |                 +------------------+ |
|                                |                 +SUB---------------+ |
|                                +-----------------+SUBTRACT          +-+
|                                |                 |Source A   R1_112A| |
|                                |                 |             32767| |
|                                |                 |Source B   R2_112A| |
|                                |                 |             32767| |
|                                |                 |Dest     DIF1_112A| |
|                                |                 |                10| |
|                                |                 +------------------+ |
|                                |                 +MOV---------------+ |
|                                +-----------------+MOVE              +-+
|                                |                 |Source     R1_112A| |
|                                |                 |             32767| |
|                                |                 |Dest       R2_112A| |
|                                |                 |             32767| |
|                                |                 +------------------+ |
|                                |                 +SUB---------------+ |
|                                +-----------------+SUBTRACT          +-+
|                                |                 |Source A DIF1_112A| |
|                                |                 |                10| |
|                                |                 |Source B DIF2_112A| |
|                                |                 |                10| |
|                                |                 |Dest          DDIF| |
|                                |                 |                 1| |
|                                |                 +------------------+ |
|                                |                                      |
                                +++                                    +++
```


+MOV
MOVE
Source DIF1_112A
10
Dest DIF2_112A
10
+SUB
SUBTRACT
Source A DIF1_112A
10
Source B
9
Dest DIF1_112A
10
+MUL
MULTIPLY
Source A DIF1_112A
10
Source B DIF1_112A
10
Dest ACC
828
+MUL
MULTIPLY
Source A DIF1_112A
10
Source B ACC
828
Dest ACC
828
+CLR
CLEAR
Dest S:5
0
+MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728

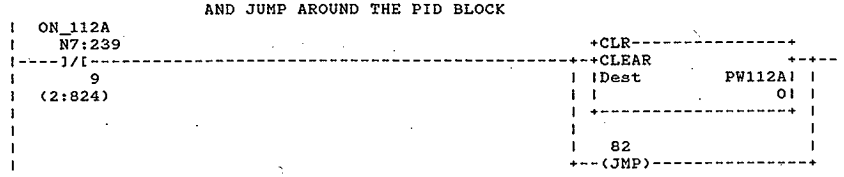

CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B 0
0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828
SCRATCH
N20:12
0
(2:190)
ADD
ADD
Source A ACC
828
Source B 1
Dest ACC
828
ADD
ADD
Source A ACC
828
Source B ACC1
-728
Dest ACC1
-728
SUB
SUBTRACT
Source A N13:11
100
Source B ACC1
-728
Dest ACC
828



Rung 2:385

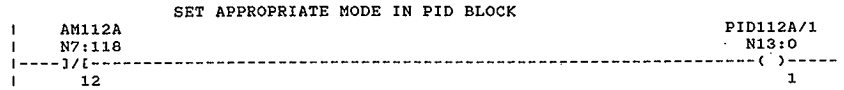
Rung 2:386

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:387

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



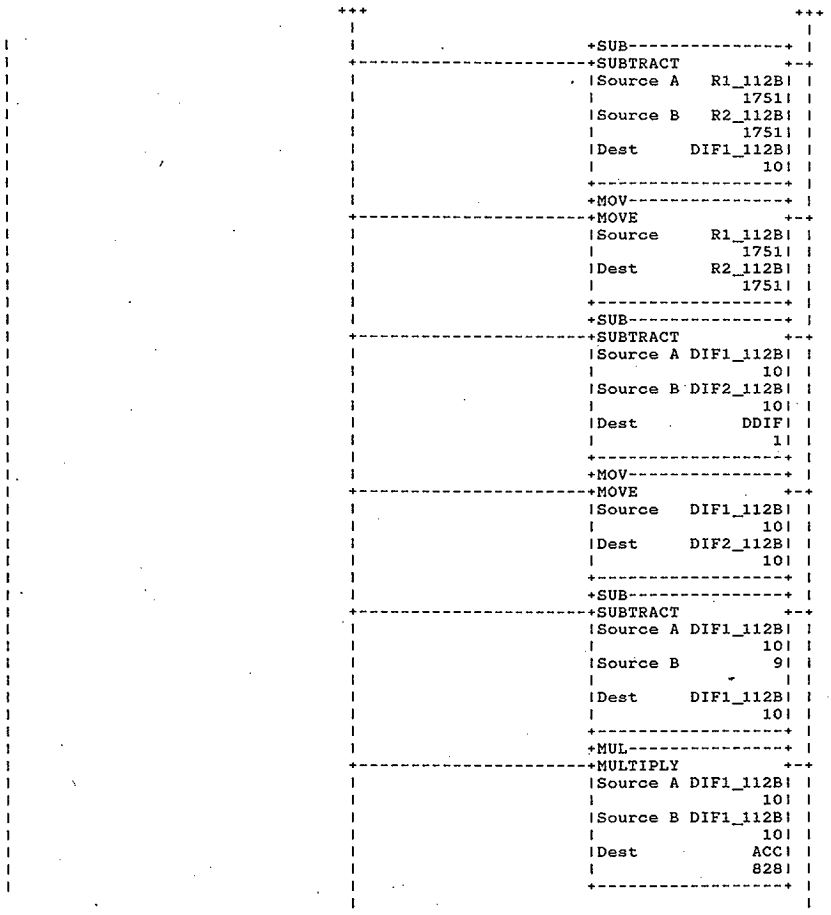
```
Rung 2:388
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source     SET112A|
|                                                          |              1779|
|                                                          |Dest     PIDSP112A|
|                                                          |              1779|
|                                                          +------------------+

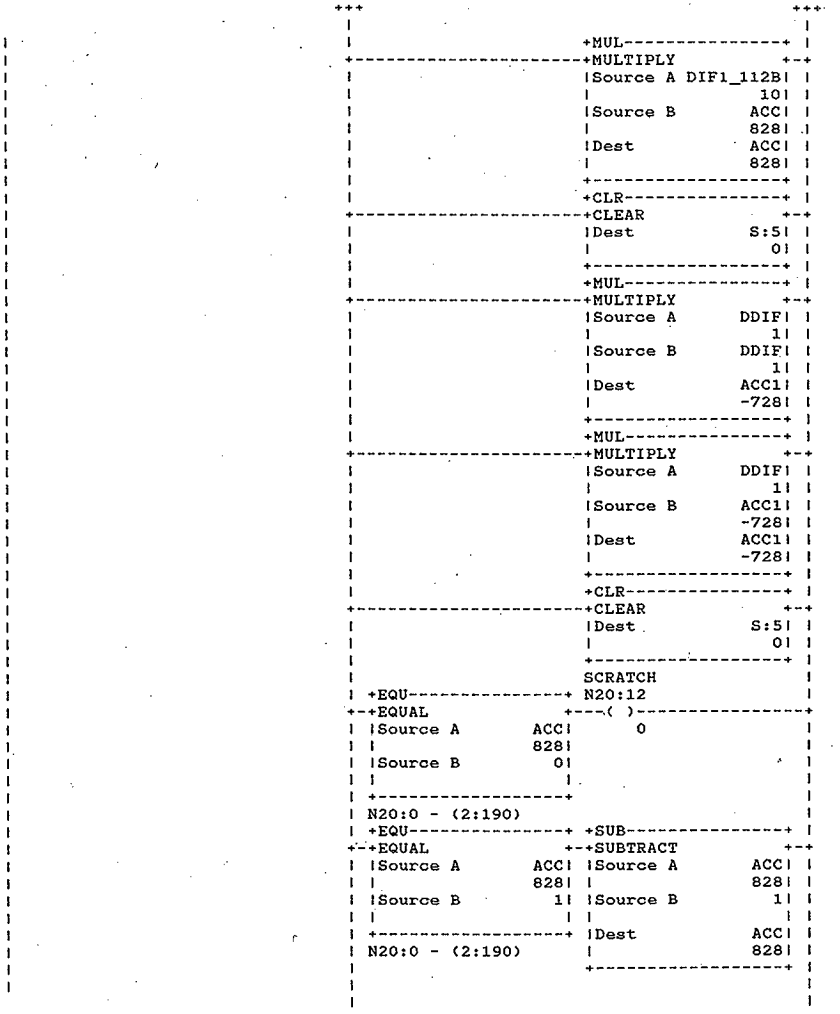
Rung 2:389
|                                                    +PID--------------------+
|----------------------------------------------------+-+PID                  +-+--
|                                                  | |Control Block   PID112A| |
|                                                  | |Process Variable AV112A| |
|                                                  | |Control Variable CV112A| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL---------------+      |
|                                                  +-+SCALE             +------+
|                                                  | |Source      CV112A|      |
|                                                  | |                 0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                  |      |
|                                                  | |Offset           0|      |
|                                                  | |                  |      |
|                                                  | |Dest        PW112A|      |
|                                                  | |                 0|      |
|                                                  | +------------------+      |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

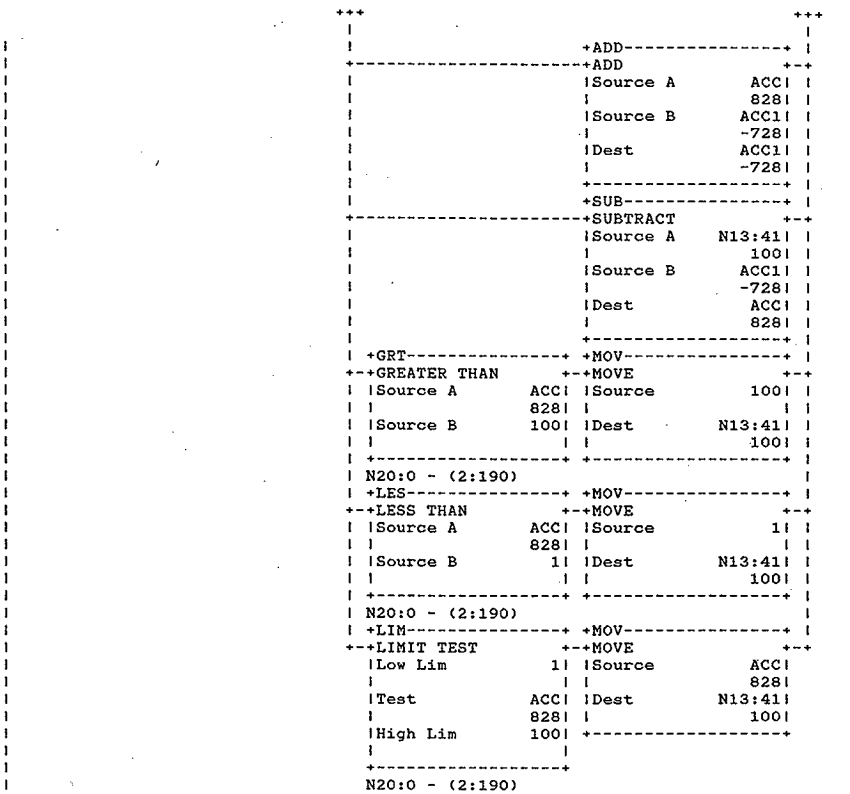
Rung 2:390
|   82                                                                    N9:20
|--[LBL]-----------------------------------------------------------------( )---
|                                                                          15

Rung 2:391
|                                                                  PID112B
| RT_TMR/DN
|   T4:62                                                                  24
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)

Rung 2:392
                          RATE CHECKING
|                                                      +MOV---------------+
|--------------------------------+-----------------------+MOVE              +-+--
|                                |                      |Source      AV112B| |
|                                |                      |              1751| |
|                                |                      |Dest       R1_112B| |
|                                |                      |              1751| |
|                                |                      +------------------+ |
|                                |                                           |
                                +++                                         +++
```


+SUB
+SUBTRACT
Source A R1_112B
1751
Source B R2_112B
1751
Dest DIF1_112B
10
+MOV
+MOVE
Source R1_112B
1751
Dest R2_112B
1751
+SUB
+SUBTRACT
Source A DIF1_112B
10
Source B DIF2_112B
10
Dest DDIF
1
+MOV
+MOVE
Source DIF1_112B
10
Dest DIF2_112B
10
+SUB
+SUBTRACT
Source A DIF1_112B
10
Source B
9
Dest DIF1_112B
10
+MUL
+MULTIPLY
Source A DIF1_112B
10
Source B DIF1_112B
10
Dest ACC
828


MUL
MULTIPLY
Source A DIF1_112B
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
0
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828



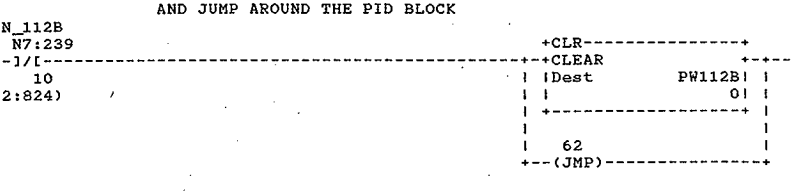
Rung 2:393
PID112B

24 [LBL]

DUMMY23 N20:8 ( ) 6

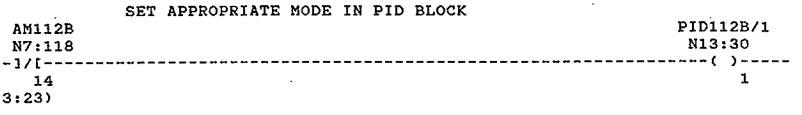
Rung 2:394

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



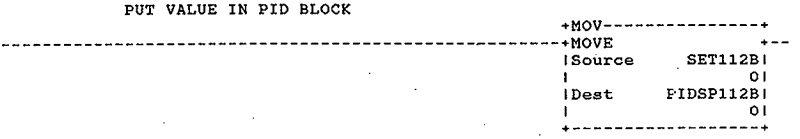
Rung 2:395

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

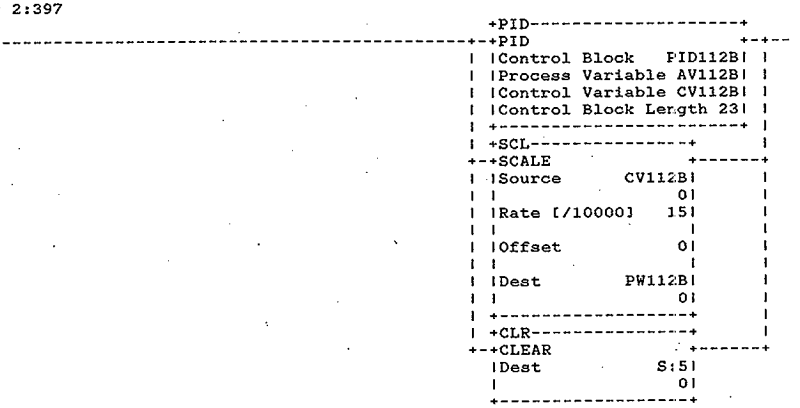


Rung 2:396

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



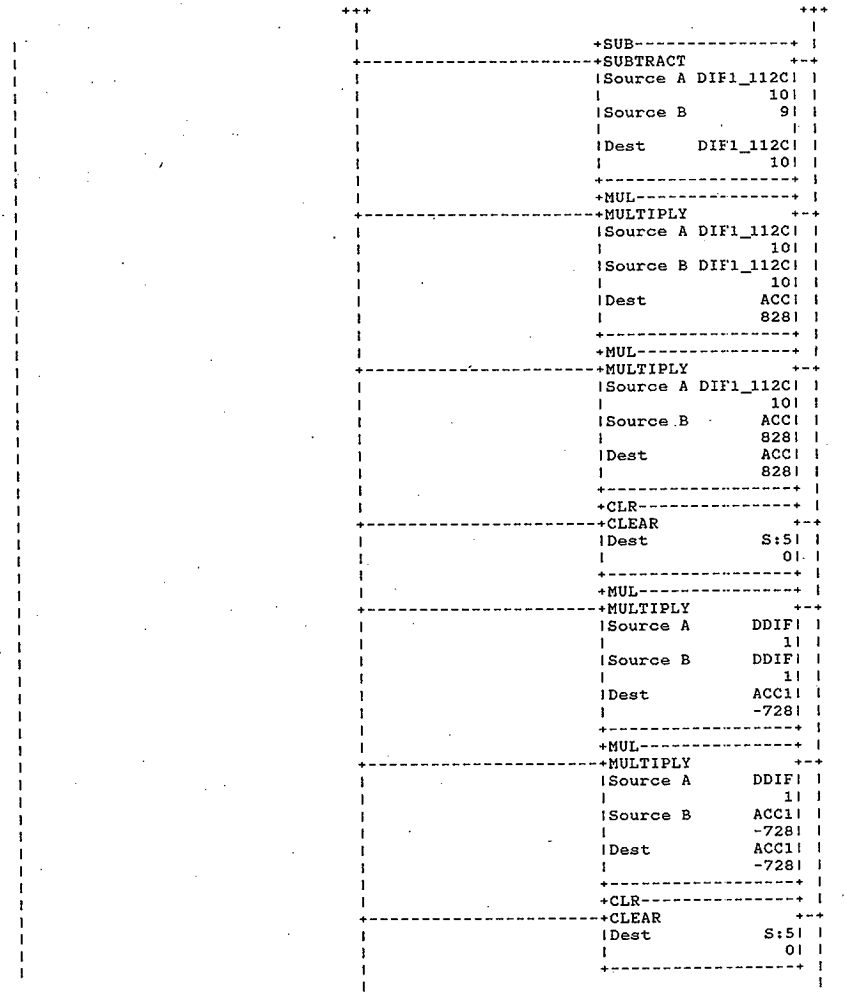
Rung 2:397

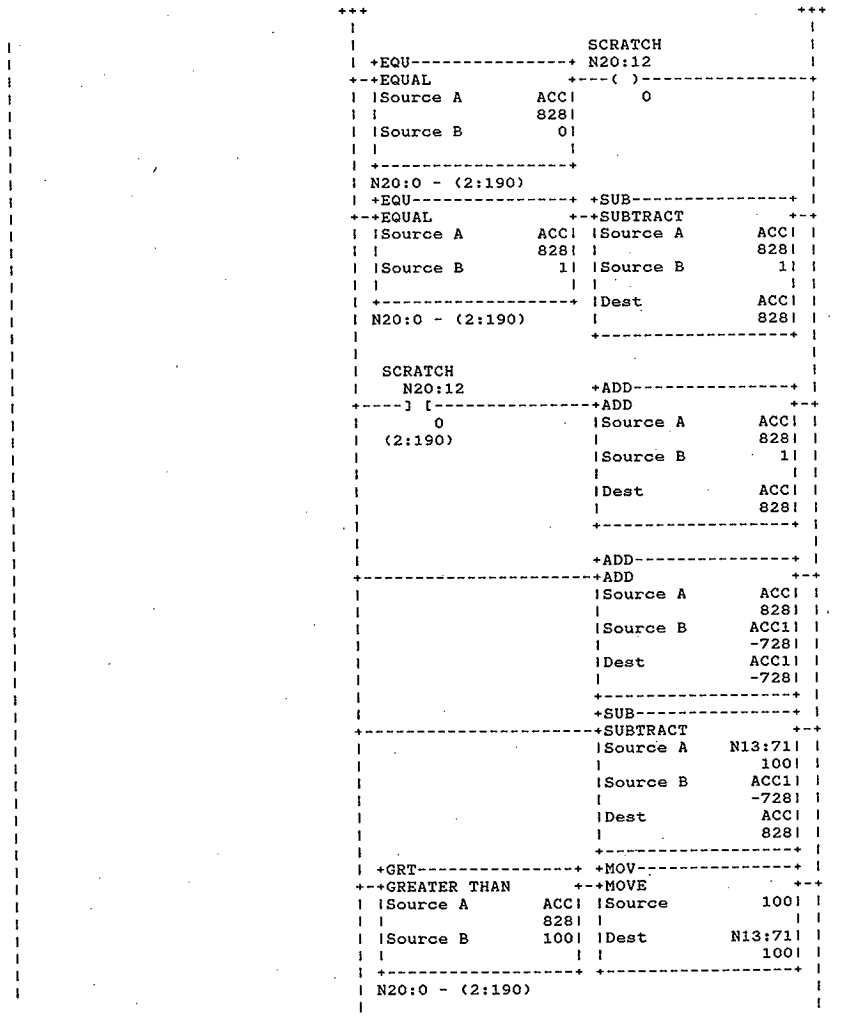


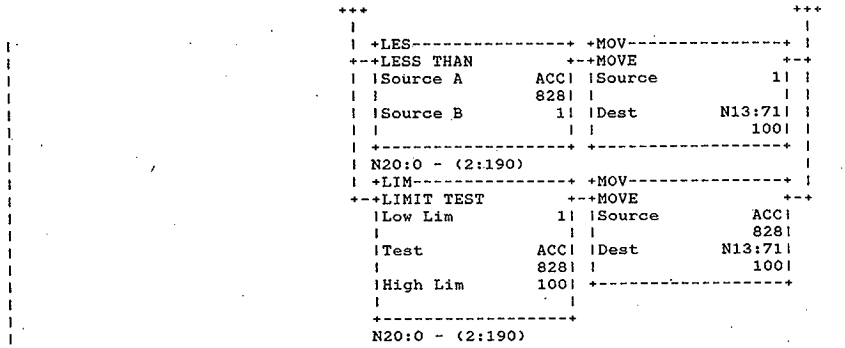
```
Rung 2:398
|   62                                                                  N20:10
|--[LBL]-------------------------------------------------------------------( )----
|                                                                            0

Rung 2:399
|                                                                     PID112C
| RT_TMR/DN
|   T4:62                                                                  25
|----]/[-------------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)

Rung 2:400
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+--
|                               |                      |Source      AV112C| |
|                               |                      |              1746| |
|                               |                      |Dest       R1_112C| |
|                               |                      |              1746| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A   R1_112C| |
|                               |                      |              1746| |
|                               |                      |Source B   R2_112C| |
|                               |                      |              1746| |
|                               |                      |Dest     DIF1_112C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source     R1_112C| |
|                               |                      |              1746| |
|                               |                      |Dest       R2_112C| |
|                               |                      |              1746| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A DIF1_112C| |
|                               |                      |                10| |
|                               |                      |Source B DIF2_112C| |
|                               |                      |                10| |
|                               |                      |Dest          DDIF| |
|                               |                      |                 1| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source   DIF1_112C| |
|                               |                      |                10| |
|                               |                      |Dest     DIF2_112C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                                           |
                              +++                                         +++
```


SUB
SUBTRACT
Source A DIF1_112C 10
Source B 9
Dest DIF1_112C 10
MUL
MULTIPLY
Source A DIF1_112C 10
Source B DIF1_112C 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_112C 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728
MUL
MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
CLR
CLEAR
Dest S:5 0

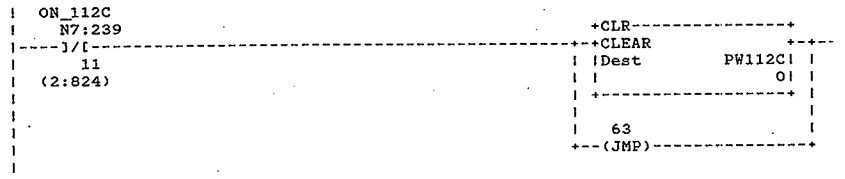

+EQU
EQUAL
Source A
ACC
828
Source B
0
N20:0 - (2:190)
SCRATCH
N20:12
0
SUB
SUBTRACT
1
Dest
ADD
-728
ACC1
GRT
GREATER THAN
100
MOV
MOVE
N13:71



Rung 2:401

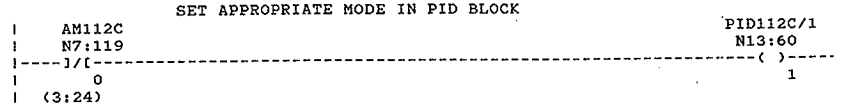
Rung 2:402

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



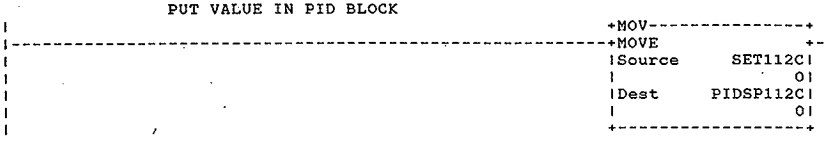
Rung 2:403

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

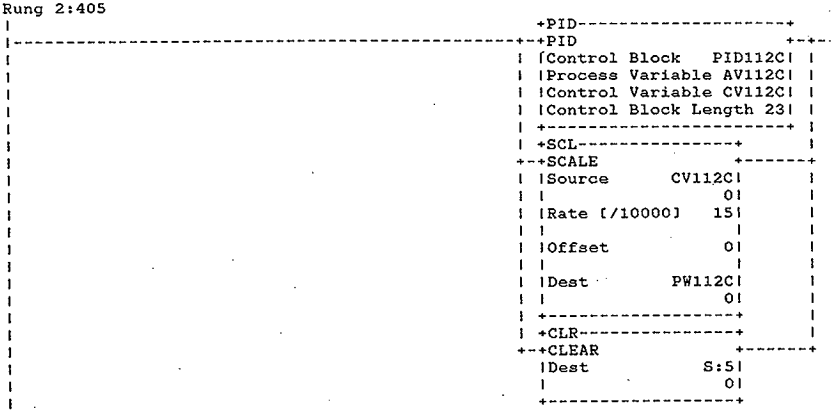


Rung 2:404

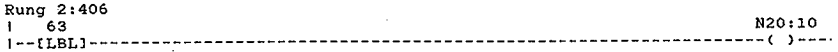
DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



Rung 2:405



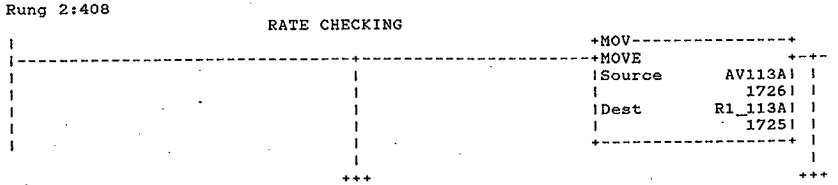
Rung 2:406

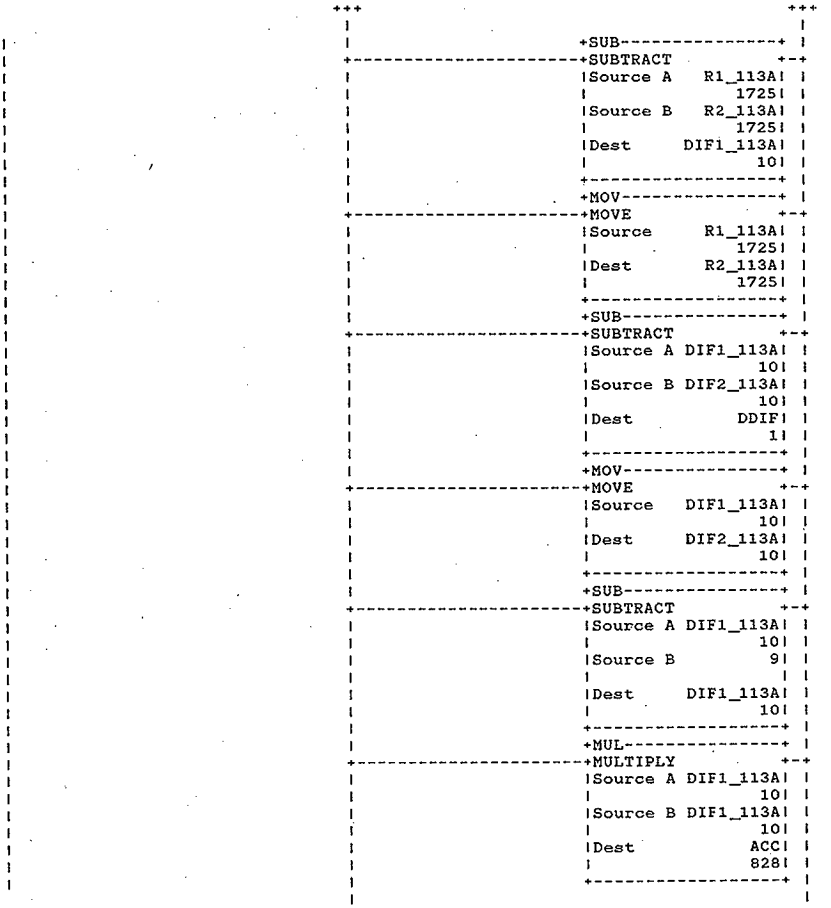


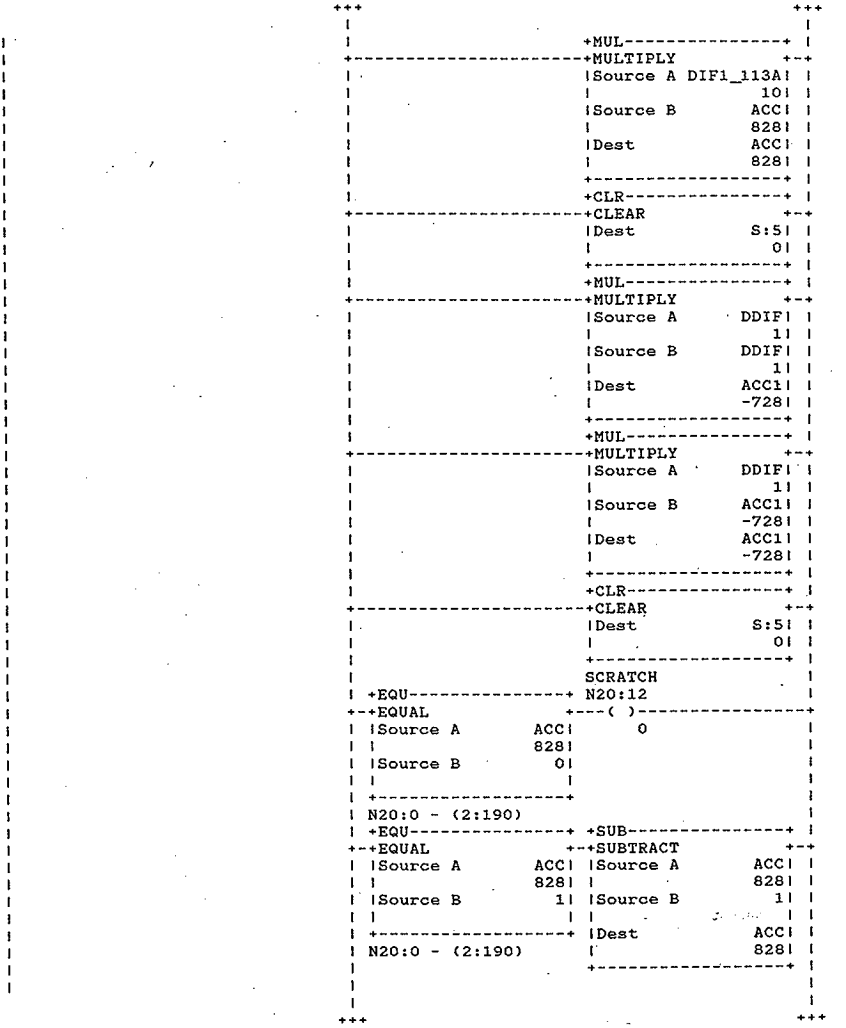
Rung 2:407

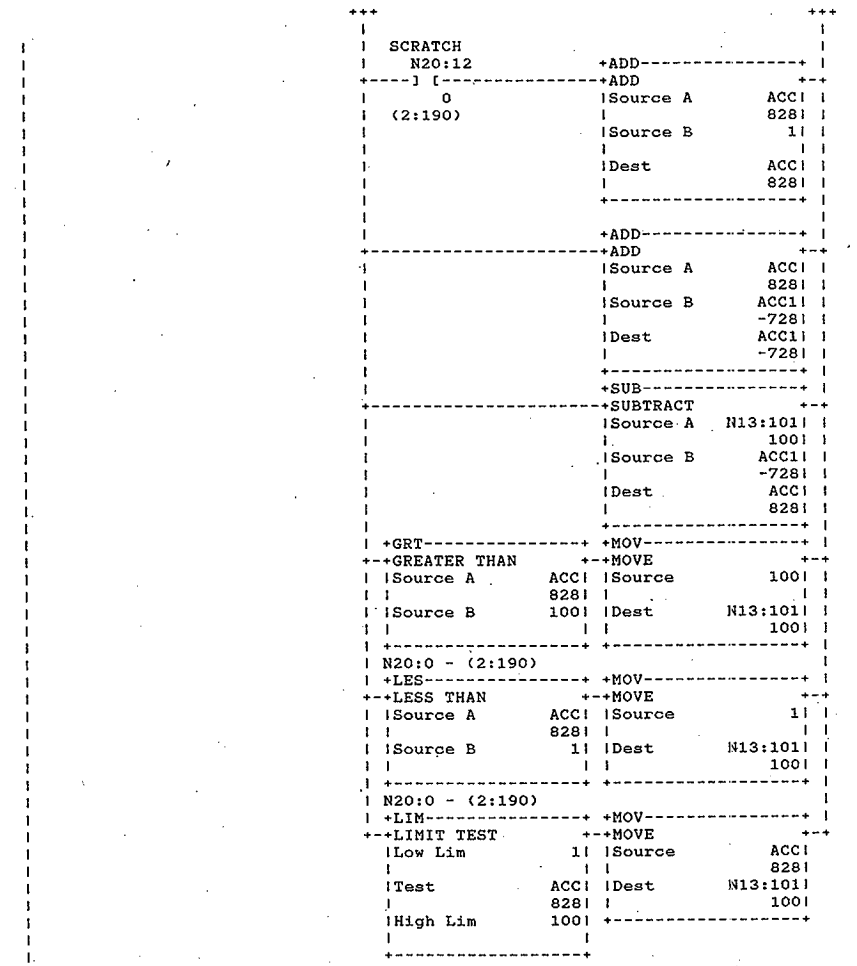
Rung 2:408

RATE CHECKING




+SUB
+SUBTRACT
Source A R1_113A
1725
Source B R2_113A
1725
Dest DIF1_113A
10
+MOV
+MOVE
Source R1_113A
1725
Dest R2_113A
1725
+SUB
+SUBTRACT
Source A DIF1_113A
10
Source B DIF2_113A
10
Dest DDIF
1
+MOV
+MOVE
Source DIF1_113A
10
Dest DIF2_113A
10
+SUB
+SUBTRACT
Source A DIF1_113A
10
Source B
9
Dest DIF1_113A
10
+MUL
+MULTIPLY
Source A DIF1_113A
10
Source B DIF1_113A
10
Dest ACC
828

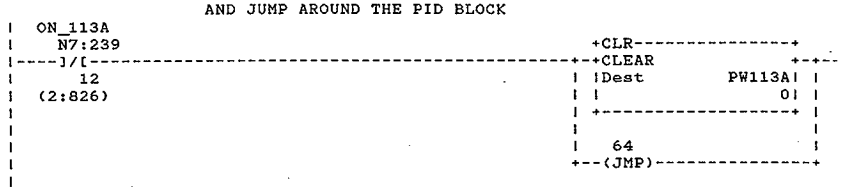

+MUL
+MULTIPLY
Source A DIF1_113A
10
Source B ACC
828
Dest ACC
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
+MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N20:12
+EQU
+EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
0
+SUB
+SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A
828
Source B
1
Dest
ACC
828
ADD
Source A
ACC
828
Source B
ACC1
-728
Dest
ACC1
-728
SUB
SUBTRACT
Source A
N13:101
100
Source B
ACC1
-728
Dest
ACC
828
GRT
GREATER THAN
Source A
ACC
828
Source B
100
MOV
MOVE
Source
100
Dest
N13:101
100
N20:0 - (2:190)
LES
LESS THAN
Source A
ACC
828
Source B
1
MOV
MOVE
Source
1
Dest
N13:101
100
N20:0 - (2:190)
LIM
LIMIT TEST
Low Lim
1
Test
ACC
828
High Lim
100
MOV
MOVE
Source
ACC
828
Dest
N13:101
100
N20:0 - (2:190)

Rung 2:409

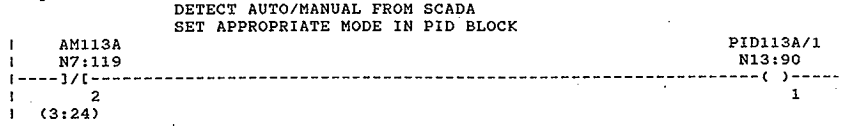
Rung 2:410

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



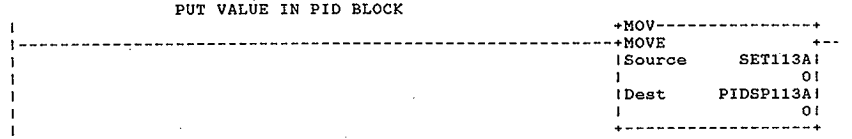
Rung 2:411

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

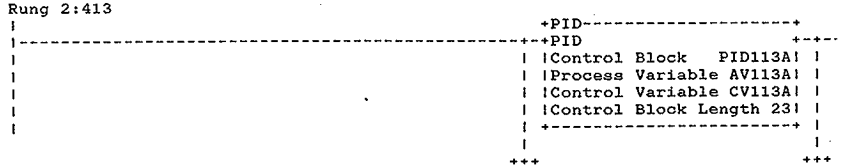


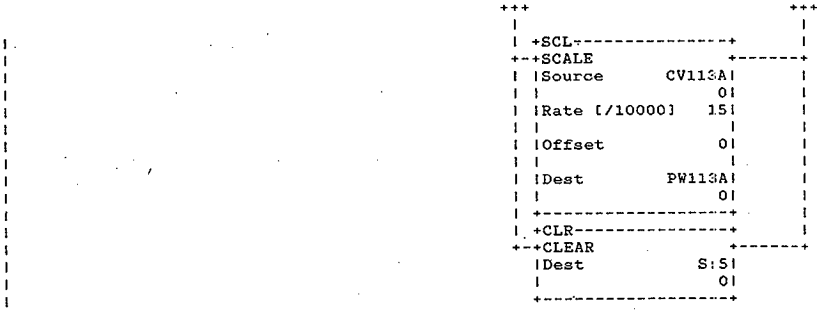
Rung 2:412

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

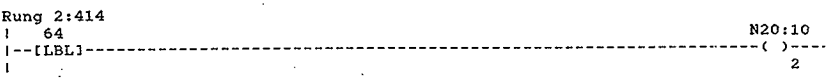


Rung 2:413

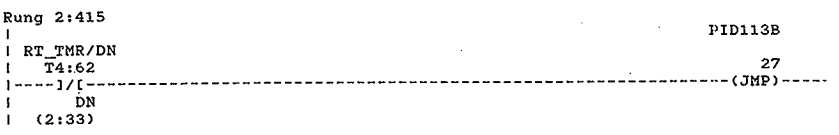




Rung 2:414

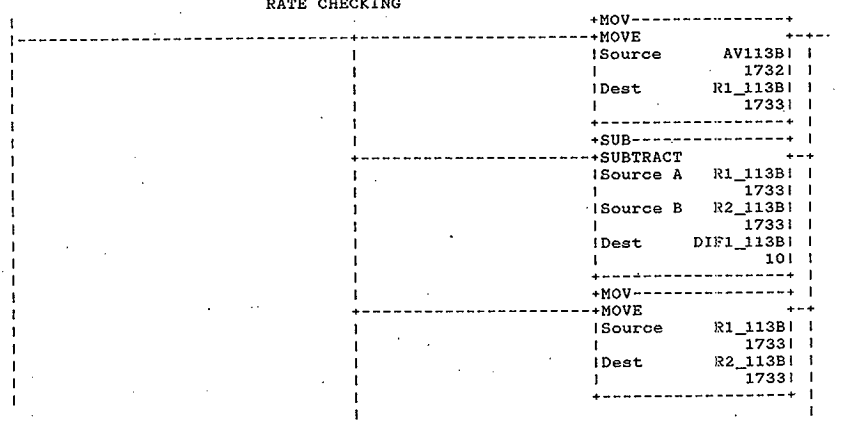


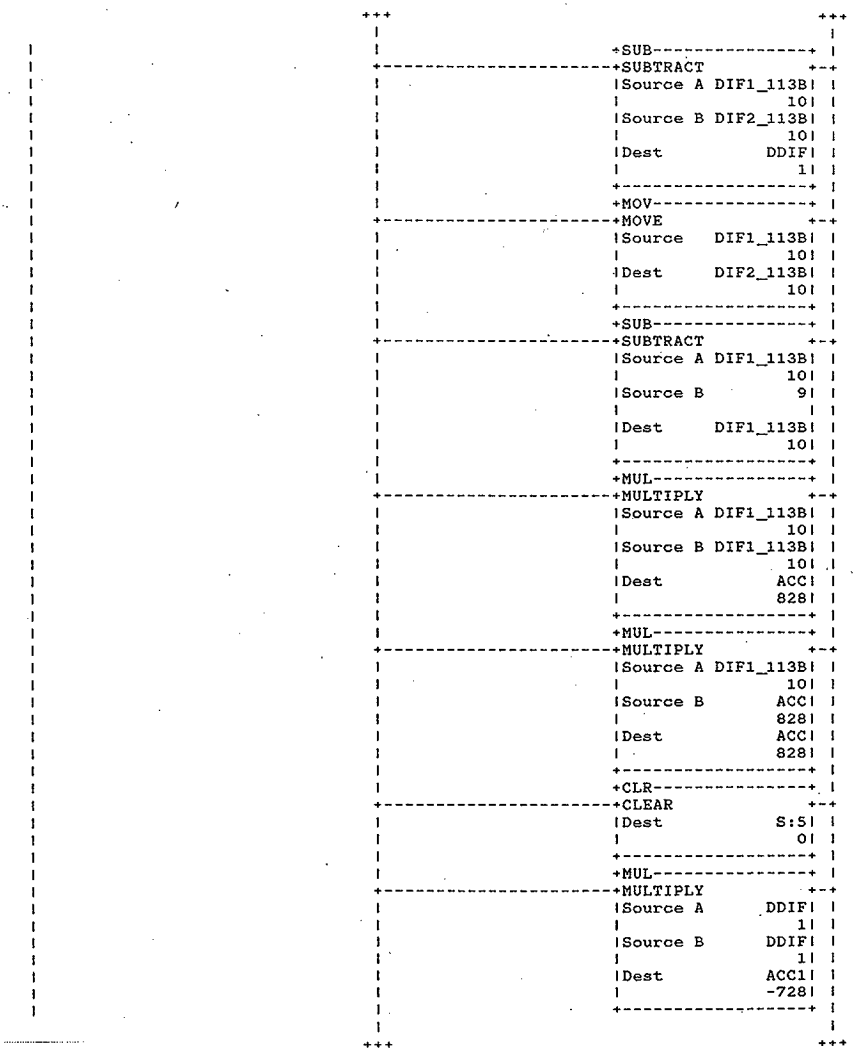
Rung 2:415

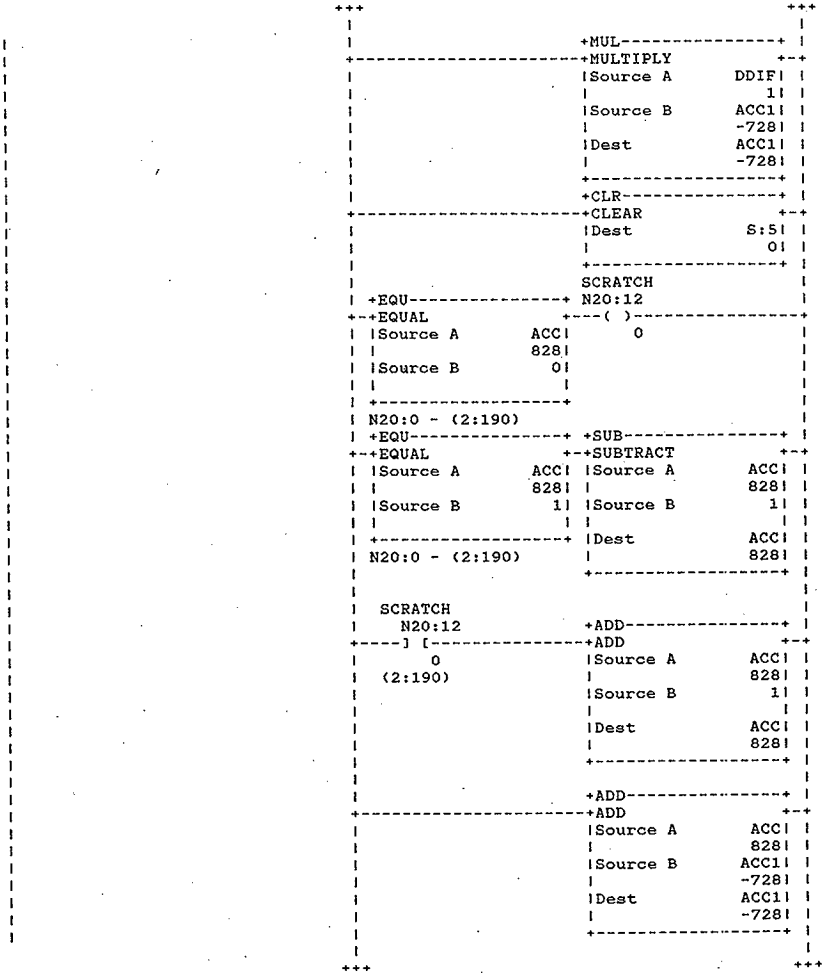


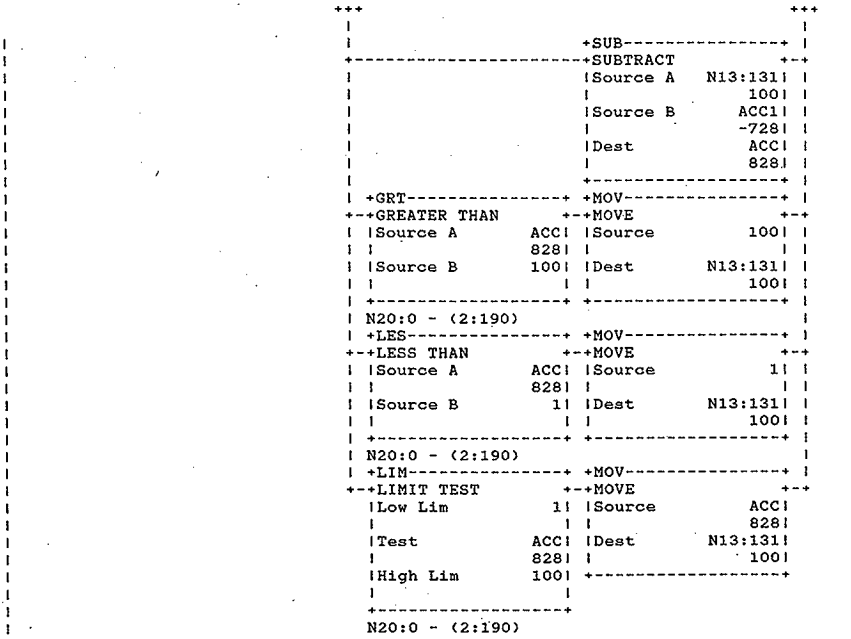
Rung 2:416

RATE CHECKING

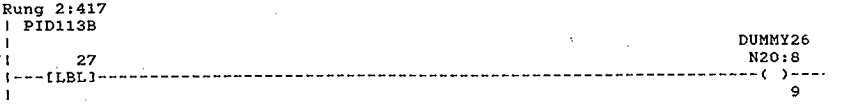



SUB
SUBTRACT
Source A DIF1_113B[10]
Source B DIF2_113B[10]
Dest DDIF[1]
MOV
MOVE
Source DIF1_113B[10]
Dest DIF2_113B[10]
SUB
SUBTRACT
Source A DIF1_113B[10]
Source B 9[ ]
Dest DIF1_113B[10]
MUL
MULTIPLY
Source A DIF1_113B[10]
Source B DIF1_113B[10]
Dest ACC[828]
MUL
MULTIPLY
Source A DIF1_113B[10]
Source B ACC[828]
Dest ACC[828]
CLR
CLEAR
Dest S:5[0]
MUL
MULTIPLY
Source A DDIF[1]
Source B DDIF[1]
Dest ACC1[-728]


+MUL
MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
CLEAR
Dest S:5 0
SCRATCH
N20:12
0
+EQU
EQUAL
Source A ACC 828
Source B 0
N20:0 - (2:190)
+EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
+SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH
N20:12
0
(2:190)
+ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728

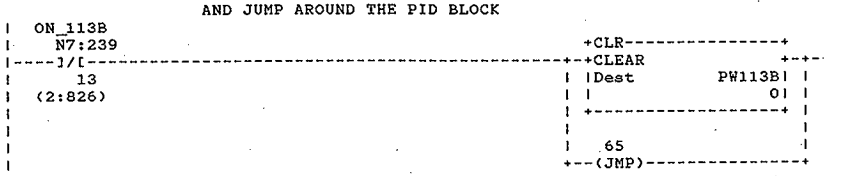


Rung 2:417



Rung 2:418

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:419
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM113B                                                          PID113B/1
|    N7:119                                                           N13:120
|----]/[-------------------------------------------------------------( )-----
|       4                                                                 1
|  (3:24)

Rung 2:420
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                        +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                        |Source     SET113B|
|                                                        |                 0|
|                                                        |Dest     PIDSP113B|
|                                                        |                 0|
|                                                        +------------------+

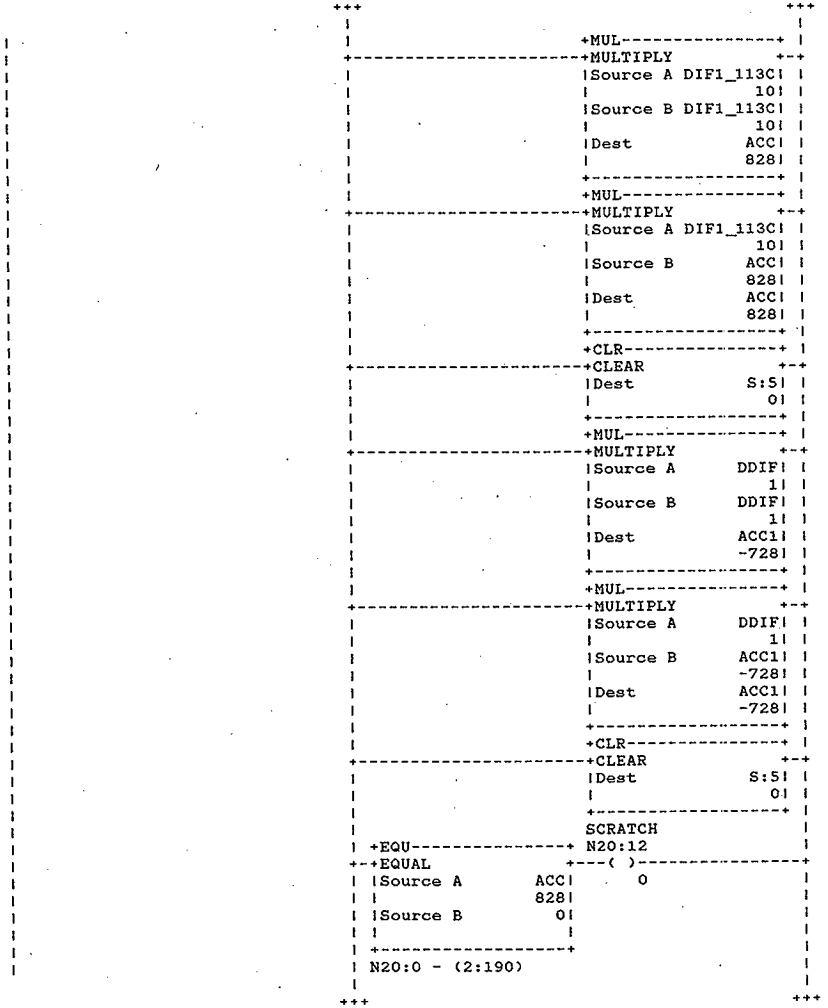
Rung 2:421
|                                                  +PID--------------------+
|-------------------------------------------------+-+PID                   +-+--
|                                                 | |Control Block   PID113B| |
|                                                 | |Process Variable AV113B| |
|                                                 | |Control Variable CV113B| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 | +SCL---------------+      |
|                                                 +-+SCALE             +------+
|                                                 | |Source      CV113B|      |
|                                                 | |                 0|      |
|                                                 | |Rate [/10000]   15|      |
|                                                 | |                  |      |
|                                                 | |Offset           0|      |
|                                                 | |                  |      |
|                                                 | |Dest        PW113B|      |
|                                                 | |                 0|      |
|                                                 | +------------------+      |
|                                                 | +CLR---------------+      |
|                                                 +-+CLEAR             +------+
|                                                   |Dest           S:5|
|                                                   |                 0|
|                                                   +------------------+

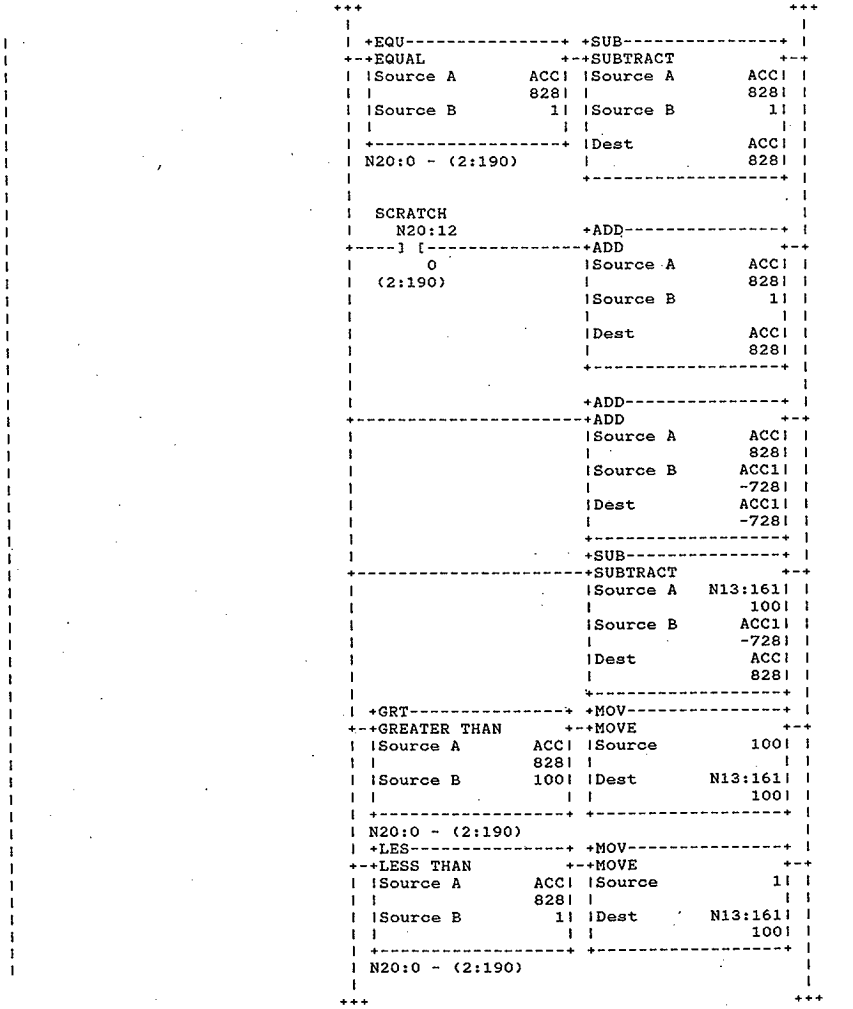
Rung 2:422
|   65                                                                N20:10
|--[LBL]-------------------------------------------------------------( )----
|                                                                         3

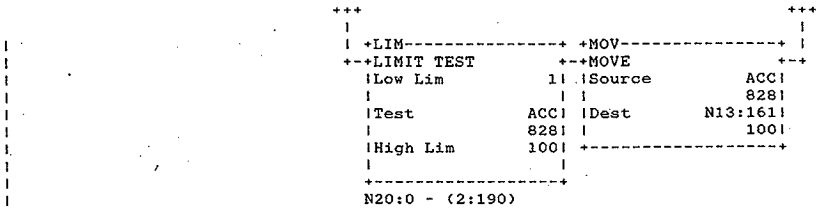
Rung 2:423
|                                                                   PID113C
| RT_TMR/DN
|   T4:62                                                              28
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

```
Rung 2:424
| RT_TMR/DN                                                                DNR_2
|   T4:62                                                                  N20:5
|----] [-------------------------------------------------------------------(L)---
|      DN                                                                     6
|  (2:33)

Rung 2:425
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+--
|                               |                      |Source      AV113C| |
|                               |                      |              1732| |
|                               |                      |Dest       R1_113C| |
|                               |                      |              1732| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A   R1_113C| |
|                               |                      |              1732| |
|                               |                      |Source B   R2_113C| |
|                               |                      |              1732| |
|                               |                      |Dest     DIF1_113C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source     R1_113C| |
|                               |                      |              1732| |
|                               |                      |Dest       R2_113C| |
|                               |                      |              1732| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A DIF1_113C| |
|                               |                      |                10| |
|                               |                      |Source B DIF2_113C| |
|                               |                      |                10| |
|                               |                      |Dest          DDIF| |
|                               |                      |                 1| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source   DIF1_113C| |
|                               |                      |                10| |
|                               |                      |Dest     DIF2_113C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A DIF1_113C| |
|                               |                      |                10| |
|                               |                      |Source B         9| |
|                               |                      |                  | |
|                               |                      |Dest     DIF1_113C| |
|                               |                      |                10| |
|                               |                      +------------------+ |
|                               |                                          |
                               +++                                        +++
```


+MUL
+MULTIPLY
Source A DIF1_113C:0
10
Source B DIF1_113C:0
10
Dest ACC
828
+MUL
+MULTIPLY
Source A DIF1_113C:0
10
Source B ACC
828
Dest ACC
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
+MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N20:12
+EQU
+EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
( )
0

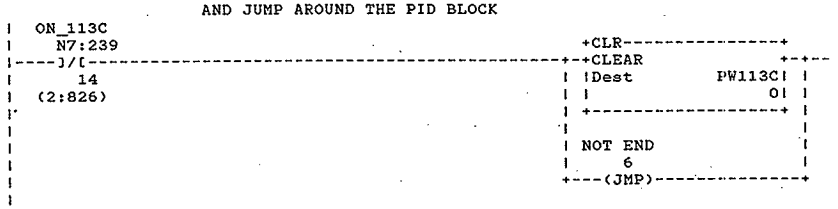

EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH
N20:12
0
(2:190)
ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728
SUB
SUBTRACT
Source A N13:161 100
Source B ACC1 -728
Dest ACC 828
GRT
GREATER THAN
Source A ACC 828
Source B 100
N20:0 - (2:190)
MOV
MOVE
Source 100
Dest N13:161 100
LES
LESS THAN
Source A ACC 828
Source B 1
N20:0 - (2:190)
MOV
MOVE
Source 1
Dest N13:161 100



Rung 2:426

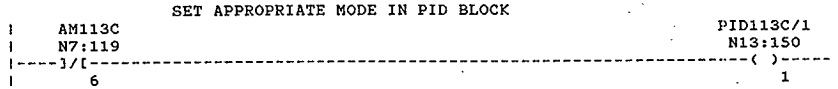
Rung 2:427

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



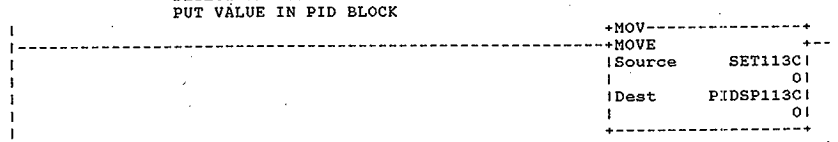
Rung 2:428

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



Rung 2:429

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



```
Rung 2:430
|                                                    +PID--------------------+
|-------------------------------------------------+-+PID                    +-+--
|                                                 | |Control Block   PID113C| |
|                                                 | |Process Variable AV113C| |
|                                                 | |Control Variable CV113C| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 | +SCL----------------+     |
|                                                 +-+SCALE              +------+
|                                                 | |Source      CV113C|      |
|                                                 | |                 0|      |
|                                                 | |Rate [/10000]   15|      |
|                                                 | |                  |      |
|                                                 | |Offset            0|      |
|                                                 | |                  |      |
|                                                 | |Dest        PW113C|      |
|                                                 | |                 0|      |
|                                                 | +------------------+      |
|                                                 | +CLR----------------+      |
|                                                 +-+CLEAR              +------+
|                                                   |Dest            S:5|
|                                                   |                 0|
|                                                   +------------------+

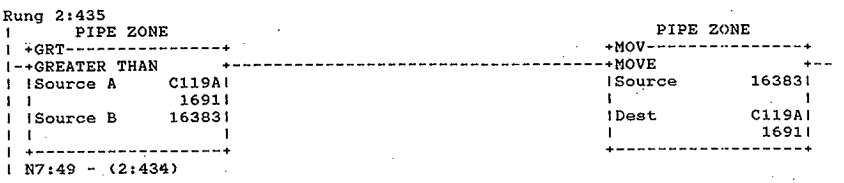
Rung 2:431
|                                                                  NOT END
|                                                                      6
|-----------------------------------------------------------------(JMP)-----
|

Rung 2:432
*******************************************************************************
                              BEGIN SECTION 3
| MD3
|                                                                   DUMMY14
|     3                                                              N20:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                       13

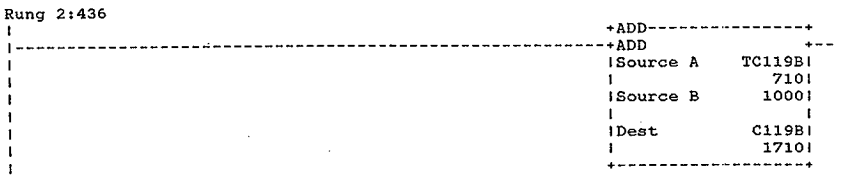
Rung 2:433
|                                                                     DN_3
|                                                                     N20:5
|-----------------------------------------------------------------------(L)---
|                                                                         3

Rung 2:434
                        SECTION 3 SUBROUTINE 7
|                                                          PIPE ZONE
|                                                       +ADD---------------+
|-----------------------------------------------------+ADD               +--
|                                                       |Source A    TC119A|
|                                                       |               691|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C119A|
|                                                       |              1691|
|                                                       +------------------+
```

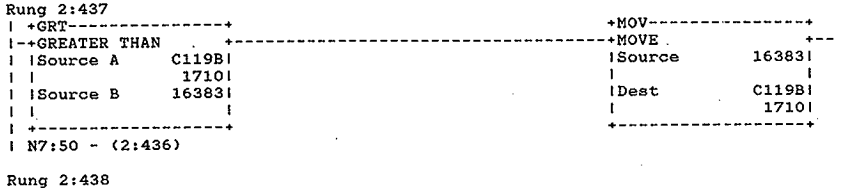
Rung 2:435



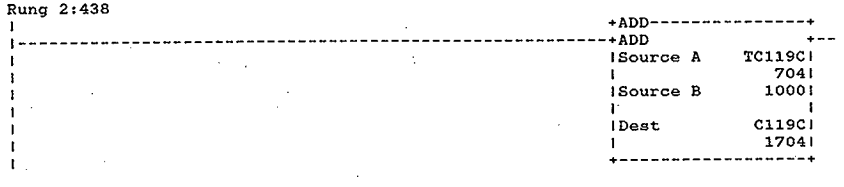
Rung 2:436



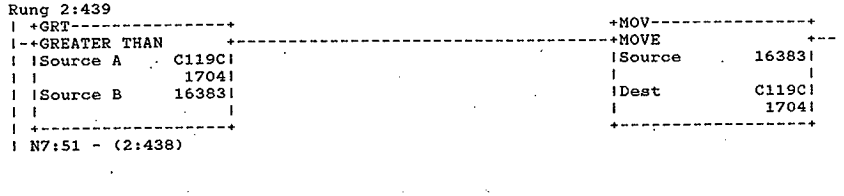
Rung 2:437



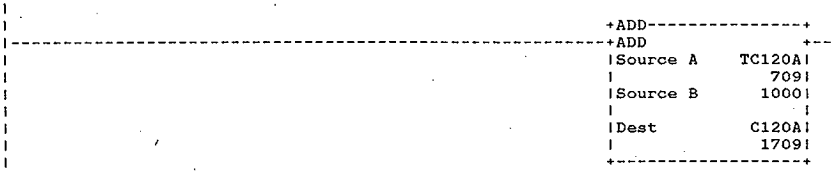
Rung 2:438



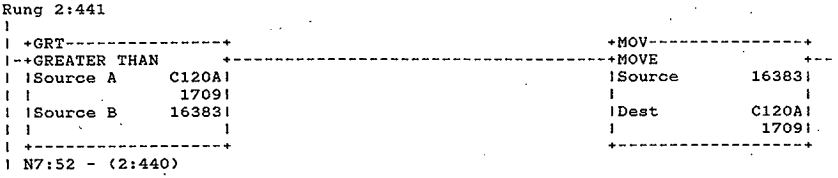
Rung 2:439



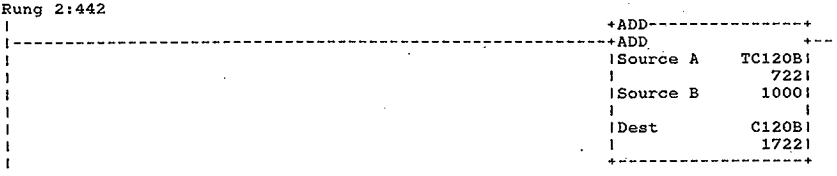
Rung 2:440



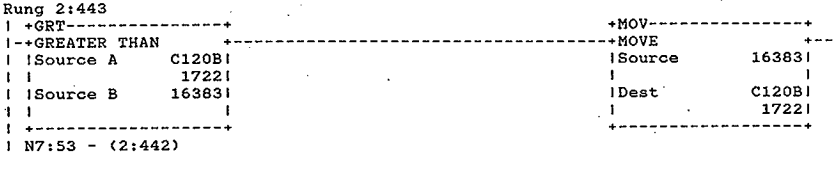
Rung 2:441



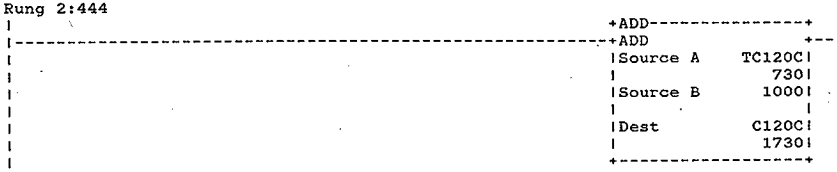
Rung 2:442



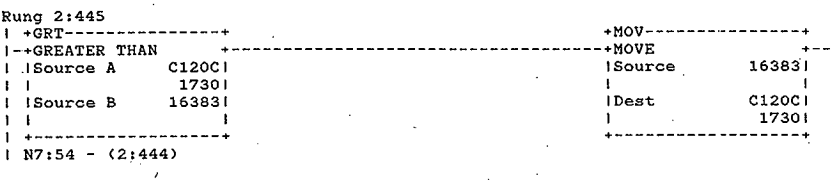
Rung 2:443



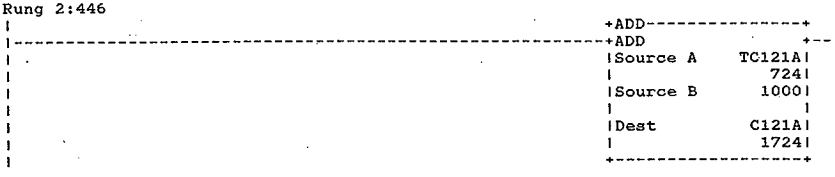
Rung 2:444



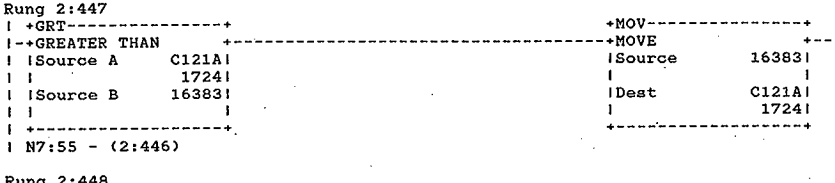
Rung 2:445



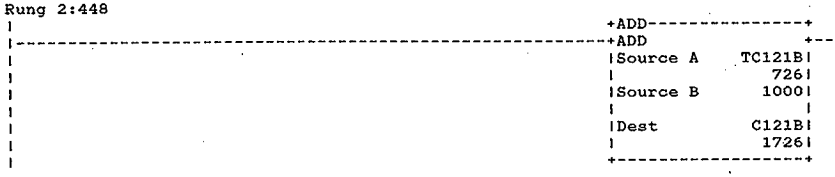
Rung 2:446



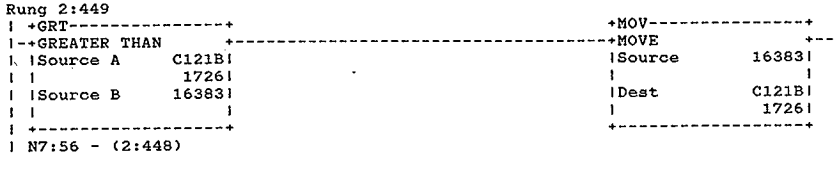
Rung 2:447



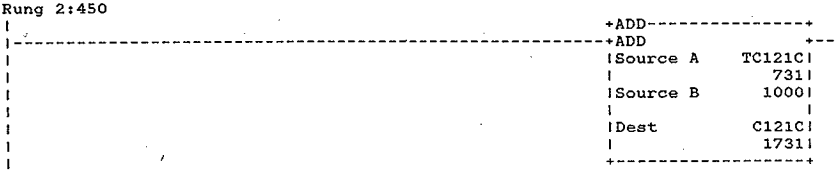
Rung 2:448



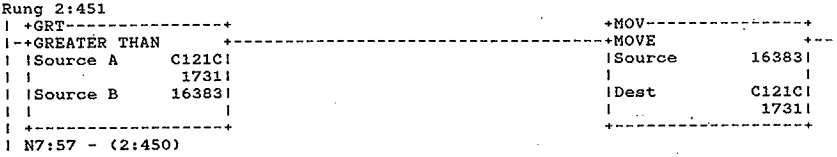
Rung 2:449



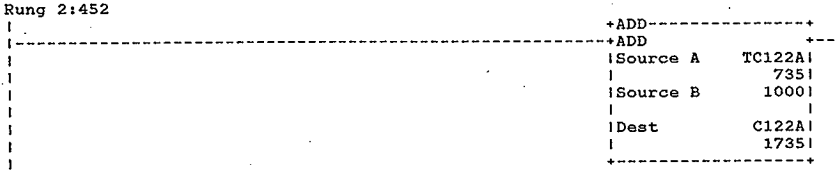
Rung 2:450



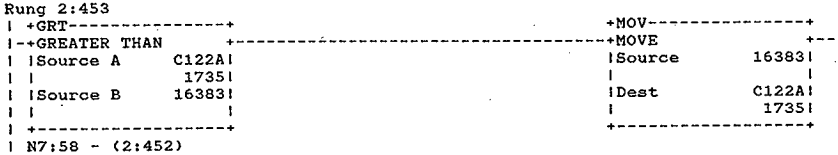
Rung 2:451



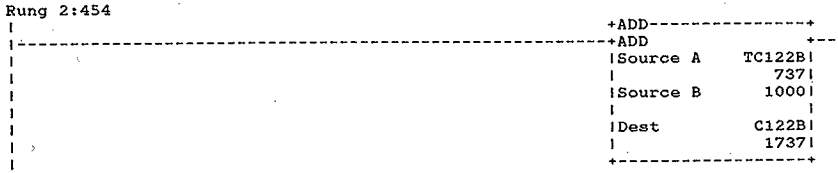
Rung 2:452



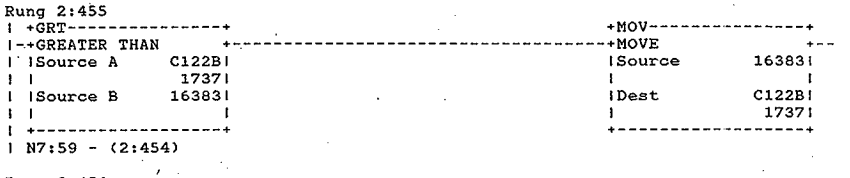
Rung 2:453



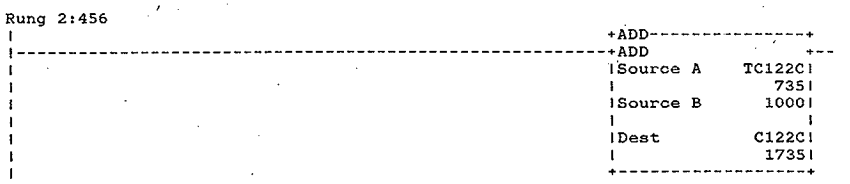
Rung 2:454



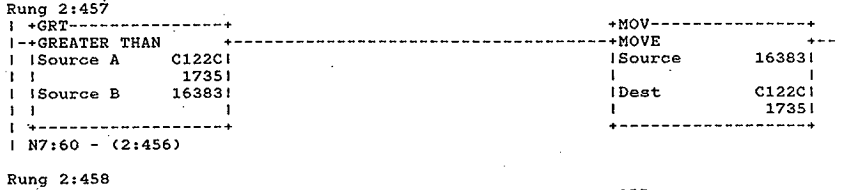
Rung 2:455



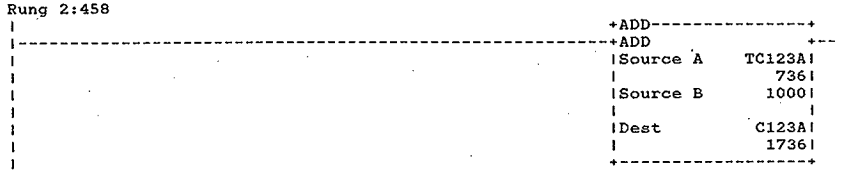
Rung 2:456



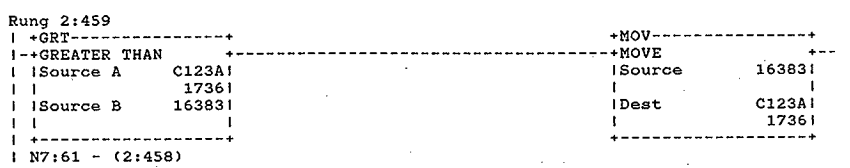
Rung 2:457



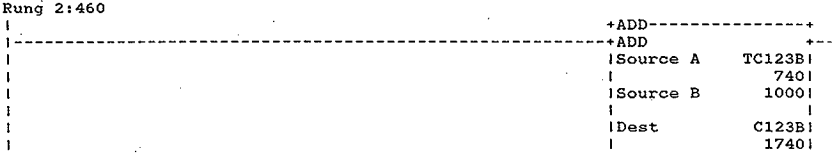
Rung 2:458



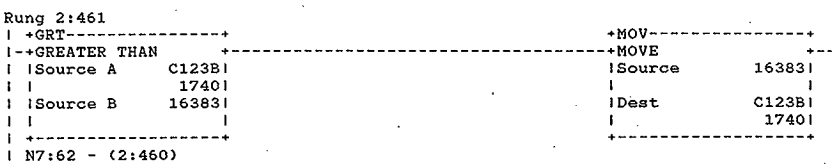
Rung 2:459



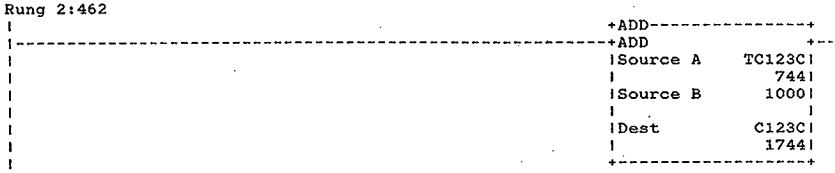
Rung 2:460



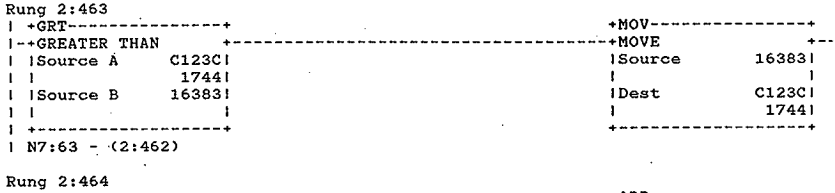
Rung 2:461



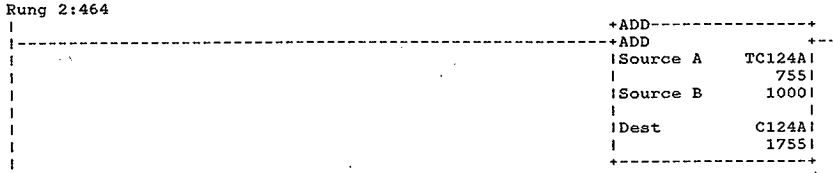
Rung 2:462



Rung 2:463



Rung 2:464



```
Rung 2:465
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C124A|                                  |Source       16383|
| |               1755|                                  |                  |
| |Source B     16383|                                  |Dest         C124A|
| |                  |                                  |              1755|
| +------------------+                                  +------------------+
| N7:64 - (2:464)

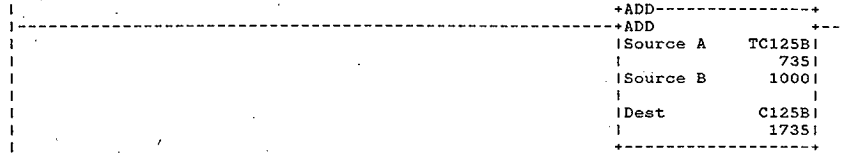
Rung 2:466
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC124B|
|                                                       |               745|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C124B|
|                                                       |              1745|
|                                                       +------------------+

Rung 2:467
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C124B|                                  |Source       16383|
| |               1745|                                  |                  |
| |Source B     16383|                                  |Dest         C124B|
| |                  |                                  |              1745|
| +------------------+                                  +------------------+
| N7:65 - (2:466)

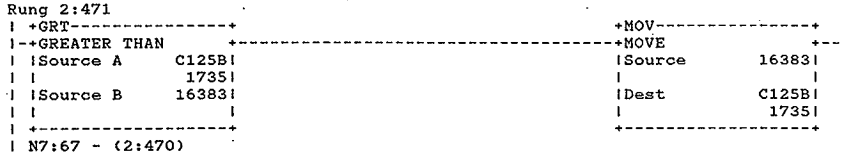
Rung 2:468
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC125A|
|                                                       |               737|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C125A|
|                                                       |              1737|
|                                                       +------------------+

Rung 2:469
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C125A|                                  |Source       16383|
| |               1737|                                  |                  |
| |Source B     16383|                                  |Dest         C125A|
| |                  |                                  |              1737|
| +------------------+                                  +------------------+
| N7:66 - (2:468)
```

Rung 2:470

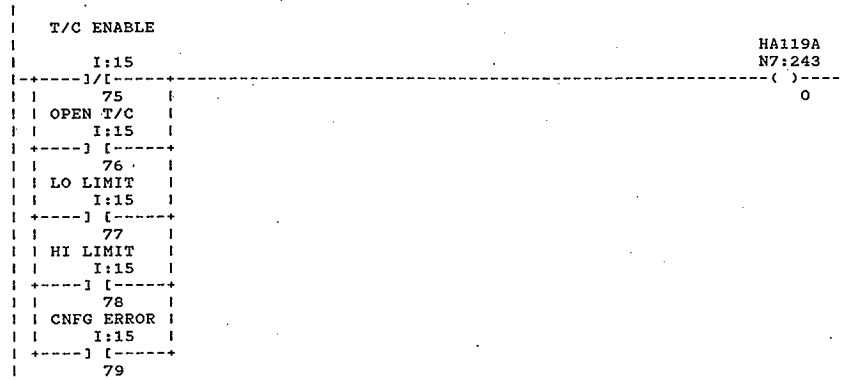


Rung 2:471

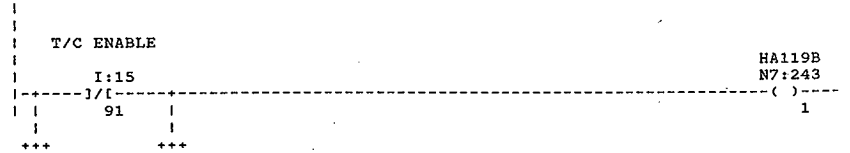


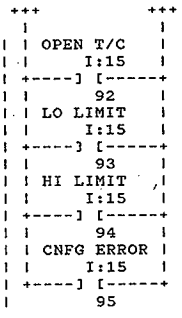
Rung 2:472

For each T/C read its STATUS BITS to detect T/C problems
HARDWARE ALARMS FOR TANK T-3002

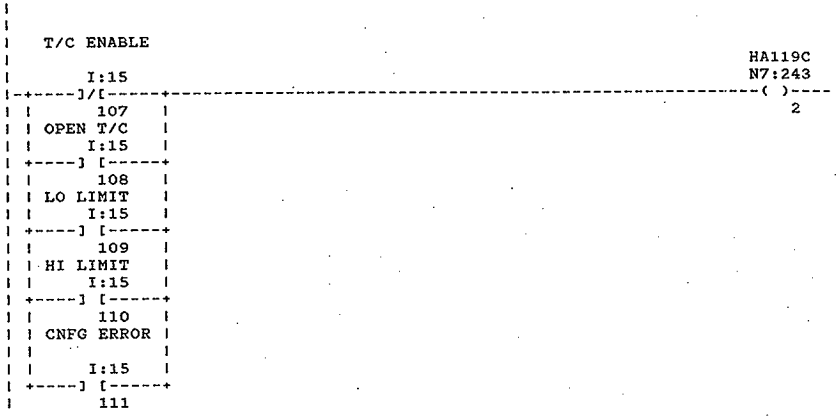


Rung 2:473

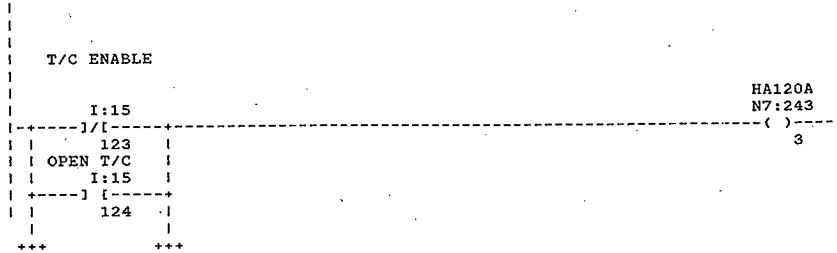


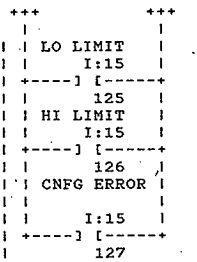


Rung 2:474

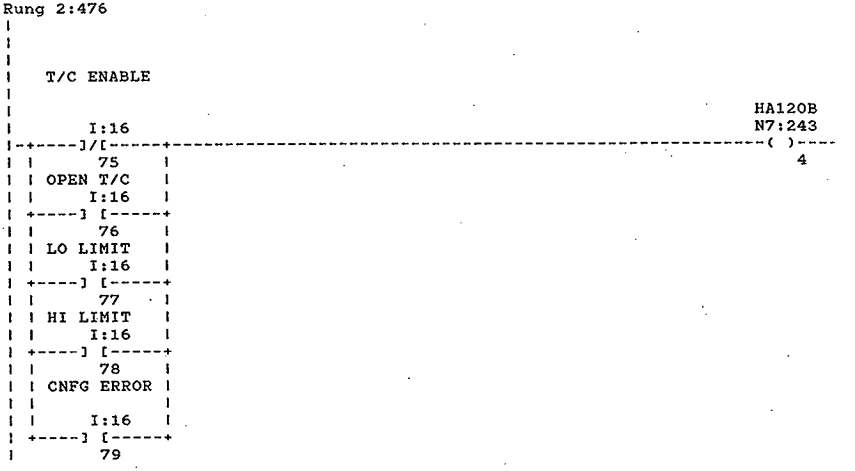


Rung 2:475

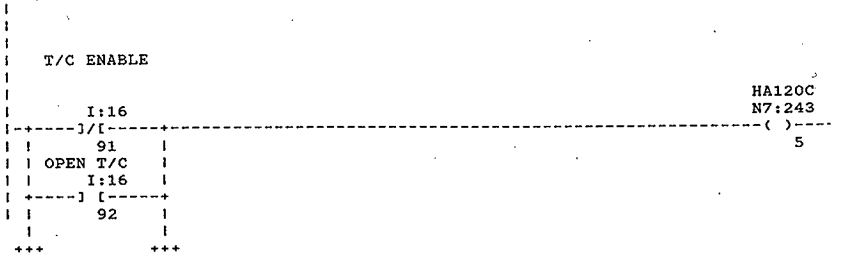


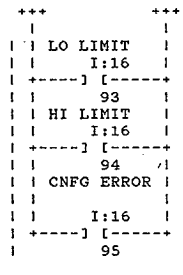


Rung 2:476

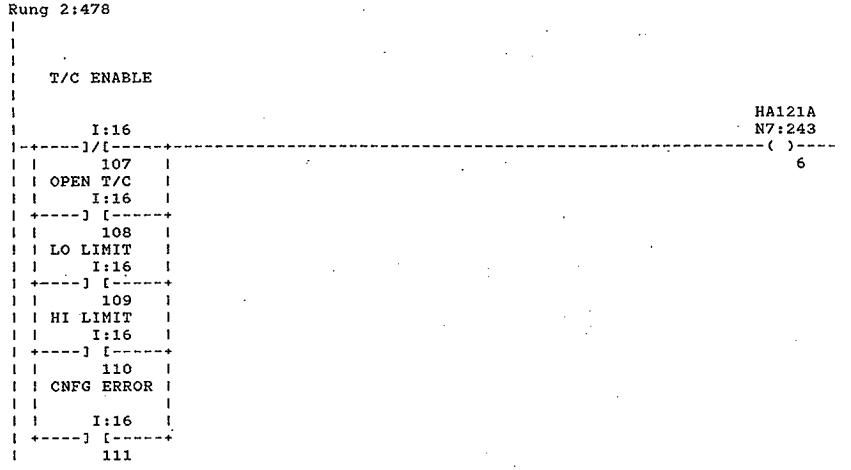


Rung 2:477

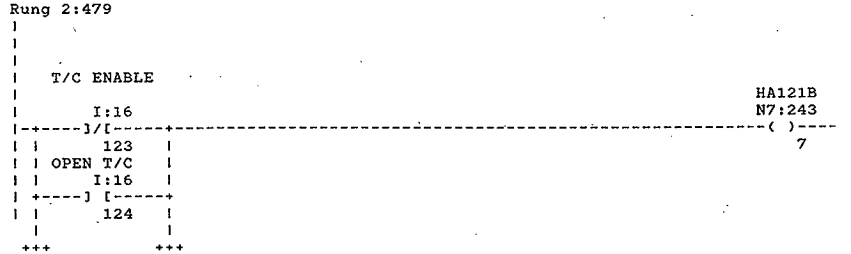


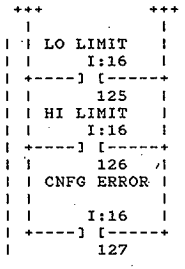


Rung 2:478

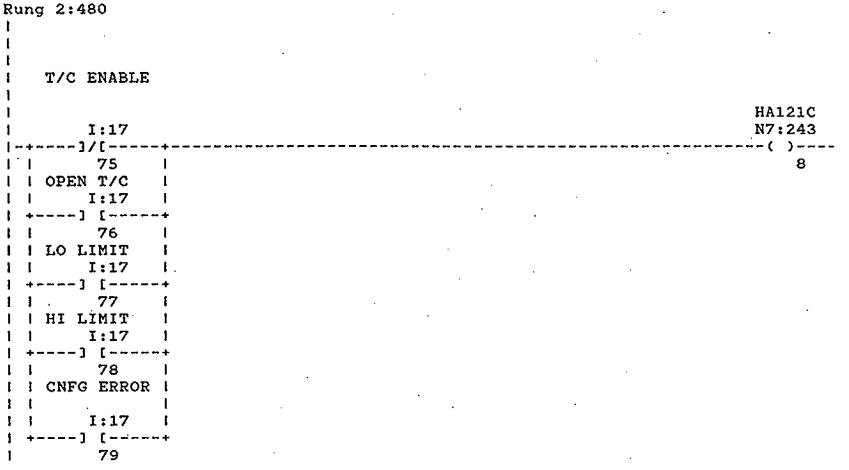


Rung 2:479

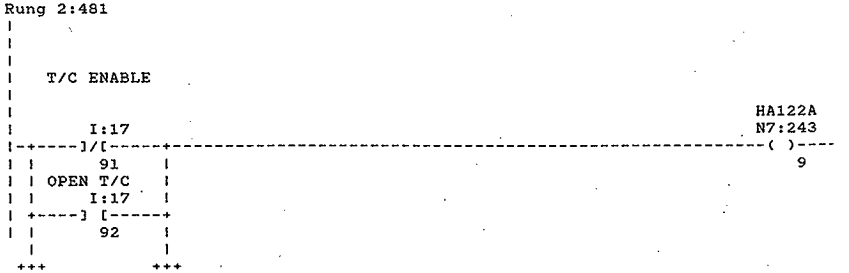


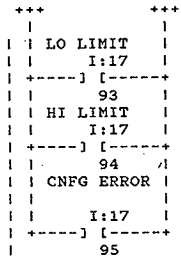


Rung 2:480

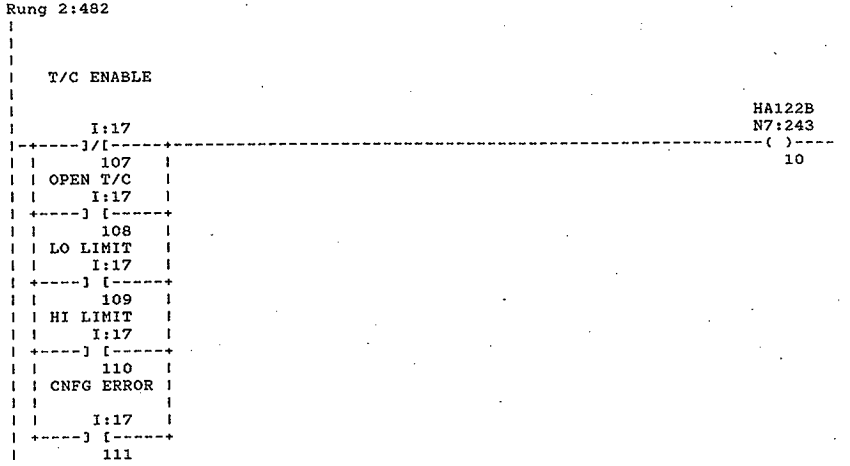


Rung 2:481

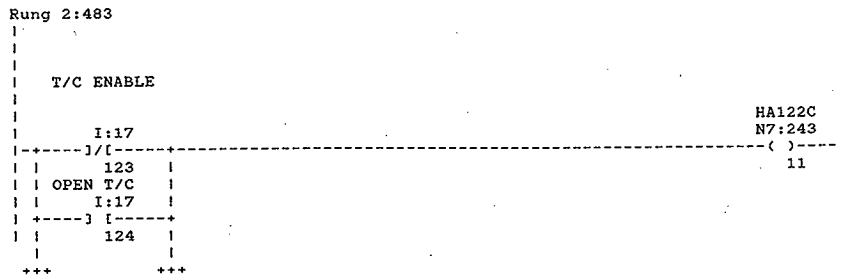


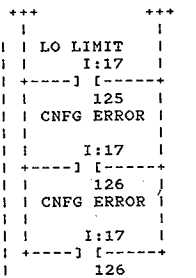


Rung 2:482

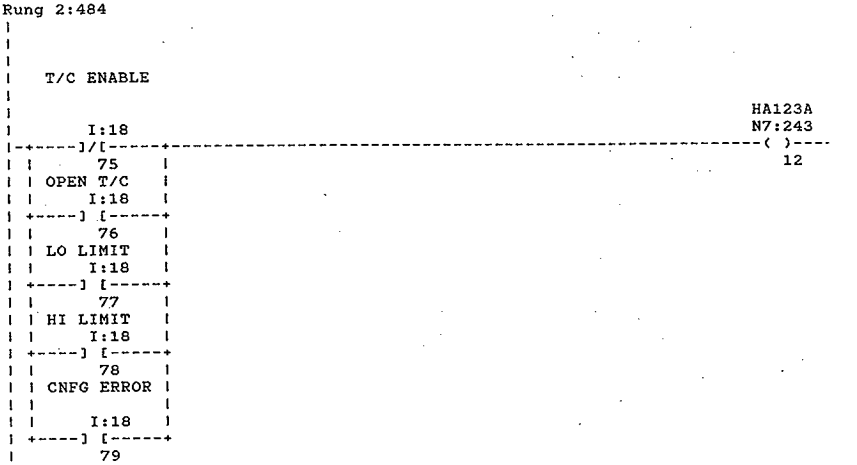


Rung 2:483

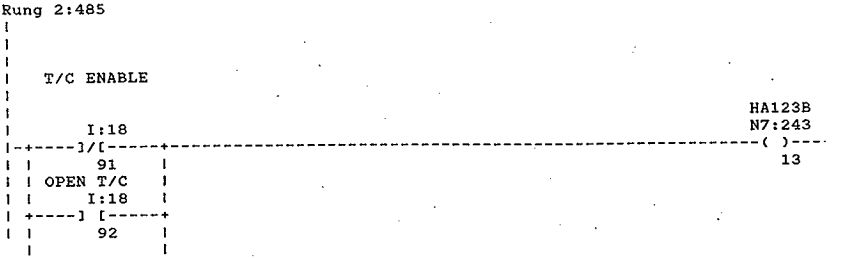




Rung 2:484



Rung 2:485



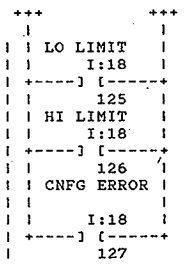
```
 +++          +++
  |            |
| | LO LIMIT   |
| |      I:18  |
| +----] [-----+
| |       93   |
| | HI LIMIT   |
| |      I:18  |
| +----] [-----+
| |       94   |
| | CNFG ERROR |
| |            |
| |      I:18  |
| +----] [-----+
|         95
```

Rung 2:486

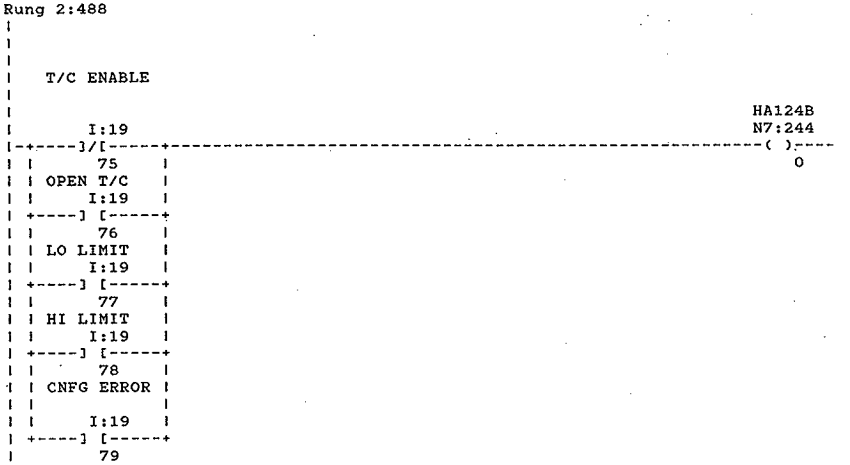
```
|
|
|
|   T/C ENABLE
|
|                                                                    HA123C
|       I:18                                                         N7:243
|-+-----]/[-----+-------------------------------------------------------( )----
| |       107   |                                                       14
| | OPEN T/C    |
| |      I:18   |
| +----] [-----+
| |       108   |
| | LO LIMIT    |
| |      I:18   |
| +----] [-----+
| |       109   |
| | HI LIMIT    |
| |      I:18   |
| +----] [-----+
| |       110   |
| | CNFG ERROR  |
| |             |
| |      I:18   |
| +-----] [-----+
|         111
```

Rung 2:487

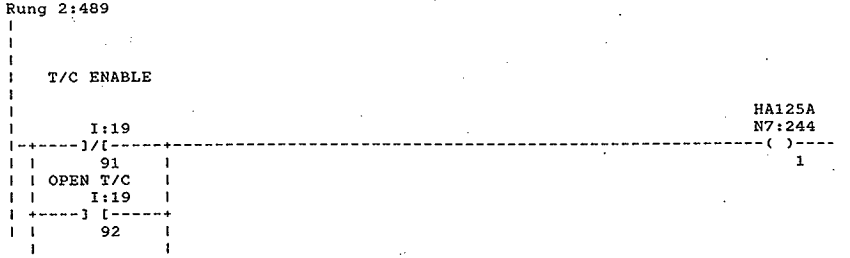
```
|
|
|
|   T/C ENABLE
|
|                                                                    HA124A
|       I:18                                                         N7:243
|-+-----]/[-----+-------------------------------------------------------( )----
| |       123   |                                                       15
| | OPEN T/C    |
| |      I:18   |
| +----] [-----+
| |       124   |
  |             |
 +++           +++
```

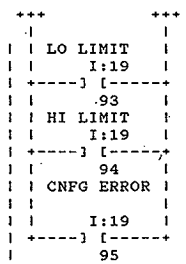


Rung 2:488

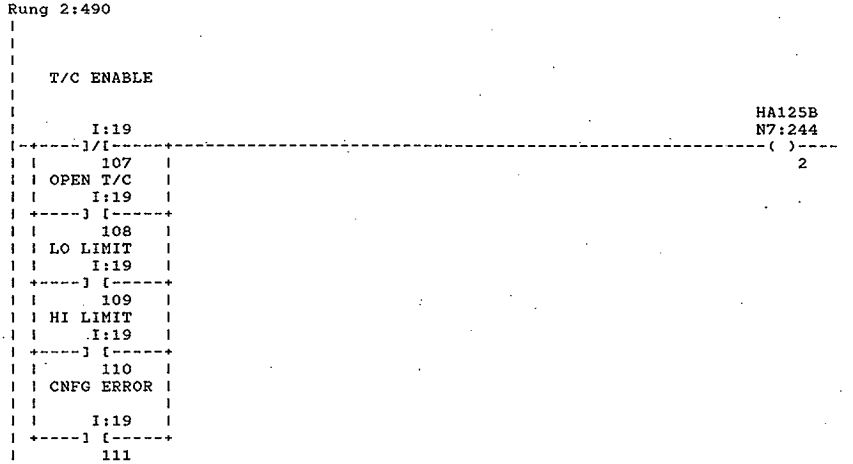


Rung 2:489

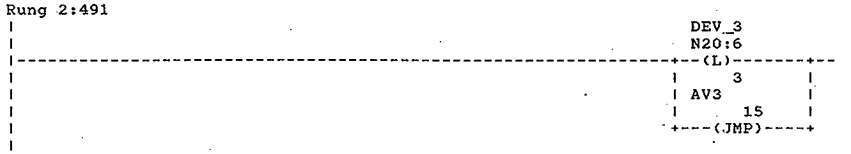




Rung 2:490



Rung 2:491

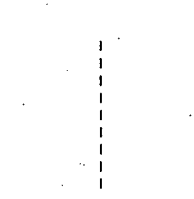


Rung 2:492

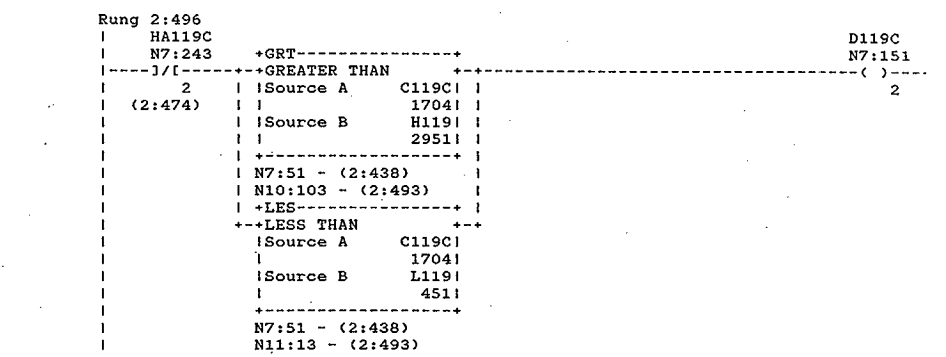
```
Rung 2:493
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-----------------------------------------------------+-+ADD                +-+--
|                                                     | |Source A     AV119| |
|                                                     | |              1702| |
|                                                     | |Source B DEVIATION| |
|                                                     | |              1250| |
|                                                     | |Dest          H119| |
|                                                     | |              2951| |
|                                                     | +------------------+ |
|                                                     | +SUB---------------+ |
|                                                     +-+SUBTRACT          +-+
|                                                       |Source A     AV119|
|                                                       |              1702|
|                                                       |Source B DEVIATION|
|                                                       |              1250|
|                                                       |Dest          L119|
|                                                       |               451|
|                                                       +------------------+

Rung 2:494
|                    PIPE ZONE
|    HA119A                                                                D119A
|    N7:243    +GRT---------------+                                        N7:151
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A     C119A| |                                        0
|  (2:472)   | |              1691| |
|            | |Source B      H119| |
|            | |              2951| |
|            | +------------------+ |
|            | N7:49 - (2:434)      |
|            | N10:103 - (2:493)    |
|            |      PIPE ZONE       |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C119A|
|              |              1691|
|              |Source B      L119|
|              |               451|
|              +------------------+
|              N7:49 - (2:434)
|              N11:13 - (2:493)

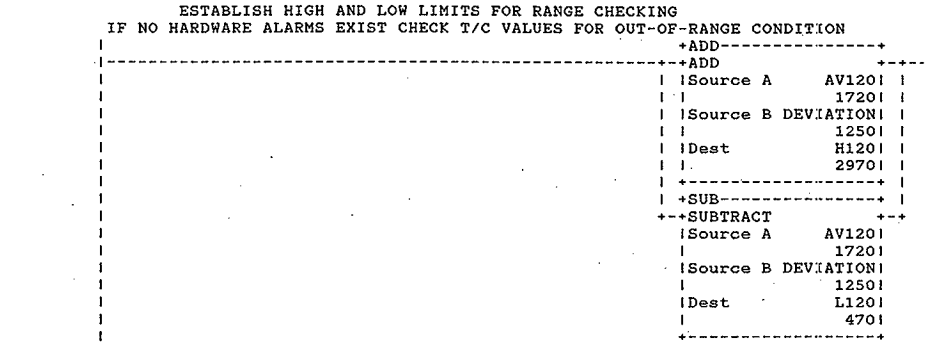
Rung 2:495
|    HA119B                                                                D119B
|    N7:243    +GRT---------------+                                        N7:151
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       1    | |Source A     C119B| |                                        1
|  (2:473)   | |              1710| |
|            | |Source B      H119| |
|            | |              2951| |
|            | +------------------+ |
|            | N7:50 - (2:436)      |
|            | N10:103 - (2:493)    |
|            |                      |
            +++                    +++
```



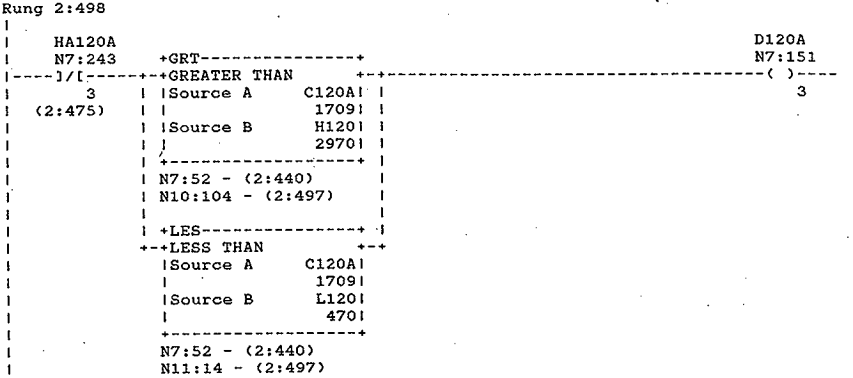
Rung 2:496



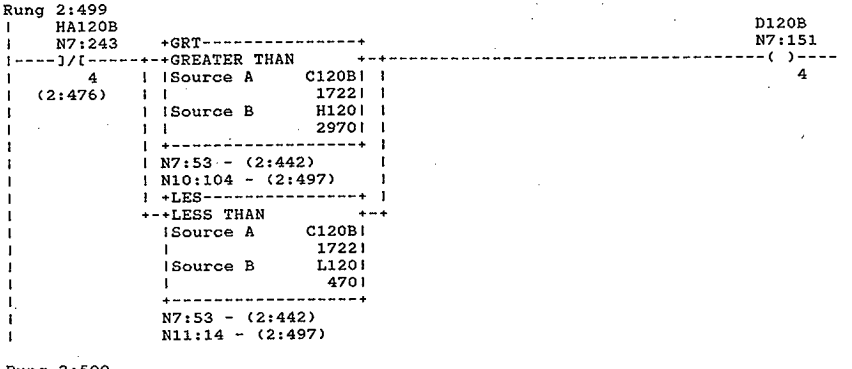
Rung 2:497



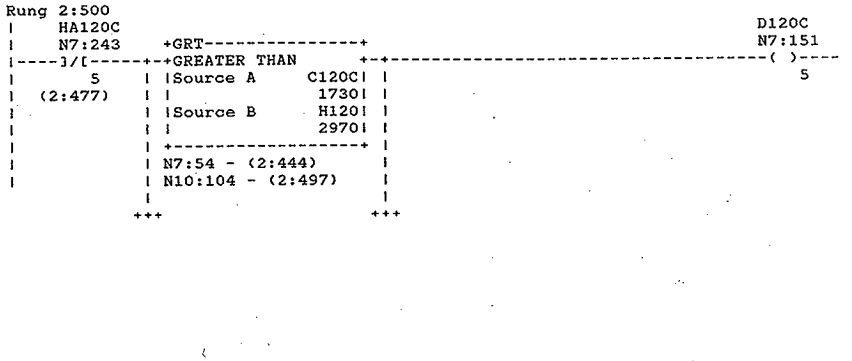
Rung 2:498

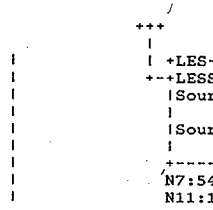


Rung 2:499



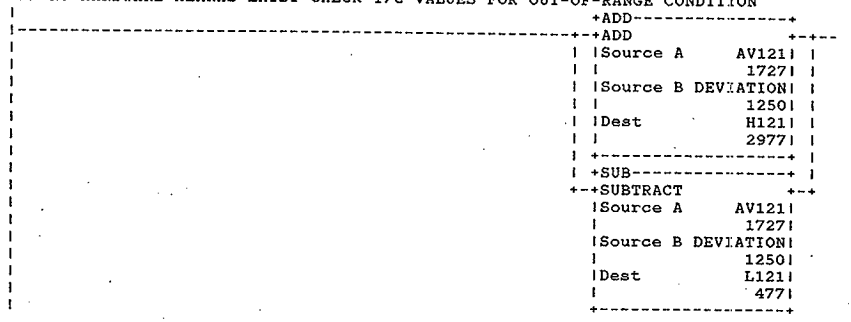
Rung 2:500



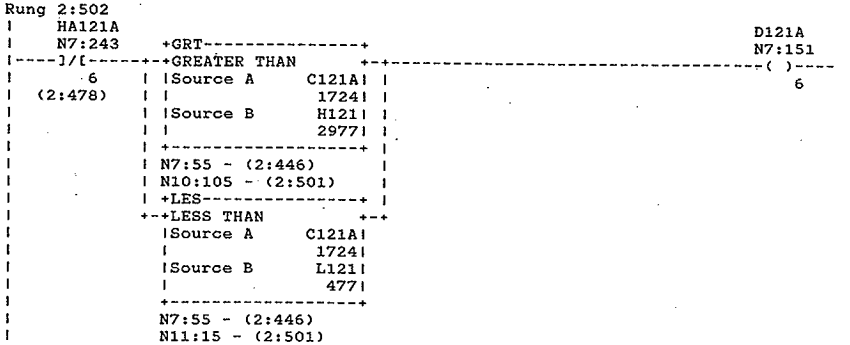


Rung 2:501

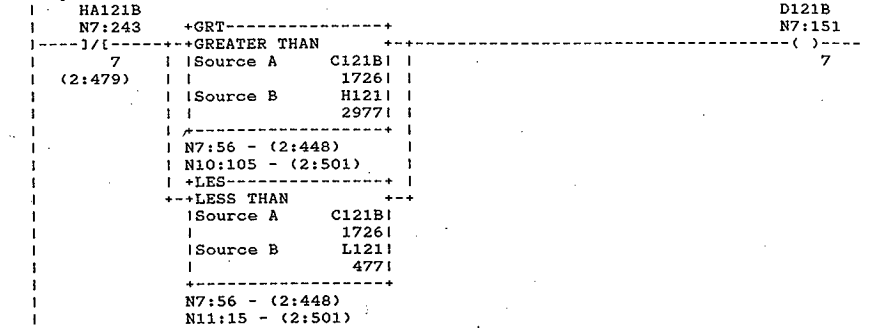
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



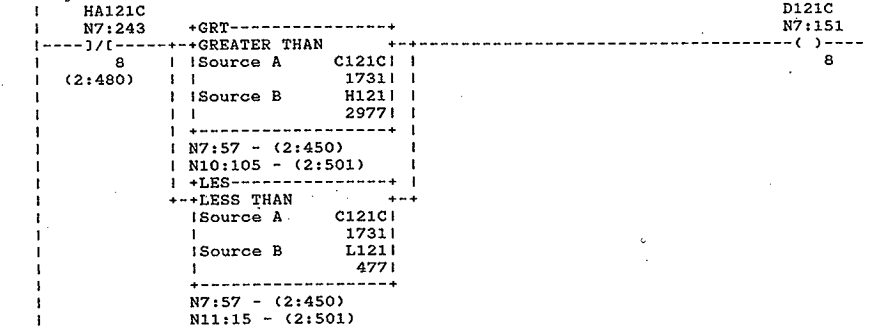
Rung 2:502



Rung 2:503



Rung 2:504



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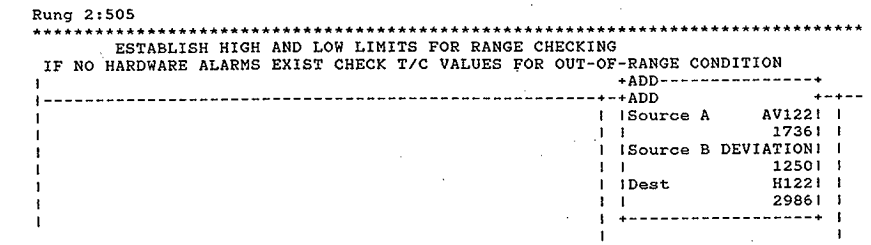

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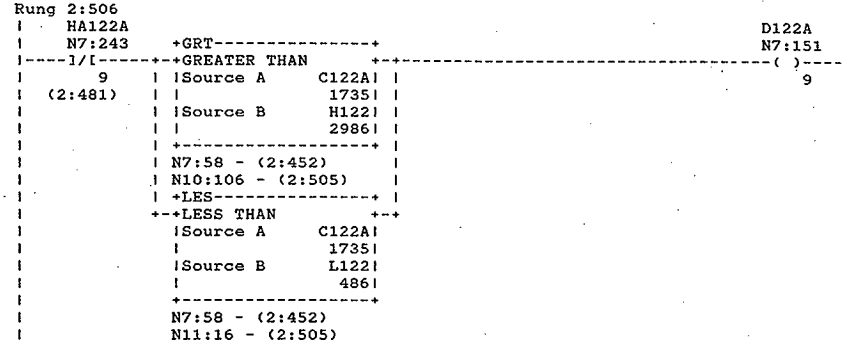

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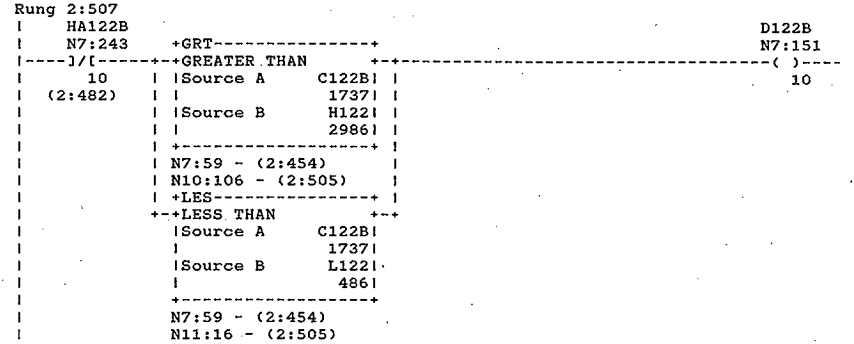

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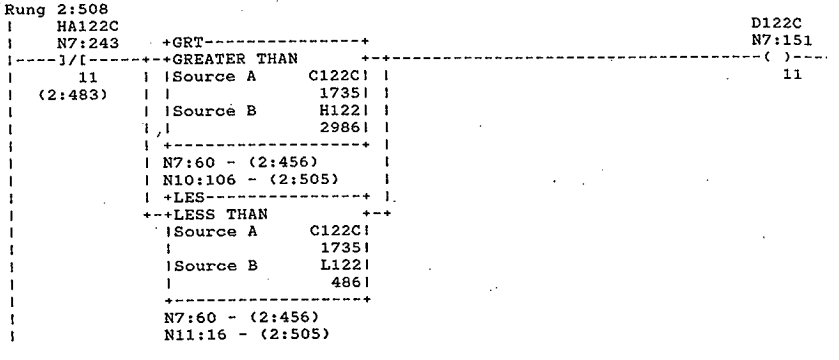
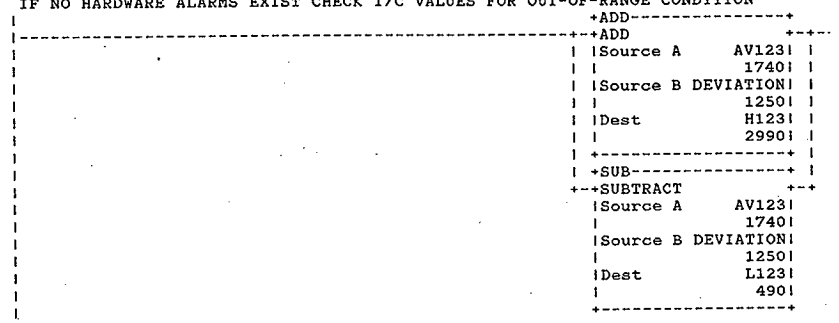
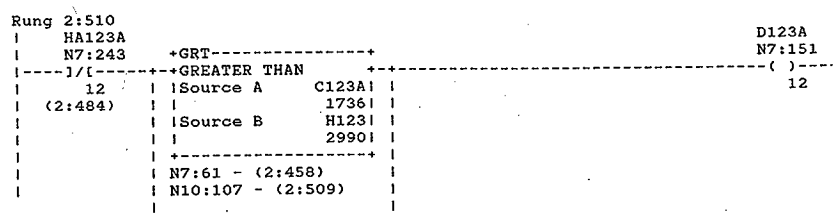


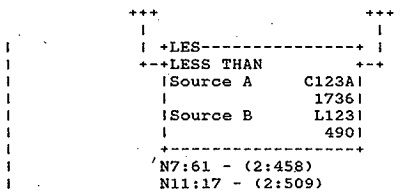
Rung 2:509

ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



Rung 2:510





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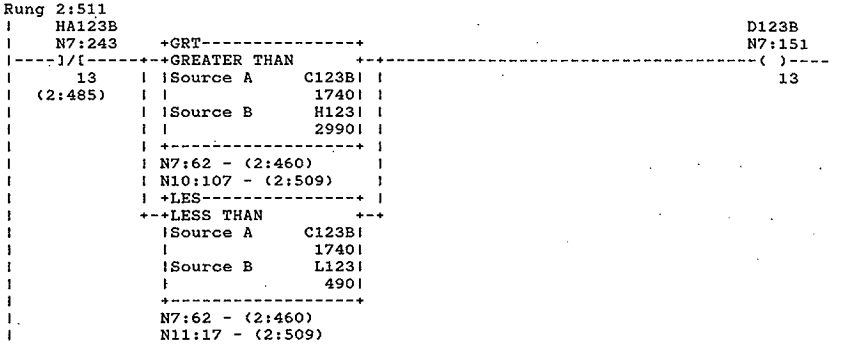
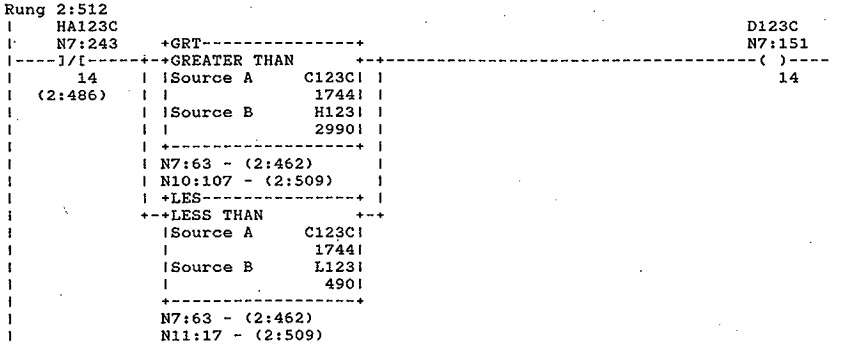


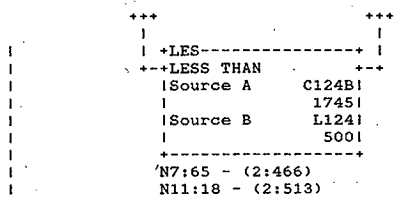
Rung 2:512



```
Rung 2:513
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A     AV124| |
|                                                       | |              1750| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest          H124| |
|                                                       | |              3000| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV124|
|                                                         |              1750|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest          L124|
|                                                         |               500|
|                                                         +------------------+

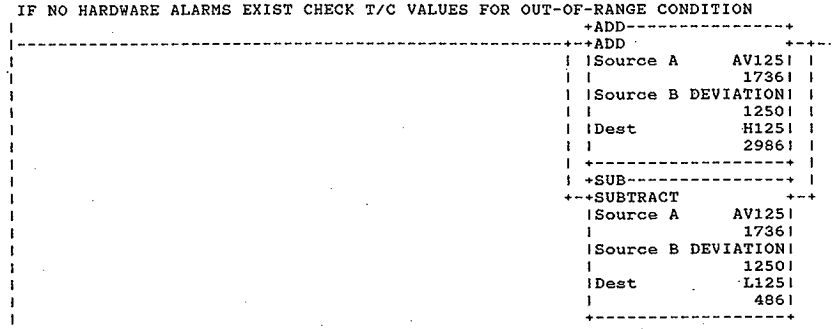
Rung 2:514
|    HA124A                                                                  D124A
|    N7:243     +GRT---------------+                                         N7:151
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      15    | |Source A     C124A| |                                        15
|  (2:487)   | |              1755| |
|            | |Source B      H124| |
|            | |              3000| |
|            | +------------------+ |
|            | N7:64 - (2:464)      |
|            | N10:108 - (2:513)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C124A|
|              |              1755|
|              |Source B      L124|
|              |               500|
|              +------------------+
|              N7:64 - (2:464)
|              N11:18 - (2:513)

Rung 2:515
|    HA124B                                                                  D124B
|    N7:244     +GRT---------------+                                         N7:152
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A     C124B| |                                         0
|  (2:488)   | |              1745| |
|            | |Source B      H124| |
|            | |              3000| |
|            | +------------------+ |
|            | N7:65 - (2:466)      |
|            | N10:108 - (2:513)    |
             |                      |
            +++                    +++
```

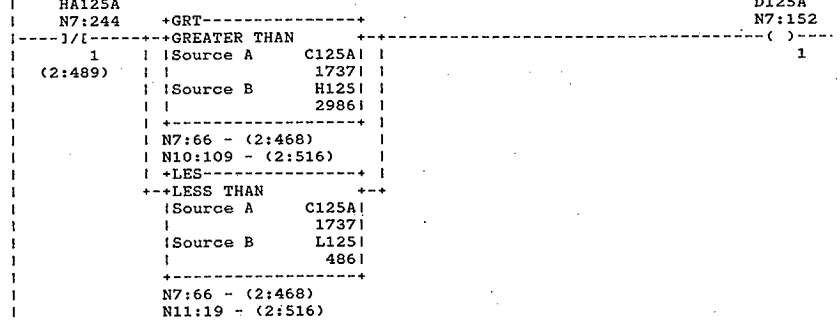


Rung 2:516

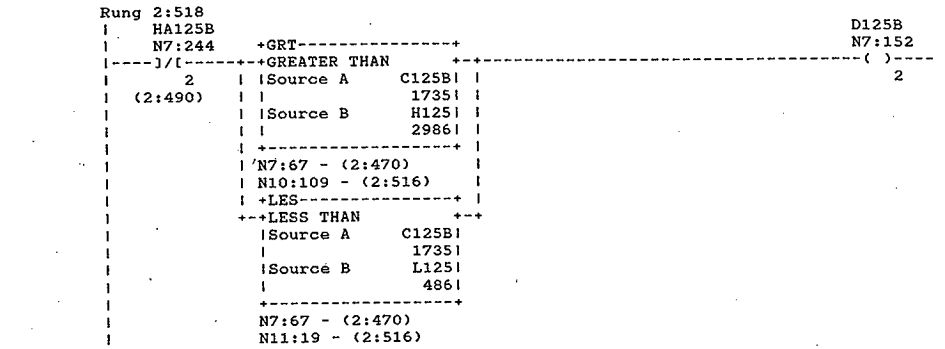
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



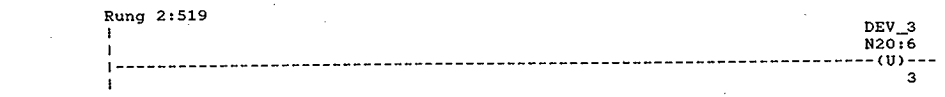
Rung 2:517



Rung 2:518

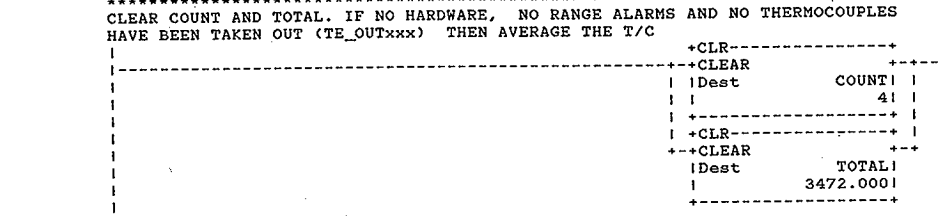


Rung 2:519

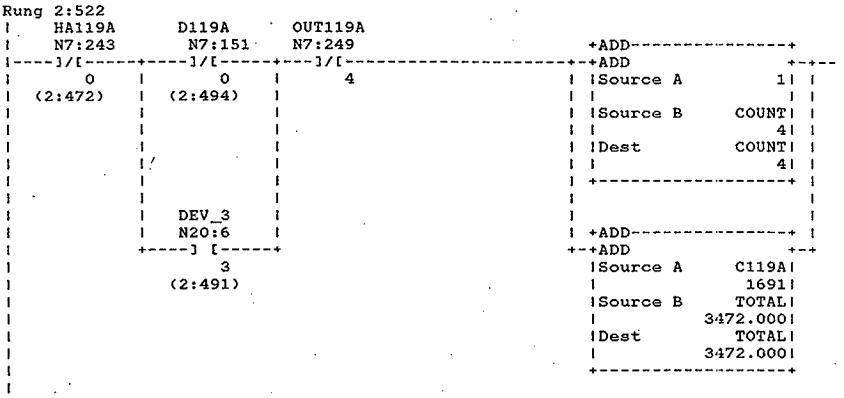


Rung 2:520

Rung 2:521



Rung 2:522



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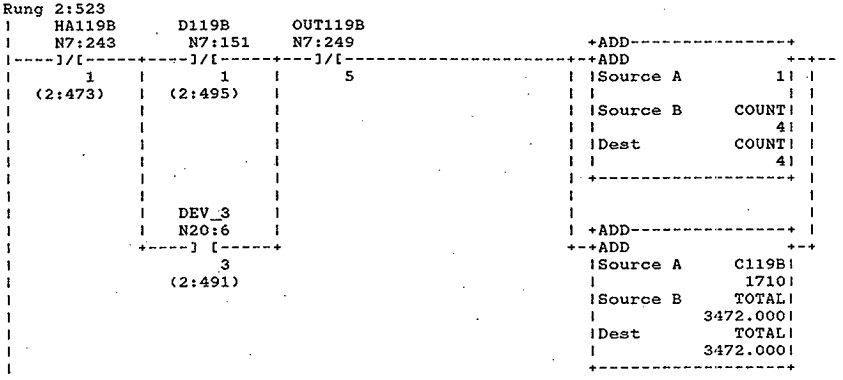

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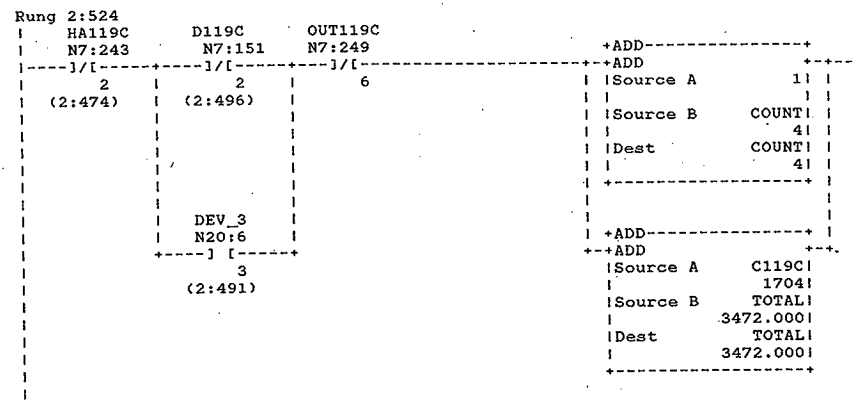
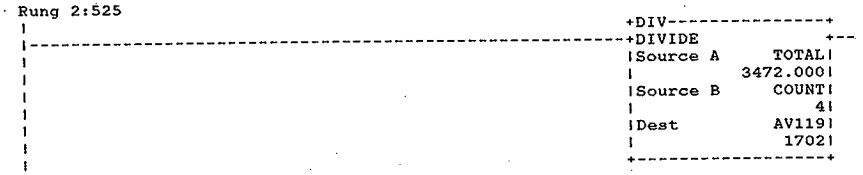
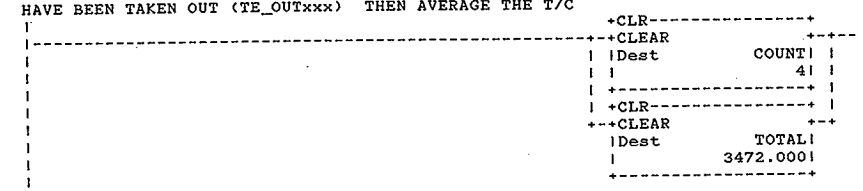


Rung 2:525

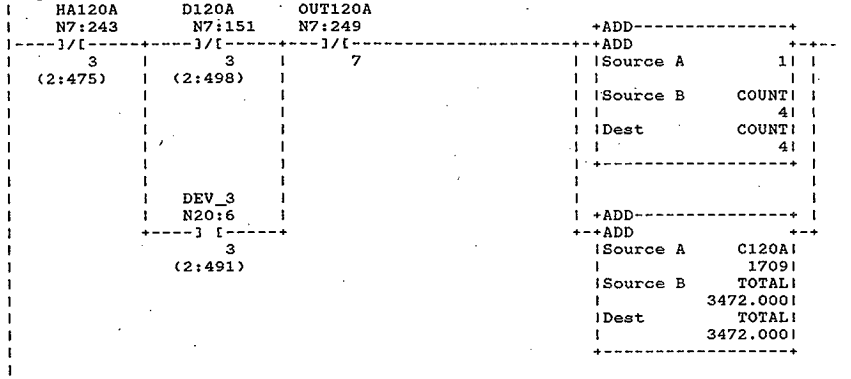


Rung 2:526

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



Rung 2:527



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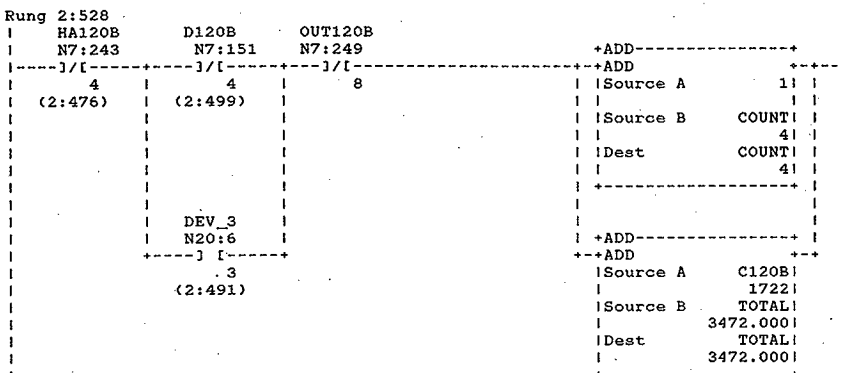
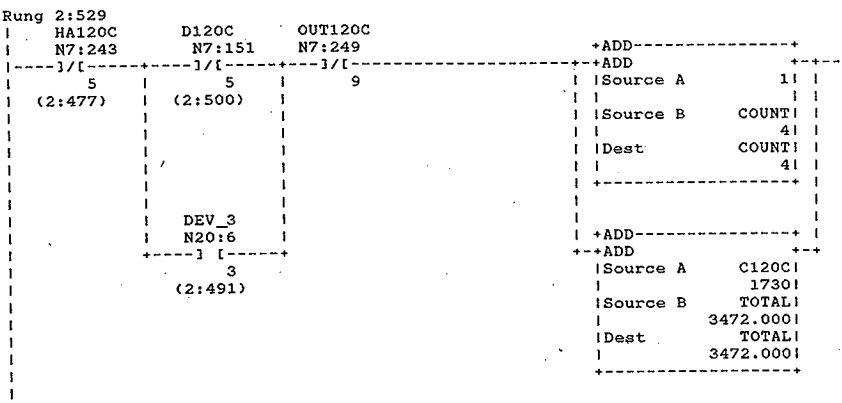
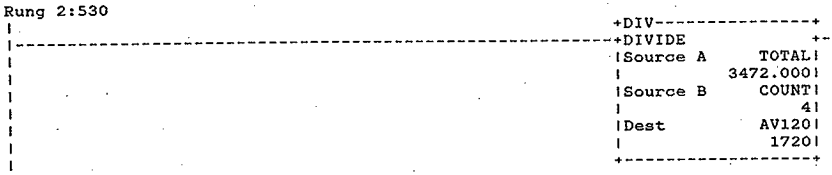


Rung 2:529

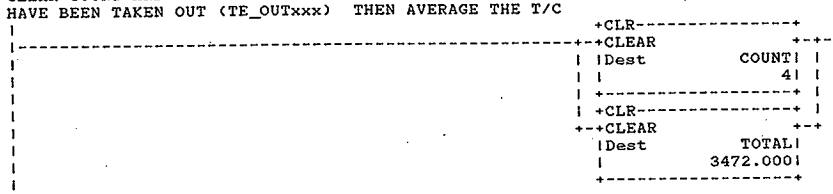


Rung 2:530

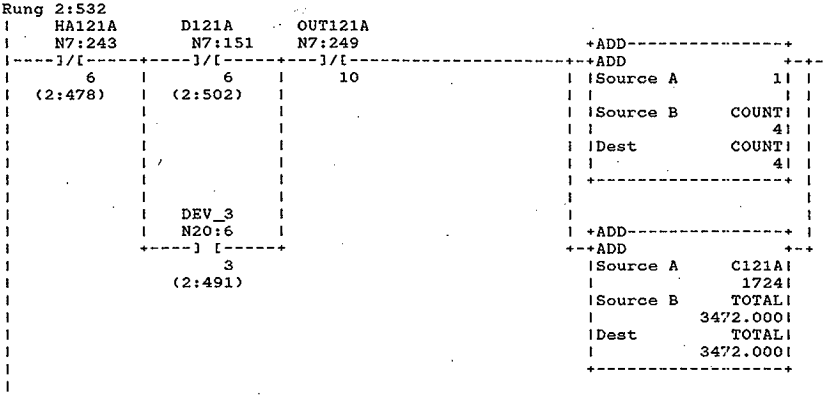


Rung 2:531

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



Rung 2:532



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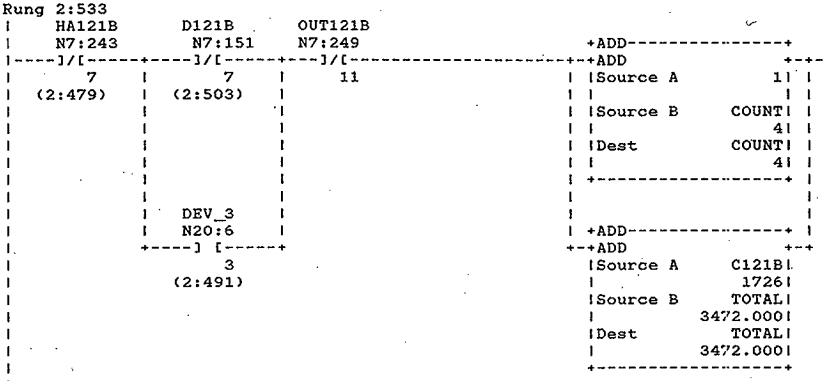
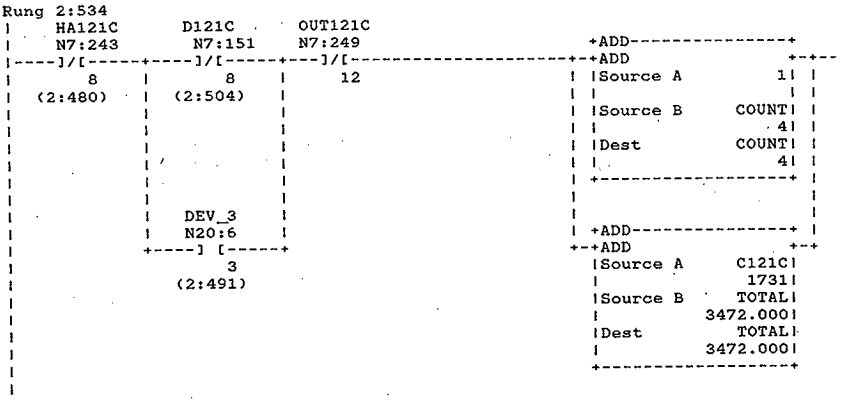
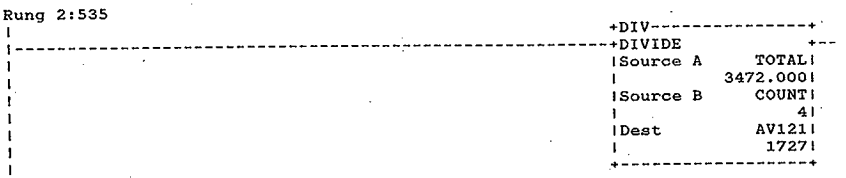


Rung 2:534

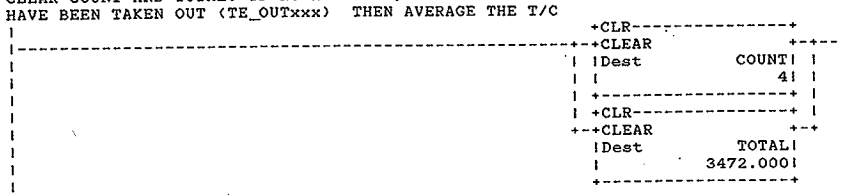


Rung 2:535

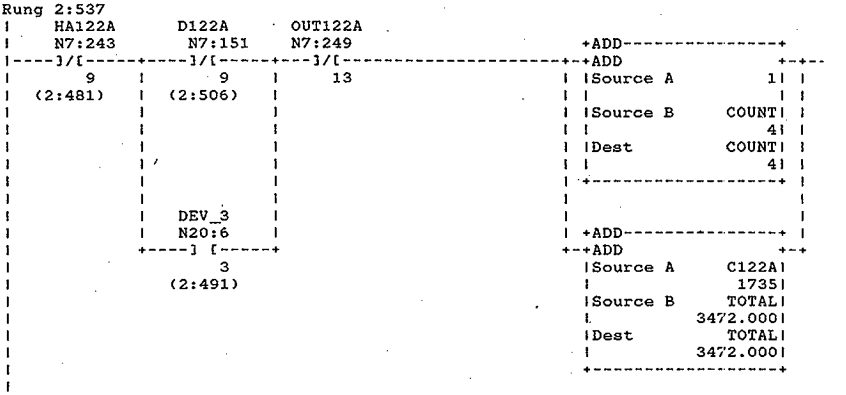


Rung 2:536

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



Rung 2:537



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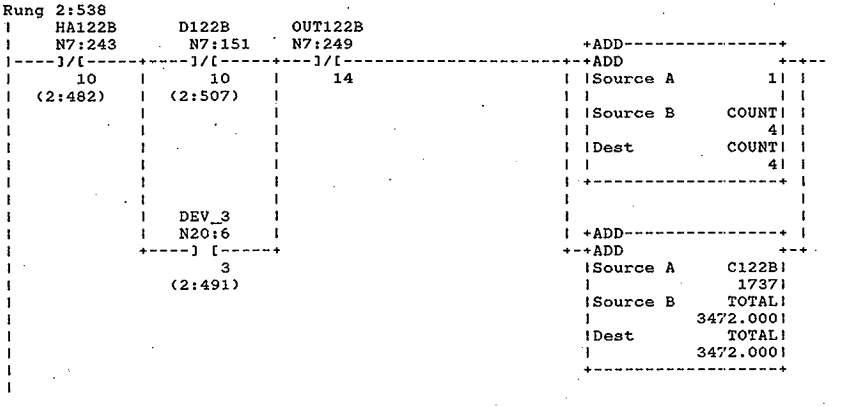

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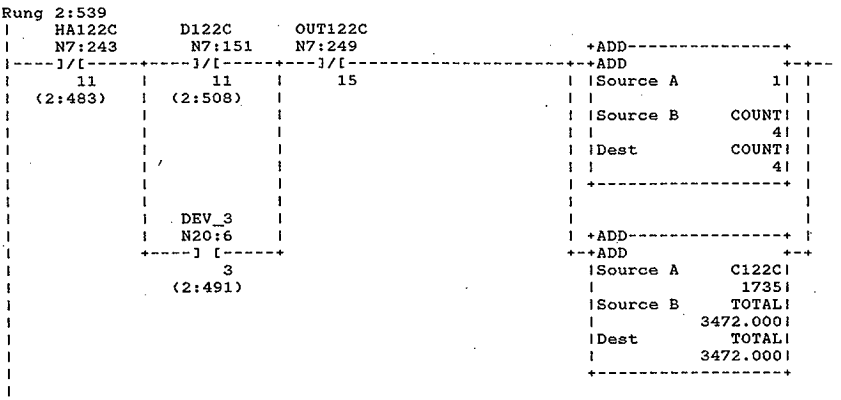

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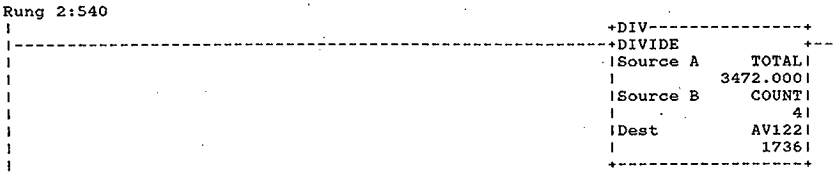
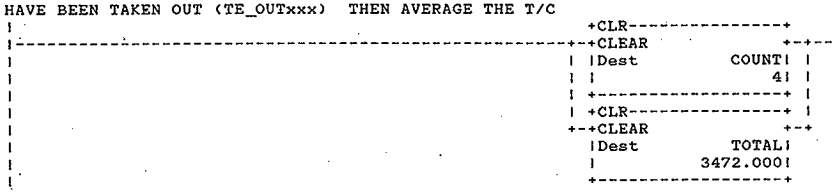


Rung 2:541

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



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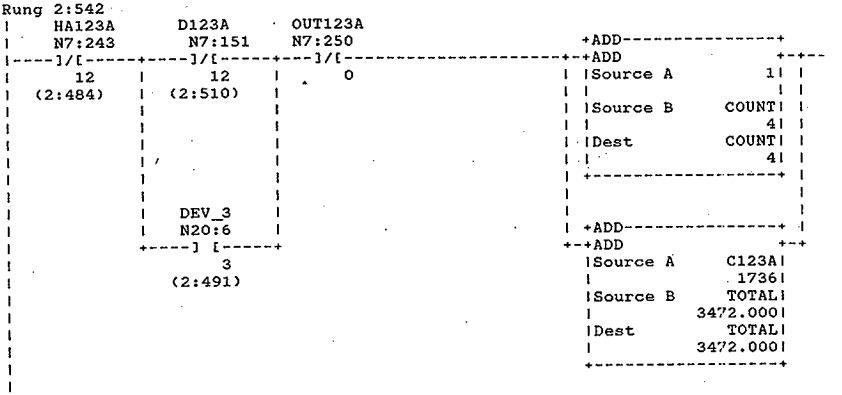

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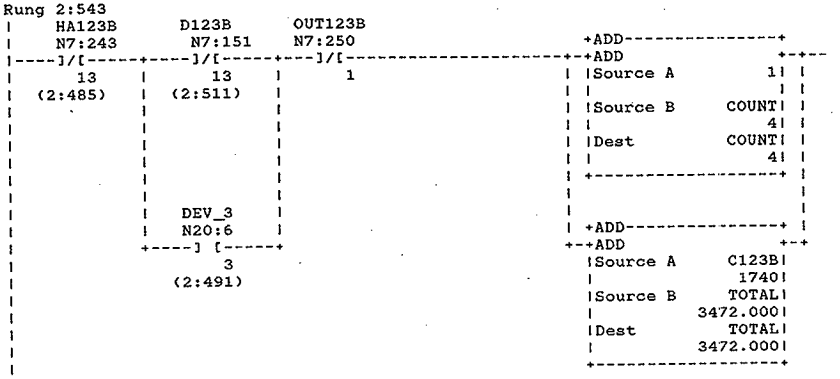
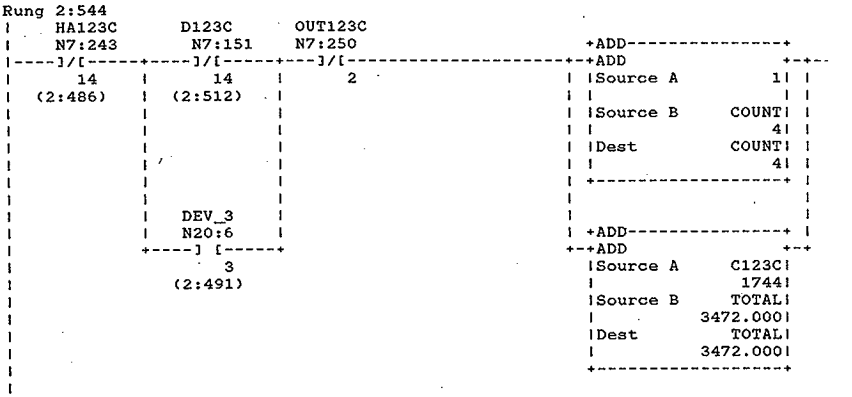
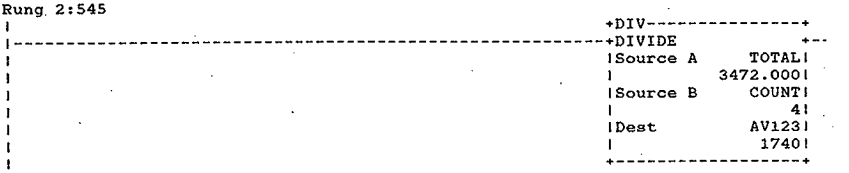


Rung 2:544

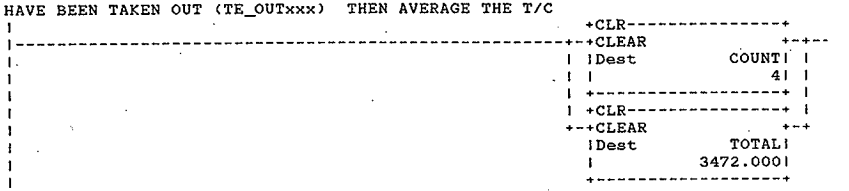


Rung 2:545

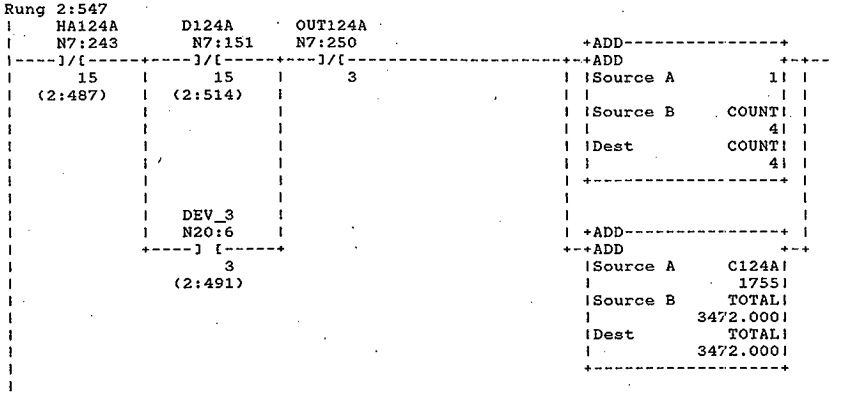


Rung 2:546

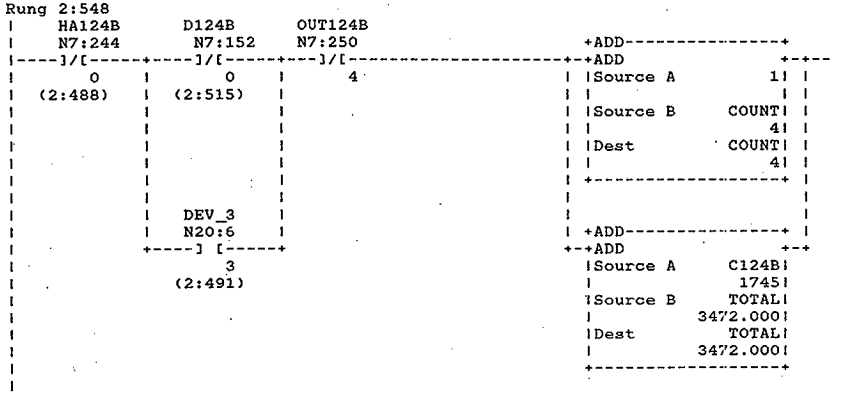
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



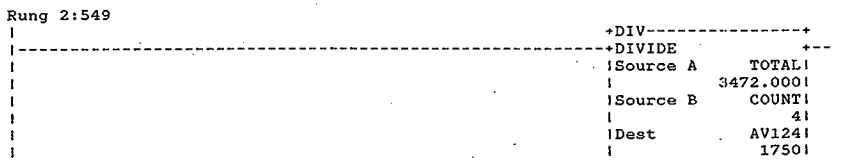
Rung 2:547



Rung 2:548

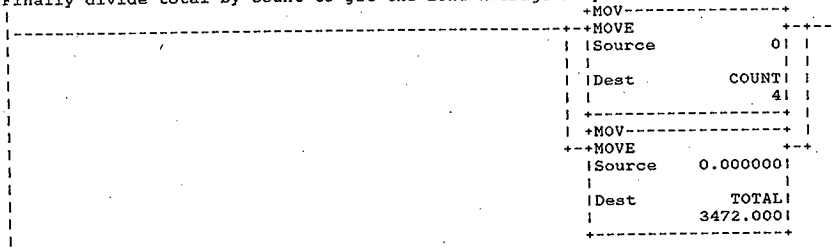


Rung 2:549

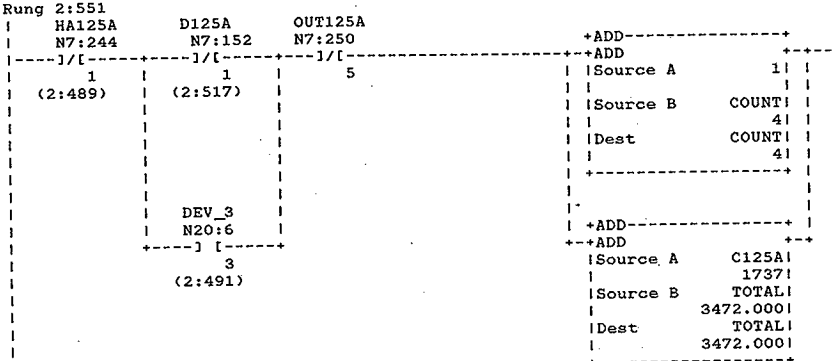


Rung 2:550

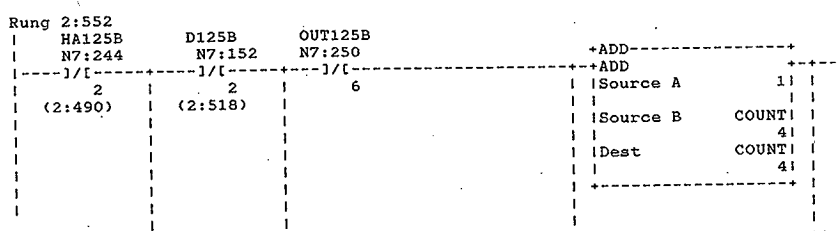
Average the good T/Cs of each zone:
Reset count and total,
For each T/C that has no alarm, count and add,
Finally divide total by count to get the Zone Average Temperature.

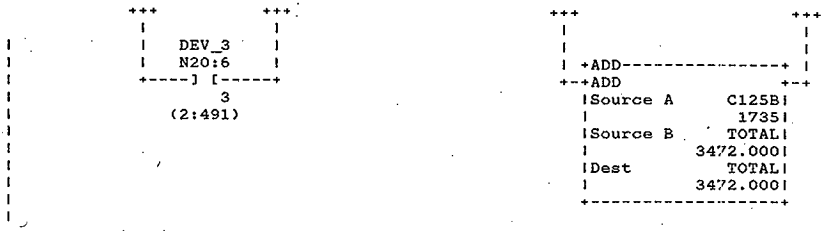


Rung 2:551



Rung 2:552

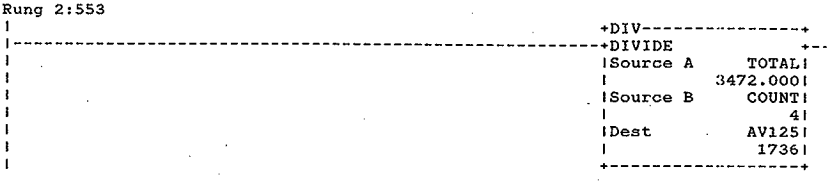




```
            +++          +++                          +++                    +++
             |            |                            |                      |
|            |   DEV_3    |                            |                      |
|            |   N20:6    |                            | +ADD---------------+ |
|            +----] [-----+                            +--+ADD              +--+
|                   3                                    |Source A     C125B|
|               (2:491)                                  |              1735|
|                                                        |Source B     TOTAL|
|                                                        |          3472.000|
|                                                        |Dest         TOTAL|
|                                                        |          3472.000|
|                                                        +------------------+
|
```

Rung 2:553

```
|                                                          +DIV---------------+
|-------------------------------------------------------+DIVIDE             +--
|                                                          |Source A     TOTAL|
|                                                          |          3472.000|
|                                                          |Source B     COUNT|
|                                                          |                 4|
|                                                          |Dest         AV125|
|                                                          |              1736|
|                                                          +------------------+
```



Rung 2:554

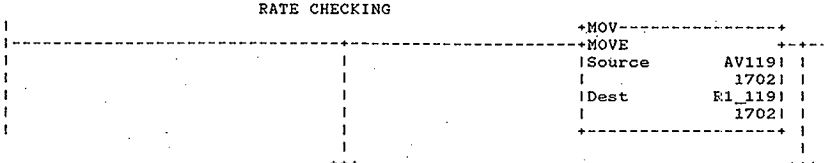
```
*******************************************************************************
    IF DEVIATION SET FOR SECTION 3 THEN GO THERE AND CALCULATE DEVIATION
|                                                                    DEV3
|   DEV_3
|   N20:6                                                                11
|----] [-------------------------------------------------------------(JMP)-----
|       3
|  (2:491)
```

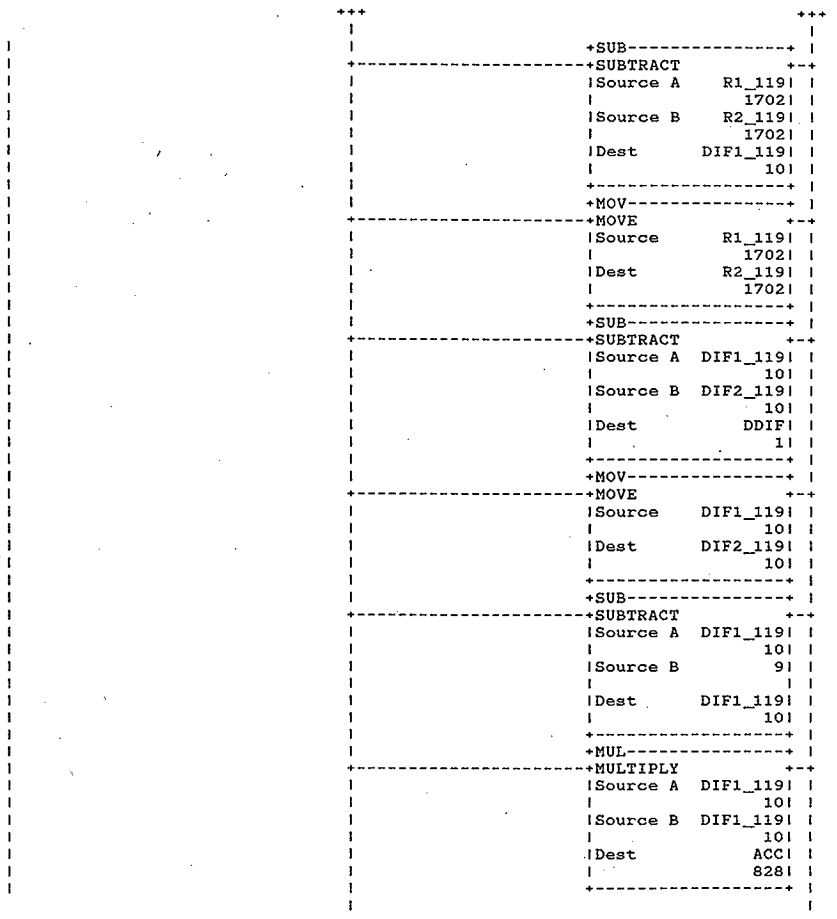
Rung 2:555

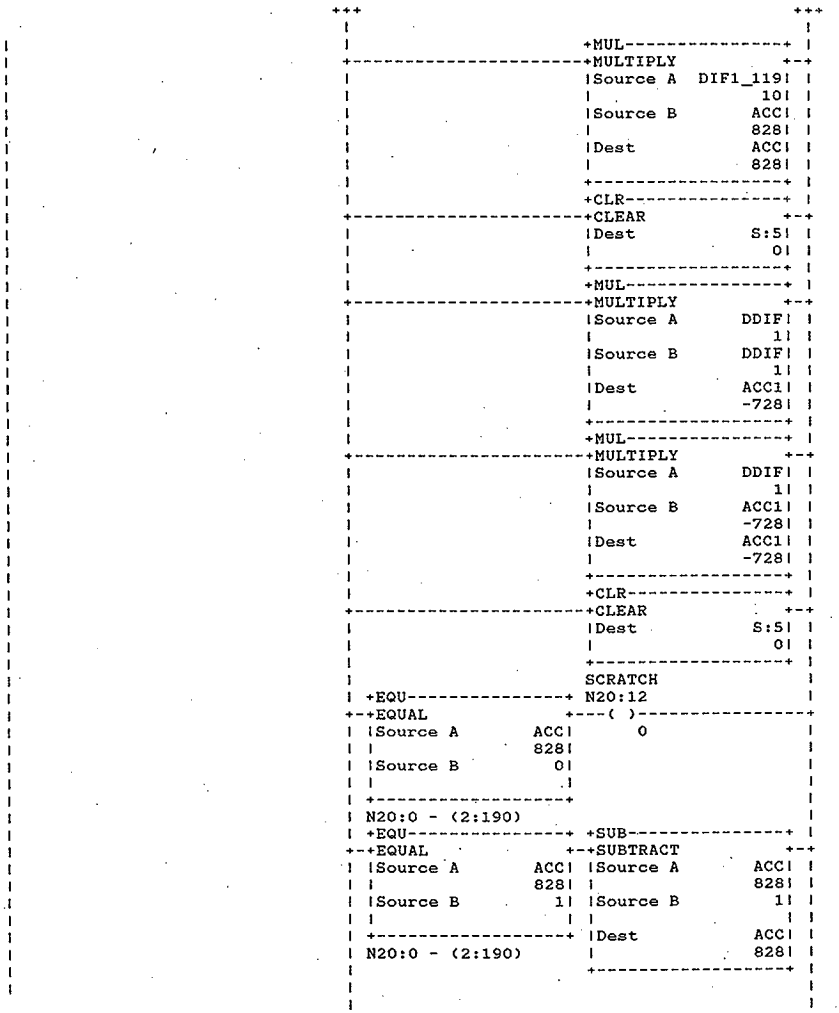
```
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                    PID119
| RT_TMR/DN
|   T4:62                                                                29
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

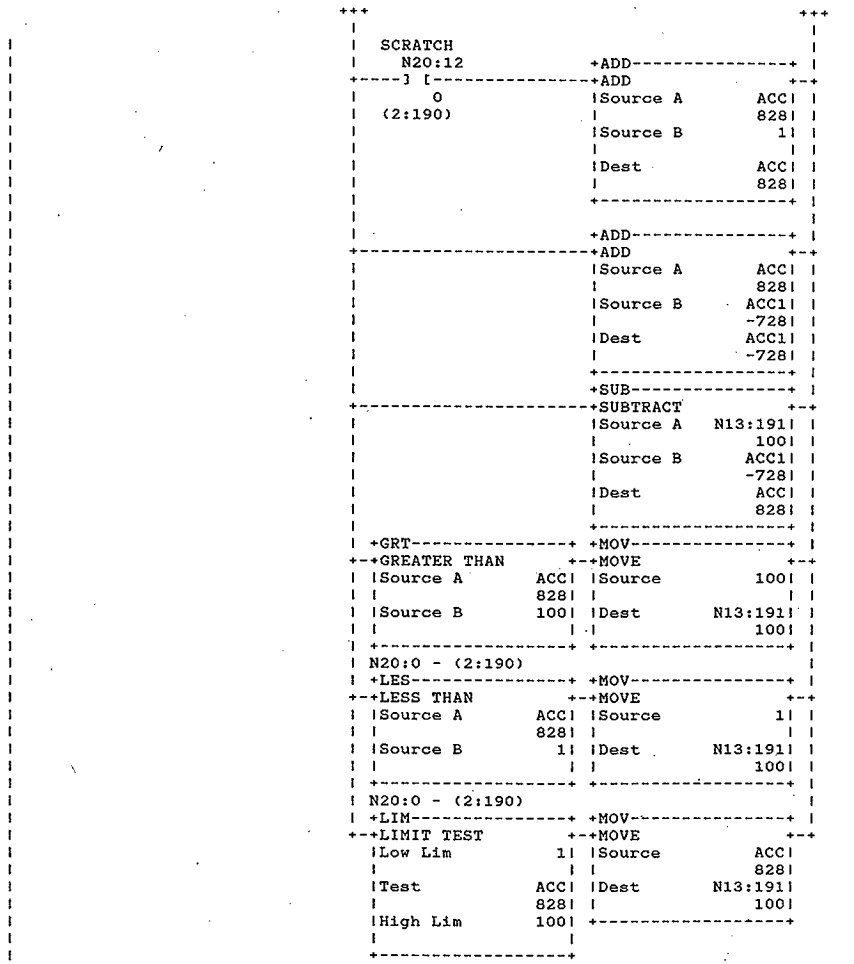
Rung 2:556

```
                          RATE CHECKING
|                                                      +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+--
|                               |                      |Source       AV119| |
|                               |                      |              1702| |
|                               |                      |Dest        R1_119| |
|                               |                      |              1702| |
|                               |                      +------------------+ |
|                               |                                           |
                               +++                                         +++
```




+SUB
+SUBTRACT
Source A R1_119
1702
Source B R2_119
1702
Dest DIF1_119
10
+MOV
+MOVE
Source R1_119
1702
Dest R2_119
1702
+SUB
+SUBTRACT
Source A DIF1_119
10
Source B DIF2_119
10
Dest DDIF
1
+MOV
+MOVE
Source DIF1_119
10
Dest DIF2_119
10
+SUB
+SUBTRACT
Source A DIF1_119
10
Source B
9
Dest DIF1_119
10
+MUL
+MULTIPLY
Source A DIF1_119
10
Source B DIF1_119
10
Dest ACC
8281


MUL
MULTIPLY
Source A DIF1_119
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
0
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A
828
Source B
1
Dest
828
ADD
Source A
828
Source B
ACC1
-728
Dest
ACC1
-728
SUB
SUBTRACT
Source A
N13:191
100
Source B
ACC1
-728
Dest
ACC
828
GRT
GREATER THAN
Source A
ACC
828
Source B
100
N20:0 - (2:190)
MOV
MOVE
Source
100
Dest
N13:191
100
LES
LESS THAN
Source A
ACC
828
Source B
1
N20:0 - (2:190)
MOV
MOVE
Source
1
Dest
N13:191
100
LIM
LIMIT TEST
Low Lim
1
Test
ACC
828
High Lim
100
N20:0 - (2:190)
MOV
MOVE
Source
ACC
828
Dest
N13:191
100

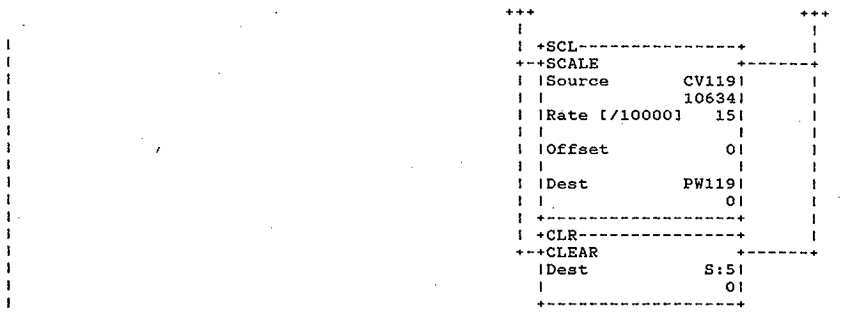
```
Rung 2:557
| PID119
|                                                                    DUMMY28
|      29                                                             N20:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                       11

Rung 2:558
                 DETECT FROM SCADA PID ON/OFF
                          IF PID OFF
                 THEN ZERO PW FOR ZERO OUTPUT AT  SCR
                   AND JUMP AROUND THE PID BLOCK
|   ON119
|    N7:119                                          +CLR---------------+
|----]/[-----------------------------------------+-+CLEAR              +-+--
|       9                                         | |Dest         PW119| |
|  (3:24)                                         | |                 0| |
|                                                 | +------------------+ |
|                                                 |                      |
|                                                 |   67                 |
|                                                 +--(JMP)---------------+
|

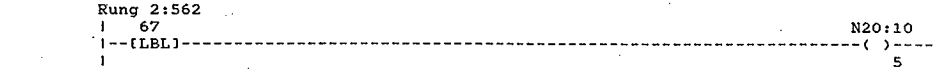
Rung 2:559
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM119                                                            PID119/1
|    N7:119                                                          N13:180
|----]/[-------------------------------------------------------------( )-----
|       8                                                                1
|  (3:24)

Rung 2:560
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                     +MOV---------------+
|-----------------------------------------------------+MOVE              +--
|                                                     |Source      SET119|
|                                                     |                400|
|                                                     |Dest      PIDSP119|
|                                                     |                400|
|                                                     +------------------+

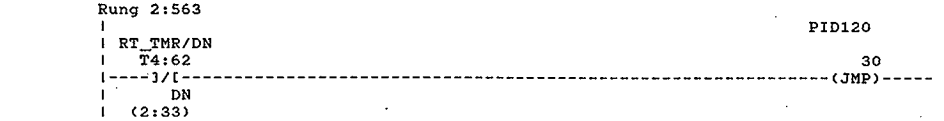
Rung 2:561
|                                                 +PID--------------------+
|-------------------------------------------------+-+PID                  +-+--
|                                                | |Control Block    PID119| |
|                                                | |Process Variable  AV119| |
|                                                | |Control Variable  CV119| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                |                           |
                                               +++                         +++
```



Rung 2:562

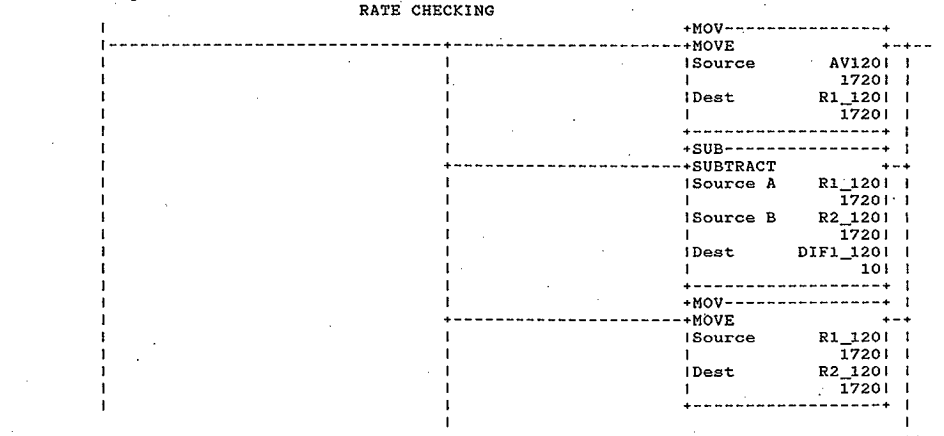


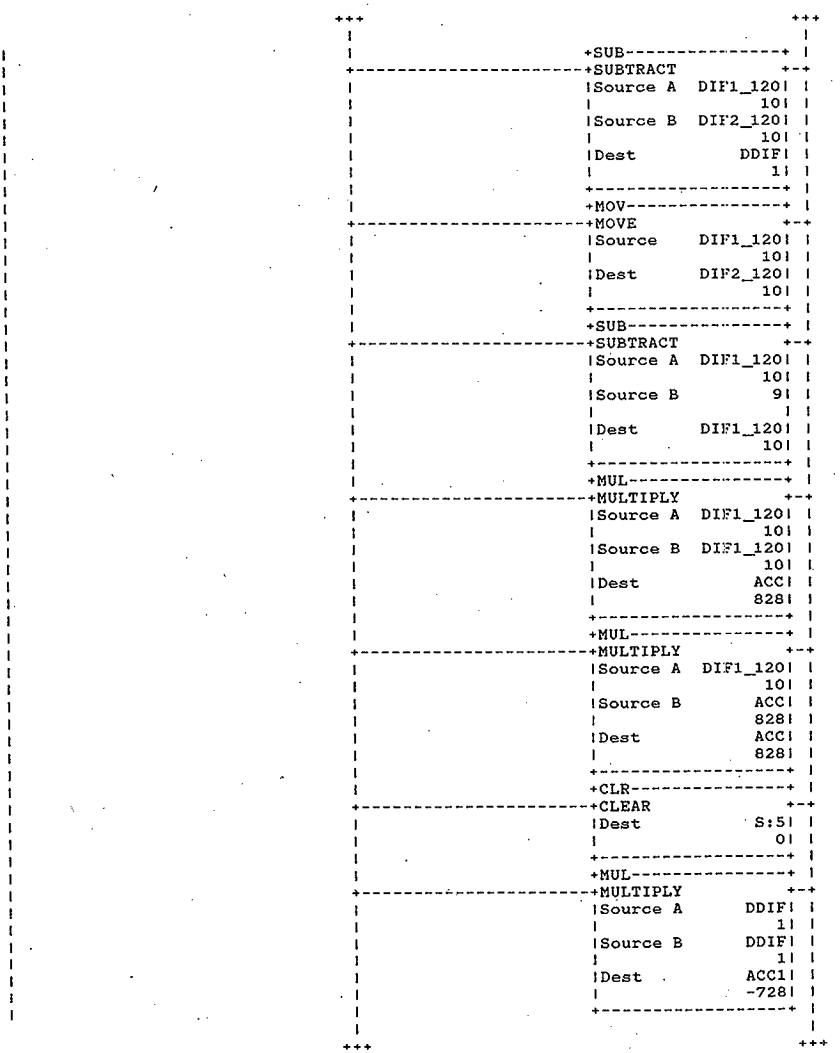
Rung 2:563

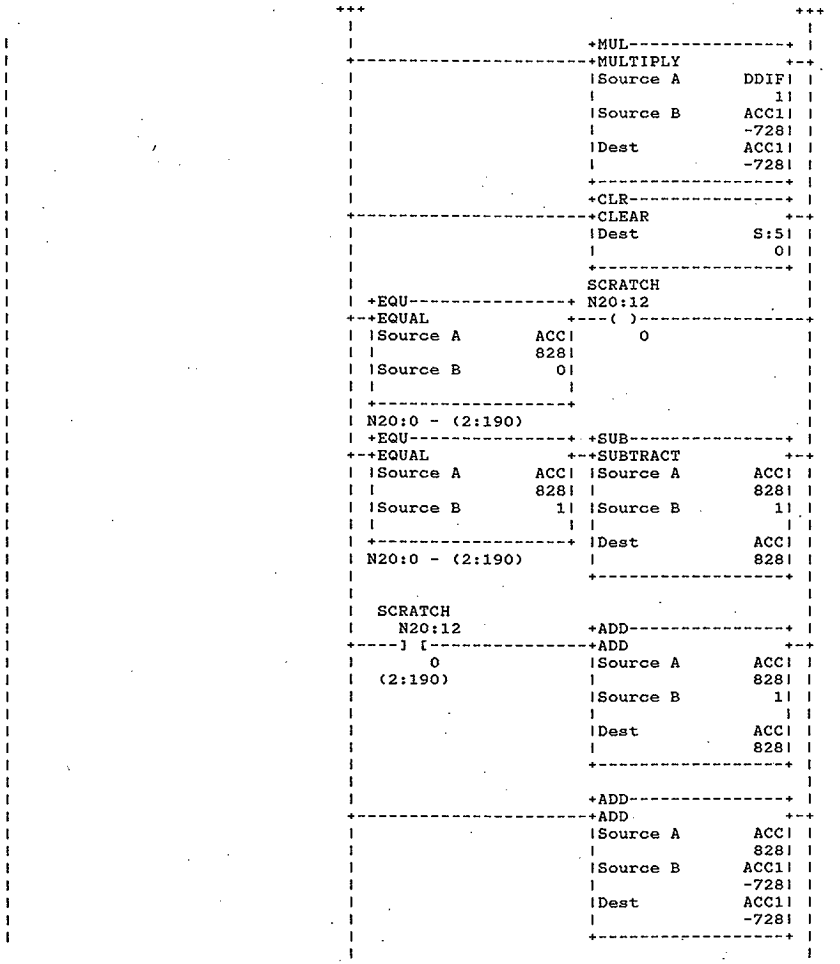


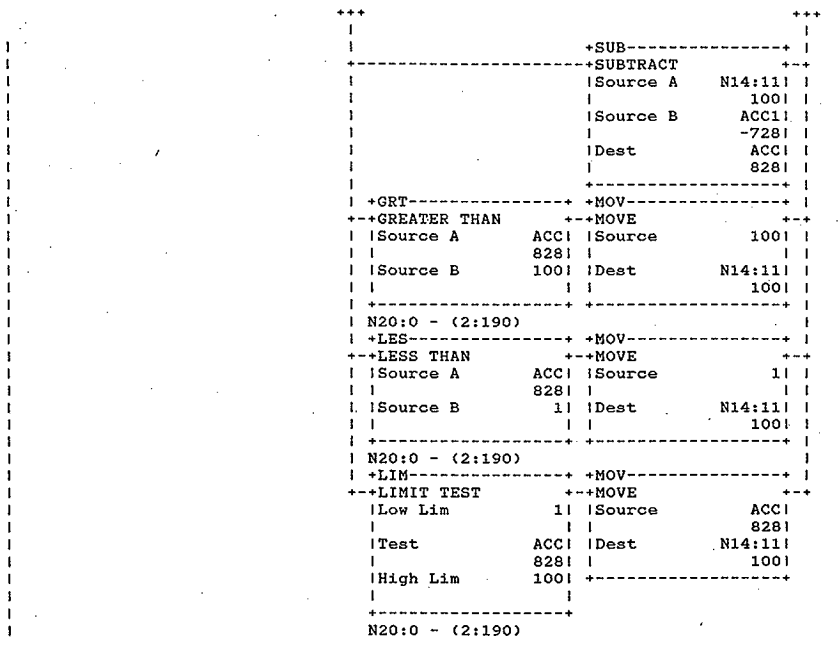
Rung 2:564

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_120 10
Source B DIF2_120 10
Dest DDIF 1
MOV
MOVE
Source DIF1_120 10
Dest DIF2_120 10
SUB
SUBTRACT
Source A DIF1_120 10
Source B 9
Dest DIF1_120 10
MUL
MULTIPLY
Source A DIF1_120 10
Source B DIF1_120 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_120 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728

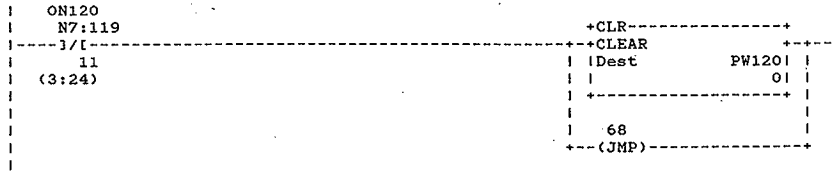

+MUL
+MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
+CLEAR
Dest S:5 0
SCRATCH
N20:12
+EQU
+EQUAL
Source A ACC 828
Source B 0
0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
+SUB
+SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH
N20:12
0
(2:190)
+ADD
+ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
+ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728



Rung 2:565

Rung 2:566

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:567

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|   AM120                                                          PID120/1
|    N7:119                                                         N14:0
|----]/[-----------------------------------------------------------( )-----
|      10                                                             1
|  (3:24)
```

Rung 2:568

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                    +MOV---------------+
|----------------------------------------------------+MOVE              +--
|                                                    |Source      SET120|
|                                                    |                  0|
|                                                    |Dest        PIDSP120|
|                                                    |                  0|
|                                                    +-------------------+
```

Rung 2:569

```
|                                                +PID-------------------+
|------------------------------------------------+-+PID                 +-+---
|                                                | |Control Block    PID120| |
|                                                | |Process Variable  AV120| |
|                                                | |Control Variable  CV120| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                | +SCL---------------+      |
|                                                +-+SCALE             +------+
|                                                | |Source       CV120|      |
|                                                | |                  0|      |
|                                                | |Rate [/10000]   15|      |
|                                                | |                   |      |
|                                                | |Offset            0|      |
|                                                | |                   |      |
|                                                | |Dest         PW120|      |
|                                                | |                  0|      |
|                                                | +------------------+      |
|                                                | +CLR---------------+      |
|                                                +-+CLEAR             +------+
|                                                  |Dest           S:5|
|                                                  |                  0|
|                                                  +-------------------+
```

Rung 2:570

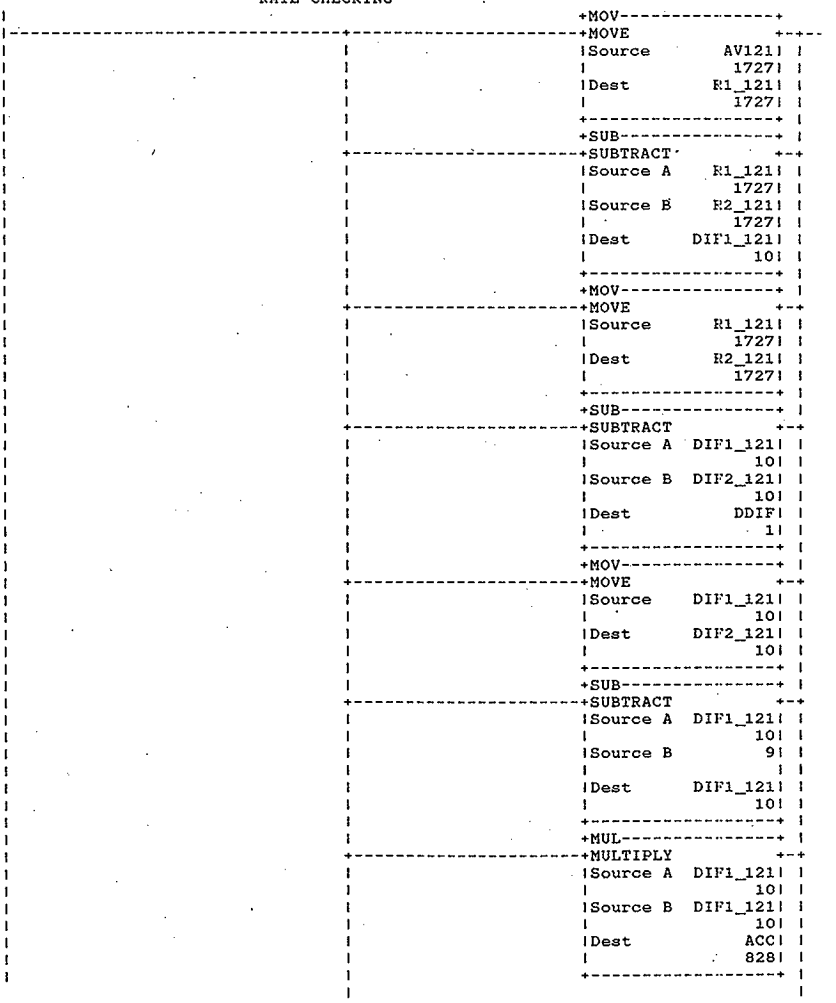
```
|   68                                                             N20:10
|--[LBL]-----------------------------------------------------------( )-----
|                                                                     6
```

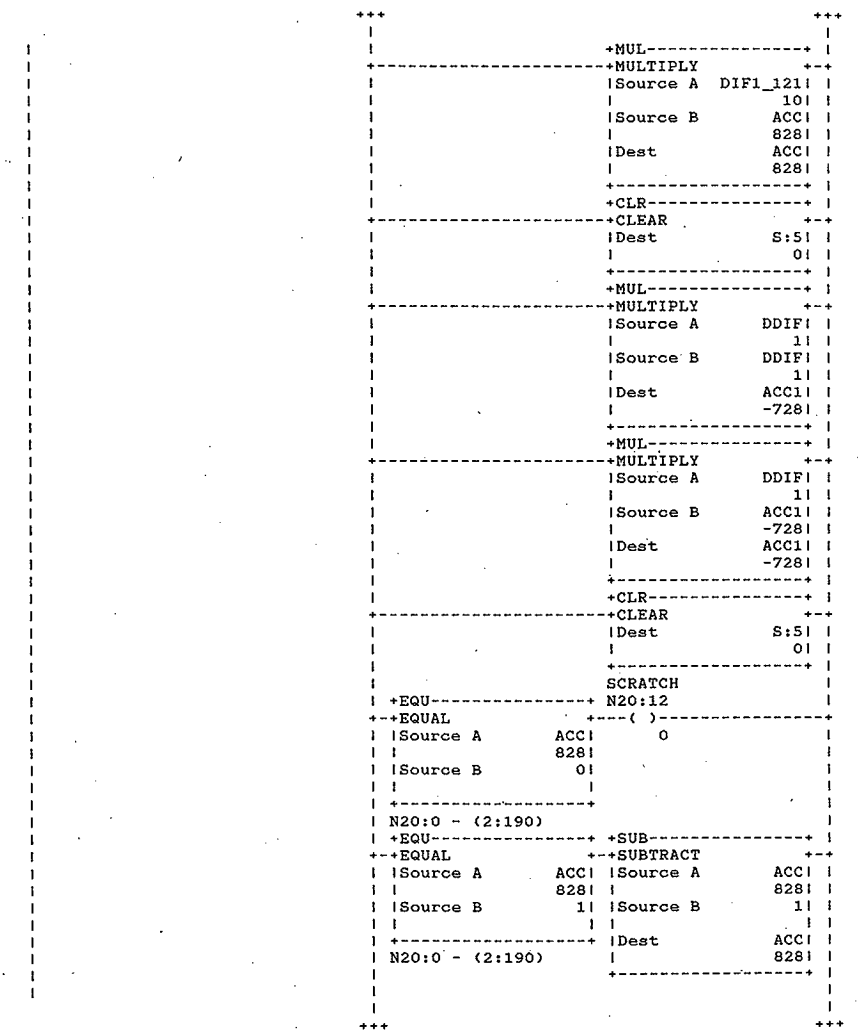
Rung 2:571

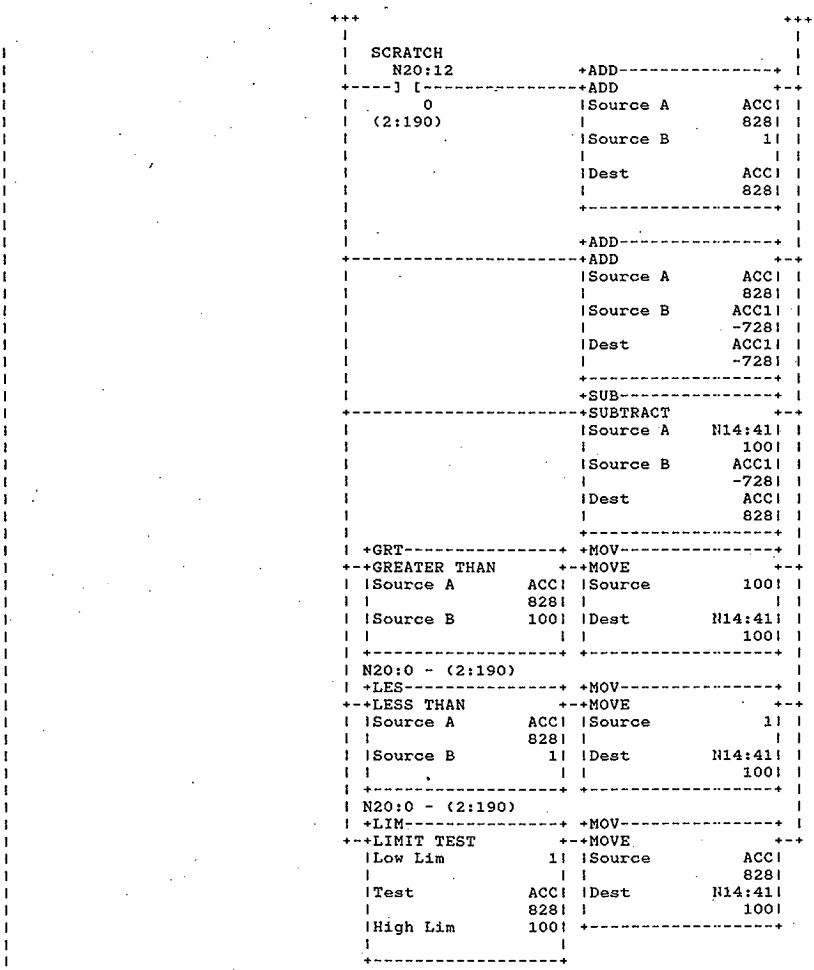
```
|                                                                  PID121
| RT_TMR/DN                                                          31
|   T4:62                                                        (JMP)-----
|----]/[-----------------------------------------------------------
|      DN
|  (2:33)
```

Rung 2:572

RATE CHECKING




MUL
MULTIPLY
Source A DIF1_121
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B
0
( )
0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC
828
Source B
1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B
1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A
ACC
828
Source B
1
Dest
ACC
828
ADD
Source A
ACC
828
Source B
ACC1
-728
Dest
ACC1
-728
SUB
SUBTRACT
Source A
N14:41
100
Source B
ACC1
-728
Dest
ACC
828
GRT
GREATER THAN
Source A
ACC
828
Source B
100
MOV
MOVE
Source
100
Dest
N14:41
100
N20:0 - (2:190)
LES
LESS THAN
Source A
ACC
828
Source B
1
MOV
MOVE
Source
1
Dest
N14:41
100
N20:0 - (2:190)
LIM
LIMIT TEST
Low Lim
1
Test
ACC
828
High Lim
100
MOV
MOVE
Source
ACC
828
Dest
N14:41
100
N20:0 - (2:190)

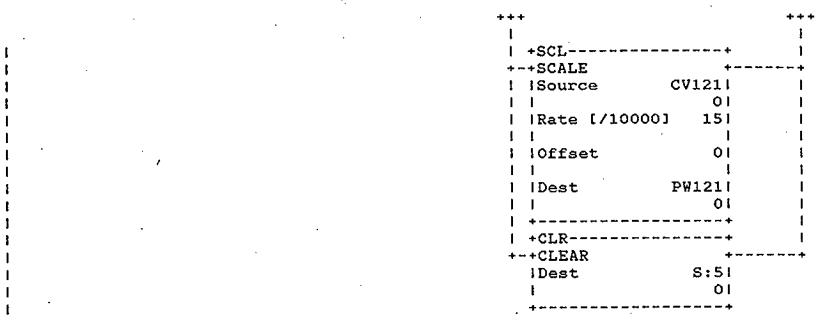
```
Rung 2:573
| PID121
|                                                                    DUMMY30
|      31                                                             N20:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                       13

Rung 2:574
                 DETECT FROM SCADA PID ON/OFF
                          IF PID OFF
                 THEN ZERO PW FOR ZERO OUTPUT AT  SCR
                   AND JUMP AROUND THE PID BLOCK
|   ON121
|    N7:119                                                 +CLR---------------+
|----]/[----------------------------------------------+--+CLEAR             +-+--
|      13                                             | |Dest         PW121| |
|  (3:24)                                             | |                 0| |
|                                                     | +------------------+ |
|                                                     |                      |
|                                                     |   69                 |
|                                                     +--(JMP)---------------+
|

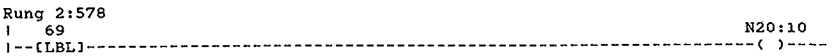
Rung 2:575
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM121                                                                PID121/1
|    N7:119                                                              N14:30
|----]/[-------------------------------------------------------------( )-----
|      12                                                                  1
|  (3:24)

Rung 2:576
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                         +MOV---------------+
|---------------------------------------------------------+MOVE              +--
|                                                         |Source      SET121|
|                                                         |                 0|
|                                                         |Dest      PIDSP121|
|                                                         |                 0|
|                                                         +------------------+

Rung 2:577
|                                                   +PID--------------------+
|-------------------------------------------------+-+PID                    +-+--
|                                                 | |Control Block    PID121| |
|                                                 | |Process Variable  AV121| |
|                                                 | |Control Variable  CV121| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 |                           |
|                                                +++                         +++
```



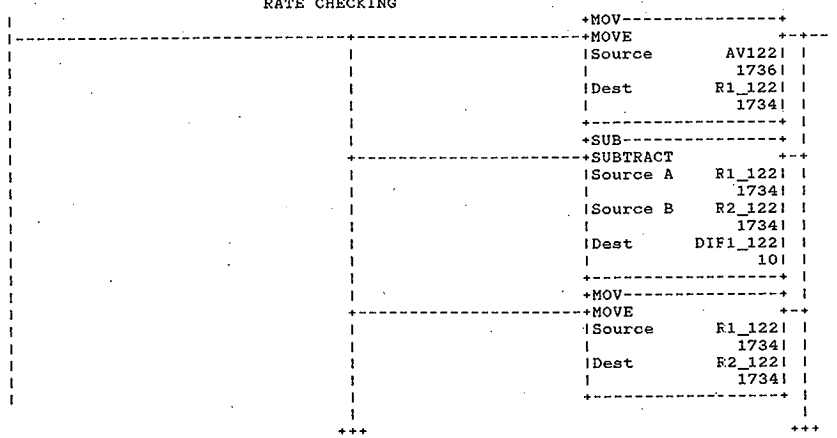
Rung 2:578

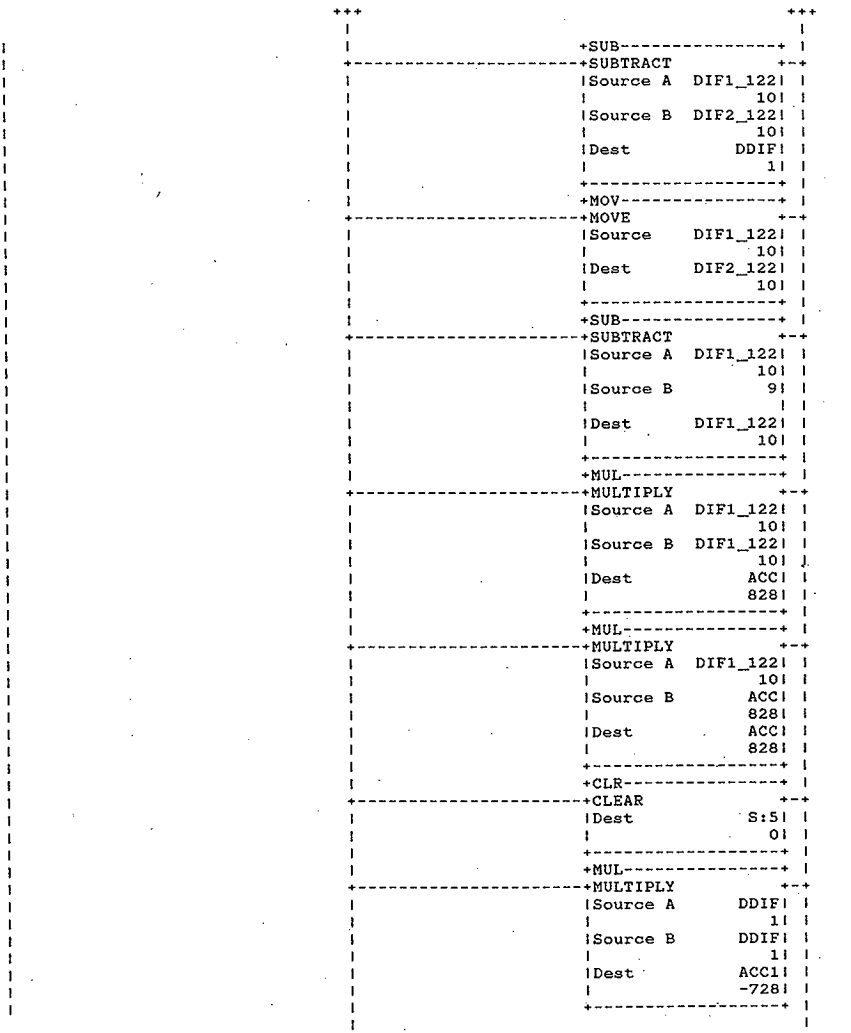


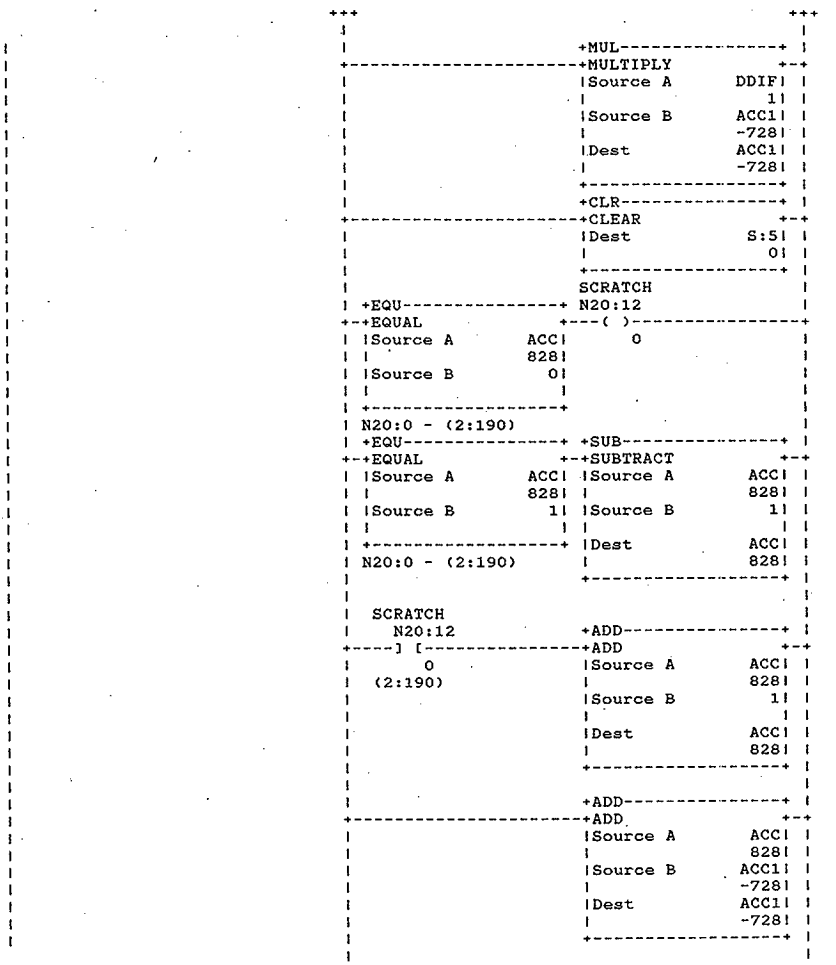
Rung 2:579

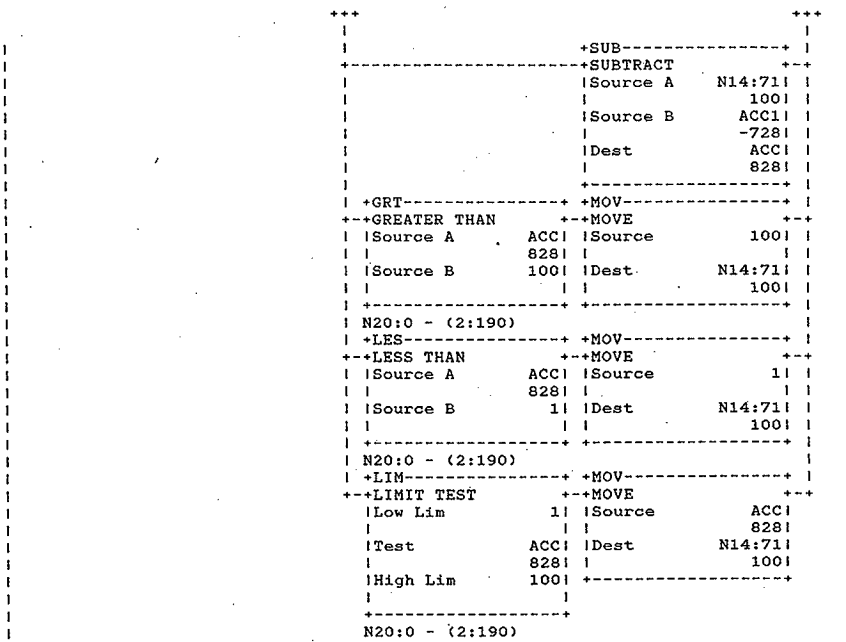
Rung 2:580

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_122 10
Source B DIF2_122 10
Dest DDIF 1
MOV
MOVE
Source DIF1_122 10
Dest DIF2_122 10
SUB
SUBTRACT
Source A DIF1_122 10
Source B 9
Dest DIF1_122 10
MUL
MULTIPLY
Source A DIF1_122 10
Source B DIF1_122 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_122 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728

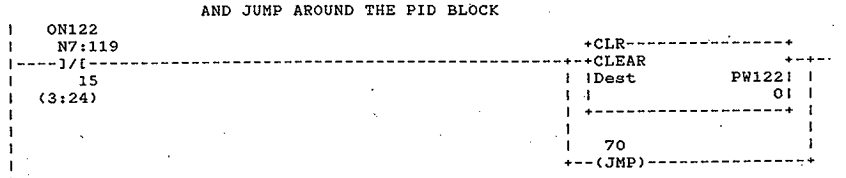

+MUL
MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
CLEAR
Dest S:5 0
SCRATCH
+EQU
EQUAL
Source A ACC 828
Source B 0
N20:12
( )
0
N20:0 - (2:190)
+EQU
EQUAL
Source A ACC 828
Source B 1
+SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
N20:0 - (2:190)
SCRATCH
N20:12
] [
0
(2:190)
+ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728



Rung 2:581

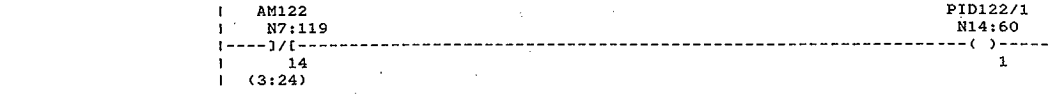
Rung 2:582

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



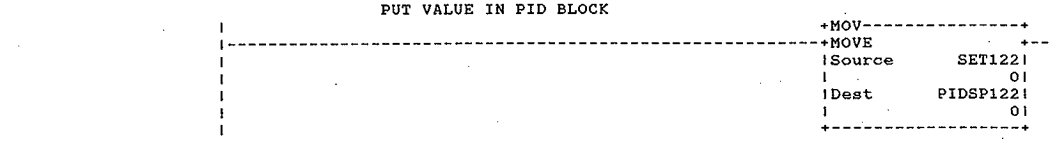
Rung 2:583

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

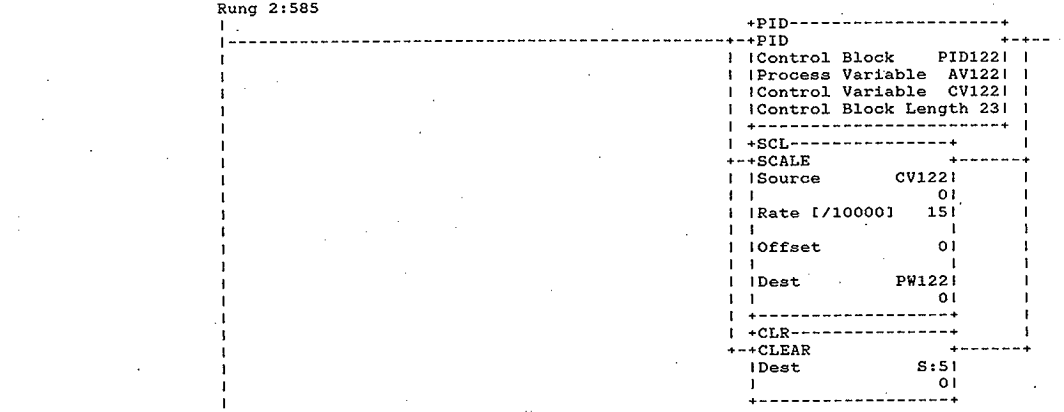


Rung 2:584

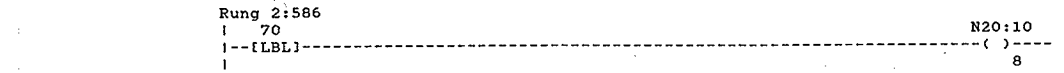
DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



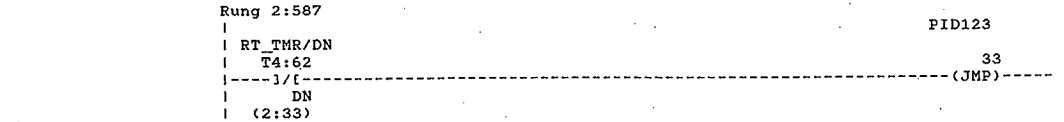
Rung 2:585



Rung 2:586

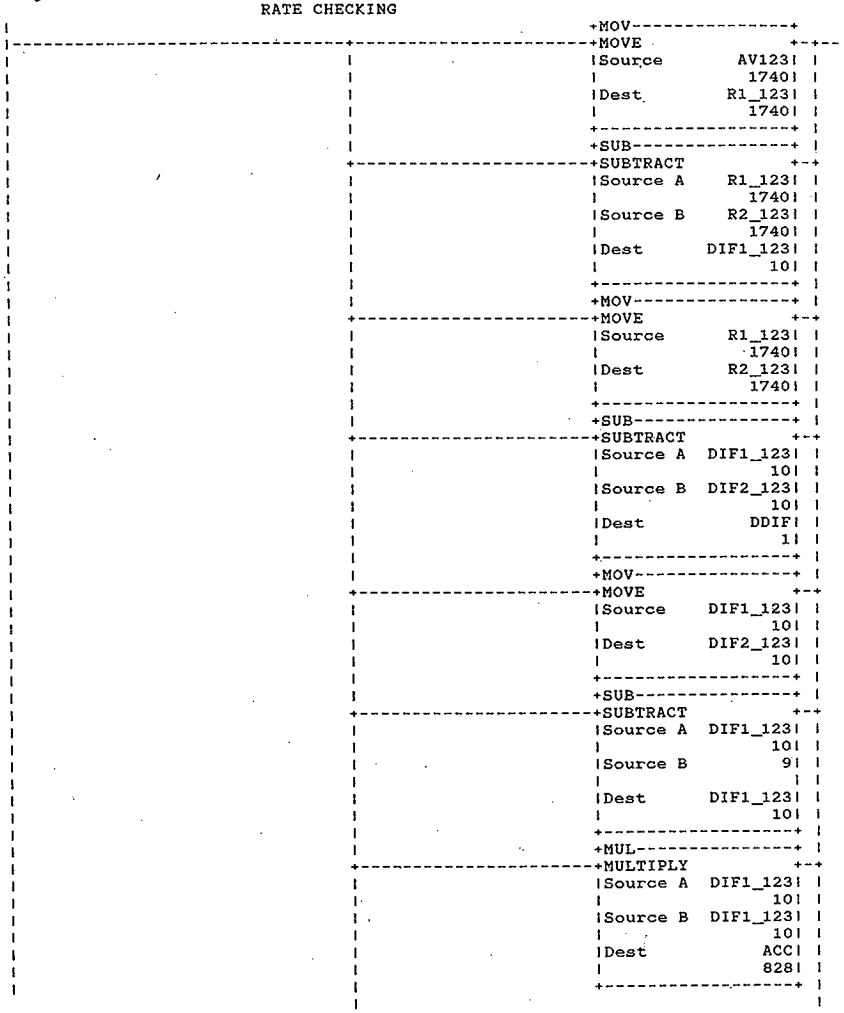


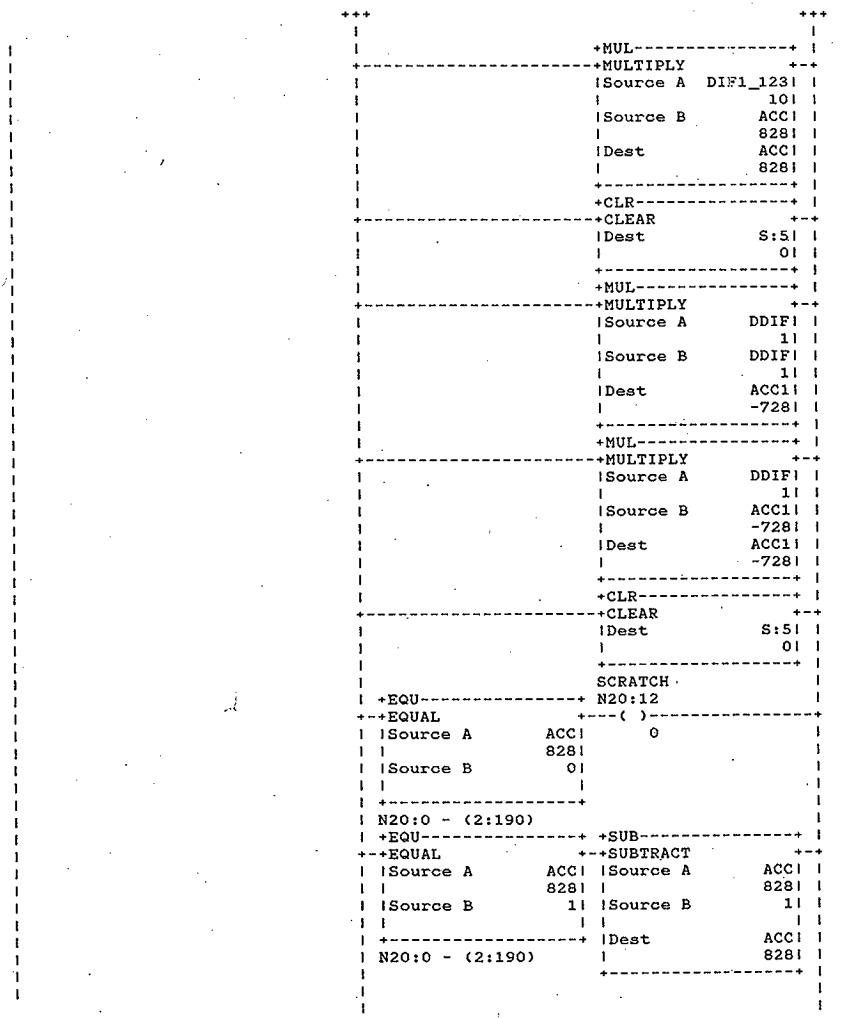
Rung 2:587

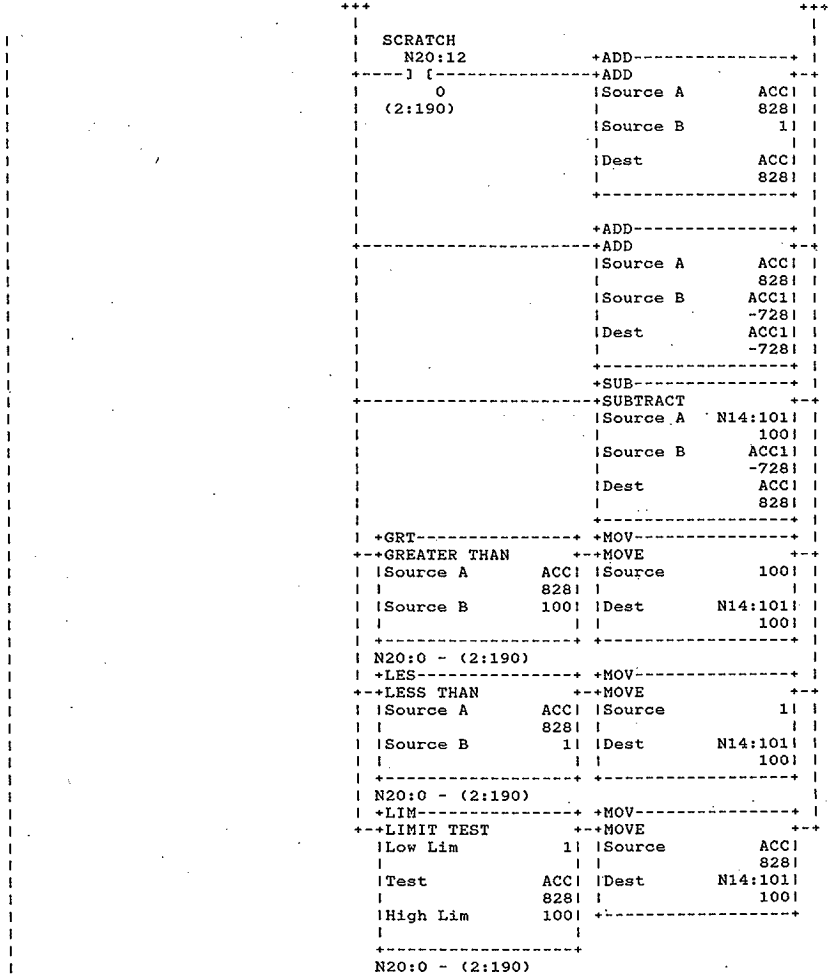


Rung 2:588

RATE CHECKING



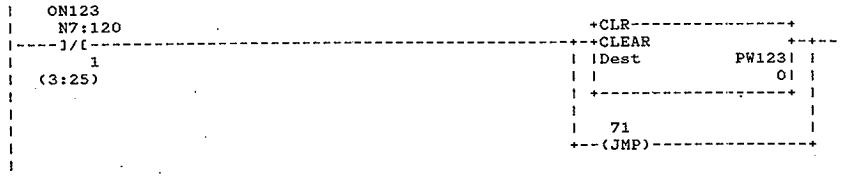

+MUL
+MULTIPLY
Source A DIF1_123
10
Source B ACC
828
Dest ACC
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
+MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N20:12
0
+EQU
+EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
+SUB
+SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A
ACC
828
Source B
1
Dest
ACC
828
ADD
Source A
ACC
828
Source B
ACC1
-728
Dest
ACC1
-728
SUB
SUBTRACT
Source A
N14:101
100
Source B
ACC1
-728
Dest
ACC
828
GRT
GREATER THAN
Source A
ACC
828
Source B
100
N20:0 - (2:190)
MOV
MOVE
Source
100
Dest
N14:101
100
LES
LESS THAN
Source A
ACC
828
Source B
1
N20:0 - (2:190)
MOV
MOVE
Source
1
Dest
N14:101
100
LIM
LIMIT TEST
Low Lim
1
Test
ACC
828
High Lim
100
N20:0 - (2:190)
MOV
MOVE
Source
ACC
828
Dest
N14:101
100

Rung 2:589

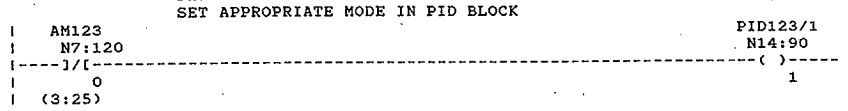
Rung 2:590

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



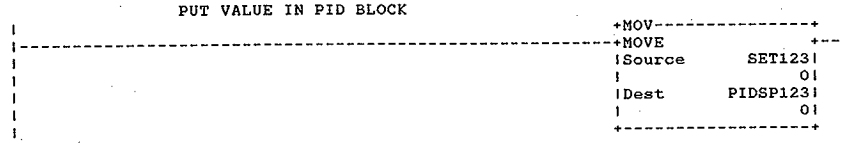
Rung 2:591

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

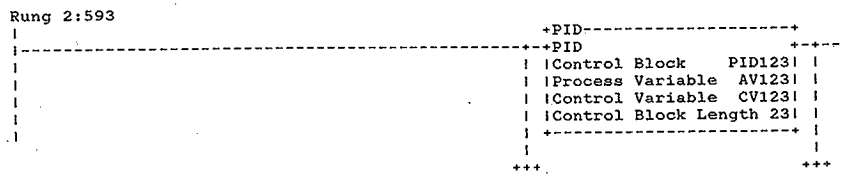


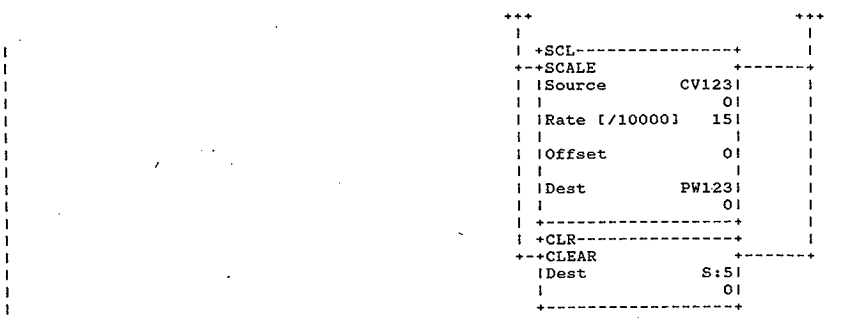
Rung 2:592

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

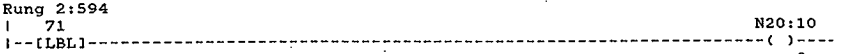


Rung 2:593





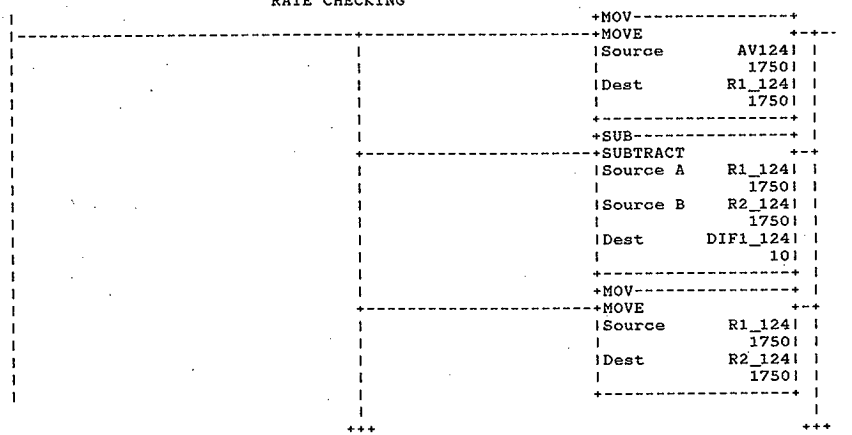
Rung 2:594

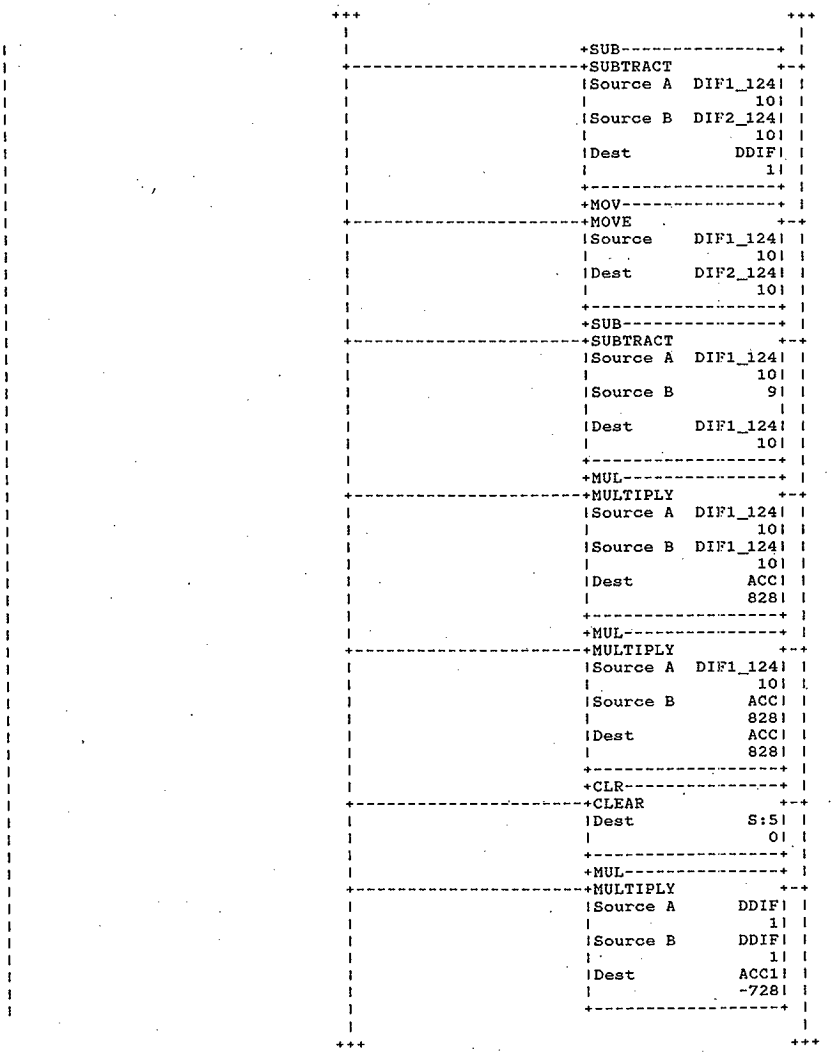


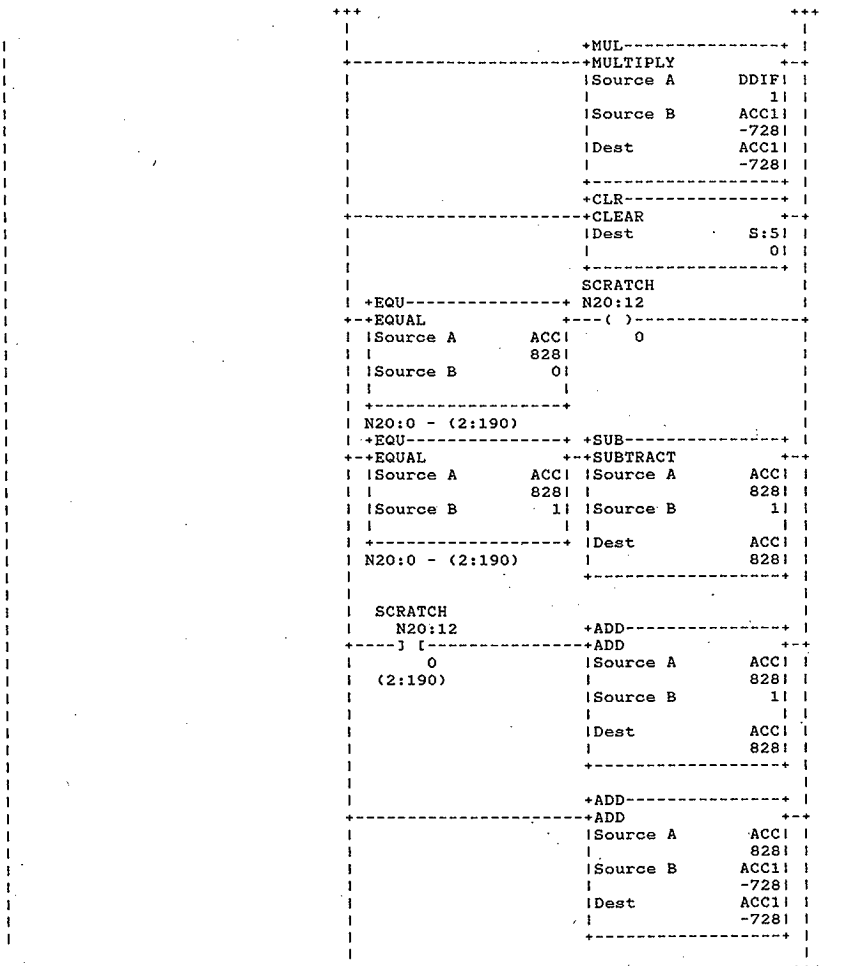
Rung 2:595

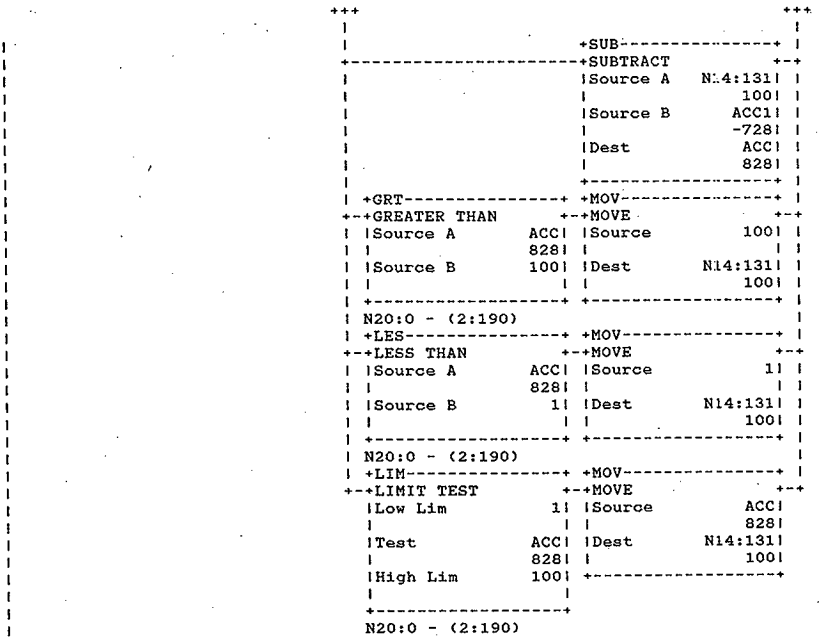
Rung 2:596

RATE CHECKING

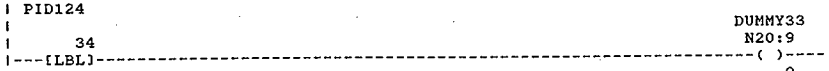



+SUB
+SUBTRACT
Source A DIF1_124
10
Source B DIF2_124
10
Dest DDIF
1
+MOV
+MOVE
Source DIF1_124
10
Dest DIF2_124
10
+SUB
+SUBTRACT
Source A DIF1_124
10
Source B
9
Dest DIF1_124
10
+MUL
+MULTIPLY
Source A DIF1_124
10
Source B DIF1_124
10
Dest ACC1
828
+MUL
+MULTIPLY
Source A DIF1_124
10
Source B ACC1
828
Dest ACC1
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728


MUL
MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
CLR
CLEAR
Dest S:5 0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC 828
Source B 0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
SCRATCH
N20:12
0
(2:190)
SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728

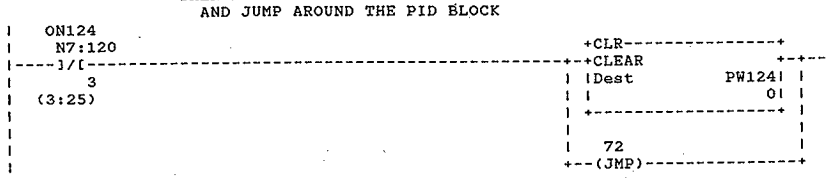


Rung 2:597



Rung 2:598

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:599

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|   AM124                                                          PID124/1
|    N7:120                                                        N14:120
|----]/[-----------------------------------------------------------( )-------
|       2                                                            1
|  (3:25)
```

Rung 2:600

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                  +MOV---------------+
|--------------------------------------------------+MOVE              +--
|                                                  |Source      SET124|
|                                                  |                  0|
|                                                  |Dest       PIDSP124|
|                                                  |                  0|
|                                                  +-------------------+
```

Rung 2:601

```
|                                          +PID--------------------+
|------------------------------------------+-+PID                  +-+--
|                                          | |Control Block    PID124| |
|                                          | |Process Variable  AV124| |
|                                          | |Control Variable  CV124| |
|                                          | |Control Block Length 23| |
|                                          | +-----------------------+ |
|                                          | +SCL----------------+     |
|                                          +-+SCALE              +-----+
|                                            |Source        CV124|     |
|                                            |                   0|     |
|                                            |Rate [/10000]    15|     |
|                                            |                    |     |
|                                            |Offset             0|     |
|                                            |                    |     |
|                                            |Dest           PW124|     |
|                                            |                   0|     |
|                                            +--------------------+     |
|                                            | +CLR----------------+     |
|                                            +-+CLEAR              +-----+
|                                              |Dest             S:5|
|                                              |                   0|
|                                              +--------------------+
```

Rung 2:602

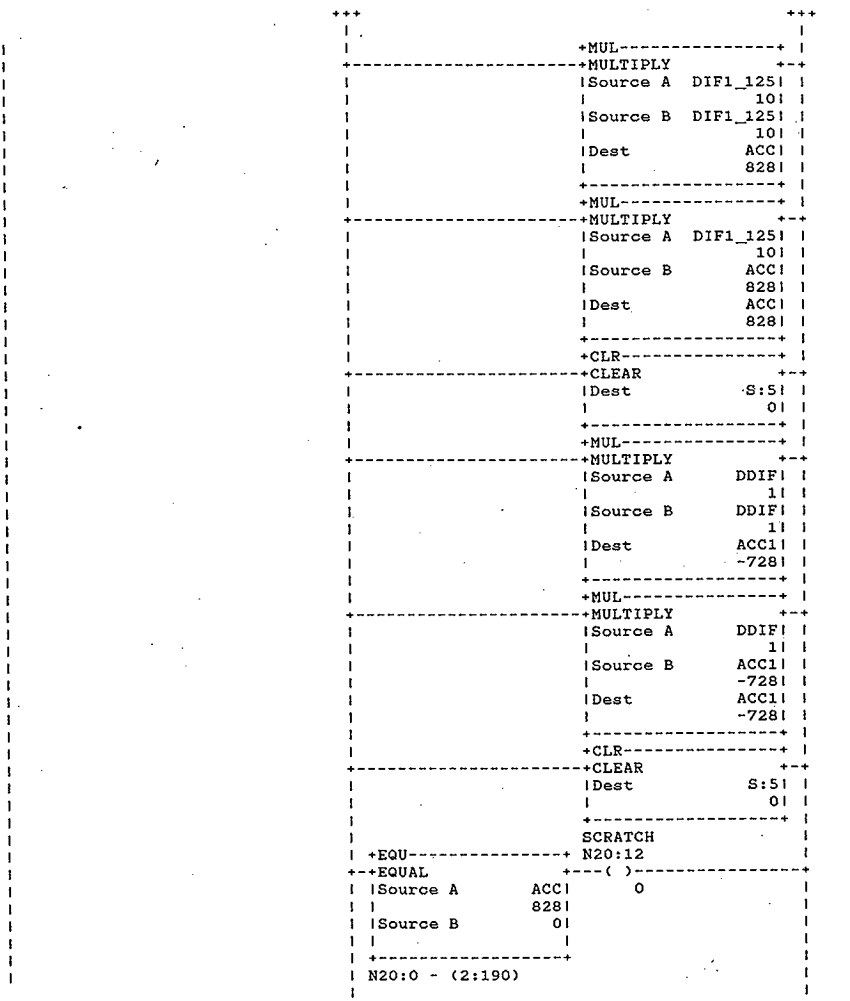
```
|   72                                                             N20:10
|--[LBL]-----------------------------------------------------------( )-----
|                                                                    10
```

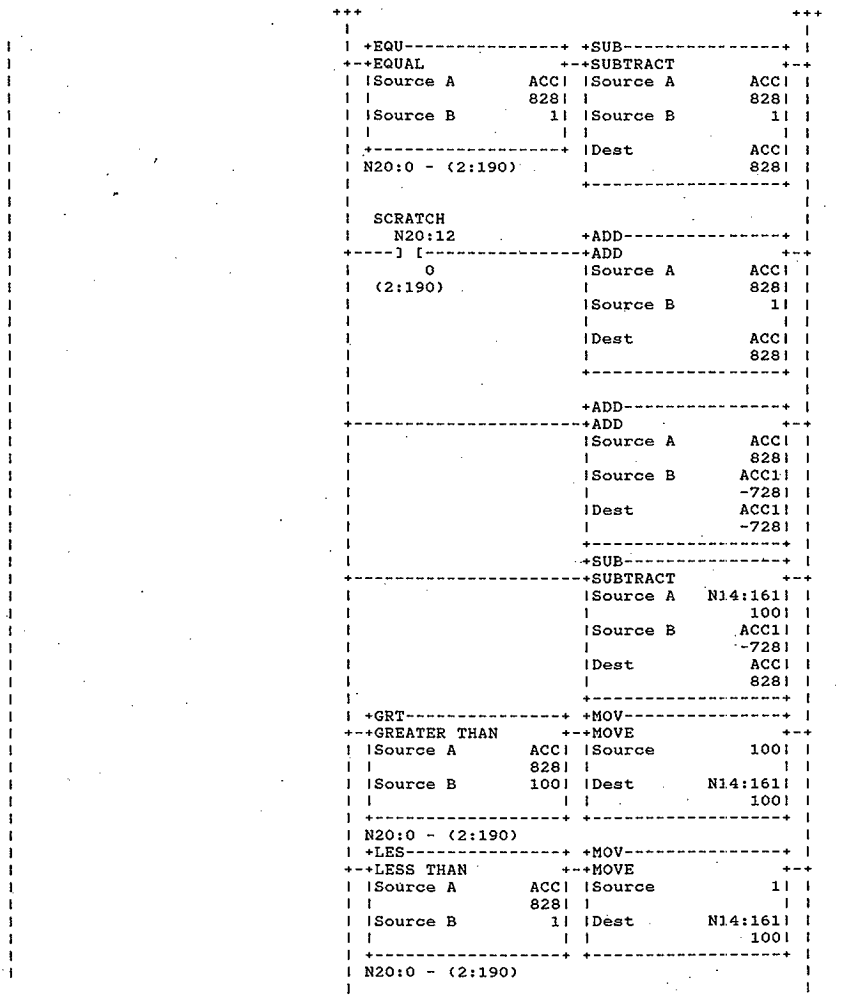
Rung 2:603

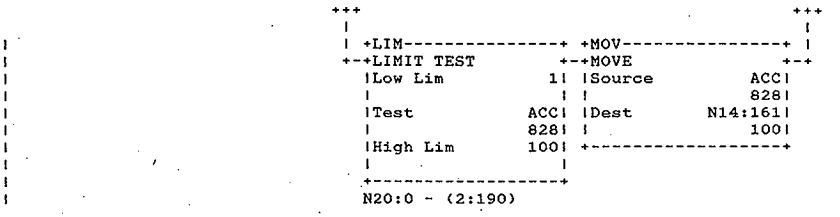
```
|                                                                  PID125
| RT_TMR/DN
|   T4:62                                                            35
|----]/[-----------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

```
Rung 2:604
| RT_TMR/DN                                                                DNR_3
|   T4:62                                                                  N20:5
|----] [-------------------------------------------------------------------(L)---
|      DN                                                                      7
|  (2:33)

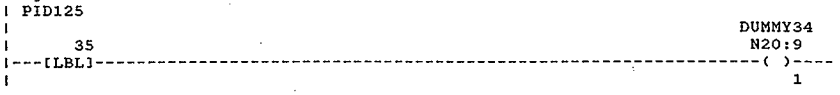
Rung 2:605
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+--
|                               |                      |Source       AV125| |
|                               |                      |               1736| |
|                               |                      |Dest         R1_125| |
|                               |                      |               1737| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A     R1_125| |
|                               |                      |               1737| |
|                               |                      |Source B     R2_125| |
|                               |                      |               1737| |
|                               |                      |Dest       DIF1_125| |
|                               |                      |                 10| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source       R1_125| |
|                               |                      |               1737| |
|                               |                      |Dest         R2_125| |
|                               |                      |               1737| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A   DIF1_125| |
|                               |                      |                 10| |
|                               |                      |Source B   DIF2_125| |
|                               |                      |                 10| |
|                               |                      |Dest           DDIF| |
|                               |                      |                  1| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source     DIF1_125| |
|                               |                      |                 10| |
|                               |                      |Dest       DIF2_125| |
|                               |                      |                 10| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A   DIF1_125| |
|                               |                      |                 10| |
|                               |                      |Source B          9| |
|                               |                      |                   | |
|                               |                      |Dest       DIF1_125| |
|                               |                      |                 10| |
|                               |                      +------------------+ |
|                               |                                          |
                               +++                                        +++
```


+MUL
+MULTIPLY
Source A DIF1_125
10
Source B DIF1_125
10
Dest ACC
828
+MUL
+MULTIPLY
Source A DIF1_125
10
Source B ACC
828
Dest ACC
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
+MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N20:12
+EQU
+EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
+---( )
0


EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
SCRATCH
N20:12
0
(2:190)
GRT
GREATER THAN
Source A ACC 828
Source B 100
N20:0 - (2:190)
LES
LESS THAN
Source A ACC 828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728
SUB
SUBTRACT
Source A N14:161 100
Source B ACC1 -728
Dest ACC 828
MOV
MOVE
Source 100
Dest N14:161 100
MOV
MOVE
Source 1
Dest N14:161 100

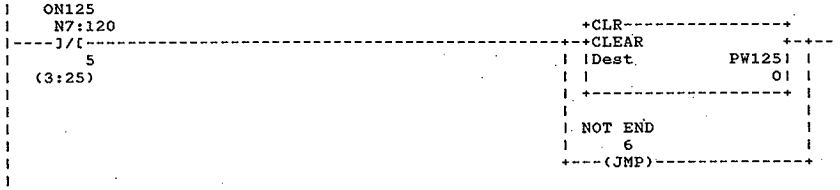


Rung 2:606



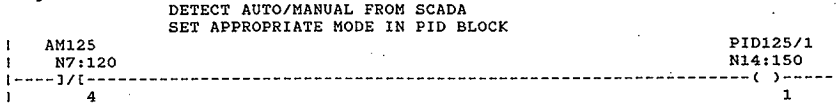
Rung 2:607

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



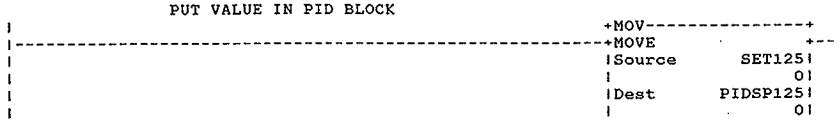
Rung 2:608

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

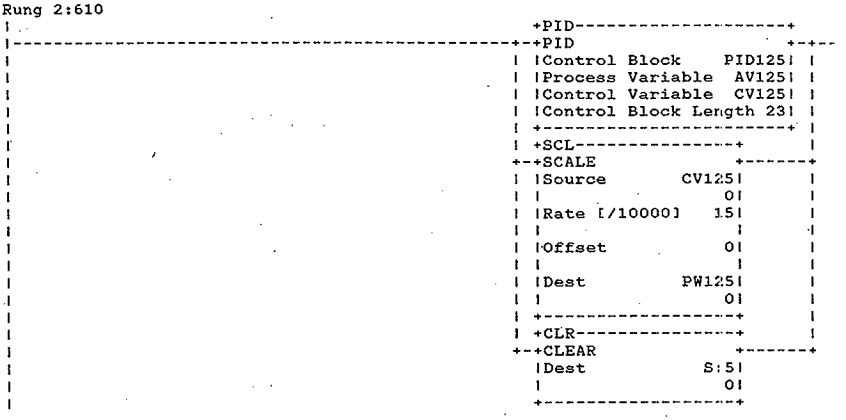


Rung 2:609

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



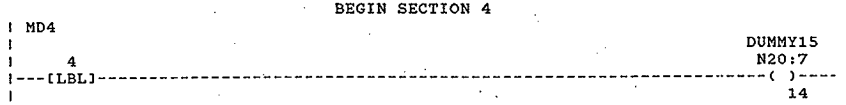
Rung 2:610



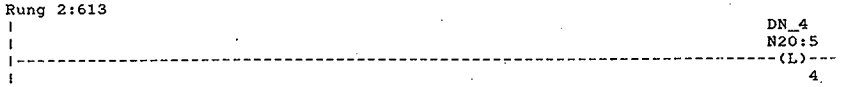
Rung 2:611

Rung 2:612

BEGIN SECTION 4

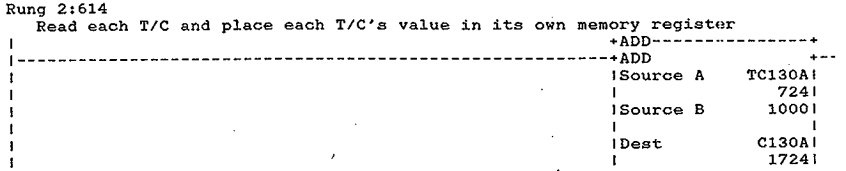


Rung 2:613



Rung 2:614

Read each T/C and place each T/C's value in its own memory register



```
Rung 2:615
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C130A|                                  |Source       16383|
| |              1724|                                  |                  |
| |Source B     16383|                                  |Dest         C130A|
| |                  |                                  |              1724|
| +------------------+                                  +------------------+
| N7:68 - (2:614)

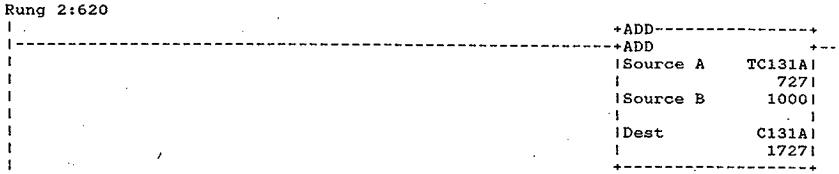
Rung 2:616
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC130B|
|                                                       |               720|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C130B|
|                                                       |              1720|
|                                                       +------------------+

Rung 2:617
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C130B|                                  |Source       16383|
| |              1720|                                  |                  |
| |Source B     16383|                                  |Dest         C130B|
| |                  |                                  |              1720|
| +------------------+                                  +------------------+
| N7:69 - (2:616)

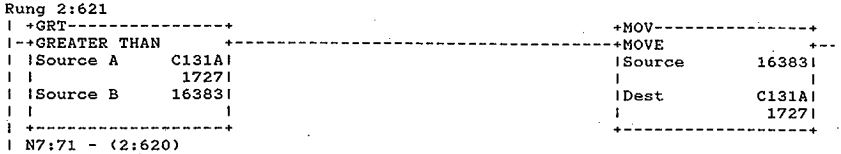
Rung 2:618
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC130C|
|                                                       |               721|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C130C|
|                                                       |              1721|
|                                                       +------------------+

Rung 2:619
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C130C|                                  |Source       16383|
| |              1721|                                  |                  |
| |Source B     16383|                                  |Dest         C130C|
| |                  |                                  |              1721|
| +------------------+                                  +------------------+
| N7:70 - (2:618)
```

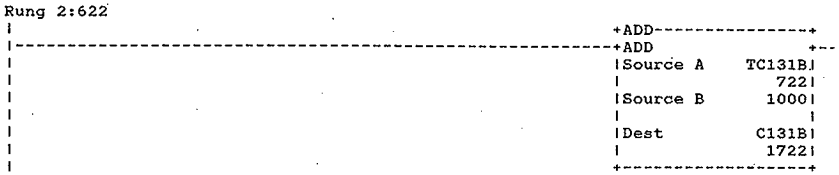
Rung 2:620



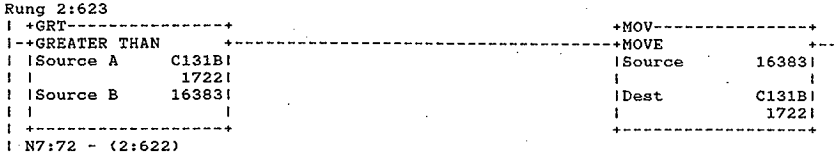
Rung 2:621



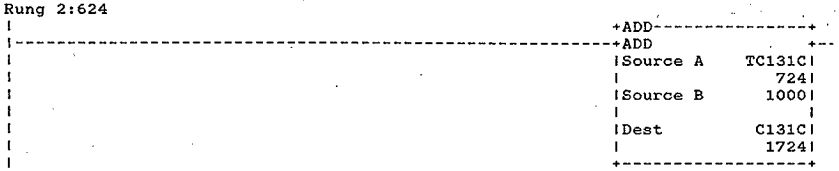
Rung 2:622



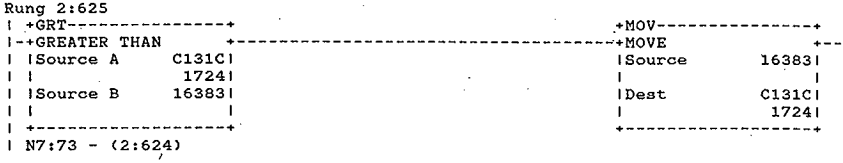
Rung 2:623



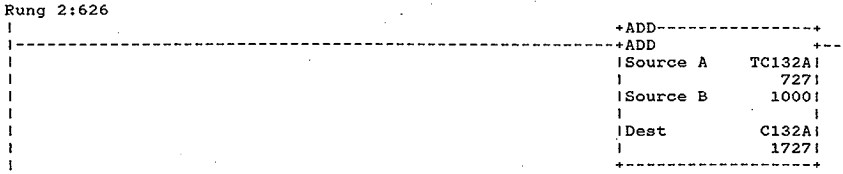
Rung 2:624



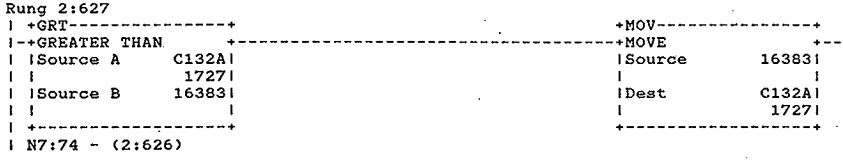
Rung 2:625



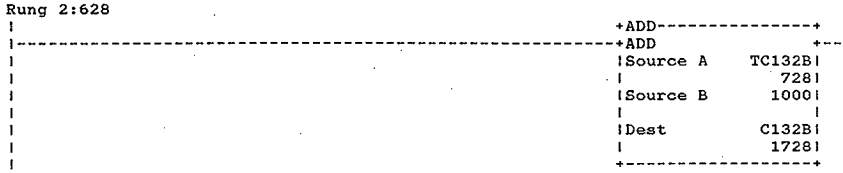
Rung 2:626



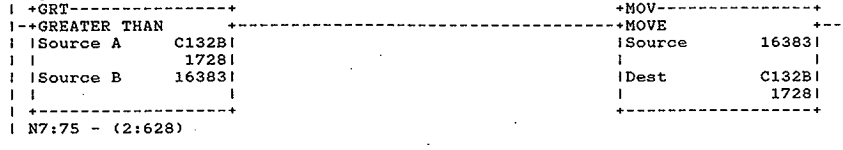
Rung 2:627



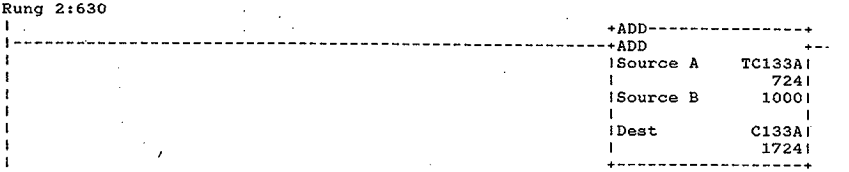
Rung 2:628



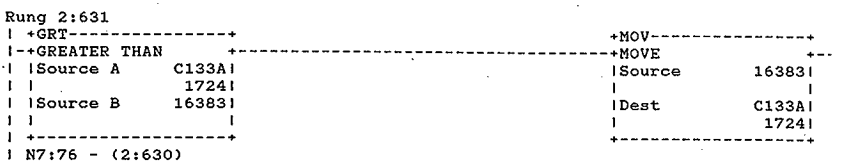
Rung 2:629



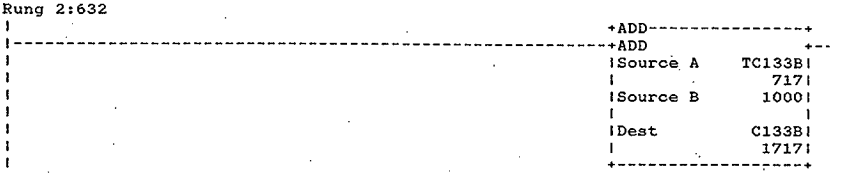
Rung 2:630



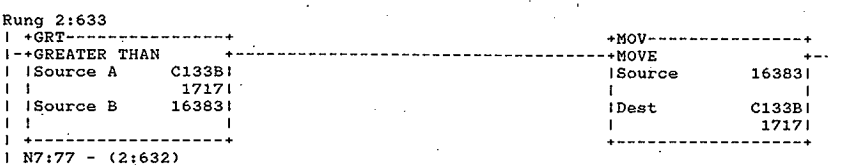
Rung 2:631



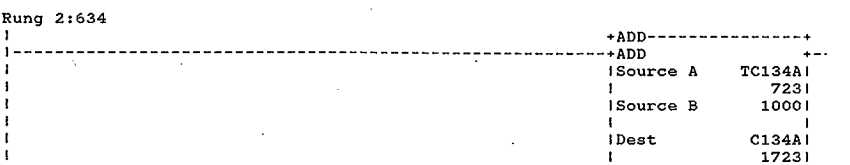
Rung 2:632



Rung 2:633



Rung 2:634



```
Rung 2:635
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C134A|                                  |Source       16383|
| |               1723|                                  |                  |
| |Source B     16383|                                  |Dest         C134A|
| |                  |                                  |              1723|
| +------------------+                                  +------------------+
| N7:78 - (2:634)

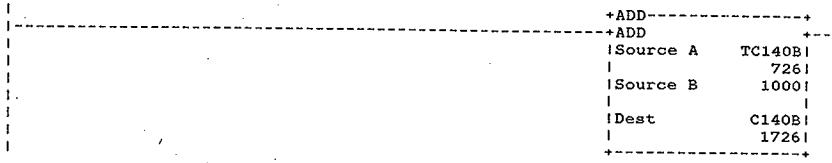
Rung 2:636
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC134B|
|                                                       |               722|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C134B|
|                                                       |              1722|
|                                                       +------------------+

Rung 2:637
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C134B|                                  |Source       16383|
| |               1722|                                  |                  |
| |Source B     16383|                                  |Dest         C134B|
| |                  |                                  |              1722|
| +------------------+                                  +------------------+
| N7:79 - (2:636)

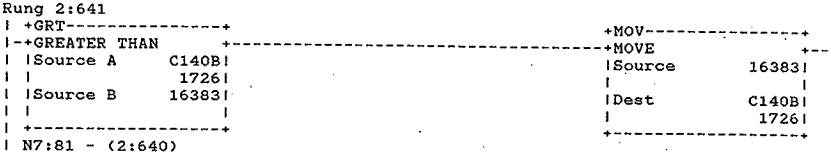
Rung 2:638
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC140A|
|                                                       |               726|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C140A|
|                                                       |              1726|
|                                                       +------------------+

Rung 2:639
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C140A|                                  |Source       16383|
| |               1726|                                  |                  |
| |Source B     16383|                                  |Dest         C140A|
| |                  |                                  |              1726|
| +------------------+                                  +------------------+
| N7:80 - (2:638)
```

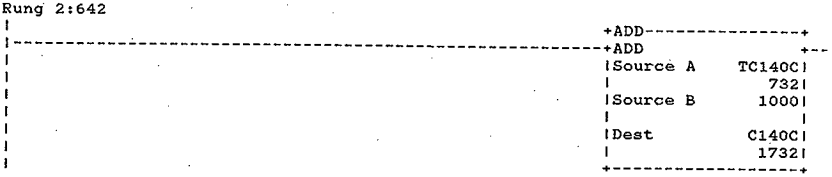
Rung 2:640



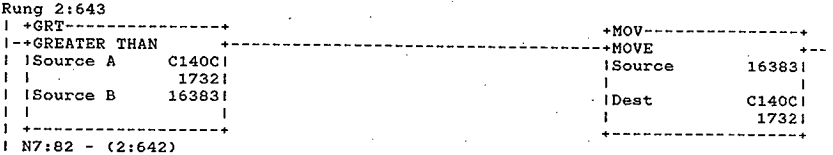
Rung 2:641



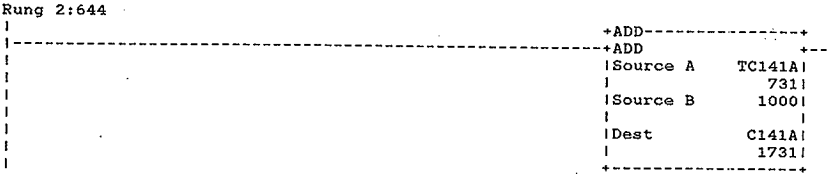
Rung 2:642



Rung 2:643



Rung 2:644



```
Rung 2:645
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C141A|                                  |Source       16383|
| |              1731|                                  |                  |
| |Source B     16383|                                  |Dest         C141A|
| |                  |                                  |              1731|
| +------------------+                                  +------------------+
| N7:83 - (2:644)

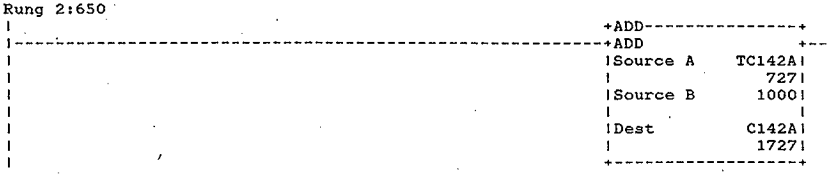
Rung 2:646
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC141B|
|                                                       |               725|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C141B|
|                                                       |              1725|
|                                                       +------------------+

Rung 2:647
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C141B|                                  |Source       16383|
| |              1725|                                  |                  |
| |Source B     16383|                                  |Dest         C141B|
| |                  |                                  |              1725|
| +------------------+                                  +------------------+
| N7:84 - (2:646)

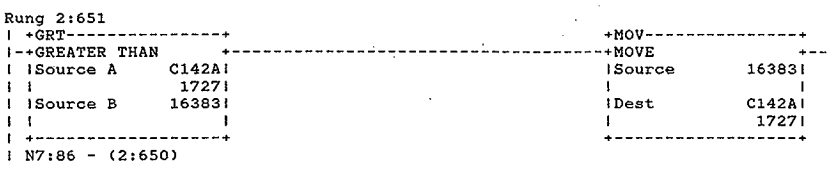
Rung 2:648
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC141C|
|                                                       |               728|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C141C|
|                                                       |              1729|
|                                                       +------------------+

Rung 2:649
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C141C|                                  |Source       16383|
| |              1729|                                  |                  |
| |Source B     16383|                                  |Dest         C141C|
| |                  |                                  |              1729|
| +------------------+                                  +------------------+
| N7:85 - (2:648)
```

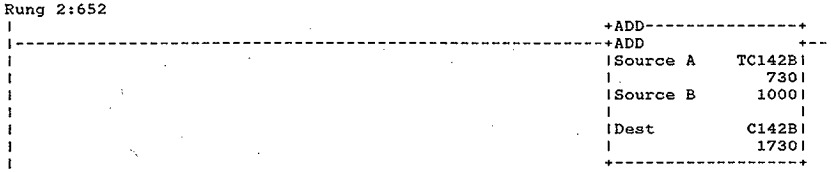
Rung 2:650



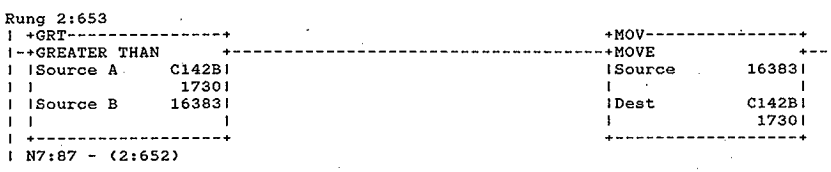
Rung 2:651



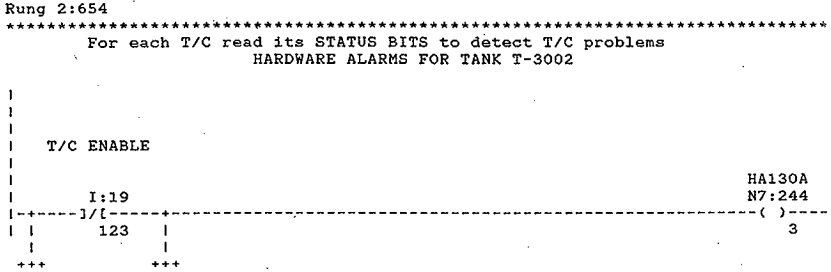
Rung 2:652

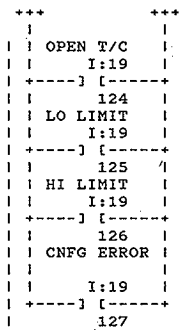


Rung 2:653

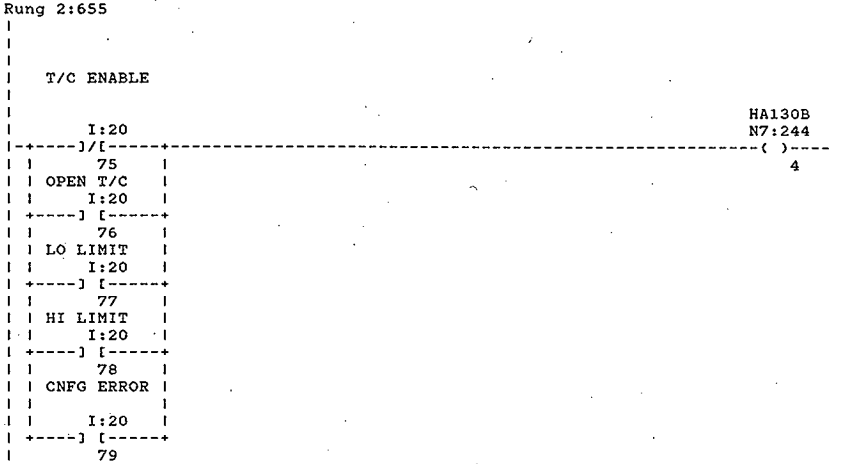


Rung 2:654

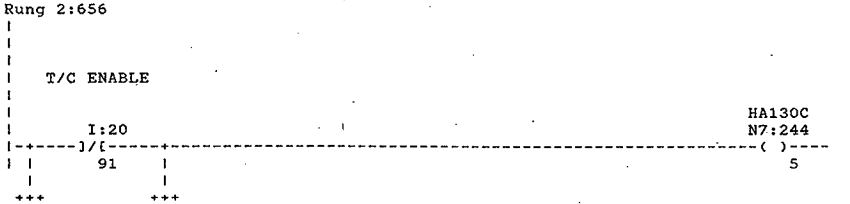


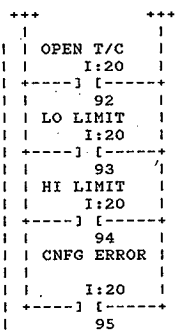


Rung 2:655

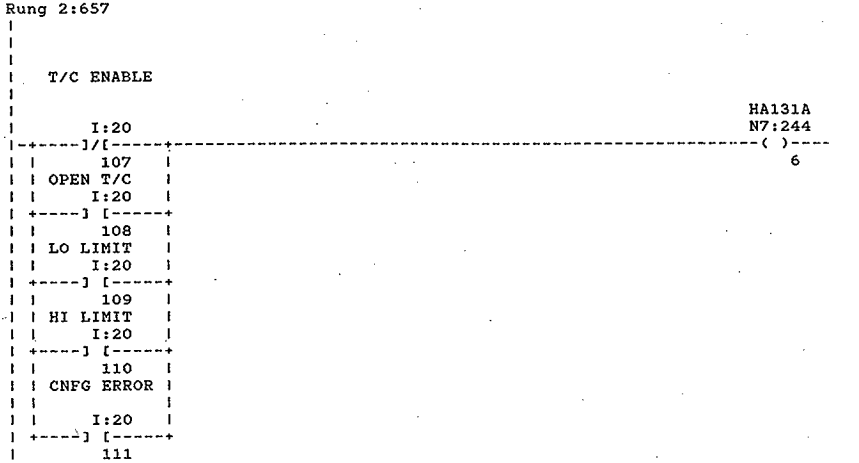


Rung 2:656

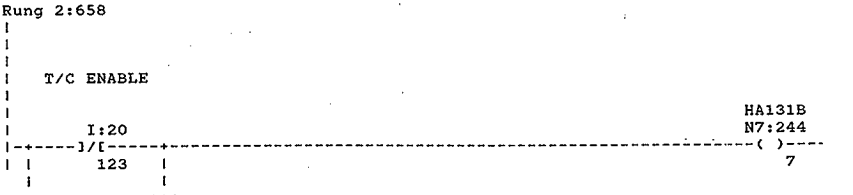


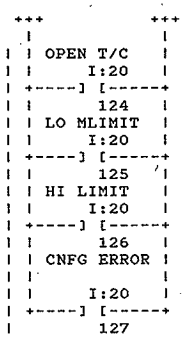


Rung 2:657

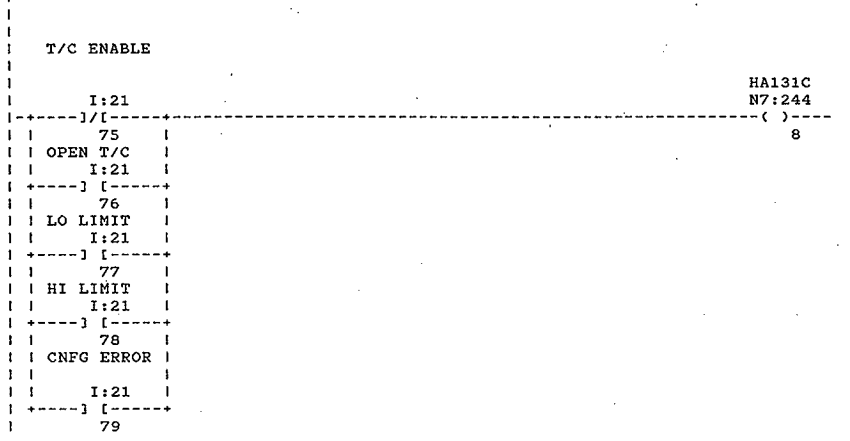


Rung 2:658

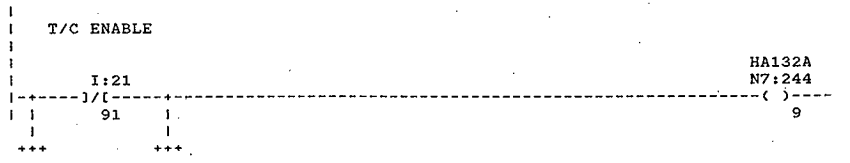


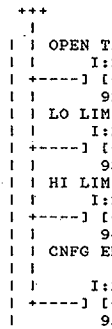


Rung 2:659

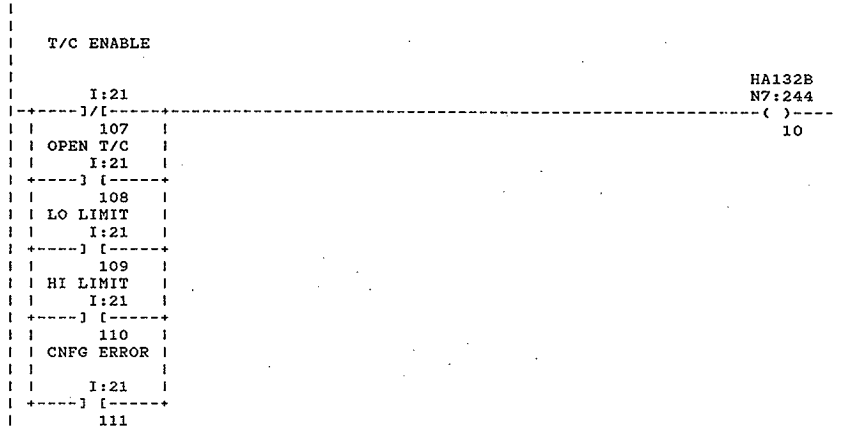


Rung 2:660

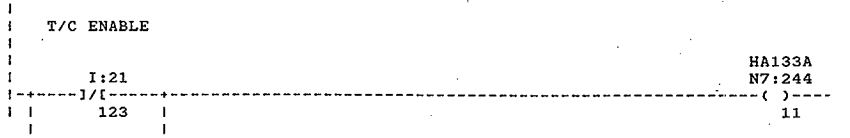


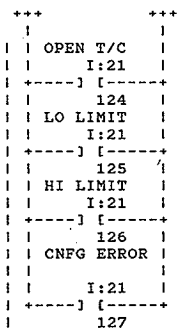


Rung 2:661

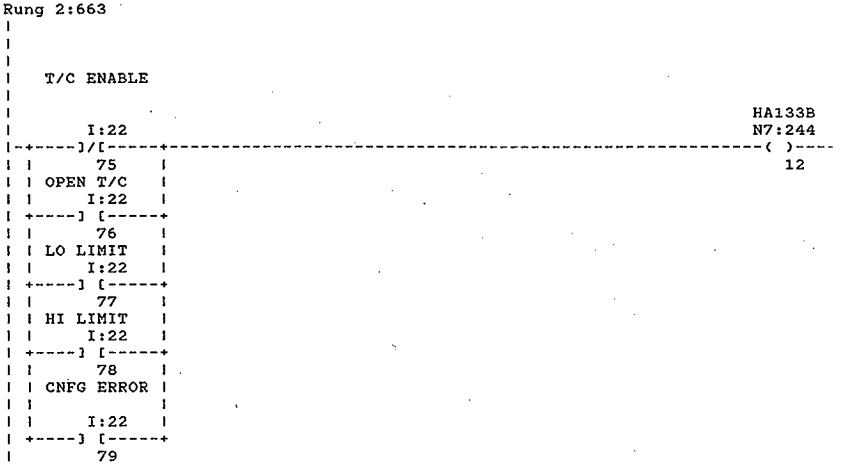


Rung 2:662

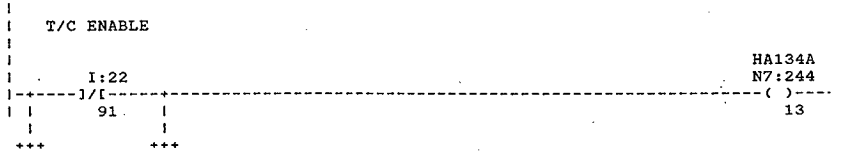


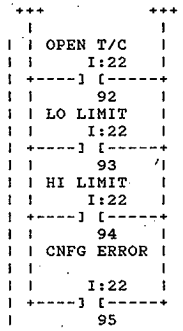


Rung 2:663

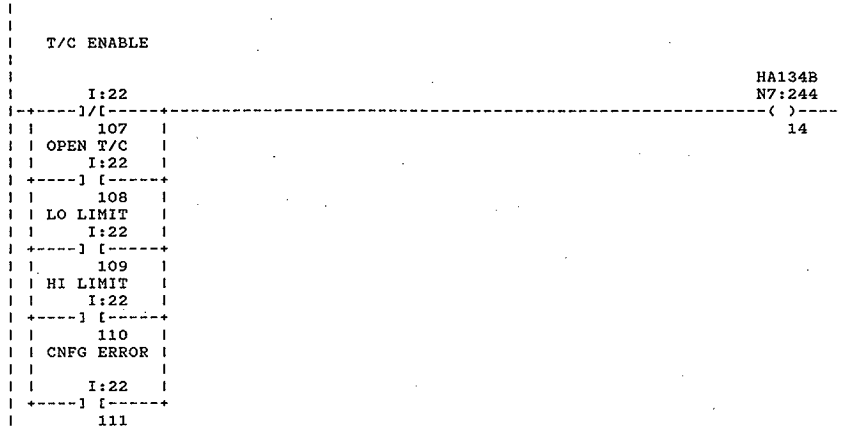


Rung 2:664

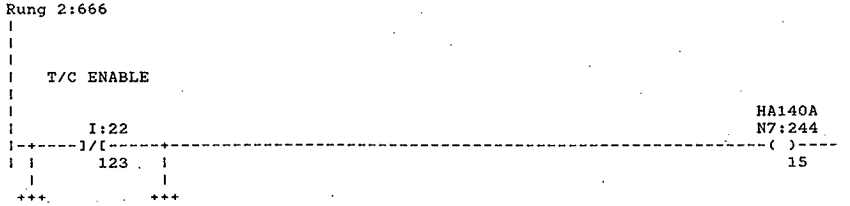




Rung 2:665



Rung 2:666



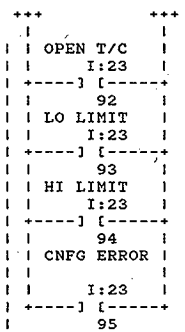
```
 +++           +++
  |             |
| | OPEN T/C    |
| |      I:22   |
| +----] [-----+
| |       124   |
| | LO LIMIT    |
| |      I:22   |
| +----] [-----+
| |       125   |
| | HI LIMIT    |
| |      I:22   |
| +----] [-----+
| |       126   |
| | CNFG ERROR  |
| |             |
| |      I:22   |
| +----] [-----+
|        127
```

Rung 2:667

```
|
|
|
|   T/C ENABLE
|
|                                                                    HA140B
|       I:23                                                         N7:245
|-+----]/[-----+-------------------------------------------------------( )----
| |       75    |                                                        0
| | OPEN T/C    |
| |      I:23   |
| +----] [-----+
| |       76    |
| | LO LIMIT    |
| |      I:23   |
| +----] [-----+
| |       77    |
| | HI LIMIT    |
| |      I:23   |
| +----] [-----+
| |       78    |
| | CNFG ERROR  |
| |             |
| |      I:23   |
| +----] [-----+
|        79
```

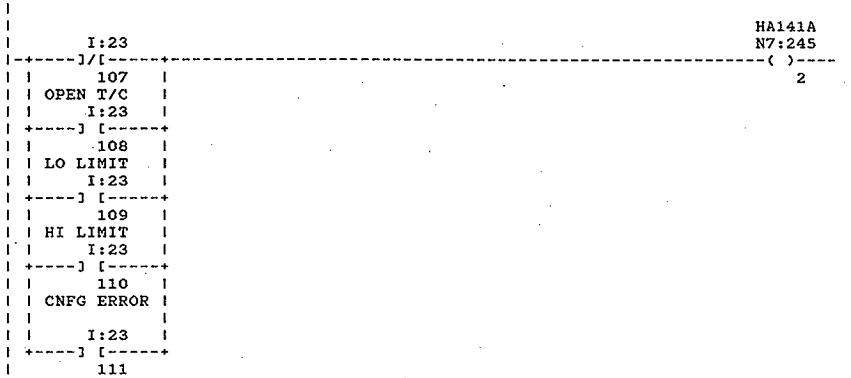
Rung 2:668

```
|
|
|
|   T/C ENABLE
|
|                                                                    HA140C
|       I:23                                                         N7:245
|-+----]/[-----+-------------------------------------------------------( )----
| |       91    |                                                        1
  |             |
 +++           +++
```



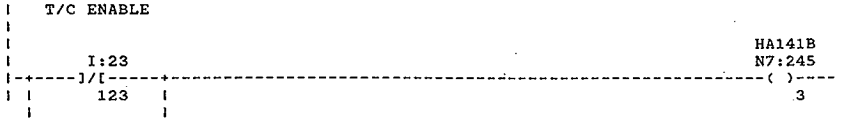
Rung 2:669

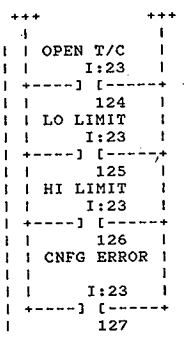
T/C ENABLE



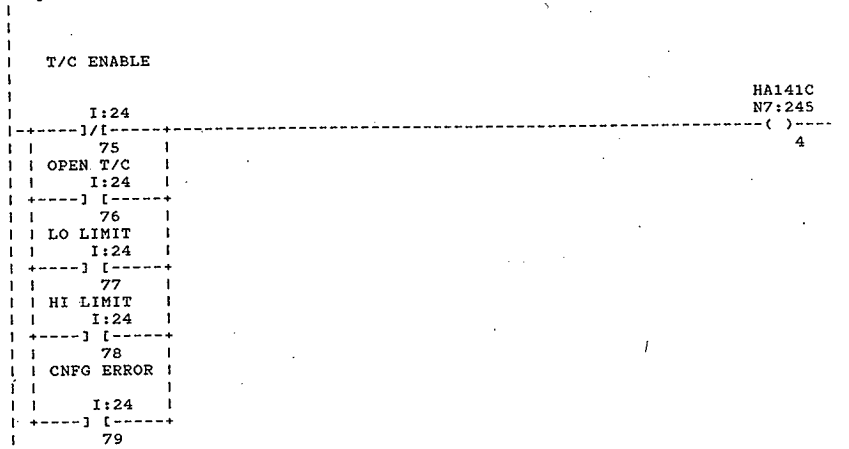
Rung 2:670

T/C ENABLE

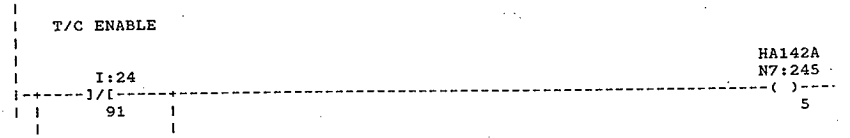




Rung 2:671



Rung 2:672



```
 +++          +++
  |            |
| | OPEN T/C   |
| |     I:24   |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |     I:24   |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |     I:24   |
| +----] [-----+
| |      94    |
| | CNFG ERROR |
| |            |
| |     I:24   |
| +----] [-----+
|        95
```

Rung 2:673

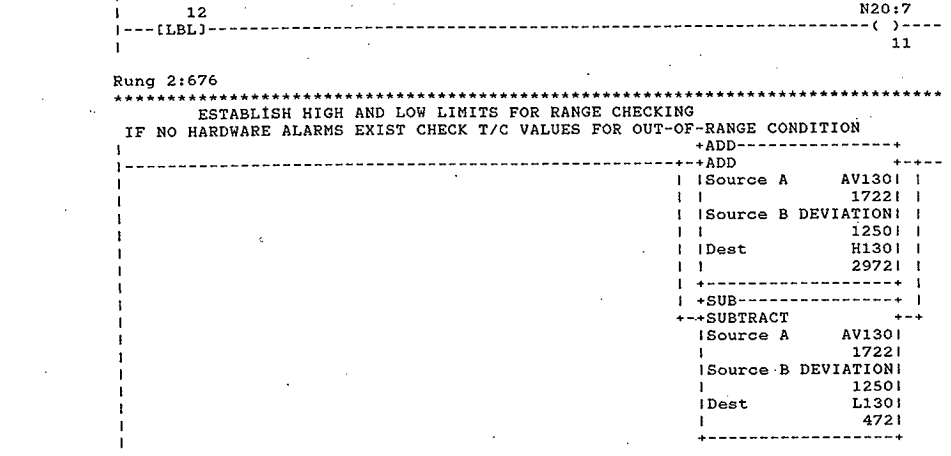
```
|
|
|
|   T/C ENABLE
|
|                                                                    HA142B
|       I:24                                                         N7:245
|-+----]/[-----+-------------------------------------------------------( )----
| |      107   |                                                         6
| | OPEN T/C   |
| |     I:24   |
| +----] [-----+
| |      108   |
| | LO LIMIT   |
| |     I:24   |
| +----] [-----+
| |      109   |
| | HI LIMIT   |
| |     I:24   |
| +----] [-----+
| |      110   |
| | CNFG ERROR |
| |            |
| |     I:24   |
| +----] [-----+
|        111
```

Rung 2:674

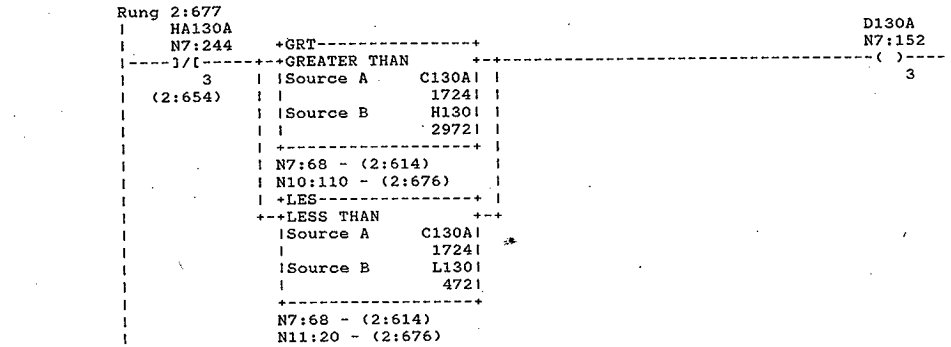
```
|                                                                DEV_4
|                                                                N20:6
|-----------------------------------------------------------+--(L)-------+--
|                                                           |     4      |
|                                                           | AV4        |
|                                                           |      16    |
|                                                           +---(JMP)----+
|
```

Rung 2:675

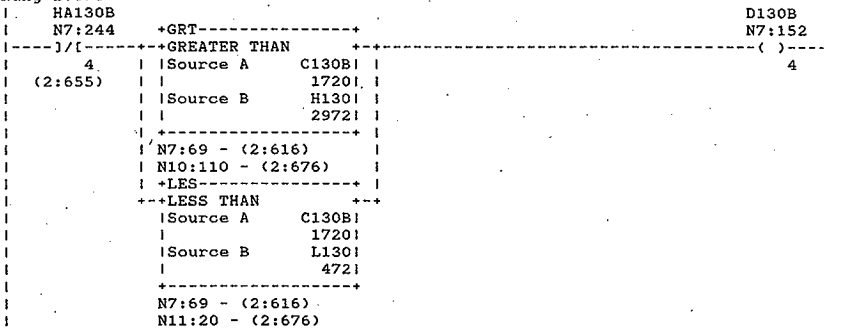
Rung 2:676



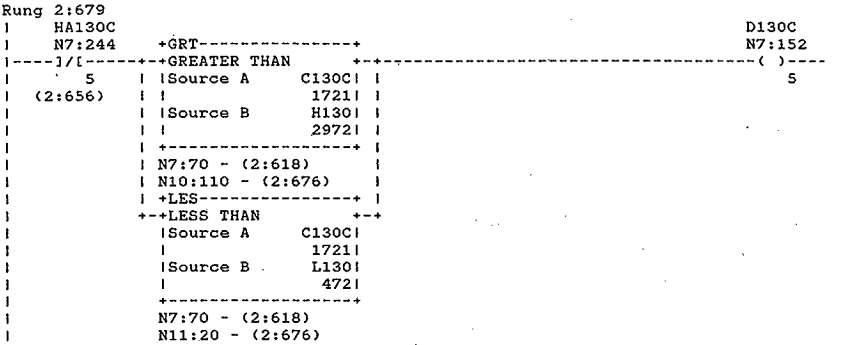
Rung 2:677



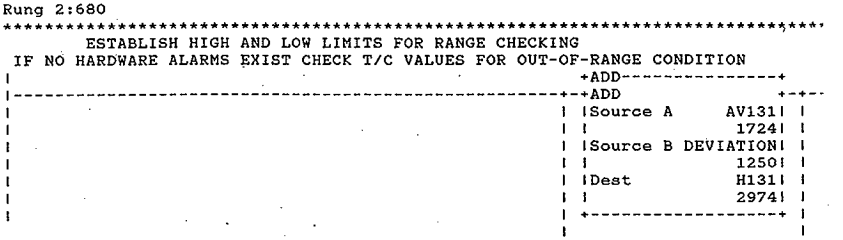
Rung 2:678



Rung 2:679



Rung 2:680



```
                                                                  +++                      +++
                                                                   |                        |
|                                                                  | +SUB---------------+ |
|                                                                  +-+SUBTRACT          +-+
|                                                                    |Source A     AV131|
|                                                                    |               1724|
|                                                                    |Source B DEVIATION|
|                                                                    |               1250|
|                                                                    |Dest           L131|
|                                                                    |                474|
|                                                                    +------------------+
```

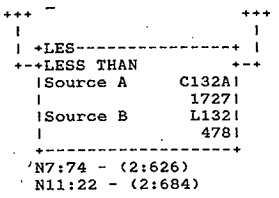
```
Rung 2:681
|    HA131A                                                                                D131A
|    N7:244     +GRT---------------+                                                       N7:152
|----]/[-----+-+GREATER THAN      +-+-----------------------------------------( )----
|       6    | |Source A     C131A| |                                                        6
|  (2:657)   | |               1727| |
|            | |Source B      H131| |
|            | |               2974| |
|            | +------------------+ |
|            | N7:71 - (2:620)      |
|            | N10:111 - (2:680)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C131A|
|              |               1727|
|              |Source B      L131|
|              |                474|
|              +------------------+
|              N7:71 - (2:620)
|              N11:21 - (2:680)
```

```
Rung 2:682
|    HA131B                                                                                D131B
|    N7:244     +GRT---------------+                                                       N7:152
|----]/[-----+-+GREATER THAN      +-+-----------------------------------------( )----
|       7    | |Source A     C131B| |                                                        7
|  (2:658)   | |               1722| |
|            | |Source B      H131| |
|            | |               2974| |
|            | +------------------+ |
|            | N7:72 - (2:622)      |
|            | N10:111 - (2:680)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C131B|
|              |               1722|
|              |Source B      L131|
|              |                474|
|              +------------------+
|              N7:72 - (2:622)
|              N11:21 - (2:680)
```

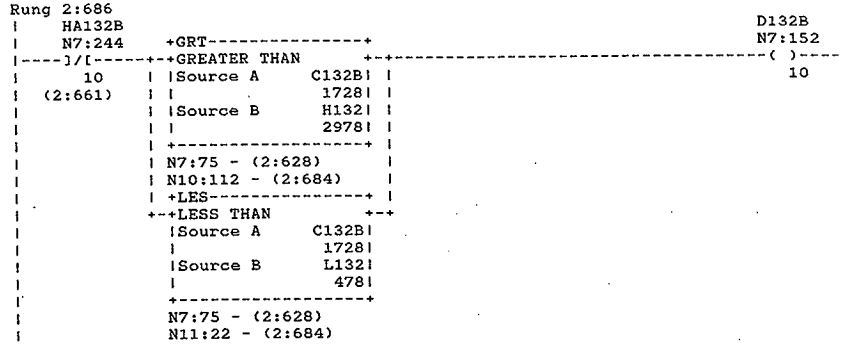
```
Rung 2:683
|    HA131C                                                                  D131C
|    N7:244    +GRT---------------+                                          N7:152
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       8    | |Source A     C131C| |                                          8
|  (2:659)   | |              1724| |
|            | |Source B      H131| |
|            | |              2974| |
|            | +------------------+ |
|            | N7:73 - (2:624)      |
|            | N10:111 - (2:680)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C131C|
|              |              1724|
|              |Source B      L131|
|              |               474|
|              +------------------+
|              N7:73 - (2:624)
|              N11:21 - (2:680)

Rung 2:684
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A     AV132| |
|                                                       | |              1728| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest          H132| |
|                                                       | |              2978| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV132|
|                                                         |              1728|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest          L132|
|                                                         |               478|
|                                                         +------------------+

Rung 2:685
|    HA132A                                                                  D132A
|    N7:244    +GRT---------------+                                          N7:152
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       9    | |Source A     C132A| |                                          9
|  (2:660)   | |              1727| |
|            | |Source B      H132| |
|            | |              2978| |
|            | +------------------+ |
|            | N7:74 - (2:626)      |
|            | N10:112 - (2:684)    |
             |                      |
            +++                    +++
```

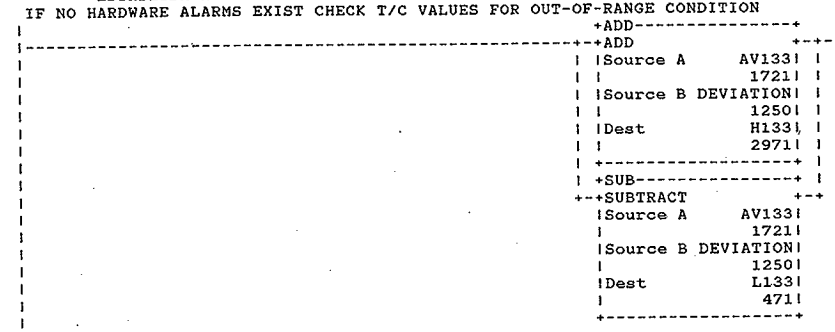


Rung 2:686

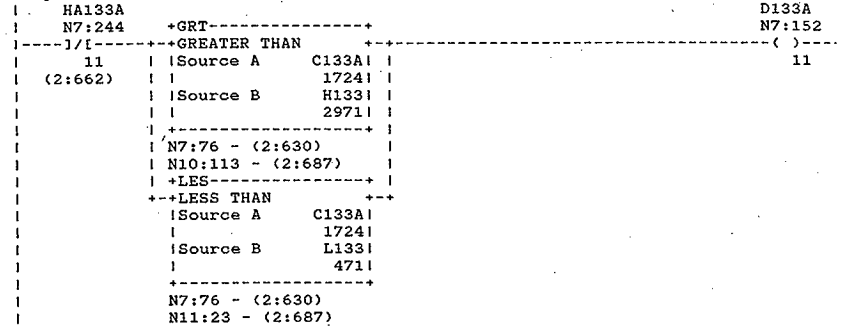


Rung 2:687

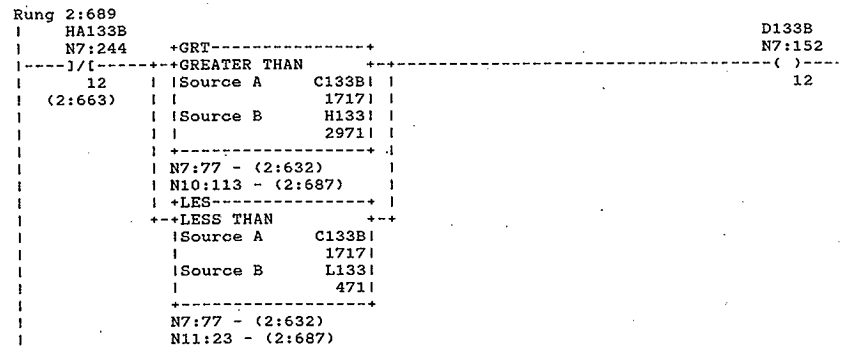
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



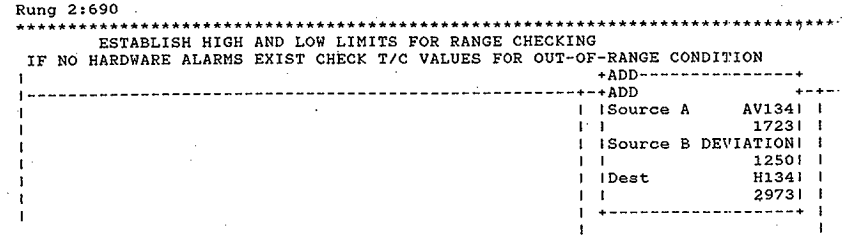
Rung 2:688



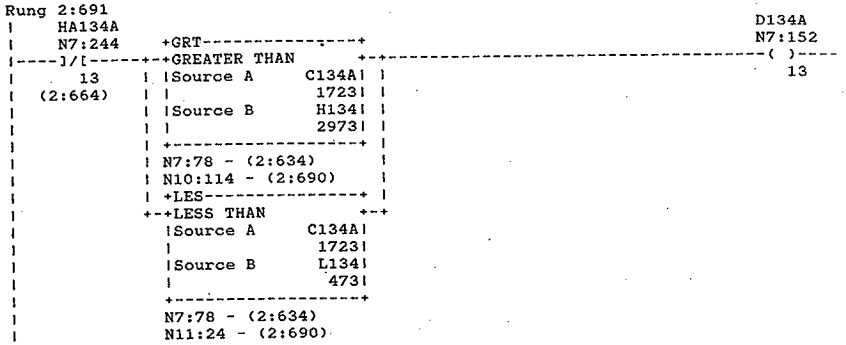
Rung 2:689



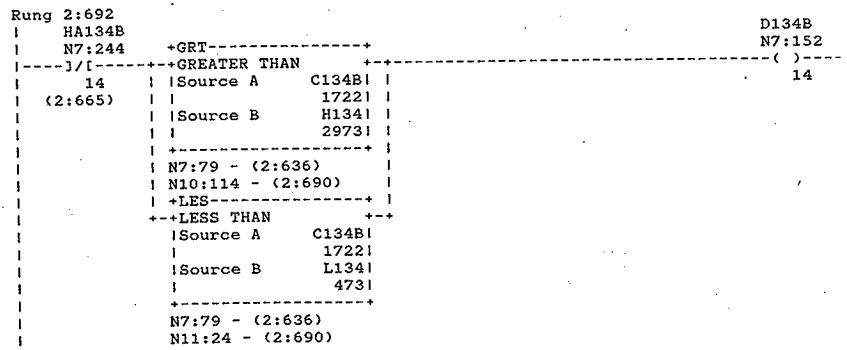
Rung 2:690



Rung 2:691



Rung 2:692



```
Rung 2:693
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD                +-+--
|                                                       | |Source A      AV140| |
|                                                       | |               1728| |
|                                                       | |Source B DEVIATION| |
|                                                       | |               1250| |
|                                                       | |Dest           H140| |
|                                                       | |               2978| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT           +-+
|                                                         |Source A      AV140|
|                                                         |               1728|
|                                                         |Source B DEVIATION|
|                                                         |               1250|
|                                                         |Dest           L140|
|                                                         |                478|
|                                                         +------------------+

Rung 2:694
|    HA140A                                                                  D140A
|    N7:244    +GRT---------------+                                         N7:152
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      15    | |Source A     C140A| |                                        15
|  (2:666)   | |               1726| |
|            | |Source B      H140| |
|            | |               2978| |
|            | +------------------+ |
|            | N7:80 - (2:638)      |
|            | N10:115 - (2:693)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C140A|
|              |               1726|
|              |Source B      L140|
|              |                478|
|              +------------------+
|              N7:80 - (2:638)
|              N11:25 - (2:693)

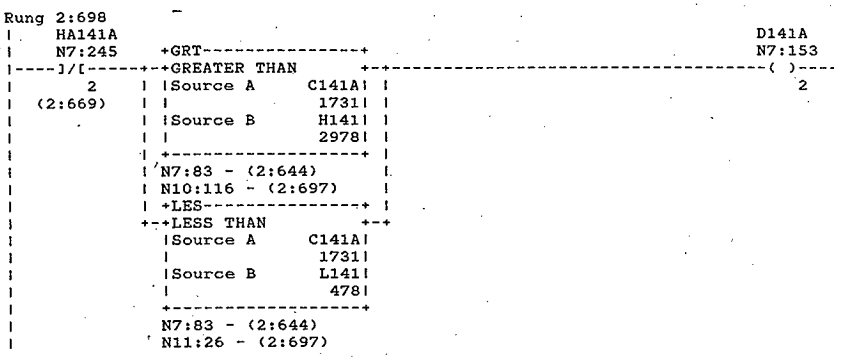
Rung 2:695
|    HA140B                                                                  D140B
|    N7:245    +GRT---------------+                                         N7:153
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A     C140B| |                                         0
|  (2:667)   | |               1726| |
|            | |Source B      H140| |
|            | |               2978| |
|            | +------------------+ |
|            | N7:81 - (2:640)      |
|            | N10:115 - (2:693)    |
             |                      |
            +++                    +++
```

```
            +++                    +++
             |                      |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C140B|
|              |               1726|
|              |Source B      L140|
|              |                478|
|              +-------------------+
|              N7:81 - (2:640)
|              N11:25 - (2:693)

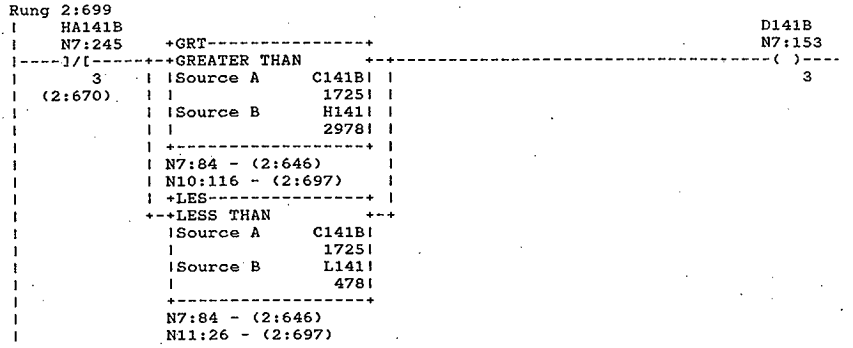
Rung 2:696
|    HA140C                                                                  D140C
|    N7:245    +GRT---------------+                                          N7:153
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       1    | |Source A     C140C| |                                        1
|  (2:668)   | |               1732| |
|            | |Source B      H140| |
|            | |               2978| |
|            | +-------------------+ |
|            | N7:82 - (2:642)       |
|            | N10:115 - (2:693)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C140C|
|              |               1732|
|              |Source B      L140|
|              |                478|
|              +-------------------+
|              N7:82 - (2:642)
|              N11:25 - (2:693)

Rung 2:697
*******************************************************************************
        ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
 IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                      +ADD---------------+
|-----------------------------------------------------+-+ADD              +-+--
|                                                    | |Source A     AV141| |
|                                                    | |               1728| |
|                                                    | |Source B DEVIATION| |
|                                                    | |               1250| |
|                                                    | |Dest          H141| |
|                                                    | |               2978| |
|                                                    | +-------------------+ |
|                                                    | +SUB---------------+ |
|                                                    +-+SUBTRACT          +-+
|                                                      |Source A     AV141|
|                                                      |               1728|
|                                                      |Source B DEVIATION|
|                                                      |               1250|
|                                                      |Dest          L141|
|                                                      |                478|
|                                                      +-------------------+
```

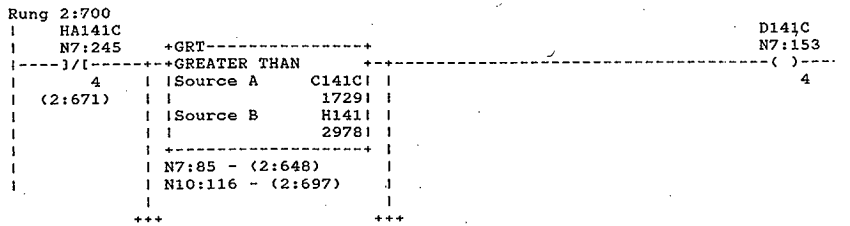
Rung 2:698

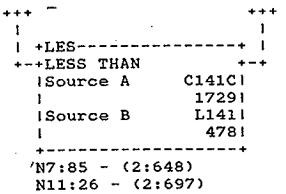


Rung 2:699



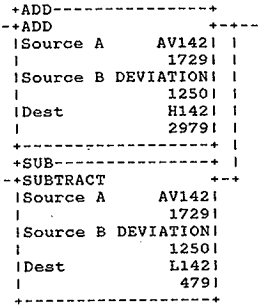
Rung 2:700



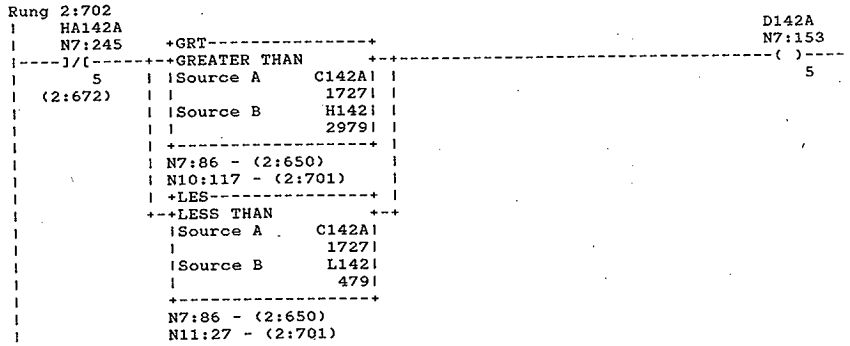


Rung 2:701

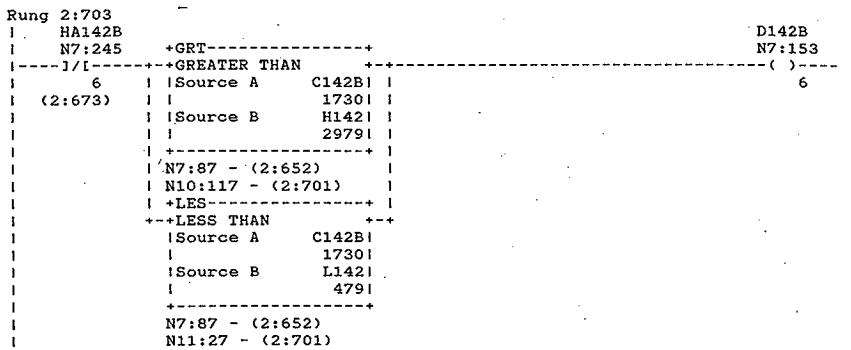
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING
IF NO HARDWARE ALARMS EXIST CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



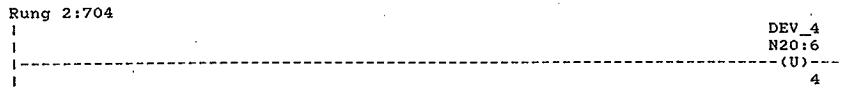
Rung 2:702



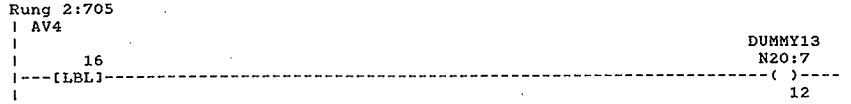
Rung 2:703



Rung 2:704

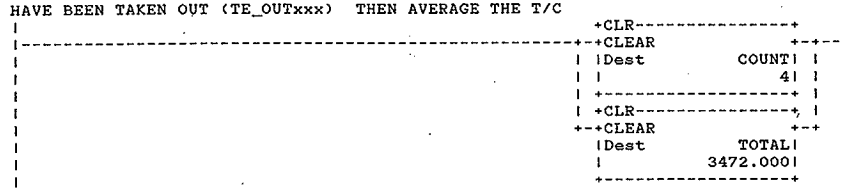


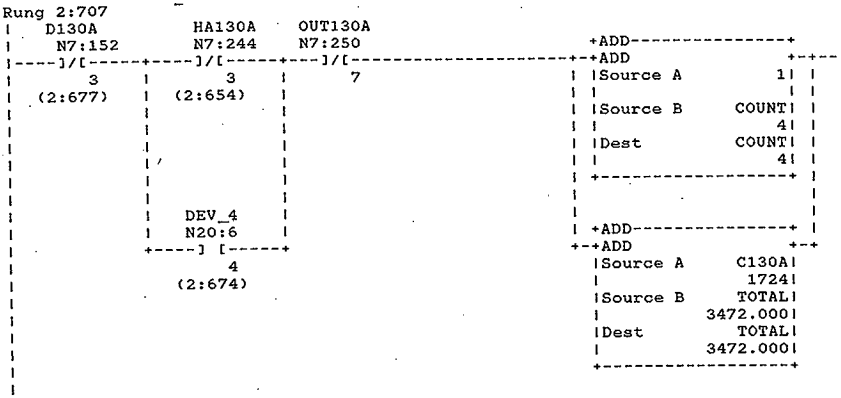
Rung 2:705

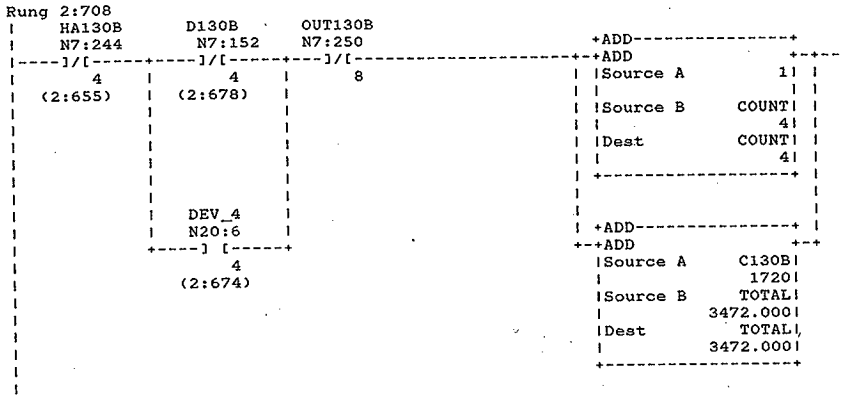


Rung 2:706

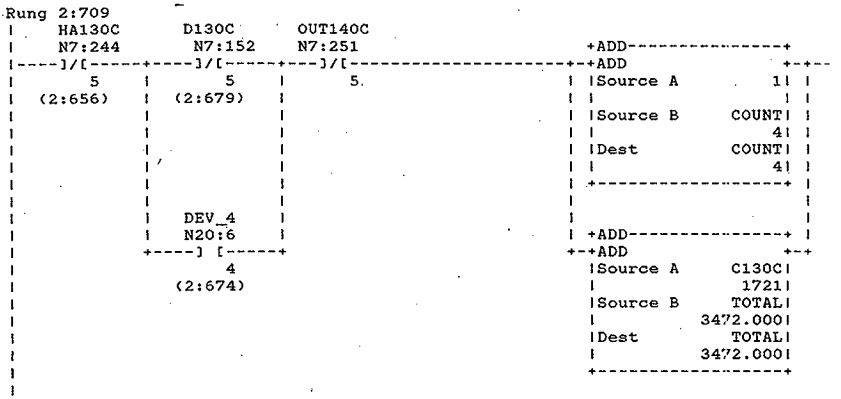
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```



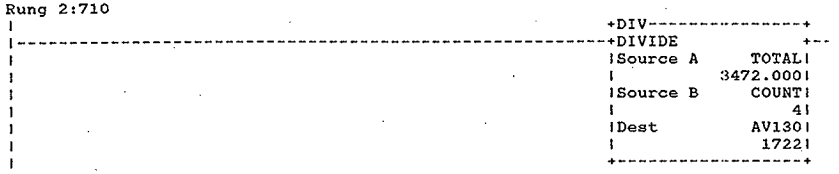

Rung 2:707
D130A
N7:152
3
(2:677)
HA130A
N7:244
3
(2:654)
DEV_4
N20:6
4
(2:674)
OUT130A
N7:250
7
ADD
Source A 1
Source B COUNT 4
Dest COUNT 4
ADD
Source A C130A 1724
Source B TOTAL 3472.000
Dest TOTAL 3472.000


Rung 2:708
HA130B
N7:244
4
(2:655)
D130B
N7:152
4
(2:678)
DEV_4
N20:6
4
(2:674)
OUT130B
N7:250
8
ADD
Source A 1
Source B COUNT 4
Dest COUNT 4
ADD
Source A C130B 1720
Source B TOTAL 3472.000
Dest TOTAL 3472.000

Rung 2:709

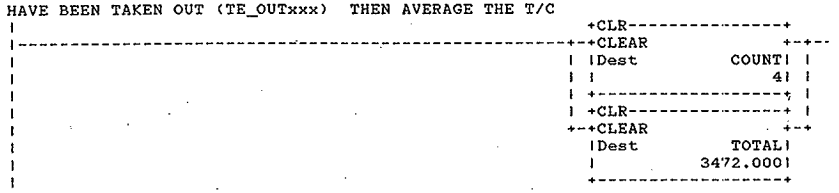


Rung 2:710

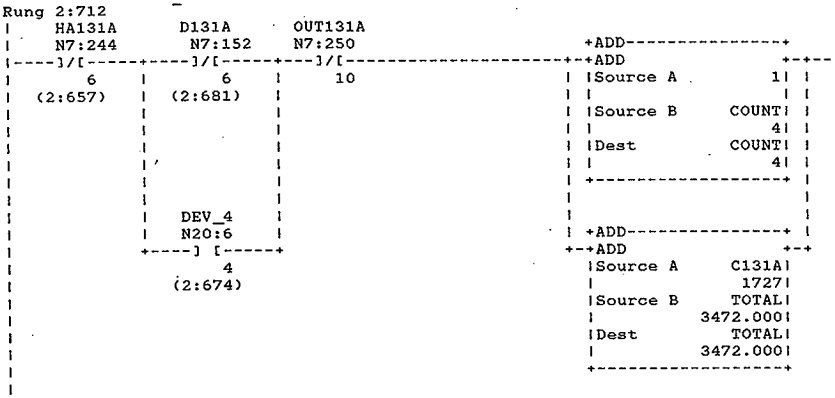


Rung 2:711

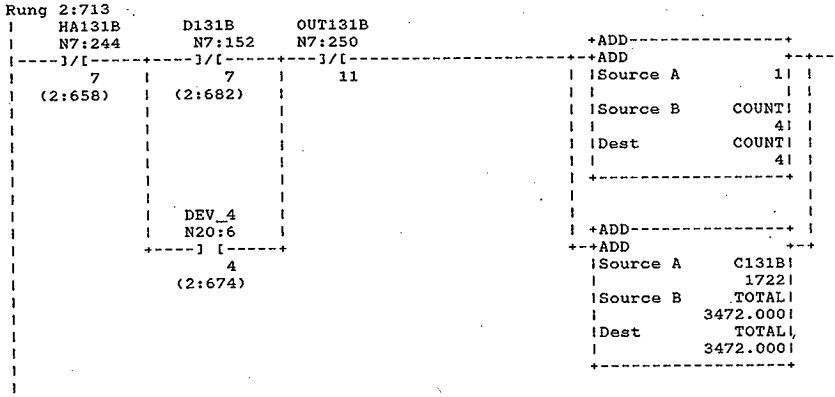
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



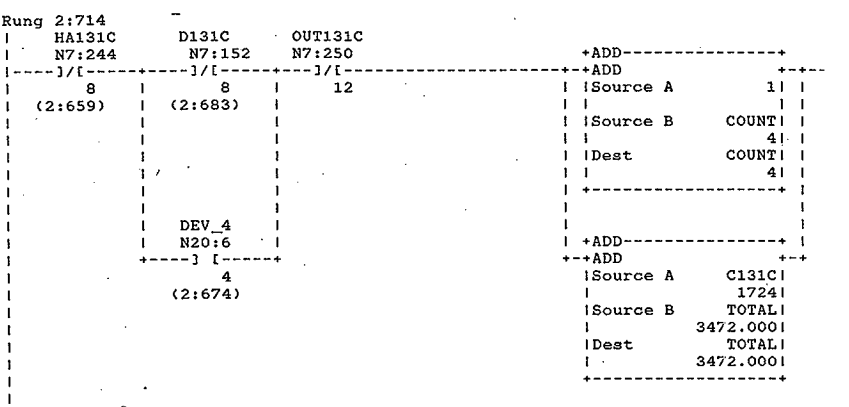
Rung 2:712



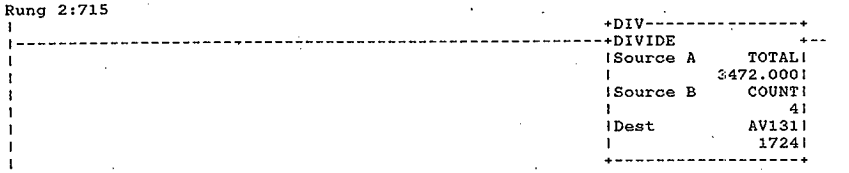
Rung 2:713



Rung 2:714

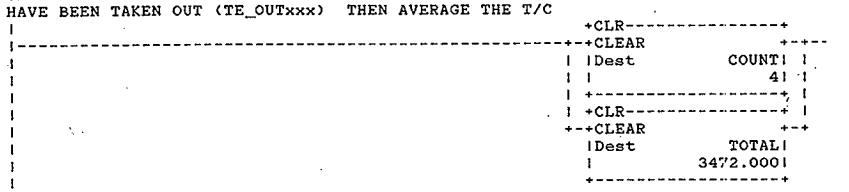


Rung 2:715

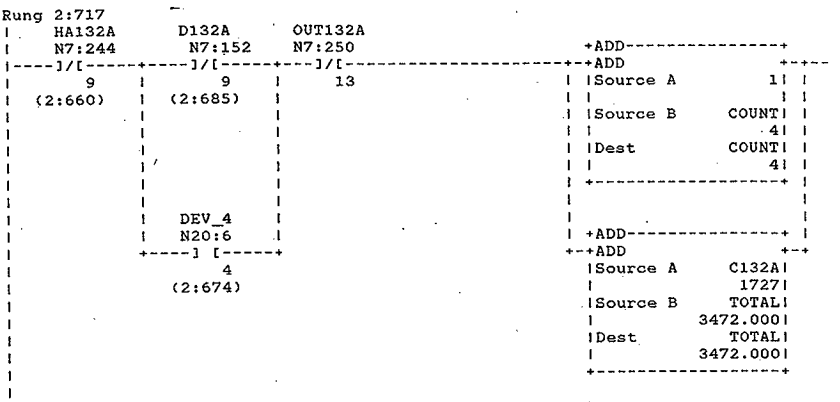


Rung 2:716

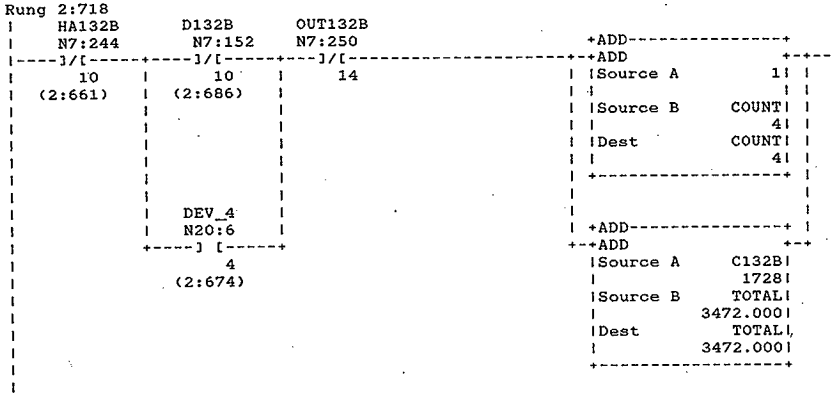
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```



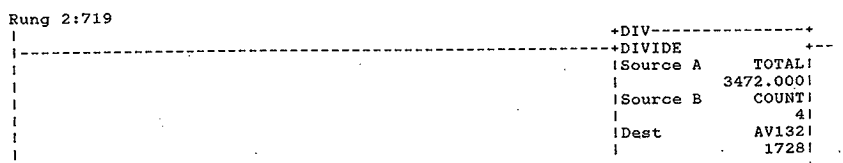
Rung 2:717



Rung 2:718

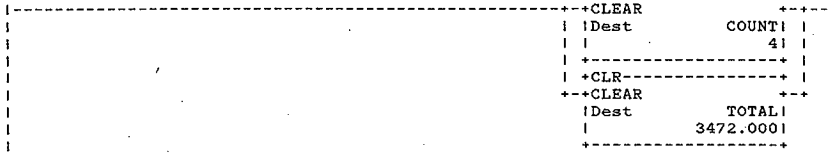


Rung 2:719

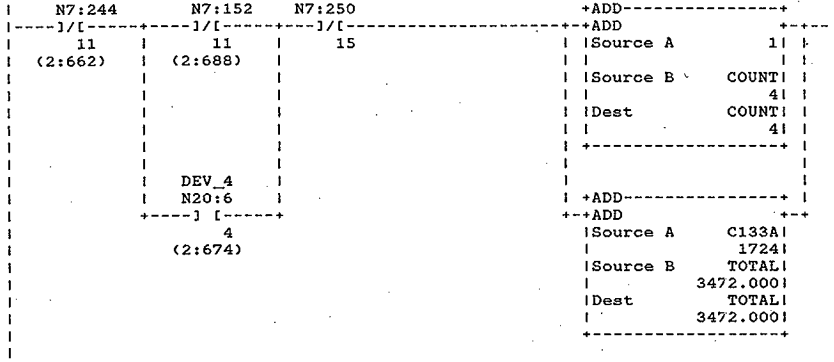


Rung 2:720

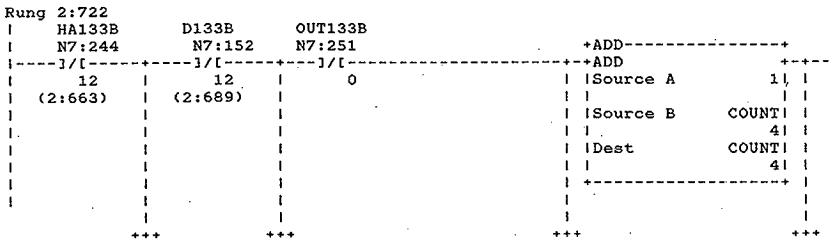
```
********************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```

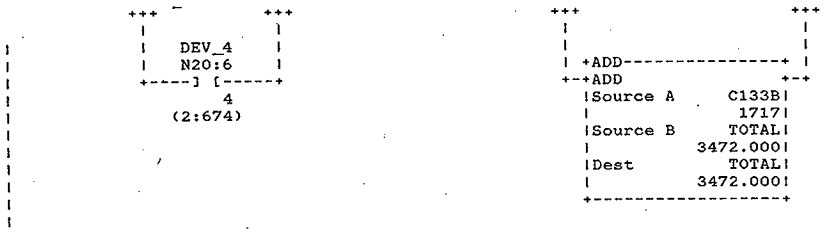


Rung 2:721

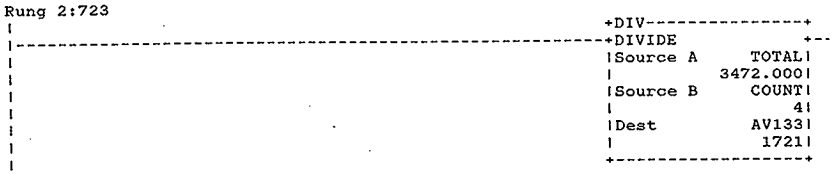


Rung 2:722



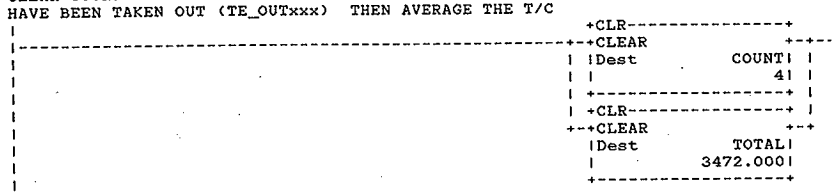


Rung 2:723

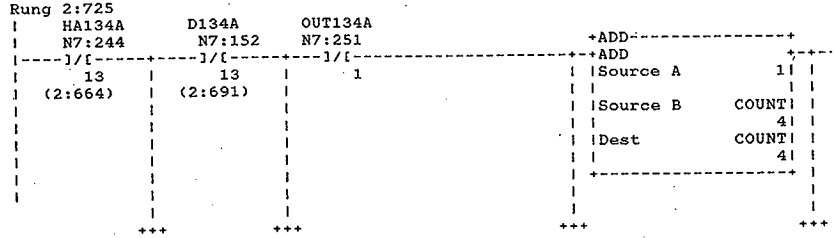


Rung 2:724

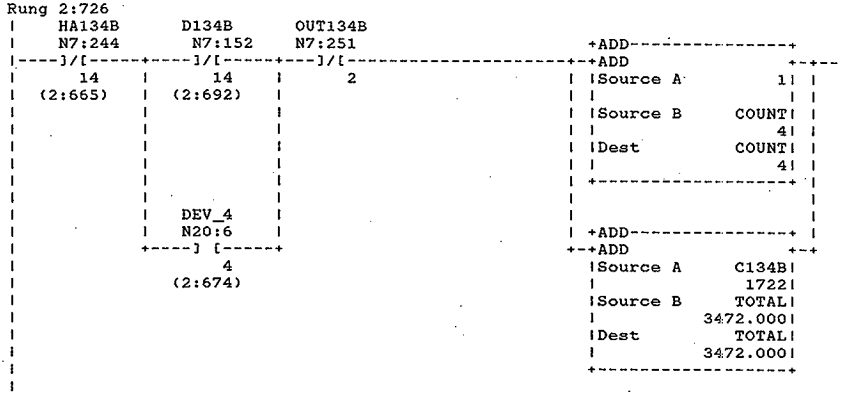
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



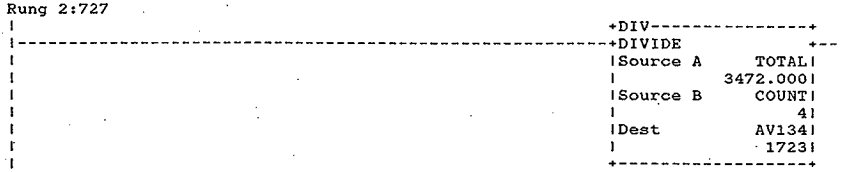
Rung 2:725



Rung 2:726

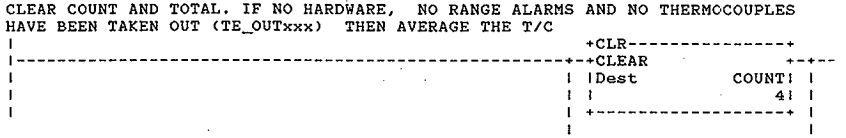


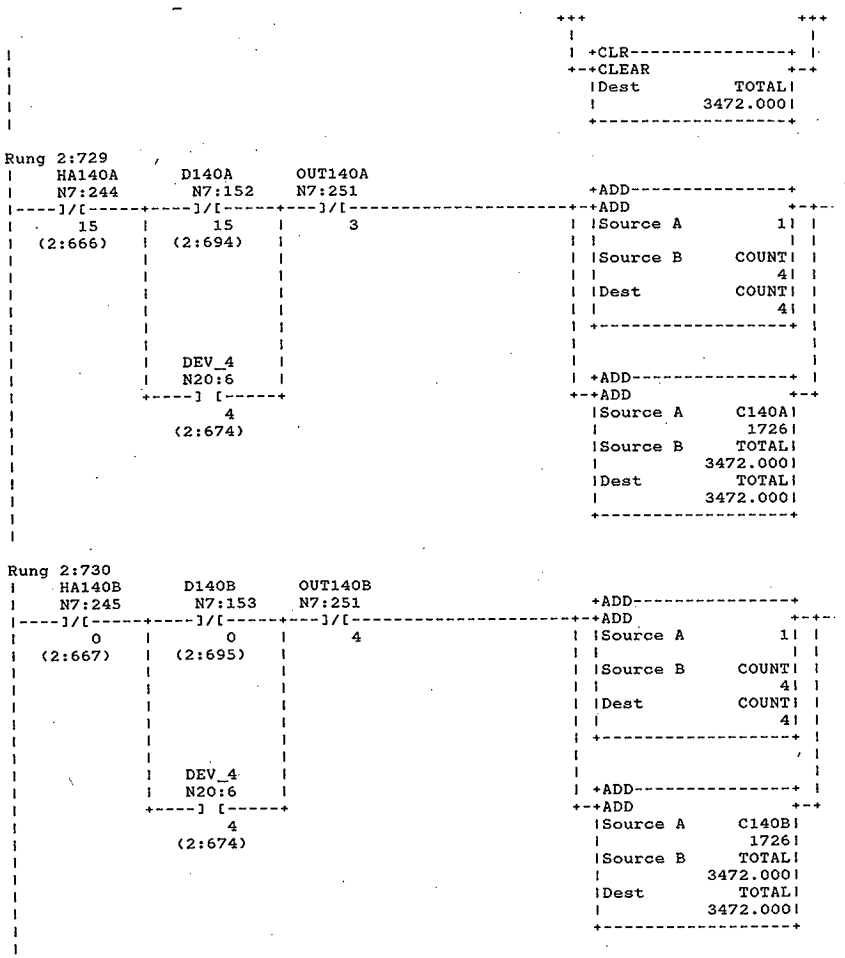
Rung 2:727



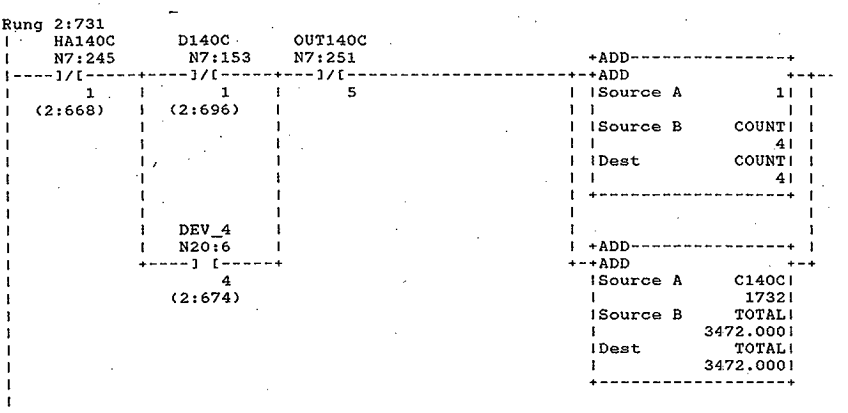
Rung 2:728

```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE,  NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx)  THEN AVERAGE THE T/C
```

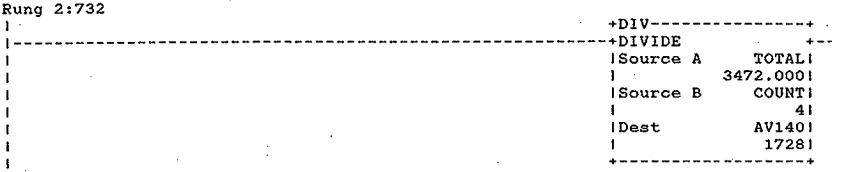



CLR
CLEAR
Dest TOTAL
3472.000
Rung 2:729
HA140A
N7:244
15
(2:666)
D140A
N7:152
15
(2:694)
DEV_4
N20:6
4
(2:674)
OUT140A
N7:251
3
ADD
Source A 1
Source B COUNT
4
Dest COUNT
4
ADD
Source A C140A
1726
Source B TOTAL
3472.000
Dest TOTAL
3472.000
Rung 2:730
HA140B
N7:245
0
(2:667)
D140B
N7:153
0
(2:695)
DEV_4
N20:6
4
(2:674)
OUT140B
N7:251
4
ADD
Source A 1
Source B COUNT
4
Dest COUNT
4
ADD
Source A C140B
1726
Source B TOTAL
3472.000
Dest TOTAL
3472.000

Rung 2:731



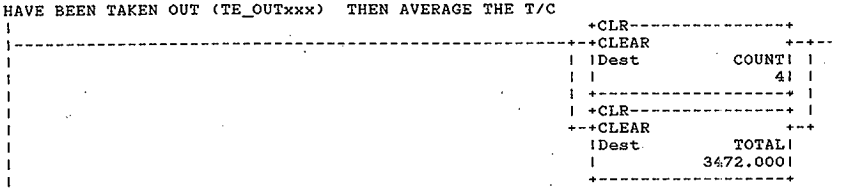
Rung 2:732



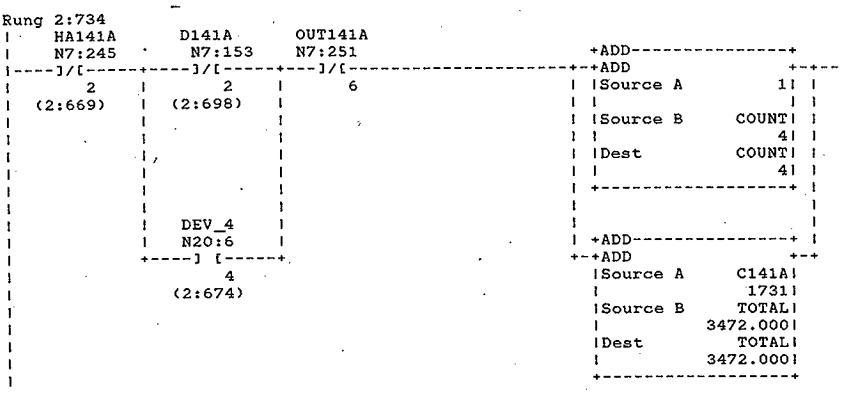
Rung 2:733

****

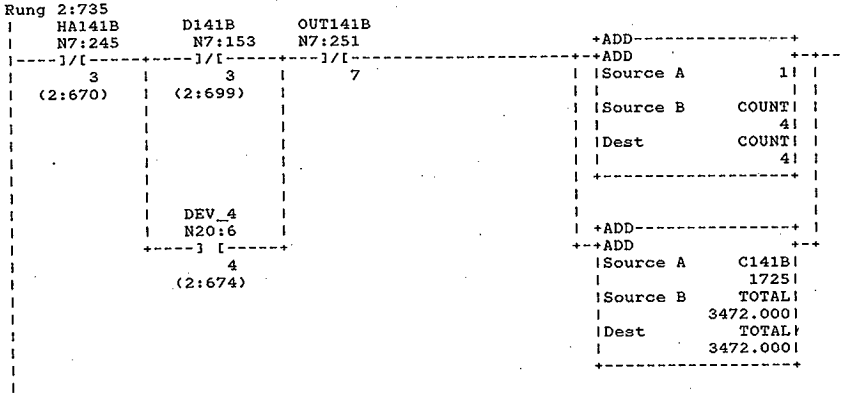
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



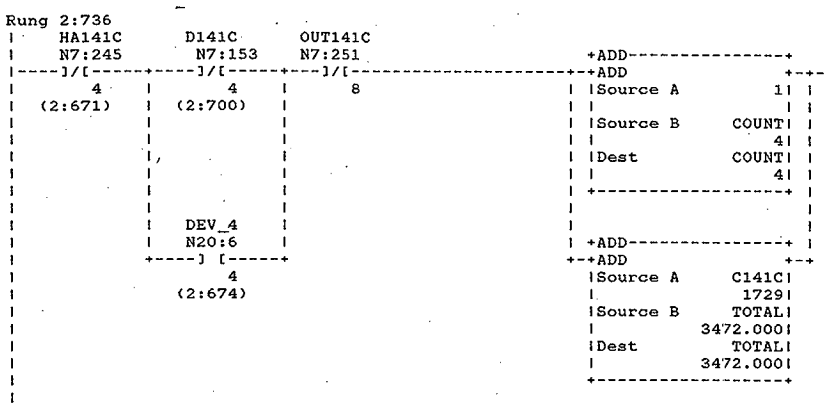
Rung 2:734



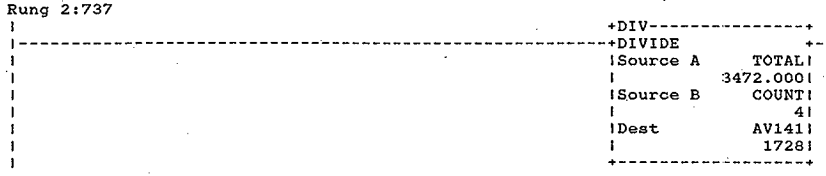
Rung 2:735



Rung 2:736

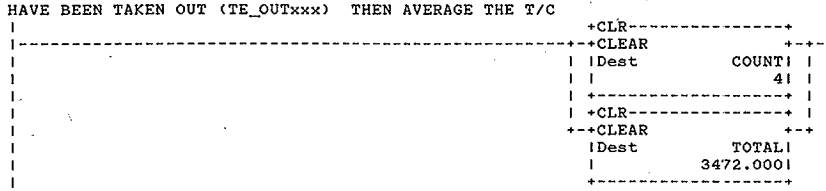


Rung 2:737

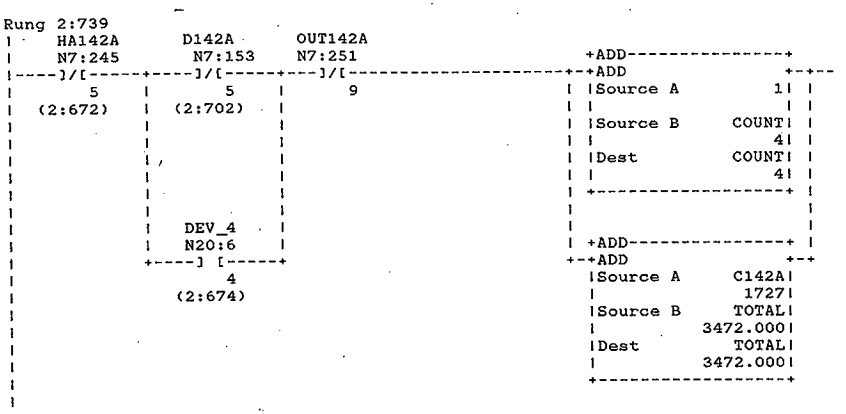


Rung 2:738

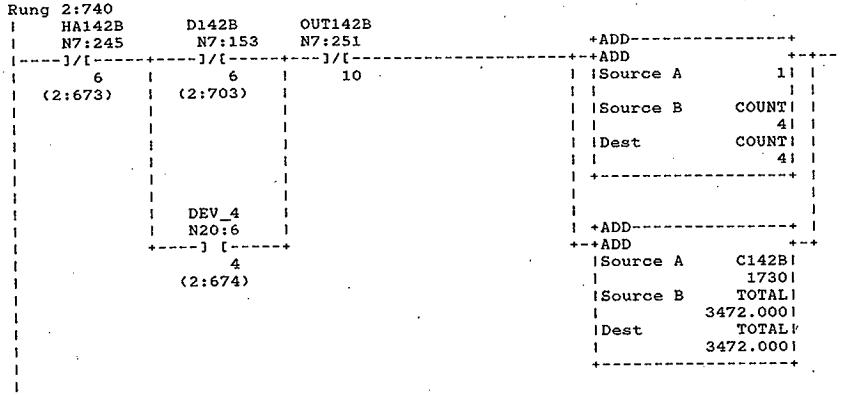
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



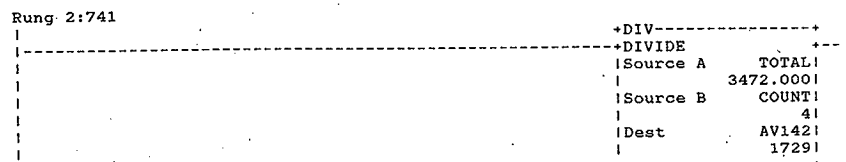
Rung 2:739



Rung 2:740



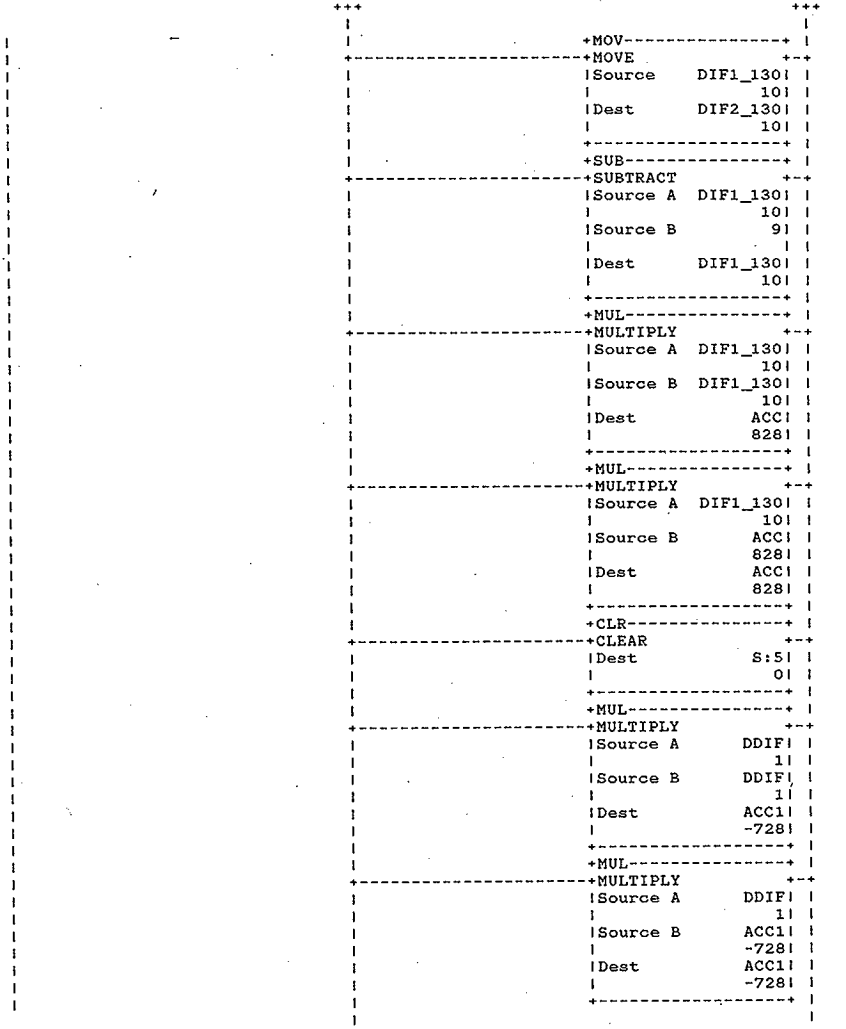
Rung 2:741

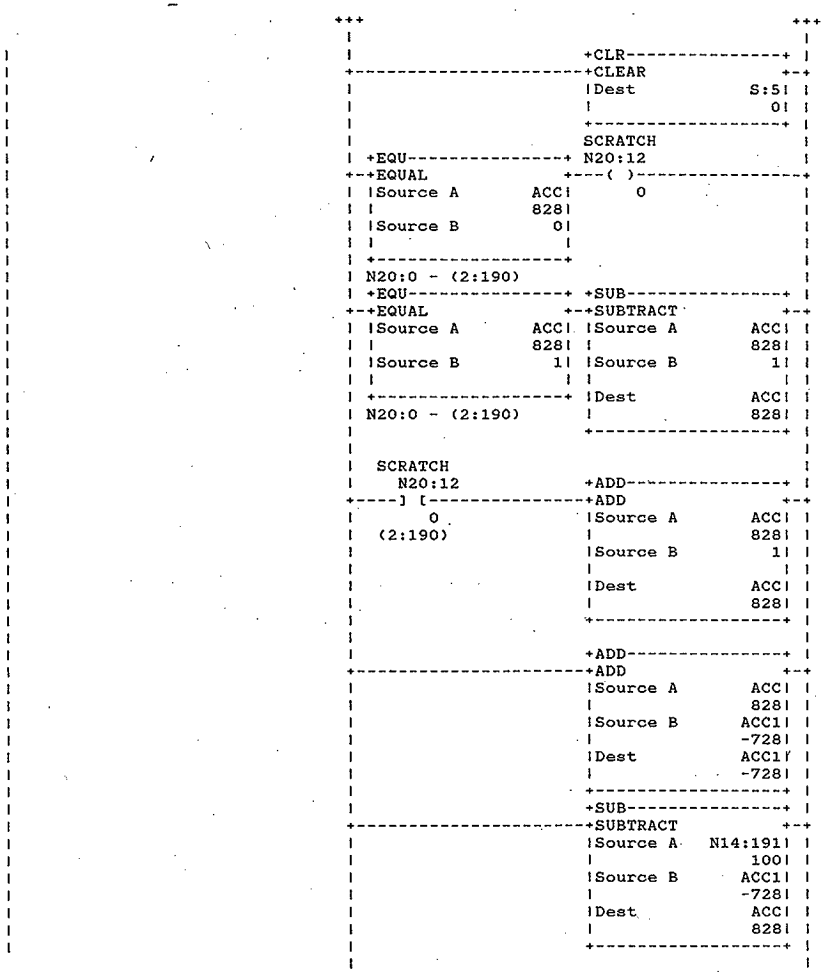


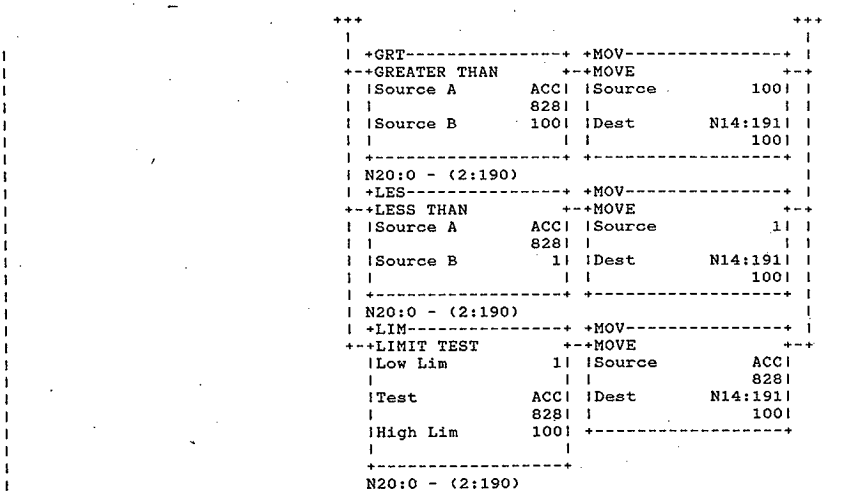
```
Rung 2:742
*******************************************************************************
     IF DEVIATION SET FOR SECTION 4 THEN GO THERE AND CALCULATE DEVIATION
|                                                                      DEV4
|   DEV_4
|   N20:6                                                                12
|----] [-------------------------------------------------------------(JMP)-----
|       4
|  (2:674)

Rung 2:743
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                      PID130
| RT_TMR/DN
|   T4:62                                                                36
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)

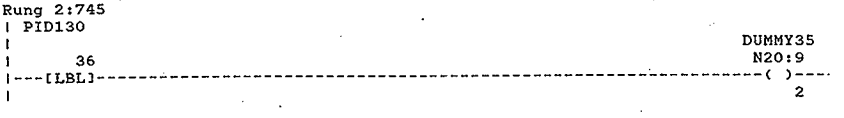
Rung 2:744
                          RATE CHECKING
|                                                  +MOV---------------+
|-------------------------------+-----------------+MOVE              +-+--
|                               |                 |Source       AV130| |
|                               |                 |              1722| |
|                               |                 |Dest        R1_130| |
|                               |                 |              1722| |
|                               |                 +------------------+ |
|                               |                 +SUB---------------+ |
|                               +-----------------+SUBTRACT          +-+
|                               |                 |Source A    R1_130| |
|                               |                 |              1722| |
|                               |                 |Source B    R2_130| |
|                               |                 |              1722| |
|                               |                 |Dest      DIF1_130| |
|                               |                 |                10| |
|                               |                 +------------------+ |
|                               |                 +MOV---------------+ |
|                               +-----------------+MOVE              +-+
|                               |                 |Source      R1_130| |
|                               |                 |              1722| |
|                               |                 |Dest        R2_130| |
|                               |                 |              1722| |
|                               |                 +------------------+ |
|                               |                 +SUB---------------+ |
|                               +-----------------+SUBTRACT          +-+
|                               |                 |Source A  DIF1_130| |
|                               |                 |                10| |
|                               |                 |Source B  DIF2_130| |
|                               |                 |                10| |
|                               |                 |Dest          DDIF| |
|                               |                 |                 1| |
|                               |                 +------------------+ |
|                               |                                      |
                              +++                                    +++
```


MOV
MOVE
Source DIF1_130
10
Dest DIF2_130
10
SUB
SUBTRACT
Source A DIF1_130
10
Source B
9
Dest DIF1_130
10
MUL
MULTIPLY
Source A DIF1_130
10
Source B DIF1_130
10
Dest ACC
8281
MUL
MULTIPLY
Source A DIF1_130
10
Source B ACC
8281
Dest ACC
8281
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-7281
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-7281
Dest ACC1
-7281


+CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B 0
( )
0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828
SCRATCH
N20:12
0
(2:190)
ADD
ADD
Source A ACC
828
Source B 1
Dest ACC
828
ADD
ADD
Source A ACC
828
Source B ACC1
-728
Dest ACC1
-728
SUB
SUBTRACT
Source A N14:191
100
Source B ACC1
-728
Dest ACC
828

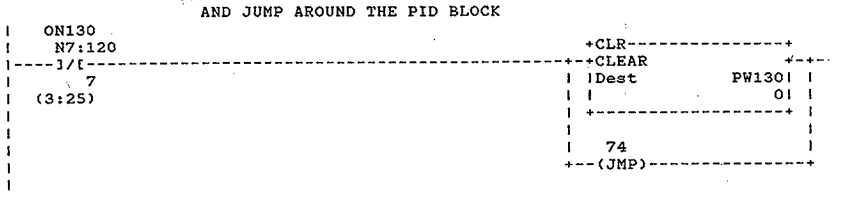


Rung 2:745



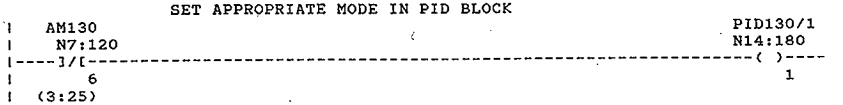
Rung 2:746

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:747

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



Rung 2:748

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +-
|                                                          |Source      SET130|
|                                                          |                  0|
|                                                          |Dest      PIDSP130|
|                                                          |                  0|
|                                                          +-------------------+
```

Rung 2:749

```
|                                                +PID--------------------+
|------------------------------------------------+-+PID                  +-+-
|                                                | |Control Block    PID130| |
|                                                | |Process Variable  AV130| |
|                                                | |Control Variable  CV130| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                | +SCL----------------+     |
|                                                +-+SCALE              +-------+
|                                                | |Source        CV130|       |
|                                                | |                   0|       |
|                                                | |Rate [/10000]    15|       |
|                                                | |                    |       |
|                                                | |Offset             0|       |
|                                                | |                    |       |
|                                                | |Dest           PW130|       |
|                                                | |                   0|       |
|                                                | +-------------------+       |
|                                                | +CLR----------------+       |
|                                                +-+CLEAR              +-------+
|                                                  |Dest            S:5|
|                                                  |                   0|
|                                                  +-------------------+
```

Rung 2:750

```
|   74                                                                  N20:10
|--[LBL]-------------------------------------------------------------------( )---
|                                                                         12
```

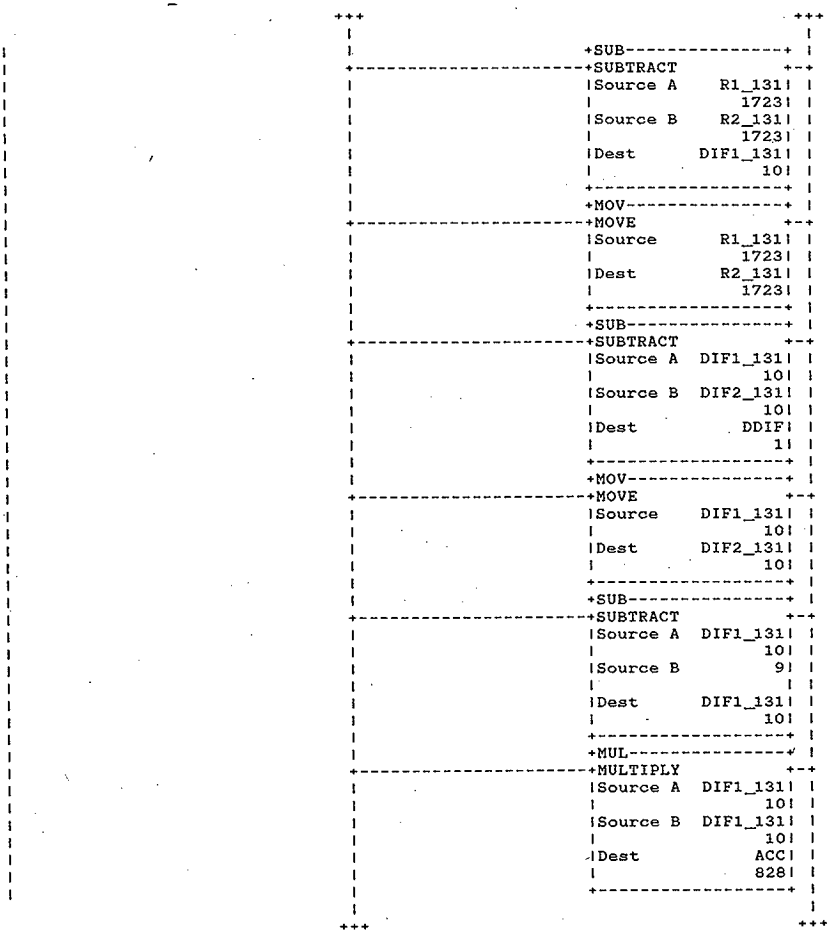
Rung 2:751

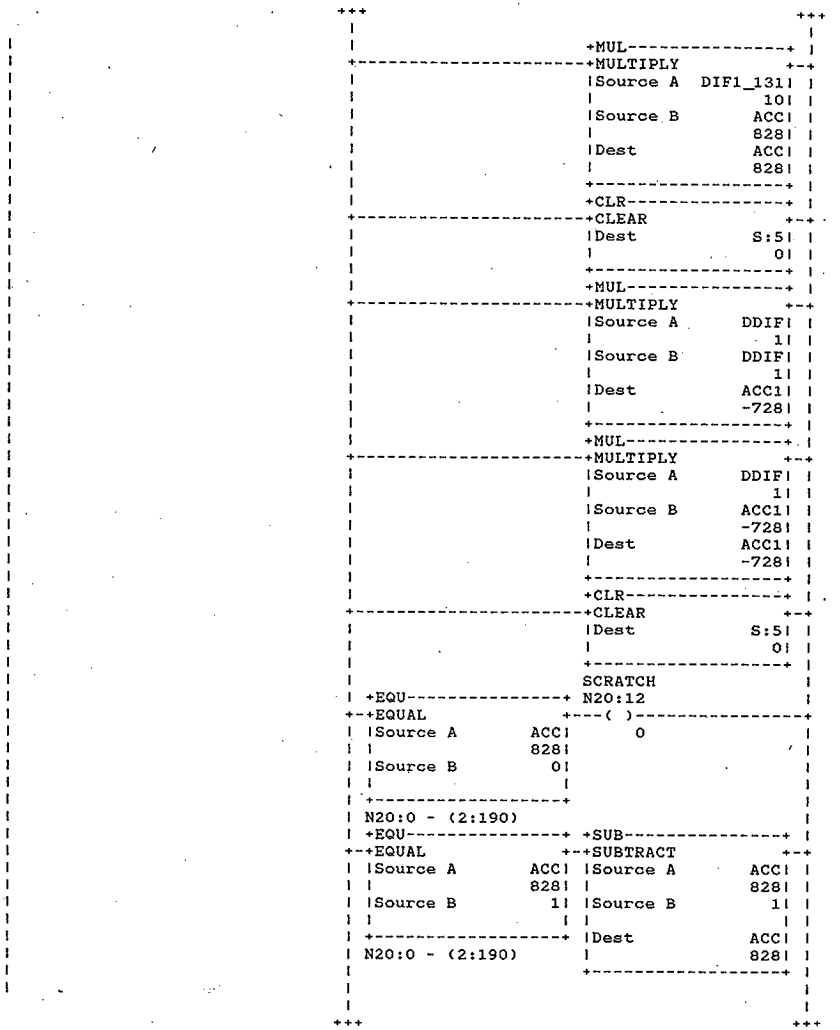
```
|                                                                     PID131
| RT_TMR/DN                                                             |
|   T4:62                                                              37
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

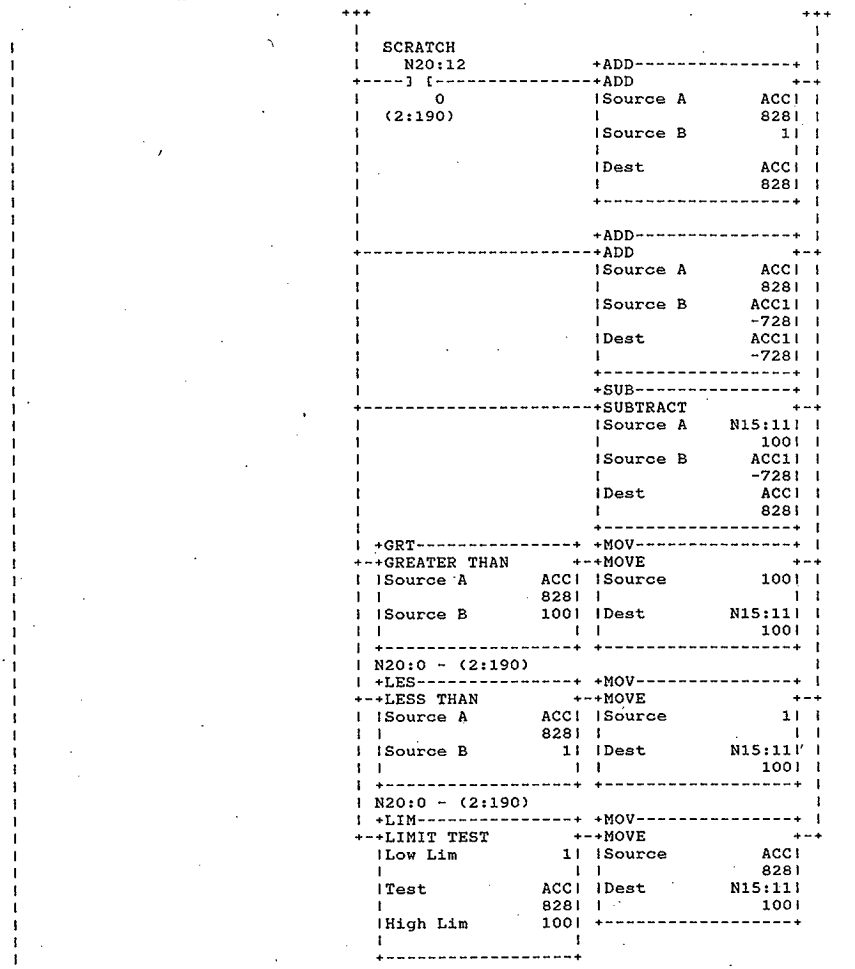
Rung 2:752

RATE CHECKING

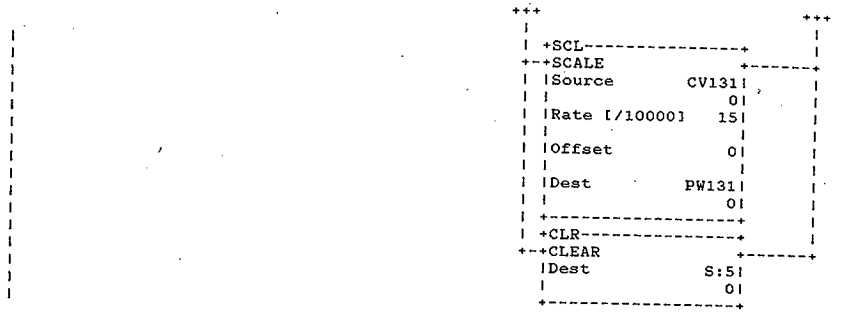
```
|                                                +MOV---------------+
|------------------------------+-----------------+MOVE              +-+-
|                              |                 |Source       AV131| |
|                              |                 |                1724| |
|                              |                 |Dest         R1_131| |
|                              |                 |                1723| |
|                              |                 +-------------------+ |
|                              |                                       |
|                             +++                                     +++
```


SUB
SUBTRACT
Source A R1_131
1723
Source B R2_131
1723
Dest DIF1_131
10
MOV
MOVE
Source R1_131
1723
Dest R2_131
1723
SUB
SUBTRACT
Source A DIF1_131
10
Source B DIF2_131
10
Dest DDIF
1
MOV
MOVE
Source DIF1_131
10
Dest DIF2_131
10
SUB
SUBTRACT
Source A DIF1_131
10
Source B
9
Dest DIF1_131
10
MUL
MULTIPLY
Source A DIF1_131
10
Source B DIF1_131
10
Dest ACC
828

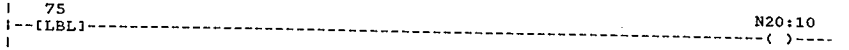

MUL
MULTIPLY
Source A DIF1_131
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
EQU
EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
( )
0
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
+ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728
+SUB
SUBTRACT
Source A N15:11 100
Source B ACC1 -728
Dest ACC 828
+GRT
GREATER THAN
Source A ACC 828
Source B 100
N20:0 - (2:190)
+MOV
MOVE
Source 100
Dest N15:11 100
+LES
LESS THAN
Source A ACC 828
Source B 1
N20:0 - (2:190)
+MOV
MOVE
Source 1
Dest N15:11 100
+LIM
LIMIT TEST
Low Lim 1
Test ACC 828
High Lim 100
N20:0 - (2:190)
+MOV
MOVE
Source ACC 828
Dest N15:11 100

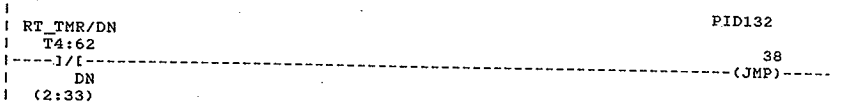
```
Rung 2:753
| PID131
|
|      37                                                                DUMMY36
|---[LBL]-------------------------------------------------------------------N20:9
|                                                                        ( )----
                                                                            3
Rung 2:754
                 DETECT FROM SCADA PID ON/OFF
                         IF PID OFF
                 THEN ZERO PW FOR ZERO OUTPUT AT  SCR
                   AND JUMP AROUND THE PID BLOCK
|   ON131
|    N7:120                                                  +CLR---------------+
|----]/[-------------------------------------------------+--+CLEAR              +-+--
|       9                                                | |Dest          PW131| |
|  (3:25)                                                | |                 0| |
|                                                        | +------------------+ |
|                                                        |                      |
|                                                        |   75                 |
|                                                        +--(JMP)---------------+
Rung 2:755
                 DETECT AUTO/MANUAL FROM SCADA
                 SET APPROPRIATE MODE IN PID BLOCK
|   AM131                                                                  PID131/1
|    N7:120                                                                N15:0
|----]/[-------------------------------------------------------------------( )-----
|       8                                                                     1
|  (3:25)
Rung 2:756
                 DETECT SETPOINT VALUE FROM SCADA
                 PUT VALUE IN PID BLOCK
|
|-------------------------------------------------------+MOV---------------+
|                                                       +MOVE               +--
|                                                       |Source       SET131|
|                                                       |                  0|
|                                                       |Dest       PIDSP131|
|                                                       |                  0|
|                                                       +------------------+
Rung 2:757
|
|-------------------------------------------------+PID-------------------+
|                                                 +-+PID                +-+--
|                                                 | |Control Block    PID131| |
|                                                 | |Process Variable  AV131| |
|                                                 | |Control Variable  CV131| |
|                                                 | |Control Block Length 23| |
|                                                 | +----------------------+ |
|                                                 |                          |
|                                                 +++                        +++
```



Rung 2:758

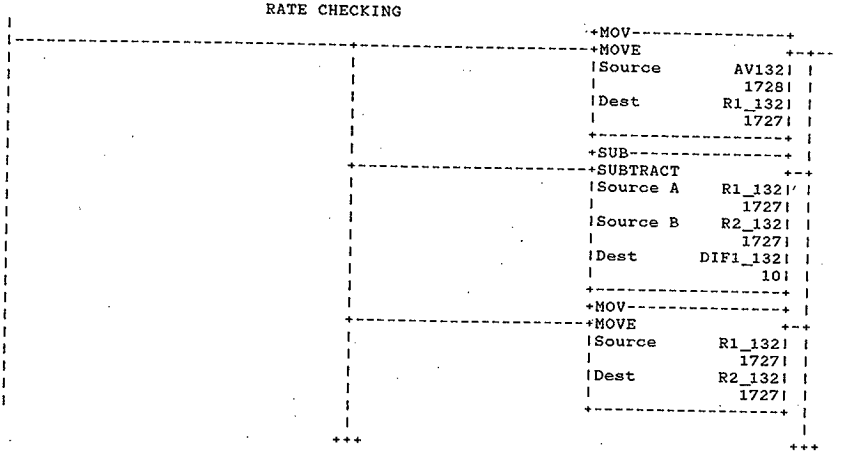


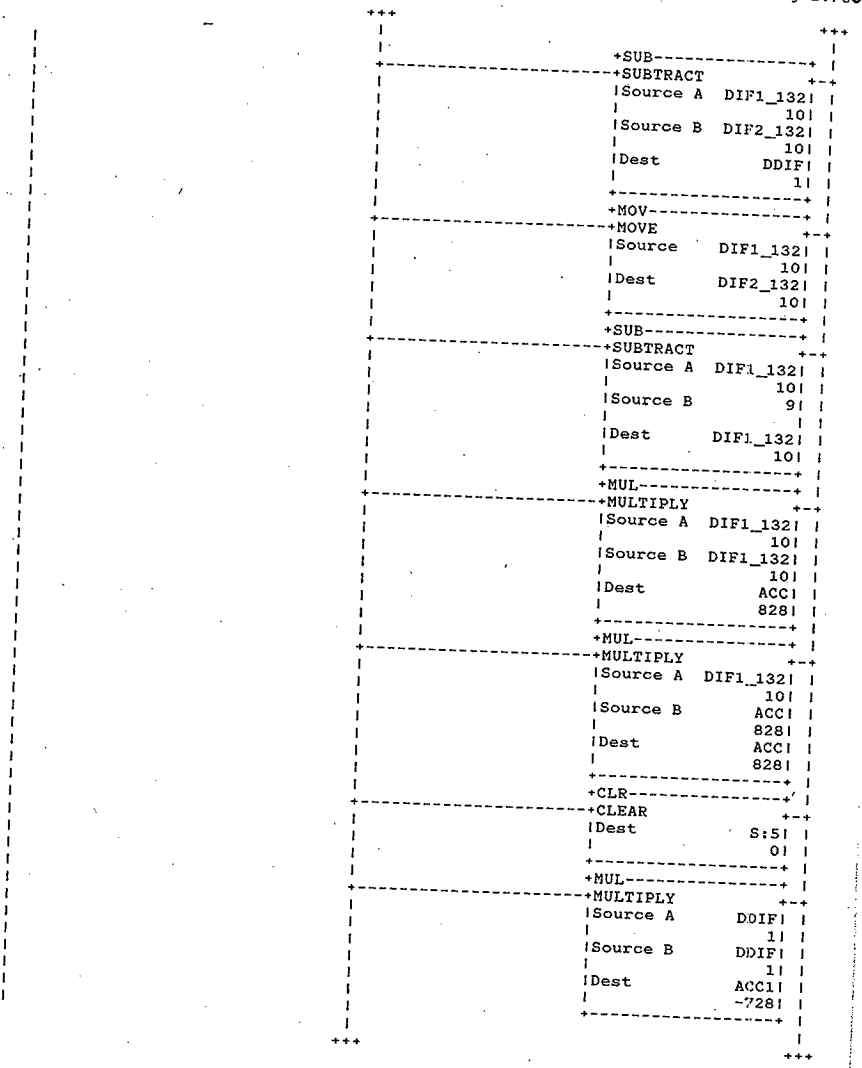
Rung 2:759

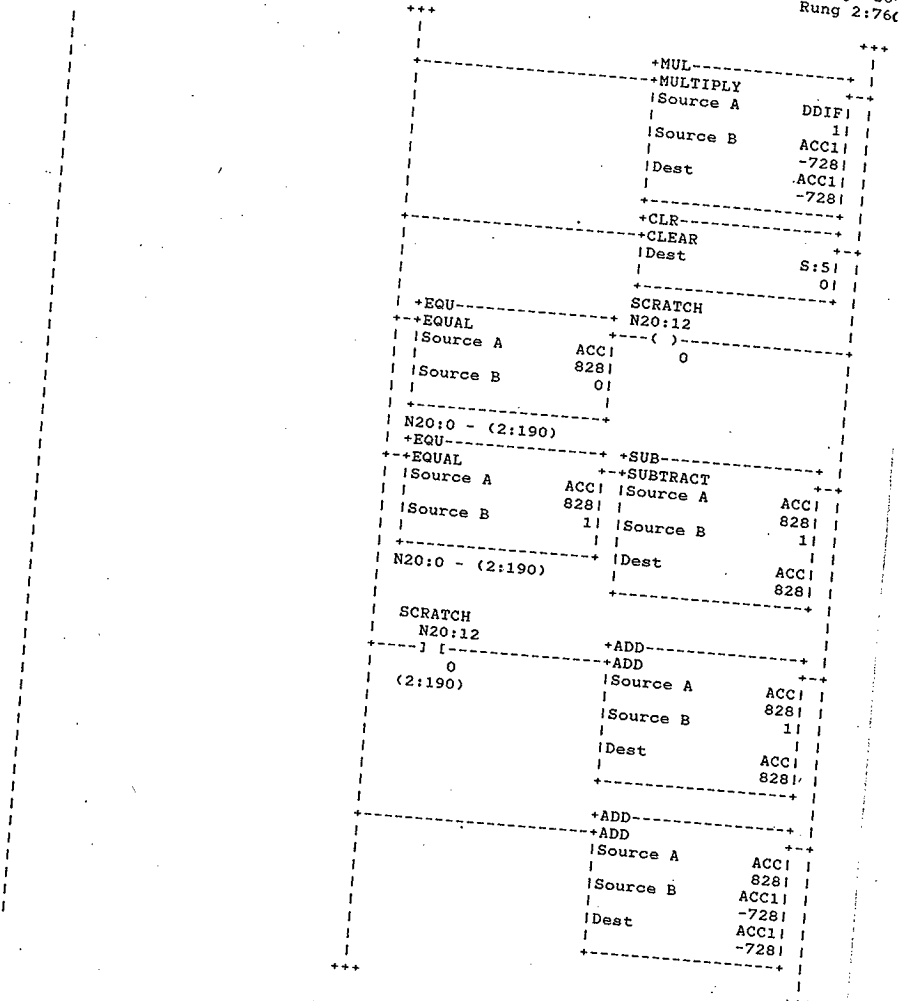


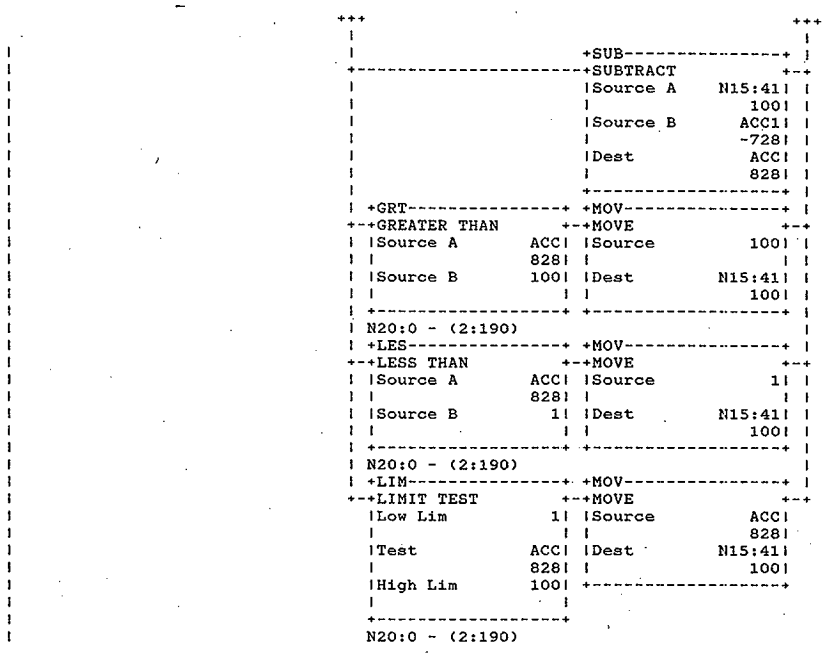
Rung 2:760

RATE CHECKING




+SUB
+SUBTRACT
Source A DIF1_132 10
Source B DIF2_132 10
Dest DDIF 1
+MOV
+MOVE
Source DIF1_132 10
Dest DIF2_132 10
+SUB
+SUBTRACT
Source A DIF1_132 10
Source B 9
Dest DIF1_132 10
+MUL
+MULTIPLY
Source A DIF1_132 10
Source B DIF1_132 10
Dest ACC 828
+MUL
+MULTIPLY
Source A DIF1_132 10
Source B ACC 828
Dest ACC 828
+CLR
+CLEAR
Dest S:5 0
+MUL
+MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728

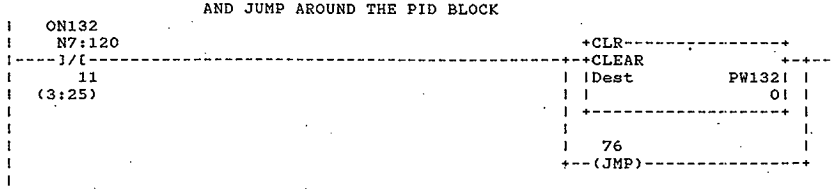

+MUL
MULTIPLY
Source A
DDIF
1
Source B
ACC1
-728
Dest
ACC1
-728
+CLR
CLEAR
Dest
S:5
0
SCRATCH
N20:12
0
+EQU
EQUAL
Source A
ACC
828
Source B
0
N20:0 - (2:190)
+EQU
EQUAL
Source A
ACC
828
Source B
1
N20:0 - (2:190)
+SUB
SUBTRACT
Source A
ACC
828
Source B
1
Dest
ACC
828
SCRATCH
N20:12
0
(2:190)
+ADD
ADD
Source A
ACC
828
Source B
1
Dest
ACC
828
+ADD
ADD
Source A
ACC
828
Source B
ACC1
-728
Dest
ACC1
-728



Rung 2:761

Rung 2:762

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:763
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM132                                                                  PID132/1
|    N7:120                                                                N15:30
|----]/[-------------------------------------------------------------------( )-----
|      10                                                                     1
|  (3:25)

Rung 2:764
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                          |Source      SET132|
|                                                          |                 0|
|                                                          |Dest      PIDSP132|
|                                                          |                 0|
|                                                          +------------------+

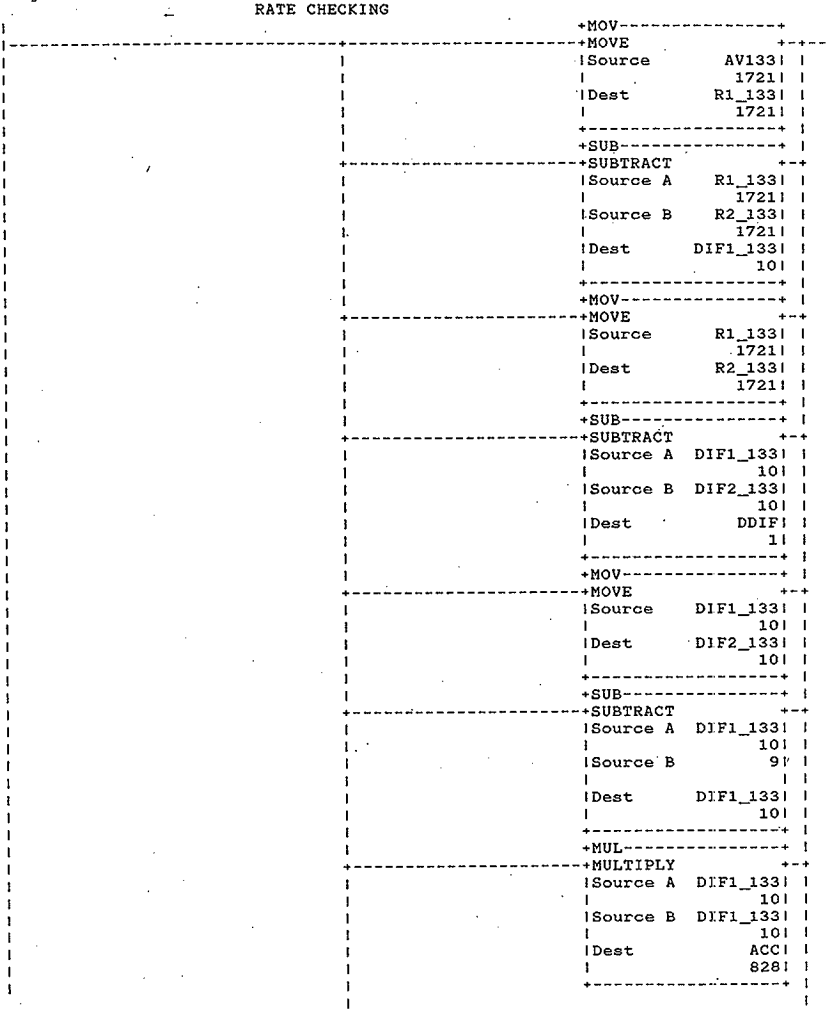
Rung 2:765
|                                                    +PID--------------------+
|-----------------------------------------------+-+PID                    +-+--
|                                               | |Control Block    PID132| |
|                                               | |Process Variable  AV132| |
|                                               | |Control Variable  CV132| |
|                                               | |Control Block Length 23| |
|                                               | +----------------------+ |
|                                               | +SCL---------------+      |
|                                               +-+SCALE             +------+
|                                               | |Source       CV132|      |
|                                               | |                 0|      |
|                                               | |Rate [/10000]   15|      |
|                                               | |                  |      |
|                                               | |Offset           0|      |
|                                               | |                  |      |
|                                               | |Dest         PW132|      |
|                                               | |                 0|      |
|                                               | +------------------+      |
|                                               | +CLR---------------+      |
|                                               +-+CLEAR             +------+
|                                                 |Dest           S:5|
|                                                 |                 0|
|                                                 +------------------+

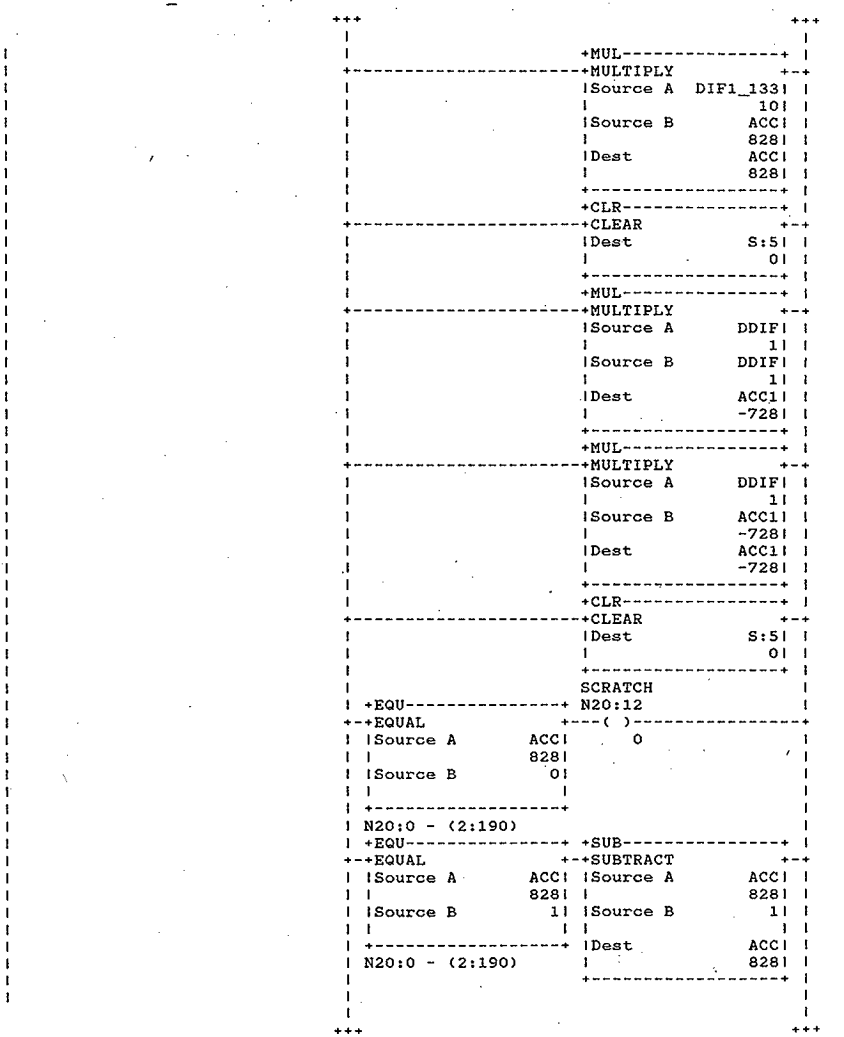
Rung 2:766
|   76                                                                    N20:10
|--[LBL]-------------------------------------------------------------------( )----
|                                                                            14

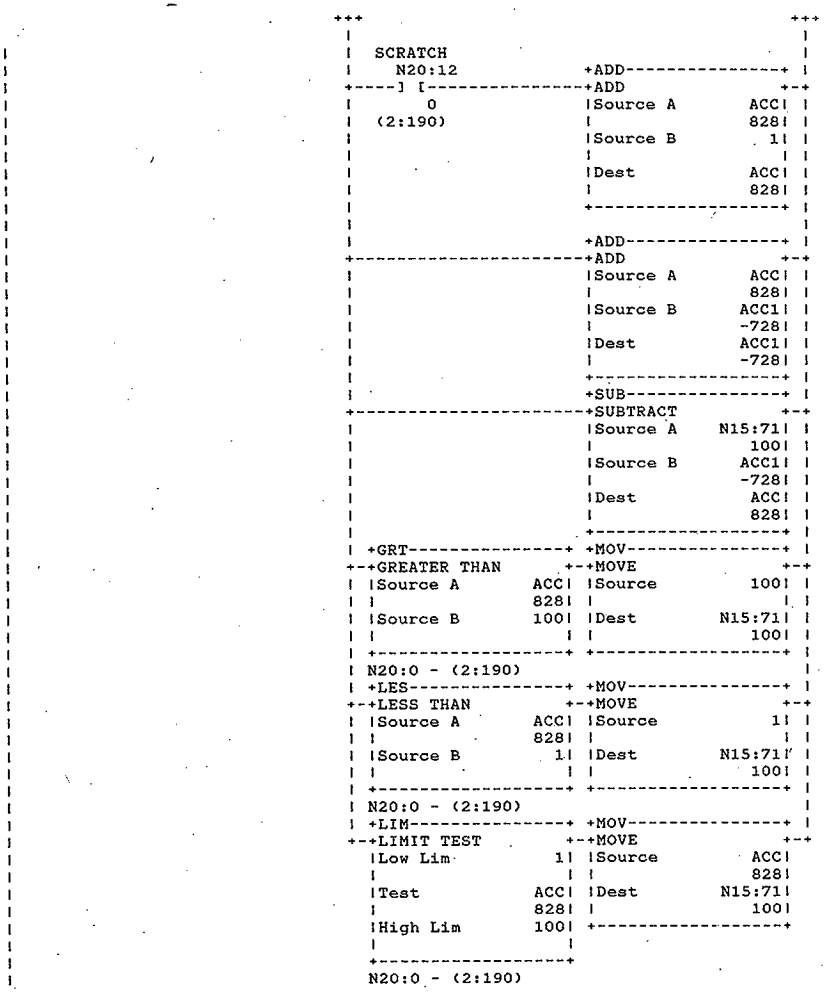
Rung 2:767
|                                                                      PID133
| RT_TMR/DN
|   T4:62                                                                   39
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

Rung 2:768

RATE CHECKING




MUL
MULTIPLY
Source A DIF1_133
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
0
EQU
EQUAL
Source A ACC
828
Source B 0
N20:0 - (2:190)
EQU
EQUAL
Source A ACC
828
Source B 1
N20:0 - (2:190)
SUB
SUBTRACT
Source A ACC
828
Source B 1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A ACC
828
Source B 1
Dest ACC
828
ADD
Source A ACC
828
Source B ACC1
-728
Dest ACC1
-728
SUB
SUBTRACT
Source A N15:71
100
Source B ACC1
-728
Dest ACC
828
GRT
GREATER THAN
Source A ACC
828
Source B 100
MOV
MOVE
Source 100
Dest N15:71
100
N20:0 - (2:190)
LES
LESS THAN
Source A ACC
828
Source B 1
MOV
MOVE
Source 1
Dest N15:71
100
N20:0 - (2:190)
LIM
LIMIT TEST
Low Lim 1
Test ACC
828
High Lim 100
MOV
MOVE
Source ACC
828
Dest N15:71
100
N20:0 - (2:190)

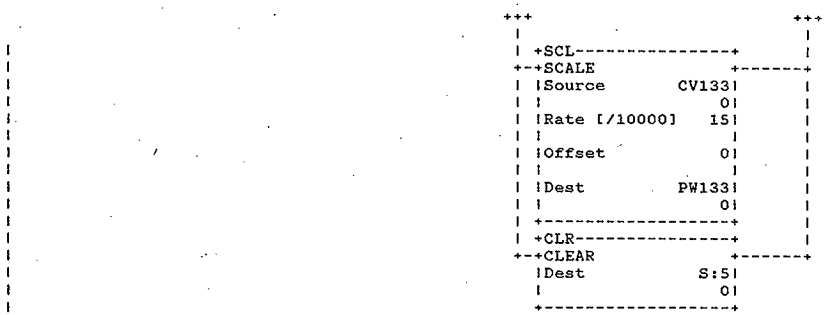
```
Rung 2:769
| PID133
|                                                                    DUMMY38
|      39                                                             N20:9
|---[LBL]-------------------------------------------------------------( )----
|                                                                        5

Rung 2:770
                 , DETECT FROM SCADA PID ON/OFF
                          IF PID OFF
                  THEN ZERO PW FOR ZERO OUTPUT AT  SCR
                    AND JUMP AROUND THE PID BLOCK
|   ON133
|    N7:120                                          +CLR---------------+
|----]/[-------------------------------------------+-+CLEAR             +-+--
|      13                                          | |Dest         PW133| |
|  (3:25)                                          | |                 0| |
|                                                  | +------------------+ |
|                                                  |                      |
|                                                  |   77                 |
|                                                  +--(JMP)---------------+
|

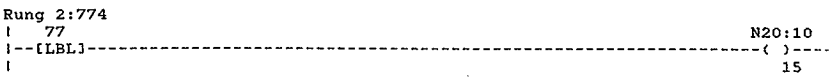
Rung 2:771
                 DETECT AUTO/MANUAL FROM SCADA
                 SET APPROPRIATE MODE IN PID BLOCK
|   AM133                                                            PID133/1
|    N7:120                                                           N15:60
|----]/[-------------------------------------------------------------( )----
|      12                                                                1
|  (3:25)

Rung 2:772
                 DETECT SETPOINT VALUE FROM SCADA
                 PUT VALUE IN PID BLOCK
|                                                      +MOV---------------+
|-----------------------------------------------------+MOVE              +--
|                                                      |Source      SET133|
|                                                      |                 0|
|                                                      |Dest      PIDSP133|
|                                                      |                 0|
|                                                      +------------------+

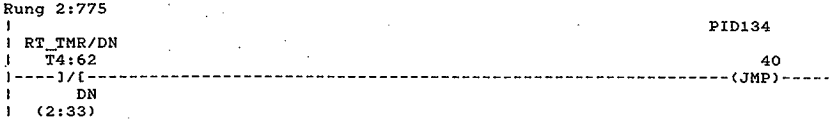
Rung 2:773
|                                                 +PID-------------------+
|-------------------------------------------------+-+PID                 +-+--
|                                                | |Control Block    PID133| |
|                                                | |Process Variable  AV133| |
|                                                | |Control Variable  CV133| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                |                           |
                                                +++                         +++
```



Rung 2:774

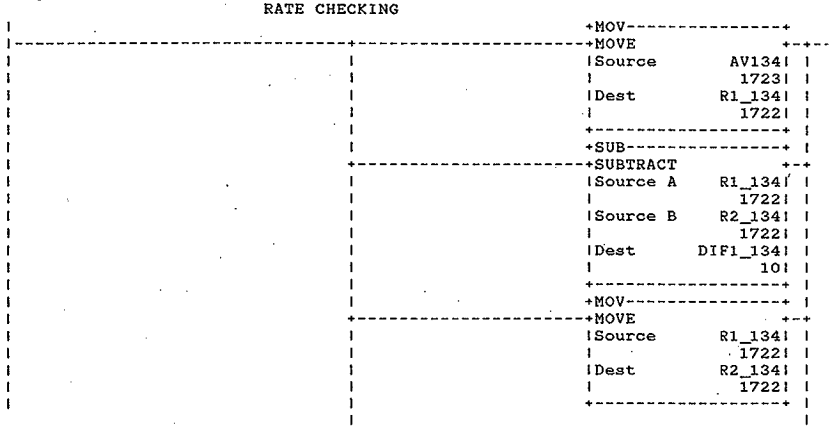


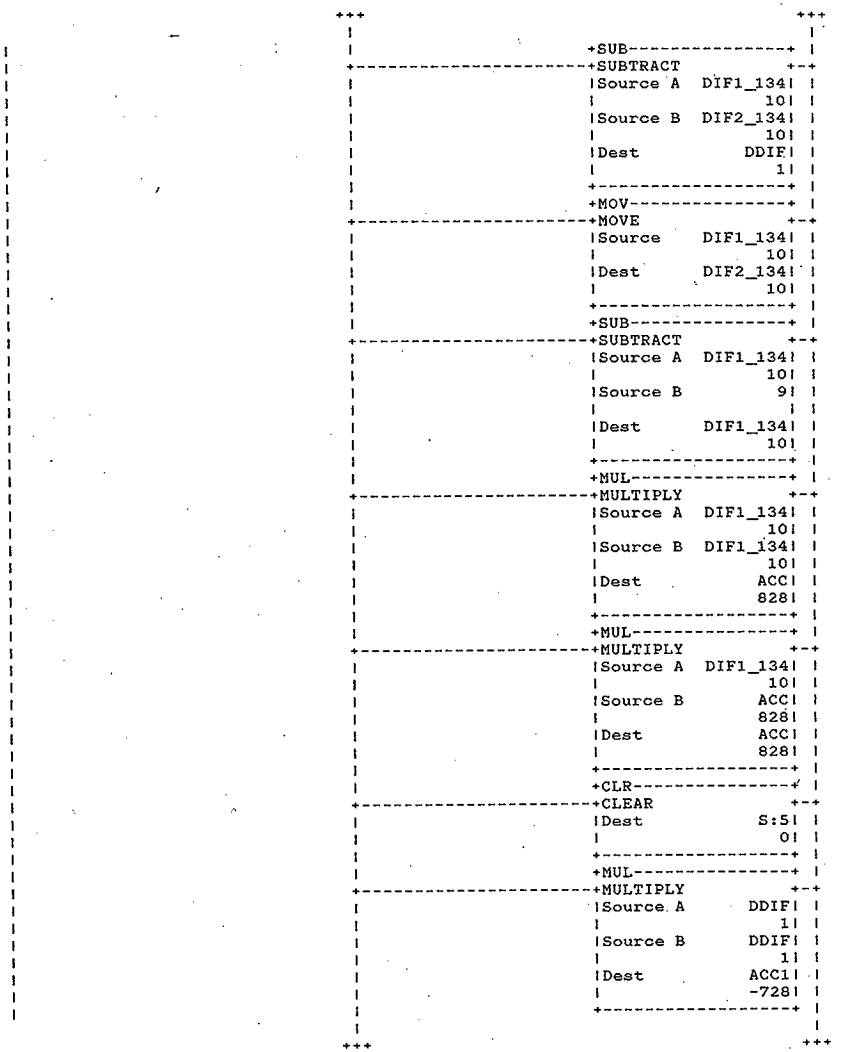
Rung 2:775

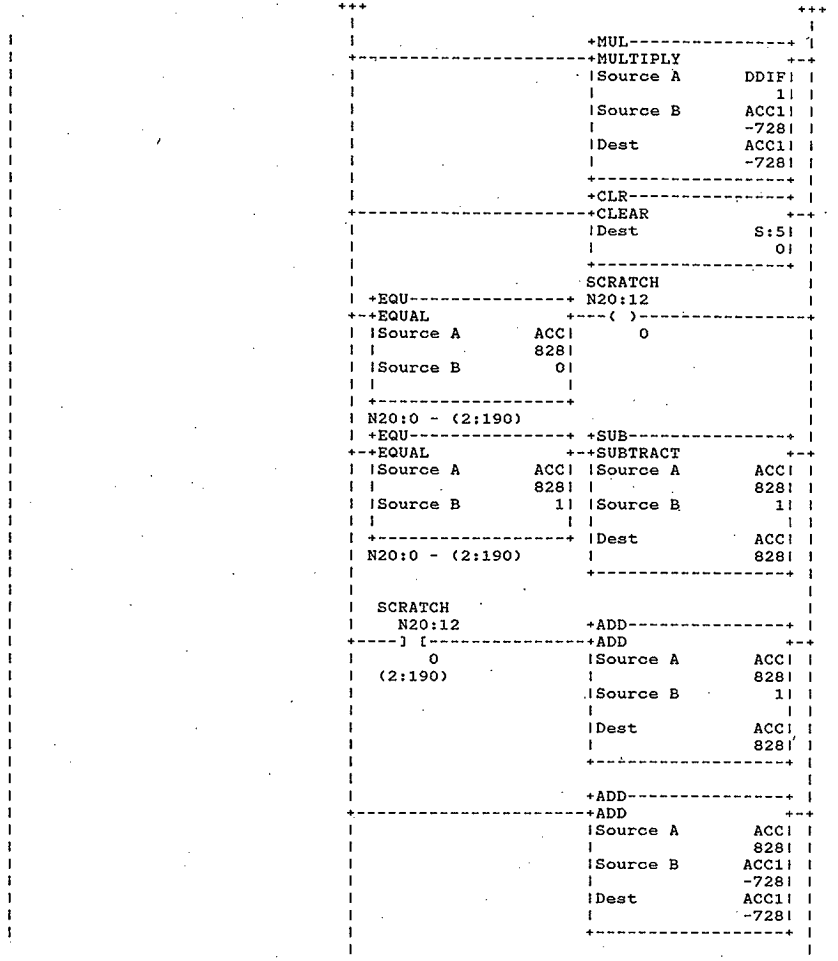


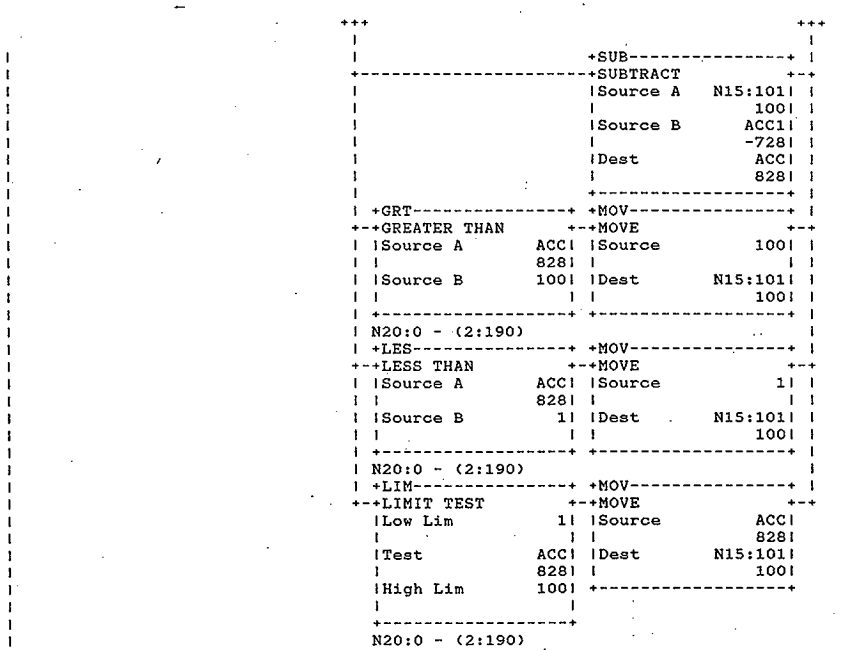
Rung 2:776

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_134 10
Source B DIF2_134 10
Dest DDIF 1
MOV
MOVE
Source DIF1_134 10
Dest DIF2_134 10
SUB
SUBTRACT
Source A DIF1_134 10
Source B 9
Dest DIF1_134 10
MUL
MULTIPLY
Source A DIF1_134 10
Source B DIF1_134 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_134 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC1 -728

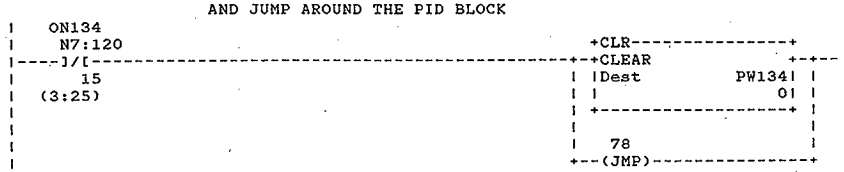

+EQU
+EQUAL
Source A ACC 828
Source B 0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
SCRATCH N20:12
0 (2:190)
+MUL
+MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
+CLEAR
Dest S:5 0
SCRATCH N20:12
( )
0
+SUB
+SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
+ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
+ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728



Rung 2:777

Rung 2:778

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:779
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM134                                                                  PID134/1
|    N7:120                                                                N15:90
|----]/[-------------------------------------------------------------------( )-----
|      14                                                                      1
|  (3:25)

Rung 2:780
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source      SET134|
|                                                          |                 0|
|                                                          |Dest      PIDSP134|
|                                                          |                 0|
|                                                          +------------------+

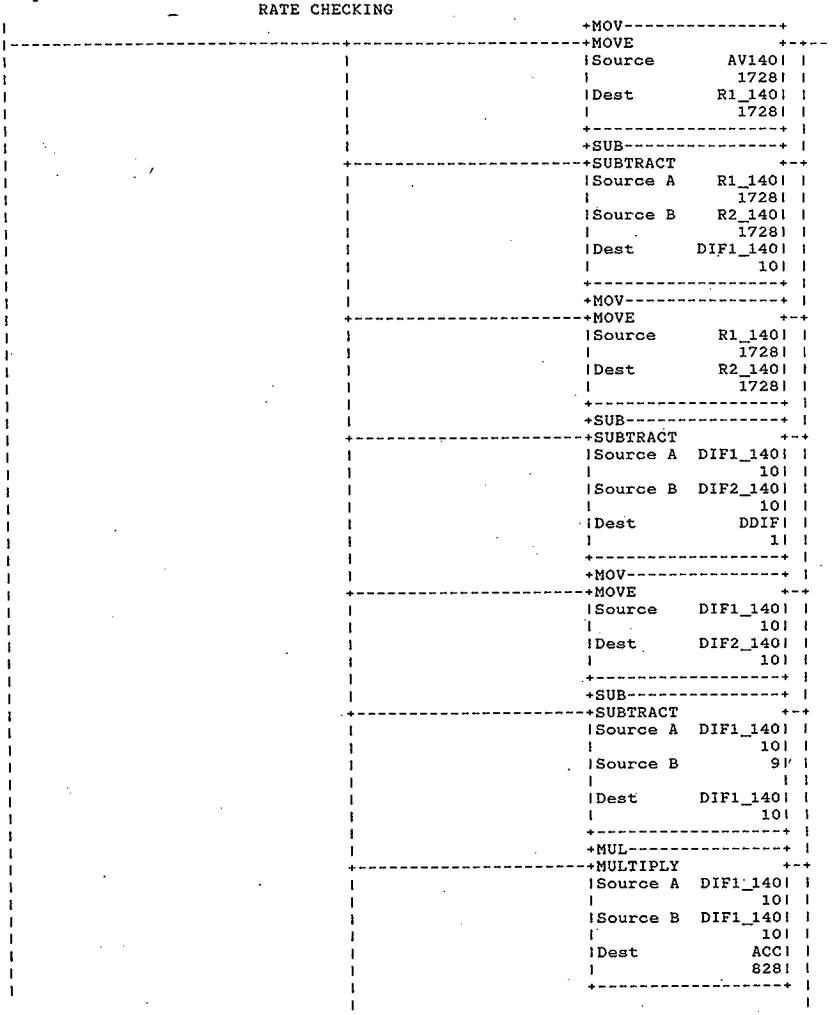
Rung 2:781
|                                                    +PID--------------------+
|----------------------------------------------------+-+PID                  +-+--
|                                                  | |Control Block    PID134| |
|                                                  | |Process Variable  AV134| |
|                                                  | |Control Variable  CV134| |
|                                                  | |Control Block Length 23| |
|                                                  | +----------------------+ |
|                                                  | +SCL---------------+      |
|                                                  +-+SCALE             +------+
|                                                  | |Source       CV134|      |
|                                                  | |                 0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                  |      |
|                                                  | |Offset           0|      |
|                                                  | |                  |      |
|                                                  | |Dest         PW134|      |
|                                                  | |                 0|      |
|                                                  | +------------------+      |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

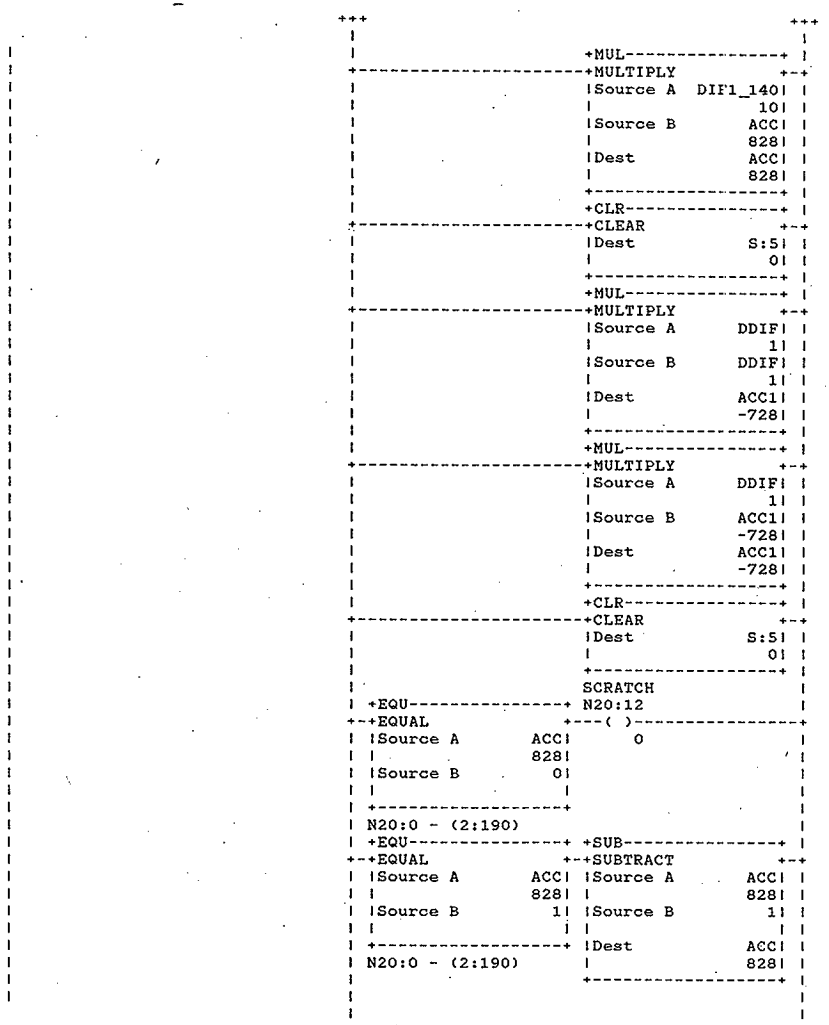
Rung 2:782
|   78                                                                     N20:11
|--[LBL]-------------------------------------------------------------------( )----
|                                                                              0

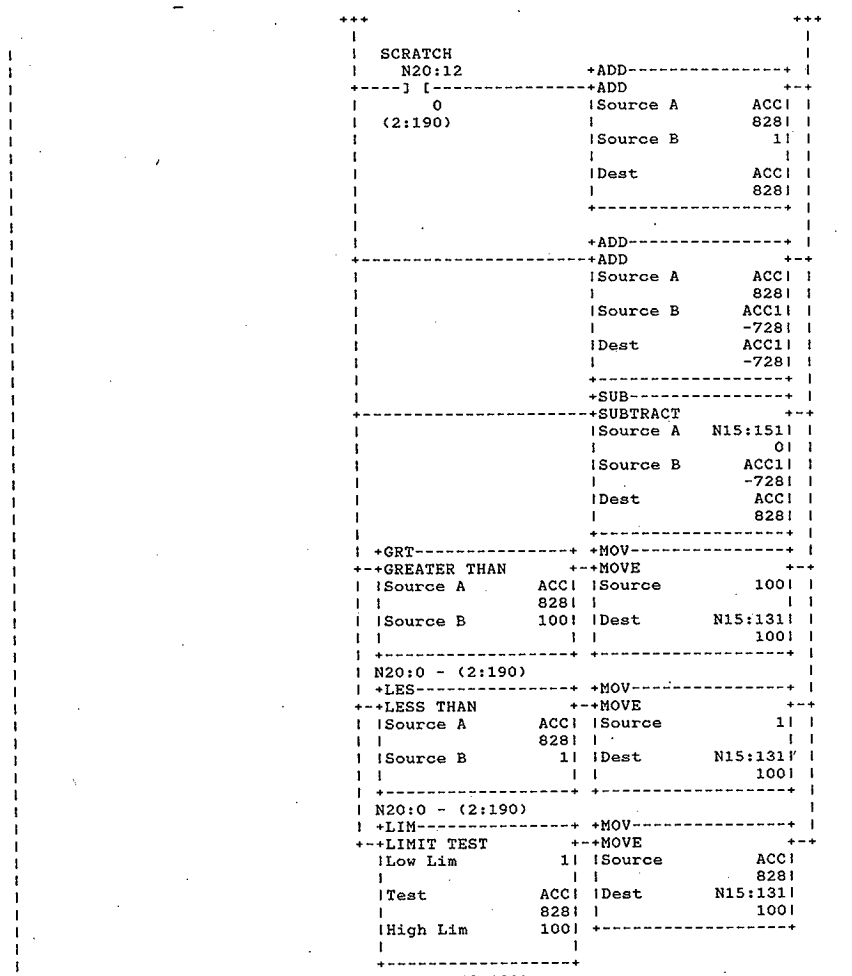
Rung 2:783
|                                                                        PID140
| RT_TMR/DN
|   T4:62                                                                     41
|----]/[-------------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

Rung 2:784

RATE CHECKING




+MUL
+MULTIPLY
Source A DIF1_140
10
Source B ACC
828
Dest ACC
828
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
+MUL
+MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
+CLR
+CLEAR
Dest S:5
0
SCRATCH
+EQU
N20:12
+EQUAL
Source A ACC
828
Source B
0
( )
0
N20:0 - (2:190)
+EQU
+EQUAL
Source A ACC
828
Source B
1
N20:0 - (2:190)
+SUB
+SUBTRACT
Source A ACC
828
Source B
1
Dest ACC
828


SCRATCH
N20:12
0
(2:190)
ADD
Source A
828
Source B
1
Dest
828
ADD
Source A
828
Source B
-728
Dest
-728
SUB
SUBTRACT
Source A
N15:151
0
Source B
-728
Dest
828
GRT
GREATER THAN
Source A
828
Source B
100
N20:0 - (2:190)
MOV
MOVE
Source
100
Dest
N15:131
100
LES
LESS THAN
Source A
828
Source B
1
N20:0 - (2:190)
MOV
MOVE
Source
1
Dest
N15:131
100
LIM
LIMIT TEST
Low Lim
1
Test
828
High Lim
100
N20:0 - (2:190)
MOV
MOVE
Source
828
Dest
N15:131
100

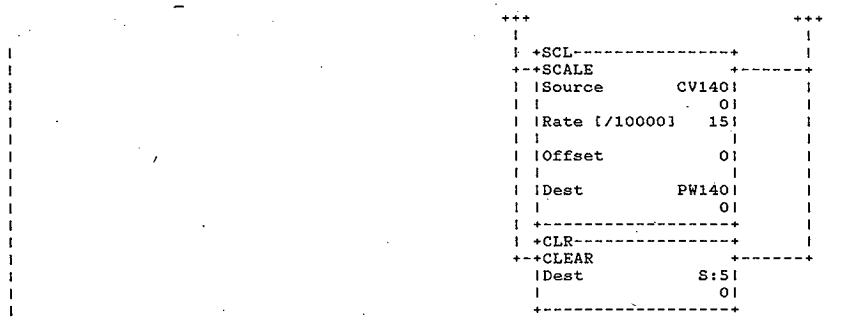
```
Rung 2:785
| PID140
|                                                                    DUMMY40
|      41                                                             N20:9
|---[LBL]-------------------------------------------------------------( )----
|                                                                        7

Rung 2:786
                 DETECT FROM SCADA PID ON/OFF
                          IF PID OFF
                 THEN ZERO PW FOR ZERO OUTPUT AT  SCR
                   AND JUMP AROUND THE PID BLOCK
|   ON140
|    N7:121                                          +CLR---------------+
|----]/[-------------------------------------------+-+CLEAR             +-+--
|       1                                          | |Dest         PW140| |
|  (3:26)                                          | |                 0| |
|                                                  | +------------------+ |
|                                                  |                      |
|                                                  |   79                 |
|                                                  +--(JMP)---------------+
|

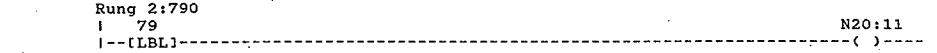
Rung 2:787
                 DETECT AUTO/MANUAL FROM SCADA
                 SET APPROPRIATE MODE IN PID BLOCK
|   AM140                                                            PID140/0
|    N7:121                                                          N15:120
|----]/[-------------------------------------------------------------( )-----
|       0                                                                0
|  (3:26)

Rung 2:788
                 DETECT SETPOINT VALUE FROM SCADA
                 PUT VALUE IN PID BLOCK
|                                                      +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                      |Source      SET140|
|                                                      |                 0|
|                                                      |Dest      PIDSP140|
|                                                      |                 0|
|                                                      +------------------+

Rung 2:789
|                                                 +PID--------------------+
|-------------------------------------------------+-+PID                  +-+--
|                                                | |Control Block    PID140| |
|                                                | |Process Variable  AV140| |
|                                                | |Control Variable  CV140| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                |                           |
                                                +++                         +++
```

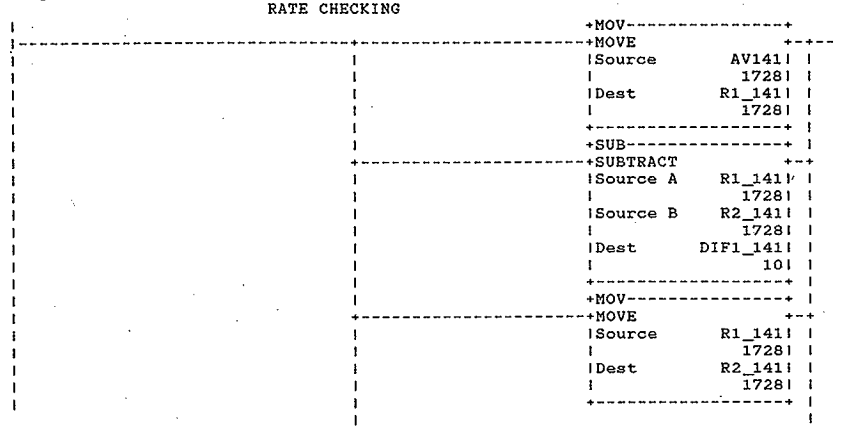


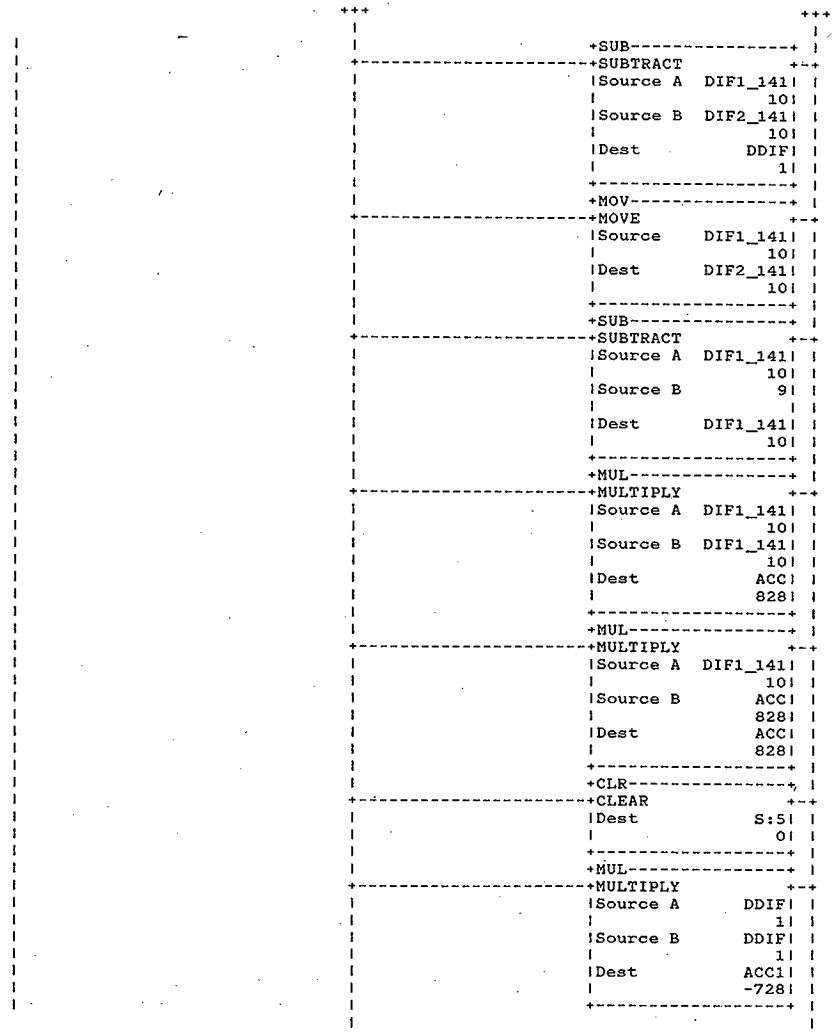
Rung 2:790

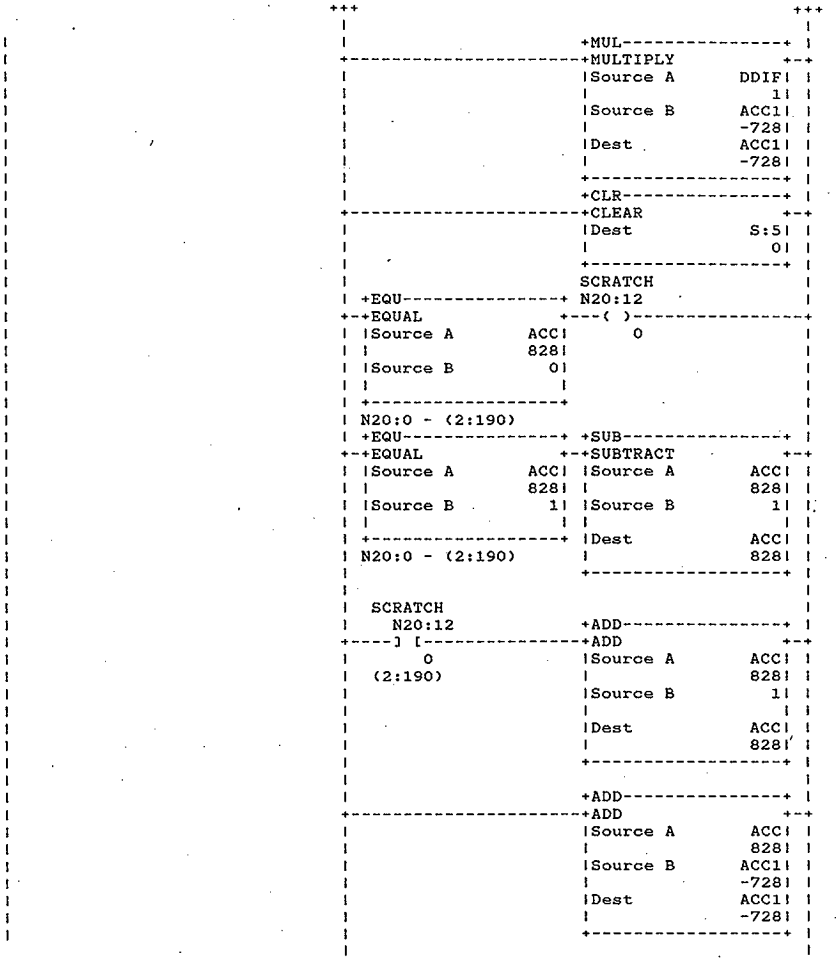


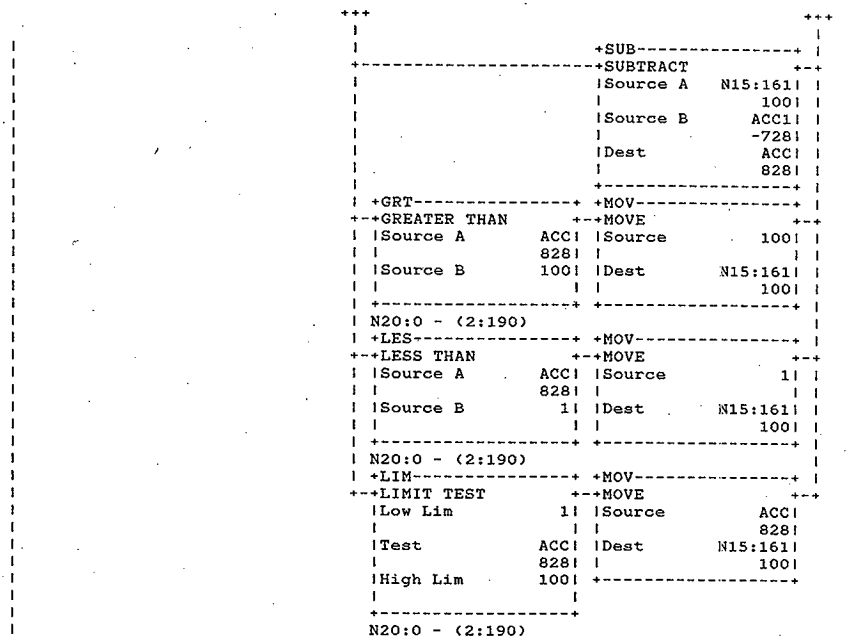
Rung 2:791

Rung 2:792

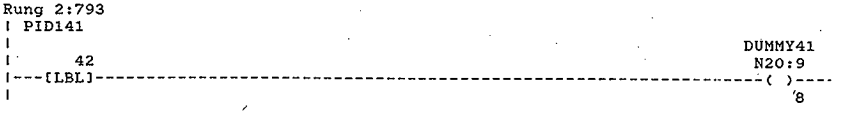



SUB
SUBTRACT
Source A DIF1_141 10
Source B DIF2_141 10
Dest DDIF 1
MOV
MOVE
Source DIF1_141 10
Dest DIF2_141 10
SUB
SUBTRACT
Source A DIF1_141 10
Source B 9
Dest DIF1_141 10
MUL
MULTIPLY
Source A DIF1_141 10
Source B DIF1_141 10
Dest ACC 828
MUL
MULTIPLY
Source A DIF1_141 10
Source B ACC 828
Dest ACC 828
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF 1
Source B DDIF 1
Dest ACC 1 -728


+MUL
MULTIPLY
Source A DDIF 1
Source B ACC1 -728
Dest ACC1 -728
+CLR
CLEAR
Dest S:5 0
SCRATCH
N20:12
+EQU
EQUAL
Source A ACC 828
Source B 0
( )
0
N20:0 - (2:190)
+EQU
EQUAL
Source A ACC 828
Source B 1
N20:0 - (2:190)
+SUB
SUBTRACT
Source A ACC 828
Source B 1
Dest ACC 828
SCRATCH
N20:12
[
0
(2:190)
+ADD
ADD
Source A ACC 828
Source B 1
Dest ACC 828
+ADD
ADD
Source A ACC 828
Source B ACC1 -728
Dest ACC1 -728

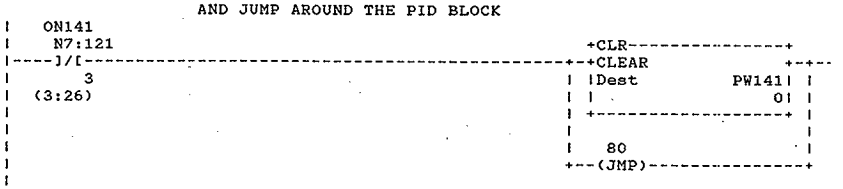


Rung 2:793



Rung 2:794

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:795
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM141                                                                  PID141/1
|    N7:121                                                                N15:150
|----]/[-------------------------------------------------------------------( )-----
|       2                                                                      1
|  (3:26)

Rung 2:796
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source      SET141|
|                                                          |                 0|
|                                                          |Dest      PIDSP141|
|                                                          |                 0|
|                                                          +------------------+

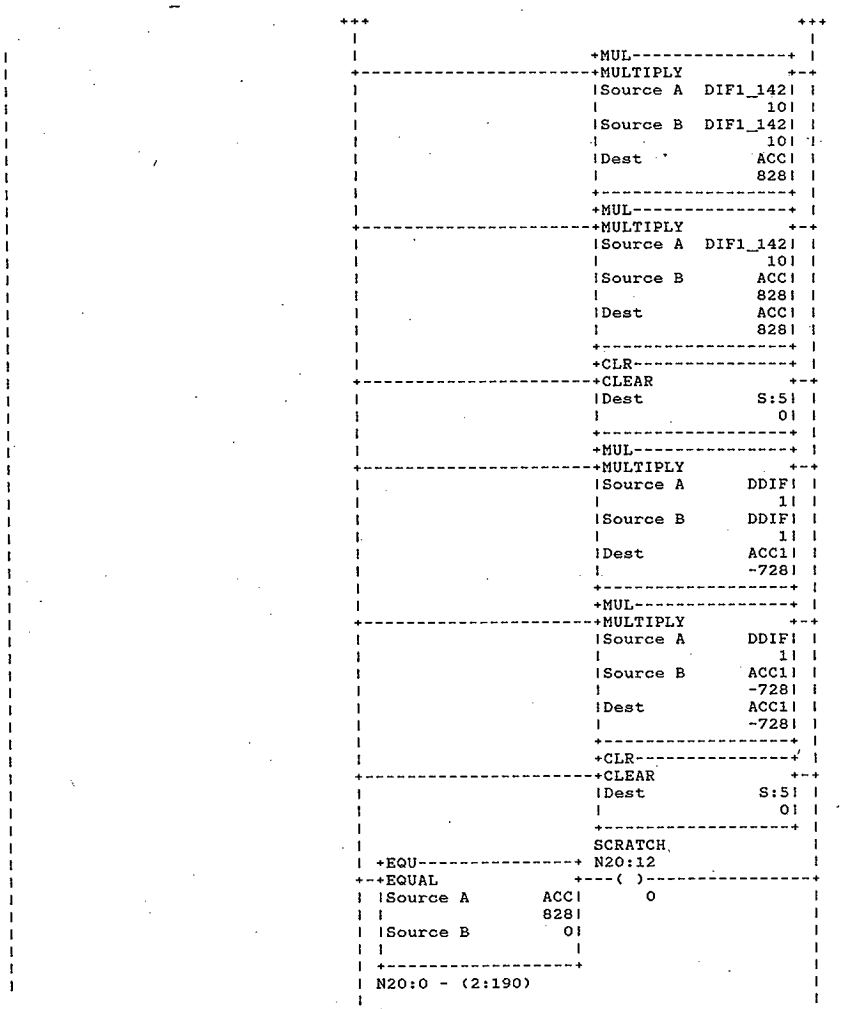
Rung 2:797
|                                                    +PID--------------------+
|----------------------------------------------------+-+PID                  +-+--
|                                                  | |Control Block    PID141| |
|                                                  | |Process Variable  AV141| |
|                                                  | |Control Variable  CV141| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL---------------+      |
|                                                  +-+SCALE             +------+
|                                                  | |Source       CV141|      |
|                                                  | |                 0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                  |      |
|                                                  | |Offset           0|      |
|                                                  | |                  |      |
|                                                  | |Dest         PW141|      |
|                                                  | |                 0|      |
|                                                  | +------------------+      |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

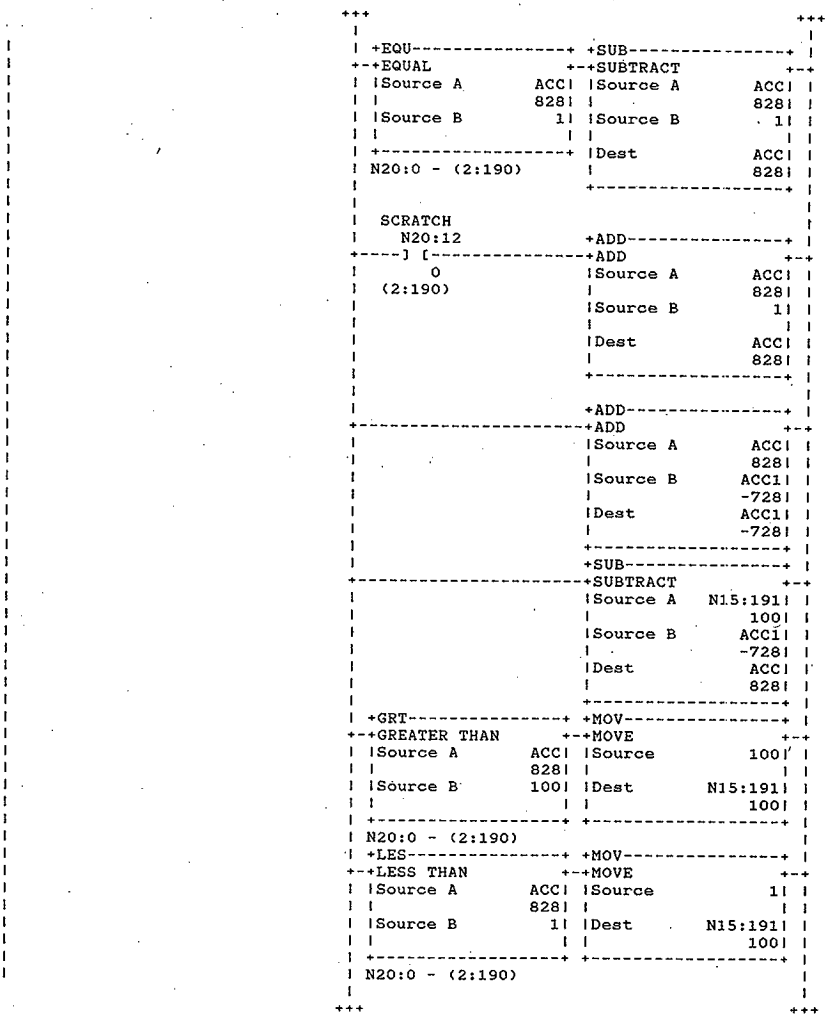
Rung 2:798
|   80                                                                    N20:11
|--[LBL]-------------------------------------------------------------------( )----
|                                                                              2

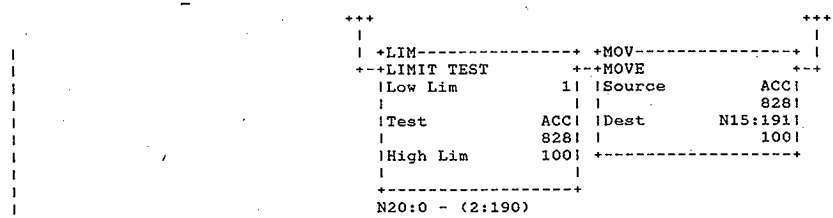
Rung 2:799
|                                                                      PID142
| RT_TMR/DN
|   T4:62                                                                   43
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:33)
```

```
Rung 2:800
| RT_TMR/DN                                                                  DNR_4
|   T4:62                                                                    N20:5
|----] [-------------------------------------------------------------------(L)---
|      DN                                                                       8
|  (2:33)

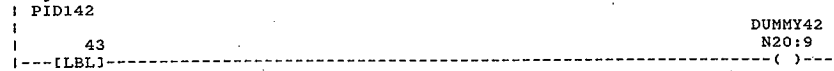
Rung 2:801
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+-----------------------+MOVE              +-+--
|                               |                       |Source       AV142| |
|                               |                       |               1729| |
|                               |                       |Dest        R1_142| |
|                               |                       |               1729| |
|                               |                       +-------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A    R1_142| |
|                               |                       |               1729| |
|                               |                       |Source B    R2_142| |
|                               |                       |               1729| |
|                               |                       |Dest      DIF1_142| |
|                               |                       |                 10| |
|                               |                       +-------------------+ |
|                               |                       +MOV---------------+ |
|                               +-----------------------+MOVE              +-+
|                               |                       |Source      R1_142| |
|                               |                       |               1729| |
|                               |                       |Dest        R2_142| |
|                               |                       |               1729| |
|                               |                       +-------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A  DIF1_142| |
|                               |                       |                 10| |
|                               |                       |Source B  DIF2_142| |
|                               |                       |                 10| |
|                               |                       |Dest          DDIF| |
|                               |                       |                  1| |
|                               |                       +-------------------+ |
|                               |                       +MOV---------------+ |
|                               +-----------------------+MOVE              +-+
|                               |                       |Source    DIF1_142| |
|                               |                       |                 10| |
|                               |                       |Dest      DIF2_142| |
|                               |                       |                 10| |
|                               |                       +-------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A  DIF1_142| |
|                               |                       |                 10| |
|                               |                       |Source B          9| |
|                               |                       |                   | |
|                               |                       |Dest      DIF1_142| |
|                               |                       |                 10| |
|                               |                       +-------------------+ |
|                               |                                             |
                              +++                                           +++
```


MUL
MULTIPLY
Source A DIF1_142
10
Source B DIF1_142
10
Dest ACC
828
MUL
MULTIPLY
Source A DIF1_142
10
Source B ACC
828
Dest ACC
828
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF
1
Source B DDIF
1
Dest ACC1
-728
MUL
MULTIPLY
Source A DDIF
1
Source B ACC1
-728
Dest ACC1
-728
CLR
CLEAR
Dest S:5
0
SCRATCH
N20:12
0
EQU
EQUAL
Source A ACC
828
Source B
0
N20:0 - (2:190)


EQU
EQUAL
Source A
828
Source B
1
N20:0 - (2:190)
SUB
SUBTRACT
Source A
828
Source B
1
Dest
828
SCRATCH
N20:12
0
(2:190)
ADD
ADD
Source A
828
Source B
1
Dest
828
ADD
ADD
Source A
828
Source B
ACC1
-728
Dest
ACC1
-728
SUB
SUBTRACT
Source A
N15:191
100
Source B
ACC1
-728
Dest
ACC
828
GRT
GREATER THAN
Source A
828
Source B
100
N20:0 - (2:190)
MOV
MOVE
Source
100
Dest
N15:191
100
LES
LESS THAN
Source A
828
Source B
1
N20:0 - (2:190)
MOV
MOVE
Source
1
Dest
N15:191
100

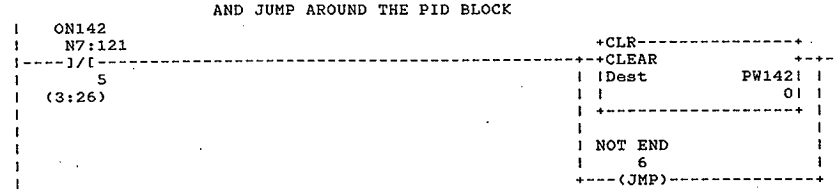


Rung 2:802



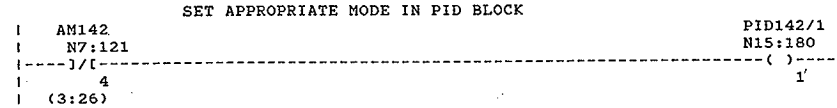
Rung 2:803

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



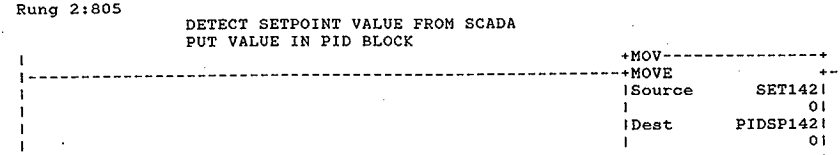
Rung 2:804

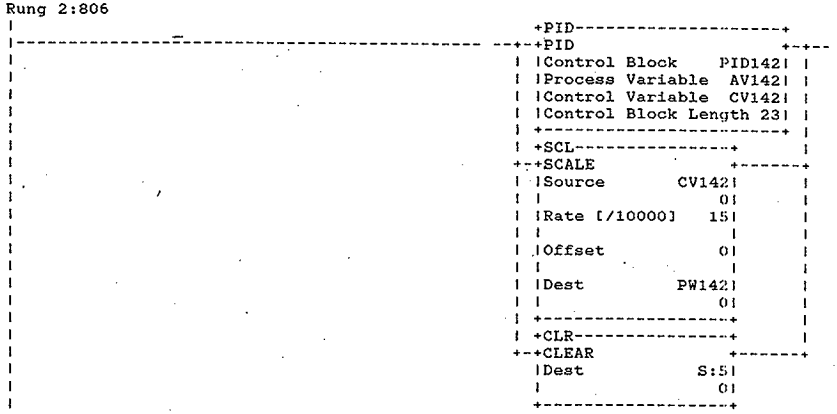
DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

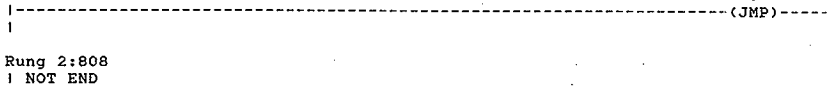


Rung 2:805

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK







```
Rung 2:806
|                                                    +PID--------------------+
|-------------------------------------------------+-+PID                     +-+--
|                                                 | |Control Block    PID142| |
|                                                 | |Process Variable  AV142| |
|                                                 | |Control Variable  CV142| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 | +SCL---------------+      |
|                                                 +-+SCALE             +------+
|                                                 | |Source       CV142|      |
|                                                 | |                 0|      |
|                                                 | |Rate [/10000]   15|      |
|                                                 | |                  |      |
|                                                 | |Offset            0|      |
|                                                 | |                  |      |
|                                                 | |Dest         PW142|      |
|                                                 | |                 0|      |
|                                                 | +------------------+      |
|                                                 | +CLR---------------+      |
|                                                 +-+CLEAR             +------+
|                                                   |Dest           S:5|
|                                                   |                 0|
|                                                   +------------------+

Rung 2:807
|                                                                    NOT END
|                                                                       6
|-------------------------------------------------------------------(JMP)-----
|

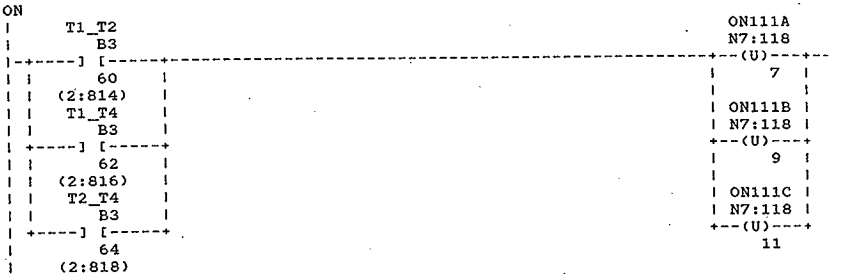
Rung 2:808
| NOT END
|                                                                     DUMMY2
|     6                                                               N20:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                        1

Rung 2:809
|                                                          +CLR---------------+
|-------------------------------------------------------+CLEAR             +--
|                                                          |Dest           S:5|
|                                                          |                 0|
|                                                          +------------------+

Rung 2:810
*******************************************************************************
IF ANY TANK PAIR ON NOT INCLUDING  T-3002 THEN DO NOT LET ANY TANK-2 ZONE COME
ON
|     T1_T3                                                          ON110A
|        B3                                                          N7:118
|-+----] [-----+-------------------------------------------------+--(U)---+--
| |       61   |                                                 |     1  |
| |   (2:815)  |                                                 |        |
| |    T1_T4   |                                                 | ON110B |
| |       B3   |                                                 | N7:118 |
| +----] [-----+                                                 +--(U)---+
| |       62   |                                                 |     3  |
| |   (2:816)  |                                                 |        |
  |            |                                                 |        |
 +++          +++                                               +++      +++
```

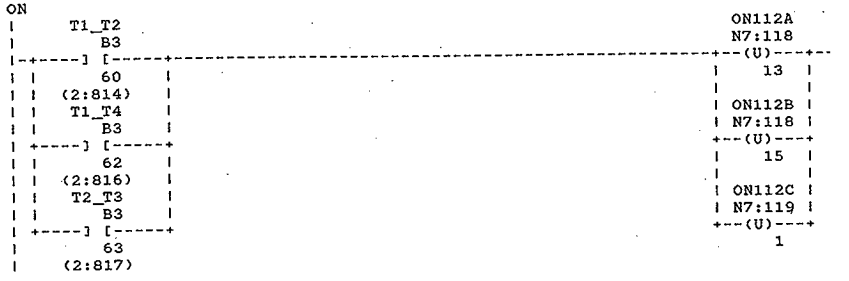
Rung 2:811

IF ANY TANK PAIR ON NOT INCLUDING T-3003 THEN DO NOT LET ANY TANK-3 ZONES COME ON



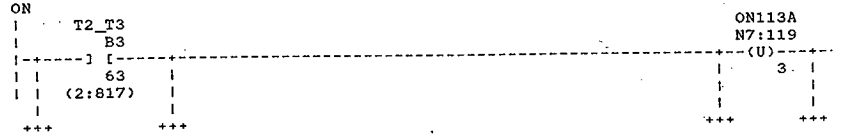
Rung 2:812

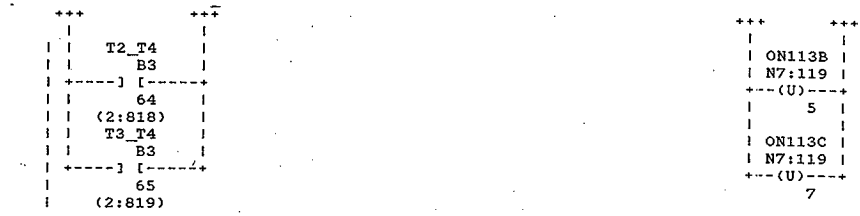
IF ANY TANK PAIR ON NOT INCLUDING T-3004 THEN DO NOT LET ANY TANK-4 ZONES COME ON



Rung 2:813

IF ANY TANK PAIR ON NOT INCLUDING T-3001 THEN DO NOT LET ANY TANK-1 ZONES COME ON





Rung 2:814

IF TANK-1 AND TANK-2 ARE ENABLED THEN SET THE PAIR_ON BIT

TNK T-3001 | TNK T-3002

ENABLE_T1 B3 24 (2:827) — ENABLE_T2 B3 21 (2:821) — T1_T2 B3 60

Rung 2:815

IF T-3001 AND T-3003 ARE ENABLED THEN SET THE PAIR_ON BIT

TNK T-3001 | TNK T-3003

ENABLE_T1 B3 24 (2:827) — ENABLE_T3 B3 22 (2:823) — T1_T3 B3 61

Rung 2:816

IF T-3001 AND T-3004 ARE ENABLED THEN SET THE PAIR_ON BIT

TNK T-3001 | TNK T-3004

ENABLE_T1 B3 24 (2:827) — ENABLE_T4 B3 23 (2:825) — T1_T4 B3 62

Rung 2:817

IF T-3003 AND T-3002 ARE ENABLED THEN SET THE PAIR_ON BIT

TNK T-3003 | TNK T-3002

ENABLE_T3 B3 22 (2:823) — ENABLE_T2 B3 21 (2:821) — T2_T3 B3 63

```
Rung 2:818
*******************************************************************************
        IF T-3004 AND T-3002 ARE ENABLED THEN SET THE PAIR_ON BIT

| TNK T-3004|TNK T-3002
|           |
|           |
| ENABLE_T4  ENABLE_T2                                                  T2_T4
|      B3         B3                                                     B3
|----] [--------] [-------------------------------------------------------( )---
|      23         21                                                       64
|  (2:825)    (2:821)

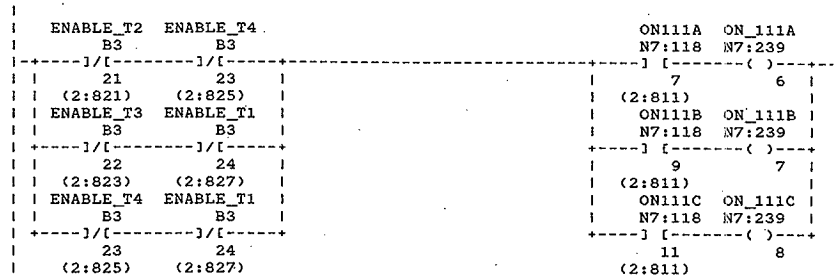
Rung 2:819
*******************************************************************************
        IF T-3003 AND T-3004 ARE ENABLED THEN SET THE PAIR_ON BIT
| TNK T-3003|TNK T-3004
|           |
| ENABLE_T3  ENABLE_T4                                                  T3_T4
|      B3         B3                                                     B3
|----] [--------] [-------------------------------------------------------( )---
|      22         23                                                       65
|  (2:823)    (2:825)

Rung 2:820
*****        AS LONG AS A PAIR OF TANKS HAVE NOT BEEN ENABLED LET T-3002
ZONES COME ON AS SELECTED
|   ENABLE_T3  ENABLE_T4                                  ON110A  ON_110A
|        B3         B3                                    N7:118  N7:239
|-+----]/[--------]/[-----+-------------------------------+----] [-------( )---+--
| |      22         23    |                               |       1         3  |
| |  (2:823)    (2:825)   |                               |  (2:810)           |
| | ENABLE_T3  ENABLE_T1  |                               |    ON110B  ON_110B |
| |      B3         B3    |                               |    N7:118  N7:239  |
| +----]/[--------]/[-----+                               +----] [-------( )---+
| |      22         24    |                               |       3         4  |
| |  (2:823)    (2:827)   |                               |  (2:810)           |
| | ENABLE_T4  ENABLE_T1  |                               |    ON110C  ON_110C |
| |      B3         B3    |                               |    N7:118  N7:239  |
| +----]/[--------]/[-----+                               +----] [-------( )---+
|        23         24                                            5         5
|    (2:825)    (2:827)                                     (2:810)

Rung 2:821
*******************************************************************************
   IF ANY TANK ZONE IS SELECTED SET THE ENABLE BIT FOR TANK PAIR COMPARISONS
|
|    ON_110A                                                        ENABLE_T2
|      N7:239                                                          B3
|-+----] [-----+-------------------------------------------------------( )------
| |       3    |                                                       21
| |  (2:820)   |
| |  ON_110B   |
| |    N7:239  |
| +----] [-----+
| |       4    |
| |  (2:820)   |
  |            |
 +++          +++
```

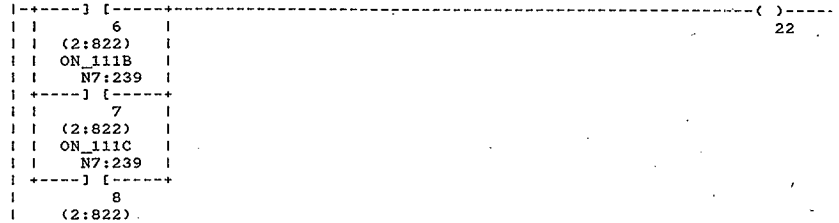
Rung 2:822

***** AS LONG AS A PAIR OF TANKS HAVE NOT BEEN ENABLED LET T-3003 ZONES COME ON AS SELECTED



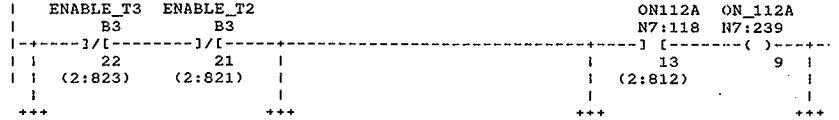
Rung 2:823

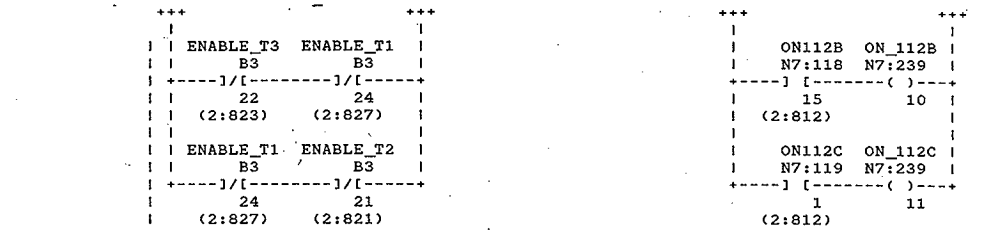
IF ANY TANK ZONE IS SELECTED SET THE ENABLE BIT FOR TANK PAIR COMPARISONS



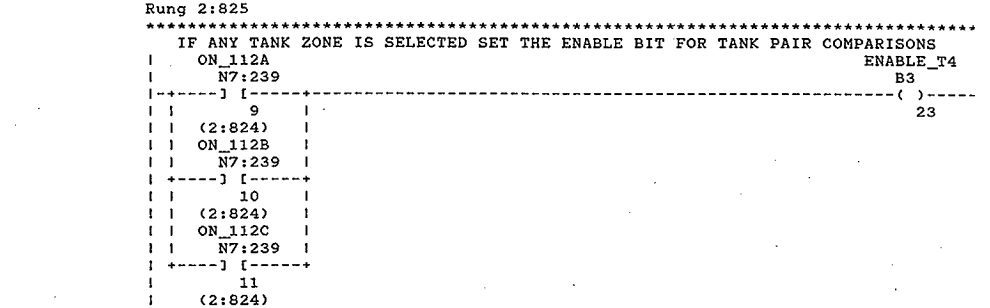
Rung 2:824

***** AS LONG AS A PAIR OF TANKS HAVE NOT BEEN ENABLED LET T-3004 COME ON AS SELECTED

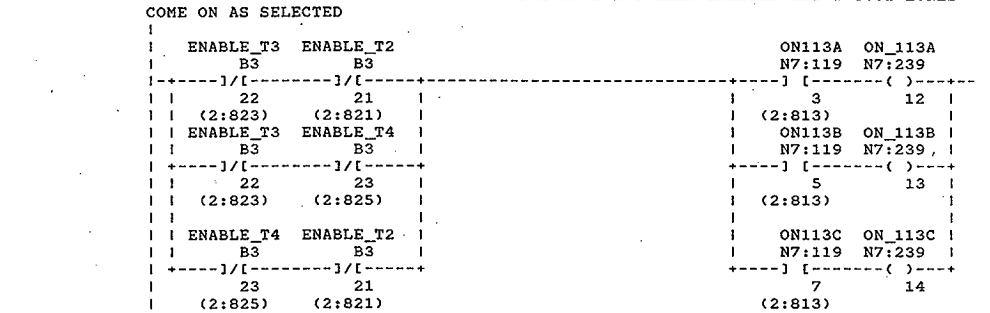




Rung 2:825



Rung 2:826



Rung 2:827

```
*******************************************************************************
   IF ANY TANK ZONE IS SELECTED SET THE ENABLE BIT FOR TANK PAIR COMPARISONS
|    ON_113A                                                          ENABLE_T1
|      N7:239                                                           B3
|-+----] [-----+-------------------------------------------------------( )-----
| |       12    |                                                        24
| |  (2:826)    |
| |  ON_113B    |
| |    N7:239   |
| +----] [-----+
| |       13    |
| |  (2:826)    |
| |  ON_113C    |
| |    N7:239   |
| +----] [-----+
|         14
|    (2:826)
```

Rung 2:828

** FIRE SCRs **
TANK ZONES

There is one timer for each zone. Each timer is reset when it reaches 200ms. The zone's SCR is turned on when the timer is less than the zone's pulse width (PW). Note: no more than two tanks can be enabled at the same time.

```
|  ON_110A
|    N7:239                                          +TON---------------+
|----] [---------------------------------------------+TIMER ON DELAY    +-(EN)--
|       3                                            |Timer      TMR110A+-(DN)
|  (2:820)                                           |Time Base     0.01|
|                                                    |Preset          25|
|                                                    |Accum            0|
|                                                    +------------------+
|
```

Rung 2:829

```
| TMR110A/DN                                                          TMR110A
|     T4:1                                                             T4:1
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:828)
```

Rung 2:830

```
|  ON_110A                                                            SCR_110A
|    N7:239  +LES--------------------+                                  0:25
|----] [-----+LESS THAN              +-----------------------------------( )-----
|       3    |Source A    TMR110A.ACC|                                     0
|  (2:820)   |                     0|
|            |Source B          PW110A|
|            |                     0|
|            +----------------------+
|            T4:1.ACC - (2:828)
|            N7:182 - (2:192)
```

```
Rung 2:831
|  ON_110B
|    N7:239                                                    +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|       4                                                      |Timer      TMR110B+-(DN)
|  (2:820)                                                     |Time Base     0.01|
|                                                              |Preset          25|
|                                                              |Accum            0|
|                                                              +------------------+
|
|
Rung 2:832
| TMR110B/DN                                                                    TMR110B
|     T4:2                                                                       T4:2
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:831)

Rung 2:833
|  ON_110C                                                                      SCR_110B
|    N7:239  +LES--------------------+                                          0:25
|----] [-----+LESS THAN              +---------------------------------( )-----
|       5    |Source A    TMR110B.ACC|                                           1
|  (2:820)   |                     0|
|            |Source B          PW110B|
|            |                     0|
|            +----------------------+
|            T4:2.ACC - (2:831)
|            N7:183 - (2:200)

Rung 2:834
|  ON_110C
|    N7:239                                                    +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|       5                                                      |Timer      TMR110C+-(DN)
|  (2:820)                                                     |Time Base     0.01|
|                                                              |Preset          25|
|                                                              |Accum            0|
|                                                              +------------------+
|
|
Rung 2:835
| TMR110C/DN                                                                    TMR110C
|     T4:3                                                                       T4:3
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:834)

Rung 2:836
|  ON_110C                                                                      SCR_110C
|    N7:239  +LES--------------------+                                          0:25
|----] [-----+LESS THAN              +---------------------------------( )-----
|       5    |Source A    TMR110C.ACC|                                           2
|  (2:820)   |                     0|
|            |Source B          PW110C|
|            |                     0|
|            +----------------------+
|            T4:3.ACC - (2:834)
|            N7:184 - (2:208)
```

```
Rung 2:837
|  ON_111A
|    N7:239                                                  +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|       6                                                     |Timer      TMR111A+-(DN)
|  (2:822)                                                    |Time Base     0.01|
|                                                             |Preset          25|
|                                                             |Accum            0|
|                                                             +------------------+
|

Rung 2:838
| TMR111A/DN                                                                    TMR111A
|     T4:4                                                                       T4:4
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:837)

Rung 2:839
|  ON_111A                                                                     SCR_111A
|    N7:239  +LES--------------------+                                           0:25
|----] [-----+LESS THAN              +-----------------------------------------( )-----
|       6    |Source A    TMR111A.ACC|                                              3
|  (2:822)   |                      0|
|            |Source B         PW111A|
|            |                      0|
|            +----------------------+
|            T4:4.ACC - (2:837)
|            N7:185 - (2:216)

Rung 2:840
|  ON_111B
|    N7:239                                                  +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|       7                                                     |Timer      TMR111B+-(DN)
|  (2:822)                                                    |Time Base     0.01|
|                                                             |Preset          25|
|                                                             |Accum            0|
|                                                             +------------------+
|

Rung 2:841
| TMR111B/DN                                                                    TMR111B
|     T4:5                                                                       T4:5
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:840)

Rung 2:842
|  ON_111B                                                                     SCR_111B
|    N7:239  +LES--------------------+                                           0:25
|----] [-----+LESS THAN              +-----------------------------------------( )-----
|       7    |Source A    TMR111B.ACC|                                              4
|  (2:822)   |                      0|
|            |Source B         PW111B|
|            |                      0|
|            +----------------------+
|            T4:5.ACC - (2:840)
|            N7:186 - (2:224)
```

```
Rung 2:843
|  ON_111C
|    N7:239                                                  +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|       8                                                     |Timer      TMR111C+-(DN)
|  (2:822)                                                    |Time Base     0.01|
|                                                             |Preset          25|
|                                                             |Accum            0|
|                                                             +------------------+
|

Rung 2:844
| TMR111C/DN                                                                  TMR111C
|     T4:6                                                                     T4:6
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:843)

Rung 2:845
|  ON_111C                                                                   SCR_111C
|    N7:239  +LES--------------------+                                         0:25
|----] [-----+LESS THAN              +-----------------------------------------( )-----
|       8    |Source A    TMR111C.ACC|                                            5
|  (2:822)   |                      0|
|            |Source B         PW111C|
|            |                      0|
|            +----------------------+
|            T4:6.ACC - (2:843)
|            N7:187 - (2:233)

Rung 2:846
|  ON_112A
|    N7:239                                                  +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|       9                                                     |Timer      TMR112A+-(DN)
|  (2:824)                                                    |Time Base     0.01|
|                                                             |Preset          25|
|                                                             |Accum            0|
|                                                             +------------------+
|

Rung 2:847
| TMR112A/DN                                                                  TMR112A
|     T4:7                                                                     T4:7
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:846)

Rung 2:848
|  ON_112A                                                                   SCR_112A
|    N7:239  +LES--------------------+                                         0:25
|----] [-----+LESS THAN              +-----------------------------------------( )-----
|       9    |Source A    TMR112A.ACC|                                            6
|  (2:824)   |                      0|
|            |Source B         PW112A|
|            |                      0|
|            +----------------------+
|            T4:7.ACC - (2:846)
|            N7:188 - (2:386)
```

```
Rung 2:849
|  ON_112B                                                    +TON---------------+
|    N7:239                                                   +TIMER ON DELAY    +-(EN)--
|----] [------------------------------------------------------+Timer      TMR112B+-(DN)
|      10                                                     |Time Base     0.01|
|  (2:824)                                                    |Preset          25|
|                                                             |Accum            0|
|                                                             +------------------+
|

Rung 2:850
| TMR112B/DN                                                                  TMR112B
|     T4:8                                                                     T4:8
|----] [-------------------------------------------------------------------(RES)---
|      DN
|  (2:849)

Rung 2:851
|  ON_112B                                                                    SCR_112B
|    N7:239  +LES--------------------+                                         0:25
|----] [-----+LESS THAN              +-------------------------------------( )-----
|      10    |Source A    TMR112B.ACC|                                          7
|  (2:824)   |                     0|
|            |Source B          PW112B|
|            |                     0|
|            +----------------------+
|            T4:8.ACC - (2:849)
|            N7:189 - (2:394)

Rung 2:852
|  ON_112C
|    N7:239                                                   +TON---------------+
|----] [------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|      11                                                     |Timer      TMR112C+-(DN)
|  (2:824)                                                    |Time Base     0.01|
|                                                             |Preset          25|
|                                                             |Accum            0|
|                                                             +------------------+
|

Rung 2:853
| TMR112C/DN                                                                  TMR112C
|     T4:9                                                                     T4:9
|----] [-------------------------------------------------------------------(RES)---
|      DN
|  (2:852)

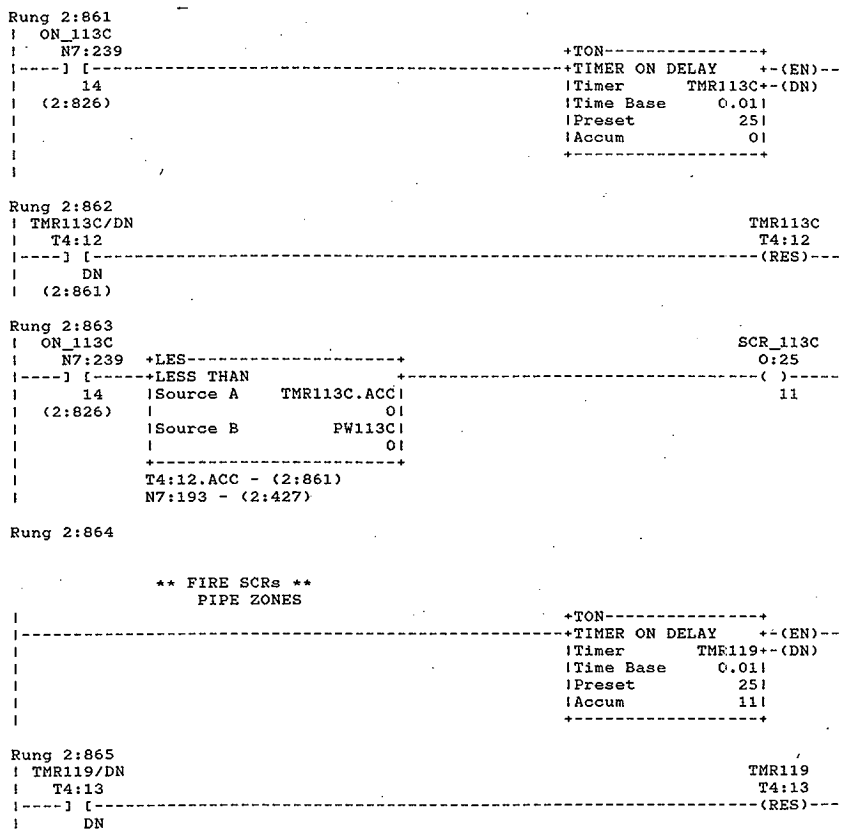
Rung 2:854
|  ON_112C                                                                    SCR_112C
|    N7:239  +LES--------------------+                                         0:25
|----] [-----+LESS THAN              +-------------------------------------( )-----
|      11    |Source A    TMR112C.ACC|                                          8
|  (2:824)   |                     0|
|            |Source B          PW112C|
|            |                     0|
|            +----------------------+
|            T4:9.ACC - (2:852)
|            N7:190 - (2:402)
```

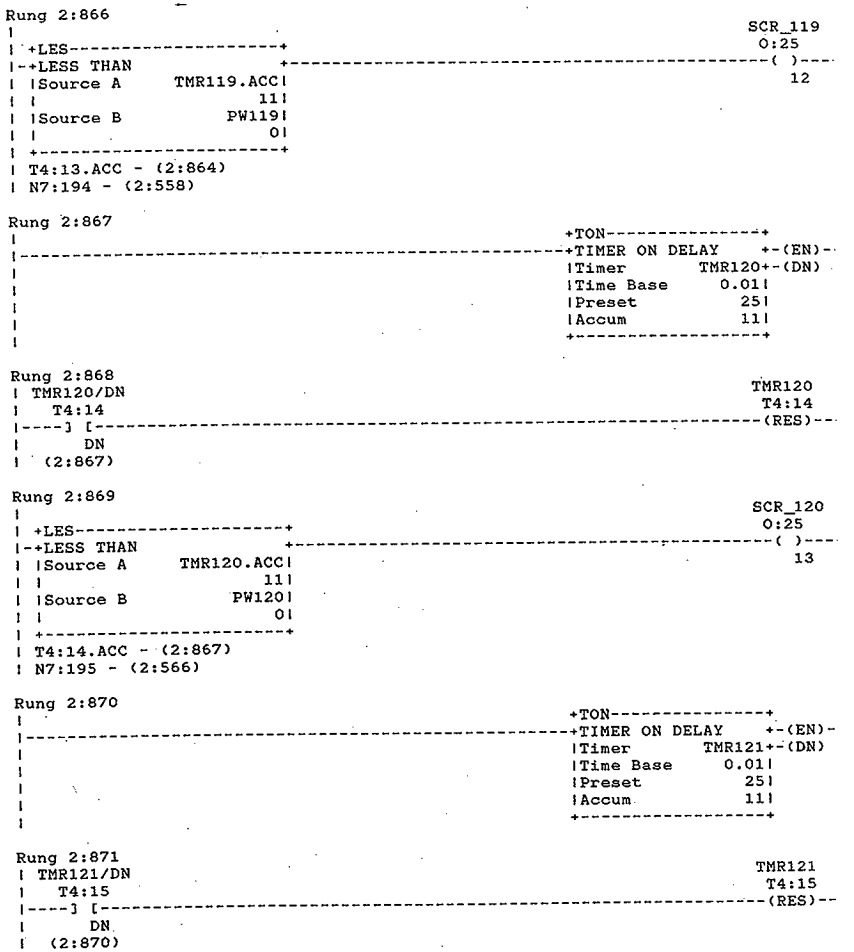
```
Rung 2:855
|  ON_113A
|    N7:239                                                    +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|      12                                                      |Timer      TMR113A+-(DN)
|  (2:826)                                                     |Time Base     0.01|
|                                                              |Preset          25|
|                                                              |Accum            0|
|                                                              +------------------+
|
|
|
Rung 2:856
| TMR113A/DN                                                                    TMR113A
|   T4:10                                                                        T4:10
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:855)

Rung 2:857
|  ON_113A                                                                      SCR_113A
|    N7:239  +LES--------------------+                                          0:25
|----] [-----+LESS THAN              +---------------------------------( )-----
|      12    |Source A    TMR113A.ACC|                                           9
|  (2:826)   |                     0|
|            |Source B          PW113A|
|            |                     0|
|            +----------------------+
|            T4:10.ACC - (2:855)
|            N7:191 - (2:410)

Rung 2:858
|  ON_113B
|    N7:239                                                    +TON---------------+
|----] [-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|      13                                                      |Timer      TMR113B+-(DN)
|  (2:826)                                                     |Time Base     0.01|
|                                                              |Preset          25|
|                                                              |Accum            0|
|                                                              +------------------+
|
|
|
Rung 2:859
| TMR113B/DN                                                                    TMR113B
|   T4:11                                                                        T4:11
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:858)

Rung 2:860
|  ON_113B                                                                      SCR_113B
|    N7:239  +LES--------------------+                                          0:25
|----] [-----+LESS THAN              +---------------------------------( )-----
|      13    |Source A    TMR113B.ACC|                                          10
|  (2:826)   |                     0|
|            |Source B          PW113B|
|            |                     0|
|            +----------------------+
|            T4:11.ACC - (2:858)
|            N7:192 - (2:418)
```


Rung 2:861
ON_113C
N7:239
14
(2:826)
TON
TIMER ON DELAY
Timer TMR113C
Time Base 0.01
Preset 25
Accum 0
EN
DN
Rung 2:862
TMR113C/DN
T4:12
DN
(2:861)
TMR113C
T4:12
RES
Rung 2:863
ON_113C
N7:239
14
(2:826)
LES
LESS THAN
Source A TMR113C.ACC
0
Source B PW113C
0
T4:12.ACC - (2:861)
N7:193 - (2:427)
SCR_113C
0:25
11
Rung 2:864
** FIRE SCRs **
PIPE ZONES
TON
TIMER ON DELAY
Timer TMR119
Time Base 0.01
Preset 25
Accum 11
EN
DN
Rung 2:865
TMR119/DN
T4:13
DN
(2:864)
TMR119
T4:13
RES


Rung 2:866
+LES
+LESS THAN
Source A TMR119.ACC
11
Source B PW119
0
T4:13.ACC - (2:864)
N7:194 - (2:558)
SCR_119
0:25
12
Rung 2:867
+TON
+TIMER ON DELAY
Timer TMR120
Time Base 0.01
Preset 25
Accum 11
(EN)
(DN)
Rung 2:868
TMR120/DN
T4:14
DN
(2:867)
TMR120
T4:14
(RES)
Rung 2:869
+LES
+LESS THAN
Source A TMR120.ACC
11
Source B PW120
0
T4:14.ACC - (2:867)
N7:195 - (2:566)
SCR_120
0:25
13
Rung 2:870
+TON
+TIMER ON DELAY
Timer TMR121
Time Base 0.01
Preset 25
Accum 11
(EN)
(DN)
Rung 2:871
TMR121/DN
T4:15
DN
(2:870)
TMR121
T4:15
(RES)

```
Rung 2:872
|                                                                          SCR_121
| +LES---------------------+                                               0:25
|-+LESS THAN               +-------------------------------------------( )----
| |Source A     TMR121.ACC|                                                 14
| |                      11|
| |Source B           PW121|
| |                       0|
| +------------------------+
| T4:15.ACC - (2:870)
| N7:196 - (2:574)

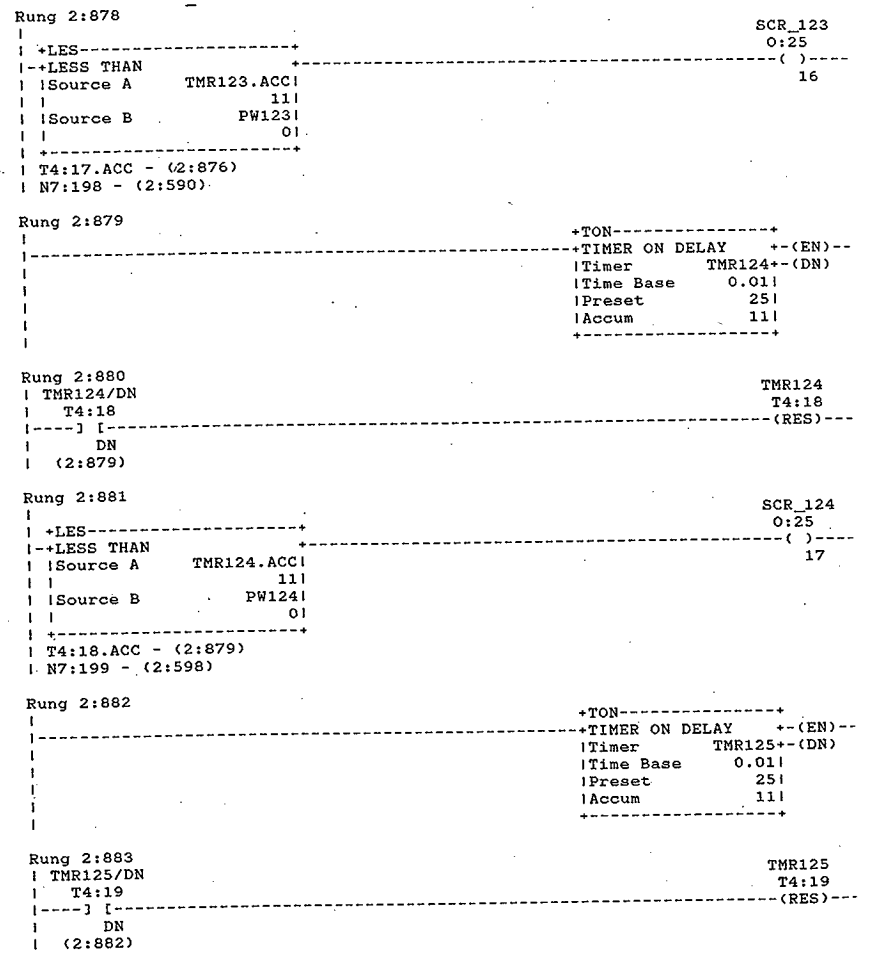
Rung 2:873
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR122+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           11|
|                                                  +------------------+

Rung 2:874
| TMR122/DN                                                          TMR122
|   T4:16                                                            T4:16
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:873)

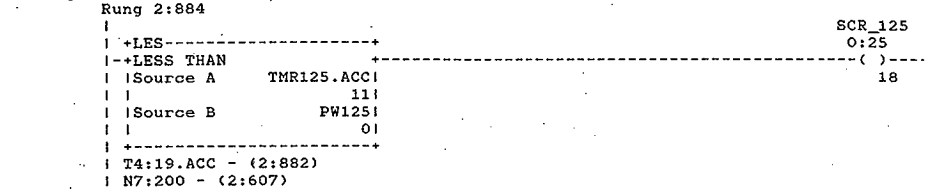
Rung 2:875
|                                                                          SCR_122
| +LES---------------------+                                               0:25
|-+LESS THAN               +-------------------------------------------( )----
| |Source A     TMR122.ACC|                                                 15
| |                      11|
| |Source B           PW122|
| |                       0|
| +------------------------+
| T4:16.ACC - (2:873)
| N7:197 - (2:582)

Rung 2:876
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR123+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           11|
|                                                  +------------------+

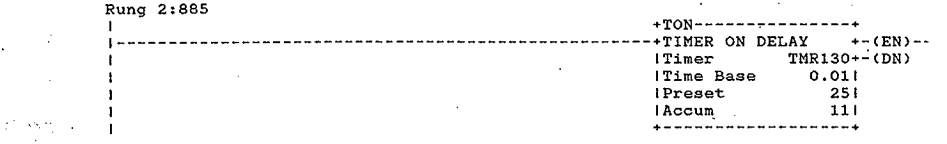
Rung 2:877
| TMR123/DN                                                          TMR123
|   T4:17                                                            T4:17
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:876)
```


Rung 2:878
+LES
-+LESS THAN
Source A TMR123.ACC
11
Source B PW123
0
T4:17.ACC - (2:876)
N7:198 - (2:590)
SCR_123
0:25
16
Rung 2:879
+TON
+TIMER ON DELAY +-(EN)-
Timer TMR124 +-(DN)
Time Base 0.01
Preset 25
Accum 11
Rung 2:880
TMR124/DN
T4:18
DN
(2:879)
TMR124
T4:18
(RES)
Rung 2:881
+LES
-+LESS THAN
Source A TMR124.ACC
11
Source B PW124
0
T4:18.ACC - (2:879)
N7:199 - (2:598)
SCR_124
0:25
17
Rung 2:882
+TON
+TIMER ON DELAY +-(EN)-
Timer TMR125 +-(DN)
Time Base 0.01
Preset 25
Accum 11
Rung 2:883
TMR125/DN
T4:19
DN
(2:882)
TMR125
T4:19
(RES)

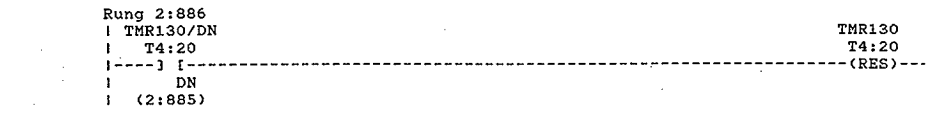
Rung 2:884



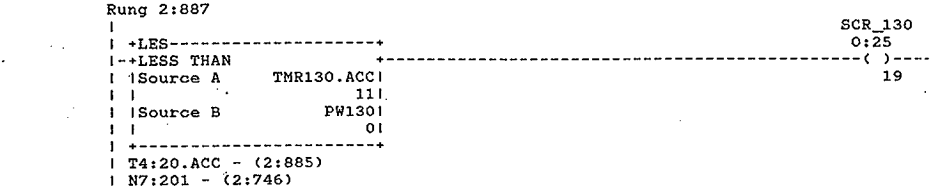
Rung 2:885



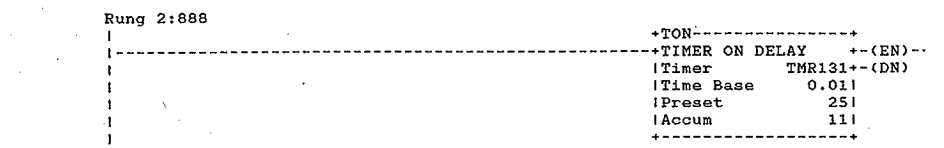
Rung 2:886



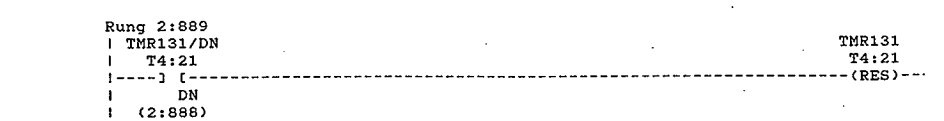
Rung 2:887



Rung 2:888



Rung 2:889



```
Rung 2:890
|                                                                    SCR_131
| +LES--------------------+                                          0:25
|-+LESS THAN               +-----------------------------------------( )----
| |Source A     TMR131.ACC|                                           20
| |                      11|
| |Source B           PW131|
| |                       0|
| +------------------------+
| T4:21.ACC - (2:888)
| N7:202 - (2:754)

Rung 2:891
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR132+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           11|
|                                                  +------------------+

Rung 2:892
| TMR132/DN                                                          TMR132
|   T4:22                                                            T4:22
|----] [-------------------------------------------------------------(RES)---
|       DN
|  (2:891)

Rung 2:893
|                                                                    SCR_132
| +LES--------------------+                                          0:25
|-+LESS THAN               +-----------------------------------------( )----
| |Source A     TMR132.ACC|                                           21
| |                      11|
| |Source B           PW132|
| |                       0|
| +------------------------+
| T4:22.ACC - (2:891)
| N7:203 - (2:762)

Rung 2:894
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR133+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           11|
|                                                  +------------------+

Rung 2:895
| TMR133/DN                                                          TMR133
|   T4:23                                                            T4:23
|----] [-------------------------------------------------------------(RES)---
|       DN
|  (2:894)
```

```
Rung 2:896
|                                                                                  SCR_133
| +LES--------------------+                                                        0:25
|-+LESS THAN              +-------------------------------------------------( )---
| |Source A     TMR133.ACC|                                                        22
| |                     11|
| |Source B          PW133|
| |                      0|
| +-----------------------+
| T4:23.ACC - (2:894)
| N7:204 - (2:770)

Rung 2:897
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)-
|                                                        |Timer       TMR134+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum           11|
|                                                        +------------------+

Rung 2:898
| TMR134/DN                                                                        TMR134
|   T4:24                                                                           T4:24
|----] [-----------------------------------------------------------------------(RES)---
|      DN
|  (2:897)

Rung 2:899
|                                                                                  SCR_134
| +LES--------------------+                                                        0:25
|-+LESS THAN              +-------------------------------------------------( )---
| |Source A     TMR134.ACC|                                                        23
| |                     11|
| |Source B          PW134|
| |                      0|
| +-----------------------+
| T4:24.ACC - (2:897)
| N7:205 - (2:778)

Rung 2:900
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)-
|                                                        |Timer       TMR140+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum           11|
|                                                        +------------------+

Rung 2:901
| TMR140/DN                                                                        TMR140
|   T4:25                                                                           T4:25
|----] [-----------------------------------------------------------------------(RES)--
|      DN
|  (2:900)
```

```
Rung 2:902
|                                                                                  SCR_140
| +LES--------------------+                                                         0:25
|-+LESS THAN              +-------------------------------------------------------( )----
| |Source A     TMR140.ACC|                                                          24
| |                     11|
| |Source B          PW140|
| |                      0|
| +-----------------------+
| T4:25.ACC - (2:900)
| N7:206 - (2:786)

Rung 2:903
|                                                          +TON---------------+
|----------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                          |Timer       TMR141+-(DN)
|                                                          |Time Base     0.01|
|                                                          |Preset          25|
|                                                          |Accum           15|
|                                                          +------------------+

Rung 2:904
| TMR141/DN                                                                        TMR141
|   T4:26                                                                           T4:26
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:903)

Rung 2:905
|                                                                                  SCR_141
| +LES--------------------+                                                         0:25
|-+LESS THAN              +-------------------------------------------------------( )----
| |Source A     TMR141.ACC|                                                          25
| |                     15|
| |Source B          PW141|
| |                      0|
| +-----------------------+
| T4:26.ACC - (2:903)
| N7:207 - (2:794)

Rung 2:906
|                                                          +TON---------------+
|----------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                          |Timer       TMR142+-(DN)
|                                                          |Time Base     0.01|
|                                                          |Preset          25|
|                                                          |Accum           15|
|                                                          +------------------+

Rung 2:907
| TMR142/DN                                                                        TMR142
|   T4:27                                                                           T4:27
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:906)
```

```
Rung 2:908
|                                                                                  SCR_142
| +LES--------------------+                                                        0:25
|-+LESS THAN              +-------------------------------------------------( )----
| |Source A     TMR142.ACC|                                                        26
| |                     15|
| |Source B          PW142|
| |                      0|
| +-----------------------+
| T4:27.ACC - (2:906)
| N7:208 - (2:803)

Rung 2:909
| END
|                                                                                  DUMMY3
|     7                                                                            N20:7
|---[LBL]-------------------------------------------------------------------( )----
|                                                                                    2

Rung 2:910
|                                                                  +CLR---------------+
|-----------------------------------------------------------------+CLEAR             +--
|                                                                  |Dest           S:5|
|                                                                  |                 0|
|                                                                  +------------------+

Rung 2:911
|
|-------------------------------------+END+-------------------------------------
|
```

Rung 3:0

```
*******************************************************************************
    Initialization Subroutine,  runs once when the PLC is started.
*******************************************************************************
       write configuration number (2369d), (100001000001b) to
       N7:0 (CONFIGURE) for use below, CONFIGURE T/C MODULES
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source        2369|
|                                                          |                  |
|                                                          |Dest     CONFIGURE|
|                                                          |              2369|
|                                                          +------------------+
```

Rung 3:1

```
                ** CONFIGURE T/C MODULES **
Use Fill File to copy the configuration to each channel of each T/C module
                          MODULE  3
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:3.0|
|                                                          |Length          4|
|                                                          +------------------+
```

Rung 3:2

```
                          MODULE 4
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:4.0|
|                                                          |Length          4|
|                                                          +------------------+
```

Rung 3:3

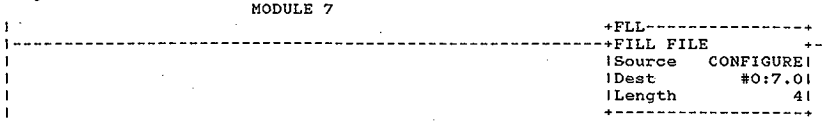
```
                          MODULE 5
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:5.0|
|                                                          |Length          4|
|                                                          +------------------+
```

Rung 3:4

```
                          MODULE 6
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:6.0|
|                                                          |Length          4|
|                                                          +------------------+
```

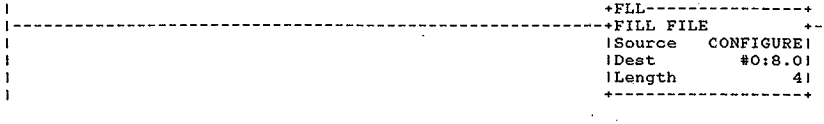
Rung 3:5

MODULE 7



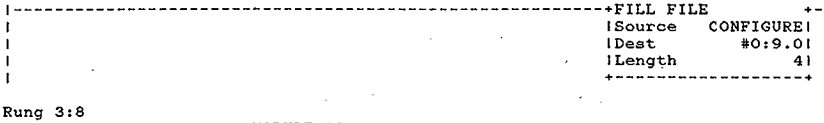
Rung 3:6

MODULE 8



Rung 3:7

MODULE 9



Rung 3:8

MODULE 10

Rung 3:9

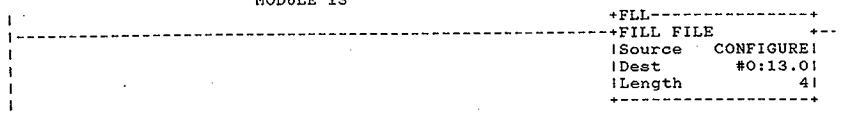
MODULE 11

Rung 3:10

MODULE 12

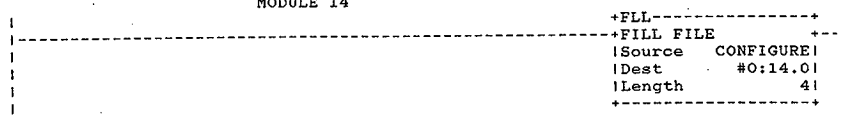
Rung 3:11

MODULE 13



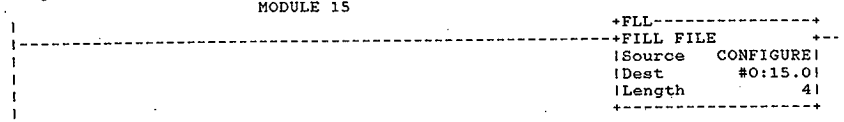
Rung 3:12

MODULE 14



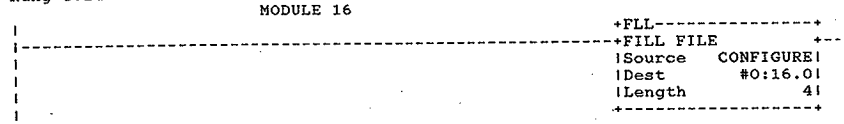
Rung 3:13

MODULE 15



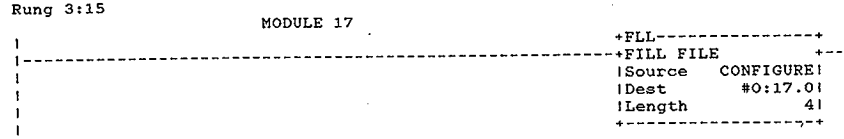
Rung 3:14

MODULE 16



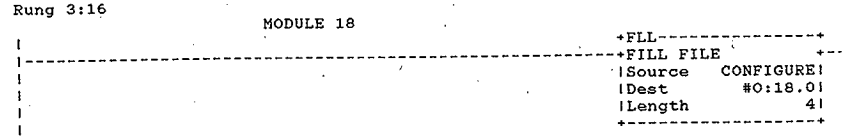
Rung 3:15

MODULE 17



Rung 3:16

MODULE 18



```
Rung 3:17
                        MODULE 19
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:19.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:18
                        MODULE 20
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:20.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:19
                        MODULE 21
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:21.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:20
                        MODULE 22
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:22.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:21
                        MODULE 23
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:23.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:22
                        MODULE 24
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:24.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:23
|                                                          +CLR---------------+
|-------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N7:118|
|                                                          |                 0|
|                                                          +------------------+
```

```
Rung 3:24
|                                                                  +CLR---------------+
|-----------------------------------------------------------------+CLEAR             +--
|                                                                  |Dest        N7:119|
|                                                                  |                 0|
|                                                                  +------------------+

Rung 3:25
|                                                                  +CLR---------------+
|-----------------------------------------------------------------+CLEAR             +--
|                                                                  |Dest        N7:120|
|                                                                  |                 0|
|                                                                  +------------------+

Rung 3:26
|                                                                  +CLR---------------+
|-----------------------------------------------------------------+CLEAR             +--
|                                                                  |Dest        N7:121|
|                                                                  |                 0|
|                                                                  +------------------+

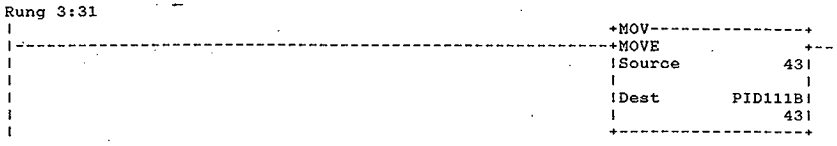
Rung 3:27
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest       PID110A|
|                                                                  |                43|
|                                                                  +------------------+

Rung 3:28
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest       PID110B|
|                                                                  |                43|
|                                                                  +------------------+

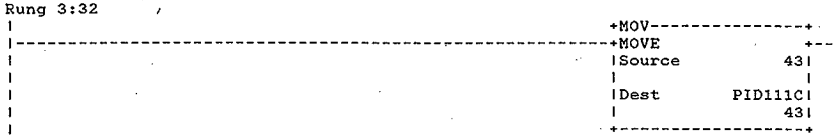
Rung 3:29
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest       PID110C|
|                                                                  |                43|
|                                                                  +------------------+

Rung 3:30
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest       PID111A|
|                                                                  |                43|
|                                                                  +------------------+
```

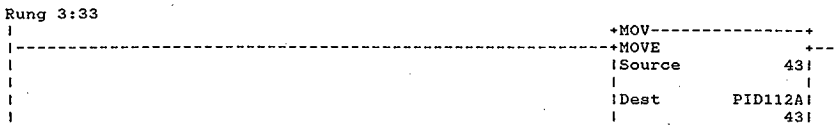
Rung 3:31



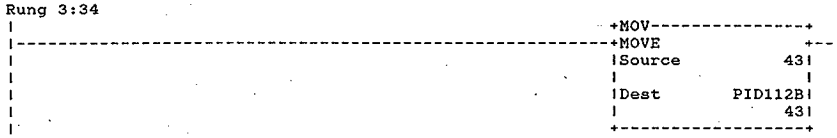
Rung 3:32



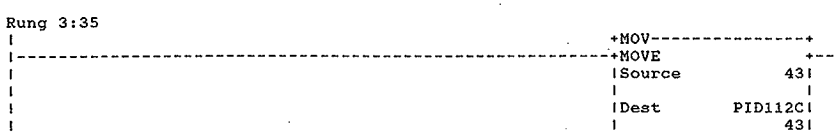
Rung 3:33



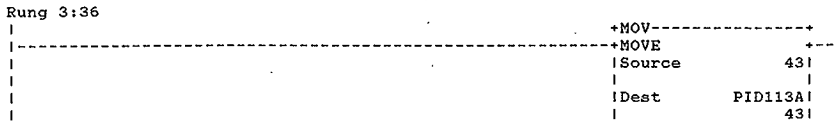
Rung 3:34



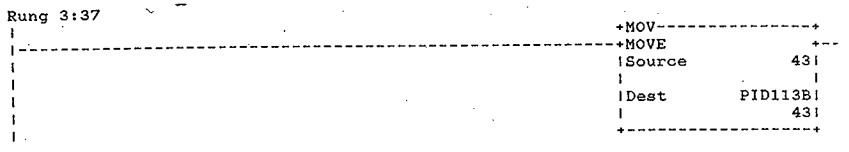
Rung 3:35



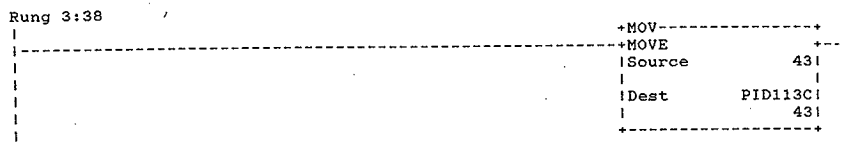
Rung 3:36



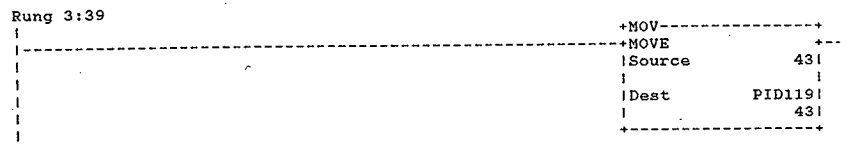
Rung 3:37



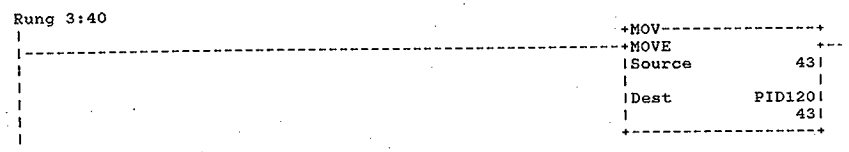
Rung 3:38



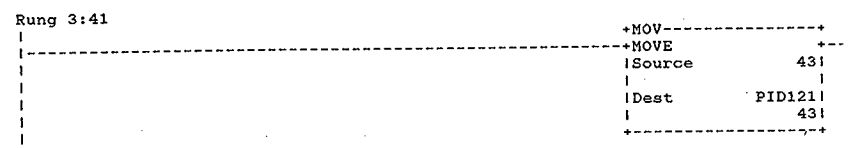
Rung 3:39



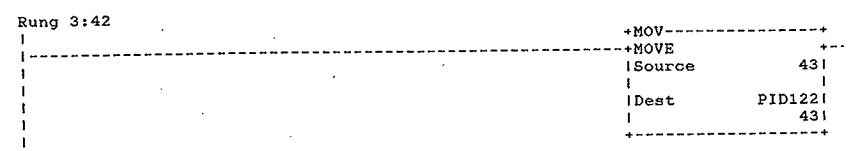
Rung 3:40



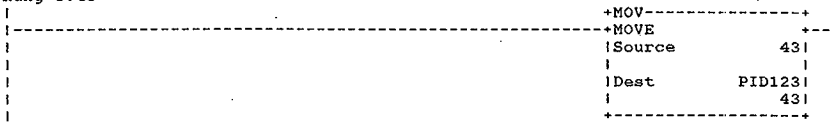
Rung 3:41



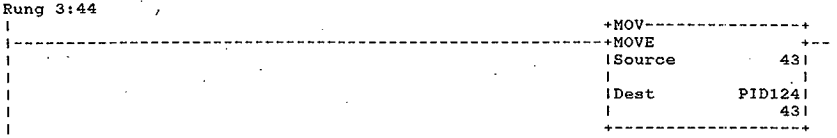
Rung 3:42



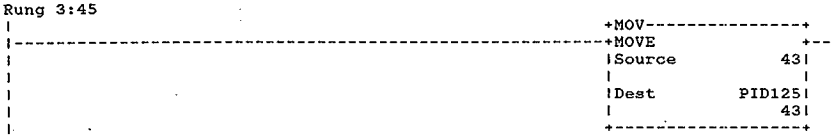
Rung 3:43



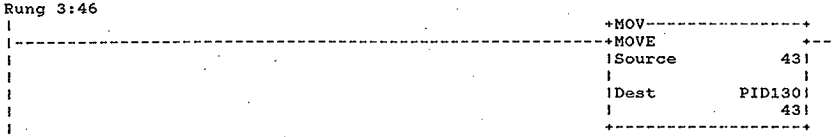
Rung 3:44



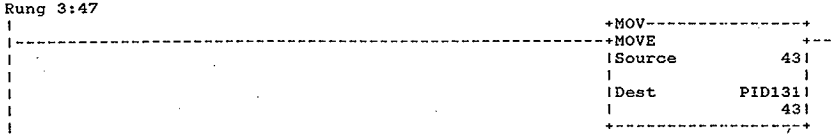
Rung 3:45



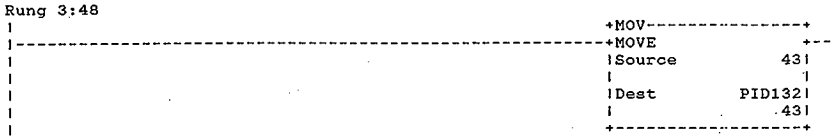
Rung 3:46



Rung 3:47



Rung 3:48



```
Rung 3:49
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest        PID133|
|                                                                  |                43|
|                                                                  +------------------+

Rung 3:50
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest        PID134|
|                                                                  |                43|
|                                                                  +------------------+

Rung 3:51
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest        PID140|
|                                                                  |                43|
|                                                                  +------------------+

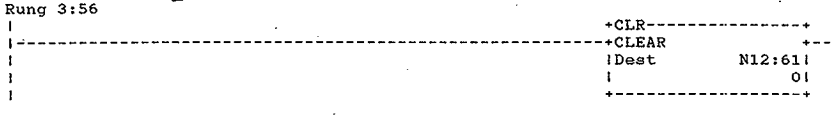
Rung 3:52
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest        PID141|
|                                                                  |                43|
|                                                                  +------------------+

Rung 3:53
|                                                                  +MOV---------------+
|-----------------------------------------------------------------+MOVE              +--
|                                                                  |Source          43|
|                                                                  |                  |
|                                                                  |Dest        PID142|
|                                                                  |                43|
|                                                                  +------------------+

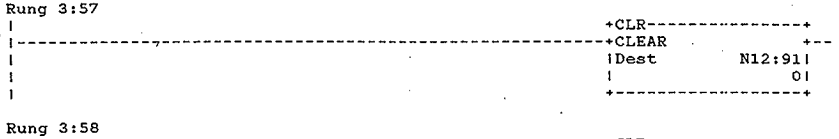
Rung 3:54
*****************************************************************************************
                SET WORD 11 OF THE PID BLOCK TO ZERO ON START UP
|                                                                  +CLR---------------+
|-----------------------------------------------------------------+CLEAR             +--
|                                                                  |Dest         N12:1|
|                                                                  |                 0|
|                                                                  +------------------+

Rung 3:55
|                                                                  +CLR---------------+
|-----------------------------------------------------------------+CLEAR             +--
|                                                                  |Dest        N12:31|
|                                                                  |                 0|
|                                                                  +------------------+
```

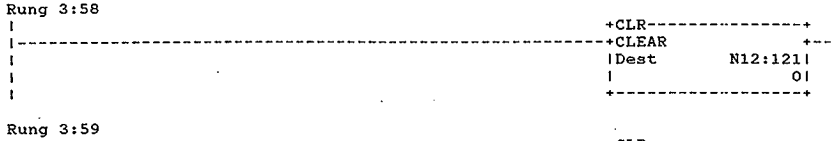
Rung 3:56



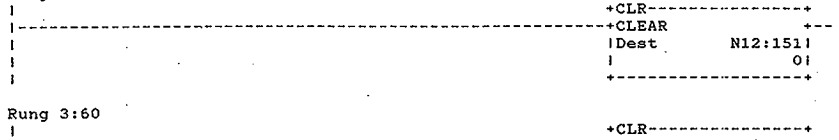
Rung 3:57



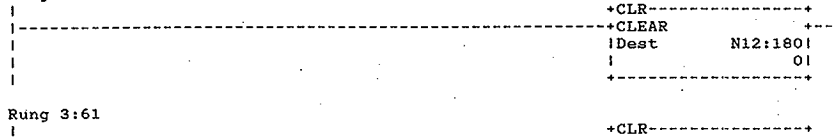
Rung 3:58



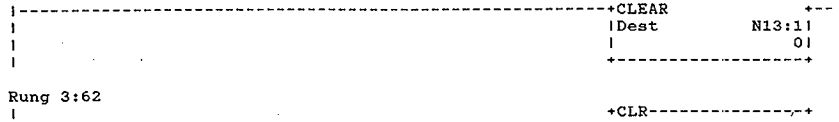
Rung 3:59



Rung 3:60

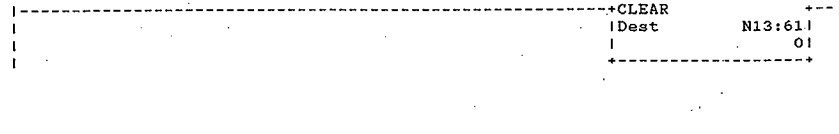


Rung 3:61

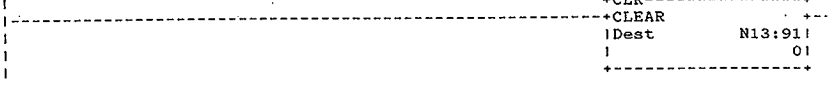


Rung 3:62

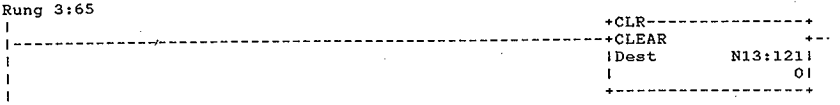
Rung 3:63



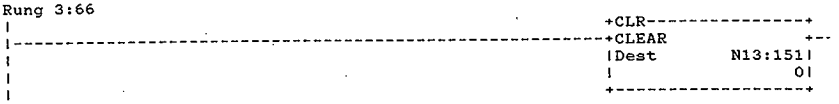
Rung 3:64



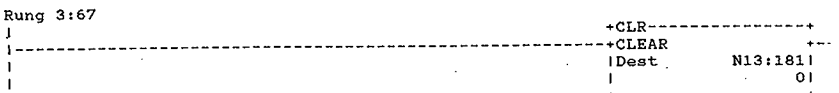
Rung 3:65



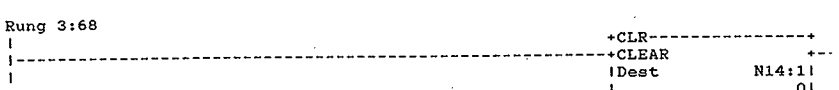
Rung 3:66



Rung 3:67



Rung 3:68



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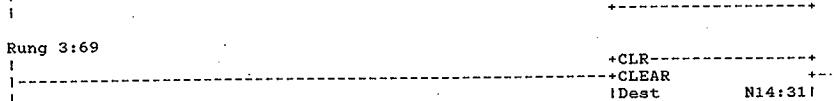
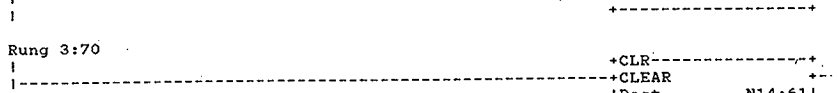
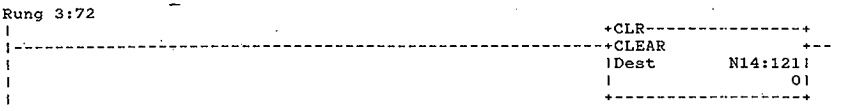


Rung 3:70

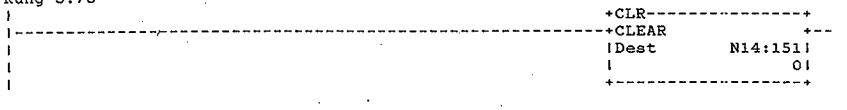


Rung 3:71

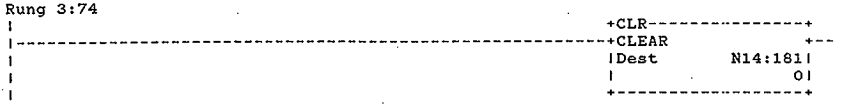
Rung 3:72



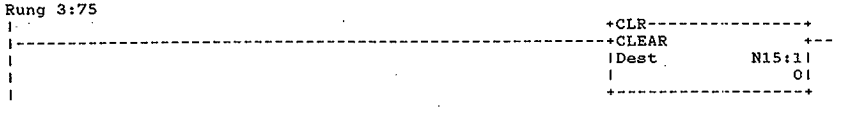
Rung 3:73



Rung 3:74



Rung 3:75



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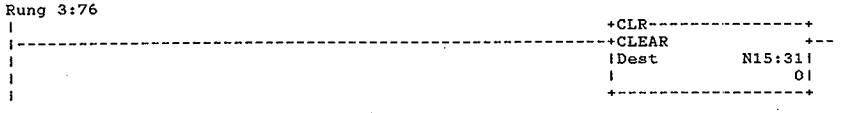

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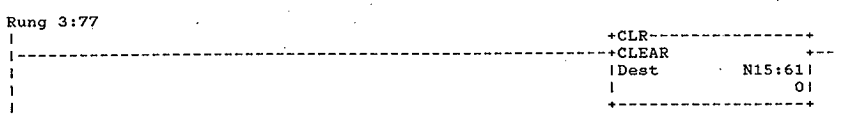
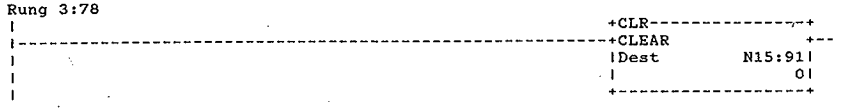
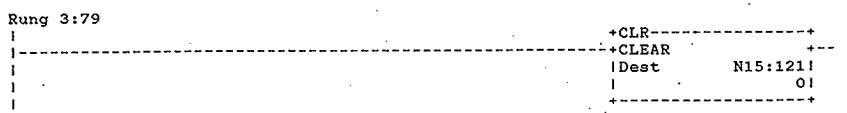


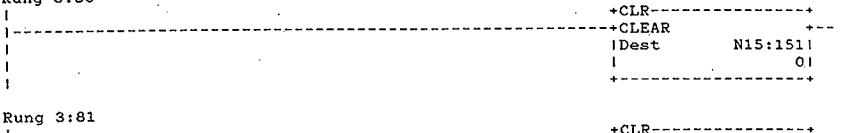
Rung 3:78



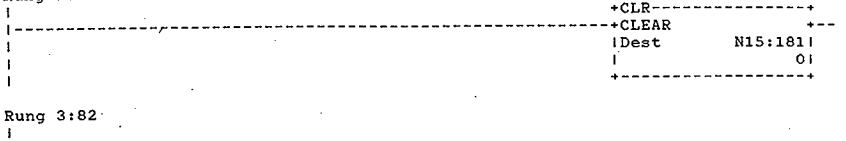
Rung 3:79



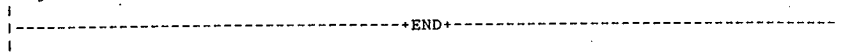
Rung 3:80



Rung 3:81



Rung 3:82



```
Rung 2:0
*******************************************************************************
                Begining of main ladder program

                Set up scheduling timer
*******************************************************************************
|                                                                   SCHTMR
| TMR_SU/DN
|   T4:85                                                                7
|----] [-------------------------------------------------------------(JMP)-----
|      DN
|   (2:2)

Rung 2:1
*******************************************************************************
                ** FIRST PASS CALL TO SUBROUTINE 3 **
        First Pass configures each channel of each T/C module
        MODULE # is the # of the slot where the module resides
*******************************************************************************

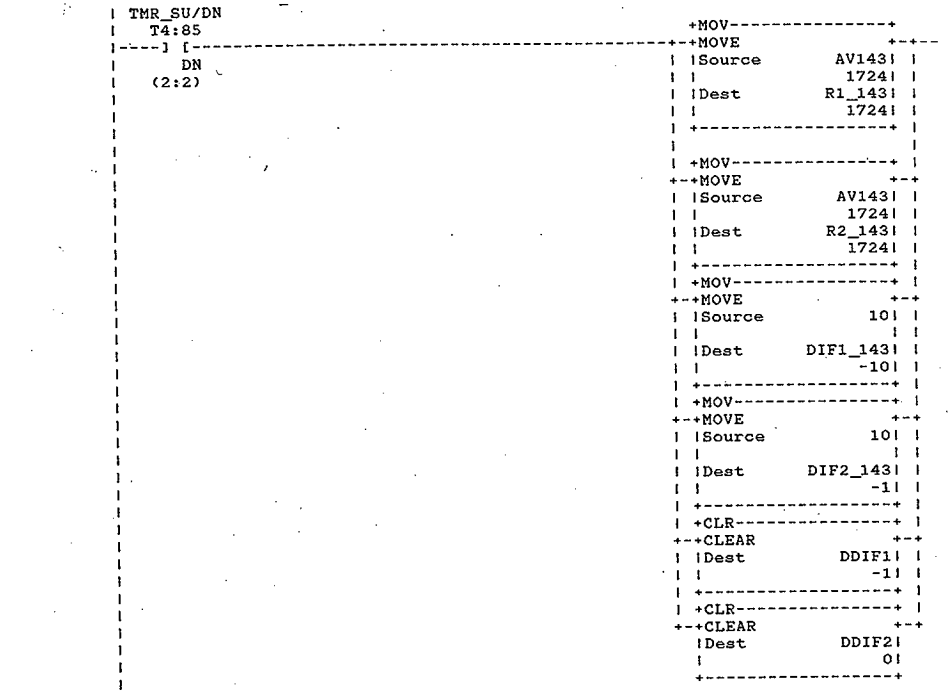
|
| FIRST_PASS
|    S:1                                                  +JSR---------------+
|----] [-------------------------------------------------+JUMP TO SUBROUTINE+--
|      15                                                 |SBR file number  3|
|                                                         +------------------+

Rung 2:2
                SETUP TIMER USED FOR INITIALIZING HEATUP RATES
|                                                     +TON---------------+
|-----------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                     |Timer       TMR_SU+-(DN)
|                                                     |Time Base     0.01|
|                                                     |Preset        6000|
|                                                     |Accum         6001|
|                                                     +------------------+

Rung 2:3
*******************************************************************************
JUMPS TO SECTION 1 IF DN_1 IS NOT LATCHED DN_1 GETS LATCHED WHEN THE SECTION
IS ENTERED
|                                                                   MD1
| TMR_SU/DN
|   T4:85                                                                1
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|   (2:2)
```

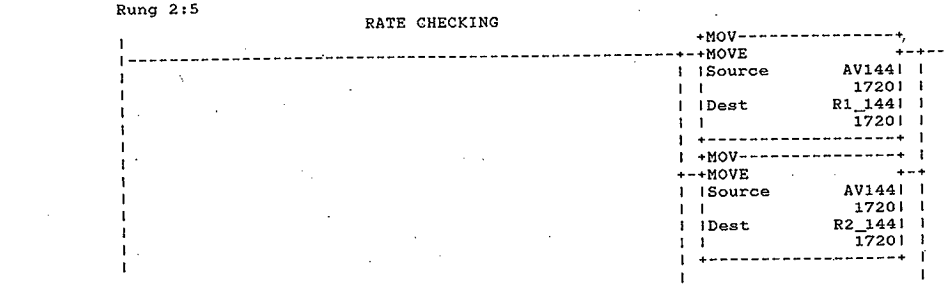
Rung 2:4

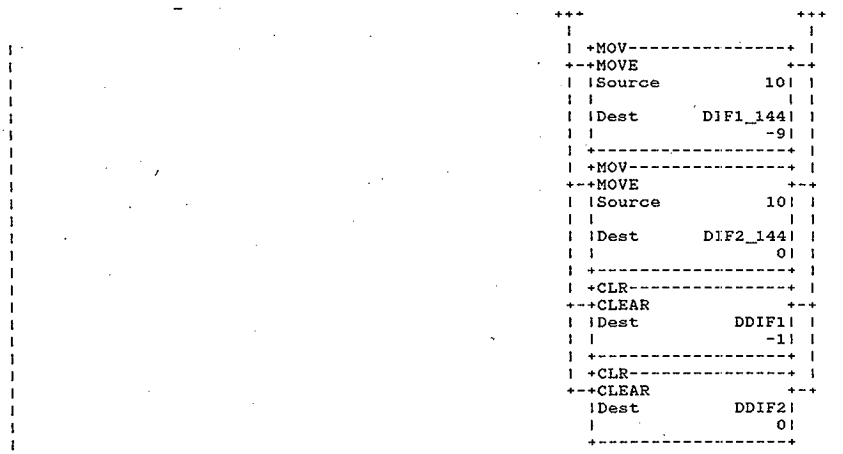
RATE CHECKING



Rung 2:5

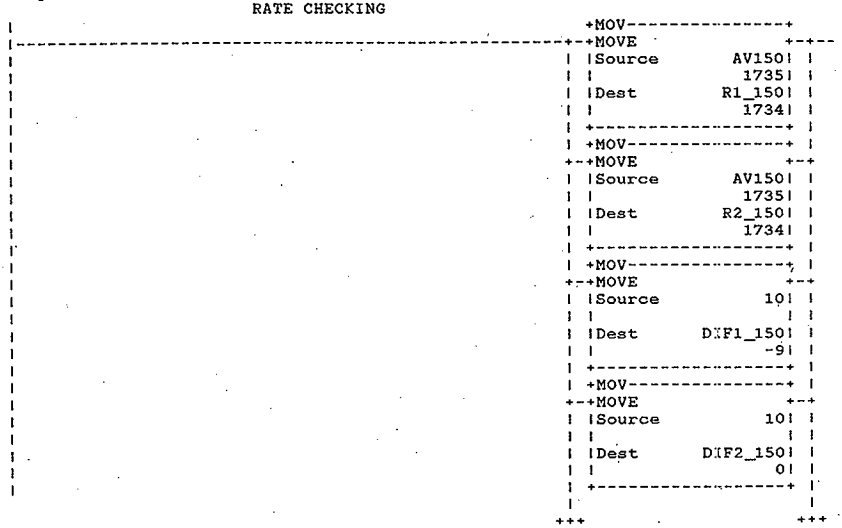
RATE CHECKING





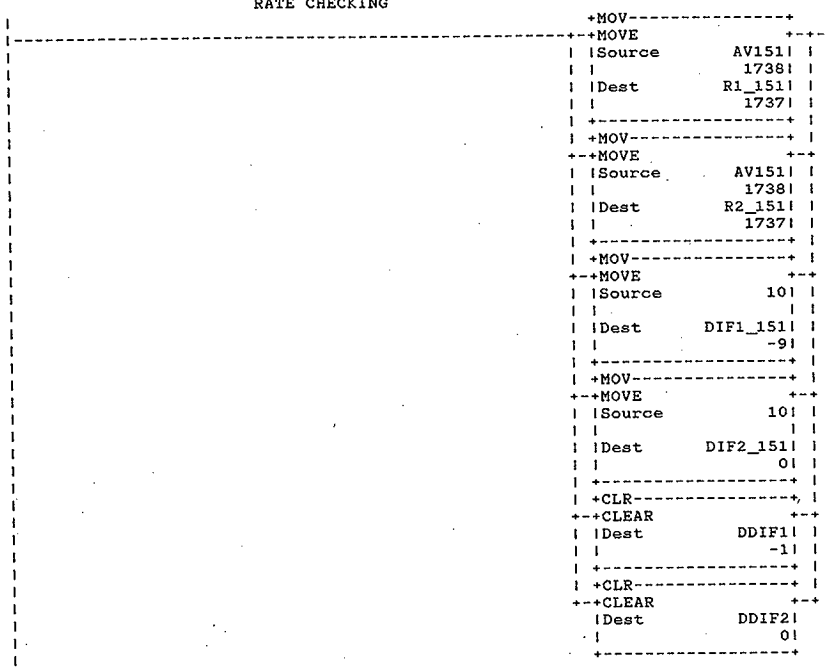
Rung 2:6

RATE CHECKING



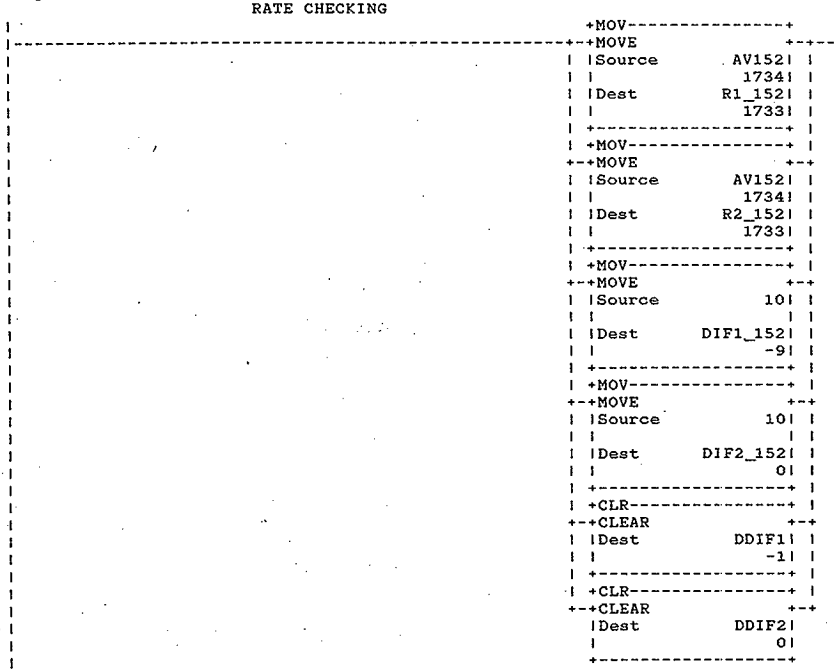
Rung 2:7

RATE CHECKING



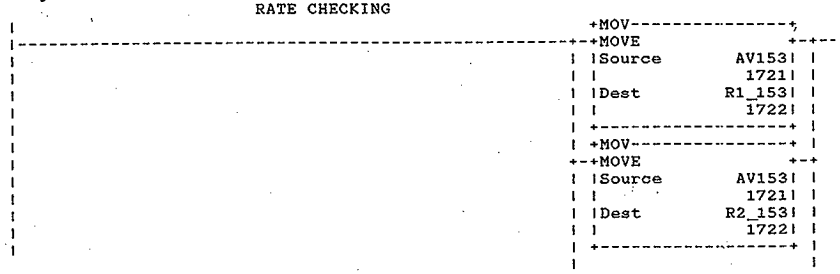
Rung 2:8

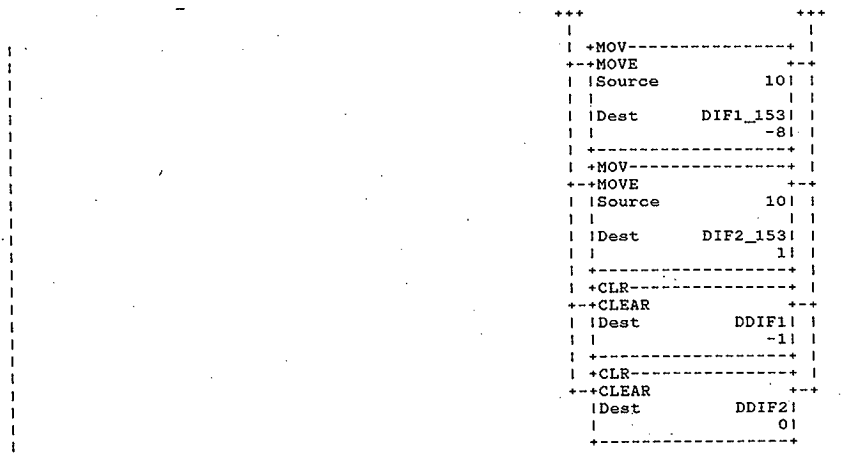
RATE CHECKING



Rung 2:9

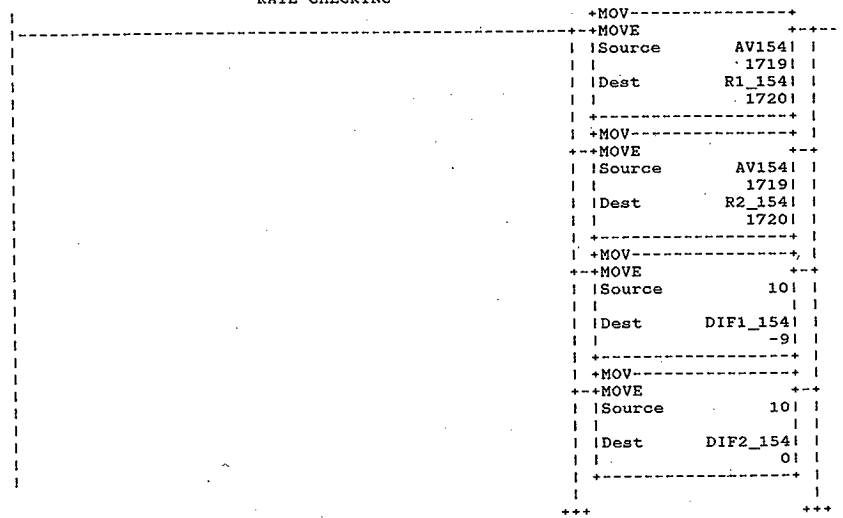
RATE CHECKING





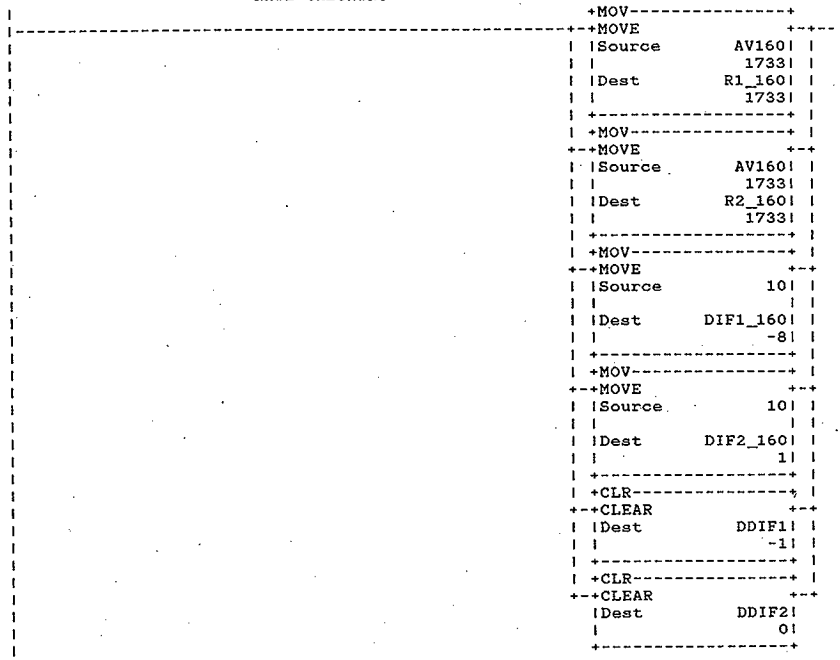
Rung 2:10

RATE CHECKING



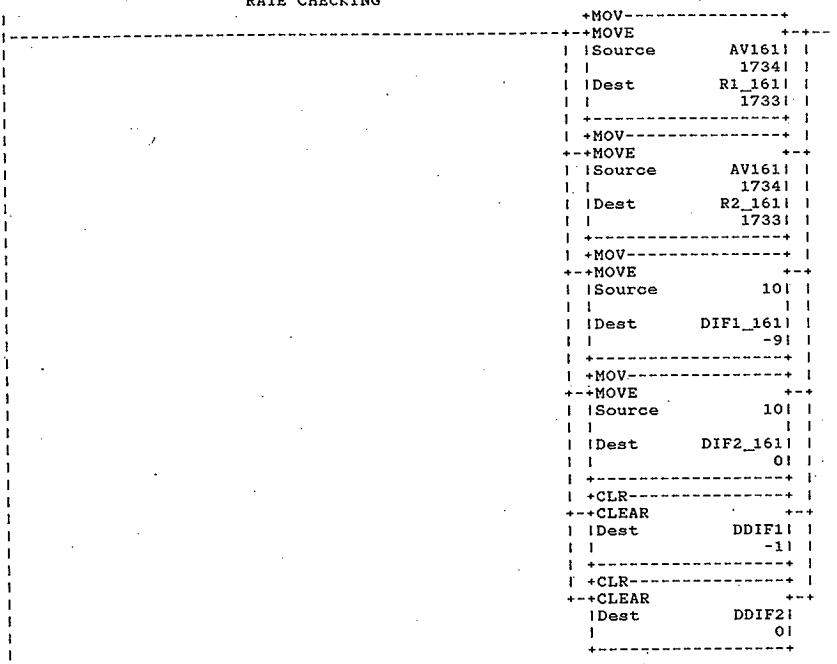
Rung 2:11

RATE CHECKING



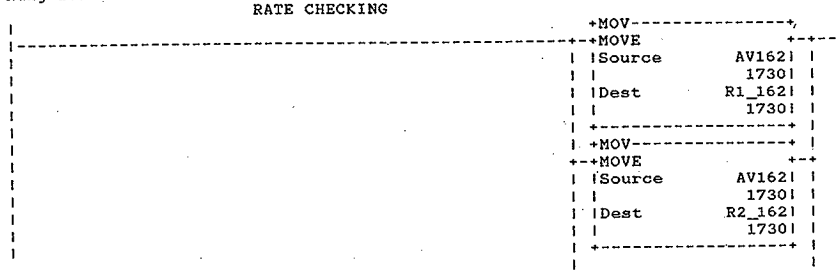
Rung 2:12

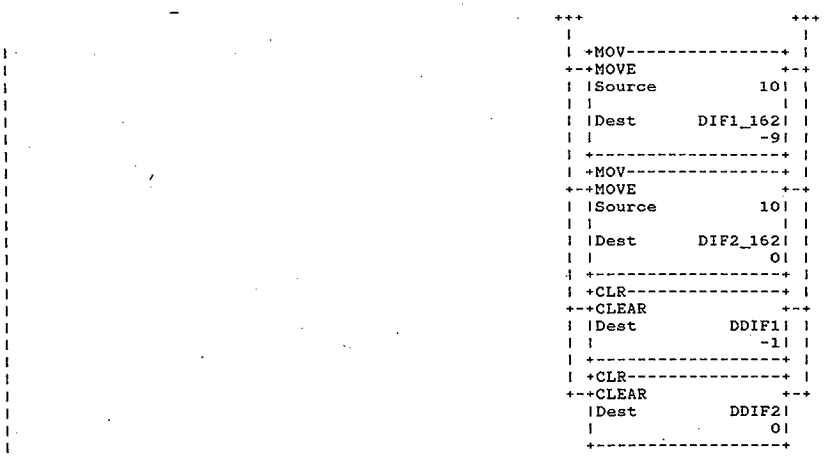
RATE CHECKING



Rung 2:13

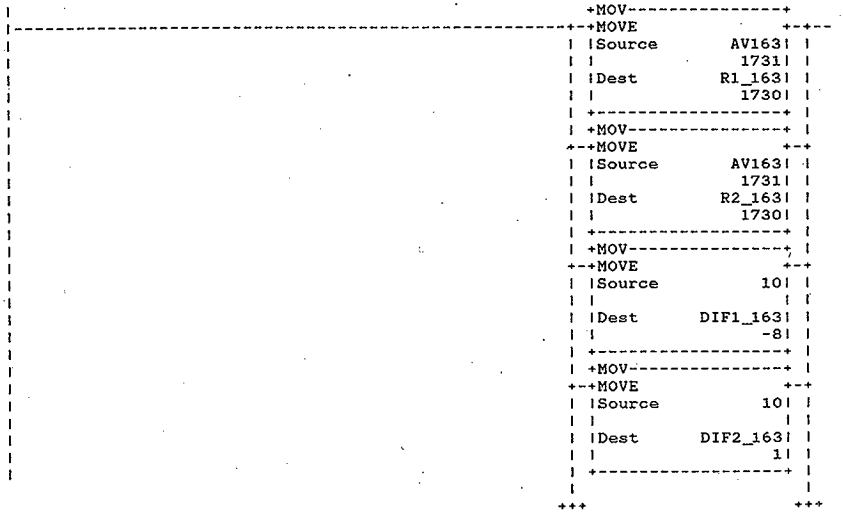
RATE CHECKING





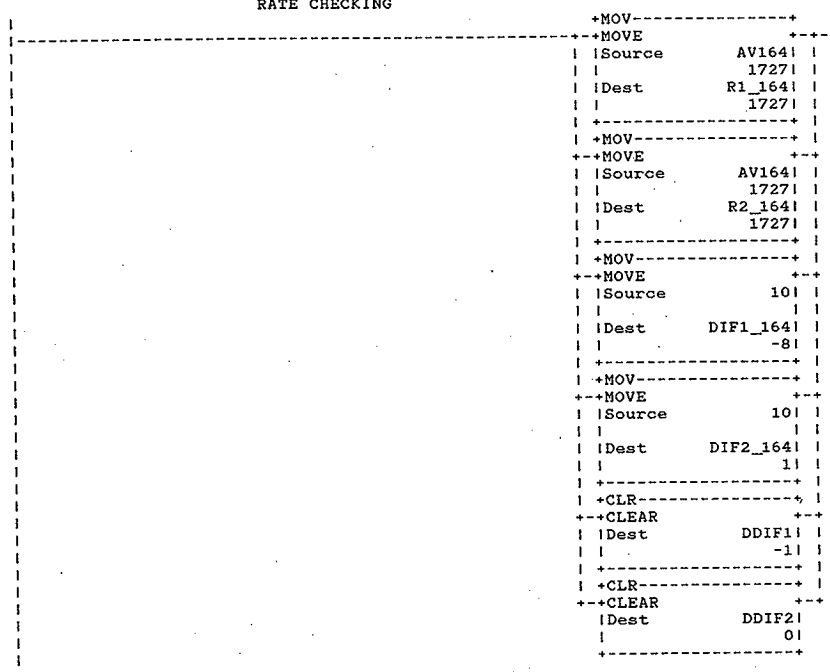
Rung 2:14

RATE CHECKING



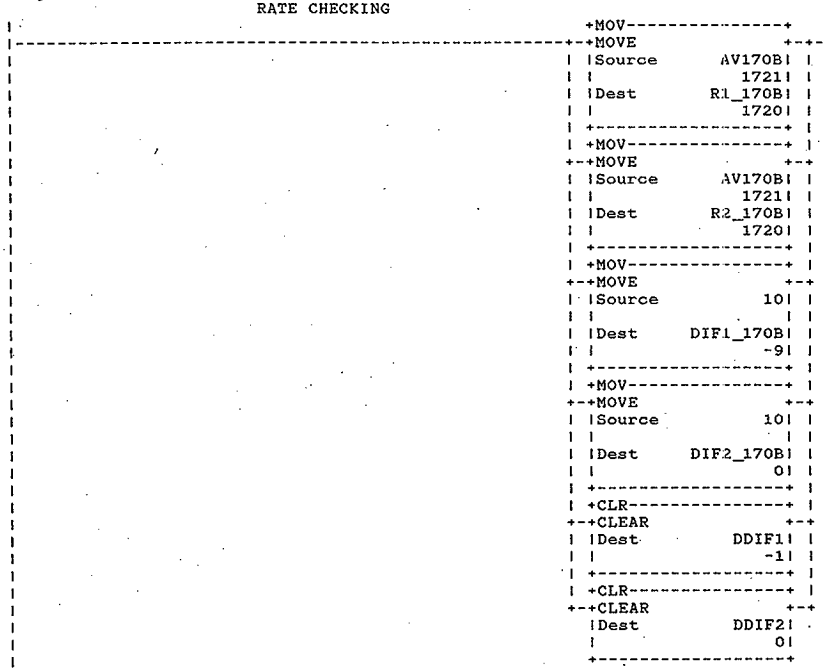
Rung 2:15

RATE CHECKING



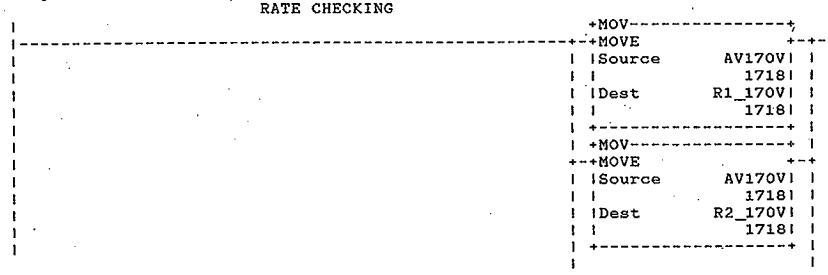
Rung 2:16

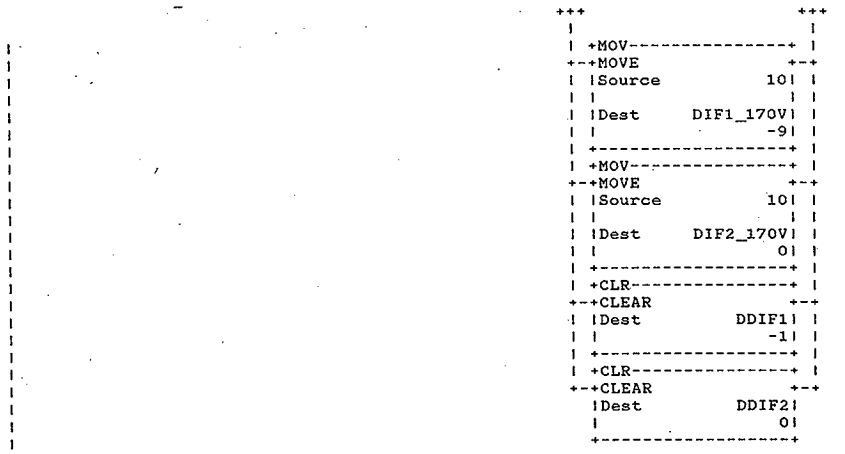
RATE CHECKING



Rung 2:17

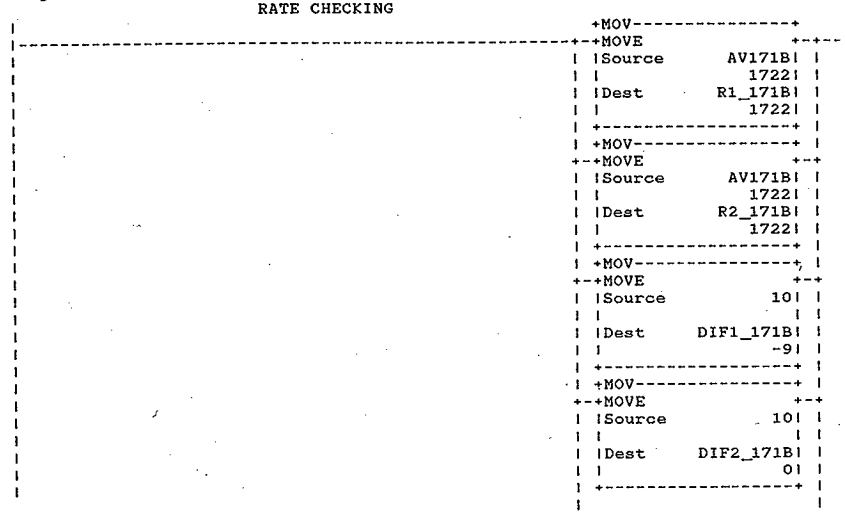
RATE CHECKING





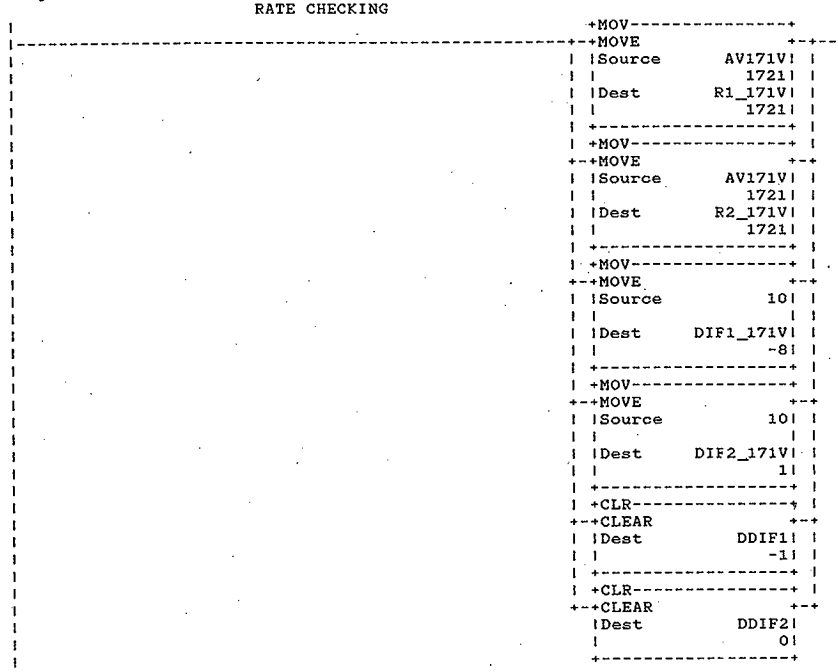
Rung 2:18

RATE CHECKING



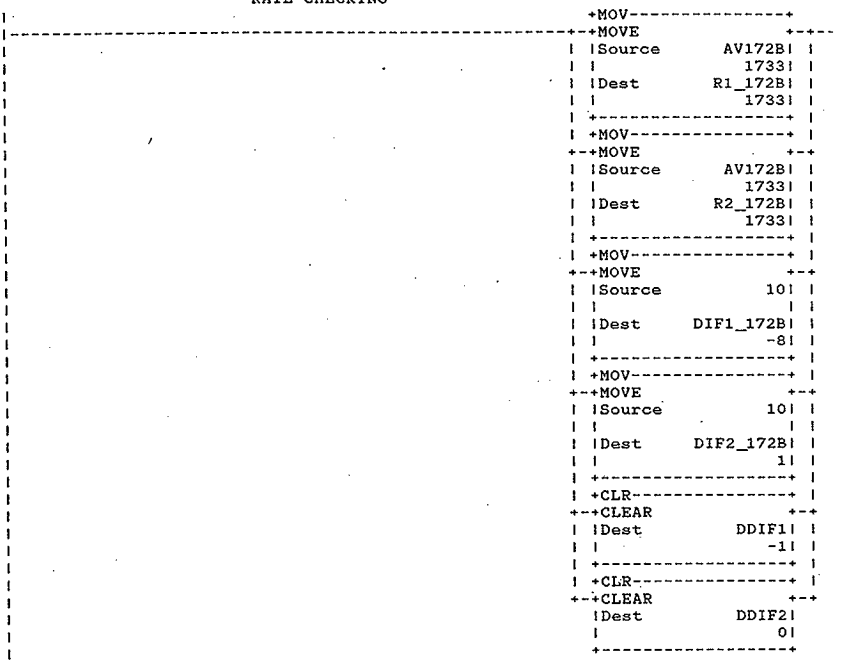
Rung 2:19

RATE CHECKING



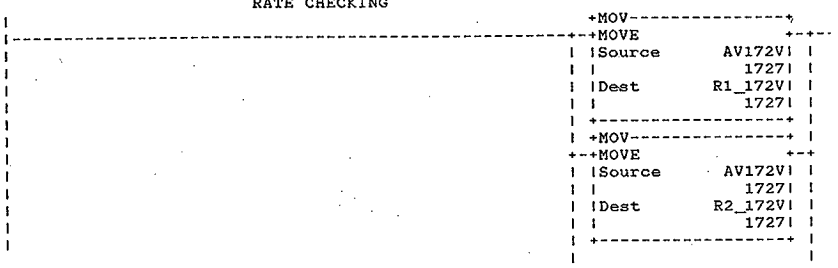
Rung 2:20

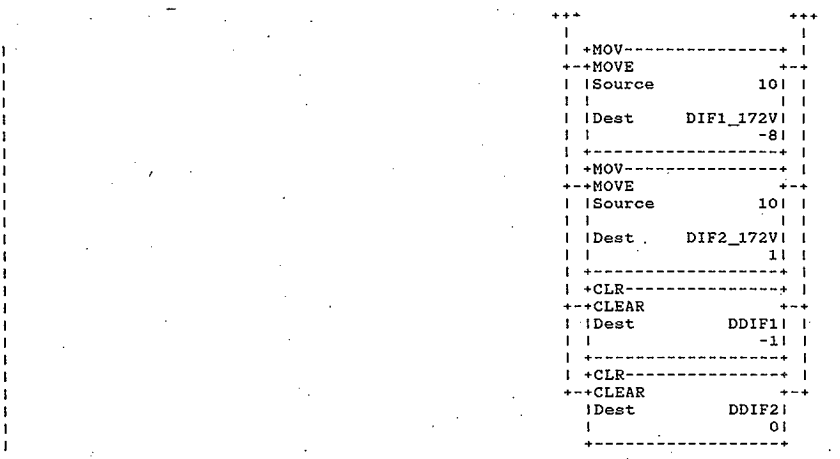
RATE CHECKING



Rung 2:21

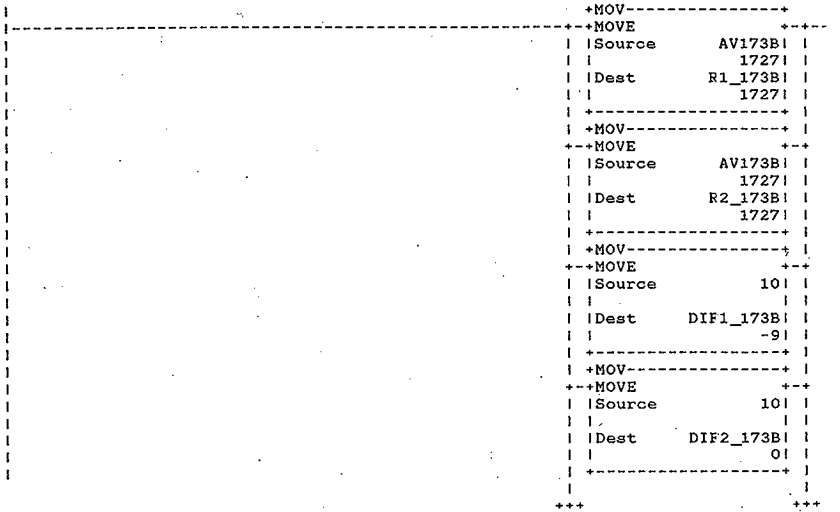
RATE CHECKING

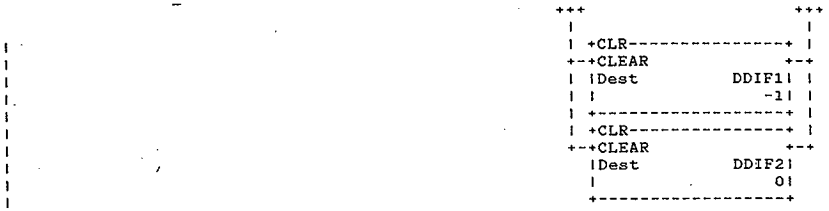




Rung 2:22

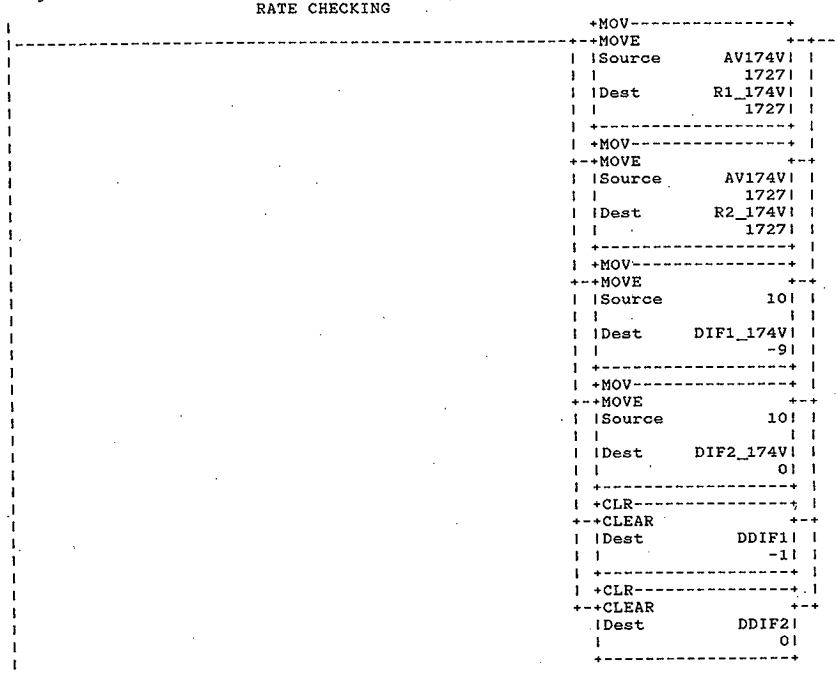
RATE CHECKING





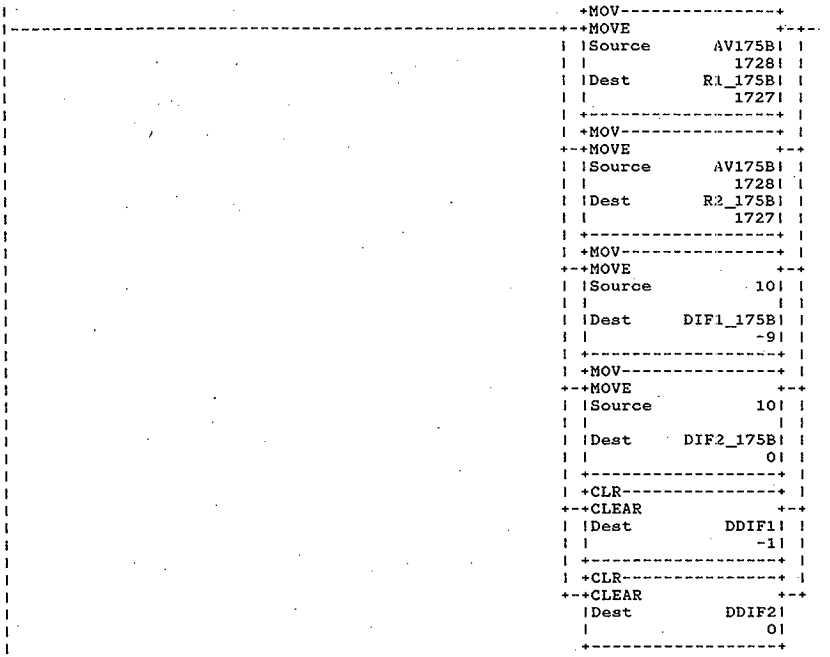
Rung 2:23

RATE CHECKING



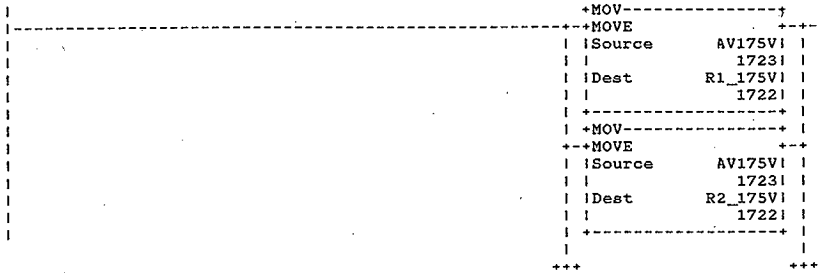
Rung 2:24

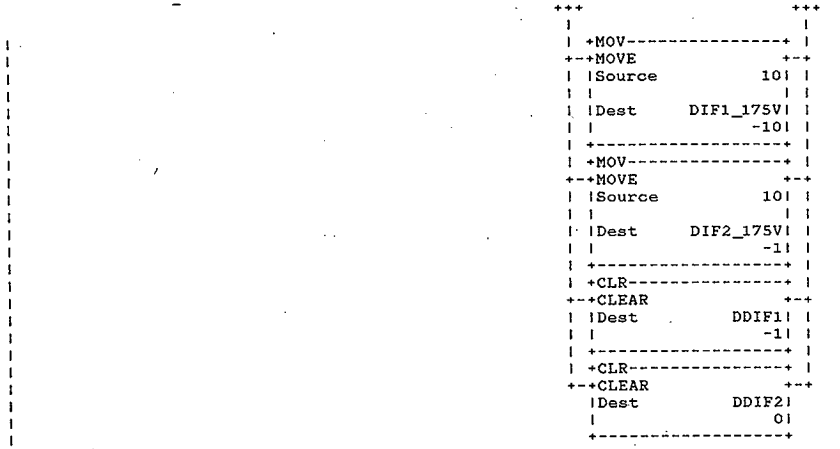
RATE CHECKING



Rung 2:25

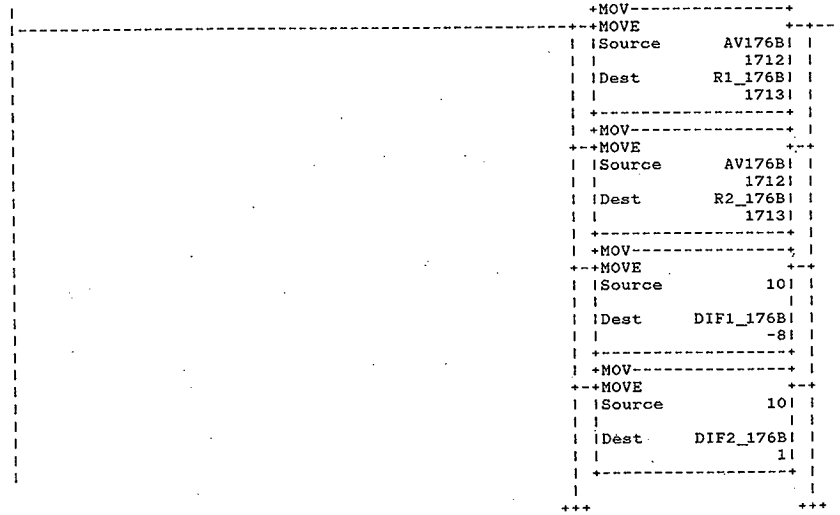
RATE CHECKING





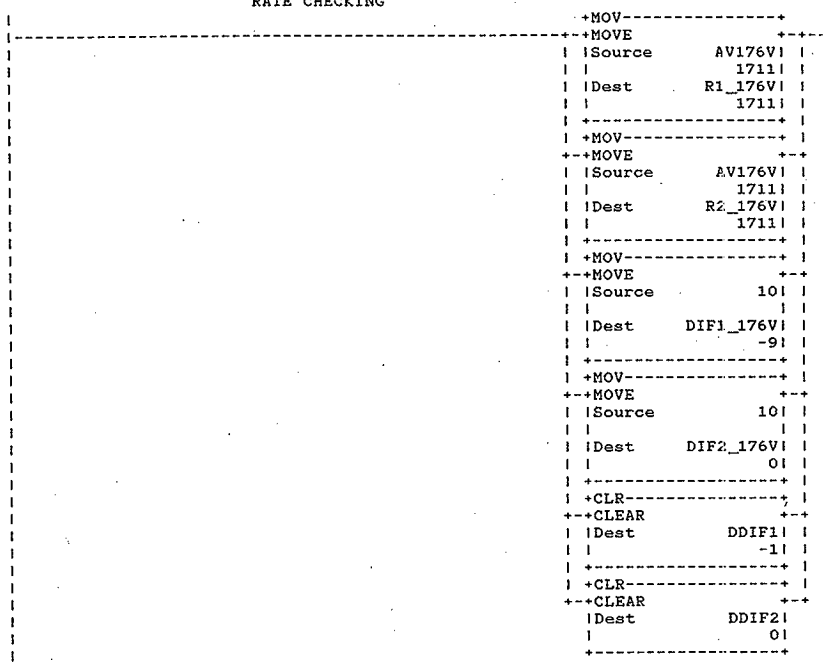
Rung 2:26

RATE CHECKING



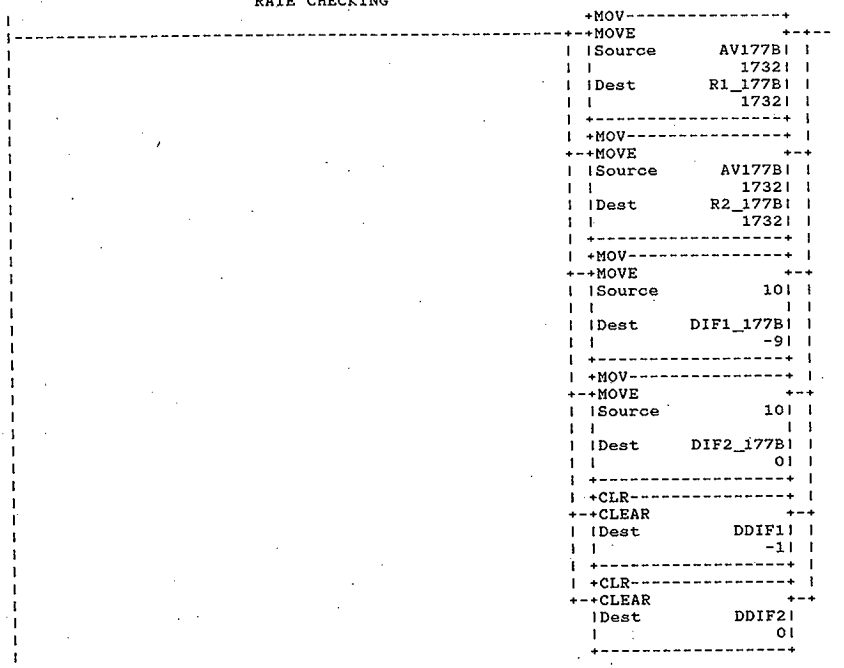
Rung 2:27

RATE CHECKING



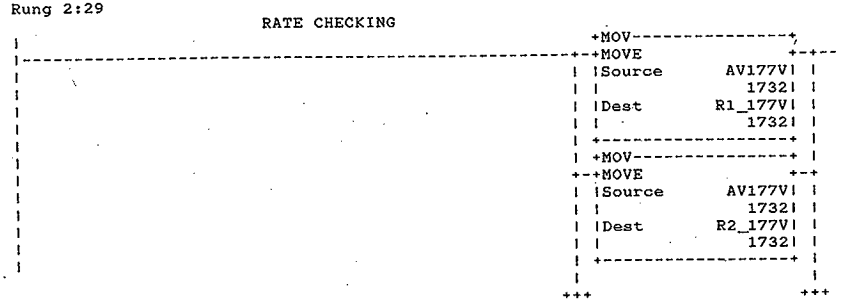
Rung 2:28

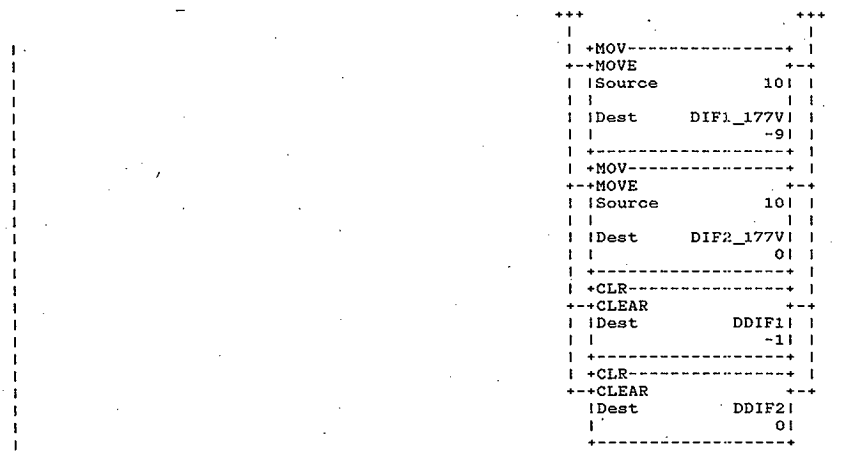
RATE CHECKING



Rung 2:29

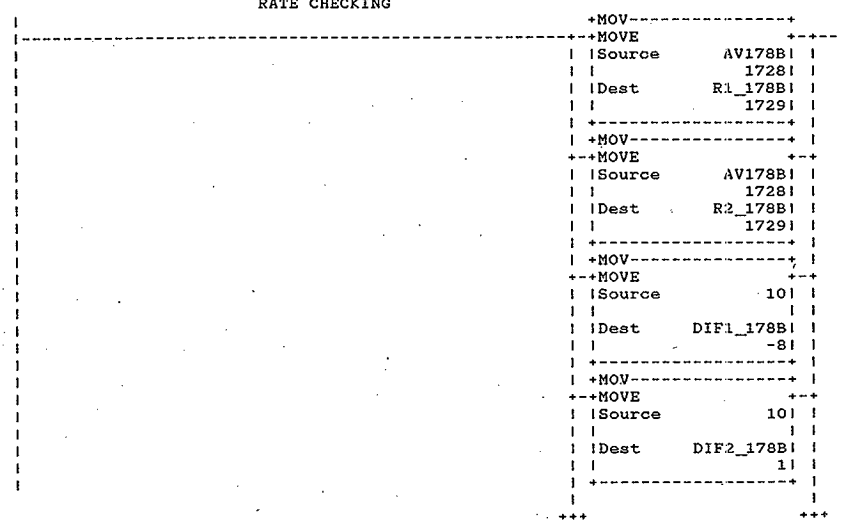
RATE CHECKING





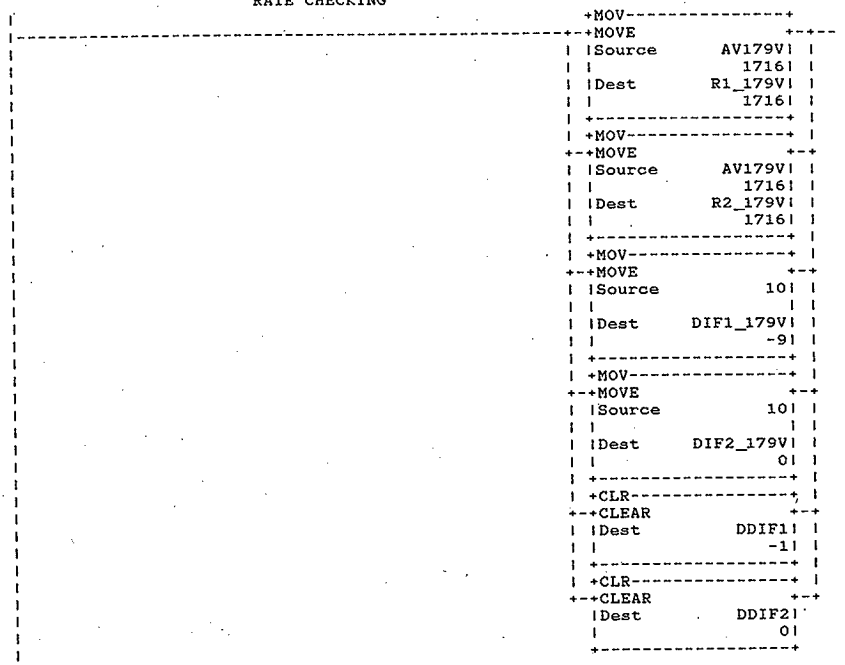
Rung 2:30

RATE CHECKING



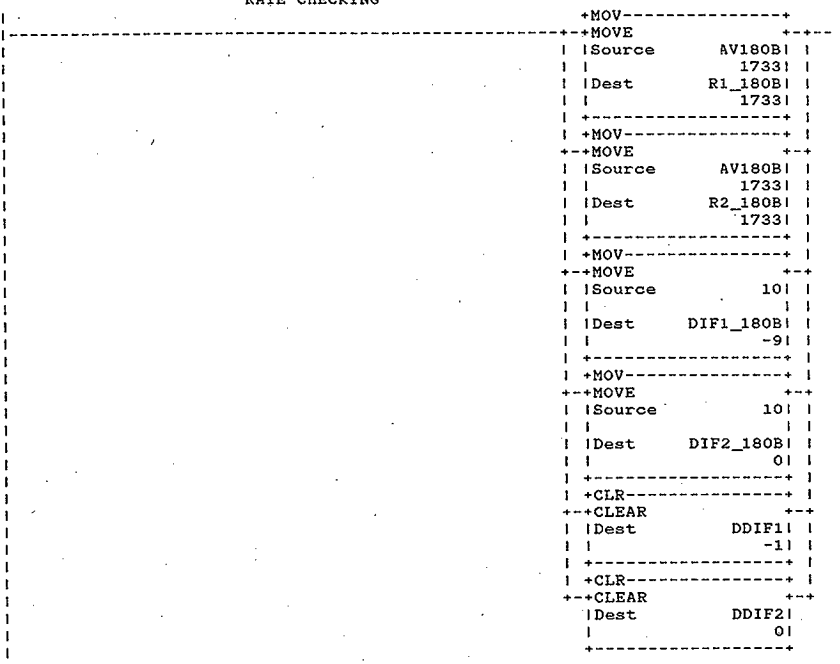
Rung 2:31

RATE CHECKING



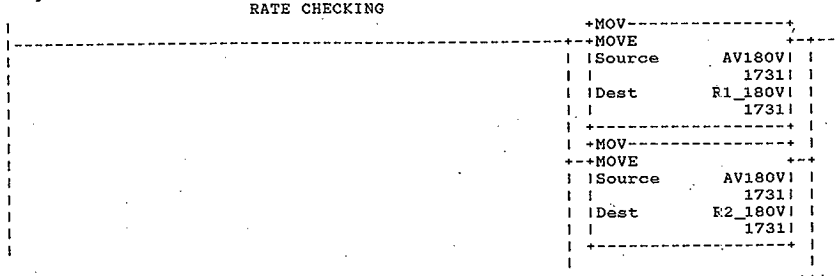
Rung 2:32

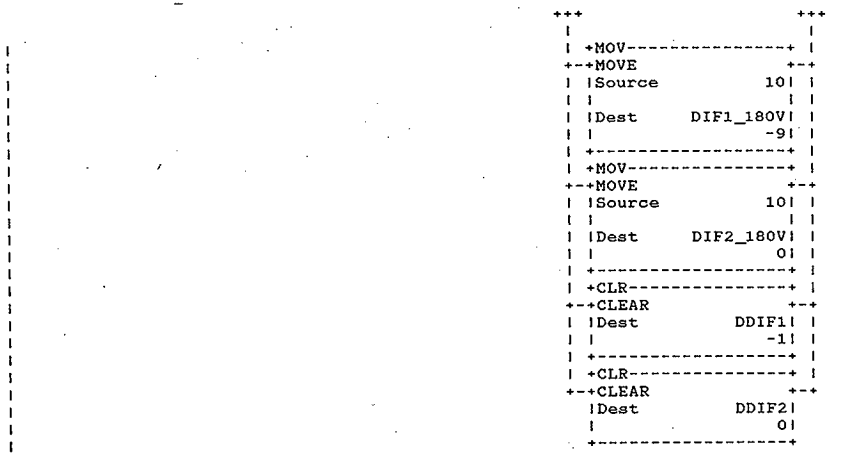
RATE CHECKING



Rung 2:33

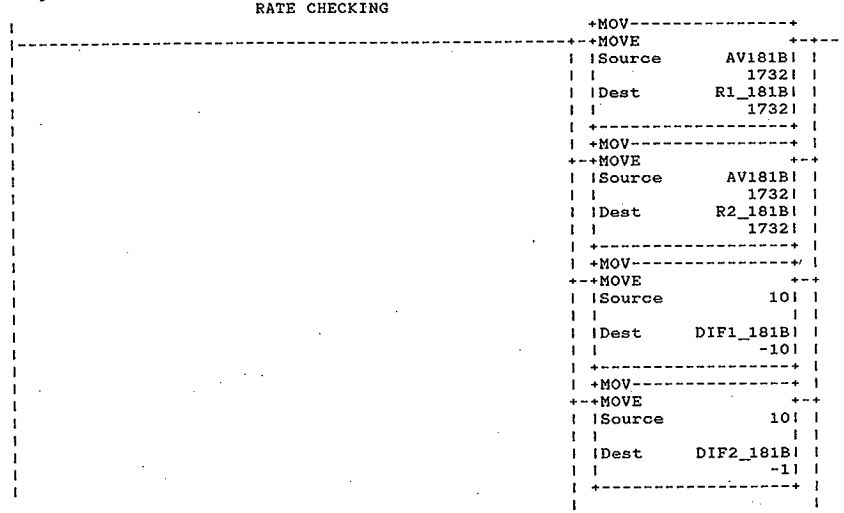
RATE CHECKING





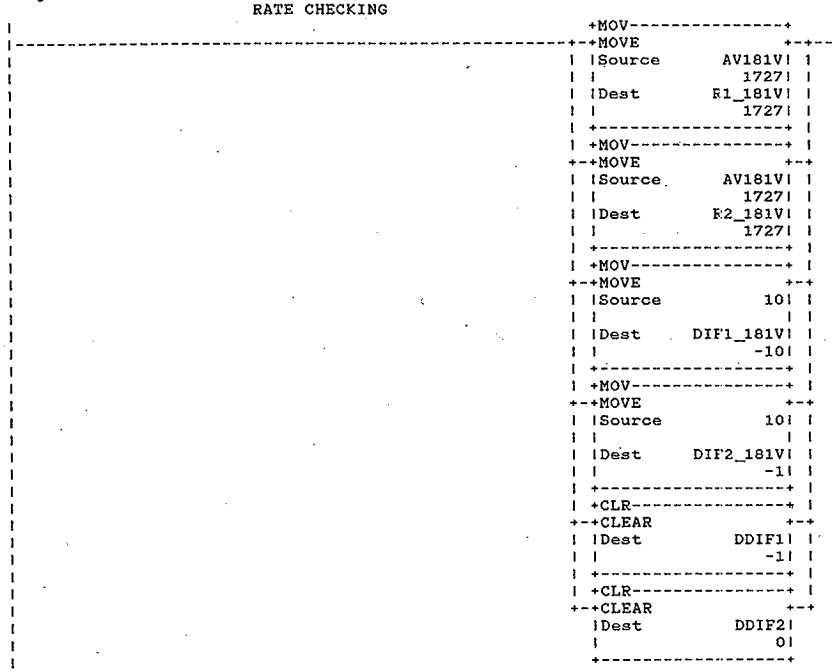
Rung 2:34

RATE CHECKING



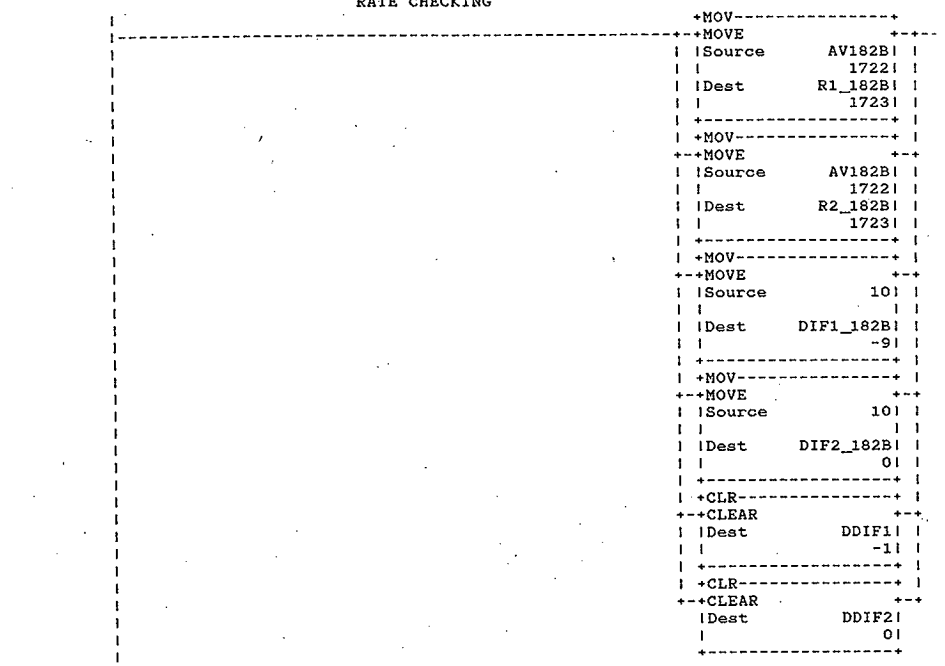
Rung 2:35

RATE CHECKING



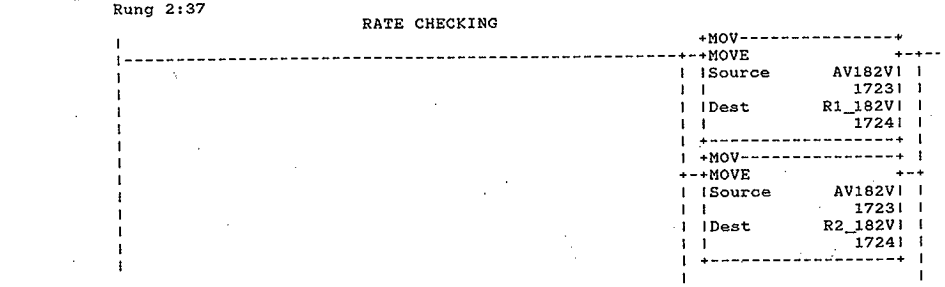
Rung 2:36

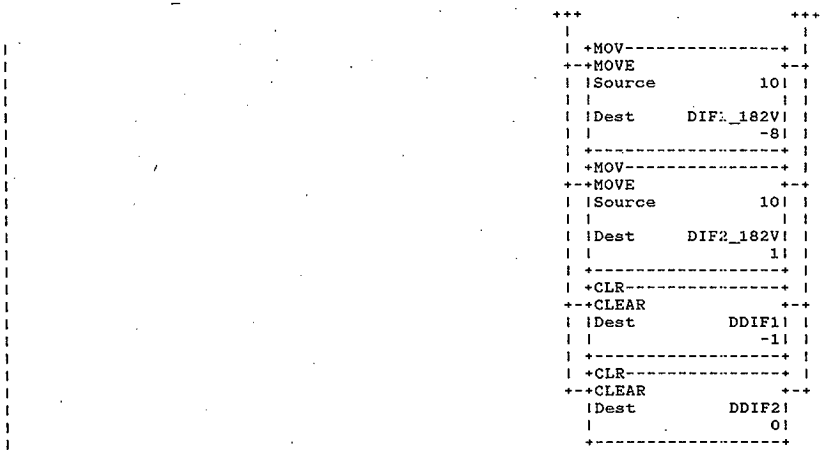
RATE CHECKING



Rung 2:37

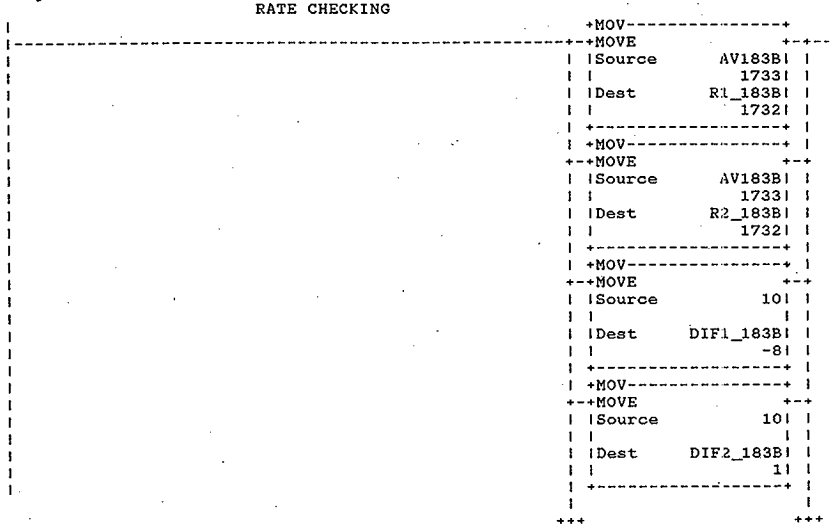
RATE CHECKING

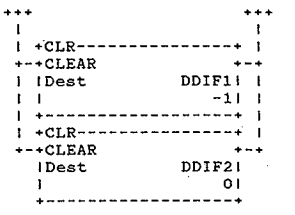




Rung 2:38

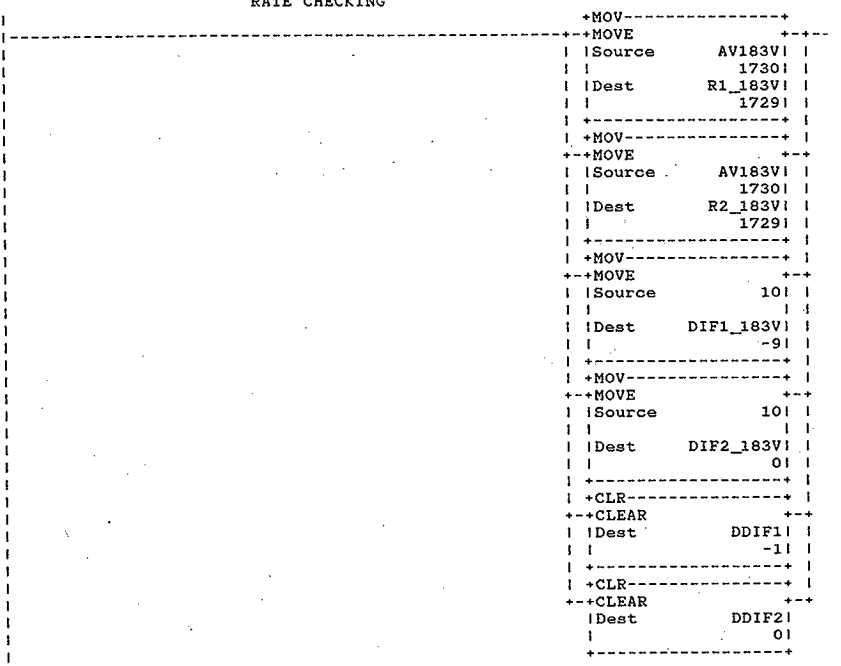
RATE CHECKING



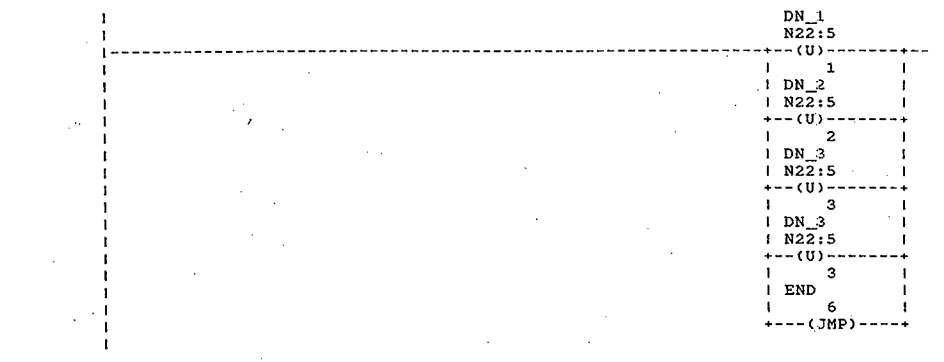


Rung 2:39

RATE CHECKING



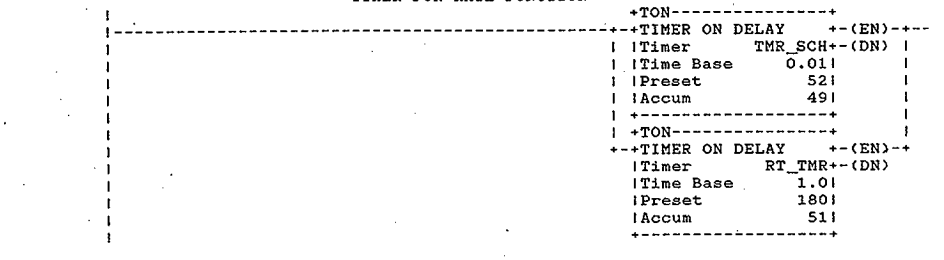
Rung 2:40



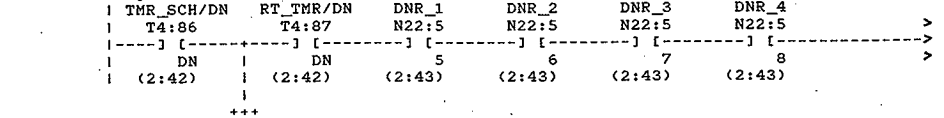
Rung 2:41

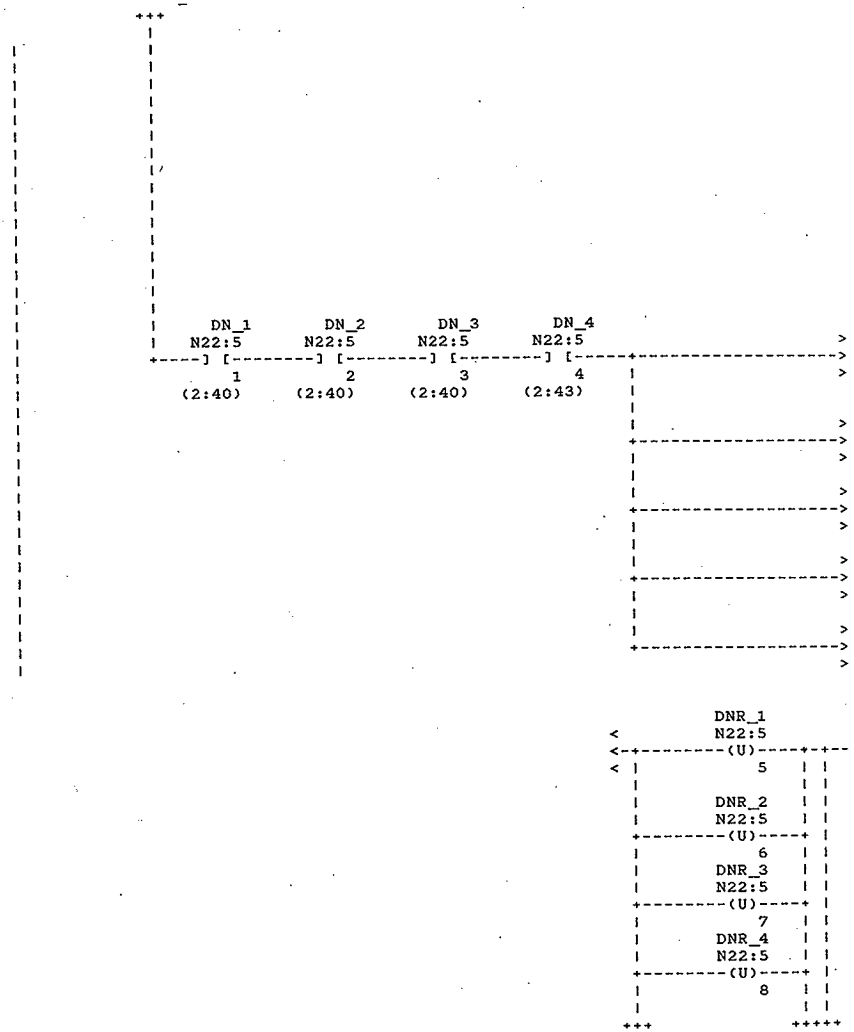
Rung 2:42

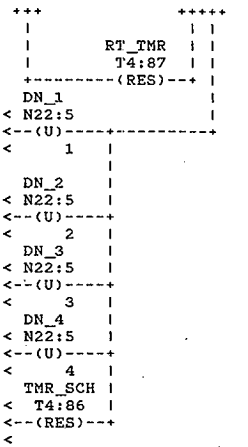
TIMERS FOR SCHEDULING SECTION OPERATION
TIMER FOR RATE FUNCTION



Rung 2:43

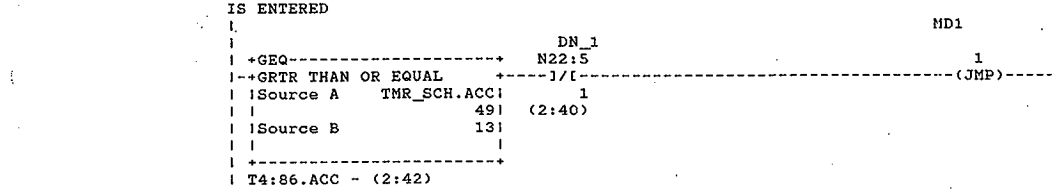



DN_1
N22:5
1
(2:40)
DN_2
N22:5
2
(2:40)
DN_3
N22:5
3
(2:40)
DN_4
N22:5
4
(2:43)
DNR_1
N22:5
5
DNR_2
N22:5
6
DNR_3
N22:5
7
DNR_4
N22:5
8



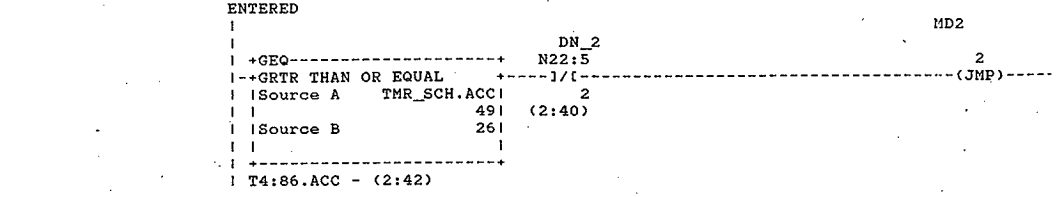
Rung 2:44

JUMPS TO SECTION 1 IF DN_1 IS NOT LATCHED DN_1 GETS LATCHED WHEN THE SECTION IS ENTERED



Rung 2:45

JUMPS TO SECTION 2 IF DN_2 IS NOT LATCHED DN_2 GETS LATCHED WHEN THE SECTION IS ENTERED



```
Rung 2:46
*******************************************************************************
JUMPS TO SECTION 3 IF DN_3 IS NOT LATCHED DN_3 GETS LATCHED WHEN THE SECTION IS
ENTERED
|                                                                    MD3
|                                 DN_3
| +GEQ--------------------+    N22:5                                    3
|-+GRTR THAN OR EQUAL      +----]/[-----------------------------------(JMP)-----
| |Source A    TMR_SCH.ACC|        3
| |                     49|   (2:40)
| |Source B             39|
| |                       |
| +-----------------------+
| T4:86.ACC - (2:42)

Rung 2:47
*******************************************************************************
JUMPS TO SECTION 3 IF DN_3 IS NOT LATCHED DN_3 GETS LATCHED WHEN THE SECTION IS
ENTERED
|                                                                    MD4
|                                 DN_4
| +GEQ--------------------+    N22:5                                    4
|-+GRTR THAN OR EQUAL      +----]/[-----------------------------------(JMP)-----
| |Source A    TMR_SCH.ACC|        4
| |                     49|   (2:43)
| |Source B             52|
| |                       |
| +-----------------------+
| T4:86.ACC - (2:42)

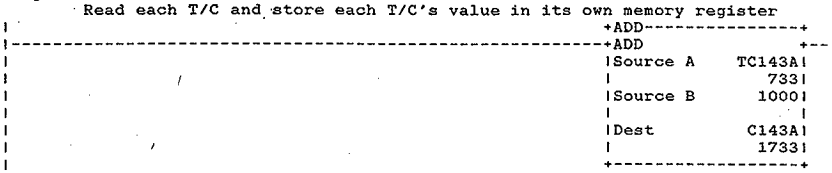
Rung 2:48
|                                                                    NOT END
|                                                                        5
|-------------------------------------------------------------------(JMP)-----
|

Rung 2:49
*******************************************************************************
                                BEGIN SECTION 1
| MD1
|                                                                    DUMMY3
|                                                                    N22:7
|     1
|---[LBL]-------------------------------------------------------------( )----
|                                                                        2

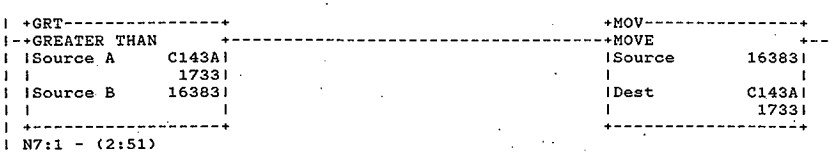
Rung 2:50
|                                                                    DN_1
|                                                                    N22:5
|-------------------------------------------------------------------(L)---
|                                                                        1
```

Rung 2:51

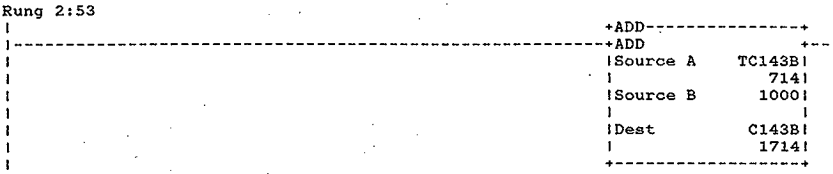
Read each T/C and store each T/C's value in its own memory register



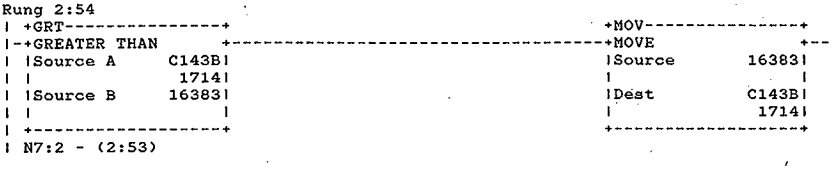
Rung 2:52



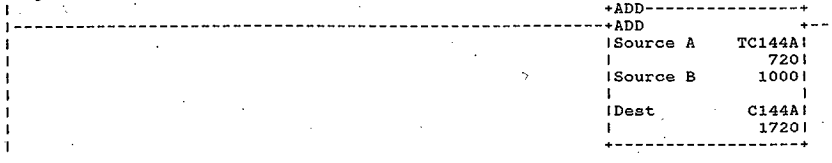
Rung 2:53



Rung 2:54



Rung 2:55



```
Rung 2:56
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C144A|                                  |Source       16383|
| |              1720|                                  |                  |
| |Source B     16383|                                  |Dest         C144A|
| |                  |                                  |              1720|
| +------------------+                                  +------------------+
| N7:3 - (2:55)

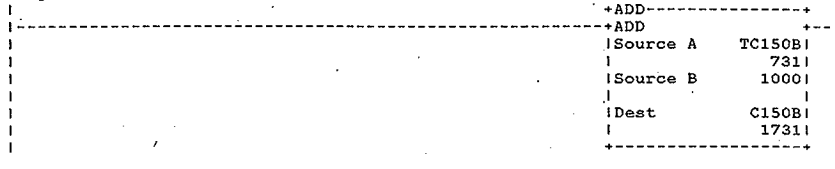
Rung 2:57
|                                                       +ADD---------------+
|-----------------------------------------------------+ADD               +--
|                                                       |Source A    TC144B|
|                                                       |               720|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C144B|
|                                                       |              1720|
|                                                       +------------------+

Rung 2:58
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C144B|                                  |Source       16383|
| |              1720|                                  |                  |
| |Source B     16383|                                  |Dest         C144B|
| |                  |                                  |              1720|
| +------------------+                                  +------------------+
| N7:4 - (2:57)

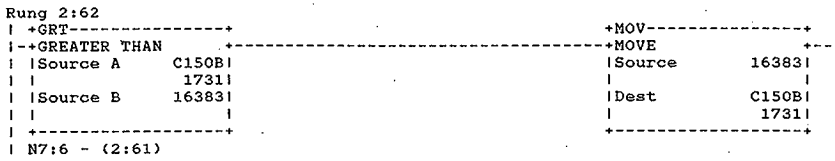
Rung 2:59
|                                                       +ADD---------------+
|-----------------------------------------------------+ADD               +--
|                                                       |Source A    TC150A|
|                                                       |               731|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C150A|
|                                                       |              1731|
|                                                       +------------------+

Rung 2:60
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C150A|                                  |Source       16383|
| |              1731|                                  |                  |
| |Source B     16383|                                  |Dest         C150A|
| |                  |                                  |              1731|
| +------------------+                                  +------------------+
| N7:5 - (2:59)
```

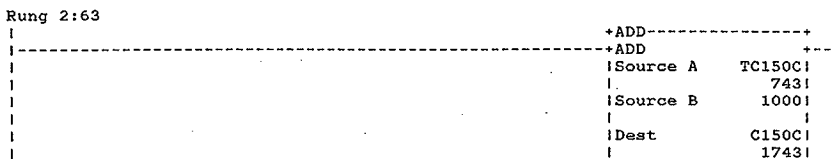
Rung 2:61



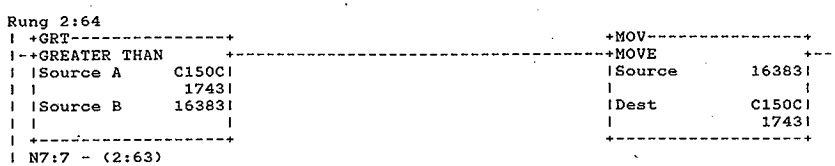
Rung 2:62



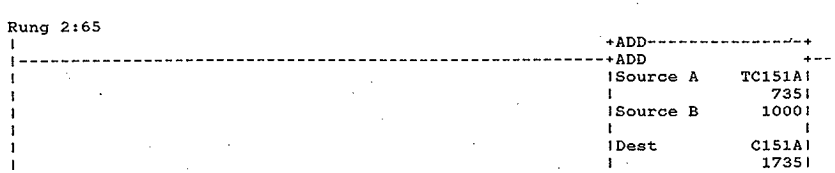
Rung 2:63



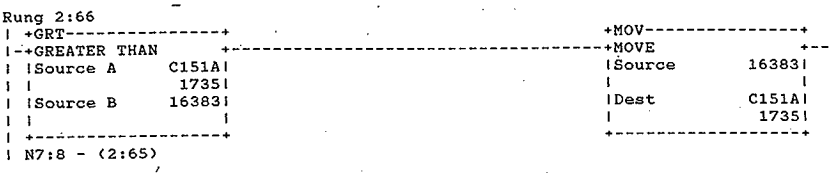
Rung 2:64



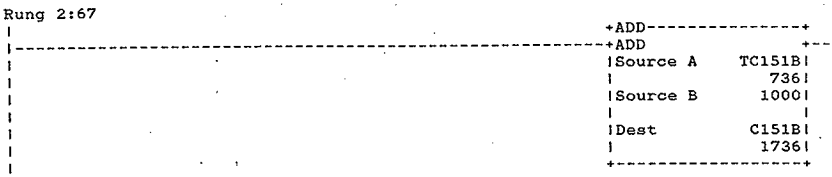
Rung 2:65



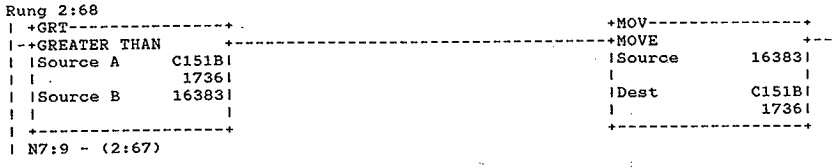
Rung 2:66



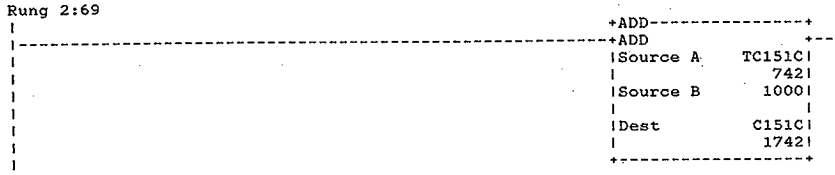
Rung 2:67



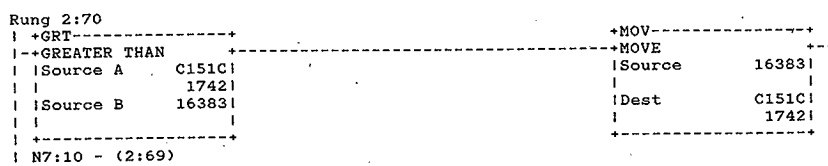
Rung 2:68



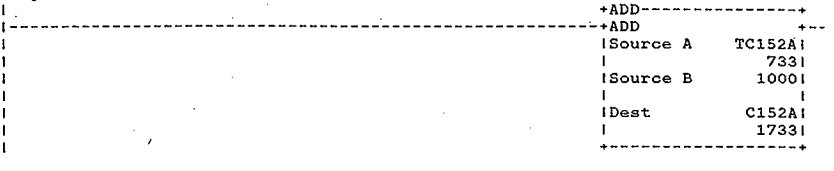
Rung 2:69



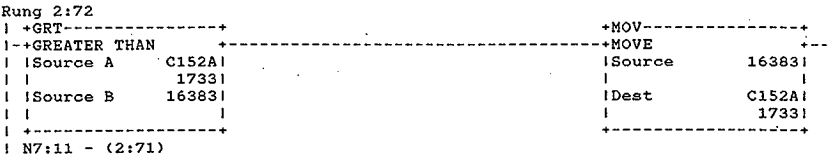
Rung 2:70



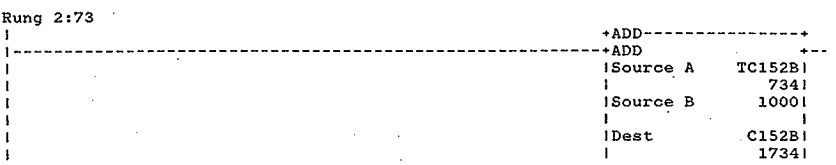
Rung 2:71



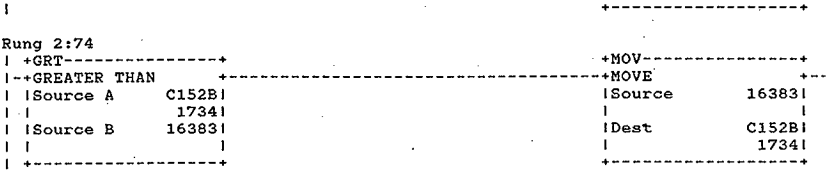
Rung 2:72



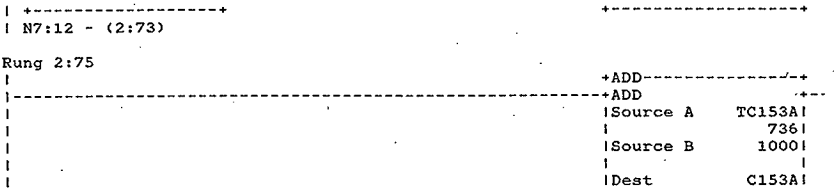
Rung 2:73



Rung 2:74



Rung 2:75



```
Rung 2:76
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C153A|                                  |Source       16383|
| |              1736|                                  |                  |
| |Source B     16383|                                  |Dest         C153A|
| |                  |                                  |              1736|
| +------------------+                                  +------------------+
| N7:13 - (2:75)

Rung 2:77
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC153B|
|                                                       |               707|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C153B|
|                                                       |              1706|
|                                                       +------------------+

Rung 2:78
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C153B|                                  |Source       16383|
| |              1706|                                  |                  |
| |Source B     16383|                                  |Dest         C153B|
| |                  |                                  |              1706|
| +------------------+                                  +------------------+
| N7:14 - (2:77)

Rung 2:79
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A    TC154A|
|                                                       |               718|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest         C154A|
|                                                       |              1718|
|                                                       +------------------+

Rung 2:80
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C154A|                                  |Source       16383|
| |              1718|                                  |                  |
| |Source B     16383|                                  |Dest         C154A|
| |                  |                                  |              1718|
| +------------------+                                  +------------------+
| N7:15 - (2:79)
```

Rung 2:81

```
|                                                          +ADD---------------+
|----------------------------------------------------------+ADD               +--
|                                                          |Source A    TC154B|
|                                                          |                720|
|                                                          |Source B       1000|
|                                                          |                  |
|                                                          |Dest         C154B|
|                                                          |                1720|
|                                                          +------------------+
```

Rung 2:82

```
| +GRT---------------+                                     +MOV---------------+
|-+GREATER THAN      +-------------------------------------+MOVE              +--
| |Source A     C154B|                                     |Source       16383|
| |               1720|                                     |                  |
| |Source B     16383|                                     |Dest         C154B|
| |                  |                                     |                1720|
| +------------------+                                     +------------------+
| N7:16 - (2:81)
```

Rung 2:83

```
|                                                          +ADD---------------+
|----------------------------------------------------------+ADD               +--
|                                                          |Source A    TC160A|
|                                                          |                729|
|                                                          |Source B       1000|
|                                                          |                  |
|                                                          |Dest         C160A|
|                                                          |                1729|
|                                                          +------------------+
```

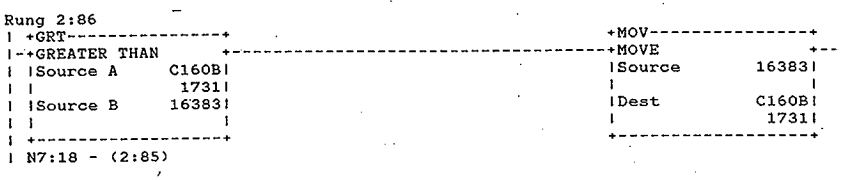
Rung 2:84

```
| +GRT---------------+                                     +MOV---------------+
|-+GREATER THAN      +-------------------------------------+MOVE              +--
| |Source A     C160A|                                     |Source       16383|
| |               1729|                                     |                  |
| |Source B     16383|                                     |Dest         C160A|
| |                  |                                     |                1729|
| +------------------+                                     +------------------+
| N7:17 - (2:83)
```

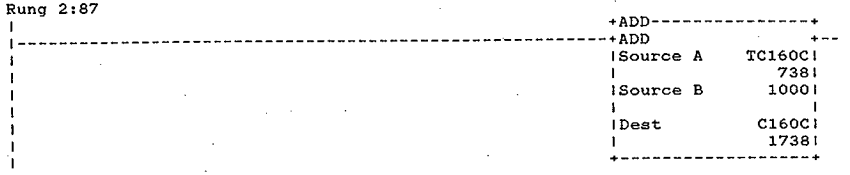
Rung 2:85

```
|                                                          +ADD---------------+
|----------------------------------------------------------+ADD               +--
|                                                          |Source A    TC160B|
|                                                          |                731|
|                                                          |Source B       1000|
|                                                          |                  |
|                                                          |Dest         C160B|
|                                                          |                1731|
|                                                          +------------------+
```

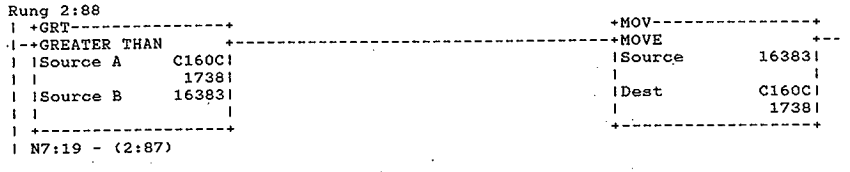
Rung 2:86



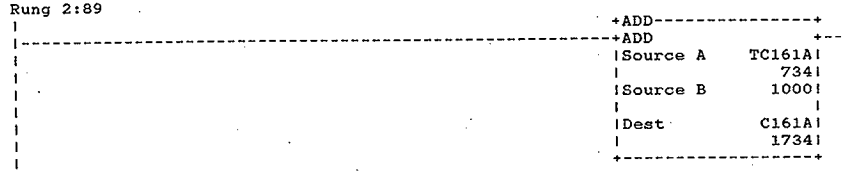
Rung 2:87



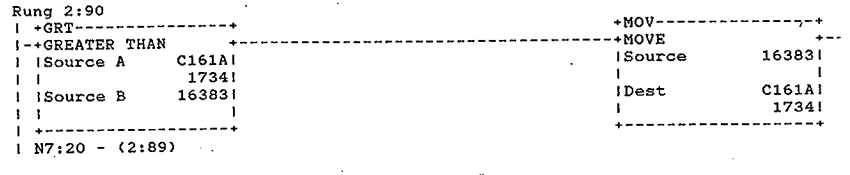
Rung 2:88



Rung 2:89



Rung 2:90



```
Rung 2:91
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD                +--
|                                                                  |Source A    TC161B|
|                                                                  |               731|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest         C161B|
|                                                                  |              1731|
|                                                                  +------------------+

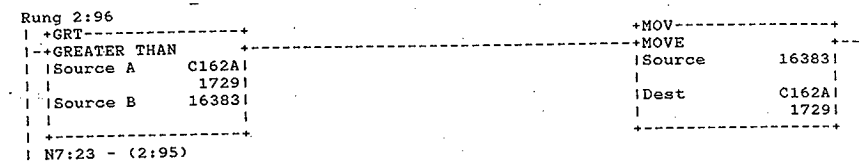
Rung 2:92
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE               +--
| |Source A     C161B|                                             |Source       16383|
| |              1731|                                             |                  |
| |Source B     16383|                                             |Dest         C161B|
| |                  |                                             |              1731|
| +------------------+                                             +------------------+
| N7:21 - (2:91)

Rung 2:93
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD                +--
|                                                                  |Source A    TC161C|
|                                                                  |               736|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest         C161C|
|                                                                  |              1736|
|                                                                  +------------------+

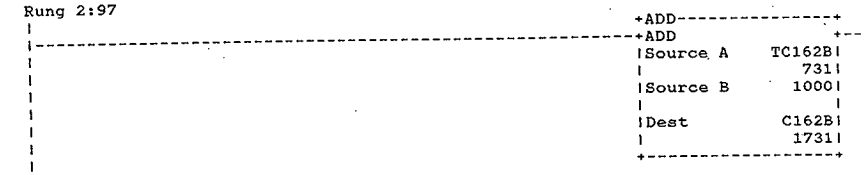
Rung 2:94
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE               +--
| |Source A     C161C|                                             |Source       16383|
| |              1736|                                             |                  |
| |Source B     16383|                                             |Dest         C161C|
| |                  |                                             |              1736|
| +------------------+                                             +------------------+
| N7:22 - (2:93)

Rung 2:95
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD                +--
|                                                                  |Source A    TC162A|
|                                                                  |               729|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest         C162A|
|                                                                  |              1729|
|                                                                  +------------------+
```

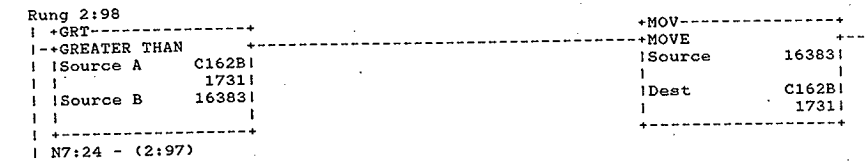
Rung 2:96



Rung 2:97

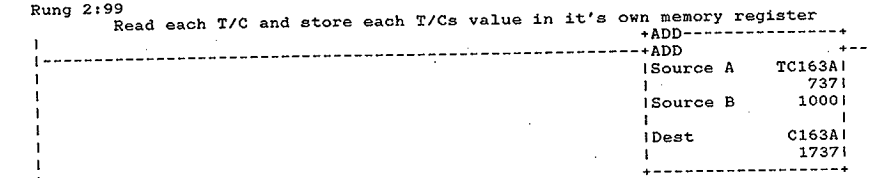


Rung 2:98

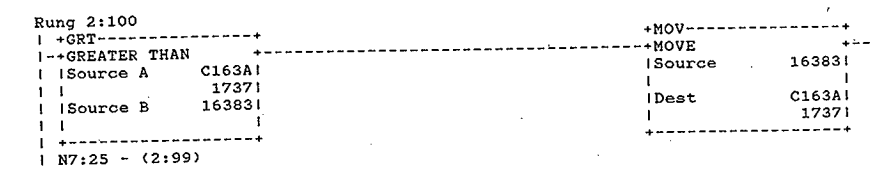


Rung 2:99

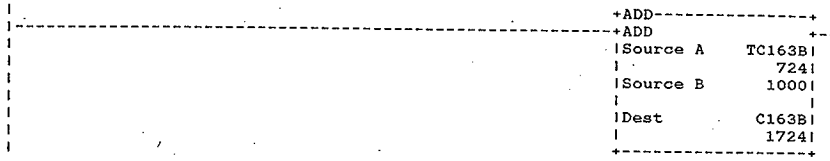
Read each T/C and store each T/Cs value in it's own memory register



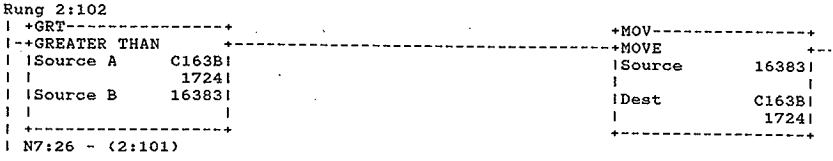
Rung 2:100



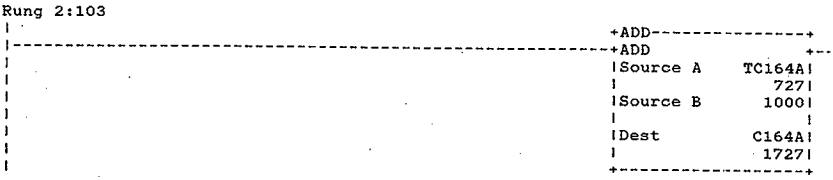
Rung 2:101



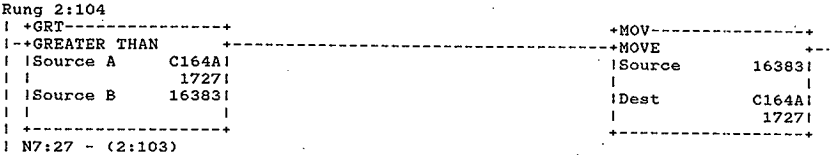
Rung 2:102



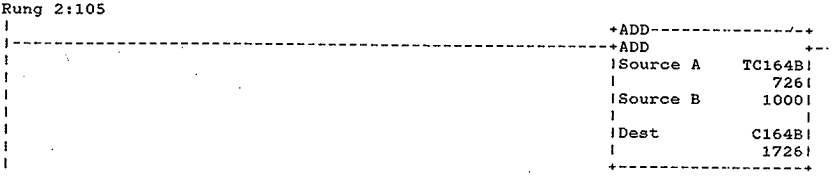
Rung 2:103



Rung 2:104



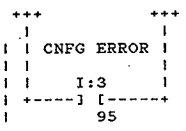
Rung 2:105



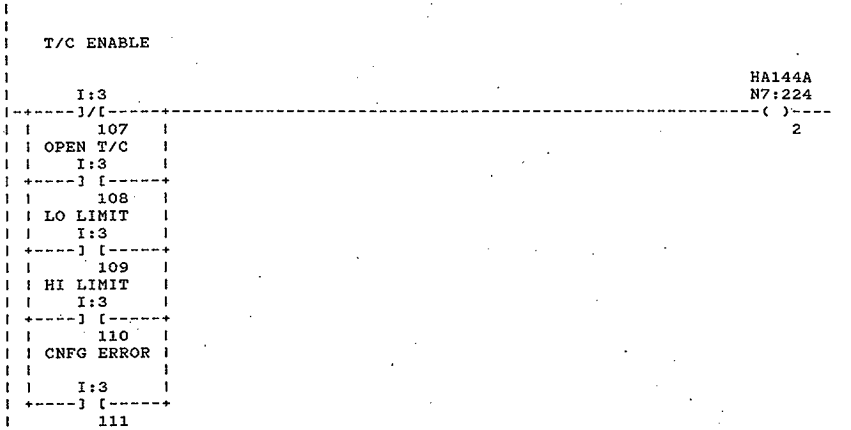
```
Rung 2:106
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A     C164B|                                  |Source       16383|
| |              1726|                                  |                  |
| |Source B     16383|                                  |Dest         C164B|
| |                  |                                  |              1726|
| +------------------+                                  +------------------+
| N7:28 - (2:105)

Rung 2:107
                          ** Alarms **
        For each T/C read its STATUS BITS to detect T/C problems
|   T/C ENABLE
|
|                                                                        HA143A
|      I:3                                                               N7:224
|-+----]/[-----+-------------------------------------------------------( )----
| |      75    |                                                           0
| | OPEN T/C   |
| |    I:3     |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |    I:3     |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |    I:3     |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |            |
| |    I:3     |
| +----] [-----+
|        79

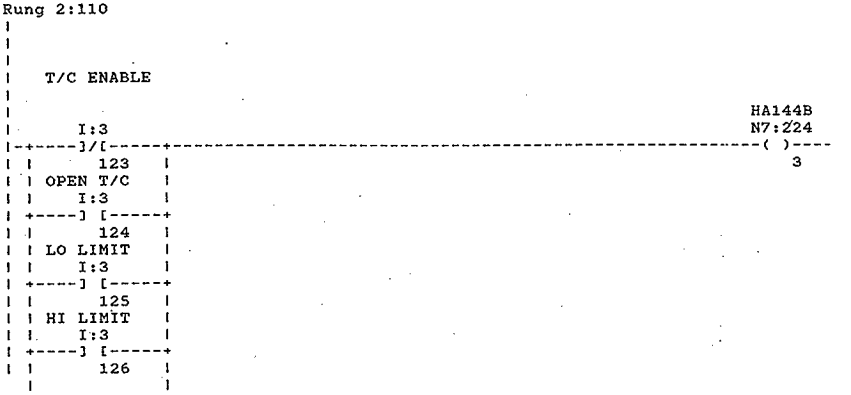
Rung 2:108
|
|
|
|   T/C ENABLE
|
|                                                                        HA143B
|      I:3                                                               N7:224
|-+----]/[-----+-------------------------------------------------------( )----
| |      91    |                                                           1
| | OPEN T/C   |
| |    I:3     |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |    I:3     |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |    I:3     |
| +----] [-----+
| |      94    |
  |            |
 +++          +++
```

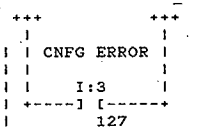


Rung 2:109

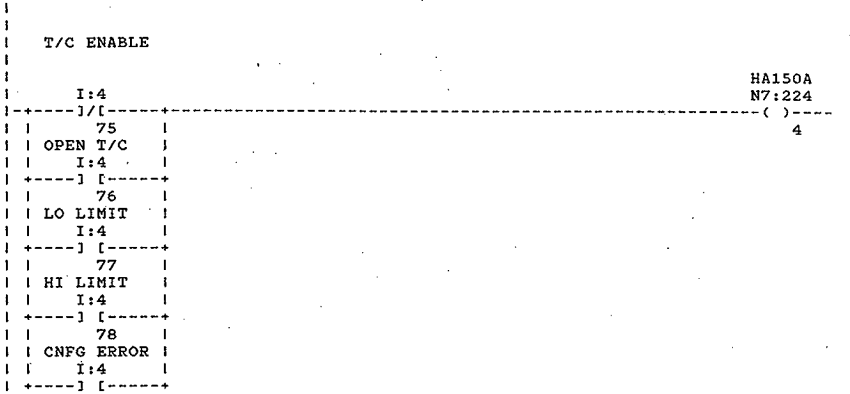


Rung 2:110

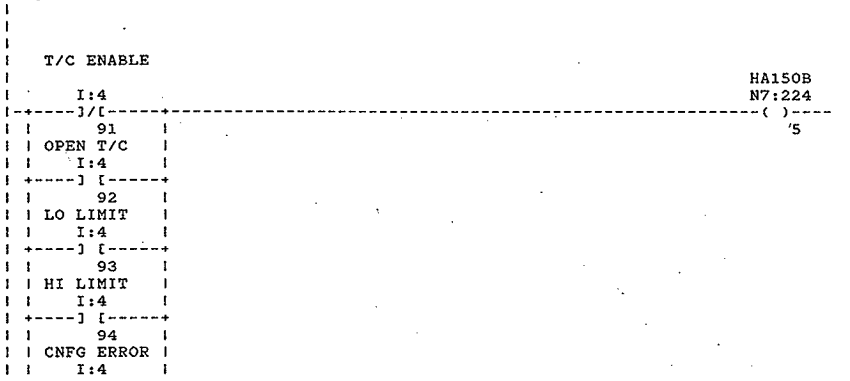




Rung 2:111



Rung 2:112



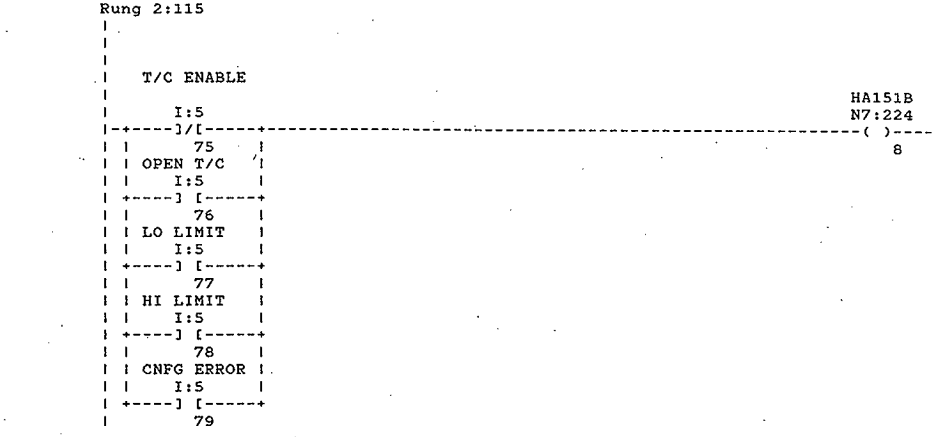
Rung 2:113

```
|
|
|
|   T/C ENABLE
|                                                                          HA150C
|      I:4                                                                 N7:224
|-+----]/[-----+-------------------------------------------------------------( )----
| |       107   |                                                              6
| | OPEN T/C    |
| |     I:4     |
| +-----] [-----+
| |       108   |
| | LO LIMIT    |
| |     I:4     |
| +-----] [-----+
| |       109   |
| | HI LIMIT    |
| |     I:4     |
| +-----] [-----+
| |       110   |
| | CNFG ERROR  |
| |     I:4     |
| +-----] [-----+
|         111
```

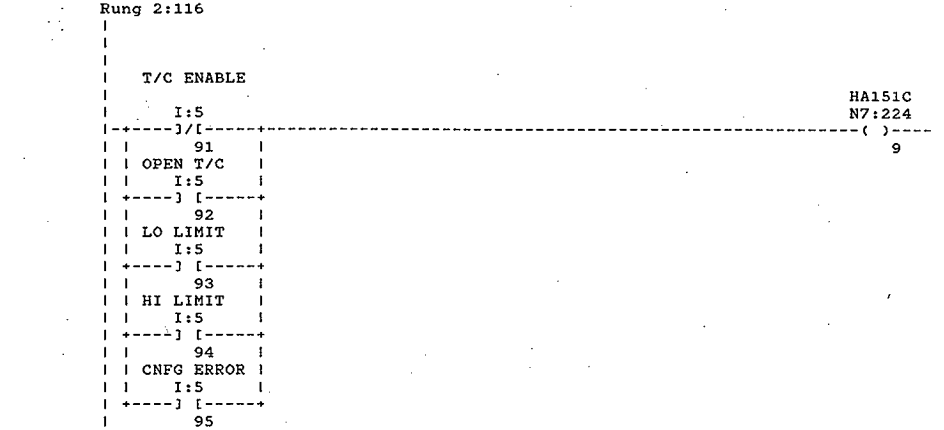
Rung 2:114

```
|
|
|
|   T/C ENABLE
|                                                                          HA151A
|      I:4                                                                 N7:224
|-+----]/[-----+-------------------------------------------------------------( )----
| |       123   |                                                              7
| | OPEN T/C    |
| |     I:4     |
| +-----] [-----+
| |       124   |
| | LO LIMIT    |
| |     I:4     |
| +-----] [-----+
| |       125   |
| | HI LIMIT    |
| |     I:4     |
| +-----] [-----+
| |       126   |
| | CNFG ERROR  |
| |     I:4     |
| +-----] [-----+
|         127
```

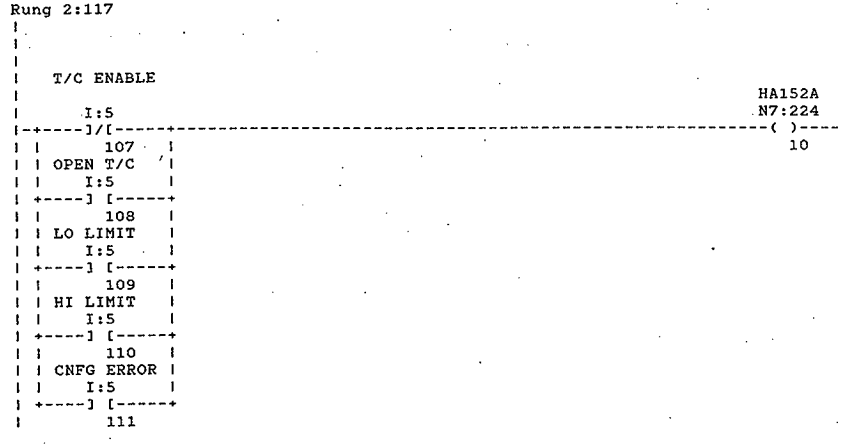
Rung 2:115



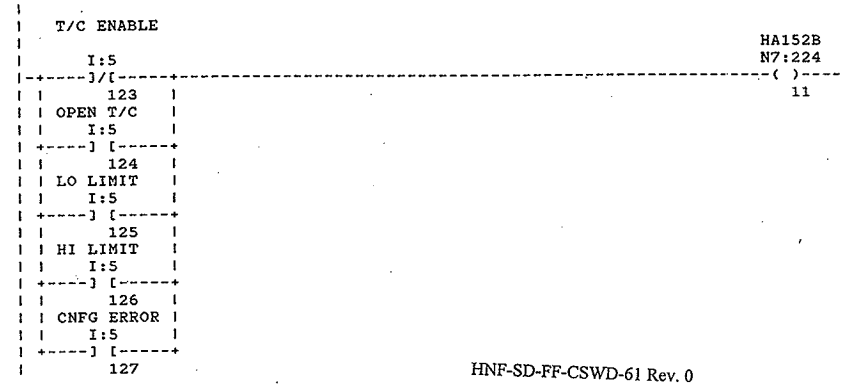
Rung 2:116



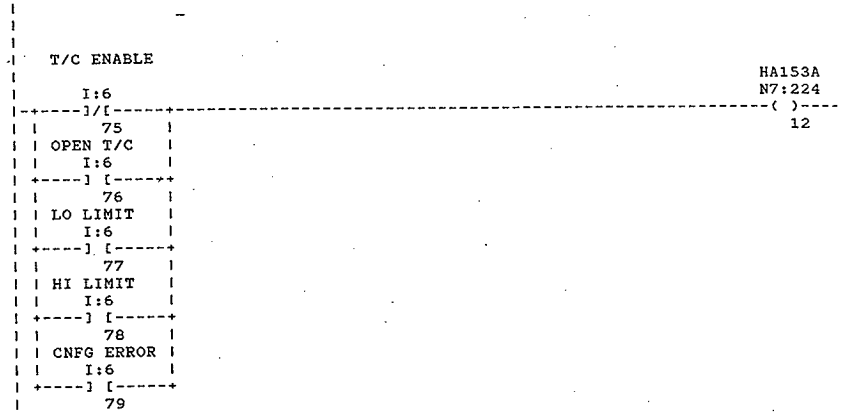
Rung 2:117



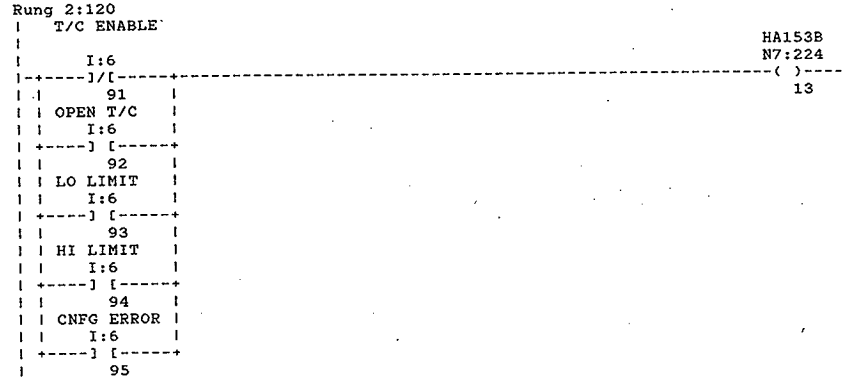
Rung 2:118



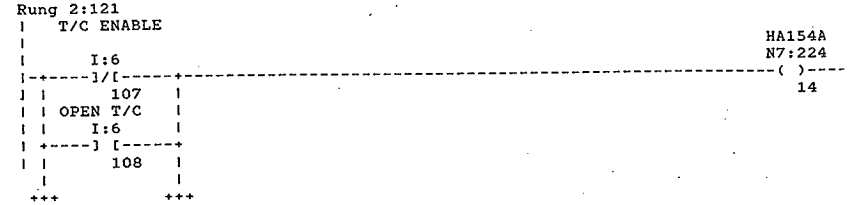
Rung 2:119



Rung 2:120



Rung 2:121



```
 +++          +++
  |            |
| | LO LIMIT   |
| |    I:6     |
| +----] [-----+
| |      109   |
| | HI LIMIT   |
| |    I:6     |
| +----] [-----+
| |      110   |
| | CNFG ERROR |
| |    I:6     |
| +----] [-----+
|        111
```

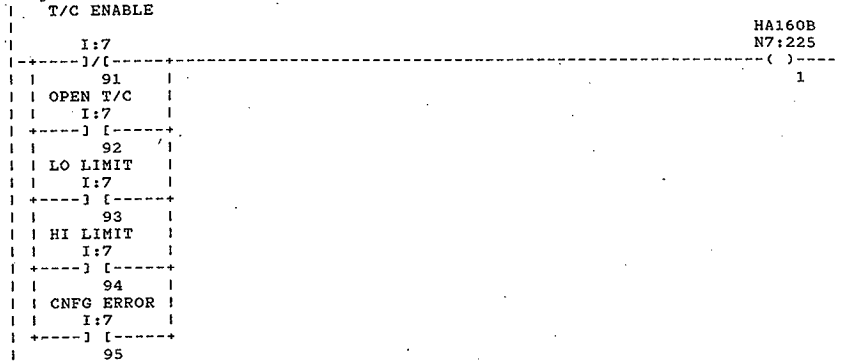
Rung 2:122

```
|   T/C ENABLE
|                                                                    HA154B
|      I:6                                                           N7:224
|-+----]/[-----+-------------------------------------------------------( )----
| |      123   |                                                        15
| | OPEN T/C   |
| |    I:6     |
| +----] [-----+
| |      124   |
| | LO LIMIT   |
| |    I:6     |
| +----] [-----+
| |      125   |
| | HI LIMIT   |
| |    I:6     |
| +----] [-----+
| |      126   |
| | CNFG ERROR |
| |    I:6     |
| +----] [-----+
|        127
```

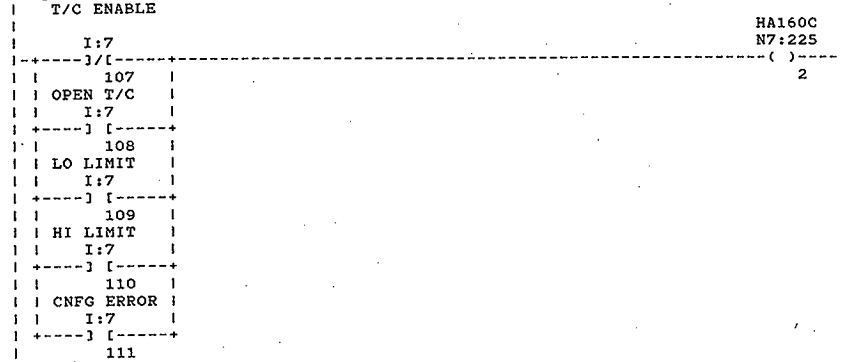
Rung 2:123

```
|   T/C ENABLE
|                                                                    HA160A
|      I:7                                                           N7:225
|-+----]/[-----+-------------------------------------------------------( )----
| |      75    |                                                        0
| | OPEN T/C   |
| |    I:7     |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |    I:7     |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |    I:7     |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |    I:7     |
| +----] [-----+
|        79
```

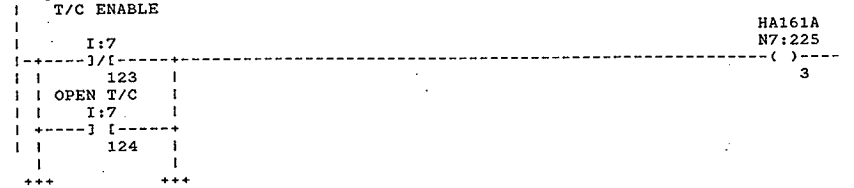
Rung 2:124
T/C ENABLE



Rung 2:125
T/C ENABLE



Rung 2:126
T/C ENABLE



```
 +++          +++
  |            |
| | LO LIMIT   |
| |    I:7     |
| +----] [-----+
| |      125   |
| | HI LIMIT   |
| |    I:7     |
| +----] [-----+
| |      126   |
| | CNFG ERROR |
| |    I:7     |
| +----] [-----+
|        127
```

Rung 2:127

```
|   T/C ENABLE
|
|      I:8                                                                  HA161B
|-+----]/[-----+-------------------------------------------------------------N7:225
| |      75    |                                                              ( )----
| | OPEN T/C   |                                                                 4
| |    I:8     |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |    I:8     |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |    I:8     |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |    I:8     |
| +----] [-----+
|        79
```

Rung 2:128

```
|   T/C ENABLE
|
|      I:8                                                                  HA161C
|-+----]/[-----+-------------------------------------------------------------N7:225
| |      91    |                                                              ( )----
| | OPEN T/C   |                                                                 5
| |    I:8     |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |    I:8     |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |    I:8     |
| +----] [-----+
| |      94    |
| | CNFG ERROR |
| |    I:8     |
| +----] [-----+
|        95
```

```
Rung 2:129
|   T/C ENABLE
|                                                                          HA162A
|      I:8                                                                 N7:225
|-+----]/[-----+-------------------------------------------------------------( )----
| |       107   |                                                             6
| | OPEN T/C    |
| |    I:8      |
| +----] [-----+
| |       108   |
| | LO LIMIT    |
| |    I:8      |
| +----] [-----+
| |       109   |
| | HI LIMIT    |
| |    I:8      |
| +----] [-----+
| |       110   |
| | CNFG ERROR  |
| |    I:8      |
| +----] [-----+
|         111

Rung 2:130
|
|
|
|   T/C ENABLE
|
|                                                                          HA162B
|      I:8                                                                 N7:225
|-+----]/[-----+-------------------------------------------------------------( )----
| |       123   |                                                             7
| | OPEN T/C    |
| |    I:8      |
| +----] [-----+
| |       124   |
| | LO LIMIT    |
| |    I:8      |
| +----] [-----+
| |       125   |
| | HI LIMIT    |
| |    I:8      |
| +----] [-----+
| |       126   |
| | CNFG ERROR  |
| |    I:8      |
| +----] [-----+
|         127

Rung 2:131
*******************************************************************************
SET DEVIATION SWITCH FOR SECTION 1 AND JUMP TO SECTION 1 AVERAGING ROUTINE
|                                                                    DEV_1
|                                                                    N22:6
|-------------------------------------------------------------------+--(L)-------+--
|                                                                   |     1       |
|                                                                   | AV1         |
|                                                                   |      12     |
|                                                                   +---(JMP)-----+
```

```
Rung 2:132
| DEV1
|                                                                    DUMMY5
|     8                                                              N22:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                       4

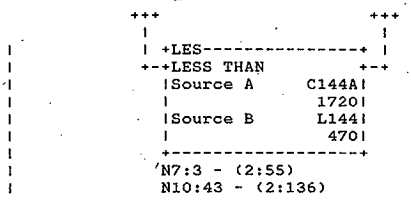
Rung 2:133
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                      +ADD---------------+
|-----------------------------------------------------+-+ADD              +-+--
|                                                     | |Source A     AV143| |
|                                                     | |              1724| |
|                                                     | |Source B DEVIATION| |
|                                                     | |              1250| |
|                                                     | |Dest          H143| |
|                                                     | |              2974| |
|                                                     | +------------------+ |
|                                                     | +SUB---------------+ |
|                                                     +-+SUBTRACT          +-+
|                                                       |Source A     AV143|
|                                                       |              1724|
|                                                       |Source B DEVIATION|
|                                                       |              1250|
|                                                       |Dest          L143|
|                                                       |               474|
|                                                       +------------------+

Rung 2:134
|    HA143A                                                          D143A
|    N7:224    +GRT---------------+                                  N7:171
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A     C143A| |                                     0
|  (2:107)   | |              1733| |
|            | |Source B      H143| |
|            | |              2974| |
|            | +------------------+ |
|            | N7:1 - (2:51)        |
|            | N10:91 - (2:133)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C143A|
|              |              1733|
|              |Source B      L143|
|              |               474|
|              +------------------+
|              N7:1 - (2:51)
|              N10:42 - (2:133)
```

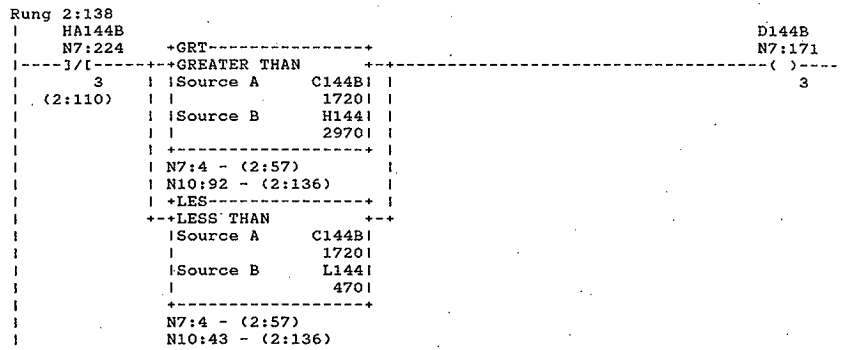
```
Rung 2:135
|    HA143B                                                          D143B
|    N7:224     +GRT---------------+                                 N7:171
|----]/[------+-+GREATER THAN      +-+-----------------------------------( )----
|       1     | |Source A     C143B| |                                    1
|   (2:108)   | |                  | |
|             | |Source B     H143 | |
|             | |                  | |
|             | +------------------+ |
|             | N7:2 - (2:53)        |
|             | N10:91 - (2:133)     |
|             | +LES---------------+ |
|             +-+LESS THAN         +-+
|               |Source A     C143B|
|               |                  |
|               |Source B     L143 |
|               |                  |
|               +------------------+
|               N7:2 - (2:53)
|               N10:42 - (2:133)
```

```
Rung 2:136
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|----------------------------------------------------------+-+ADD             +-+---
|                                                          | |Source A   AV144| |
|                                                          | |                | |
|                                                          | |Source B DEVIATION| |
|                                                          | |                | |
|                                                          | |Dest         H144| |
|                                                          | |                | |
|                                                          | +----------------+ |
|                                                          | +SUB-------------+ |
|                                                          +-+SUBTRACT        +-+
|                                                            |Source A   AV144|
|                                                            |                |
|                                                            |Source B DEVIATION|
|                                                            |                |
|                                                            |Dest         L144|
|                                                            |                |
|                                                            +----------------+
```

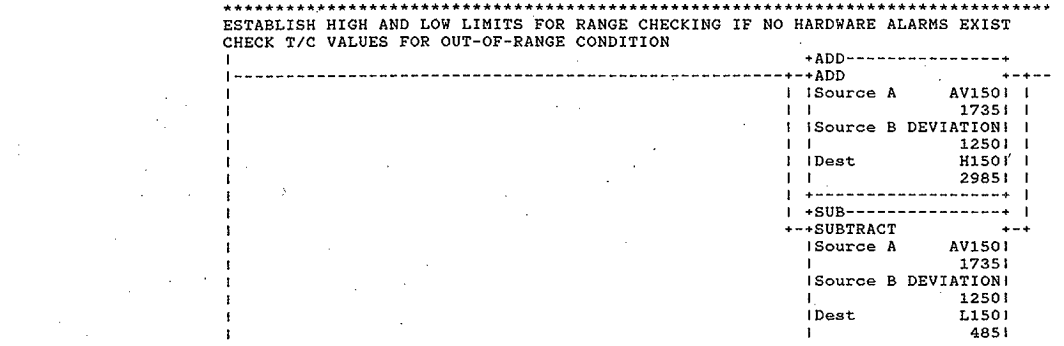
```
Rung 2:137
|    HA144A                                                          D144A
|    N7:224     +GRT---------------+                                 N7:171
|----]/[------+-+GREATER THAN      +-+-----------------------------------( )----
|       2     | |Source A     C144A| |                                    2
|   (2:109)   | |                  | |
|             | |Source B     H144 | |
|             | |                  | |
|             | +------------------+ |
|             | N7:3 - (2:55)        |
|             | N10:92 - (2:136)     |
|             |                      |
|            +++                    +++
```

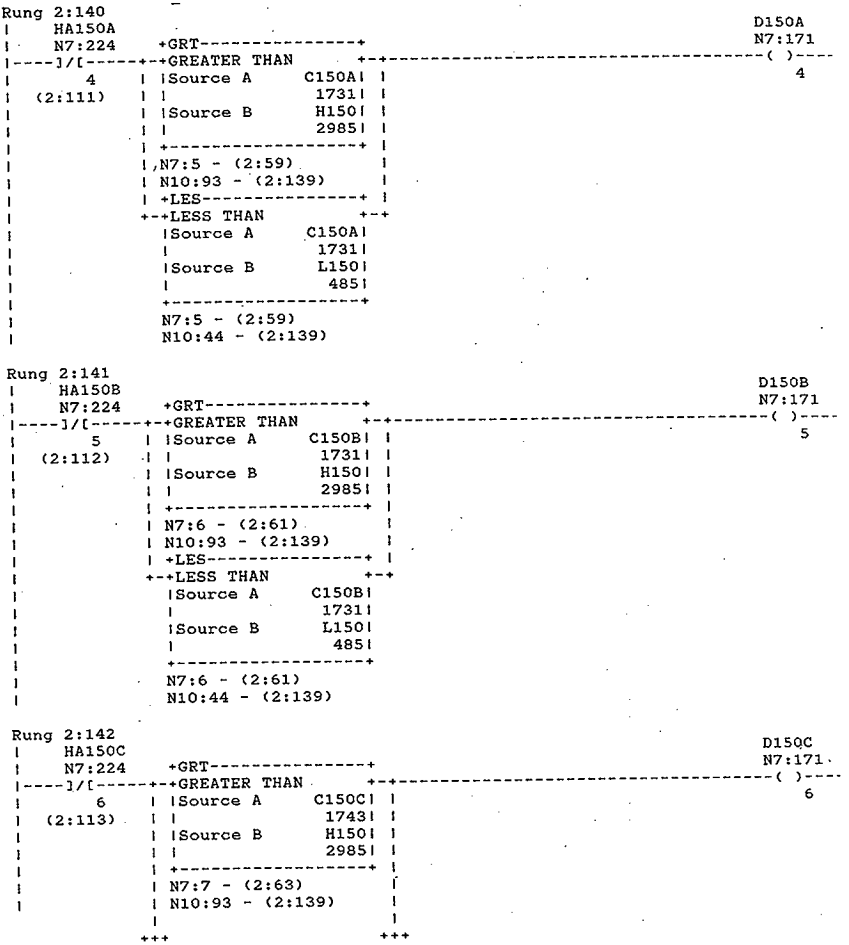


Rung 2:138



Rung 2:139




Rung 2:140
HA150A
N7:224
4
(2:111)
GRT
GREATER THAN
Source A
C150A
1731
Source B
H150
2985
N7:5 - (2:59)
N10:93 - (2:139)
LES
LESS THAN
Source A
C150A
1731
Source B
L150
485
N7:5 - (2:59)
N10:44 - (2:139)
D150A
N7:171
4
Rung 2:141
HA150B
N7:224
5
(2:112)
GRT
GREATER THAN
Source A
C150B
1731
Source B
H150
2985
N7:6 - (2:61)
N10:93 - (2:139)
LES
LESS THAN
Source A
C150B
1731
Source B
L150
485
N7:6 - (2:61)
N10:44 - (2:139)
D150B
N7:171
5
Rung 2:142
HA150C
N7:224
6
(2:113)
GRT
GREATER THAN
Source A
C150C
1743
Source B
H150
2985
N7:7 - (2:63)
N10:93 - (2:139)
D150C
N7:171
6

```
            +++                     +++
             |                       |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C150C|
|              |               1743|
|              |Source B      L150|
|              |                485|
|              +-------------------+
|              N7:7 - (2:63)
|              N10:44 - (2:139)
```

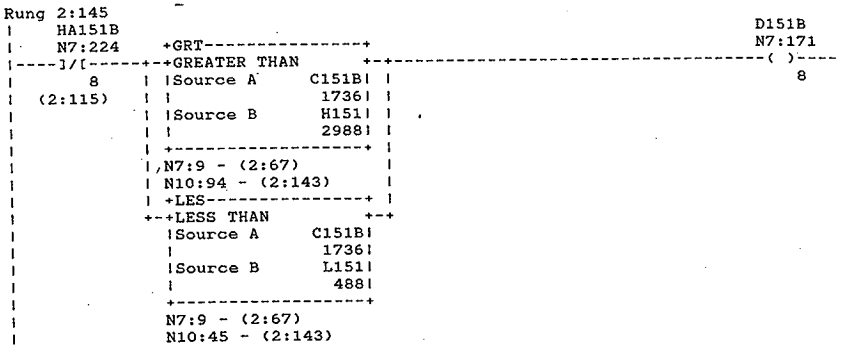
Rung 2:143

```
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A     AV151| |
|                                                       | |              1738| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest          H151| |
|                                                       | |              2988| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV151|
|                                                         |              1738|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest          L151|
|                                                         |               488|
|                                                         +------------------+
```

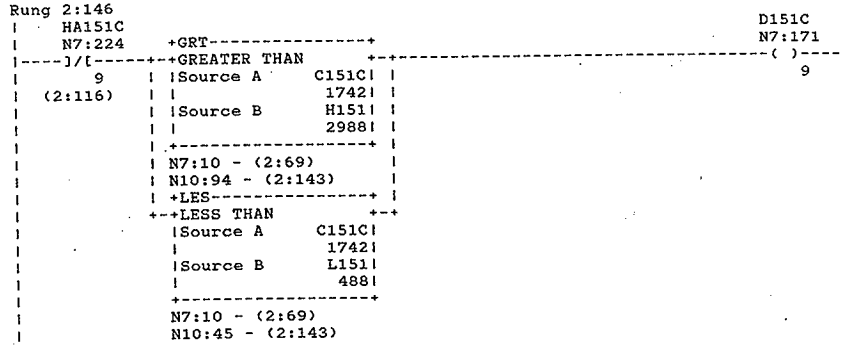
Rung 2:144

```
|    HA151A                                                                D151A
|    N7:224    +GRT---------------+                                        N7:171
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       7    | |Source A     C151A| |                                        7
|  (2:114)   | |               1735| |
|            | |Source B      H151| |
|            | |               2988| |
|            | +-------------------+ |
|            | N7:8 - (2:65)         |
|            | N10:94 - (2:143)      |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C151A|
|              |               1735|
|              |Source B      L151|
|              |                488|
|              +-------------------+
|              N7:8 - (2:65)
|              N10:45 - (2:143)
```

Rung 2:145

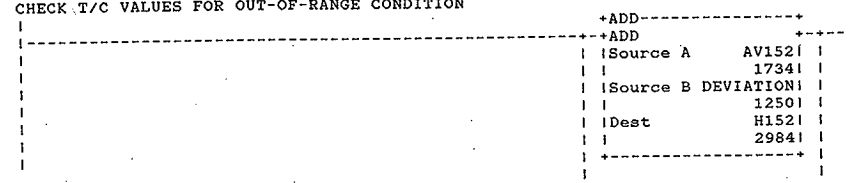


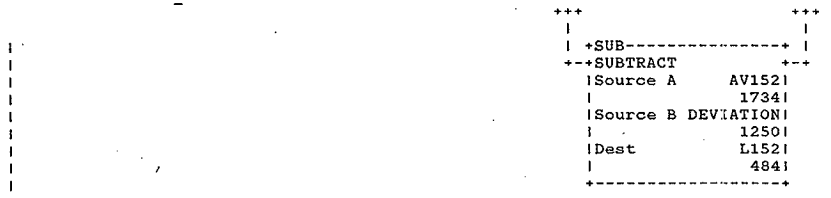
Rung 2:146



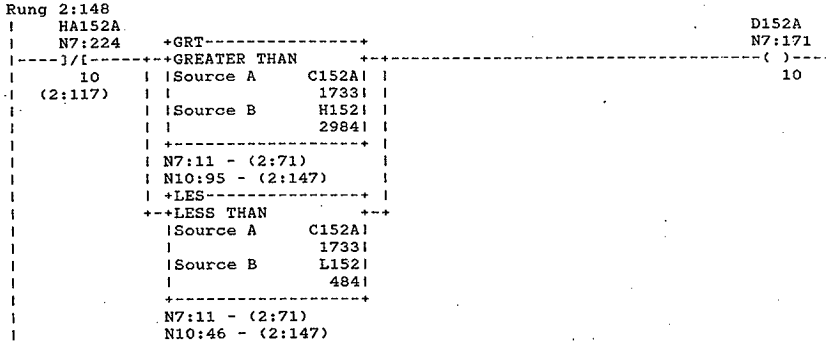
Rung 2:147

ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION

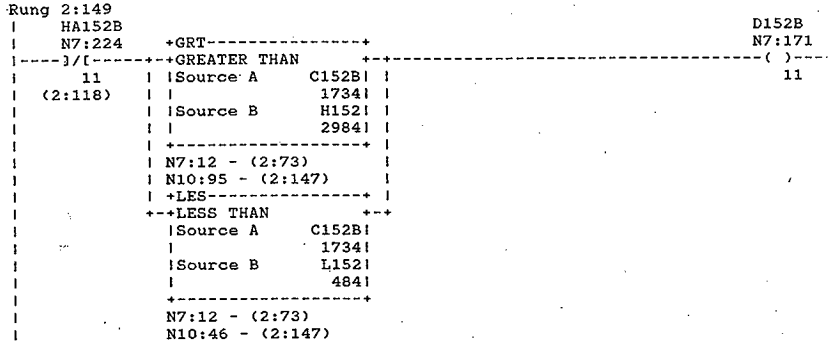




Rung 2:148

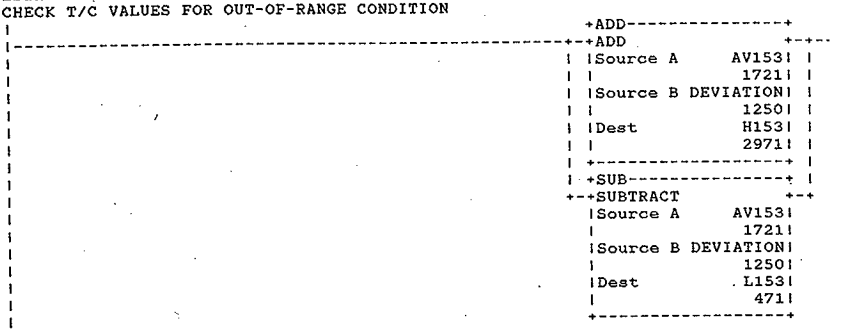


Rung 2:149

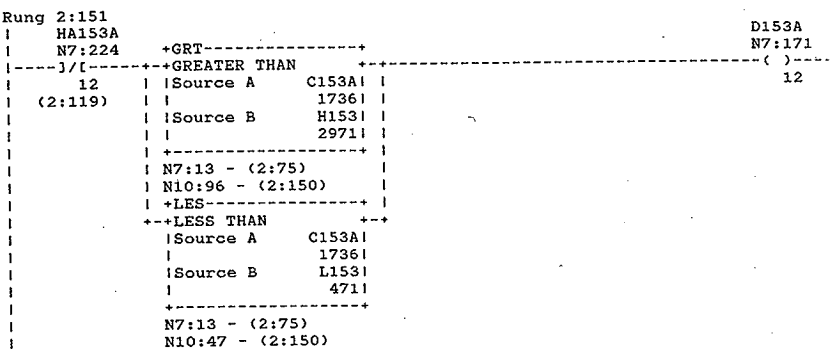


Rung 2:150

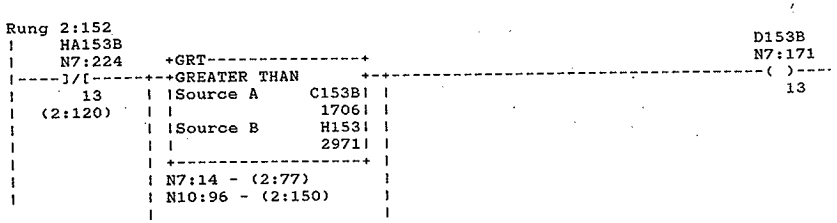
```
**************************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```



Rung 2:151



Rung 2:152



```
            +++                     +++
             |                       |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C153B|
|              |               1706|
|              |Source B      L153|
|              |                471|
|              +------------------+
|              N7:14 - (2:77)
|              N10:47 - (2:150)
```

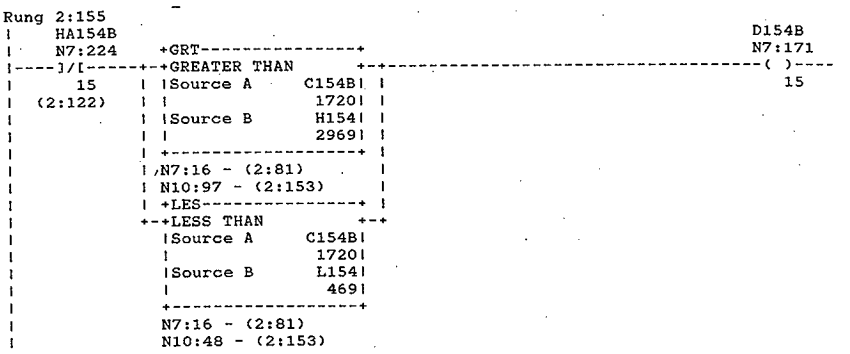
Rung 2:153

```
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A     AV154| |
|                                                       | |              1719| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest          H154| |
|                                                       | |              2969| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV154|
|                                                         |              1719|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest          L154|
|                                                         |               469|
|                                                         +------------------+
```

Rung 2:154

```
|    HA154A                                                                D154A
|    N7:224    +GRT---------------+                                        N7:171
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      14    | |Source A     C154A| |                                        14
|  (2:121)   | |               1718| |
|            | |Source B      H154| |
|            | |               2969| |
|            | +------------------+ |
|            | N7:15 - (2:79)       |
|            | N10:97 - (2:153)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C154A|
|              |               1718|
|              |Source B      L154|
|              |                469|
|              +------------------+
|              N7:15 - (2:79)
|              N10:48 - (2:153)
```

Rung 2:155



Rung 2:156

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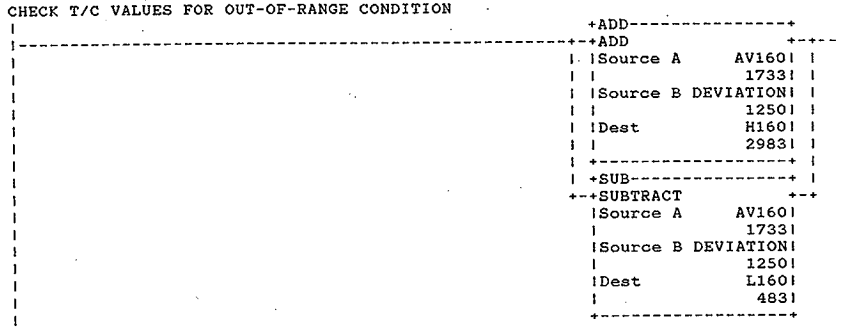
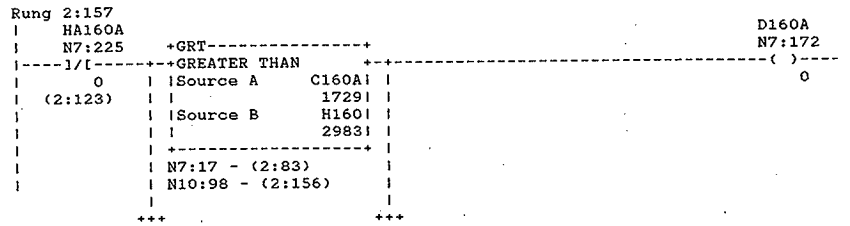
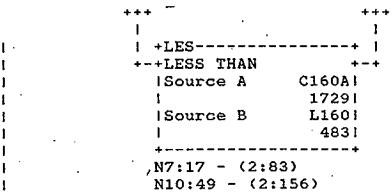
**********************************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```

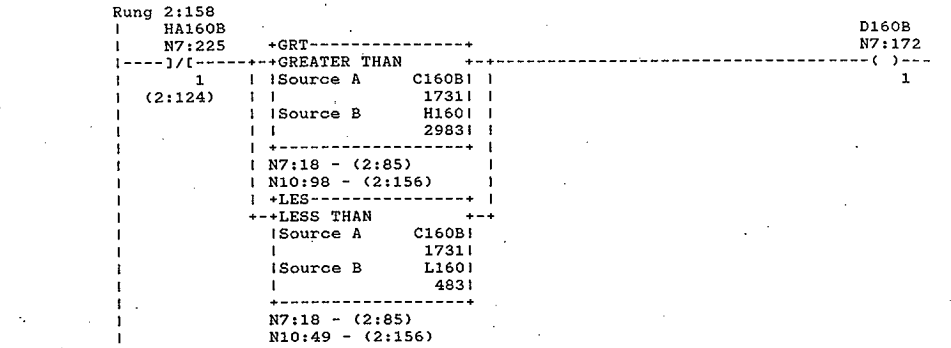


Rung 2:157

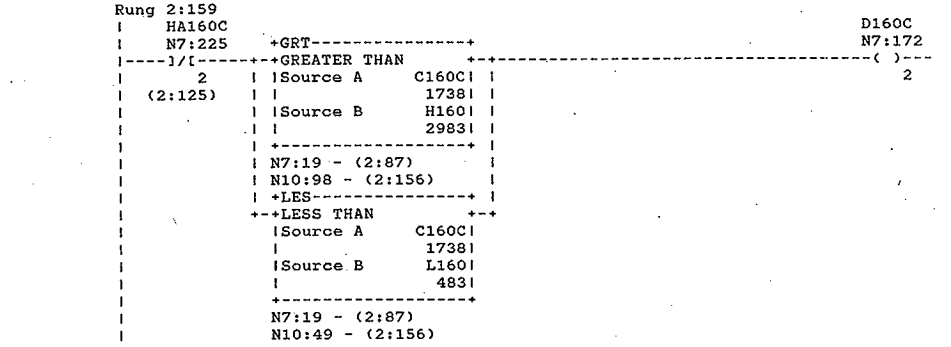




Rung 2:158



Rung 2:159



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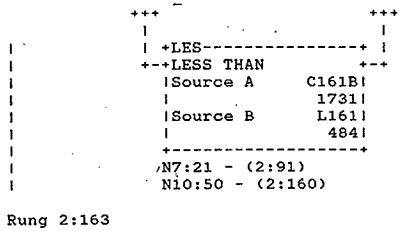
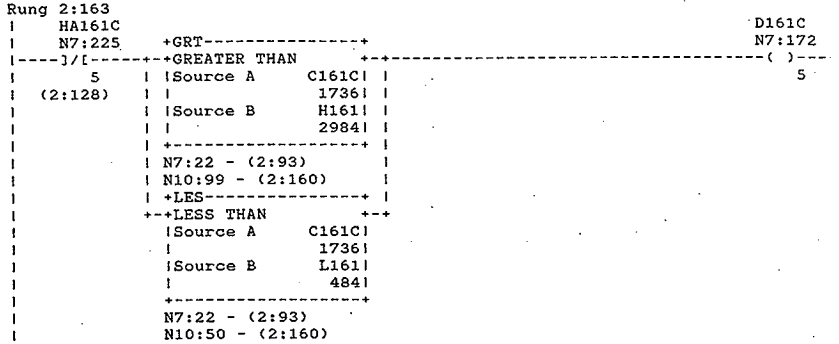
Rung 2:160
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A     AV161| |
|                                                       | |              1734| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest          H161| |
|                                                       | |              2984| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV161|
|                                                         |              1734|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest          L161|
|                                                         |               484|
|                                                         +------------------+

Rung 2:161
|    HA161A                                                                  D161A
|    N7:225     +GRT---------------+                                         N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       3    | |Source A     C161A| |                                        3
|  (2:126)   | |              1734| |
|            | |Source B      H161| |
|            | |              2984| |
|            | +------------------+ |
|            | N7:20 - (2:89)       |
|            | N10:99 - (2:160)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C161A|
|              |              1734|
|              |Source B      L161|
|              |               484|
|              +------------------+
|              N7:20 - (2:89)
|              N10:50 - (2:160)

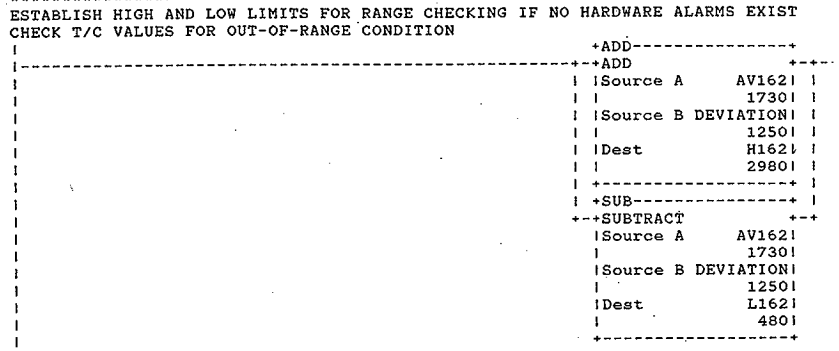
Rung 2:162
|    HA161B                                                                  D161B
|    N7:225     +GRT---------------+                                         N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       4    | |Source A     C161B| |                                        4
|  (2:127)   | |              1731| |
|            | |Source B      H161| |
|            | |              2984| |
|            | +------------------+ |
|            | N7:21 - (2:91)       |
|            | N10:99 - (2:160)     |
             |                      |
            +++                    +++
```



Rung 2:163



Rung 2:164



```
Rung 2:165
|    HA162A                                                                    D162A
|    N7:225     +GRT---------------+                                           N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------------( )----
|       6    | |Source A     C162A| |                                            6
|  (2:129)   | |               1729| |
|            | |Source B      H162| |
|            | |               2980| |
|            | +------------------+ |
|            | N7:23 - (2:95)       |
|            | N10:100 - (2:164)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C162A|
|              |               1729|
|              |Source B      L162|
|              |                480|
|              +------------------+
|              N7:23 - (2:95)
|              N10:51 - (2:164)

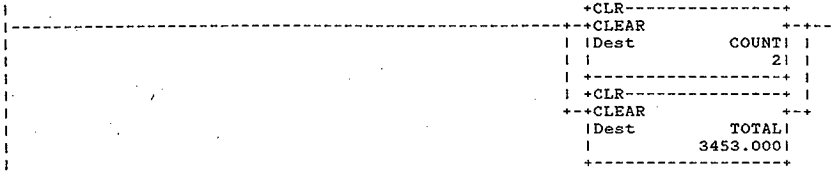
Rung 2:166
|    HA162B                                                                    D162B
|    N7:225     +GRT---------------+                                           N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------------( )----
|       7    | |Source A     C162B| |                                            7
|  (2:130)   | |               1731| |
|            | |Source B      H162| |
|            | |               2980| |
|            | +------------------+ |
|            | N7:24 - (2:97)       |
|            | N10:100 - (2:164)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C162B|
|              |               1731|
|              |Source B      L162|
|              |                480|
|              +------------------+
|              N7:24 - (2:97)
|              N10:51 - (2:164)

Rung 2:167
                ***** END OF DEVIATION CHECKING *****
|                                                                             DEV_1
|                                                                             N22:6
|-----------------------------------------------------------------------------(U)---
|                                                                                1

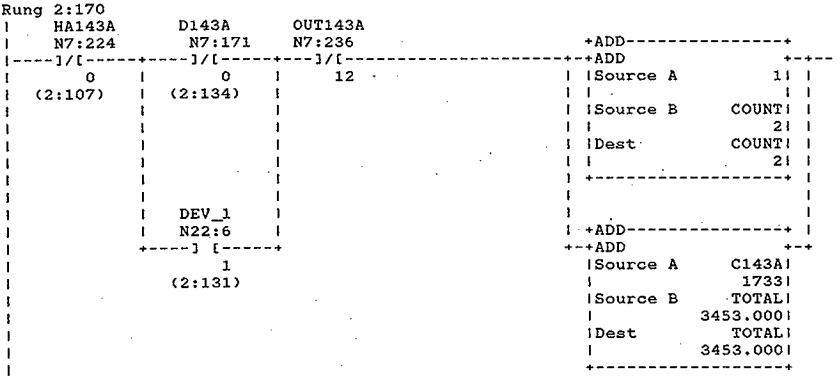
Rung 2:168
| AV1
|                                                                             DUMMY6
|      12                                                                     N22:7
|---[LBL]-----------------------------------------------------------------( )----
|                                                                                5
```

Rung 2:169

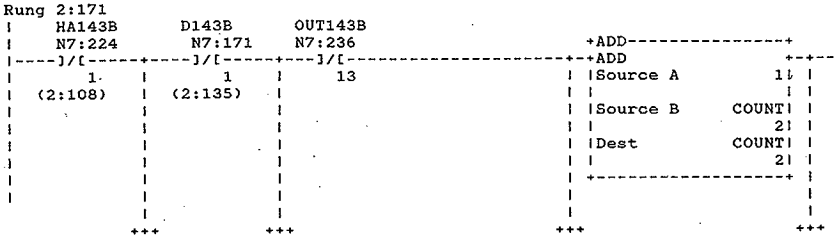
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C

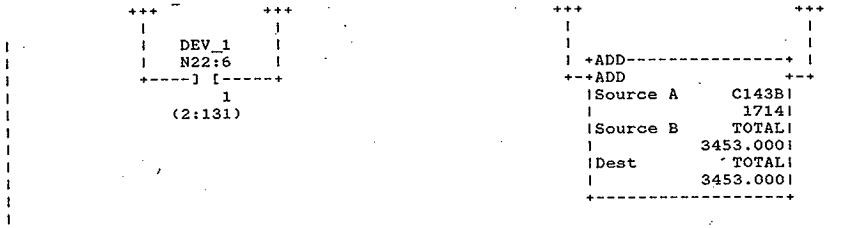


Rung 2:170

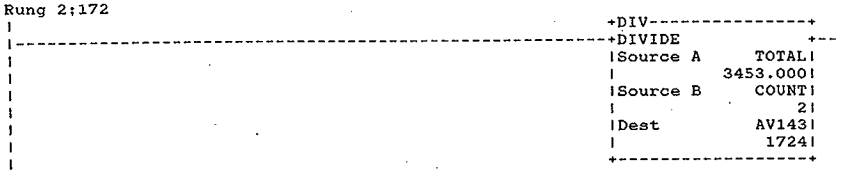


Rung 2:171



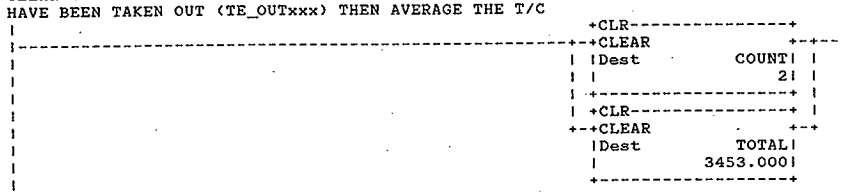


Rung 2;172

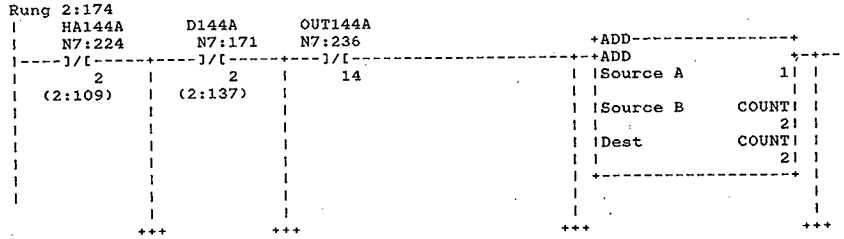


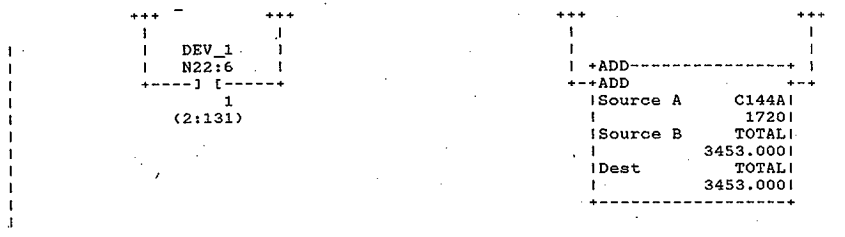
Rung 2:173

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C

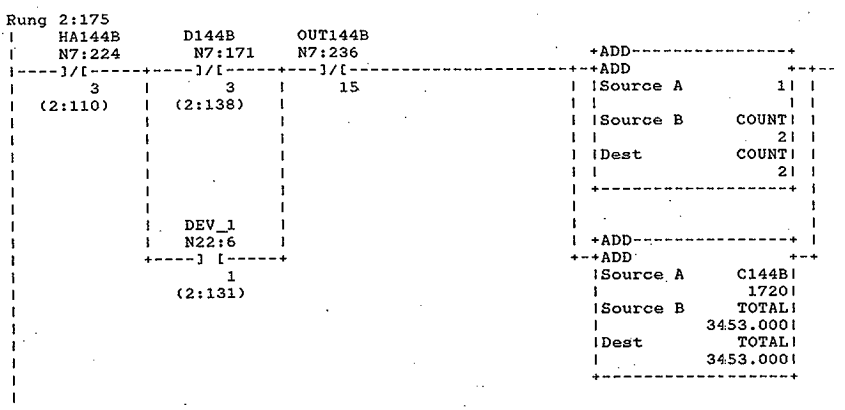


Rung 2:174

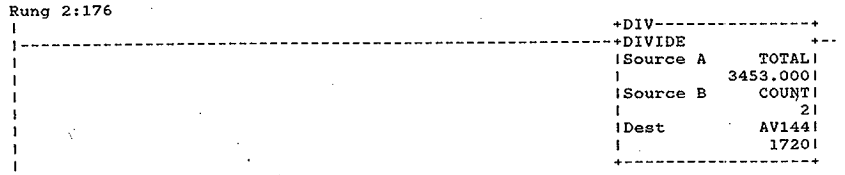




Rung 2:175

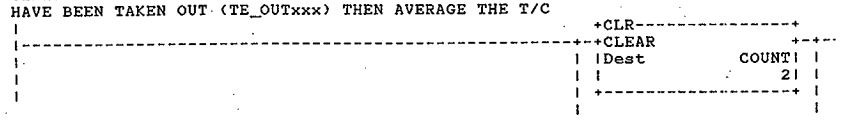


Rung 2:176

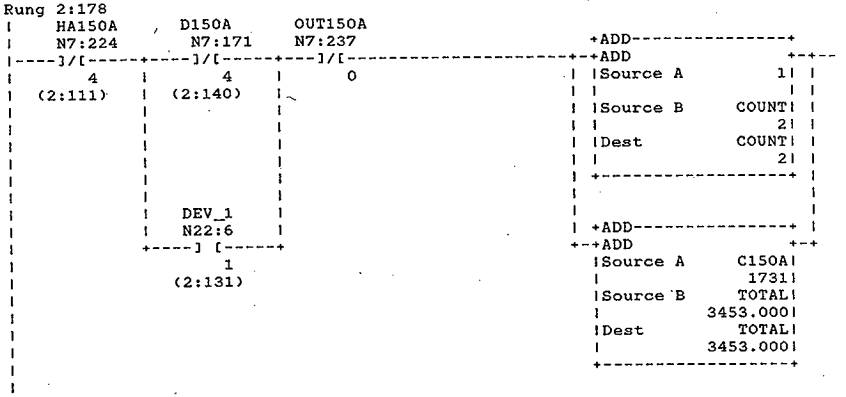


Rung 2:177

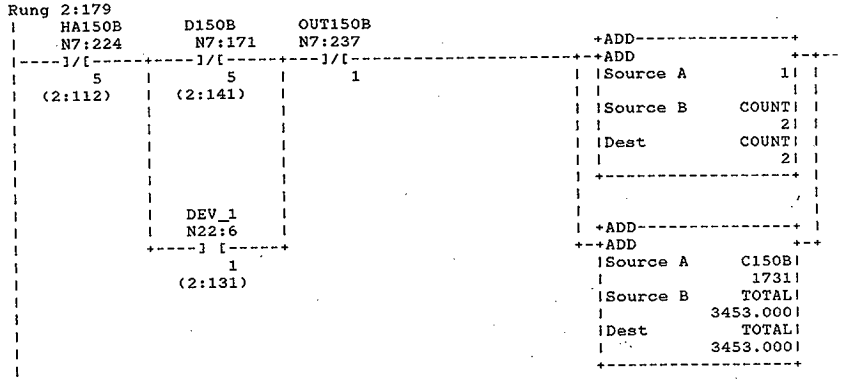
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



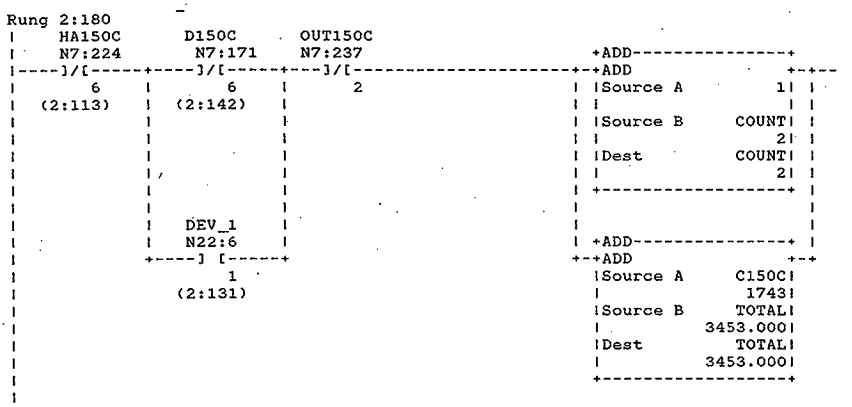
Rung 2:178



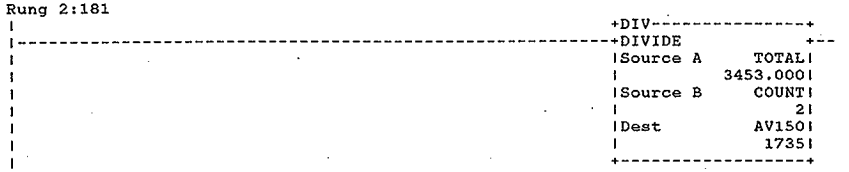
Rung 2:179



Rung 2:180



Rung 2:181



Rung 2:182

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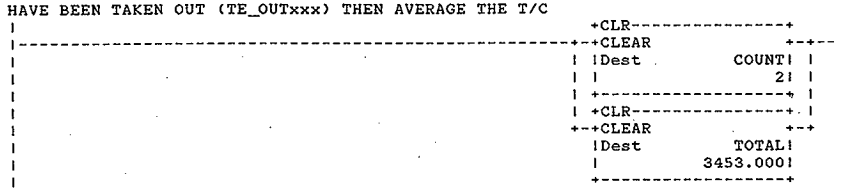
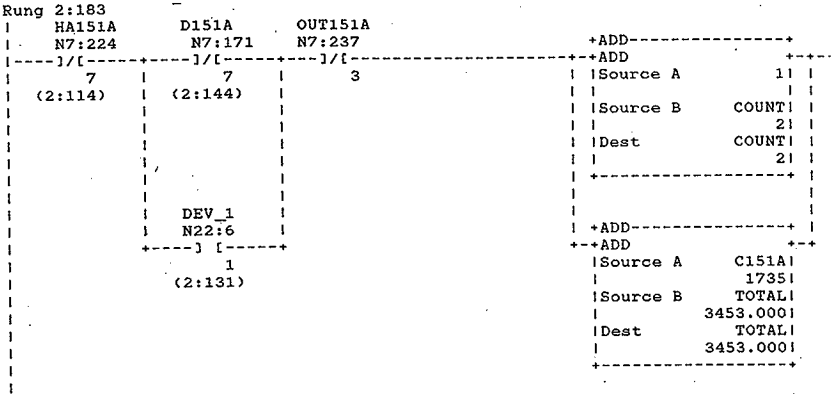
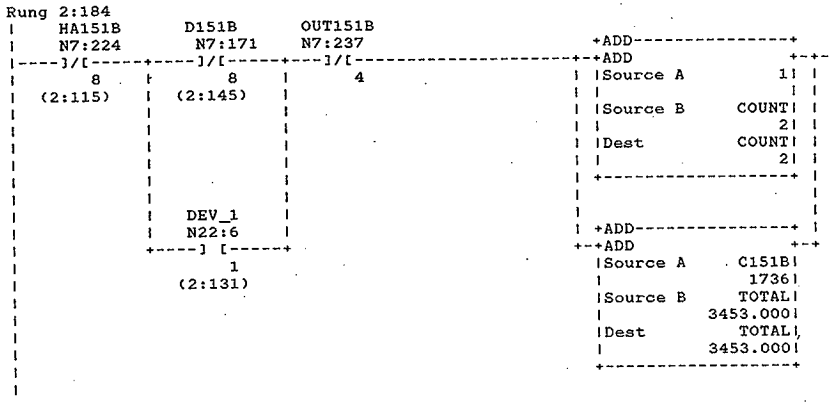
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



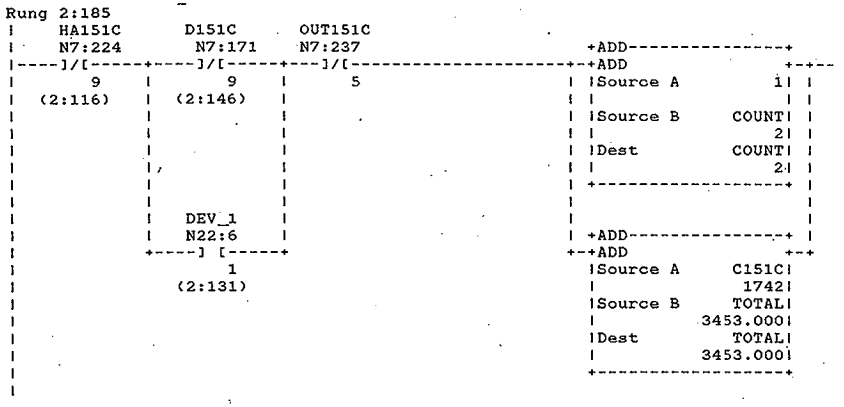
Rung 2:183



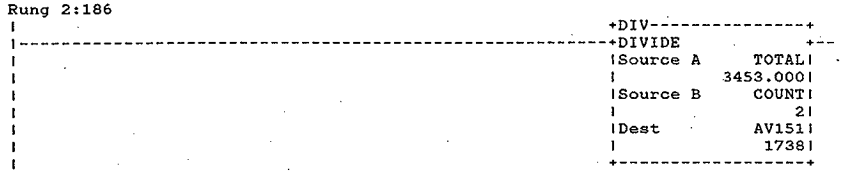
Rung 2:184



Rung 2:185

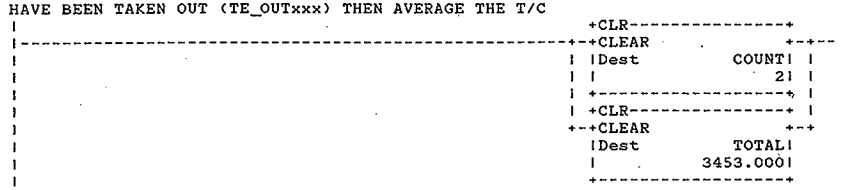


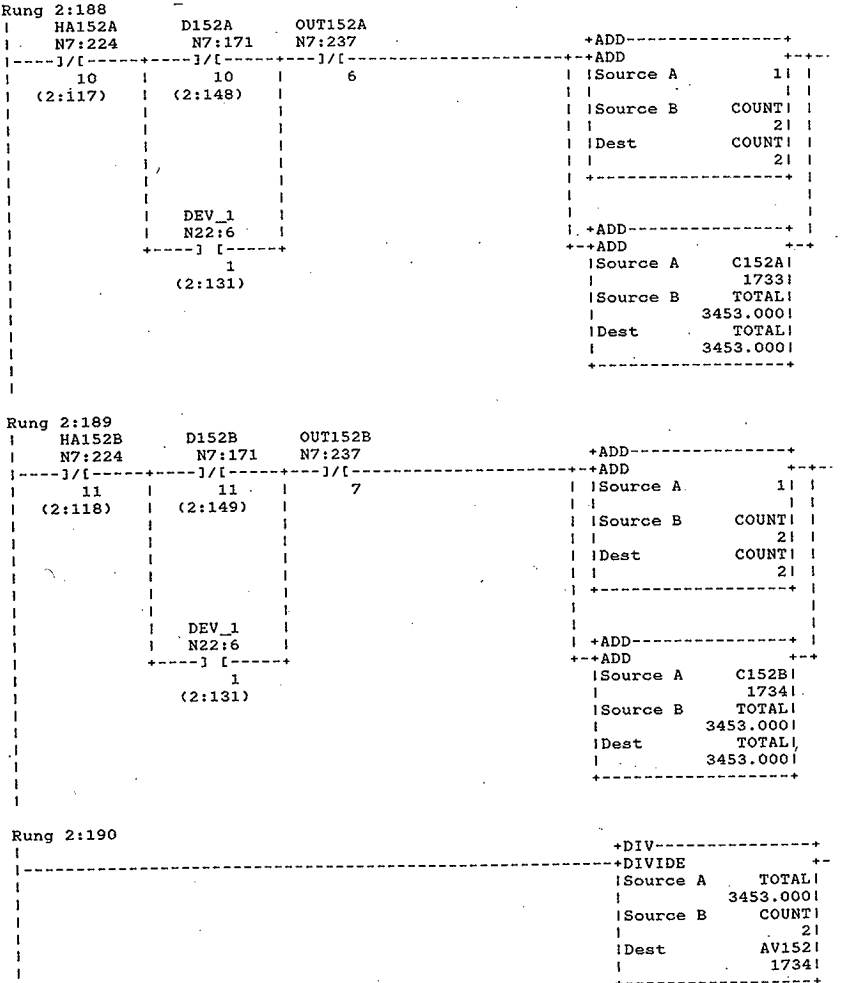
Rung 2:186



Rung 2:187

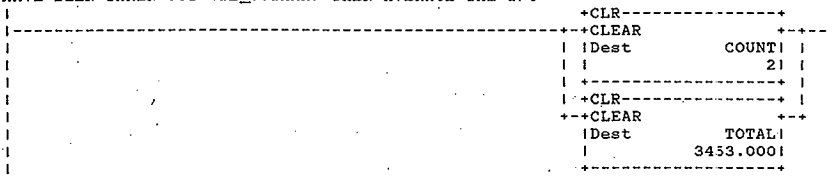
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



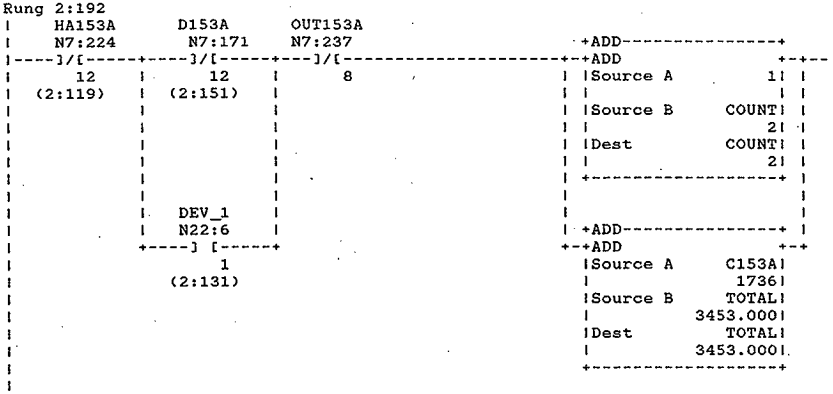

Rung 2:188
HA152A
N7:224
10
(2:117)
D152A
N7:171
10
(2:148)
DEV_1
N22:6
1
(2:131)
OUT152A
N7:237
6
ADD
Source A 1
Source B COUNT 2
Dest COUNT 2
ADD
Source A C152A 1733
Source B TOTAL 3453.000
Dest TOTAL 3453.000
Rung 2:189
HA152B
N7:224
11
(2:118)
D152B
N7:171
11
(2:149)
DEV_1
N22:6
1
(2:131)
OUT152B
N7:237
7
ADD
Source A 1
Source B COUNT 2
Dest COUNT 2
ADD
Source A C152B 1734
Source B TOTAL 3453.000
Dest TOTAL 3453.000
Rung 2:190
DIV
DIVIDE
Source A TOTAL 3453.000
Source B COUNT 2
Dest AV152 1734

Rung 2:191

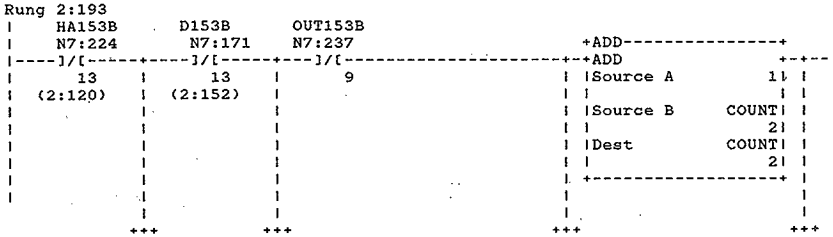
```
********************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



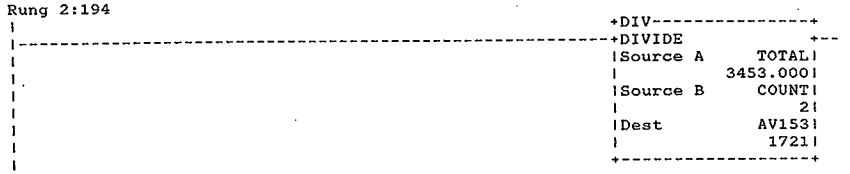
Rung 2:192



Rung 2:193

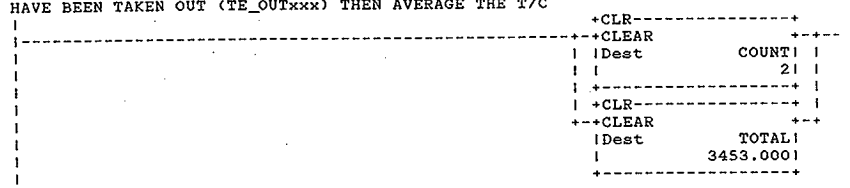


Rung 2:194

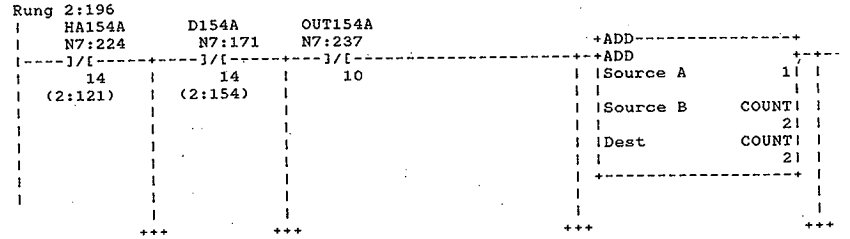


Rung 2:195

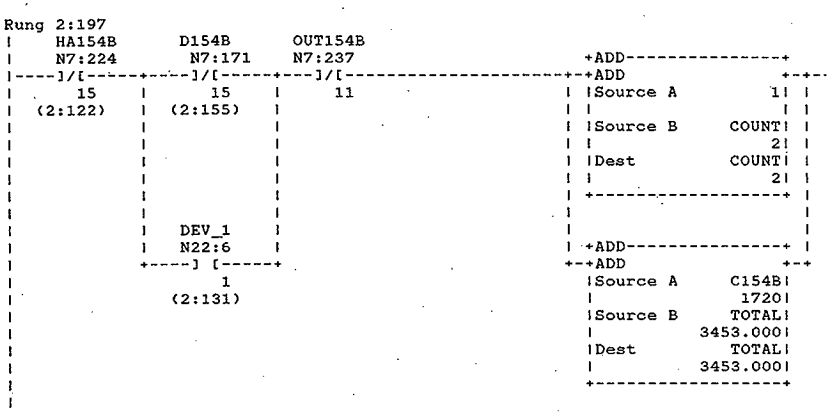
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



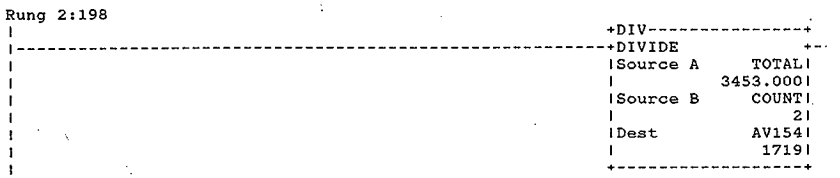
Rung 2:196



Rung 2:197

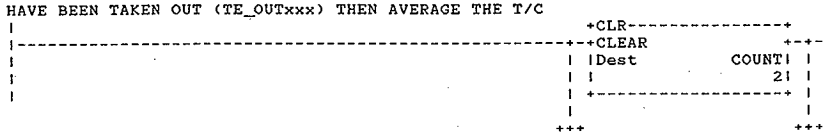


Rung 2:198

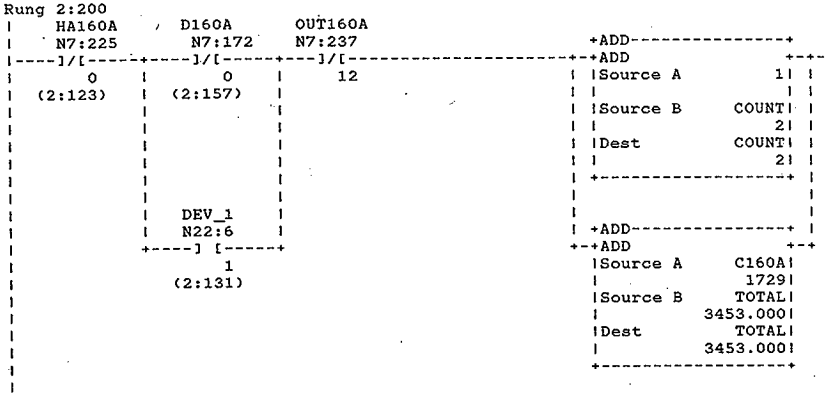


Rung 2:199

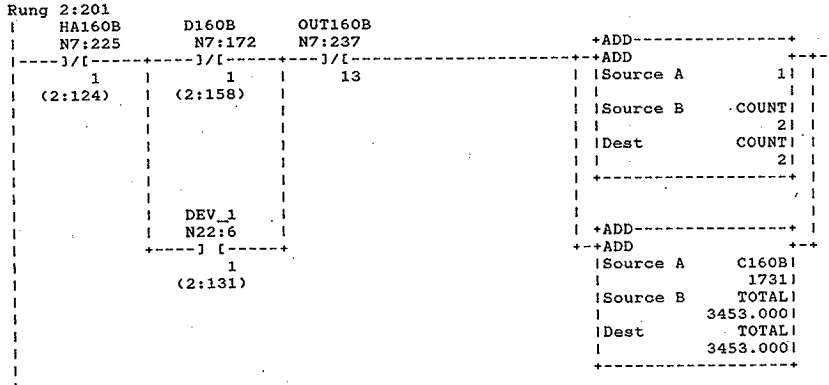
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



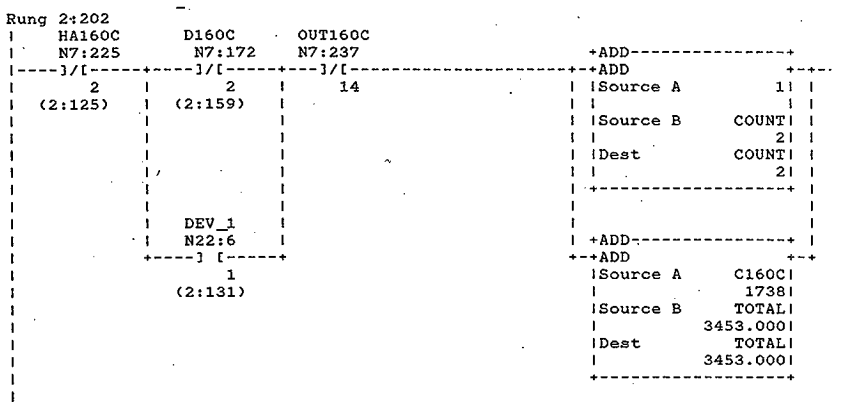
Rung 2:200



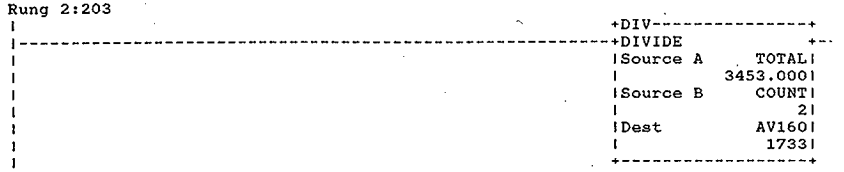
Rung 2:201



Rung 2:202

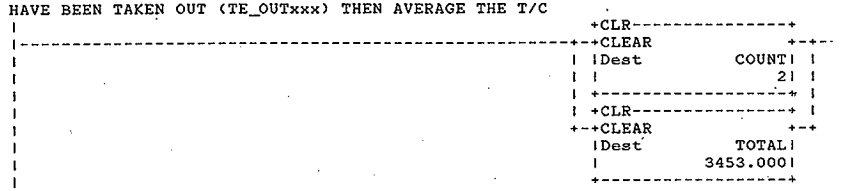


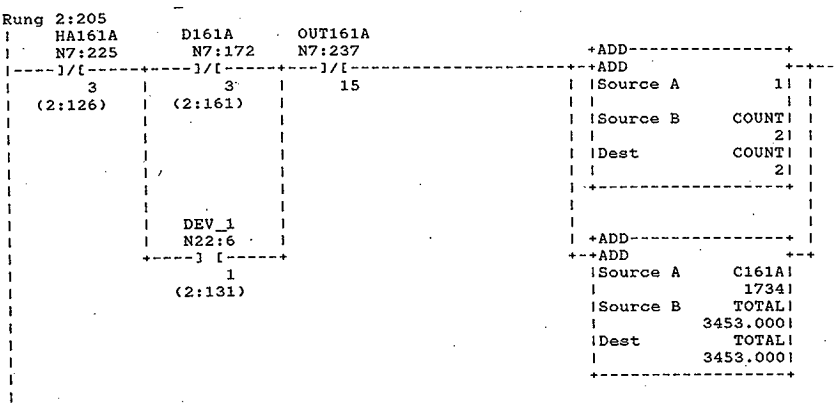
Rung 2:203

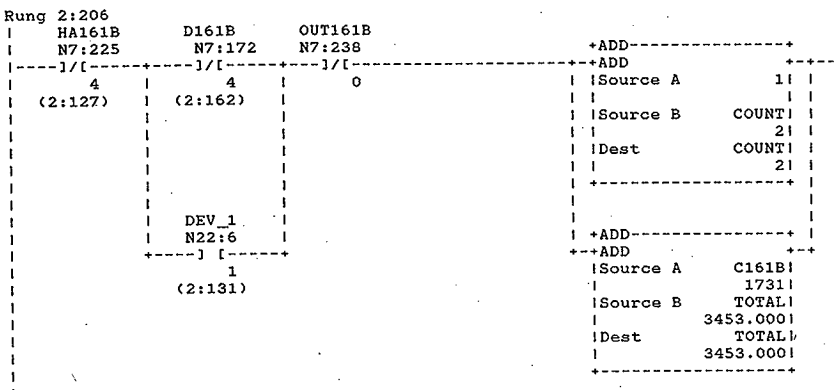


Rung 2:204

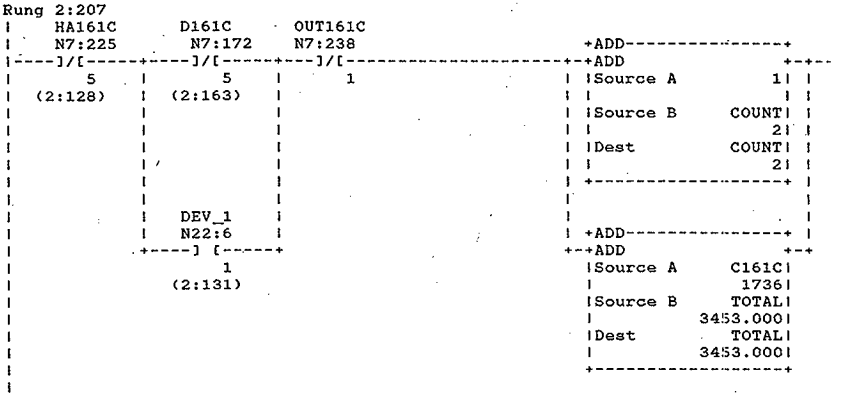
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



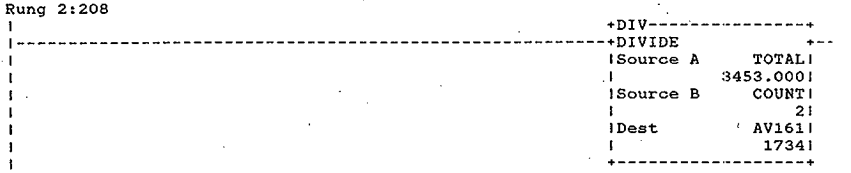

Rung 2:205
HA161A
N7:225
3
(2:126)
D161A
N7:172
3
(2:161)
DEV_1
N22:6
1
(2:131)
OUT161A
N7:237
15
+ADD
Source A 1
Source B COUNT 2
Dest COUNT 2
+ADD
Source A C161A 1734
Source B TOTAL 3453.000
Dest TOTAL 3453.000


Rung 2:206
HA161B
N7:225
4
(2:127)
D161B
N7:172
4
(2:162)
DEV_1
N22:6
1
(2:131)
OUT161B
N7:238
0
+ADD
Source A 1
Source B COUNT 2
Dest COUNT 2
+ADD
Source A C161B 1731
Source B TOTAL 3453.000
Dest TOTAL 3453.000

Rung 2:207

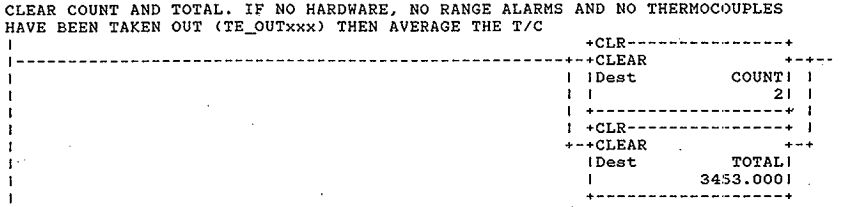


Rung 2:208

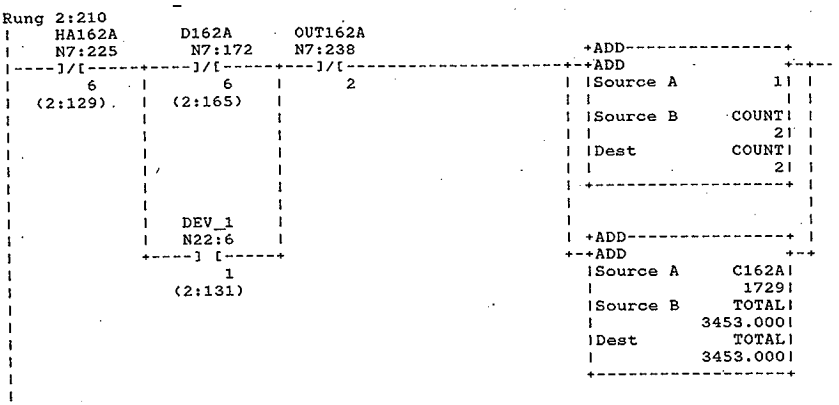


Rung 2:209

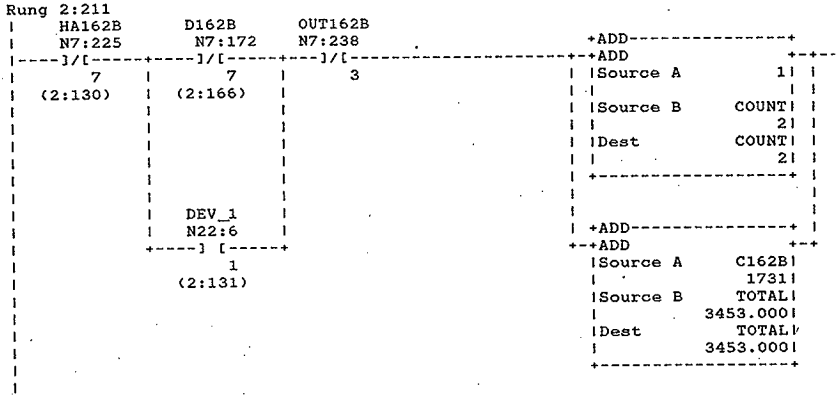
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



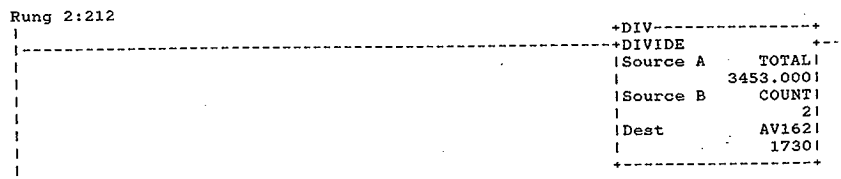
Rung 2:210



Rung 2:211



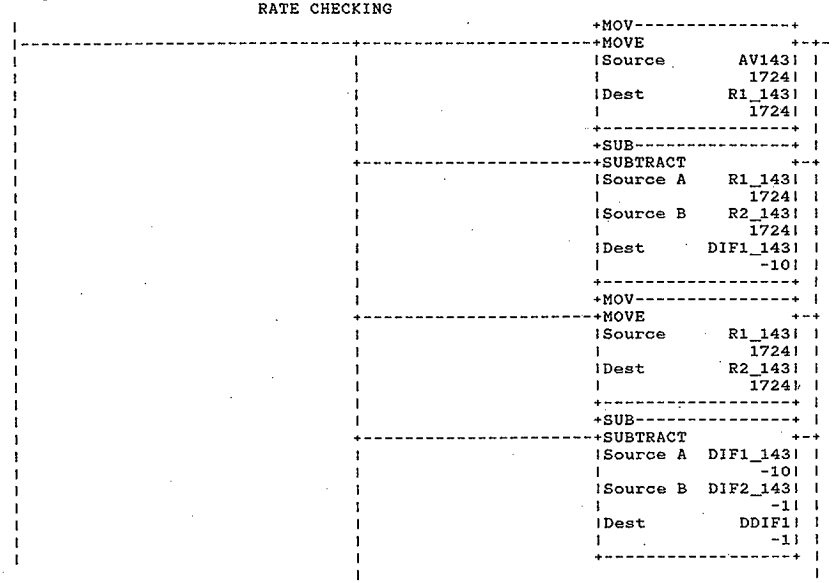
Rung 2:212

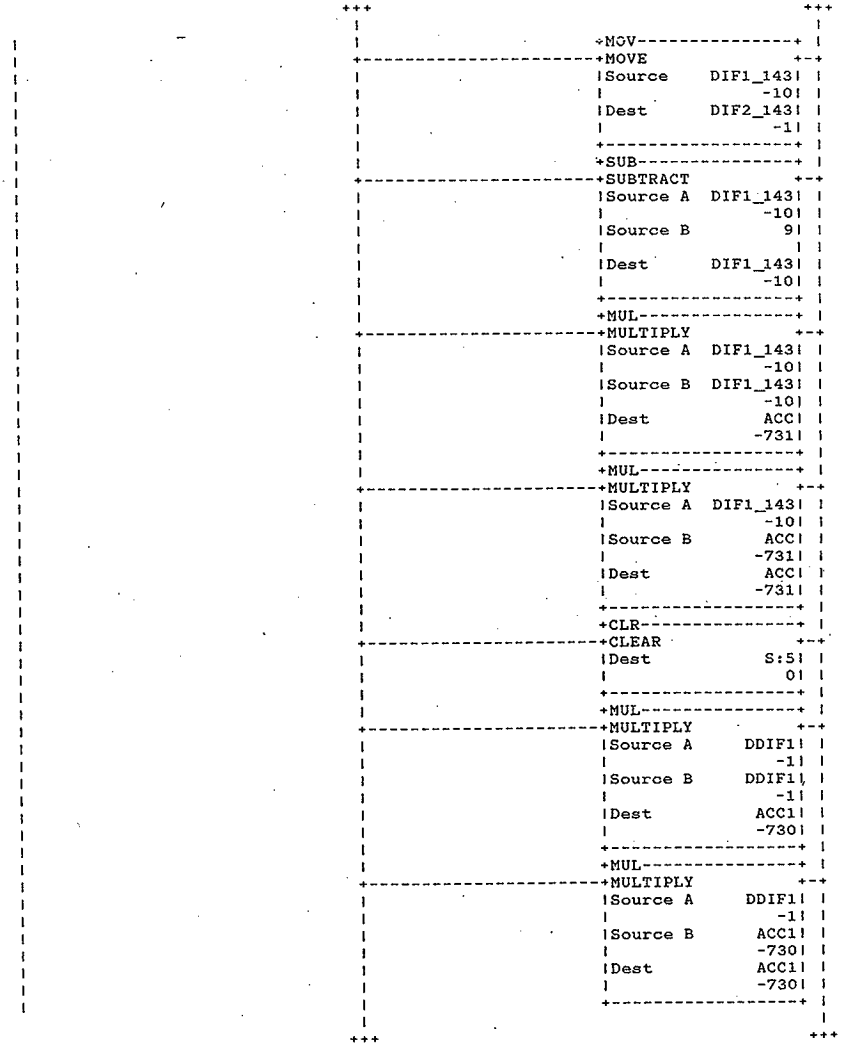


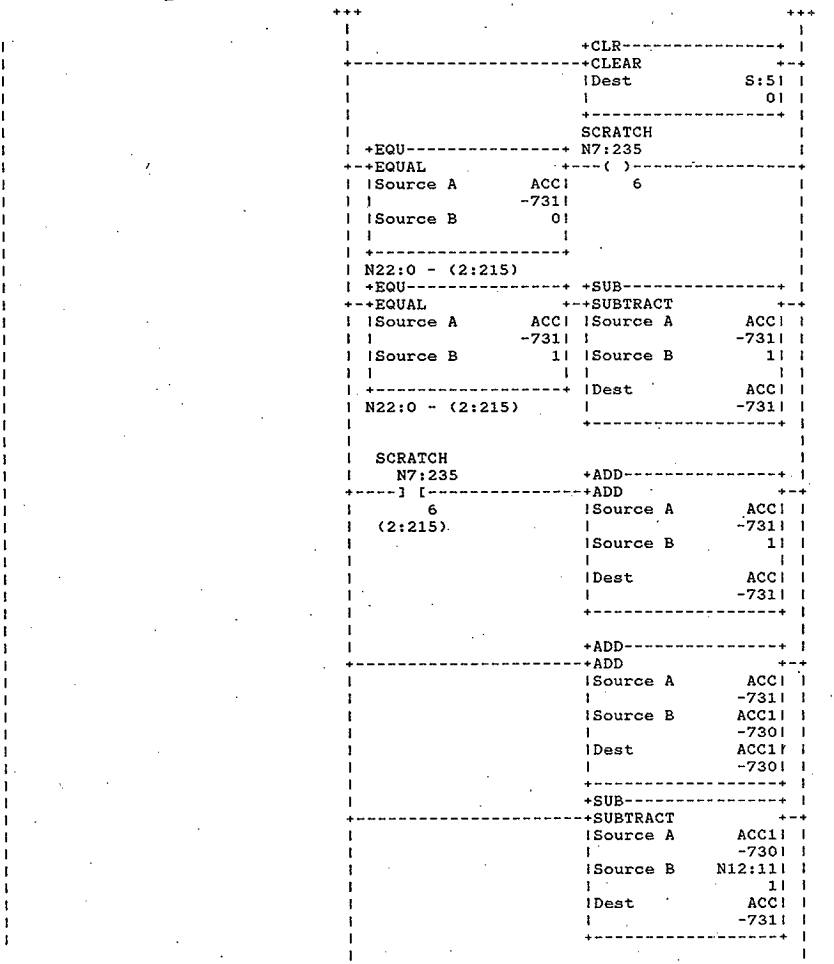
```
Rung 2:213
*******************************************************************************
IF DEVIATION SET FOR SECTION 1 THEN GO THERE AND CALCULATE DEVIATION
|                                                                    DEV1
|   DEV_1
|   N22:6                                                               8
|----] [-------------------------------------------------------------(JMP)----
|       1
|  (2:131)

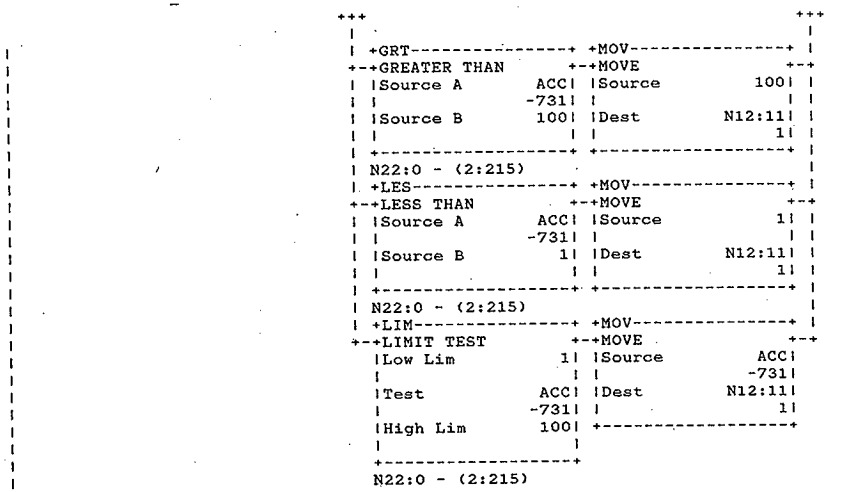
Rung 2:214
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                    PID143
| RT_TMR/DN
|   T4:87                                                                16
|----]/[-------------------------------------------------------------(JMP)----
|      DN
|  (2:42)

Rung 2:215
                         RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+-
|                               |                      |Source       AV143| |
|                               |                      |               1724| |
|                               |                      |Dest        R1_143| |
|                               |                      |               1724| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A    R1_143| |
|                               |                      |               1724| |
|                               |                      |Source B    R2_143| |
|                               |                      |               1724| |
|                               |                      |Dest      DIF1_143| |
|                               |                      |                -10| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source      R1_143| |
|                               |                      |               1724| |
|                               |                      |Dest        R2_143| |
|                               |                      |               1724| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A  DIF1_143| |
|                               |                      |                -10| |
|                               |                      |Source B  DIF2_143| |
|                               |                      |                 -1| |
|                               |                      |Dest         DDIF1| |
|                               |                      |                 -1| |
|                               |                      +------------------+ |
|                               |                                           |
                               +++                                         +++
```




MOV
MOVE
Source DIF1_143
-10
Dest DIF2_143
-1
SUB
SUBTRACT
Source A DIF1_143
-10
Source B
9
Dest DIF1_143
-10
MUL
MULTIPLY
Source A DIF1_143
-10
Source B DIF1_143
-10
Dest ACC
-731
MUL
MULTIPLY
Source A DIF1_143
-10
Source B ACC
-731
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730


+CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
( )
6
+EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
N22:0 - (2:215)
SCRATCH
N7:235
[
6
(2:215)
+ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
+ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
+SUB
SUBTRACT
Source A ACC1
-730
Source B N12:11
1
Dest ACC
-731

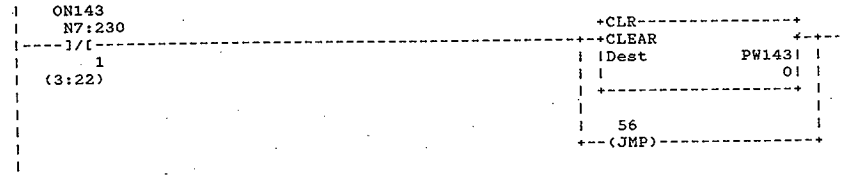


Rung 2:216

PID143

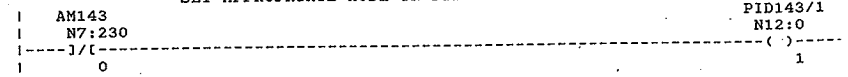
Rung 2:217

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:218

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



Rung 2:219

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +-
|                                                          |Source      SET143|
|                                                          |                  0|
|                                                          |Dest      PIDSP143|
|                                                          |                  0|
|                                                          +-------------------+
```

Rung 2:220

PID BLOCK OPERATION

```
|                                                  +PID--------------------+
|--------------------------------------------------+-+PID                  +-+--
|                                                  | |Control Block   PID143| |
|                                                  | |Process Variable  AV143| |
|                                                  | |Control Variable  CV143| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL---------------+      |
|                                                  +-+SCALE             +------+
|                                                  | |Source       CV143|      |
|                                                  | |                  0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                  |      |
|                                                  | |Offset            0|      |
|                                                  | |                  |      |
|                                                  | |Dest         PW143|      |
|                                                  | |                  0|      |
|                                                  | +------------------+      |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                  0|
|                                                    +-------------------+
```

Rung 2:221

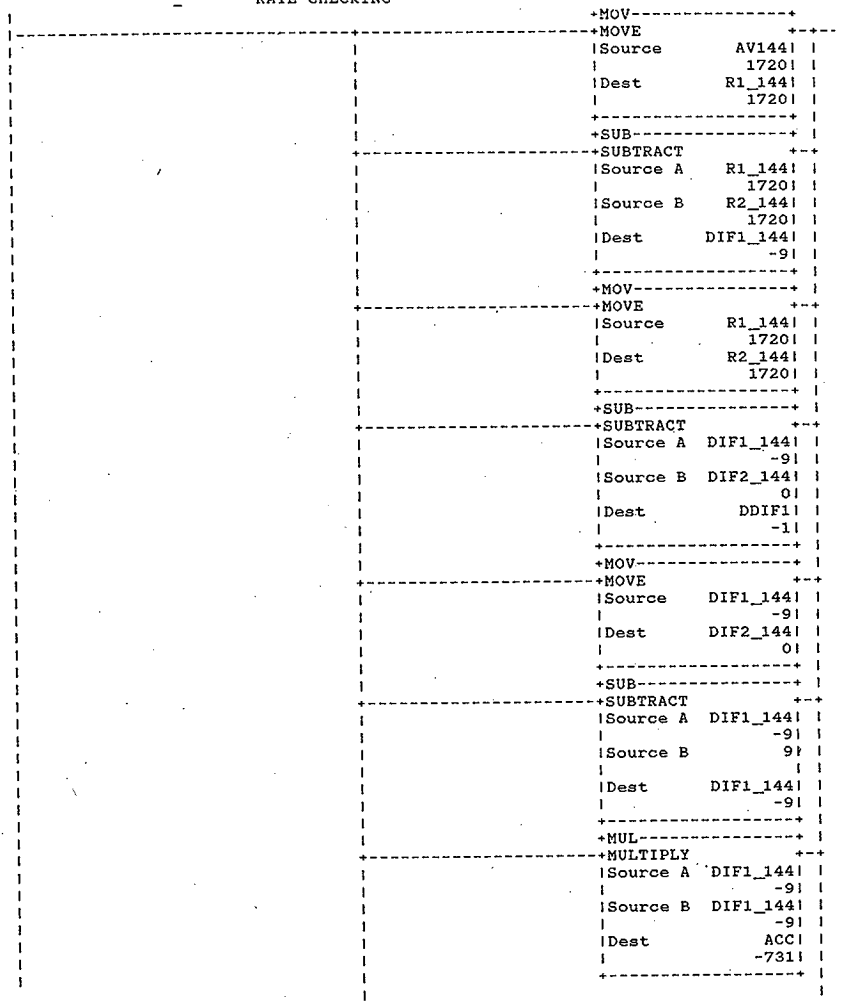
```
|   56                                                                  N7:229
|--[LBL]-------------------------------------------------------------------( )----
|                                                                          4
```

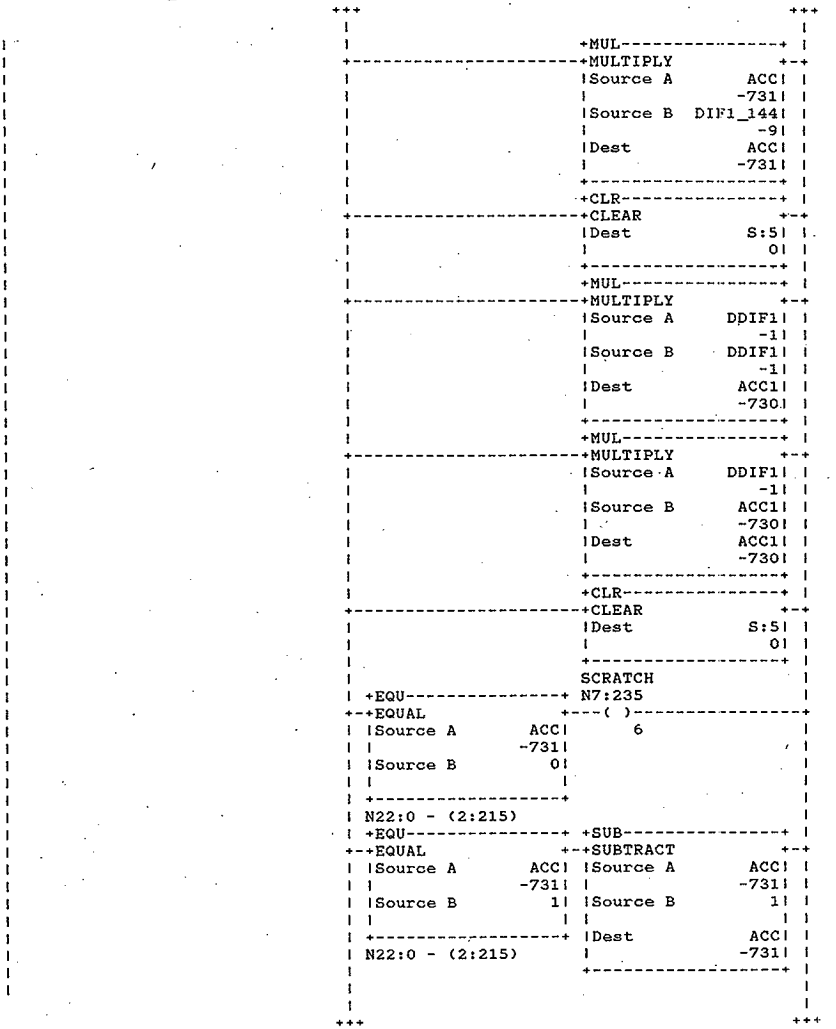
Rung 2:222

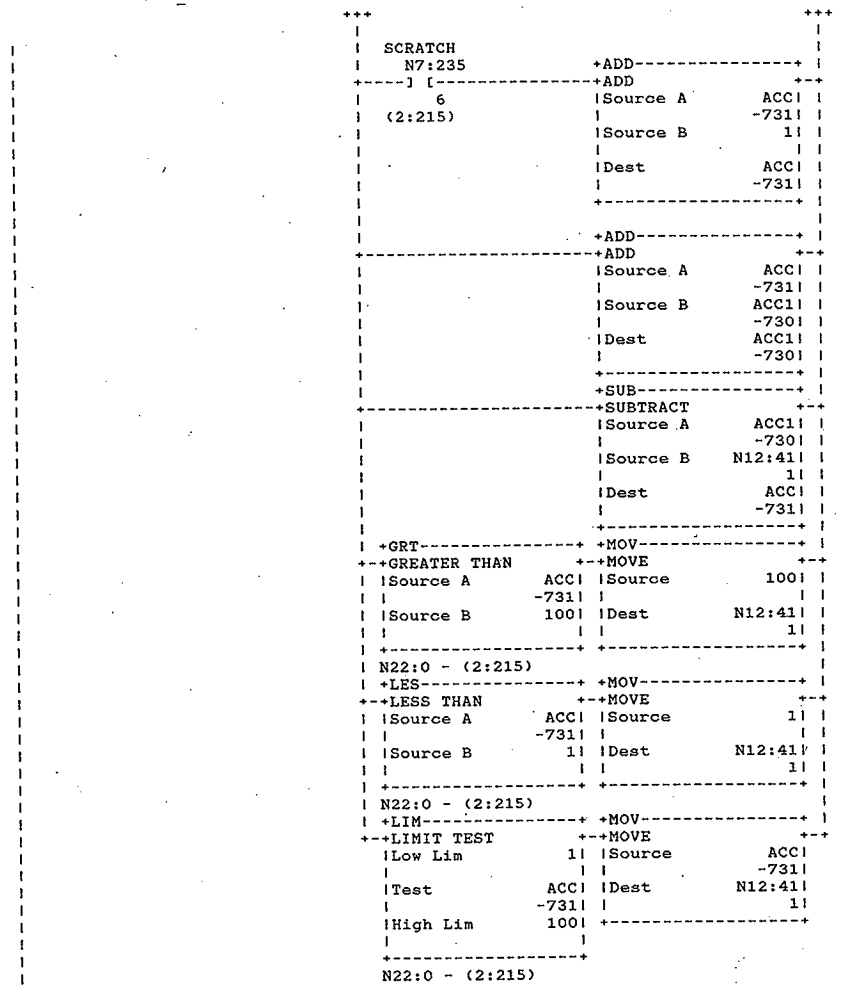
```
|                                                                      PID144
| RT_TMR/DN
|   T4:87                                                                17
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

Rung 2:223

RATE CHECKING




MUL
MULTIPLY
Source A ACC -731
Source B DIF1_144 -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730
MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
OTE
6
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N12:41
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N12:41
1
MOV
MOVE
Source 1
Dest N12:41
1
MOV
MOVE
Source ACC
-731
Dest N12:41
1

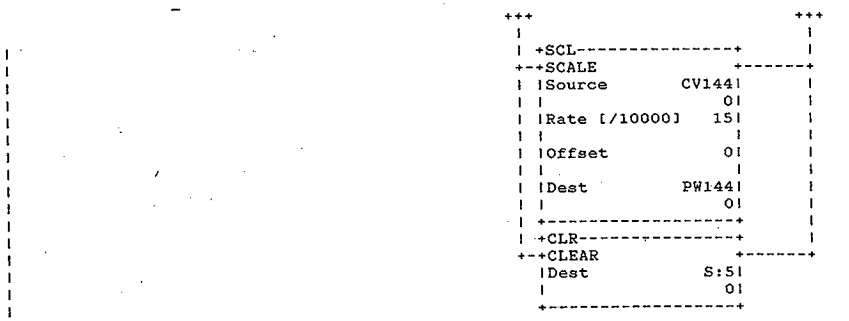
```
Rung 2:224
| PID144
|                                                                    DUMMY17
|      17                                                             N22:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                       0
```

```
Rung 2:225
                DETECT FROM SCADA PID ON/OFF
                      IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|   ON144
|    N7:230                                          +CLR---------------+
|----]/[---------------------------------------------+-+CLEAR           +-+--
|       3                                            | |Dest        PW144| |
|  (3:22)                                            | |                 0| |
|                                                    | +------------------+ |
|                                                    |                      |
|                                                    |   57                 |
|                                                    +--(JMP)---------------+
|
```

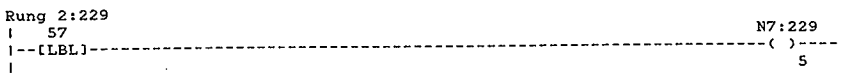
```
Rung 2:226
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM144                                                             PID144/0
|    N7:230                                                           N12:30
|----]/[--------------------------------------------------------------( )-----
|       2                                                               0
|  (3:22)
```

```
Rung 2:227
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                    +MOV---------------+
|----------------------------------------------------+-+MOVE            +-+--
|                                                    | |Source     SET144| |
|                                                    | |                 0| |
|                                                    | |Dest     PIDSP144| |
|                                                    | |                 0| |
|                                                    | +------------------+ |
```

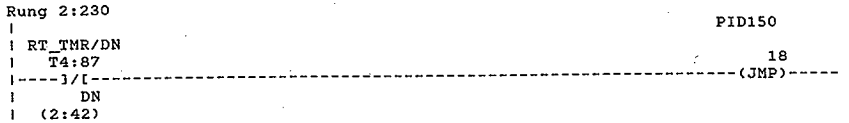
```
Rung 2:228
|                                                  +PID-------------------+
|--------------------------------------------------+-+PID                +-+--
|                                                  | |Control Block   PID144| |
|                                                  | |Process Variable AV144| |
|                                                  | |Control Variable CV144| |
|                                                  | |Control Block Length 23| |
|                                                  | +----------------------+ |
|                                                  |                          |
|                                                 +++                        +++
```



Rung 2:229

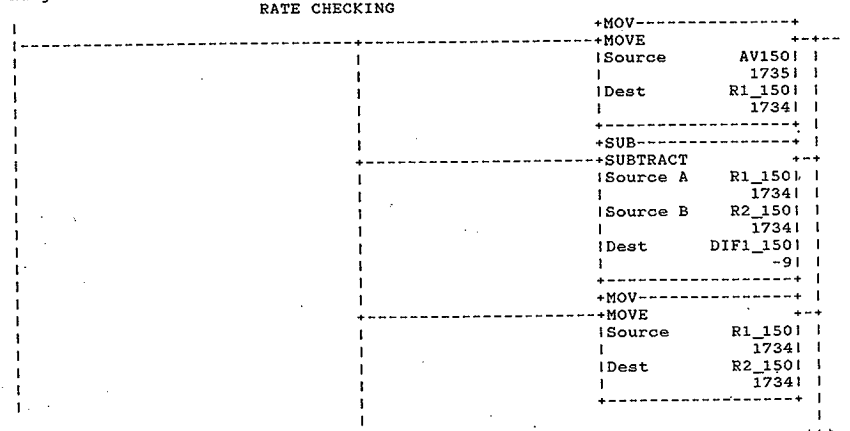


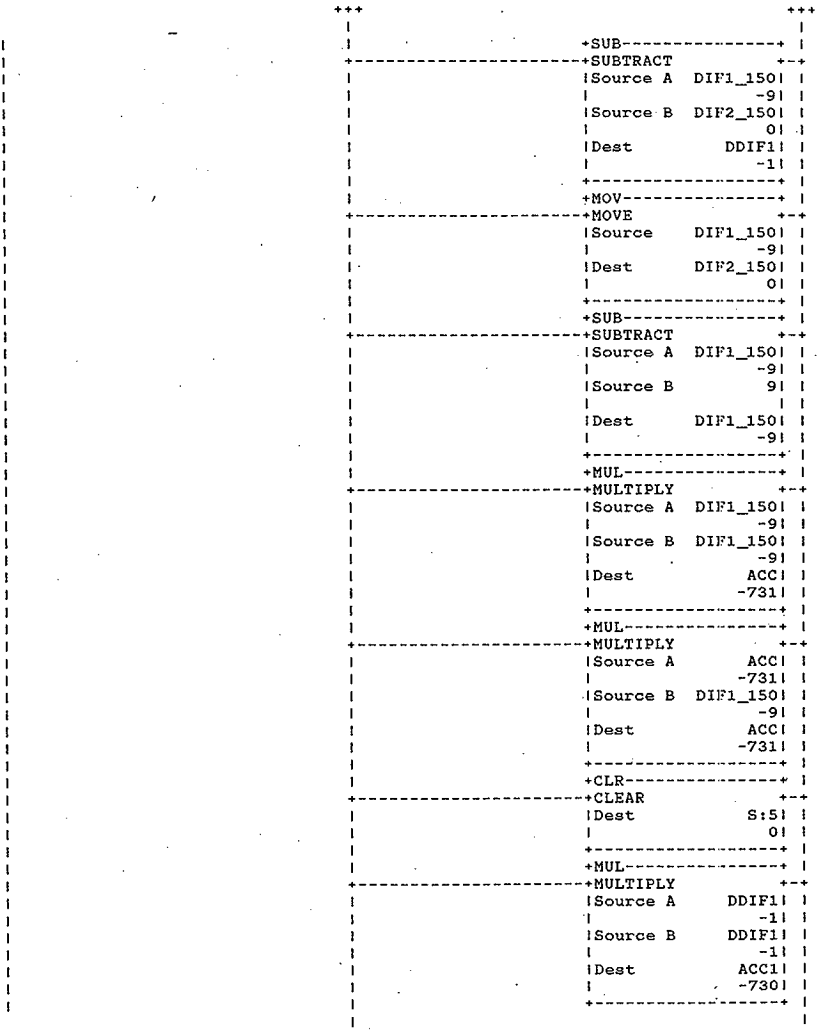
Rung 2:230

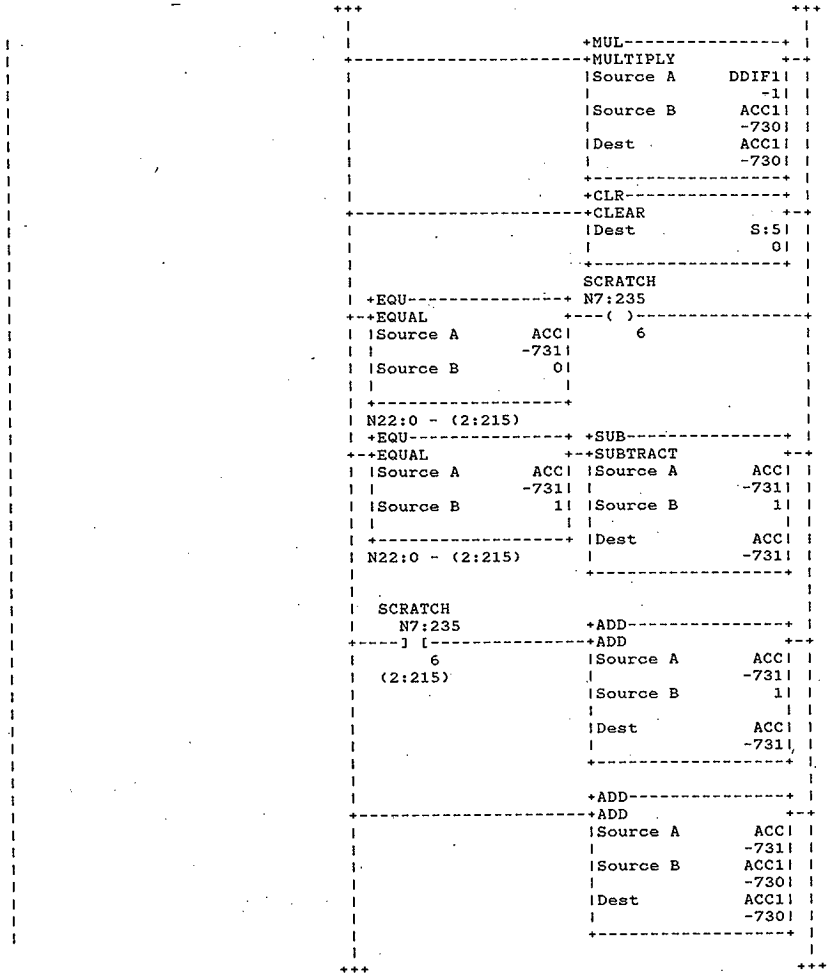


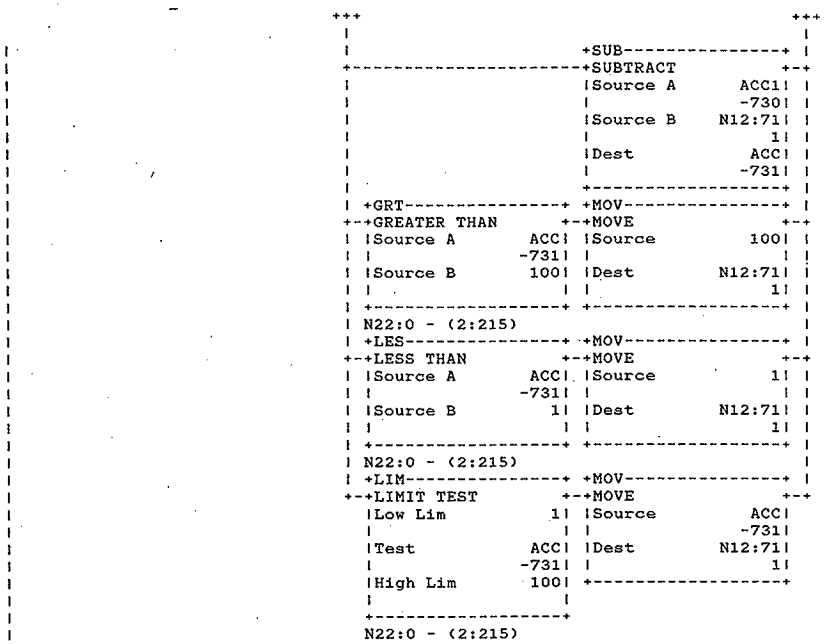
Rung 2:231

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_150
-9
Source B DIF2_150
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_150
-9
Dest DIF2_150
0
SUB
SUBTRACT
Source A DIF1_150
-9
Source B
9
Dest DIF1_150
-9
MUL
MULTIPLY
Source A DIF1_150
-9
Source B DIF1_150
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_150
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

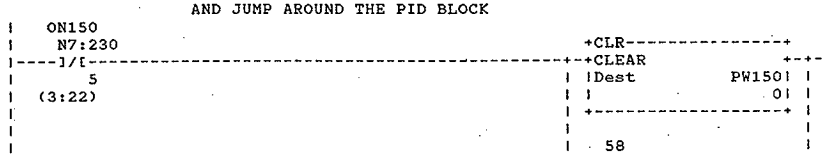

+MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
+CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
+EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
( )
6
+EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
+ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730



Rung 2:232

Rung 2:233

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:234
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM150                                                                  PID150/1
|    N7:230                                                                N12:60
|----]/[-------------------------------------------------------------------( )-----
|       4                                                                     1
|  (3:22)

Rung 2:235
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                          |Source      SET150|
|                                                          |                 0|
|                                                          |Dest      PIDSP150|
|                                                          |                 0|
|                                                          +------------------+

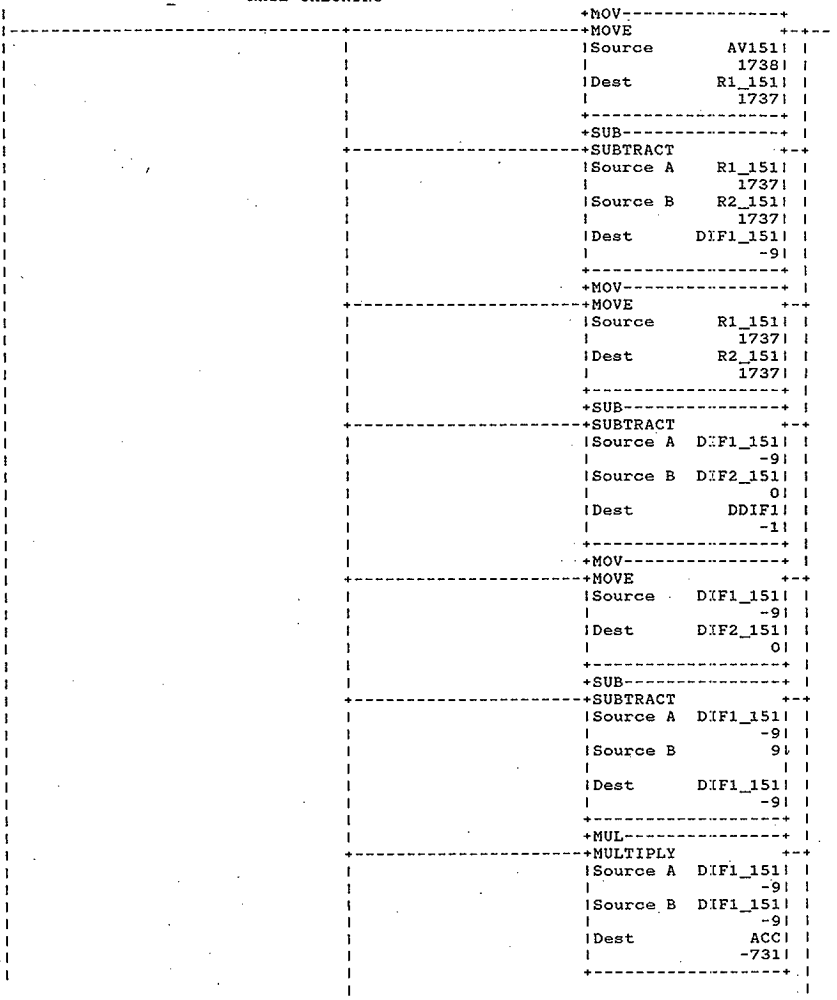
Rung 2:236
|                                                    +PID--------------------+
|-----------------------------------------------+-+PID                     +-+--
|                                               | |Control Block    PID150| |
|                                               | |Process Variable  AV150| |
|                                               | |Control Variable  CV150| |
|                                               | |Control Block Length 23| |
|                                               | +----------------------+ |
|                                               | +SCL---------------+      |
|                                               +-+SCALE             +------+
|                                               | |Source       CV150|      |
|                                               | |                 0|      |
|                                               | |Rate [/10000]   15|      |
|                                               | |                  |      |
|                                               | |Offset           0|      |
|                                               | |                  |      |
|                                               | |Dest         PW150|      |
|                                               | |                 0|      |
|                                               | +------------------+      |
|                                               | +CLR---------------+      |
|                                               +-+CLEAR             +------+
|                                                 |Dest           S:5|
|                                                 |                 0|
|                                                 +------------------+

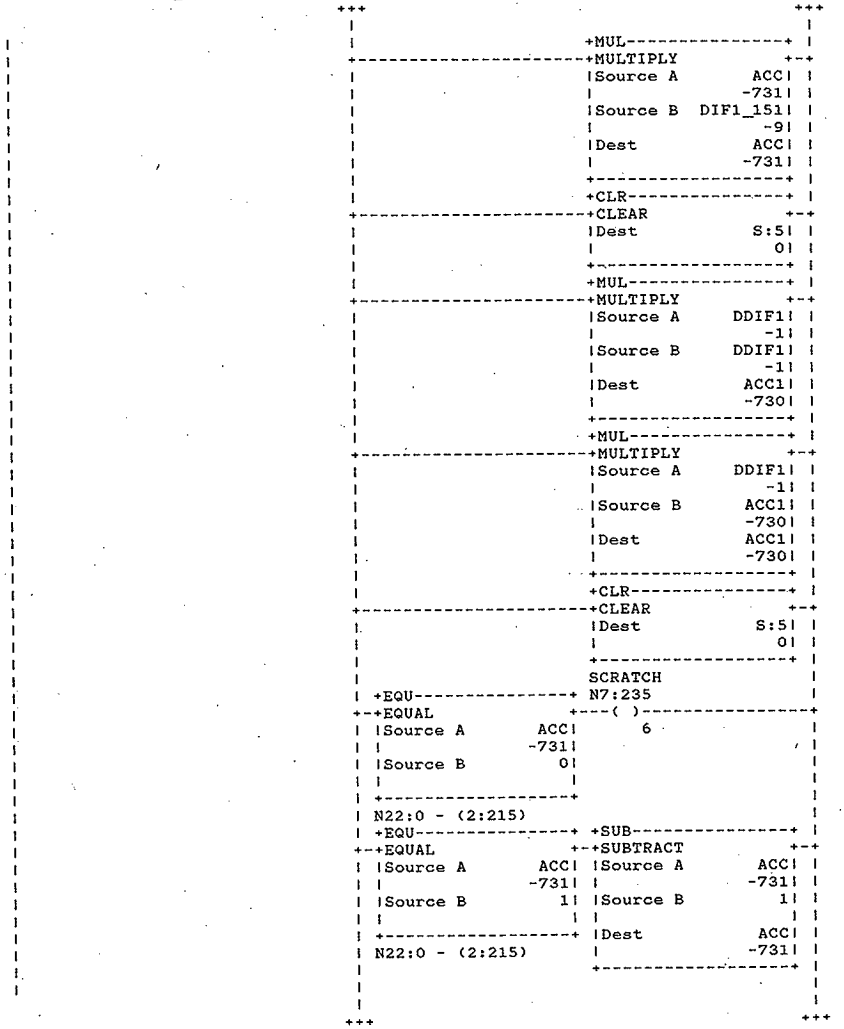
Rung 2:237
|   58                                                                     N7:229
|--[LBL]-------------------------------------------------------------------( )----
|                                                                             6

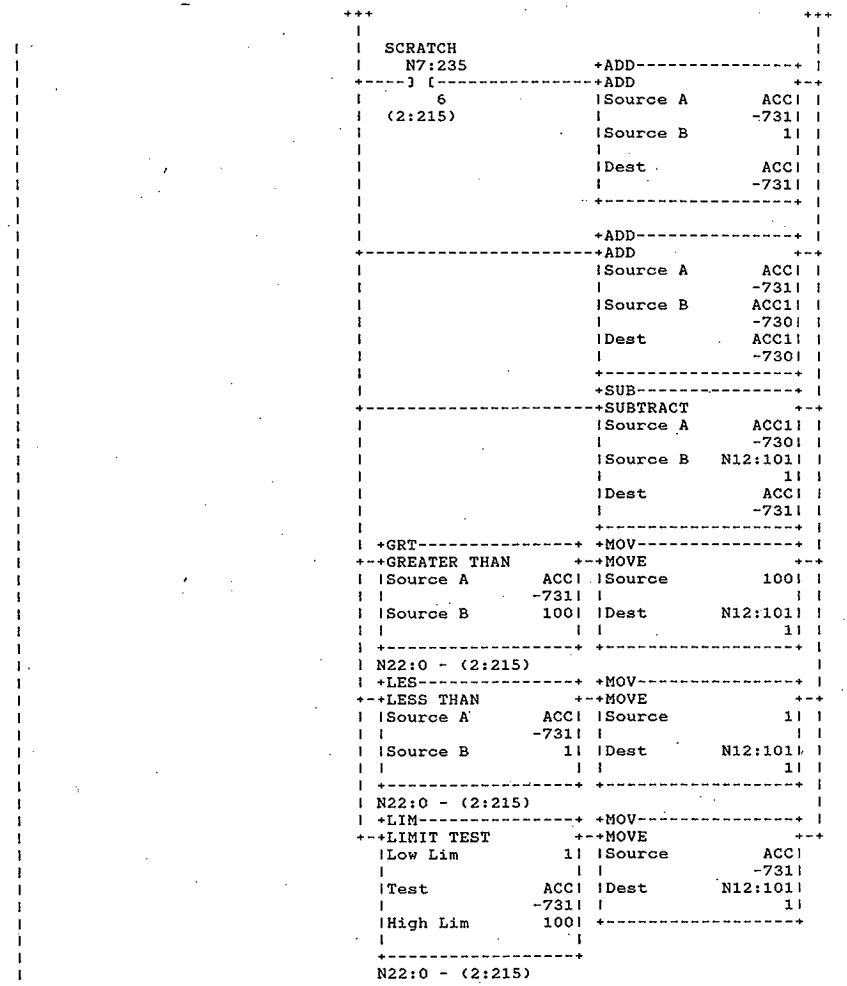
Rung 2:238
|                                                                        PID151
| RT_TMR/DN
|   T4:87                                                                    19
|----]/[-------------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

Rung 2:239

RATE CHECKING



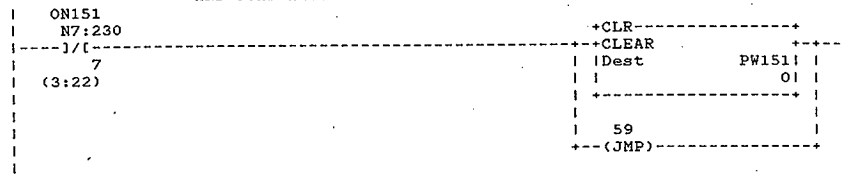

MUL
MULTIPLY
Source A ACC -731
Source B DIF1_151 -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730
MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC
-730
Dest ACC
-730
SUB
SUBTRACT
Source A ACC
-730
Source B N12:101
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N12:101
1
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
MOV
MOVE
Source 1
Dest N12:101
1
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source ACC
-731
Dest N12:101
1

Rung 2:240

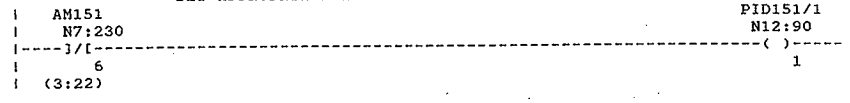
Rung 2:241

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



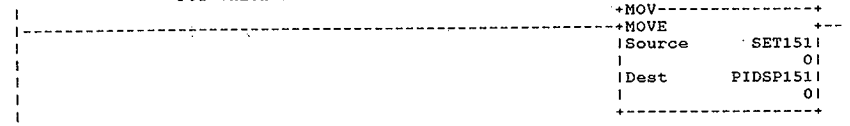
Rung 2:242

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

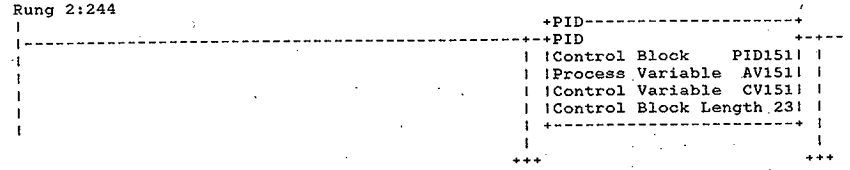


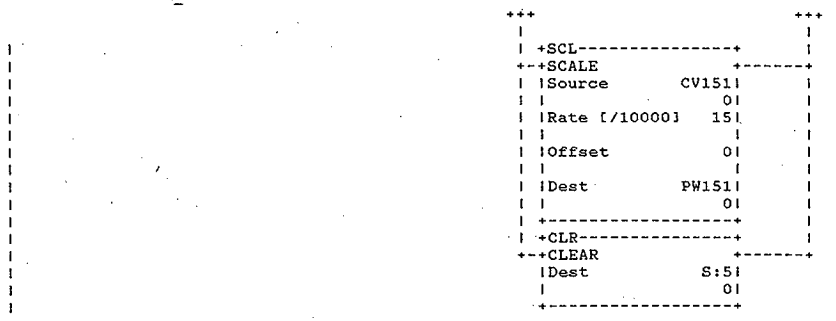
Rung 2:243

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

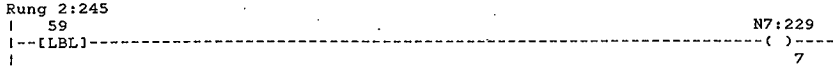


Rung 2:244

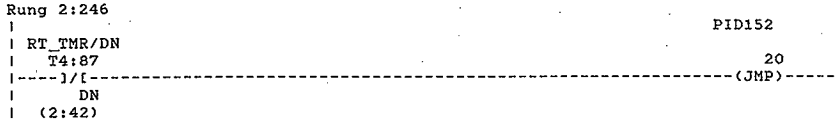




Rung 2:245

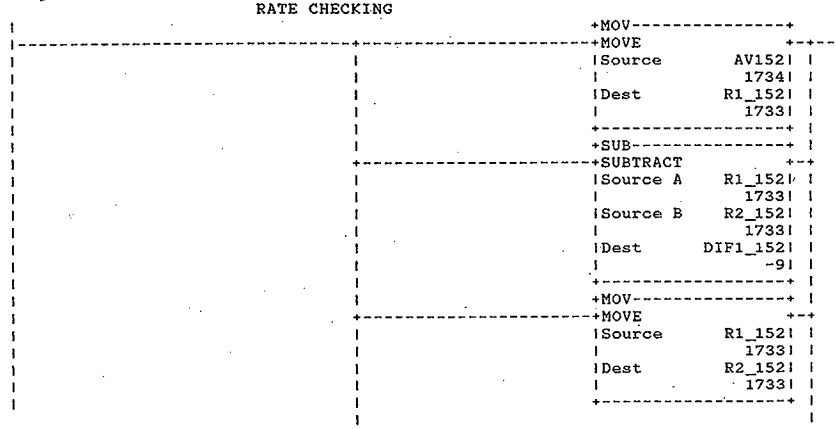


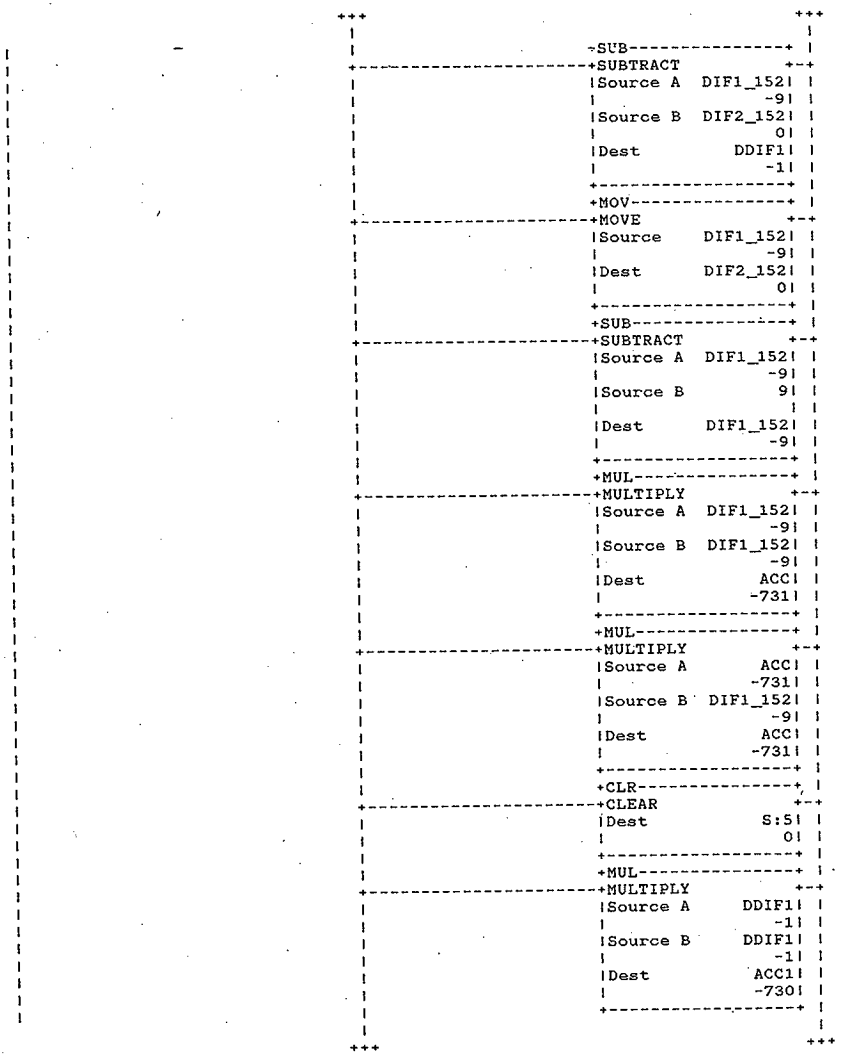
Rung 2:246

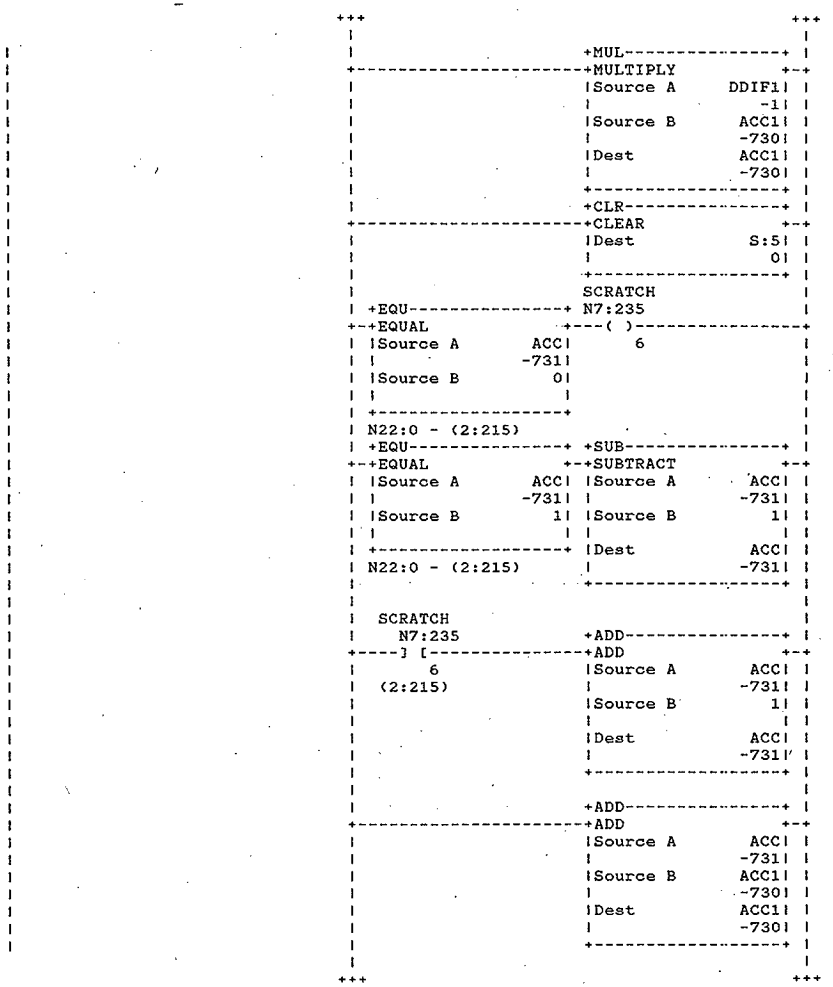


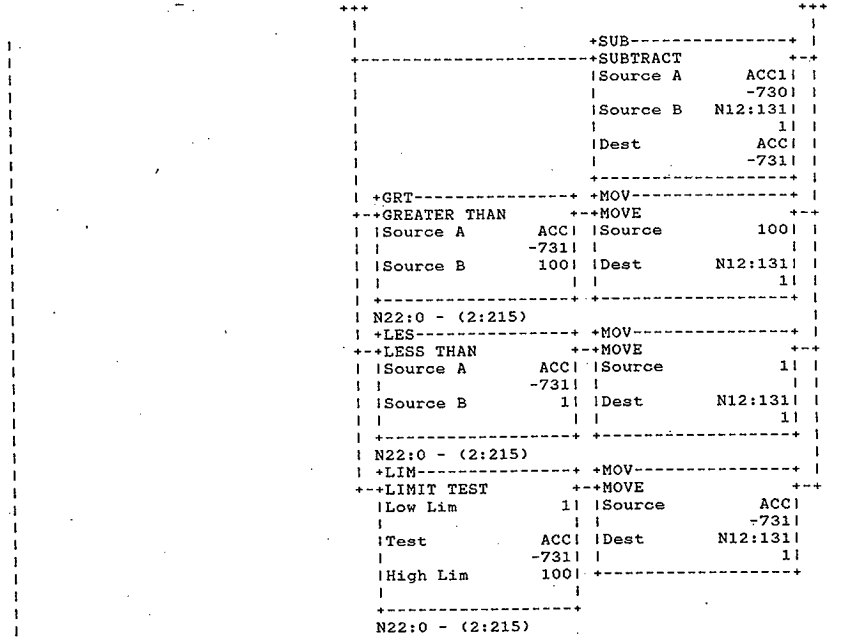
Rung 2:247

RATE CHECKING

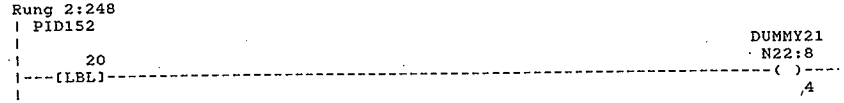



SUB
SUBTRACT
Source A DIF1_152 -9
Source B DIF2_152 0
Dest DDIF1 -1
MOV
MOVE
Source DIF1_152 -9
Dest DIF2_152 0
SUB
SUBTRACT
Source A DIF1_152 -9
Source B 9
Dest DIF1_152 -9
MUL
MULTIPLY
Source A DIF1_152 -9
Source B DIF1_152 -9
Dest ACC -731
MUL
MULTIPLY
Source A ACC -731
Source B DIF1_152 -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730


MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
6
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730

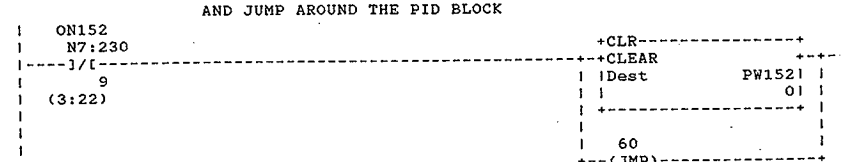


Rung 2:248



Rung 2:249

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:250

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|   AM152                                                          PID152/1
|    N7:230                                                        N12:120
|----]/[-----------------------------------------------------------( )------
|       8                                                            1
|  (3:22)
```

Rung 2:251

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                    +MOV---------------+
|----------------------------------------------------+MOVE              +--
|                                                    |Source     SET152|
|                                                    |                 0|
|                                                    |Dest      PIDSP152|
|                                                    |                 0|
|                                                    +------------------+
```

Rung 2:252

```
|                                                  +PID-------------------+
|--------------------------------------------------+-+PID                 +-+--
|                                                  | |Control Block    PID152| |
|                                                  | |Process Variable  AV152| |
|                                                  | |Control Variable  CV152| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL----------------+     |
|                                                  +-+SCALE              +------+
|                                                  | |Source       CV152|     |
|                                                  | |                  0|     |
|                                                  | |Rate [/10000]   15|     |
|                                                  | |                   |     |
|                                                  | |Offset             0|     |
|                                                  | |                   |     |
|                                                  | |Dest           PW152|     |
|                                                  | |                  0|     |
|                                                  | +-------------------+     |
|                                                  | +CLR----------------+     |
|                                                  +-+CLEAR              +------+
|                                                    |Dest           S:5|
|                                                    |                  0|
|                                                    +-------------------+
```

Rung 2:253

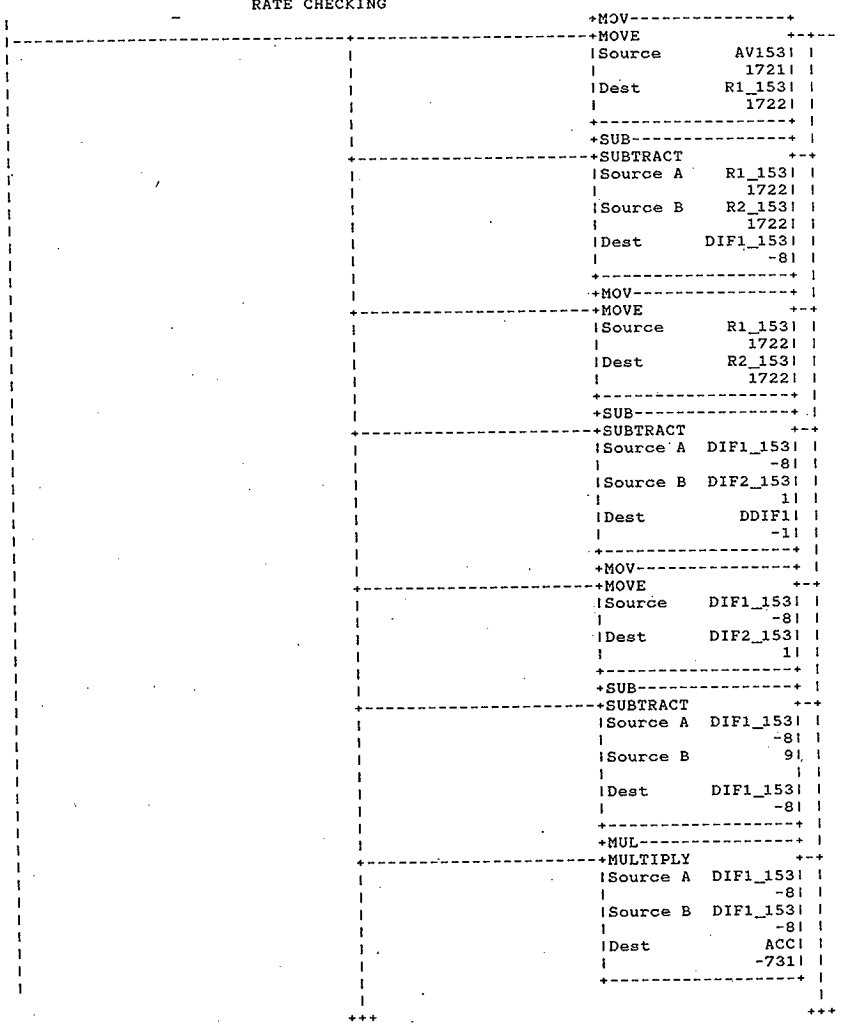
```
|   60                                                             N7:229
|--[LBL]-----------------------------------------------------------( )-----
|                                                                    8
```

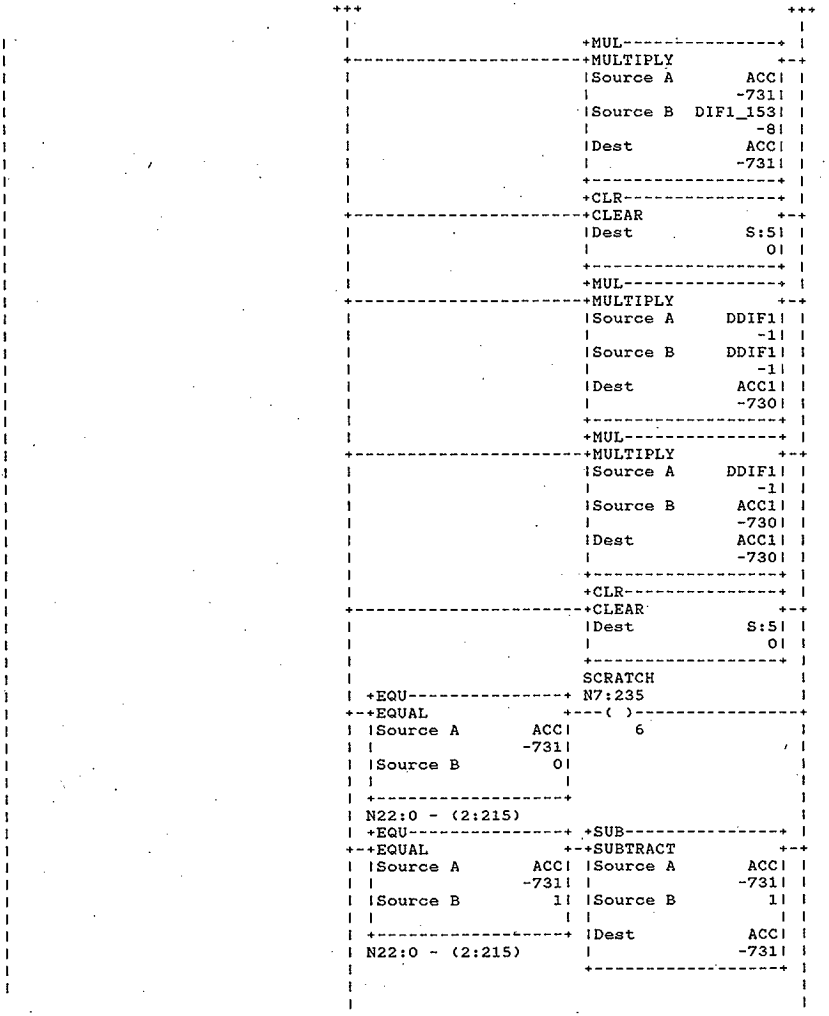
Rung 2:254

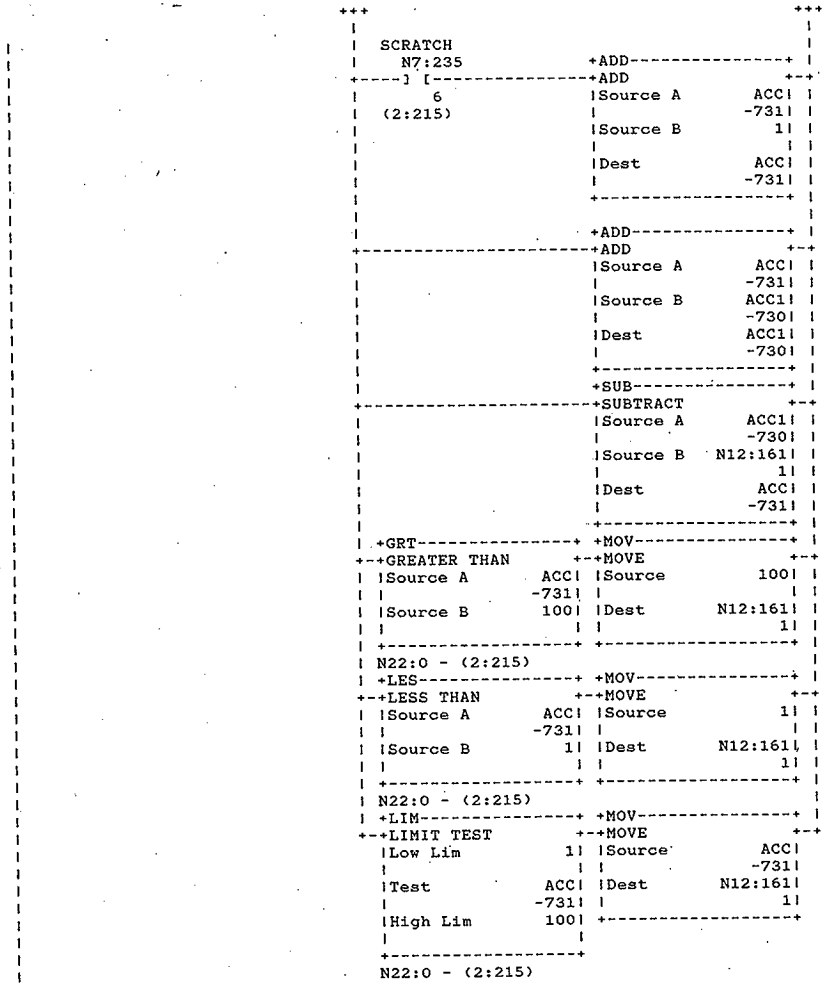
```
|                                                                  PID153
| RT_TMR/DN
|   T4:87                                                            21
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

Rung 2:255

RATE CHECKING




MUL
MULTIPLY
Source A ACC -731
Source B DIF1_153 -8
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730
MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC -731
Source B 0
( )
6
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N12:161
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N12:161
1
MOV
MOVE
Source 1
Dest N12:161
1
MOV
MOVE
Source ACC
-731
Dest N12:161
1

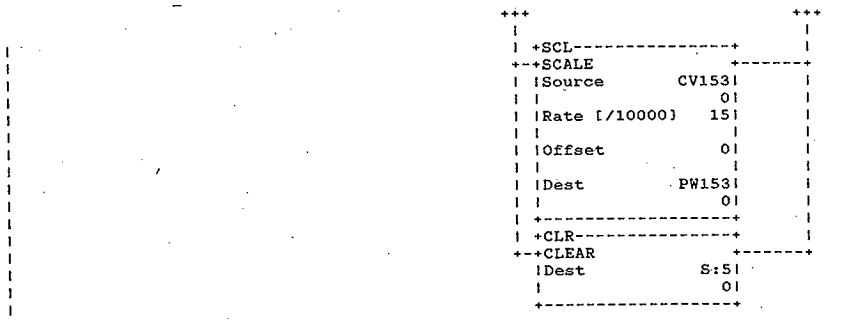
```
Rung 2:256
| PID153
|                                                                    DUMMY21
|      21                                                             N22:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                        4

Rung 2:257
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|   ON153
|    N7:230                                                  +CLR---------------+
|----]/[-----------------------------------------------+--+CLEAR             +-+--
|      11                                               | |Dest         PW153| |
|  (3:22)                                               | |                 0| |
|                                                       | +------------------+ |
|                                                       |                      |
|                                                       |   61                 |
|                                                       +--(JMP)---------------+
|

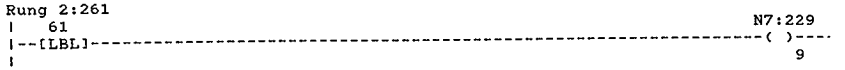
Rung 2:258
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM153                                                                PID153/1
|    N7:230                                                              N12:150
|----]/[-------------------------------------------------------------( )-----
|      10                                                                   1
|  (3:22)

Rung 2:259
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source      SET153|
|                                                          |                 0|
|                                                          |Dest      PIDSP153|
|                                                          |                 0|
|                                                          +------------------+

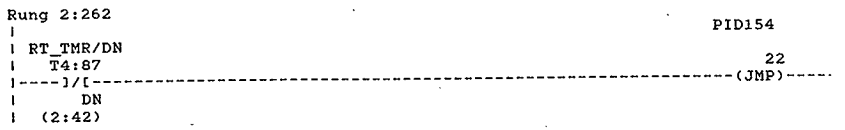
Rung 2:260
|                                                     +PID--------------------+
|-----------------------------------------------+--+PID                     +-+--
|                                               | |Control Block     PID153| |
|                                               | |Process Variable  AV153| |
|                                               | |Control Variable  CV153| |
|                                               | |Control Block Length 23| |
|                                               | +-----------------------+ |
|                                               |                           |
|                                              +++                         +++
```



Rung 2:261

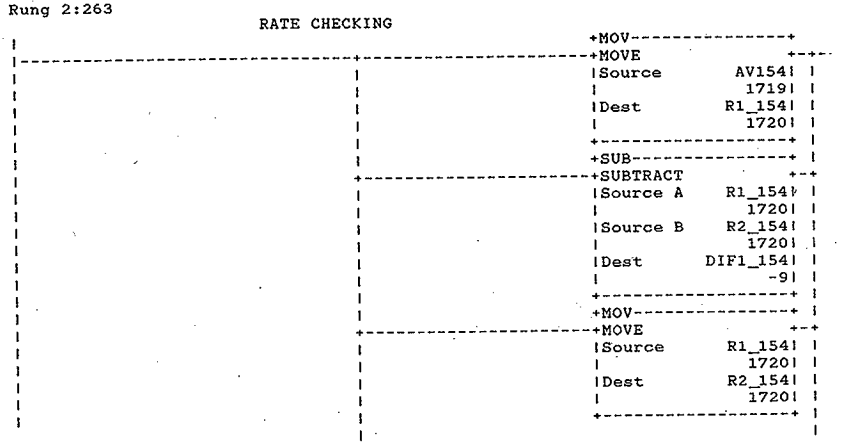


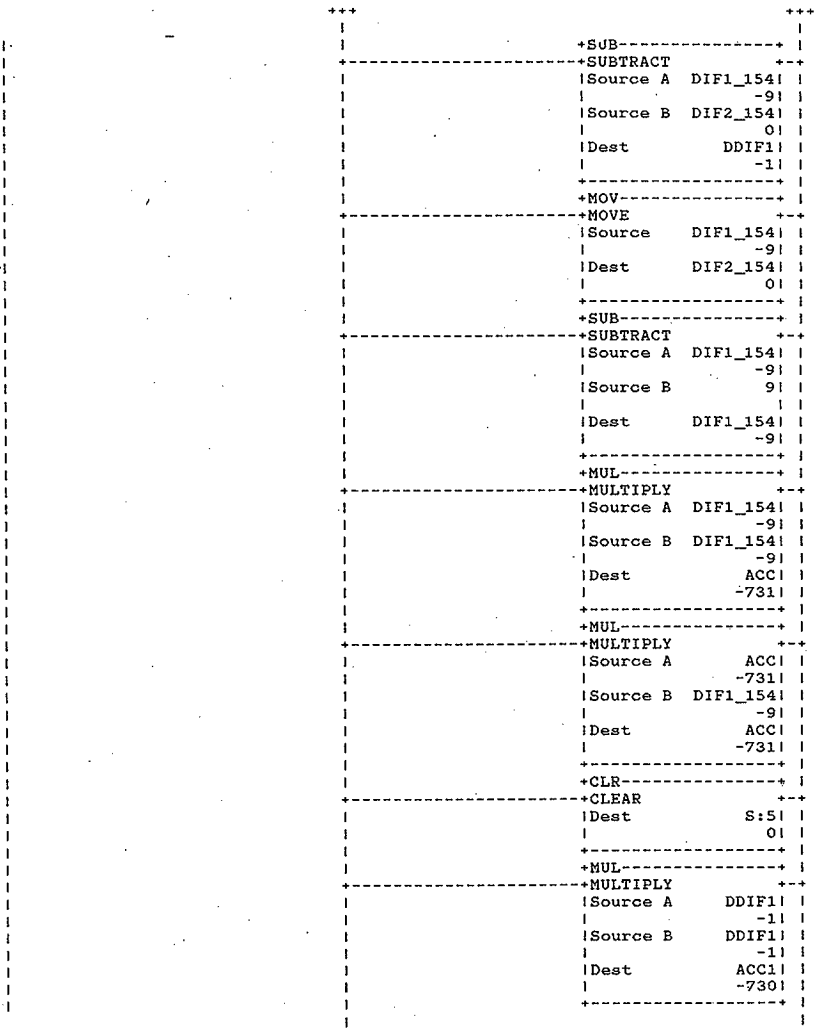
Rung 2:262

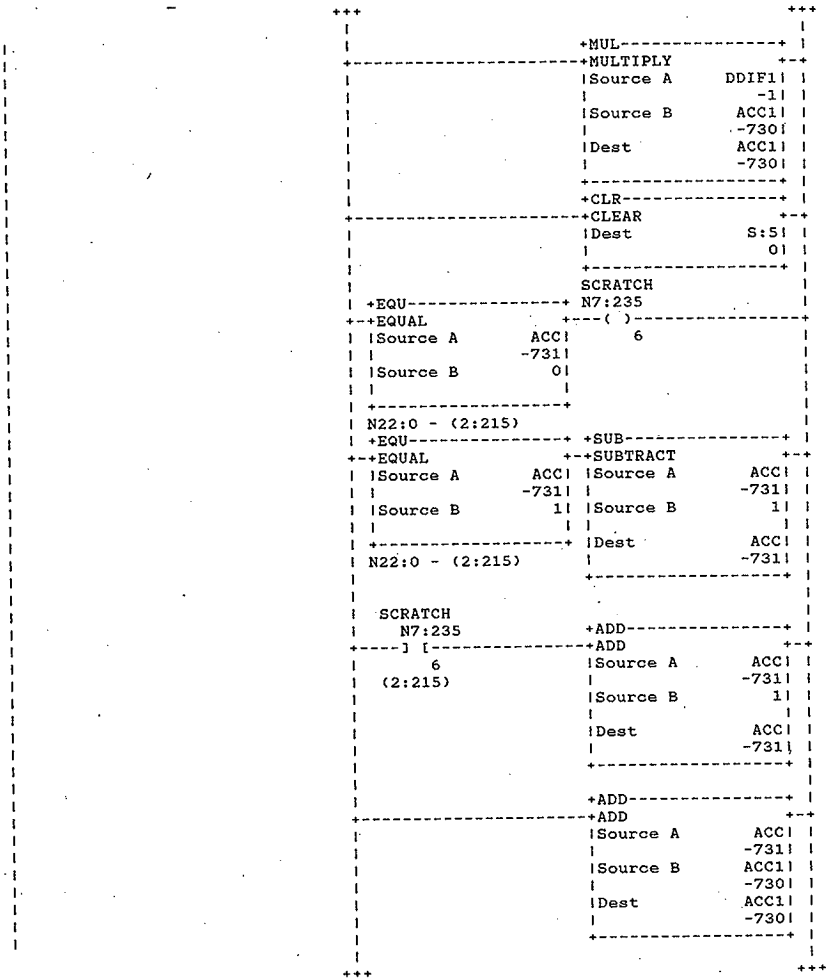


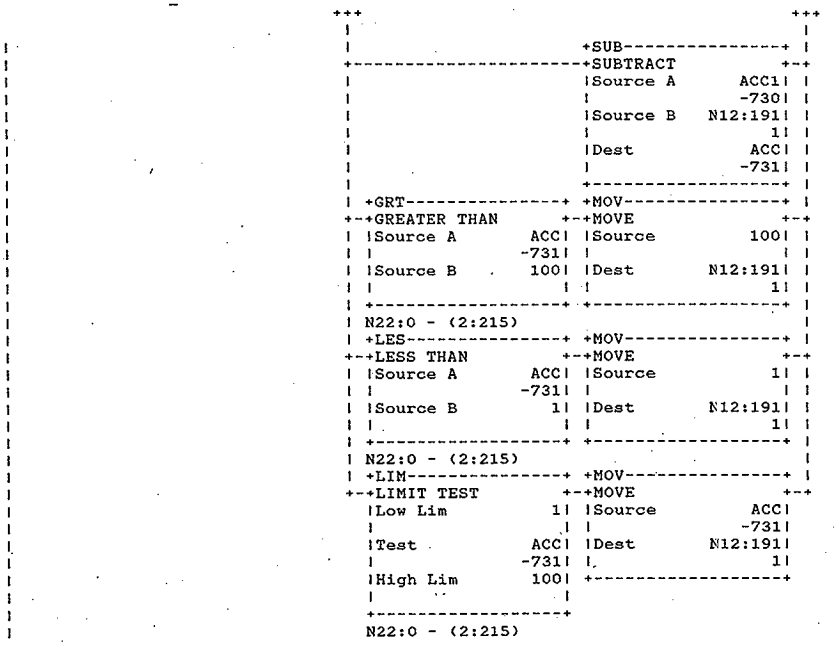
Rung 2:263

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_154 -9
Source B DIF2_154 0
Dest DDIF1 -1
MOV
MOVE
Source DIF1_154 -9
Dest DIF2_154 0
SUB
SUBTRACT
Source A DIF1_154 -9
Source B 9
Dest DIF1_154 -9
MUL
MULTIPLY
Source A DIF1_154 -9
Source B DIF1_154 -9
Dest ACC -731
MUL
MULTIPLY
Source A ACC -731
Source B DIF1_154 -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730

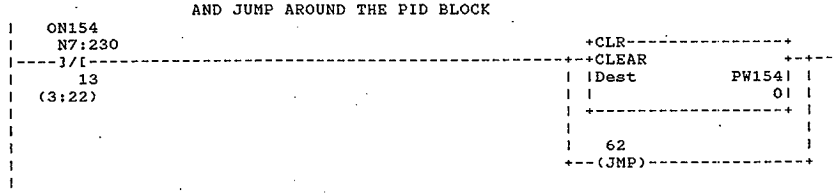

+MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
+CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
+EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
( )
6
+EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
+ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730



Rung 2:264

Rung 2:265

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:266
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM154                                                          PID154/1
|    N7:230                                                        N12:180
|----]/[-------------------------------------------------------------( )-----
|      12                                                                1
|  (3:22)

Rung 2:267
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                  +MOV---------------+
|-------------------------------------------------+MOVE              +--
|                                                  |Source      SET154|
|                                                  |                 0|
|                                                  |Dest      PIDSP154|
|                                                  |                 0|
|                                                  +------------------+

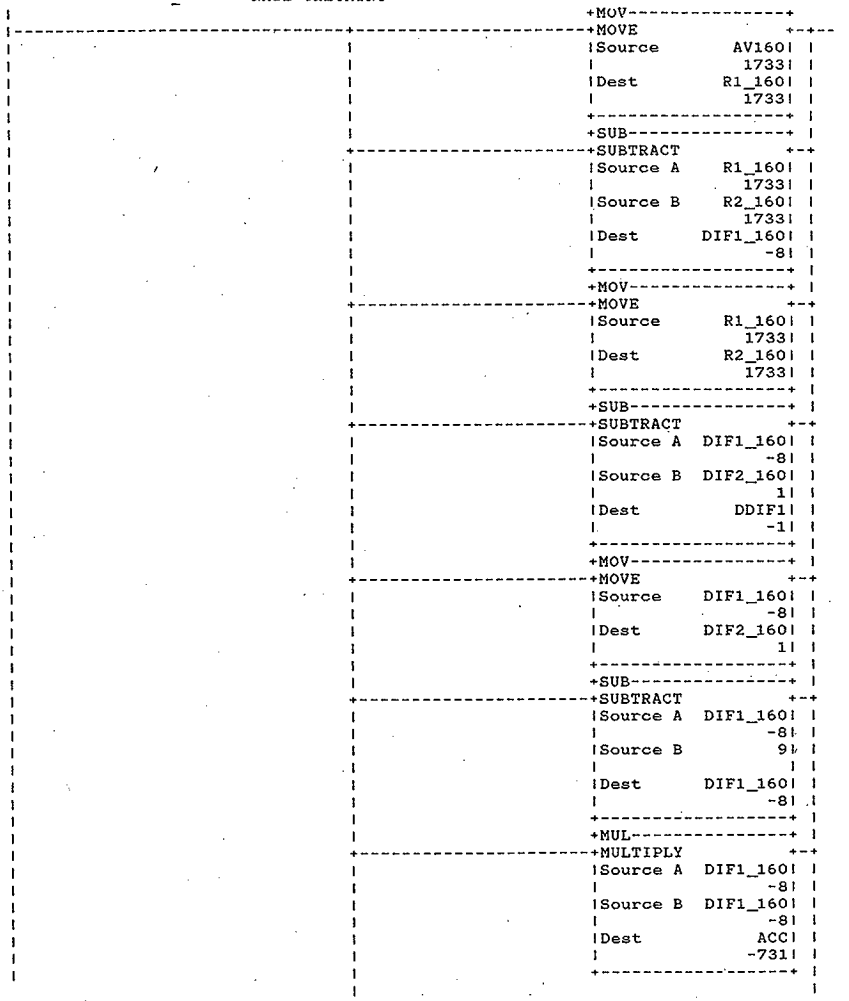
Rung 2:268
|                                                +PID--------------------+
|-----------------------------------------------+-+PID                   +-+--
|                                              | |Control Block    PID154| |
|                                              | |Process Variable  AV154| |
|                                              | |Control Variable  CV154| |
|                                              | |Control Block Length 23| |
|                                              | +----------------------+ |
|                                              | +SCL---------------+      |
|                                              +-+SCALE             +------+
|                                              | |Source       CV154|      |
|                                              | |                 0|      |
|                                              | |Rate [/10000]   15|      |
|                                              | |                  |      |
|                                              | |Offset           0|      |
|                                              | |                  |      |
|                                              | |Dest         PW154|      |
|                                              | |                 0|      |
|                                              | +------------------+      |
|                                              | +CLR---------------+      |
|                                              +-+CLEAR             +------+
|                                                |Dest           S:5|
|                                                |                 0|
|                                                +------------------+

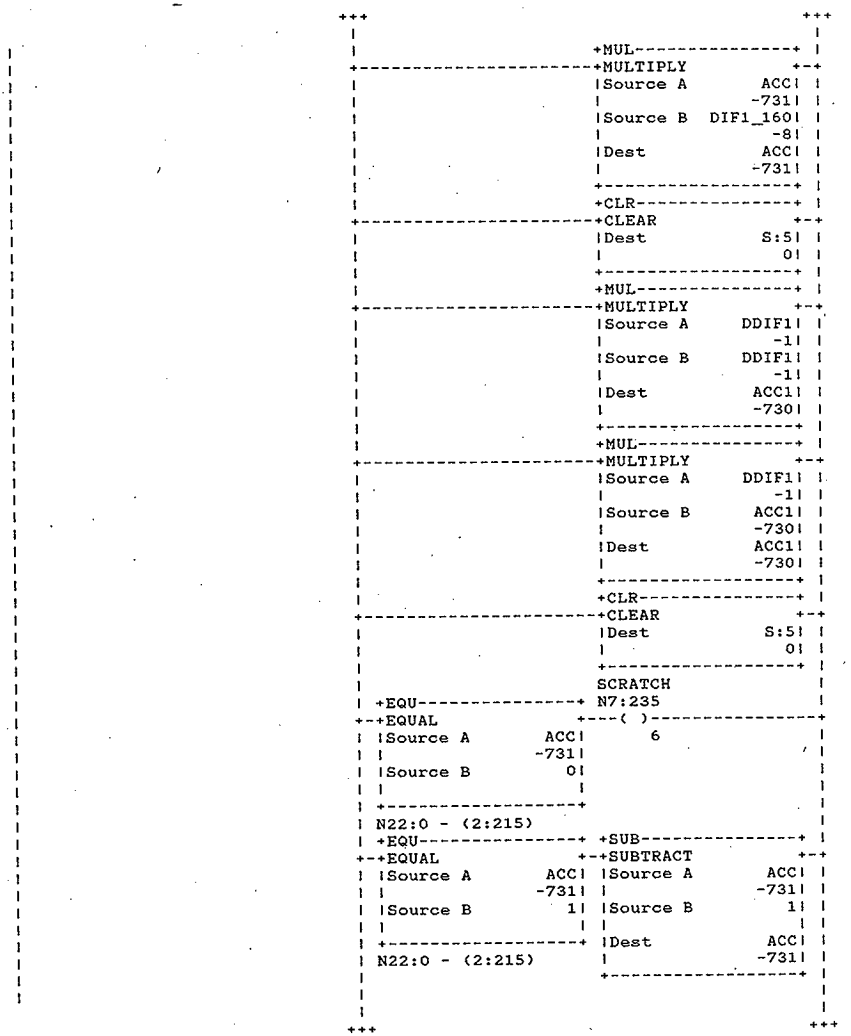
Rung 2:269
|   62                                                              N7:229
|--[LBL]-------------------------------------------------------------( )----
|                                                                      10

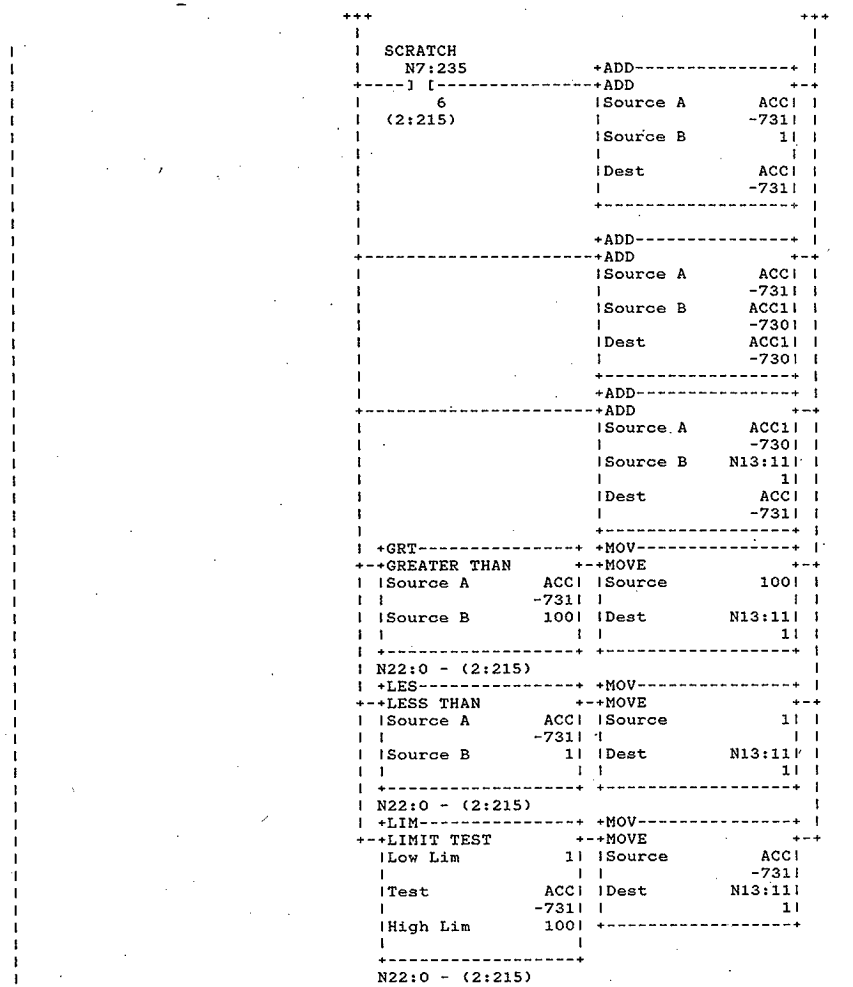
Rung 2:270
|                                                                PID160
| RT_TMR/DN
|   T4:87                                                            23
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

Rung 2:271

RATE CHECKING




MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_160
-8
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
ADD
Source A ACC1
-730
Source B N13:11
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N13:11
1
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
MOV
MOVE
Source 1
Dest N13:11
1
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source ACC
-731
Dest N13:11
1

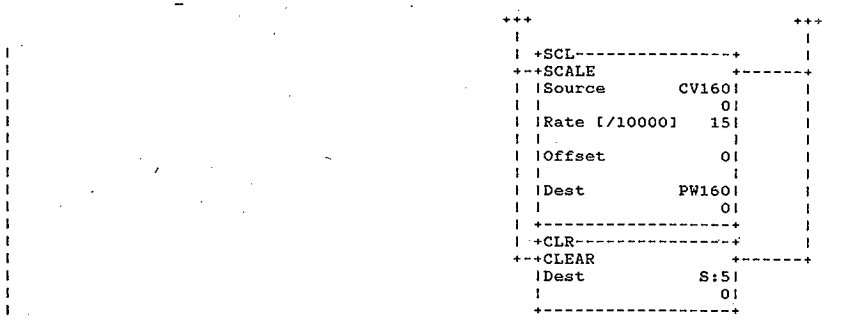
```
Rung 2:272
| PID160
|                                                                    DUMMY23
|      23                                                             N22:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                        6

Rung 2:273
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|   ON160
|    N7:230                                                  +CLR---------------+
|----]/[-----------------------------------------------------+-+CLEAR            +-+--
|      15                                                    | |Dest        PW160| |
|  (3:22)                                                    | |                0| |
|                                                            | +------------------+ |
|                                                            |                      |
|                                                            |   63                 |
|                                                            +--(JMP)---------------+
|

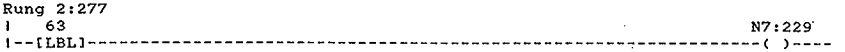
Rung 2:274
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|   AM160                                                                  PID160/1
|    N7:230                                                                 N13:0
|----]/[-------------------------------------------------------------------( )-----
|      14                                                                      1
|  (3:22)

Rung 2:275
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                              +MOV---------------+
|-------------------------------------------------------------+MOVE              +--
|                                                              |Source      SET160|
|                                                              |                  0|
|                                                              |Dest      PIDSP160|
|                                                              |                  0|
|                                                              +------------------+

Rung 2:276
|                                                        +PID--------------------+
|-------------------------------------------------------+-+PID                  +-+--
|                                                       | |Control Block    PID160| |
|                                                       | |Process Variable  AV160| |
|                                                       | |Control Variable  CV160| |
|                                                       | |Control Block Length 23| |
|                                                       | +----------------------+ |
|                                                       |                          |
                                                       +++                        +++
```



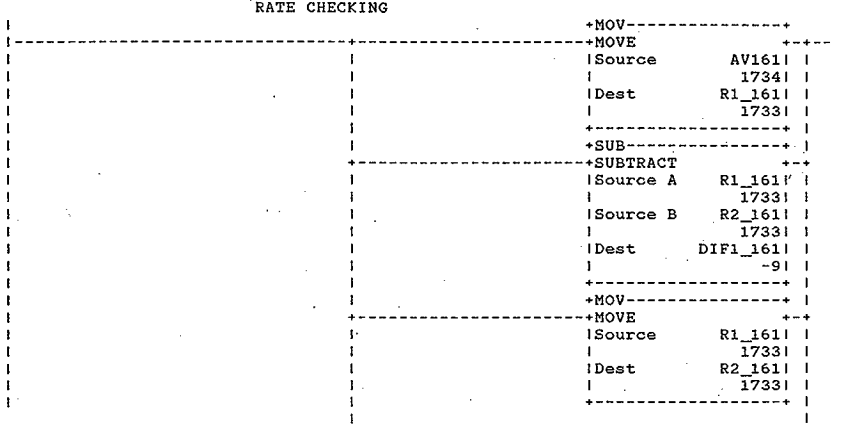
Rung 2:277

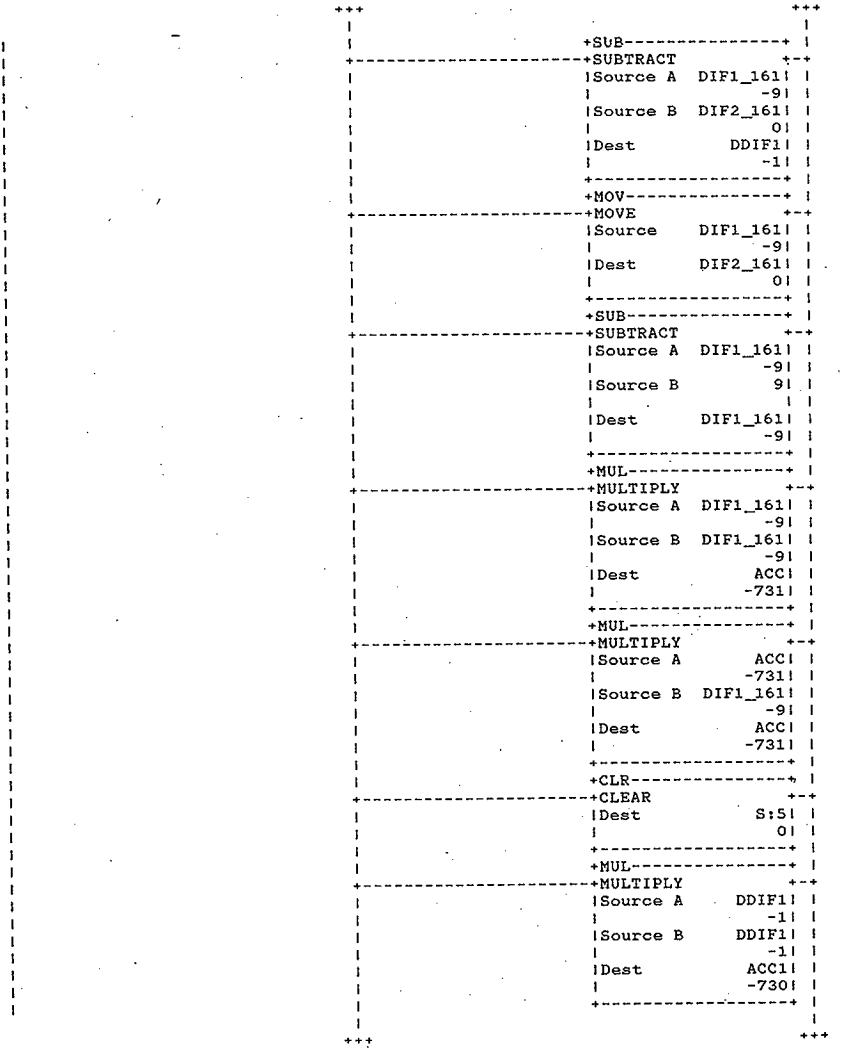


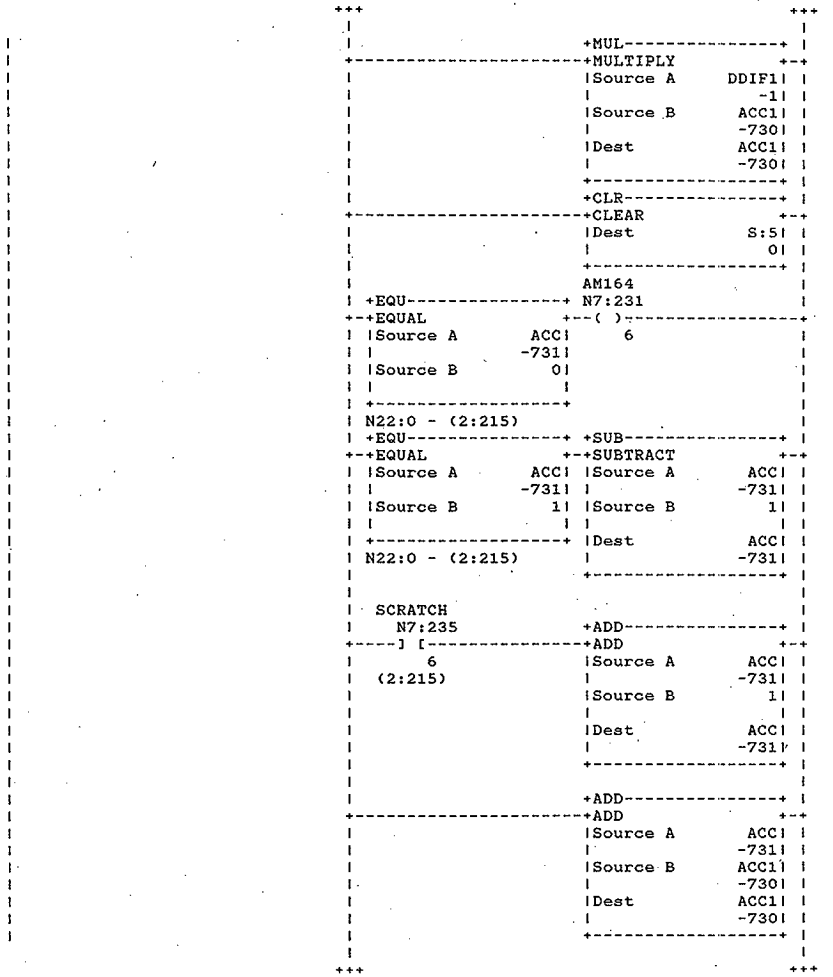
Rung 2:278

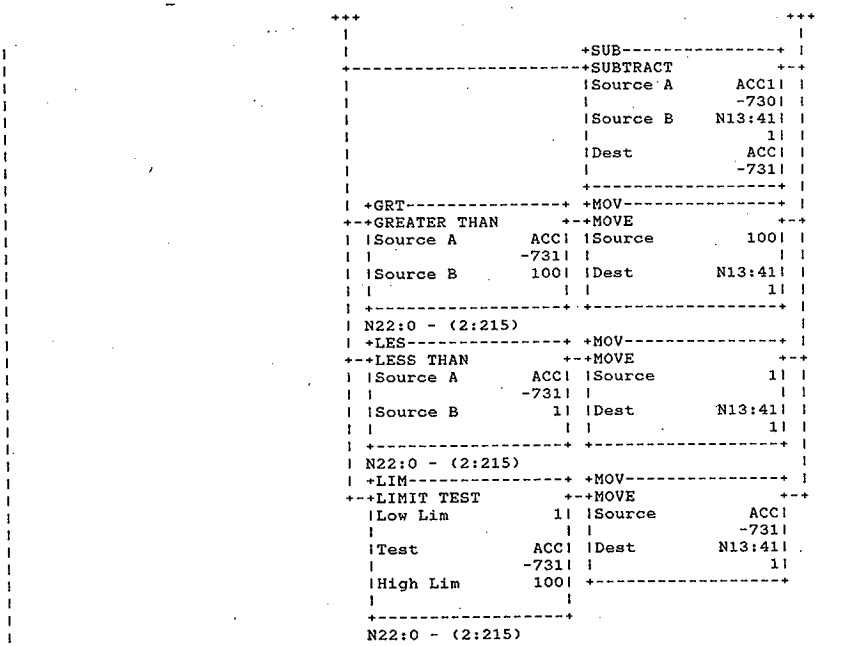
Rung 2:279

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_161 -9
Source B DIF2_161 0
Dest DDIF1 -1
MOV
MOVE
Source DIF1_161 -9
Dest DIF2_161 0
SUB
SUBTRACT
Source A DIF1_161 -9
Source B 9
Dest DIF1_161 -9
MUL
MULTIPLY
Source A DIF1_161 -9
Source B DIF1_161 -9
Dest ACC -731
MUL
MULTIPLY
Source A ACC -731
Source B DIF1_161 -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730

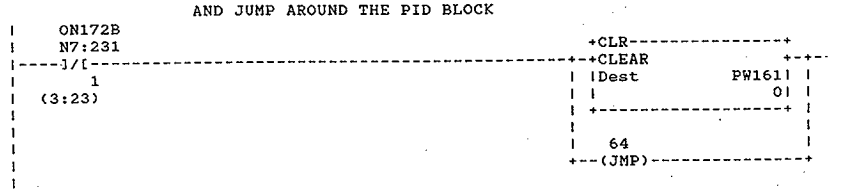

+MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
CLEAR
Dest S:5
0
AM164
N7:231
6
+EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
+ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730



Rung 2:280

Rung 2:281

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:282

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|   AM161                                                          PID161/1
|    N7:231                                                         N13:30
|----]/[-------------------------------------------------------------( )-----
|       0                                                             1
|  (3:23)
```

Rung 2:283

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                    +MOV---------------+
|----------------------------------------------------+MOVE              +--
|                                                    |Source      SET161|
|                                                    |                 0|
|                                                    |Dest       PIDSP161|
|                                                    |                 0|
|                                                    +------------------+
```

Rung 2:284

```
|                                              +PID--------------------+
|----------------------------------------------+-+PID                  +-+--
|                                              | |Control Block    PID161| |
|                                              | |Process Variable  AV161| |
|                                              | |Control Variable  CV161| |
|                                              | |Control Block Length 23| |
|                                              | +-----------------------+ |
|                                              | +SCL----------------+     |
|                                              +-+SCALE              +-------+
|                                              | |Source        CV161|       |
|                                              | |                   0|       |
|                                              | |Rate [/10000]    15|       |
|                                              | |                    |       |
|                                              | |Offset             0|       |
|                                              | |                    |       |
|                                              | |Dest           PW161|       |
|                                              | |                   0|       |
|                                              | +--------------------+       |
|                                              | +CLR----------------+        |
|                                              +-+CLEAR              +-------+
|                                                |Dest            S:5|
|                                                |                   0|
|                                                +--------------------+
```

Rung 2:285

```
|   64                                                              N7:229
|--[LBL]-------------------------------------------------------------( )-----
|                                                                     12
```

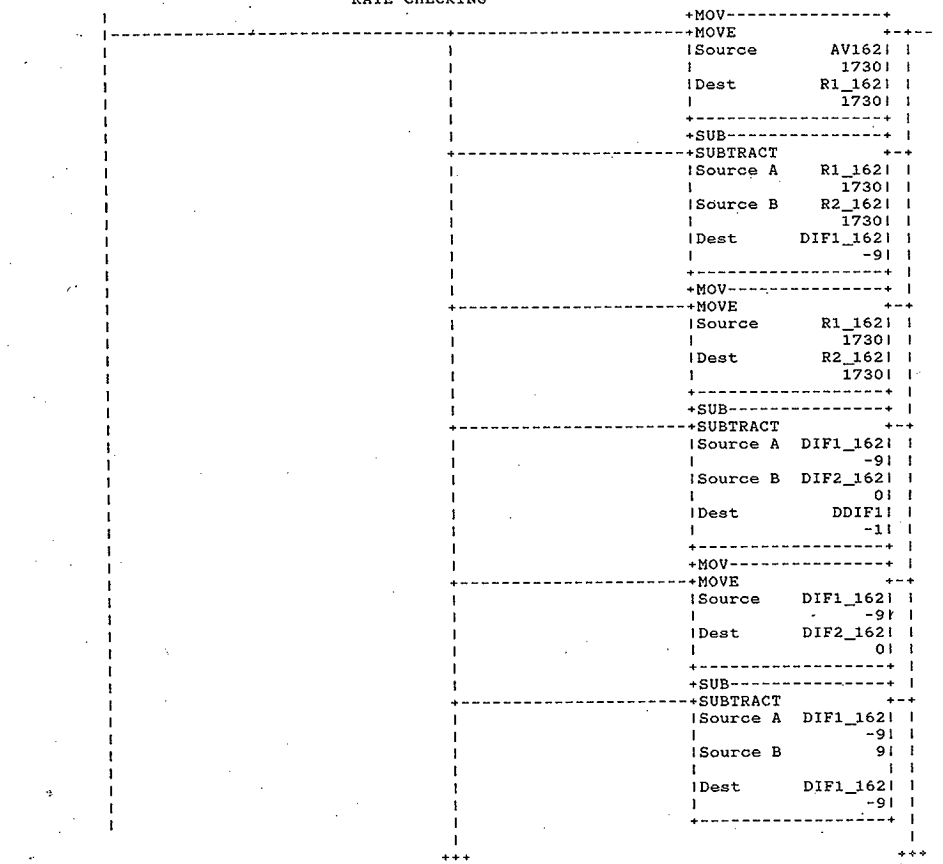
Rung 2:286

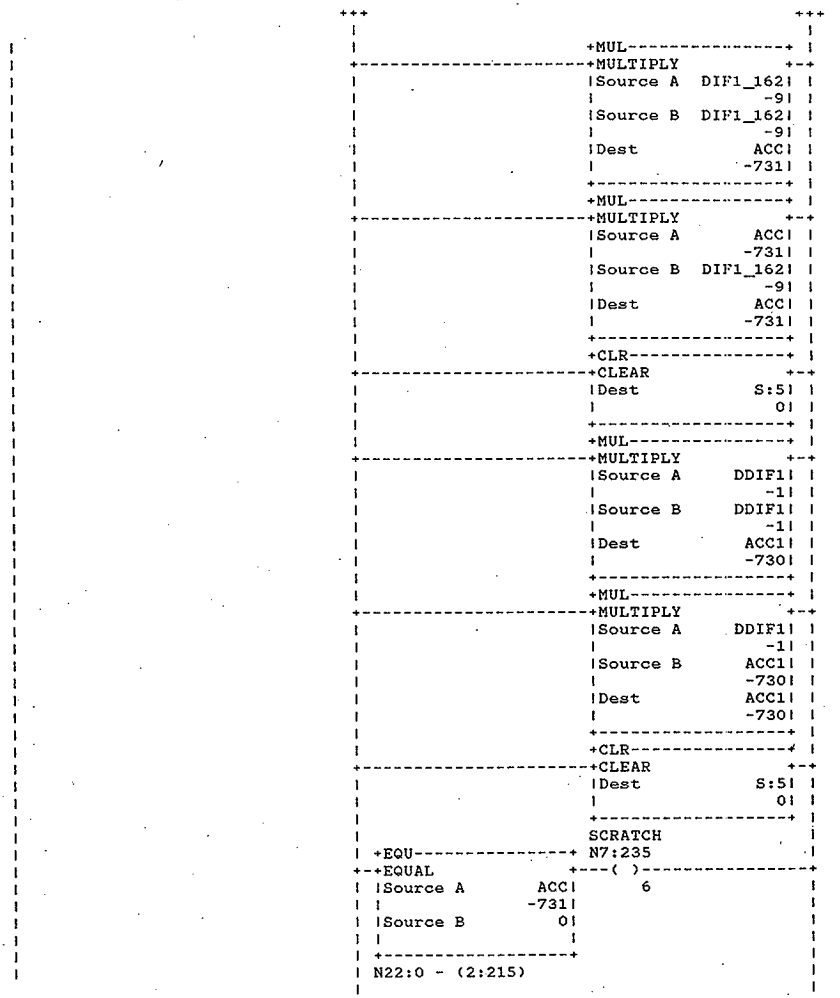
```
|                                                                  PID162
| RT_TMR/DN
|   T4:87                                                            25
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

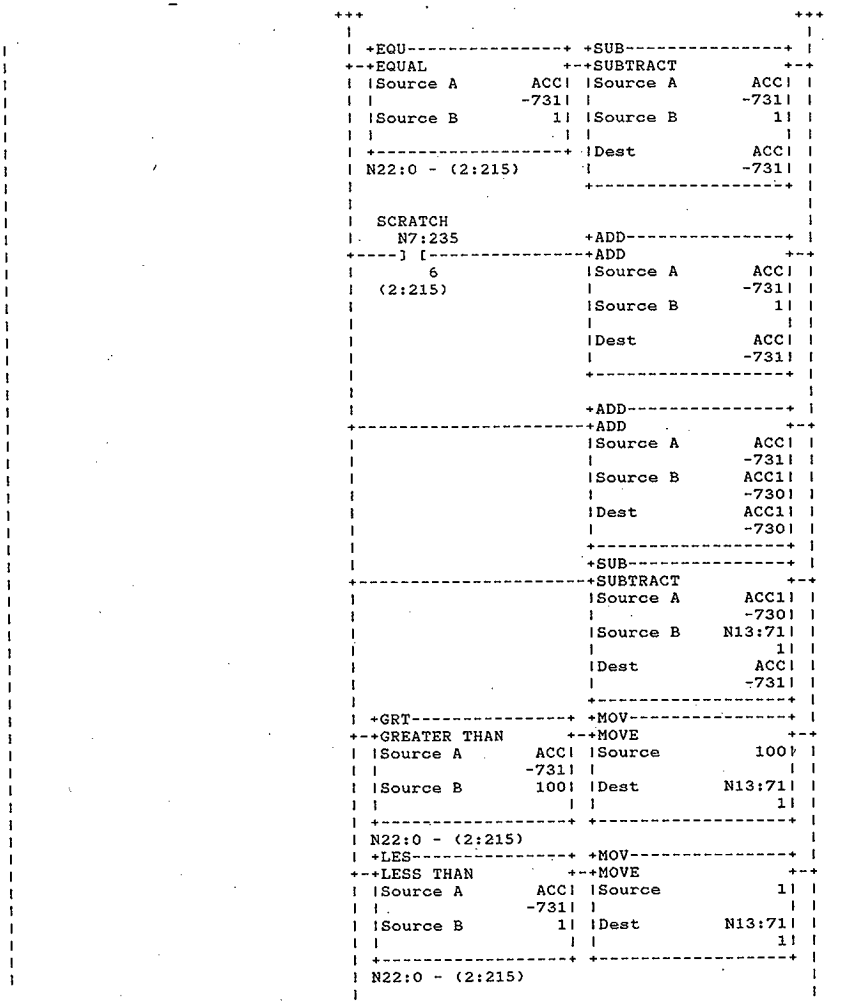
Rung 2:287

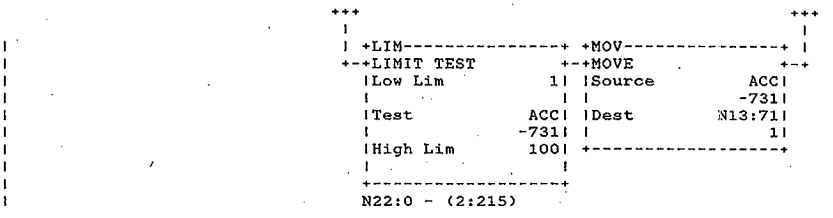
Rung 2:288

RATE CHECKING

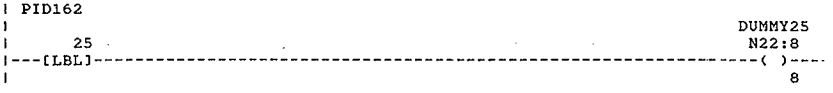



+MUL
+MULTIPLY
Source A DIF1_162
-9
Source B DIF1_162
-9
Dest ACC
-731
+MUL
+MULTIPLY
Source A ACC
-731
Source B DIF1_162
-9
Dest ACC
-731
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N7:235
+EQU
+EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
( )
6


EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SCRATCH
N7:235
6
(2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N13:71
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N13:71
1
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
MOV
MOVE
Source 1
Dest N13:71
1

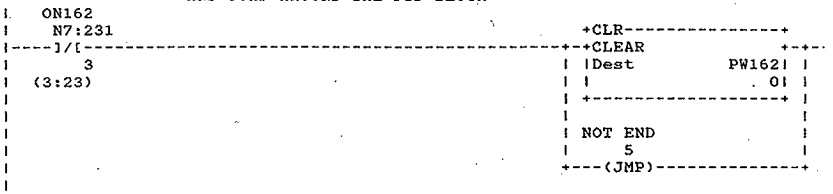


Rung 2:289



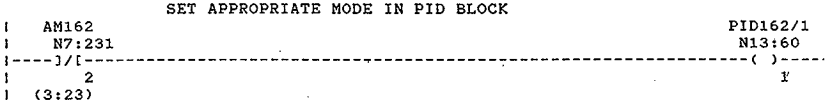
Rung 2:290

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



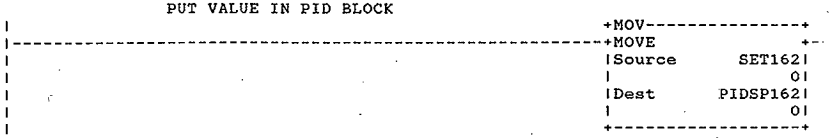
Rung 2:291

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



Rung 2:292

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



```
Rung 2:293
|                                                  +PID--------------------+
|-------------------------------------------------+-+PID                    +-+--
|                                                 | |Control Block    PID162| |
|                                                 | |Process Variable  AV162| |
|                                                 | |Control Variable  CV162| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 | +SCL----------------+      |
|                                                 +-+SCALE              +------+
|                                                 | |Source        CV162|      |
|                                                 | |                  0|      |
|                                                 | |Rate [/10000]    15|      |
|                                                 | |                  |      |
|                                                 | |Offset             0|      |
|                                                 | |                  |      |
|                                                 | |Dest          PW162|      |
|                                                 | |                  0|      |
|                                                 | +-------------------+      |
|                                                 | +CLR----------------+      |
|                                                 +-+CLEAR              +------+
|                                                   |Dest            S:5|
|                                                   |                  0|
|                                                   +-------------------+

Rung 2:294
|                                                                   NOT END
|                                                                       5
|-------------------------------------------------------------------(JMP)-----
|

Rung 2:295
*******************************************************************************
                        BEGIN SECTION 2
| MD2
|                                                                   DUMMY7
|     2                                                             N22:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                       6

Rung 2:296
|                                                                    DN_2
|                                                                   N22:5
|-------------------------------------------------------------------(L)---
|                                                                       2

Rung 2:297
*******************************************************************************
  READ EACH THERMOCOUPLE AND STORE EACH TE'S VALUE IN ITS OWN MEMORY REGISTER
*******************************************************************************
|                                                     +ADD---------------+
|-------------------------------------------------+ADD                +--
|                                                     |Source A   TC170B1|
|                                                     |               719|
|                                                     |Source B      1000|
|                                                     |                  |
|                                                     |Dest        C170B1|
|                                                     |              1719|
|                                                     +------------------+
```

```
Rung 2:298
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C170B1|                                  |Source       16383|
| |              1719|                                  |                  |
| |Source B     16383|                                  |Dest        C170B1|
| |                  |                                  |              1719|
| +------------------+                                  +------------------+
| N7:29 - (2:297)

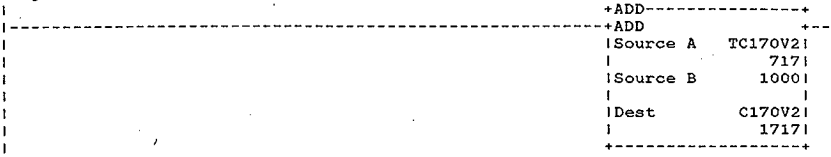
Rung 2:299
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC170B2|
|                                                       |               722|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C170B2|
|                                                       |              1722|
|                                                       +------------------+

Rung 2:300
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C170B2|                                  |Source       16383|
| |              1722|                                  |                  |
| |Source B     16383|                                  |Dest        C170B2|
| |                  |                                  |              1722|
| +------------------+                                  +------------------+
| N7:30 - (2:299)

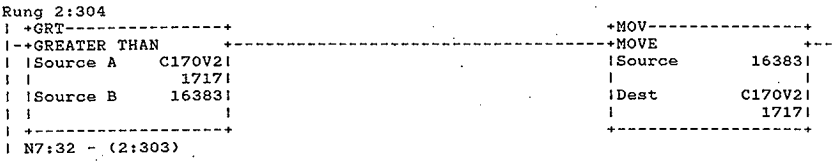
Rung 2:301
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC170V1|
|                                                       |               719|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C170V1|
|                                                       |              1719|
|                                                       +------------------+

Rung 2:302
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C170V1|                                  |Source       16383|
| |              1719|                                  |                  |
| |Source B     16383|                                  |Dest        C170V1|
| |                  |                                  |              1719|
| +------------------+                                  +------------------+
| N7:31 - (2:301)
```

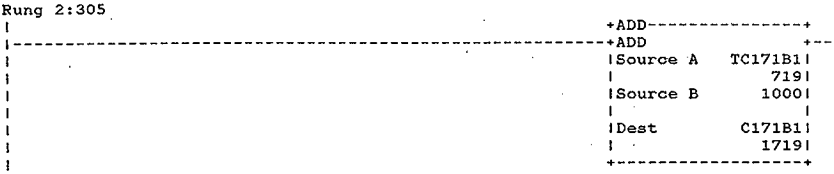
Rung 2:303



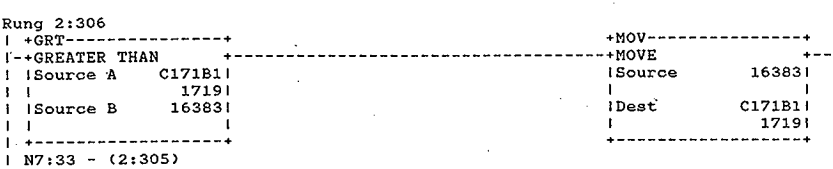
Rung 2:304



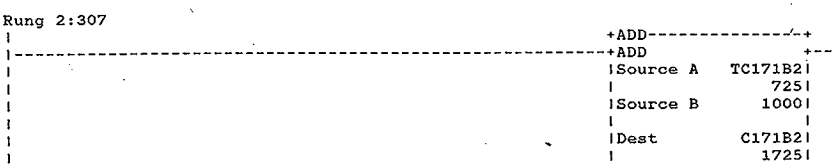
Rung 2:305



Rung 2:306



Rung 2:307



```
Rung 2:308
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C171B2|                                  |Source       16383|
| |              1725|                                  |                  |
| |Source B     16383|                                  |Dest        C171B2|
| |                  |                                  |              1725|
| +------------------+                                  +------------------+
| N7:34 - (2:307)

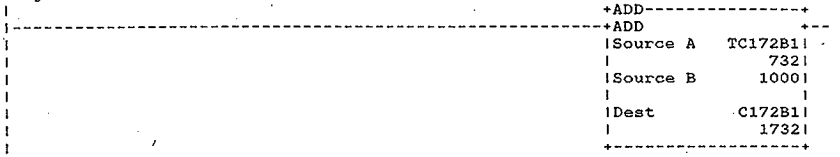
Rung 2:309
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC171V1|
|                                                       |               721|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C171V1|
|                                                       |              1721|
|                                                       +------------------+

Rung 2:310
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C171V1|                                  |Source       16383|
| |              1721|                                  |                  |
| |Source B     16383|                                  |Dest        C171V1|
| |                  |                                  |              1721|
| +------------------+                                  +------------------+
| N7:35 - (2:309)

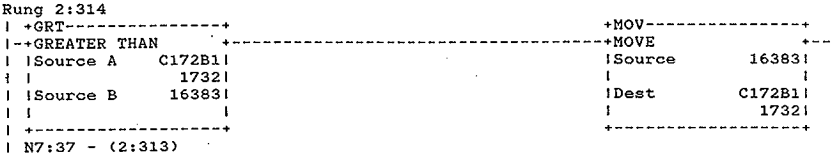
Rung 2:311
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC171V2|
|                                                       |               720|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C171V2|
|                                                       |              1720|
|                                                       +------------------+

Rung 2:312
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C171V2|                                  |Source       16383|
| |              1720|                                  |                  |
| |Source B     16383|                                  |Dest        C171V2|
| |                  |                                  |              1720|
| +------------------+                                  +------------------+
| N7:36 - (2:311)
```

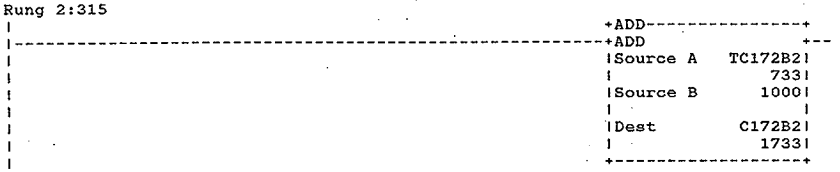
Rung 2:313



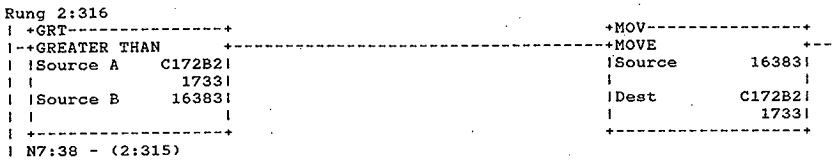
Rung 2:314



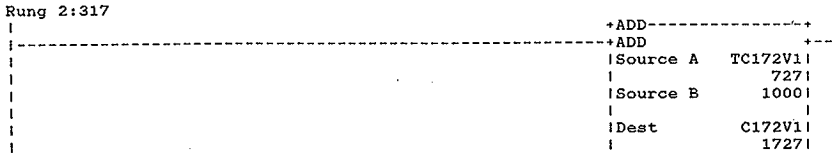
Rung 2:315



Rung 2:316



Rung 2:317



```
Rung 2:318
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C172V1|                                  |Source       16383|
| |              1727|                                  |                  |
| |Source B     16383|                                  |Dest        C172V1|
| |                  |                                  |              1727|
| +------------------+                                  +------------------+
| N7:39 - (2:317)

Rung 2:319
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC172V2|
|                                                       |               726|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C172V2|
|                                                       |              1726|
|                                                       +------------------+

Rung 2:320
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C172V2|                                  |Source       16383|
| |              1726|                                  |                  |
| |Source B     16383|                                  |Dest        C172V2|
| |                  |                                  |              1726|
| +------------------+                                  +------------------+
| N7:40 - (2:319)

Rung 2:321
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC173B1|
|                                                       |               726|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C173B1|
|                                                       |              1726|
|                                                       +------------------+

Rung 2:322
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C173B1|                                  |Source       16383|
| |              1726|                                  |                  |
| |Source B     16383|                                  |Dest        C173B1|
| |                  |                                  |              1726|
| +------------------+                                  +------------------+
| N7:41 - (2:321)
```

This document was too large to scan as a whole document, therefore it required breaking into smaller sections.

Document number: SD-FF-CSWD-061

Section 2 **of** 2

Title: Sodium Storage Facility Ladder Logic Diagrams

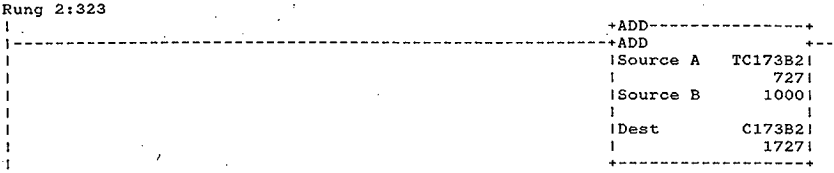
Date: 6/12/97 **Revision:** A000

Originator: Jones DD
Co: BWHC

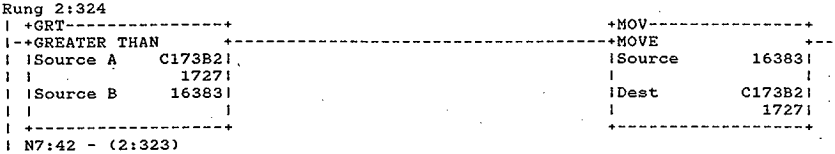
Recipient:
Co:

References: EDT-619594

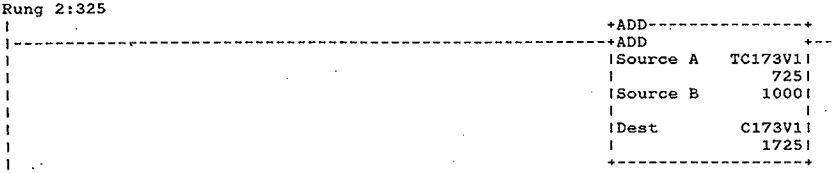
Rung 2:323



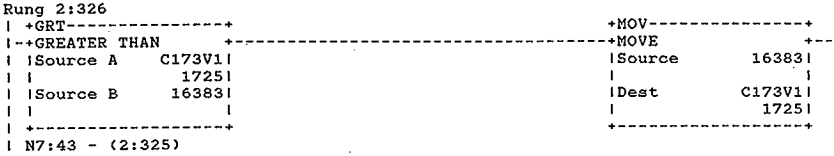
Rung 2:324



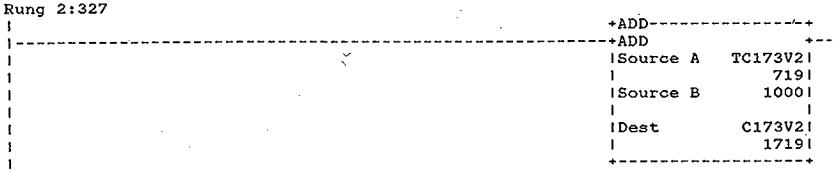
Rung 2:325



Rung 2:326



Rung 2:327



```
Rung 2:328
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C173V2|                                  |Source       16383|
| |              1719|                                  |                  |
| |Source B     16383|                                  |Dest        C173V2|
| |                  |                                  |              1719|
| +------------------+                                  +------------------+
| N7:44 - (2:327)

Rung 2:329
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC174B1|
|                                                       |               728|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C174B1|
|                                                       |              1728|
|                                                       +------------------+

Rung 2:330
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C174B1|                                  |Source       16383|
| |              1728|                                  |                  |
| |Source B     16383|                                  |Dest        C174B1|
| |                  |                                  |              1728|
| +------------------+                                  +------------------+
| N7:45 - (2:329)

Rung 2:331
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC174B2|
|                                                       |               729|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C174B2|
|                                                       |              1730|
|                                                       +------------------+

Rung 2:332
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C174B2|                                  |Source       16383|
| |              1730|                                  |                  |
| |Source B     16383|                                  |Dest        C174B2|
| |                  |                                  |              1730|
| +------------------+                                  +------------------+
| N7:46 - (2:331)
```

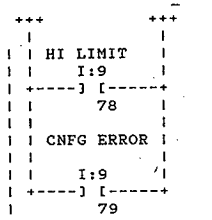
```
Rung 2:333
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC174V1|
|                                                                  |               727|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C174V1|
|                                                                  |              1727|
|                                                                  +------------------+

Rung 2:334
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C174V1|                                             |Source       16383|
| |              1727|                                             |                  |
| |Source B     16383|                                             |Dest        C174V1|
| |                  |                                             |              1727|
| +------------------+                                             +------------------+
| N7:47 - (2:333)

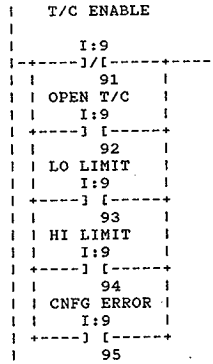
Rung 2:335
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC174V2|
|                                                                  |               726|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C174V2|
|                                                                  |              1726|
|                                                                  +------------------+

Rung 2:336
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C174V2|                                             |Source       16383|
| |              1726|                                             |                  |
| |Source B     16383|                                             |Dest        C174V2|
| |                  |                                             |              1726|
| +------------------+                                             +------------------+
| N7:48 - (2:335)

Rung 2:337
                          ** Alarms **
        For each T/C read its STATUS BITS to detect T/C problems
|
|
|   T/C ENABLE
|                                                                                HA163A
|      I:9                                                                       N7:225
|-+----]/[-----+-------------------------------------------------------------( )----
| |      75    |                                                                  8
| | OPEN T/C   |
| |    I:9     |
| +----] [-----+
| |      76    |
| |  I:9       |
| +--] [-------+
| |    77      |
  |            |
 +++          +++
```

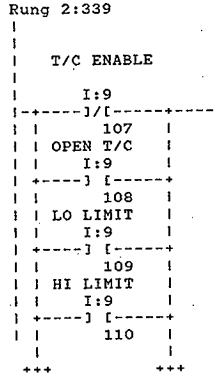


Rung 2:338

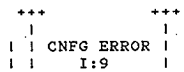


HA163B
N7:225
9

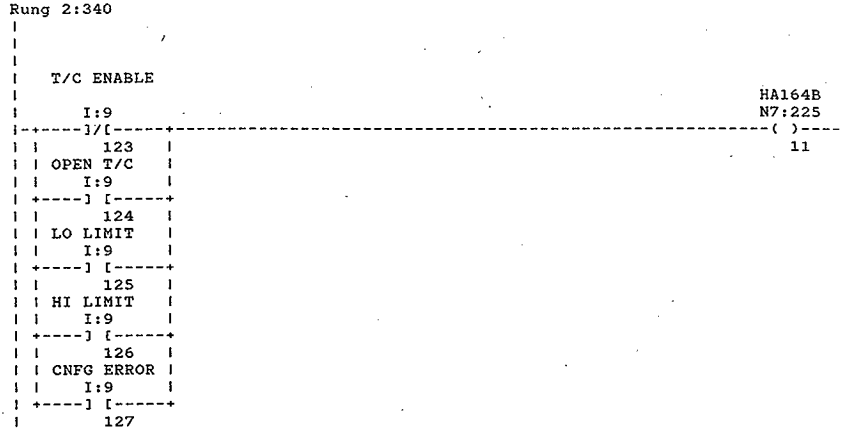
Rung 2:339



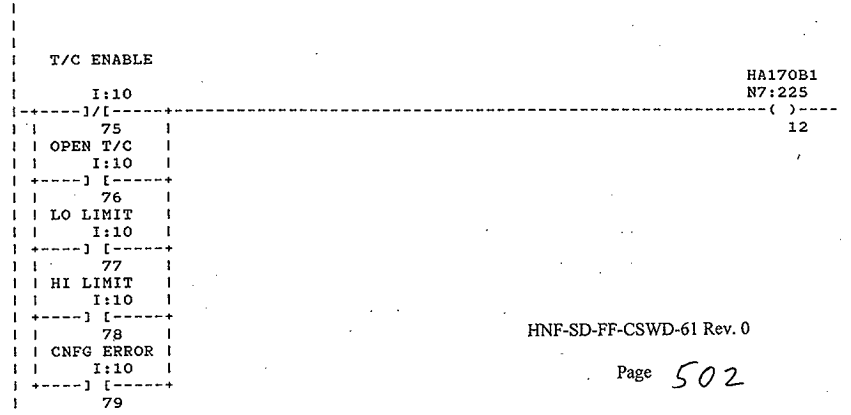
HA164A
N7:225
10



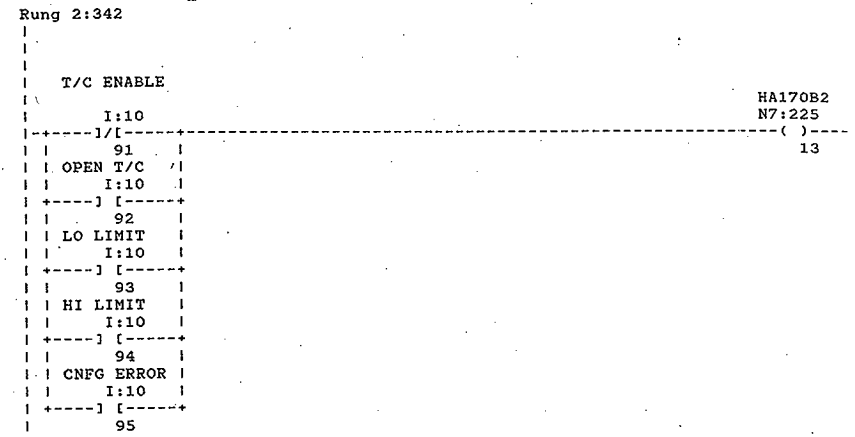
Rung 2:340



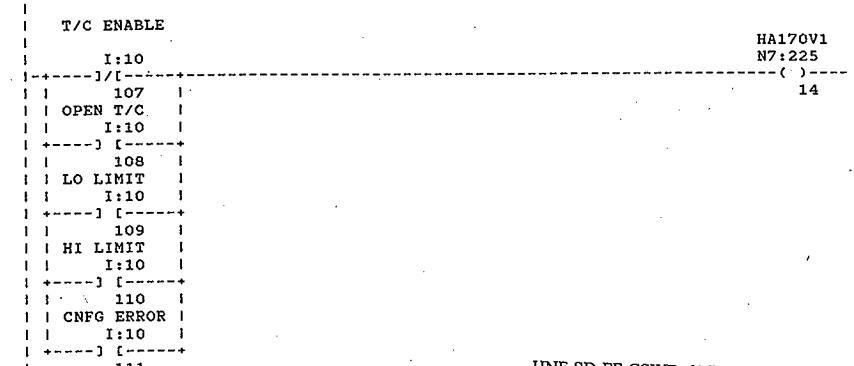
Rung 2:341



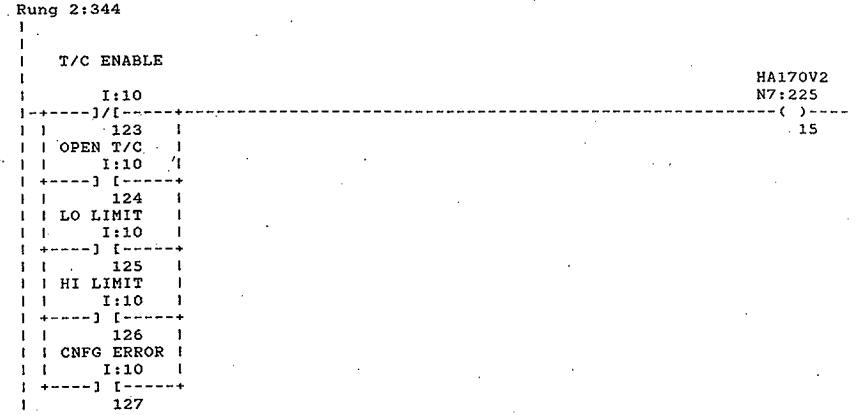
Rung 2:342



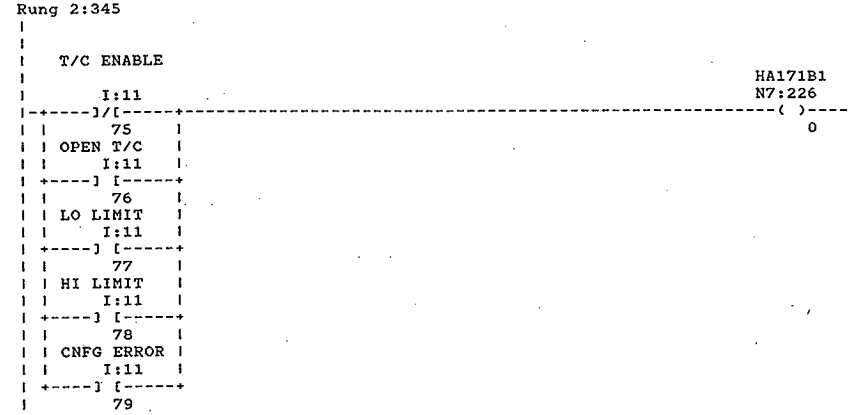
Rung 2:343



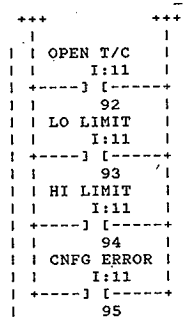
Rung 2:344



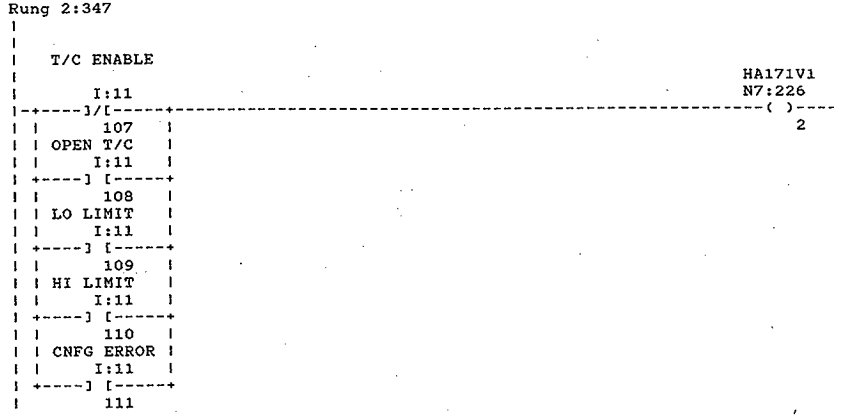
Rung 2:345



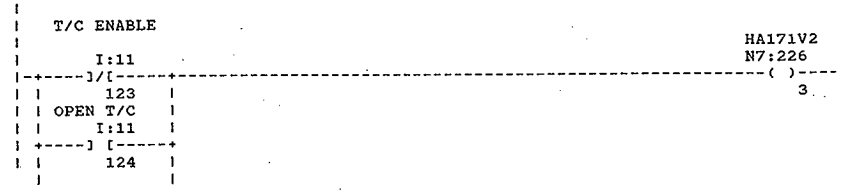
Rung 2:346

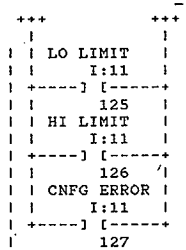


Rung 2:347

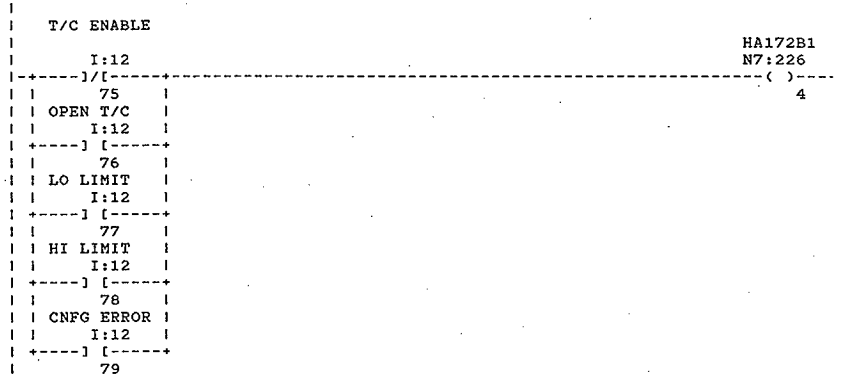


Rung 2:348

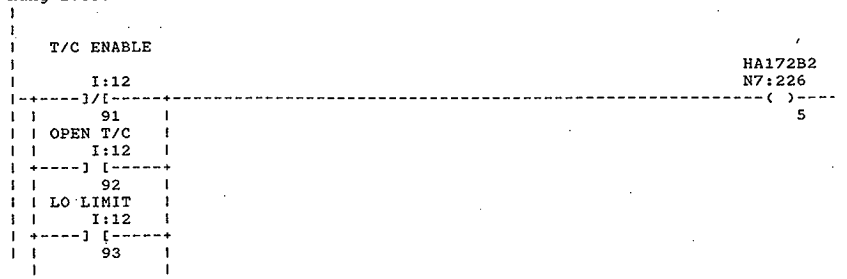


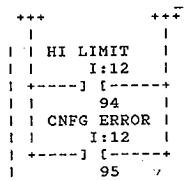


Rung 2:349

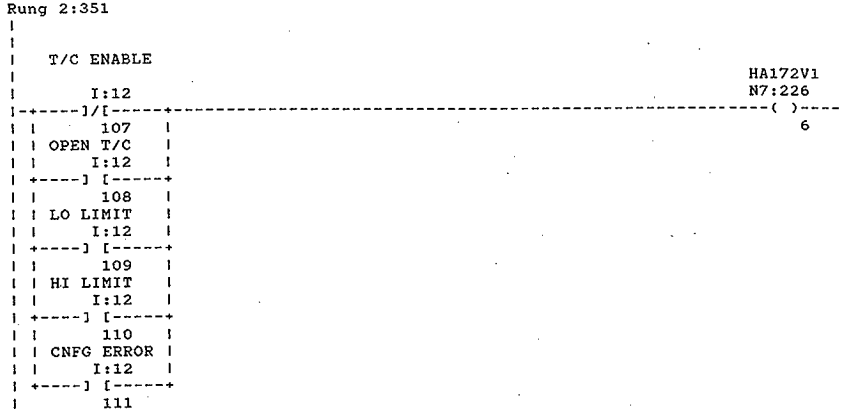


Rung 2:350

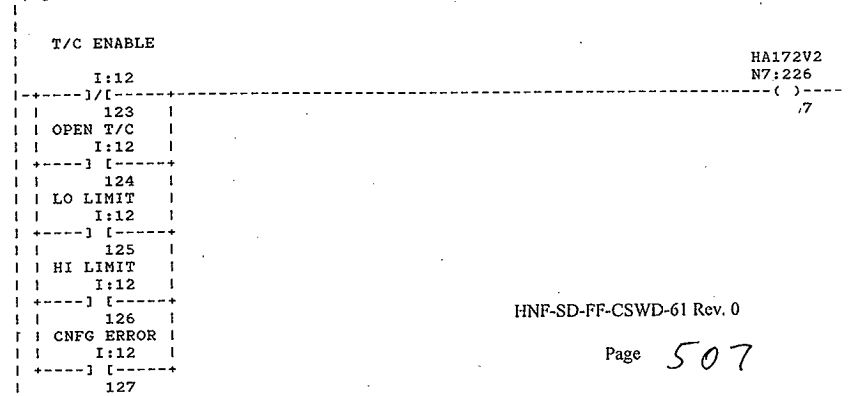




Rung 2:351



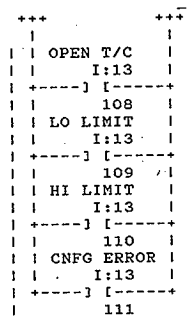
Rung 2:352



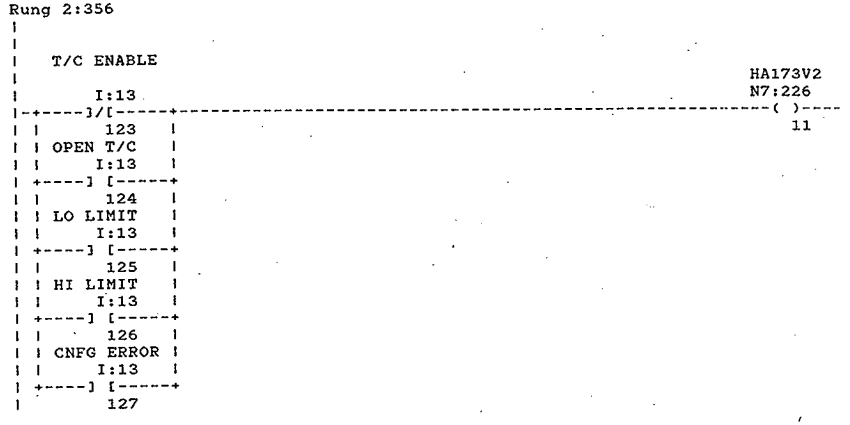
```
Rung 2:353
|
|
|   T/C ENABLE
|                                                                          HA173B1
|       I:13                                                               N7:226
|-+----]/[-----+-------------------------------------------------------------( )---
| |      75    |                                                                8
| | OPEN T/C   |
| |     I:13   |
| +----] [-----+
| |      76    |
| | LO LIMIT   |
| |     I:13   |
| +----] [-----+
| |      77    |
| | HI LIMIT   |
| |     I:13   |
| +----] [-----+
| |      78    |
| | CNFG ERROR |
| |     I:13   |
| +----] [-----+
|        79

Rung 2:354
|
|
|   T/C ENABLE
|                                                                          HA173B2
|       I:13                                                               N7:226
|-+----]/[-----+-------------------------------------------------------------( )---
| |      91    |                                                                9
| | OPEN T/C   |
| |     I:13   |
| +----] [-----+
| |      92    |
| | LO LIMIT   |
| |     I:13   |
| +----] [-----+
| |      93    |
| | HI LIMIT   |
| |     I:13   |
| +----] [-----+
| |      94    |
| | CNFG ERROR |
| |     I:13   |
| +----] [-----+
|        95

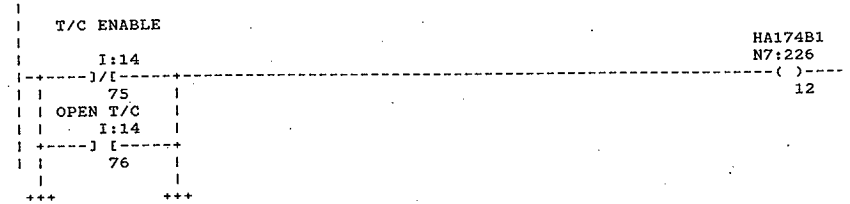
Rung 2:355
|
|
|   T/C ENABLE
|                                                                          HA173V1
|       I:13                                                               N7:226
|-+----]/[-----+-------------------------------------------------------------( )---
| |      107   |                                                               10
  |            |
 +++          +++
```

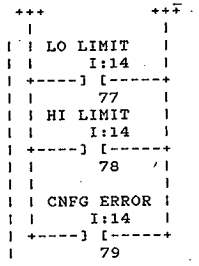


Rung 2:356

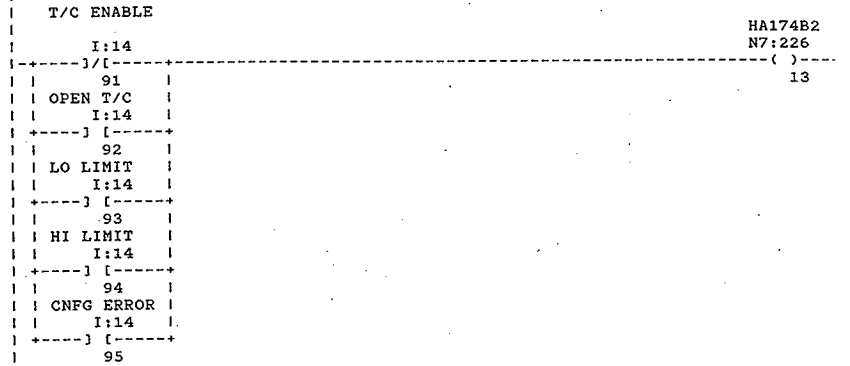


Rung 2:357

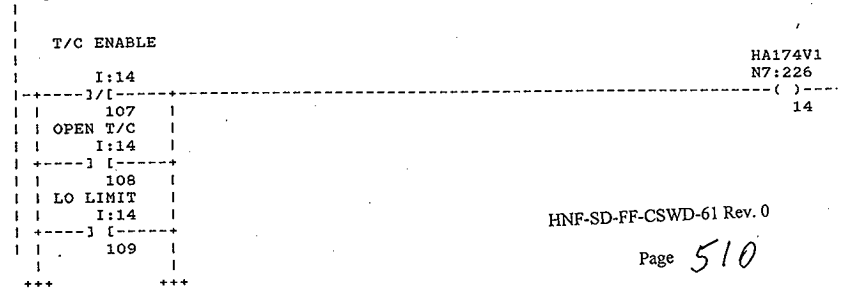


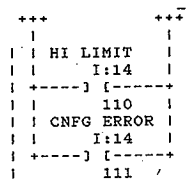


Rung 2:358

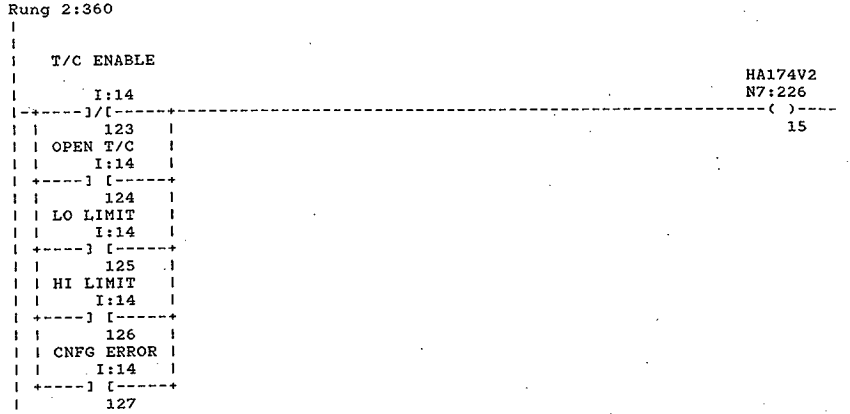


Rung 2:359

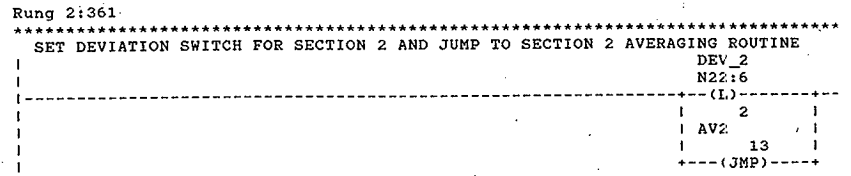




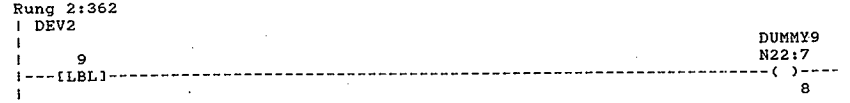
Rung 2:360



Rung 2:361



Rung 2:362



```
Rung 2:363
*****************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+-
|                                                       | |Source A     AV163| |
|                                                       | |              1731| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest          H163| |
|                                                       | |              2981| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV163|
|                                                         |              1731|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest          L163|
|                                                         |               481|
|                                                         +------------------+

Rung 2:364
|    HA163A                                                                D163A
|    N7:225     +GRT---------------+                                       N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )---
|       8    | |Source A     C163A| |                                        8
|  (2:337)   | |              1737| |
|            | |Source B      H163| |
|            | |              2981| |
|            | +------------------+ |
|            | N7:25 - (2:99)       |
|            | N10:101 - (2:363)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C163A|
|              |              1737|
|              |Source B      L163|
|              |               481|
|              +------------------+
|              N7:25 - (2:99)
|              N10:52 - (2:363)

Rung 2:365
|    HA163B                                                                D163B
|    N7:225     +GRT---------------+                                       N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )---
|       9    | |Source A     C163B| |                                        9
|  (2:338)   | |              1724| |
|            | |Source B      H163| |
|            | |              2981| |
|            | +------------------+ |
|            | N7:26 - (2:101)      |
|            | N10:101 - (2:363)    |
|            |                      |
            +++                    +++
```

```
            +++                     +++
             |                       |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C163B|
|              |               1724|
|              |Source B      L163|
|              |                481|
|              +-------------------+
|              N7:26 - (2:101)
|              N10:52 - (2:363)
```

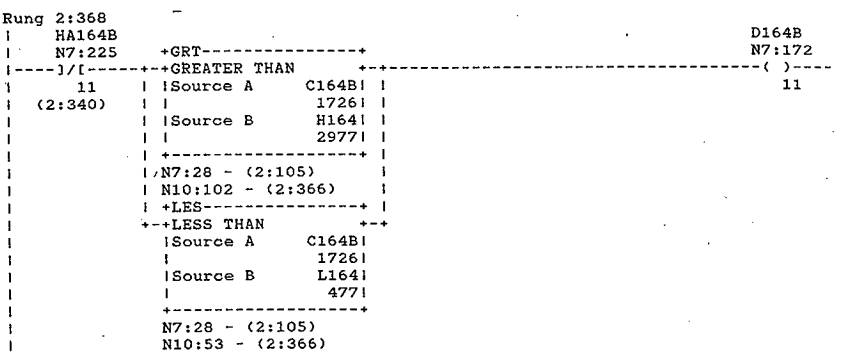
Rung 2:366

```
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A     AV164| |
|                                                       | |               1727| |
|                                                       | |Source B DEVIATION| |
|                                                       | |               1250| |
|                                                       | |Dest          H164| |
|                                                       | |               2977| |
|                                                       | +-------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A     AV164|
|                                                         |               1727|
|                                                         |Source B DEVIATION|
|                                                         |               1250|
|                                                         |Dest          L164|
|                                                         |                477|
|                                                         +-------------------+
```

Rung 2:367

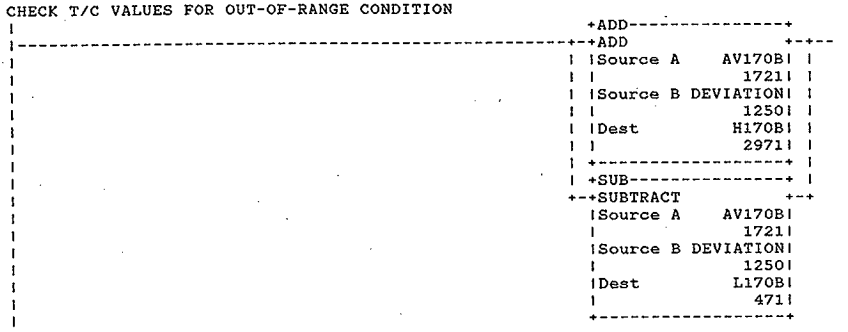
```
|    HA164A                                                                D164A
|    N7:225    +GRT---------------+                                        N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      10    | |Source A     C164A| |                                      10
|  (2:339)   | |               1727| |
|            | |Source B      H164| |
|            | |               2977| |
|            | +-------------------+ |
|            | N7:27 - (2:103)       |
|            | N10:102 - (2:366)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A     C164A|
|              |               1727|
|              |Source B      L164|
|              |                477|
|              +-------------------+
|              N7:27 - (2:103)
|              N10:53 - (2:366)
```

Rung 2:368

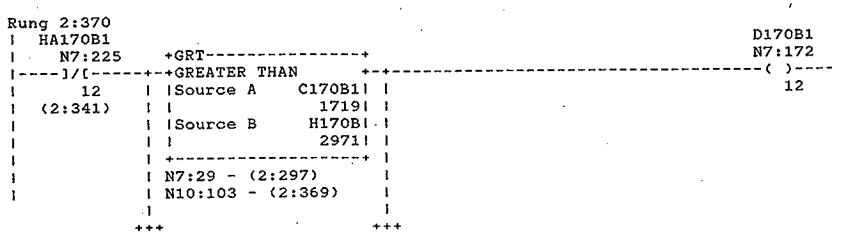


Rung 2:369

```
**********************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```



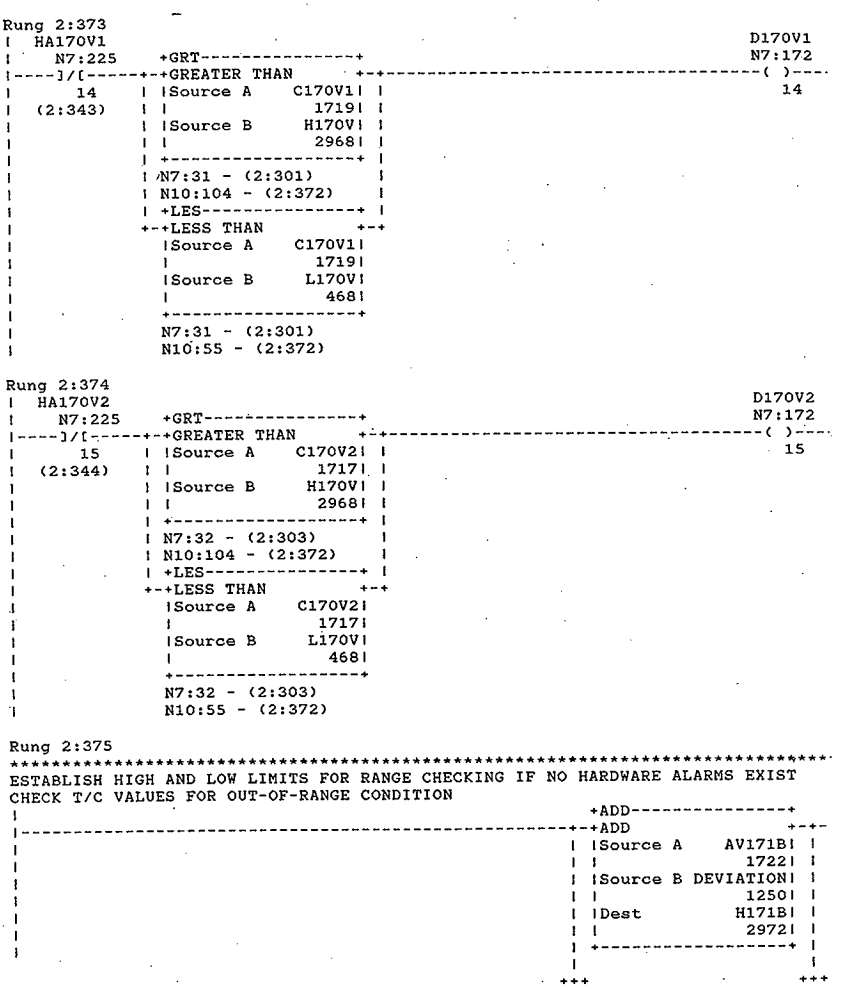
Rung 2:370



```
            +++                    +++
             |                      |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C170B1|
|              |               1719|
|              |Source B     L170B|
|              |                471|
|              +------------------+
|             N7:29 - (2:297)
|             N10:54 - (2:369)

Rung 2:371
|  HA170B2                                                                  D170B2
|    N7:225    +GRT---------------+                                         N7:172
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      13    | |Source A    C170B2| |                                       13
|  (2:342)   | |               1722| |
|            | |Source B     H170B| |
|            | |               2971| |
|            | +------------------+ |
|            | N7:30 - (2:299)      |
|            | N10:103 - (2:369)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C170B2|
|              |               1722|
|              |Source B     L170B|
|              |                471|
|              +------------------+
|              N7:30 - (2:299)
|              N10:54 - (2:369)

Rung 2:372
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                      +ADD---------------+
|-----------------------------------------------------+-+ADD              +-+--
|                                                    | |Source A    AV170V| |
|                                                    | |               1718| |
|                                                    | |Source B DEVIATION| |
|                                                    | |               1250| |
|                                                    | |Dest         H170V| |
|                                                    | |               2968| |
|                                                    | +------------------+ |
|                                                    | +SUB---------------+ |
|                                                    +-+SUBTRACT          +-+
|                                                      |Source A    AV170V|
|                                                      |               1718|
|                                                      |Source B DEVIATION|
|                                                      |               1250|
|                                                      |Dest         L170V|
|                                                      |                468|
|                                                      +------------------+
```


Rung 2:373
HA170V1
N7:225
14
(2:343)
+GRT
GREATER THAN
Source A C170V1
1719
Source B H170V
2968
N7:31 - (2:301)
N10:104 - (2:372)
+LES
LESS THAN
Source A C170V1
1719
Source B L170V
468
N7:31 - (2:301)
N10:55 - (2:372)
D170V1
N7:172
14
Rung 2:374
HA170V2
N7:225
15
(2:344)
+GRT
GREATER THAN
Source A C170V2
1717
Source B H170V
2968
N7:32 - (2:303)
N10:104 - (2:372)
+LES
LESS THAN
Source A C170V2
1717
Source B L170V
468
N7:32 - (2:303)
N10:55 - (2:372)
D170V2
N7:172
15
Rung 2:375
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
+ADD
ADD
Source A AV171B
1722
Source B DEVIATION
1250
Dest H171B
2972

```
                                                                  +++                      +++
                                                                   |                        |
|                                                                  | +SUB---------------+ |
|                                                                  +-+SUBTRACT          +-+
|                                                                    |Source A     AV171B|
|                                                                    |               1722|
|                                                                    |Source B DEVIATION|
|                                                                    |               1250|
|                                                                    |Dest          L171B|
|                                                                    |                472|
|                                                                    +------------------+

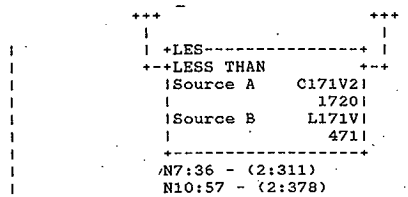
Rung 2:376
|  HA171B1                                                                          D171B1
|    N7:226     +GRT---------------+                                                N7:173
|----]/[-----+-+GREATER THAN      +-+-----------------------------------------( )----
|       0    | |Source A    C172B1| |                                                 0
|  (2:345)   | |               1732| |
|            | |Source B     H172B| |
|            | |               2983| |
|            | +------------------+ |
|            | N7:37 - (2:313)      |
|            | N10:107 - (2:381)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C172B1|
|              |               1732|
|              |Source B     L172B|
|              |                483|
|              +------------------+
|              N7:37 - (2:313)
|              N10:58 - (2:381)

Rung 2:377
|  HA171B2                                                                          D171B2
|    N7:226     +GRT---------------+                                                N7:173
|----]/[-----+-+GREATER THAN      +-+-----------------------------------------( )----
|       1    | |Source A    C171B2| |                                                 1
|  (2:346)   | |               1725| |
|            | |Source B     H171B| |
|            | |               2972| |
|            | +------------------+ |
|            | N7:34 - (2:307)      |
|            | N10:105 - (2:375)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C171B2|
|              |               1725|
|              |Source B     L171B|
|              |                472|
|              +------------------+
|              N7:34 - (2:307)
|              N10:56 - (2:375)
```

```
Rung 2:378
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV171V| |
|                                                       | |              1721| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H171V| |
|                                                       | |              2971| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV171V|
|                                                         |              1721|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L171V|
|                                                         |               471|
|                                                         +------------------+

Rung 2:379
|  HA171V1                                                                  D171V1
|    N7:226     +GRT---------------+                                        N7:173
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       2    | |Source A    C171V1| |                                        2
|  (2:347)   | |              1721| |
|            | |Source B     H171V| |
|            | |              2971| |
|            | +------------------+ |
|            | N7:35 - (2:309)      |
|            | N10:106 - (2:378)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C171V1|
|              |              1721|
|              |Source B     L171V|
|              |               471|
|              +------------------+
|              N7:35 - (2:309)
|              N10:57 - (2:378)

Rung 2:380
|  HA171V2                                                                  D171V2
|    N7:226     +GRT---------------+                                        N7:173
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       3    | |Source A    C171V2| |                                        3
|  (2:348)   | |              1720| |
|            | |Source B     H171V| |
|            | |              2971| |
|            | +------------------+ |
|            | N7:36 - (2:311)      |
|            | N10:106 - (2:378)    |
             |                      |
            +++                    +++
```



Rung 2:381

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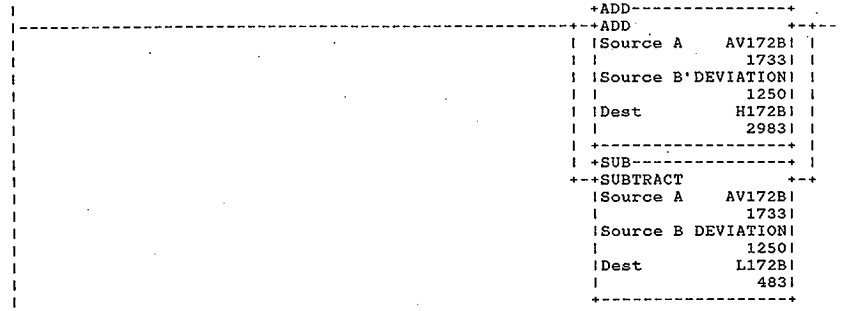
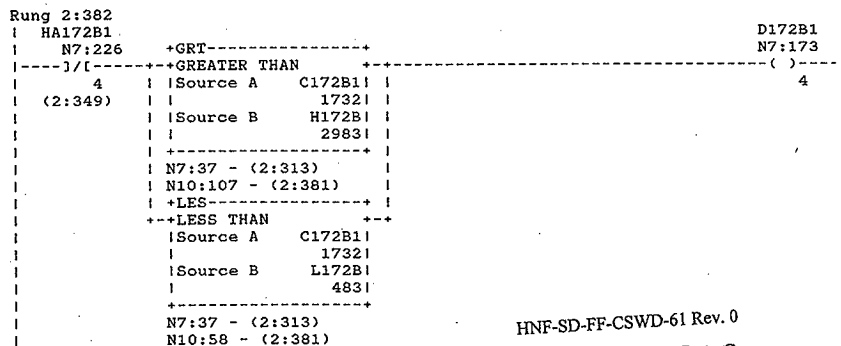
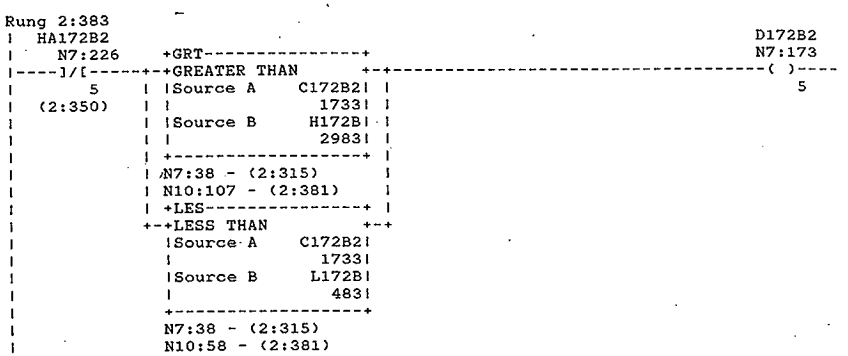
**********************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```



Rung 2:382



Rung 2:383



Rung 2:384

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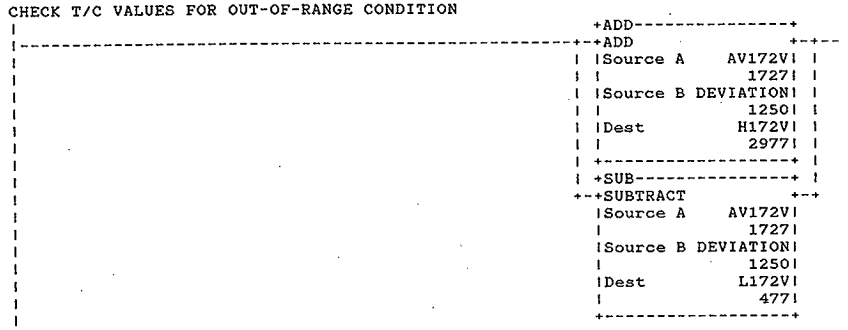
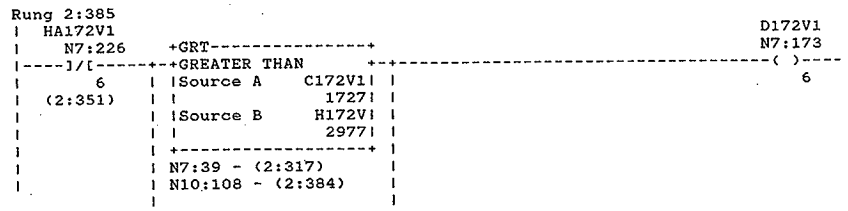
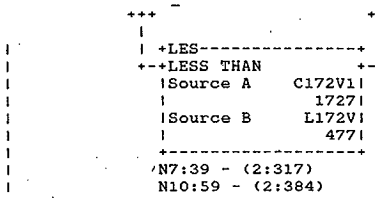
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION

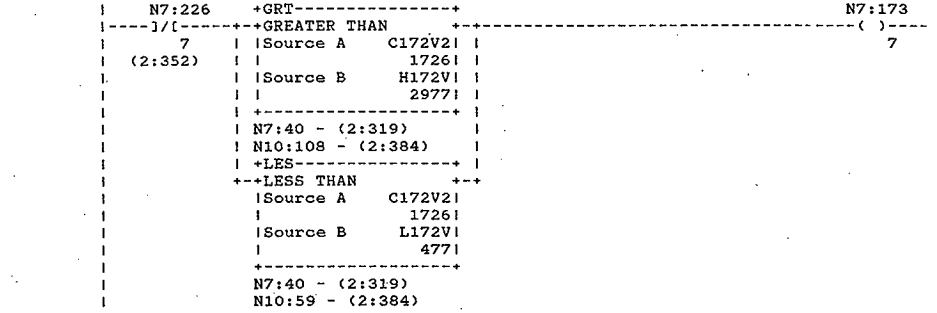


Rung 2:385



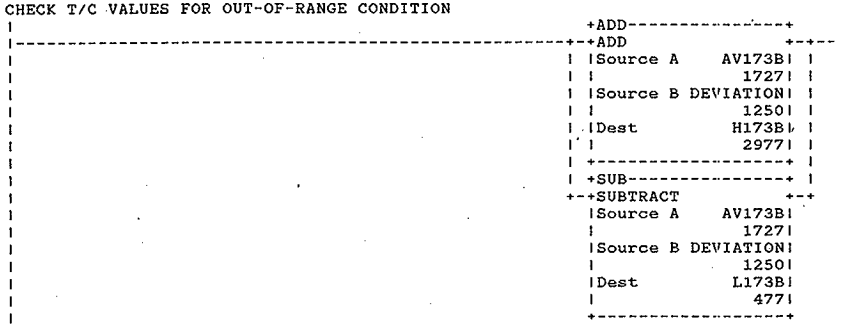


Rung 2:386

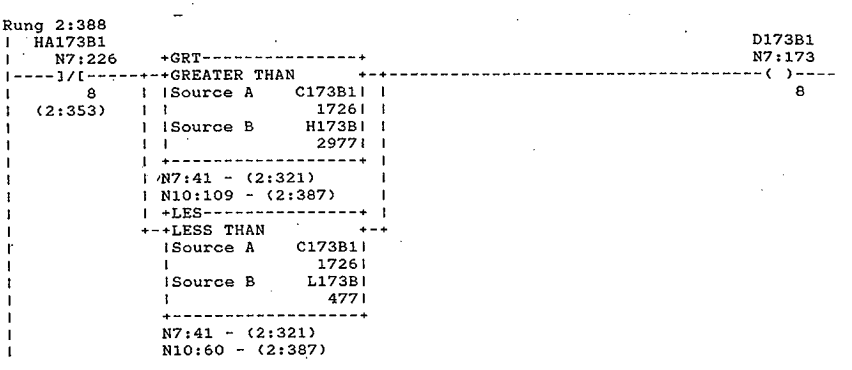


Rung 2:387

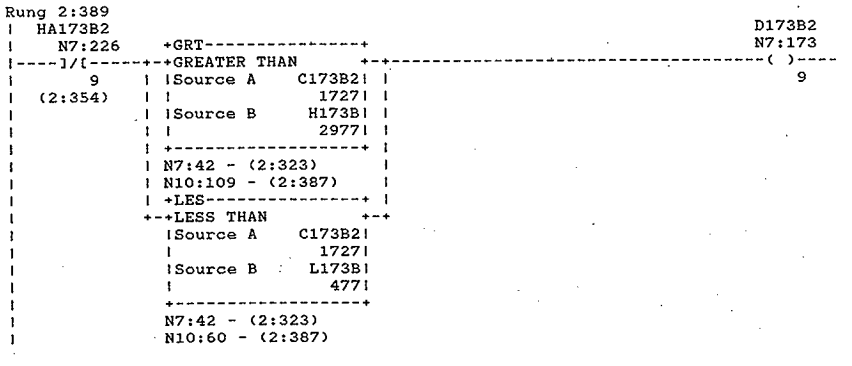
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



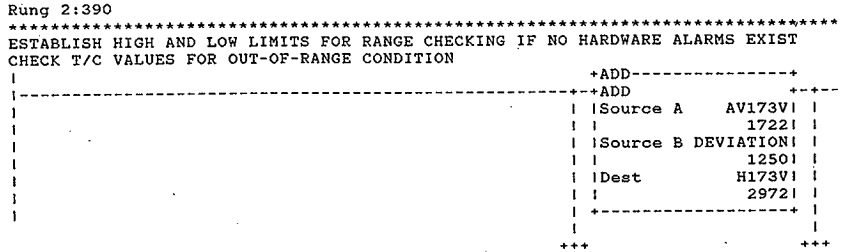
Rung 2:388



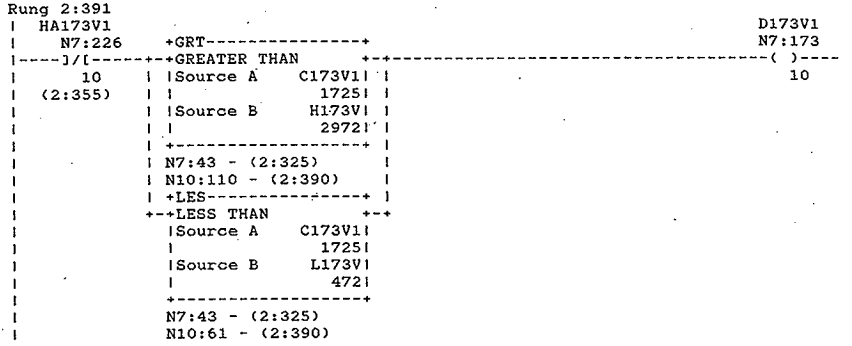
Rung 2:389



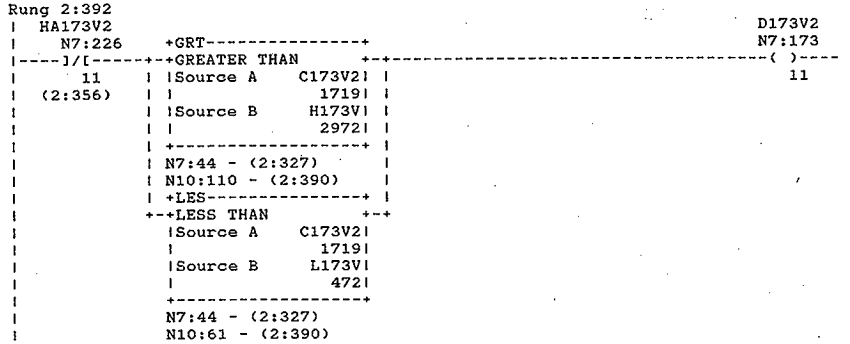
Rung 2:390



Rung 2:391



Rung 2:392



Rung 2:393

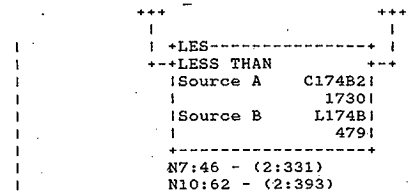
```
********************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|----------------------------------------------------------+-+ADD             +-+---
|                                                          | |Source A   AV174B| |
|                                                          | |              1729| |
|                                                          | |Source B DEVIATION| |
|                                                          | |              1250| |
|                                                          | |Dest       H174B| |
|                                                          | |              2979| |
|                                                          | +------------------+ |
|                                                          | +SUB---------------+ |
|                                                          +-+SUBTRACT          +-+
|                                                            |Source A   AV174B|
|                                                            |              1729|
|                                                            |Source B DEVIATION|
|                                                            |              1250|
|                                                            |Dest       L174B|
|                                                            |               479|
|                                                            +------------------+
```

Rung 2:394

```
|  HA174B1                                                                  D174B1
|    N7:226    +GRT---------------+                                         N7:173
|----]/[------+-+GREATER THAN     +-+---------------------------------------( )----
|      12     | |Source A    C174B1| |                                        12
|  (2:357)    | |              1728| |
|             | |Source B    H174B| |
|             | |              2979| |
|             | +------------------+ |
|             | N7:45 - (2:329)      |
|             | N10:111 - (2:393)    |
|             | +LES---------------+ |
|             +-+LESS THAN         +-+
|               |Source A    C174B1|
|               |              1728|
|               |Source B    L174B|
|               |               479|
|               +------------------+
|               N7:45 - (2:329)
|               N10:62 - (2:393)
```

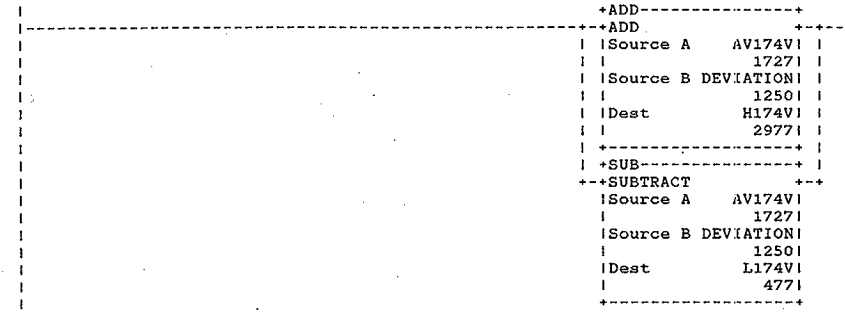
Rung 2:395

```
|  HA174B2                                                                  D174B2
|    N7:226    +GRT---------------+                                         N7:173
|----]/[------+-+GREATER THAN     +-+---------------------------------------( )----
|      13     | |Source A    C174B2| |                                        13
|  (2:358)    | |              1730| |
|             | |Source B    H174B| |
|             | |              2979| |
|             | +------------------+ |
|             | N7:46 - (2:331)      |
|             | N10:111 - (2:393)    |
|             |                      |
|             +++                    +++
```

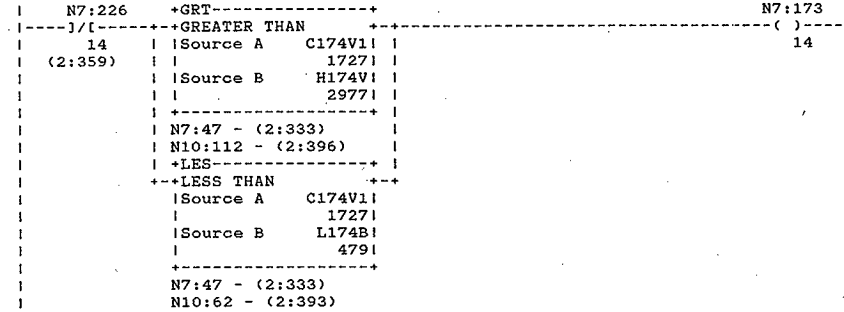


Rung 2:396

ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



Rung 2:397



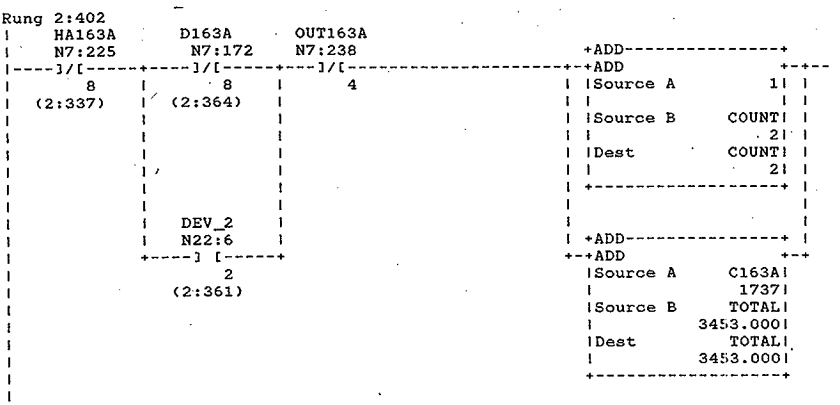
```
Rung 2:398
|  HA174V2                                                                    D174V2
|    N7:226     +GRT----------------+                                         N7:173
|----]/[------+-+GREATER THAN      +-+-------------------------------------( )----
|       15    | |Source A     C174V2| |                                        15
|   (2:360)   | |                1726| |
|             | |Source B      H174V| |
|             | |                2977| |
|             | +--------------------+ |
|             | N7:48 - (2:335)        |
|             | N10:112 - (2:396)      |
|             | +LES----------------+  |
|             +-+LESS THAN          +-+
|               |Source A     C174V2|
|               |                1726|
|               |Source B      L174V|
|               |                 477|
|               +--------------------+
|               N7:48 - (2:335)
|               N10:63 - (2:396)

Rung 2:399
|                                                                             DEV_2
|                                                                             N22:6
|-----------------------------------------------------------------------------(U)---
|                                                                               2

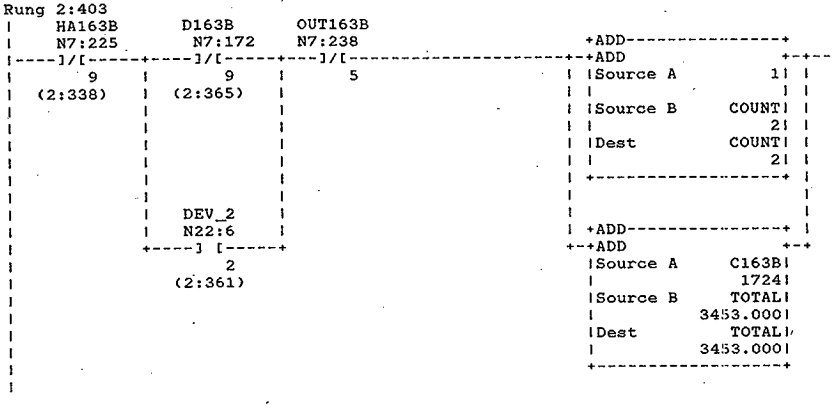
Rung 2:400
| AV2
|                                                                            DUMMY10
|       13                                                                    N22:7
|---[LBL]-------------------------------------------------------------------( )----
|                                                                               9

Rung 2:401
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
|                                                          +CLR----------------+
|----------------------------------------------------------+-+CLEAR           +-+--
|                                                          | |Dest        COUNT| |
|                                                          | |                2| |
|                                                          | +-----------------+ |
|                                                          | +CLR----------------+ |
|                                                          +-+CLEAR           +-+
|                                                            |Dest         TOTAL|
|                                                            |          3453.000|
|                                                            +------------------+
```

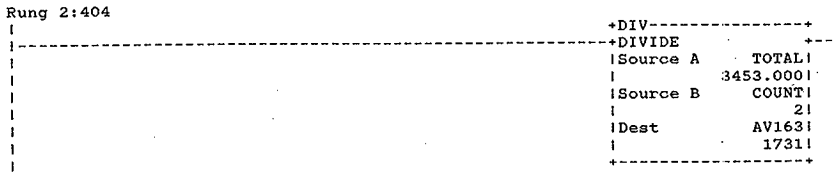
Rung 2:402



Rung 2:403

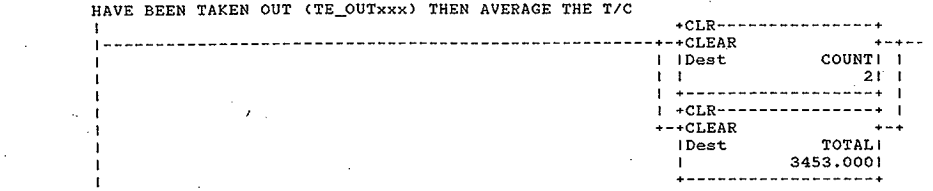


Rung 2:404

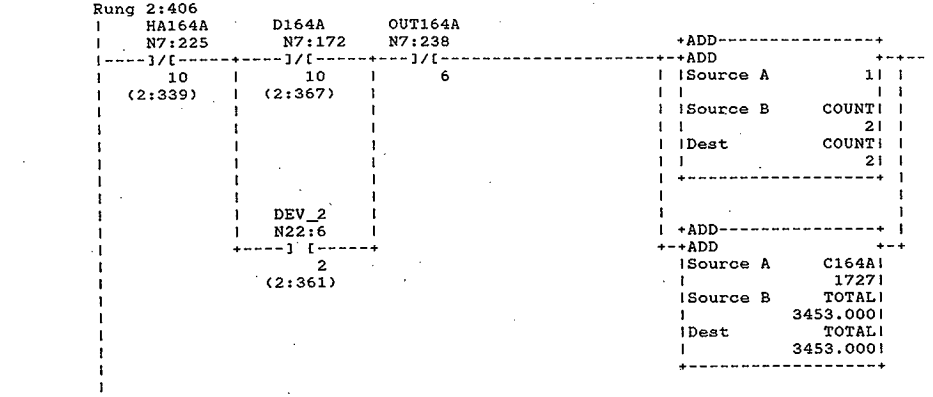


Rung 2:405

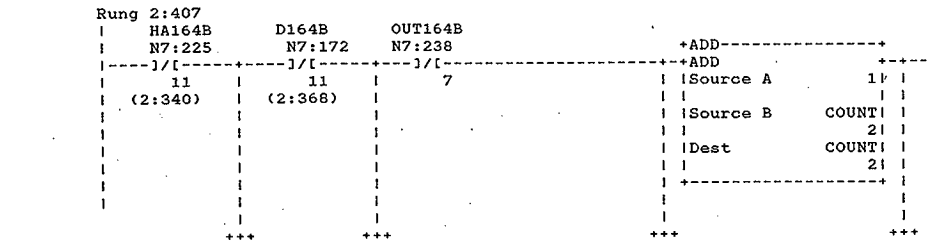
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



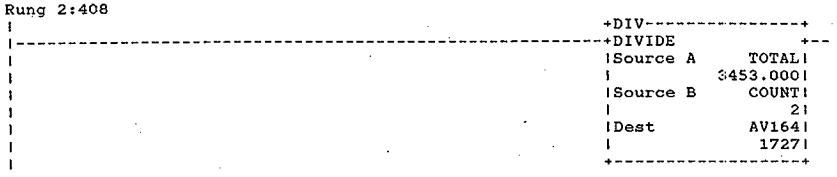
Rung 2:406



Rung 2:407



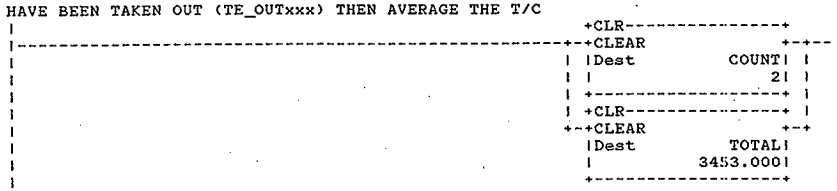
Rung 2:408



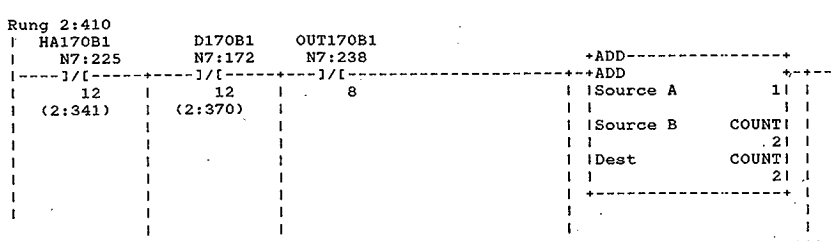
Rung 2:409

****

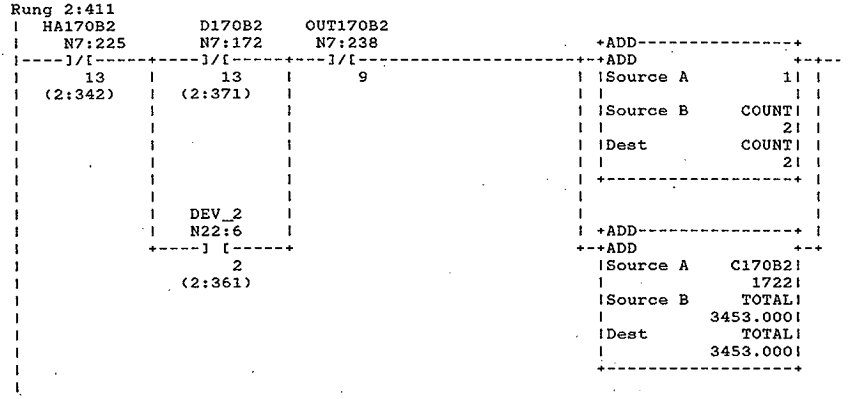
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



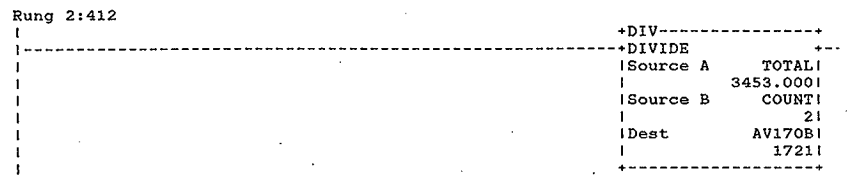
Rung 2:410



Rung 2:411



Rung 2:412



Rung 2:413

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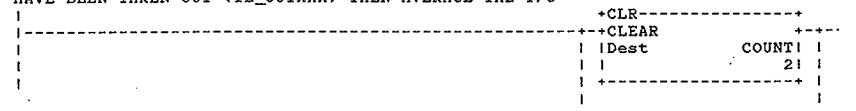
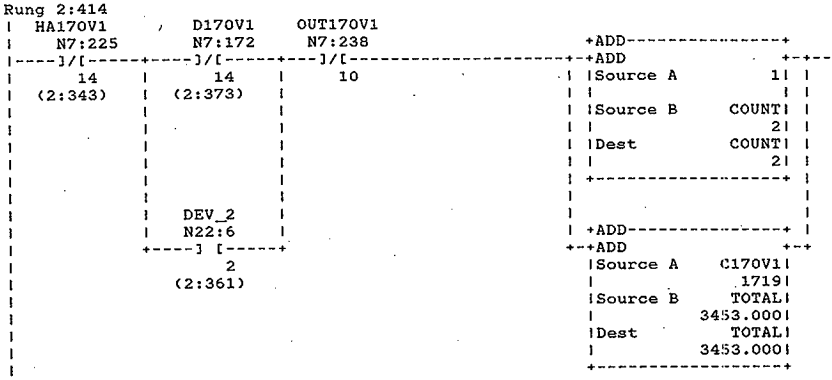
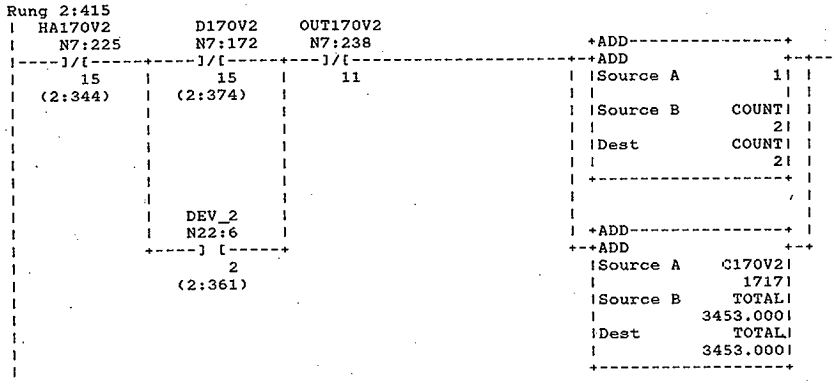
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



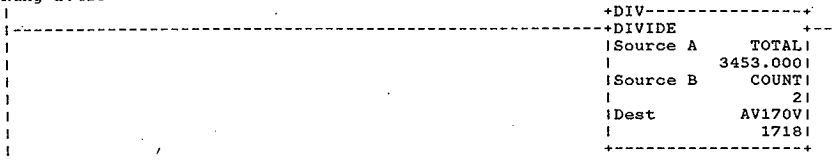
Rung 2:414



Rung 2:415

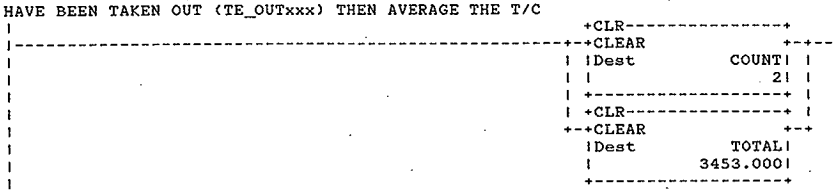


Rung 2:416

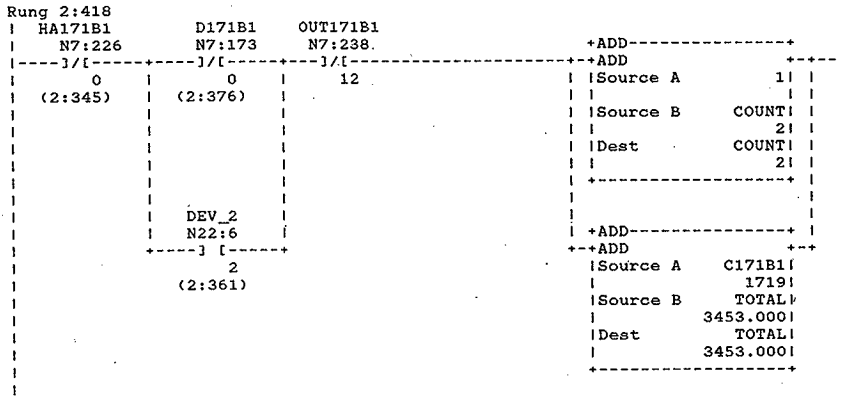


Rung 2:417

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



Rung 2:418

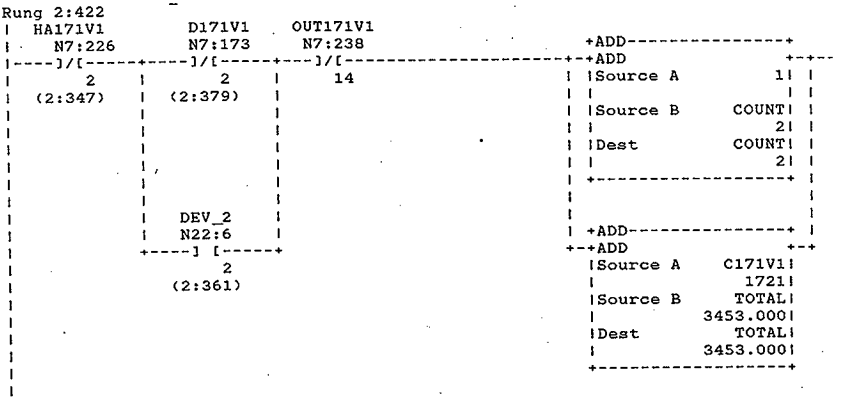


```
Rung 2:419
|  HA171B2      D171B2  OUT171B2
|    N7:226     N7:173   N7:238                                  +ADD---------------+
|----]/[--------]/[-------]/[-------------------------------+-+ADD                +-+--
|       1          1        13                              | |Source A          1| |
|  (2:346)    (2:377)                                       | |                   | |
|                                                           | |Source B      COUNT| |
|                                                           | |                  2| |
|                                                           | |Dest          COUNT| |
|                                                           | |                  2| |
|                                                           | +-------------------+ |
|                                                           |                       |
|                                                           | +ADD---------------+ |
|                                                           +-+ADD                +-+
|                                                             |Source A     C171B2|
|                                                             |               1725|
|                                                             |Source B      TOTAL|
|                                                             |           3453.000|
|                                                             |Dest          TOTAL|
|                                                             |           3453.000|
|                                                             +-------------------+

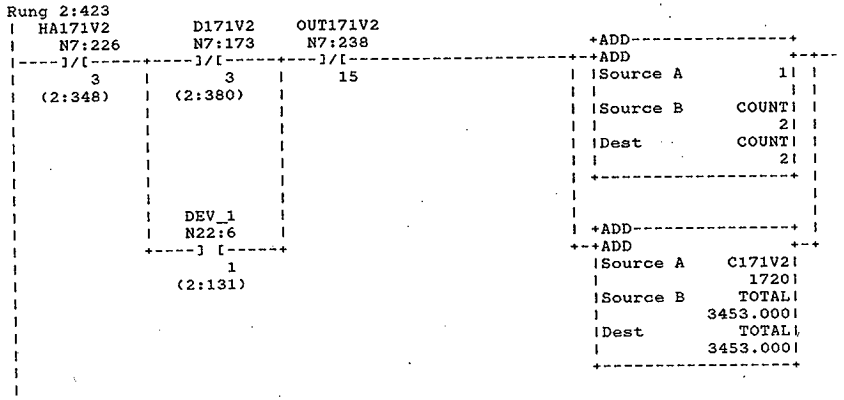
Rung 2:420
|                                                               +DIV---------------+
|-------------------------------------------------------------+DIVIDE             +--
|                                                               |Source A      TOTAL|
|                                                               |           3453.000|
|                                                               |Source B      COUNT|
|                                                               |                  2|
|                                                               |Dest         AV171B|
|                                                               |               1722|
|                                                               +-------------------+

Rung 2:421
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
|                                                               +CLR---------------+
|-------------------------------------------------------------+-+CLEAR              +-+--
|                                                           | |Dest          COUNT| |
|                                                           | |                  2| |
|                                                           | +-------------------+ |
|                                                           | +CLR---------------+ |
|                                                           +-+CLEAR              +-+
|                                                             |Dest          TOTAL|
|                                                             |           3453.000|
|                                                             +-------------------+
```

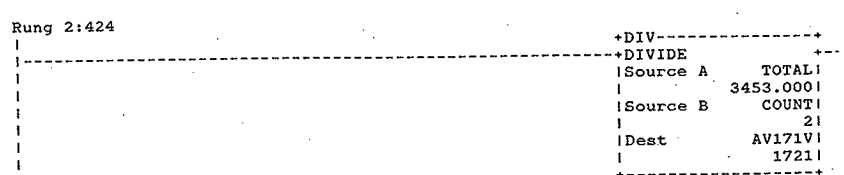
Rung 2:422



Rung 2:423

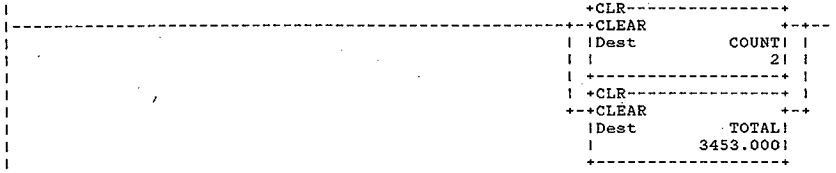


Rung 2:424

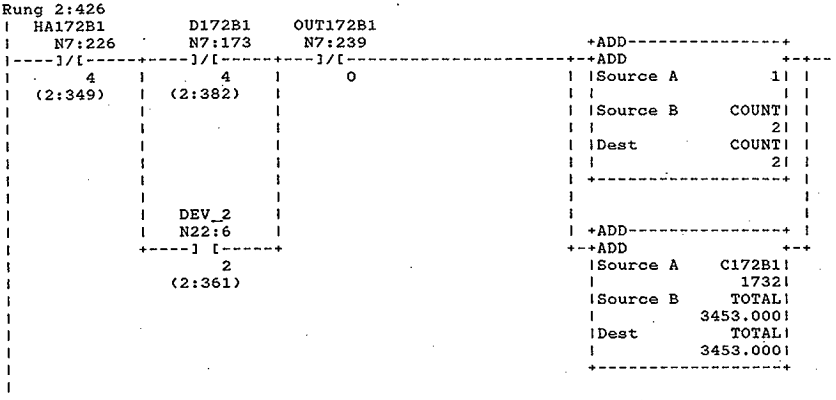


Rung 2:425

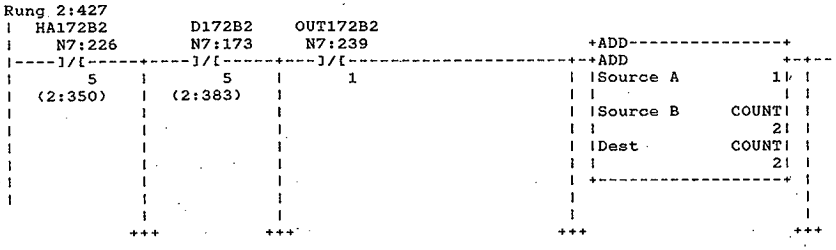
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



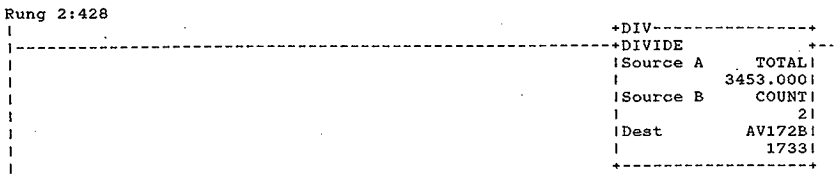
Rung 2:426



Rung 2:427

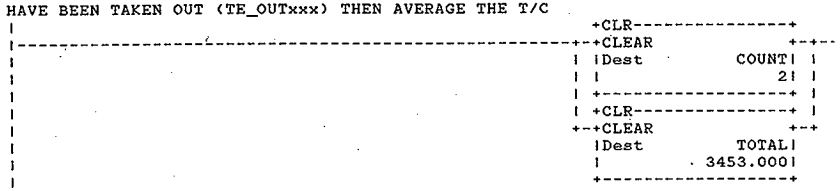


Rung 2:428

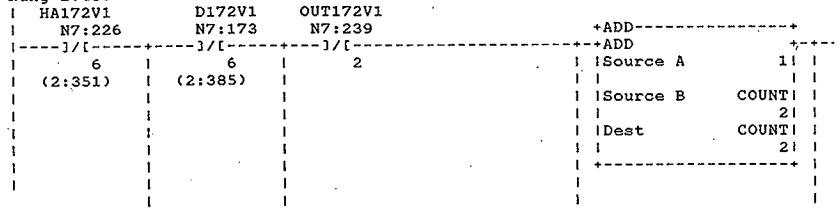


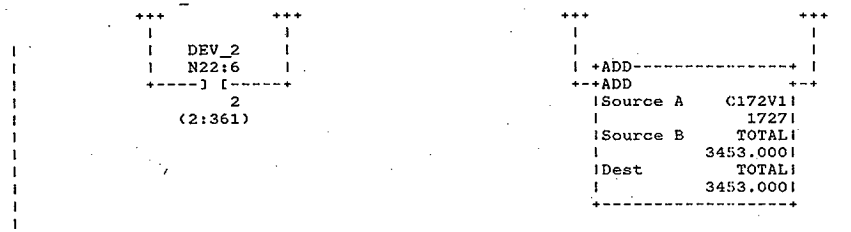
Rung 2:429

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C

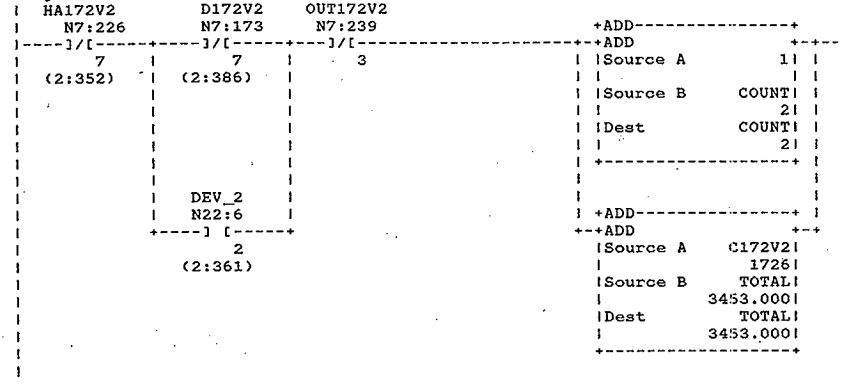


Rung 2:430

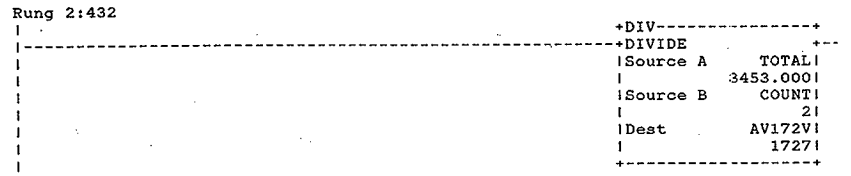




Rung 2:431



Rung 2:432



Rung 2:433

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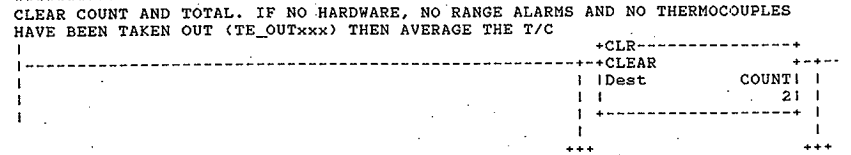
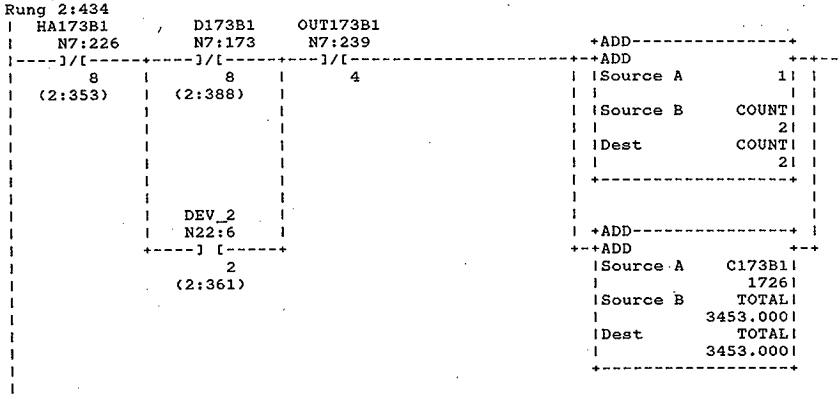
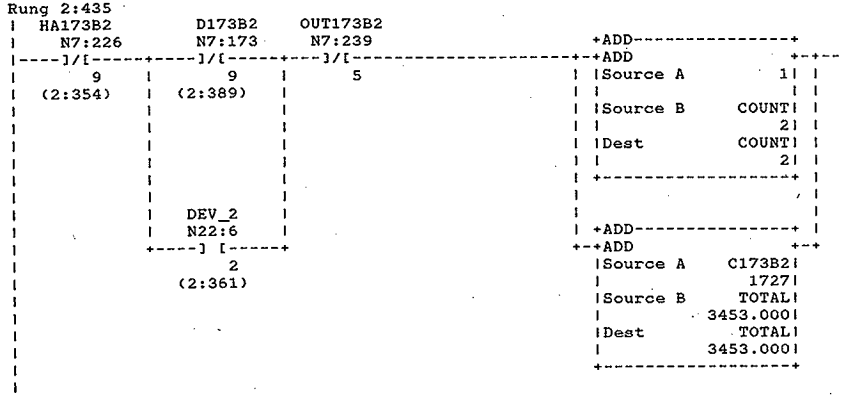
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



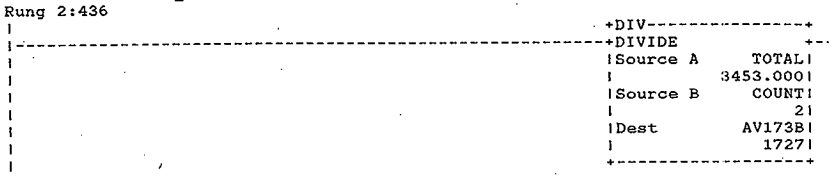
Rung 2:434



Rung 2:435

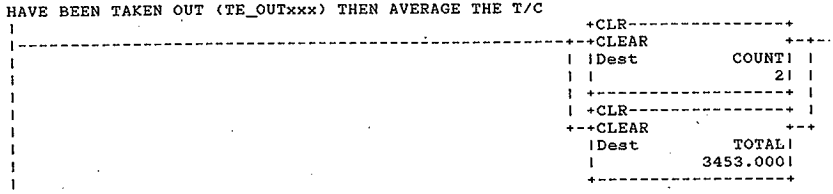


Rung 2:436

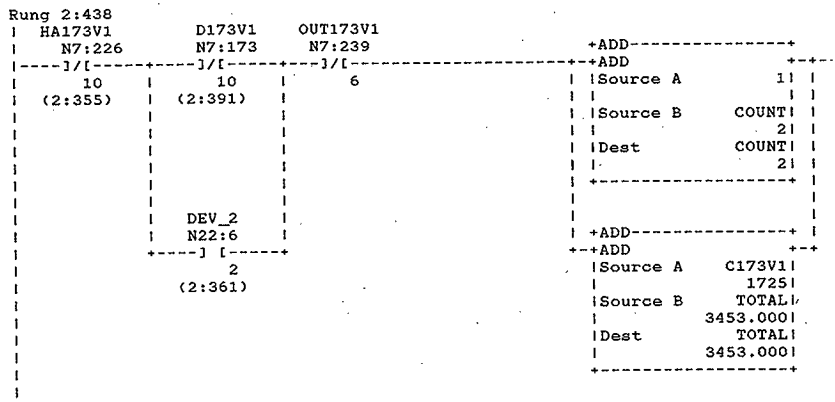


Rung 2:437

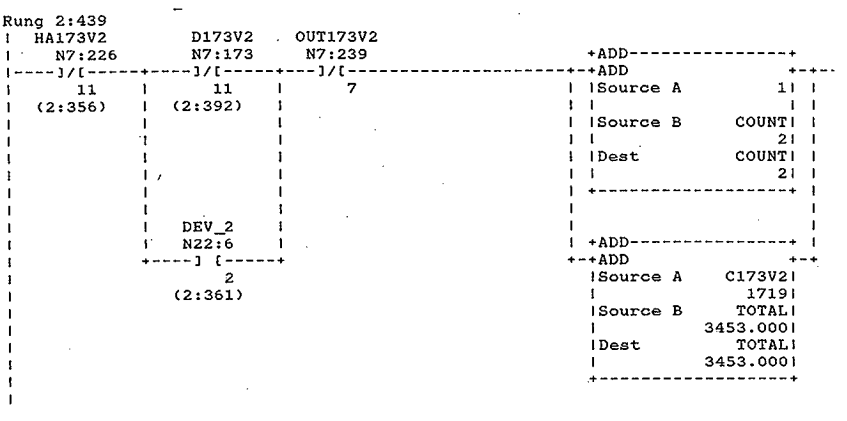
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



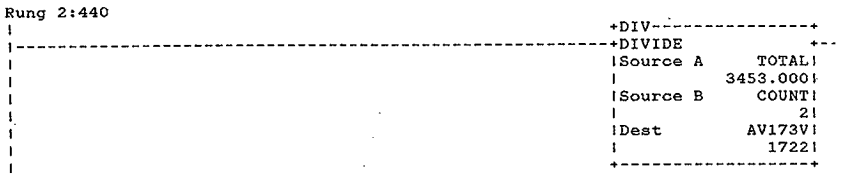
Rung 2:438



Rung 2:439



Rung 2:440



Rung 2:441

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CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
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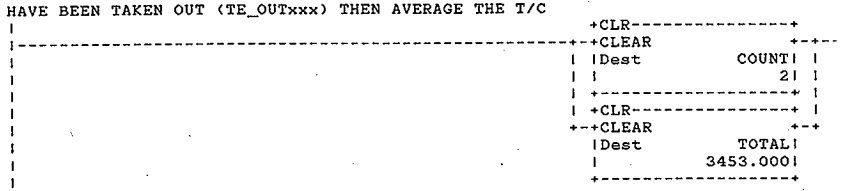
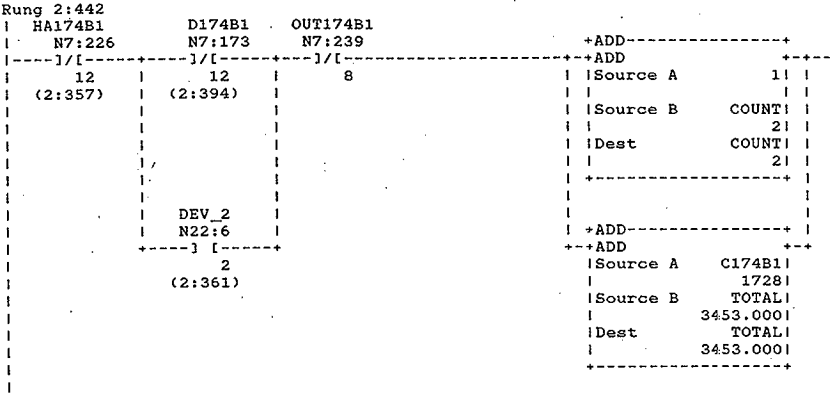
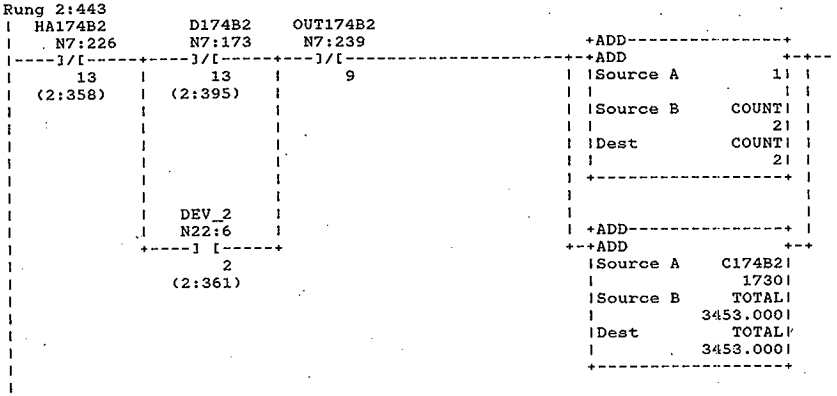


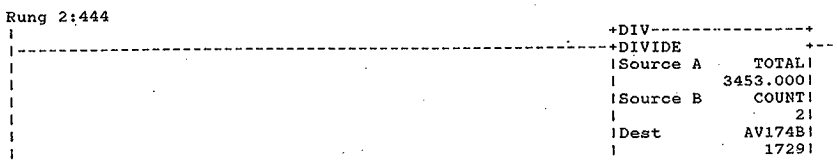
Rung 2:442



Rung 2:443

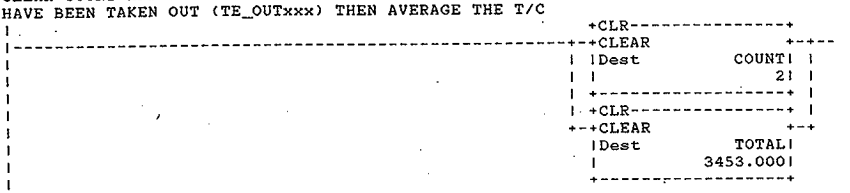


Rung 2:444

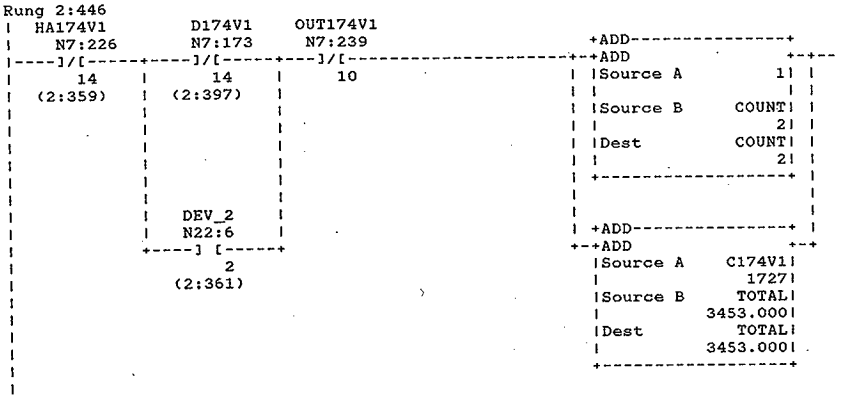


Rung 2:445

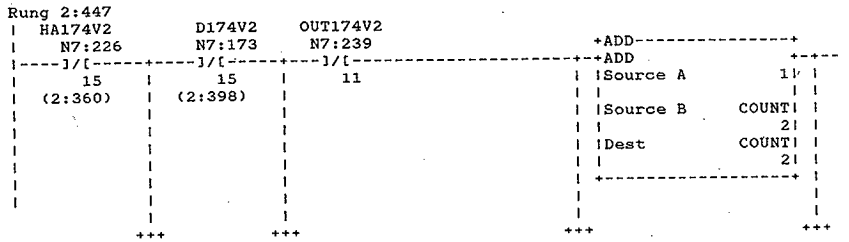
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C

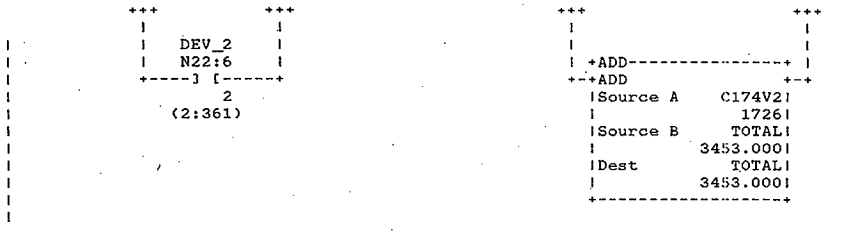


Rung 2:446



Rung 2:447

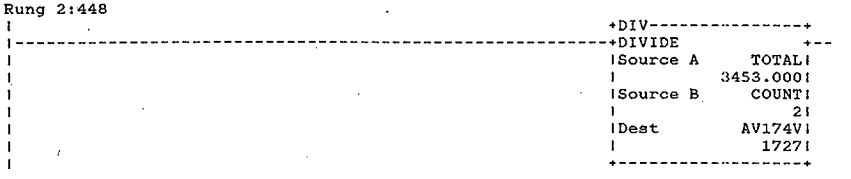




```
            +++          +++                          +++                    +++
             |            |                            |                      |
|            |   DEV_2    |                            |                      |
|            |   N22:6    |                            | +ADD---------------+ |
|            +----] [-----+                            +-+ADD               +-+
|                   2                                    |Source A    C174V2|
|               (2:361)                                  |              1726|
|                                                        |Source B     TOTAL|
|                                                        |          3453.000|
|                                                        |Dest         TOTAL|
|                                                        |          3453.000|
|                                                        +------------------+
|
```

Rung 2:448

```
|                                                          +DIV---------------+
|-------------------------------------------------------+DIVIDE            +--
|                                                          |Source A     TOTAL|
|                                                          |          3453.000|
|                                                          |Source B     COUNT|
|                                                          |                 2|
|                                                          |Dest        AV174V|
|                                                          |              1727|
|                                                          +------------------+
```



Rung 2:449

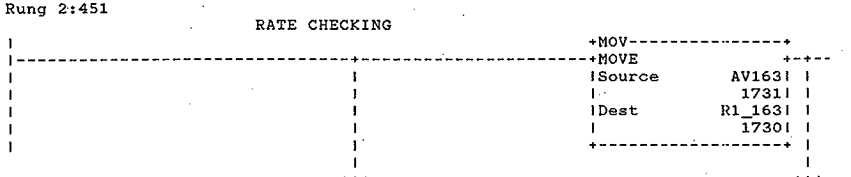
```
*******************************************************************************
IF DEVIATION SET FOR SECTION 2 THEN GO THERE AND CALCULATE DEVIATION
|                                                                  DEV2
|   DEV_2
|   N22:6                                                            9
|----] [-------------------------------------------------------------(JMP)-----
|       2
|  (2:361)
```

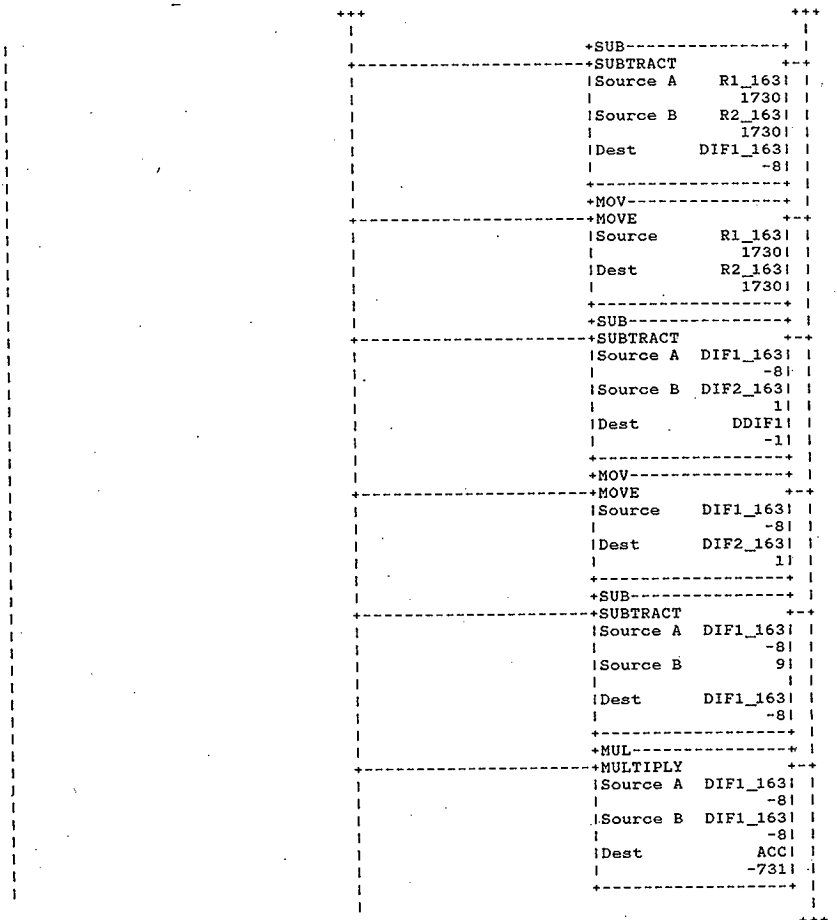
Rung 2:450

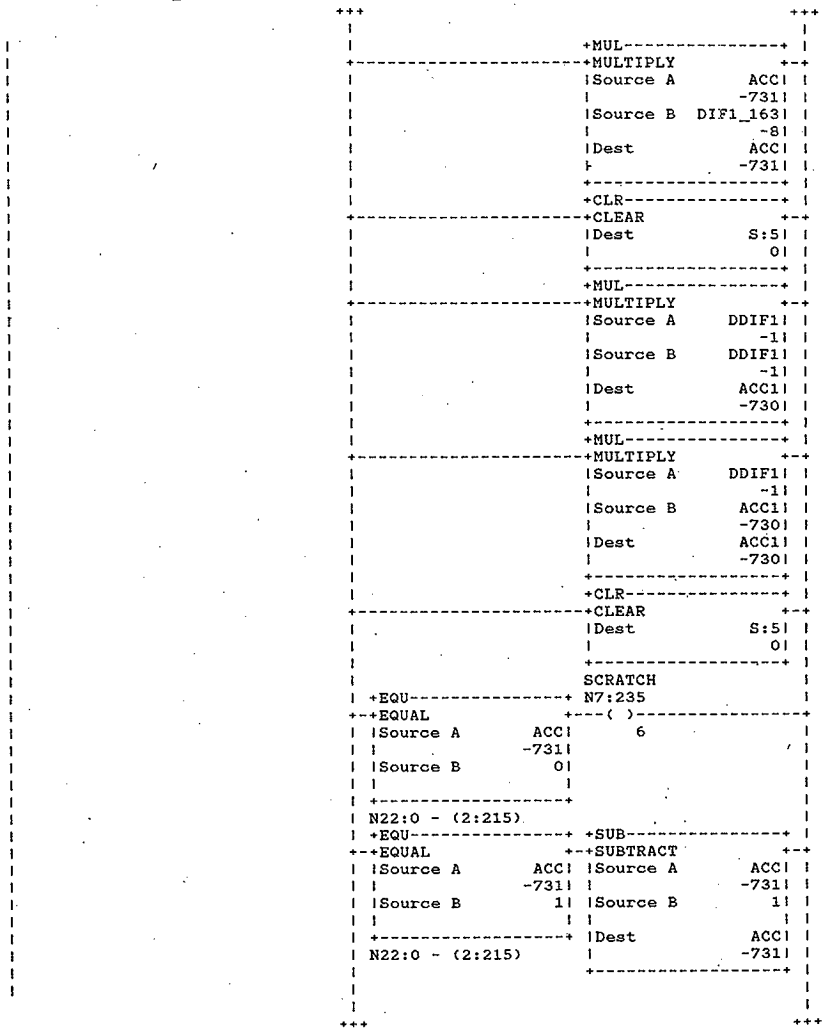
```
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                  PID163
| RT_TMR/DN
|   T4:87                                                           26
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

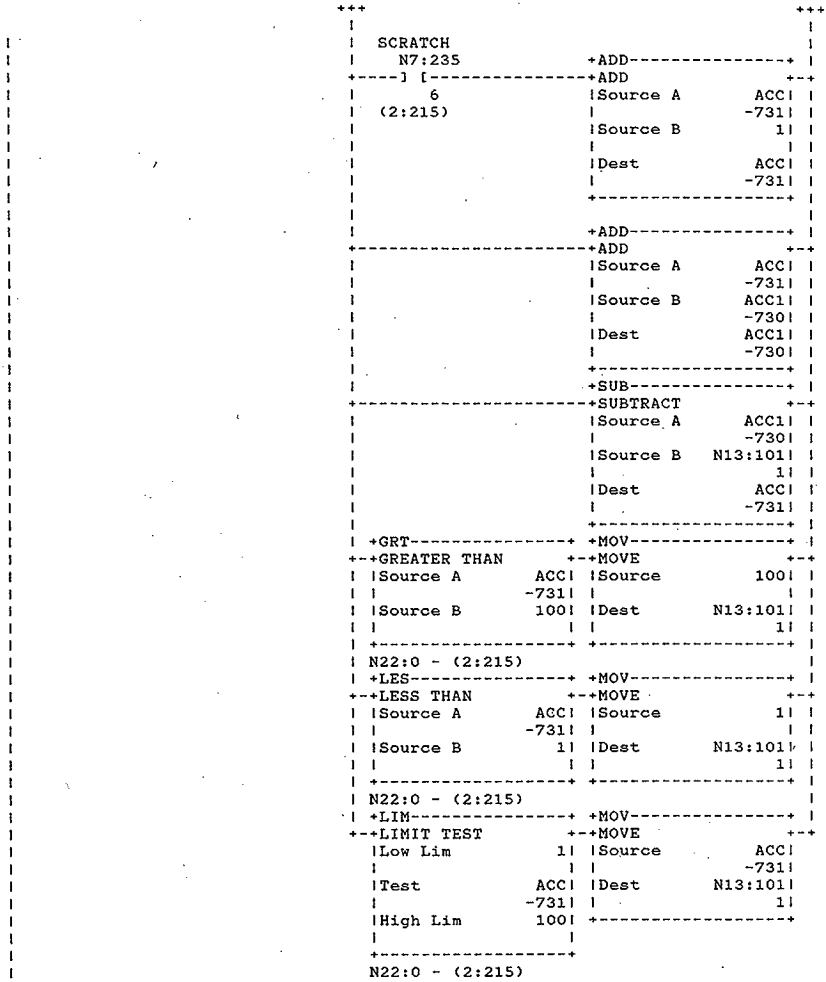
Rung 2:451

```
                        RATE CHECKING
|                                                      +MOV---------------+
|-------------------------------+-----------------------+MOVE             +-+--
|                               |                       |Source       AV163| |
|                               |                       |              1731| |
|                               |                       |Dest        R1_163| |
|                               |                       |              1730| |
|                               |                       +------------------+ |
|                               |                                            |
                               +++                                          +++
```




SUB
SUBTRACT
Source A R1_163 1730
Source B R2_163 1730
Dest DIF1_163 -8
MOV
MOVE
Source R1_163 1730
Dest R2_163 1730
SUB
SUBTRACT
Source A DIF1_163 -8
Source B DIF2_163 1
Dest DDIF1 -1
MOV
MOVE
Source DIF1_163 -8
Dest DIF2_163 1
SUB
SUBTRACT
Source A DIF1_163 -8
Source B 9
Dest DIF1_163 -8
MUL
MULTIPLY
Source A DIF1_163 -8
Source B DIF1_163 -8
Dest ACC -731

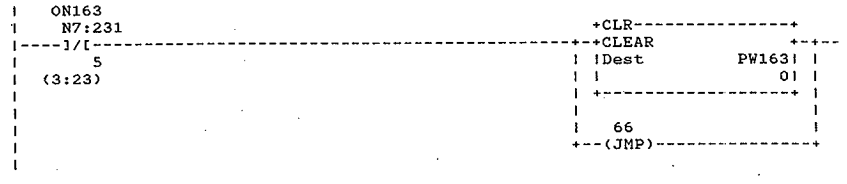

+MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_163
-8
Dest ACC
-731
+CLR
CLEAR
Dest S:5
0
+MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
+EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B
1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N13:101
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B
100
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B
1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim
1
Test ACC
-731
High Lim
100
N22:0 - (2:215)
MOV
MOVE
Source
100
Dest N13:101
1
MOV
MOVE
Source
1
Dest N13:101
1
MOV
MOVE
Source ACC
-731
Dest N13:101
1

Rung 2:452

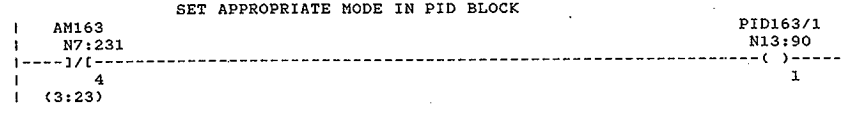
Rung 2:453

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



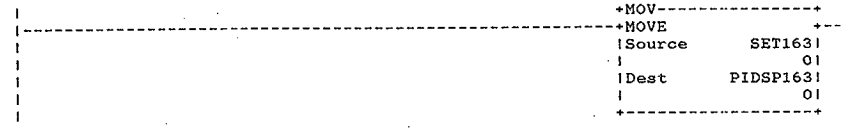
Rung 2:454

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

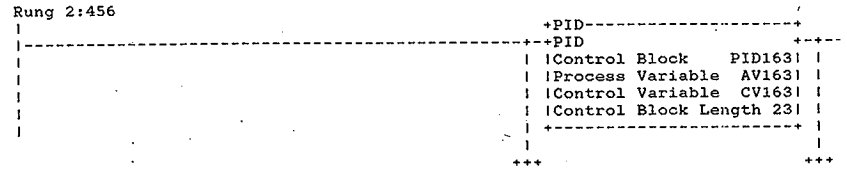


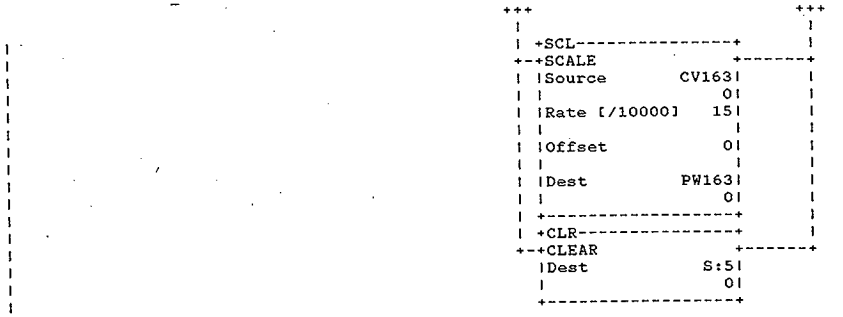
Rung 2:455

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

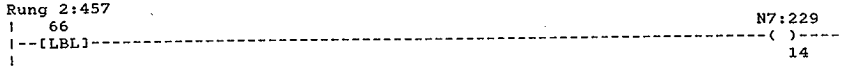


Rung 2:456

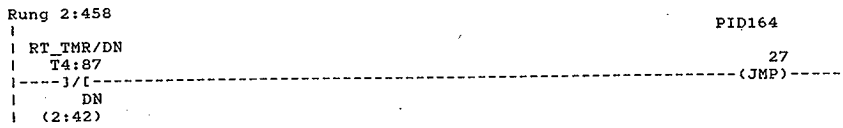




Rung 2:457

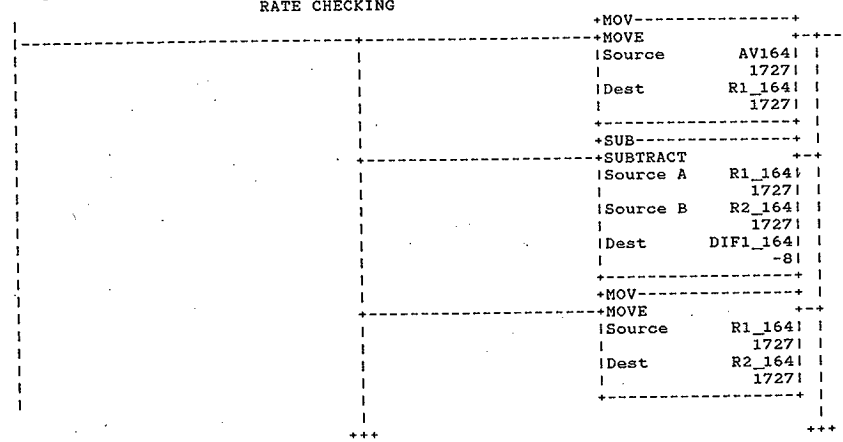


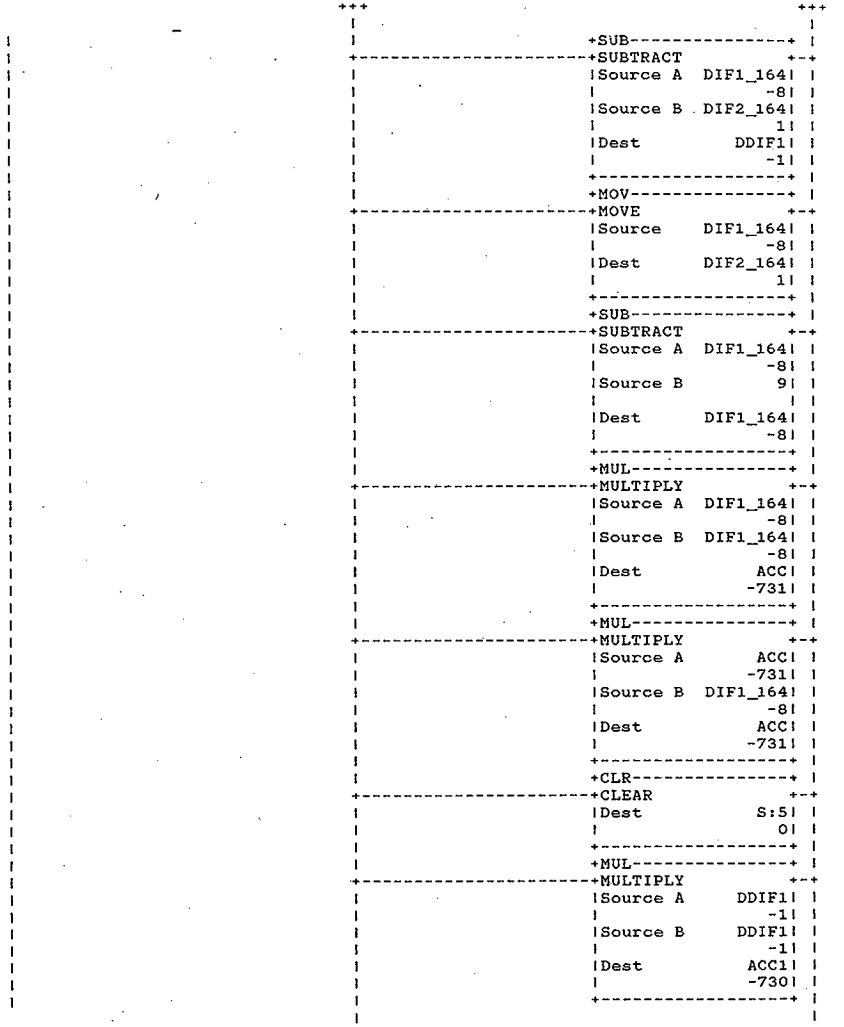
Rung 2:458

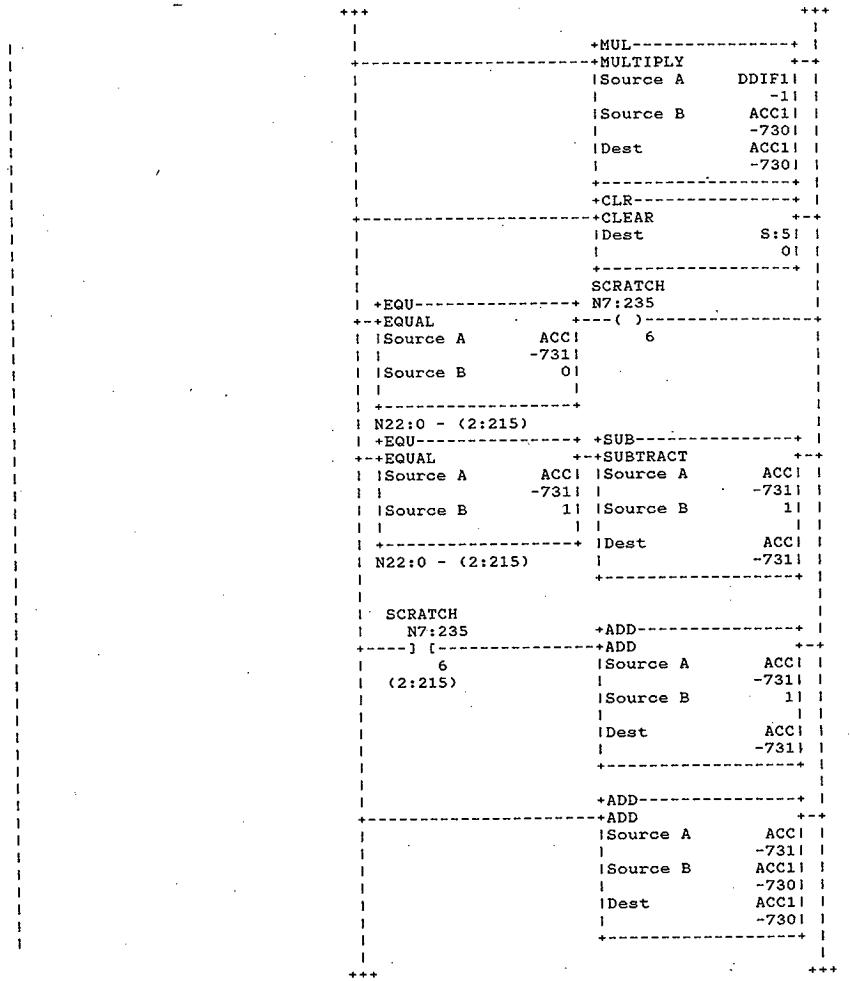


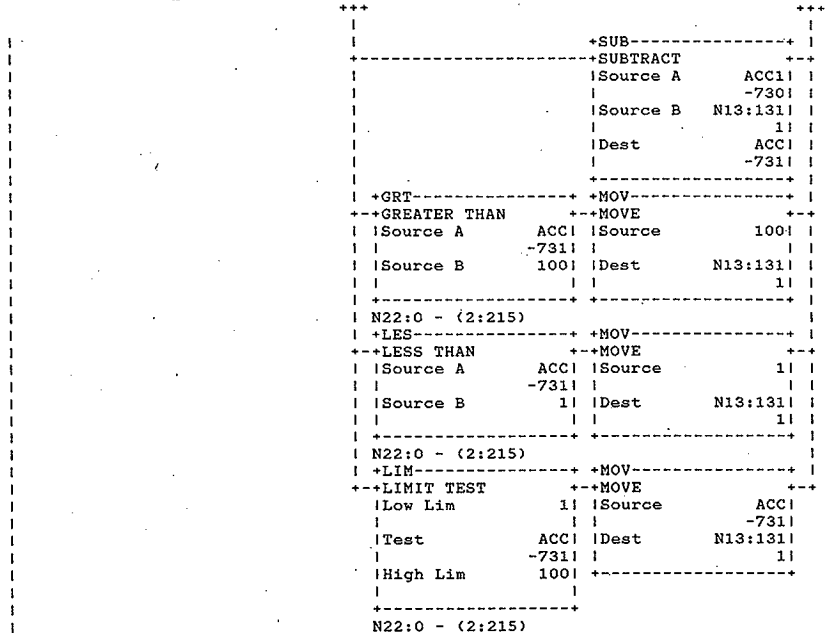
Rung 2:459

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_164 -8
Source B DIF2_164 1
Dest DDIF1 -1
MOV
MOVE
Source DIF1_164 -8
Dest DIF2_164 1
SUB
SUBTRACT
Source A DIF1_164 -8
Source B 9
Dest DIF1_164 -8
MUL
MULTIPLY
Source A DIF1_164 -8
Source B DIF1_164 -8
Dest ACC -731
MUL
MULTIPLY
Source A ACC -731
Source B DIF1_164 -8
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730

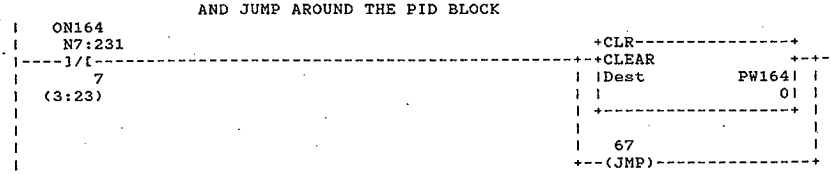

+MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
+EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
+ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730



Rung 2:460

Rung 2:461

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:462

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|   AM164                                                          PID164/1
|    N7:231                                                        N13:120
|----]/[-------------------------------------------------------------( )-----
|       6                                                            1
|  (2:279)
```

Rung 2:463

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                    +MOV---------------+
|----------------------------------------------------+MOVE              +--
|                                                    |Source      SET164|
|                                                    |                 0|
|                                                    |Dest        PIDSP164|
|                                                    |                 0|
|                                                    +------------------+
```

Rung 2:464

```
|                                                  +PID-------------------+
|--------------------------------------------------+-+PID                 +-+--
|                                                  | |Control Block    PID164| |
|                                                  | |Process Variable  AV164| |
|                                                  | |Control Variable  CV164| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL----------------+     |
|                                                  +-+SCALE              +-------+
|                                                  | |Source        CV164|     |
|                                                  | |                   0|     |
|                                                  | |Rate [/10000]    15|     |
|                                                  | |                    |     |
|                                                  | |Offset             0|     |
|                                                  | |                    |     |
|                                                  | |Dest           PW164|     |
|                                                  | |                   0|     |
|                                                  | +--------------------+     |
|                                                  | +CLR----------------+     |
|                                                  +-+CLEAR              +-------+
|                                                    |Dest            S:5|
|                                                    |                   0|
|                                                    +--------------------+
```

Rung 2:465

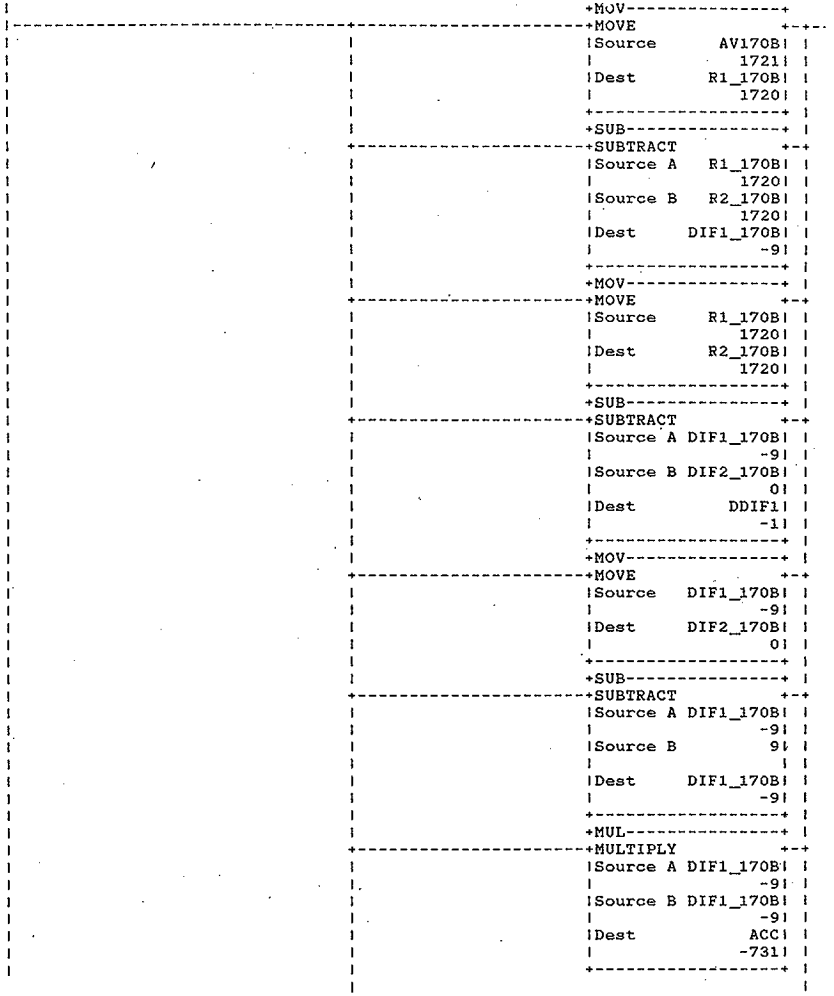
```
|   67                                                                N7:229
|--[LBL]-------------------------------------------------------------( )-----
|                                                                      15
```

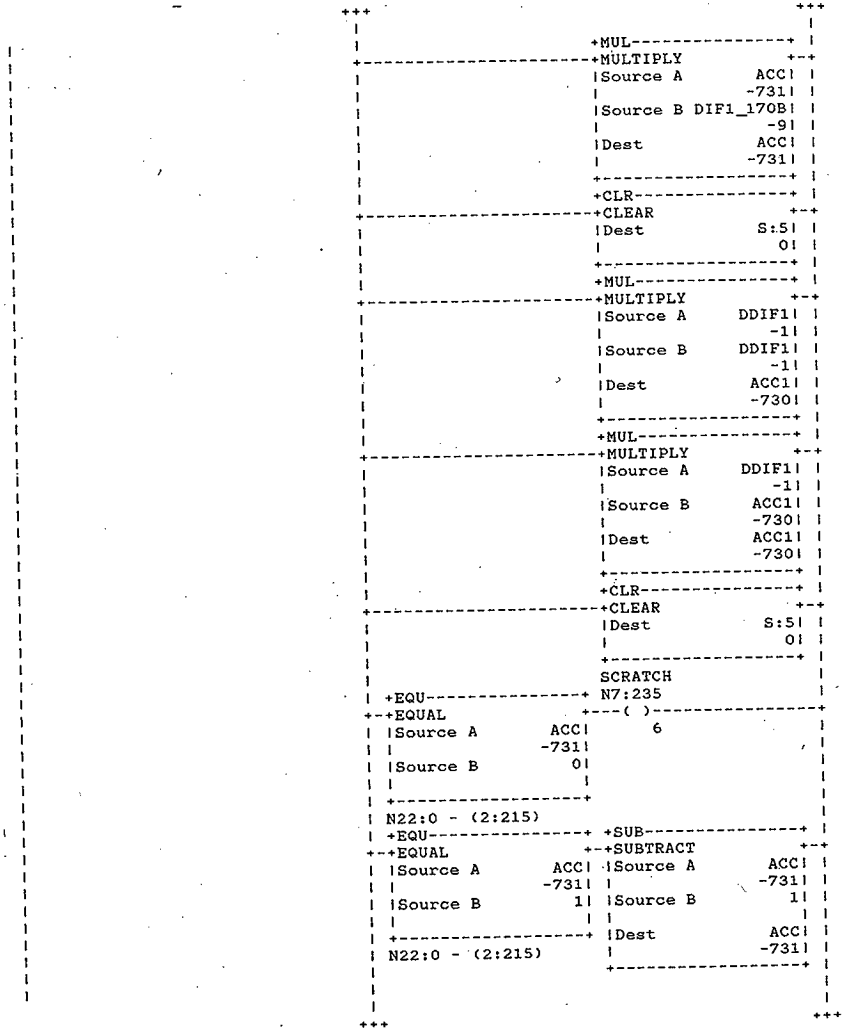
Rung 2:466

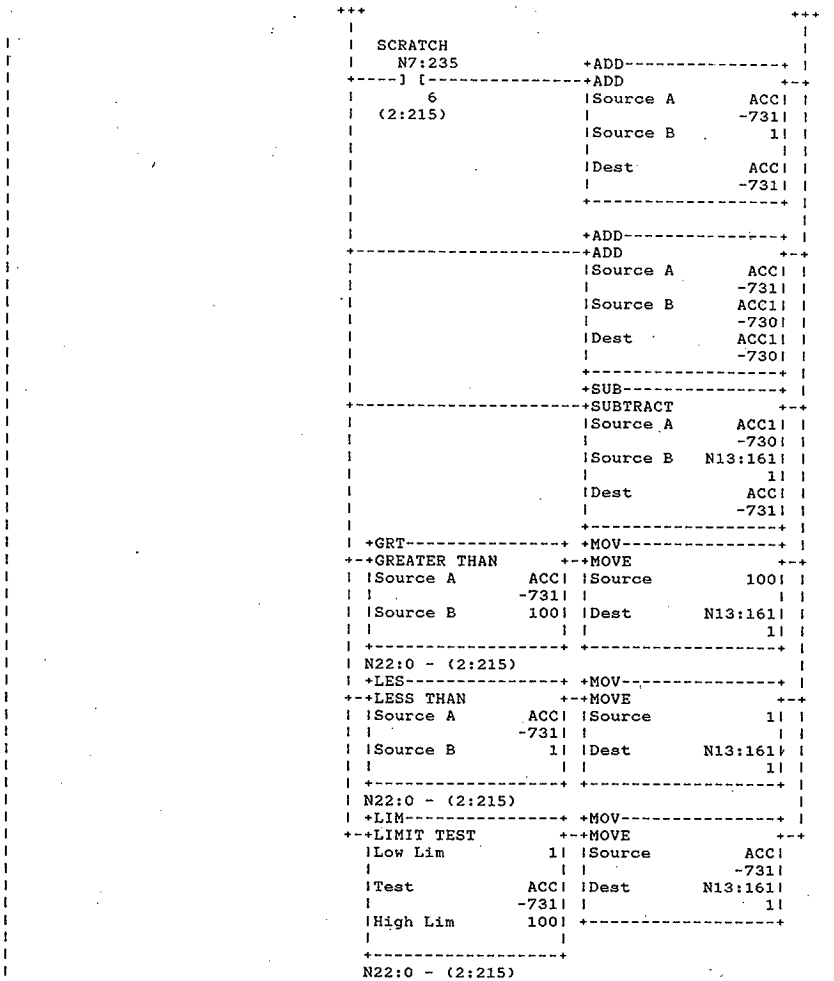
```
|                                                                    PID170B
| RT_TMR/DN                                                            28
|   T4:87                                                          (JMP)-----
|----]/[-------------------------------------------------------------------
|      DN
|  (2:42)
```

Rung 2:467

RATE CHECKING



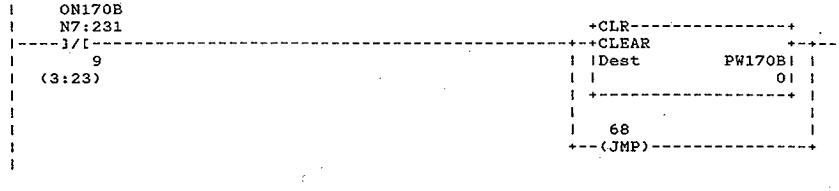

MUL
MULTIPLY
Source A ACC -731
Source B DIF1_170B -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730
MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731


SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
+ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
+SUB
SUBTRACT
Source A ACC1
-730
Source B N13:161
1
Dest ACC
-731
+GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
+MOV
MOVE
Source 100
Dest N13:161
1
+LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+MOV
MOVE
Source 1
Dest N13:161
1
+LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
+MOV
MOVE
Source ACC
-731
Dest N13:161
1

Rung 2:468

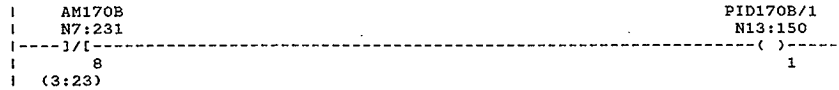
Rung 2:469

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



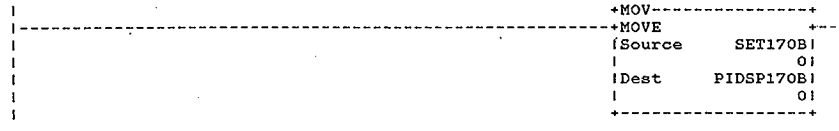
Rung 2:470

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

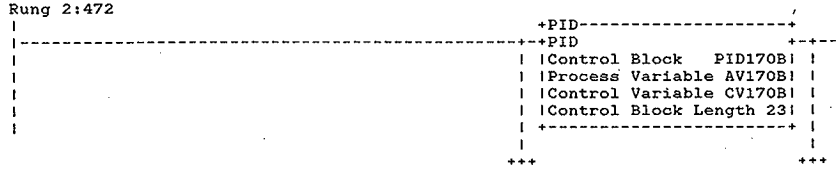


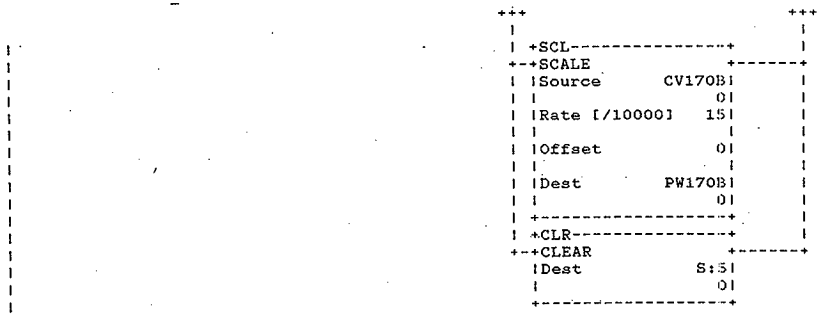
Rung 2:471

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

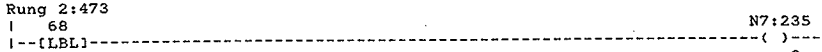


Rung 2:472

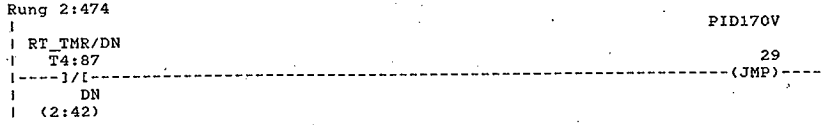




Rung 2:473

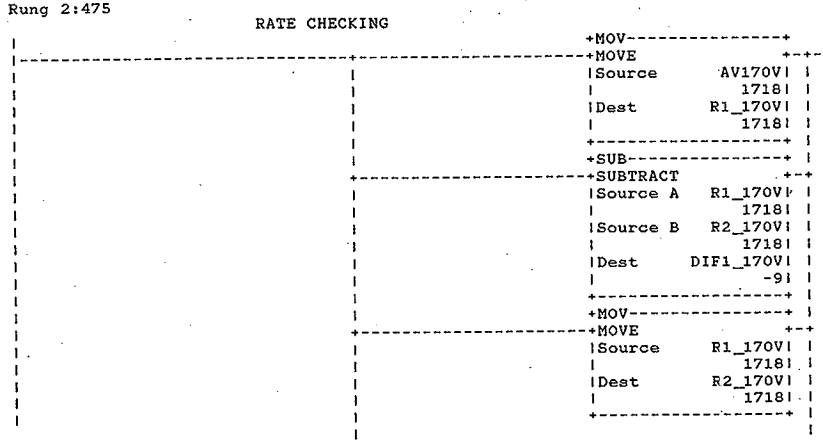


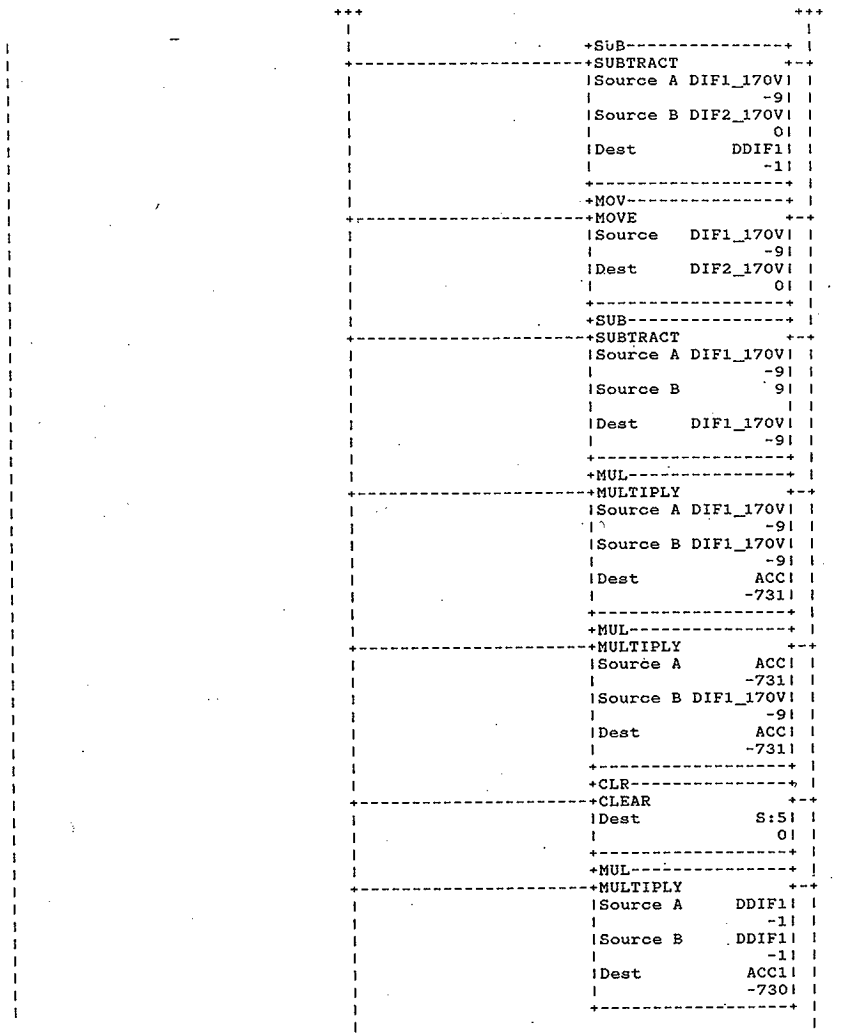
Rung 2:474

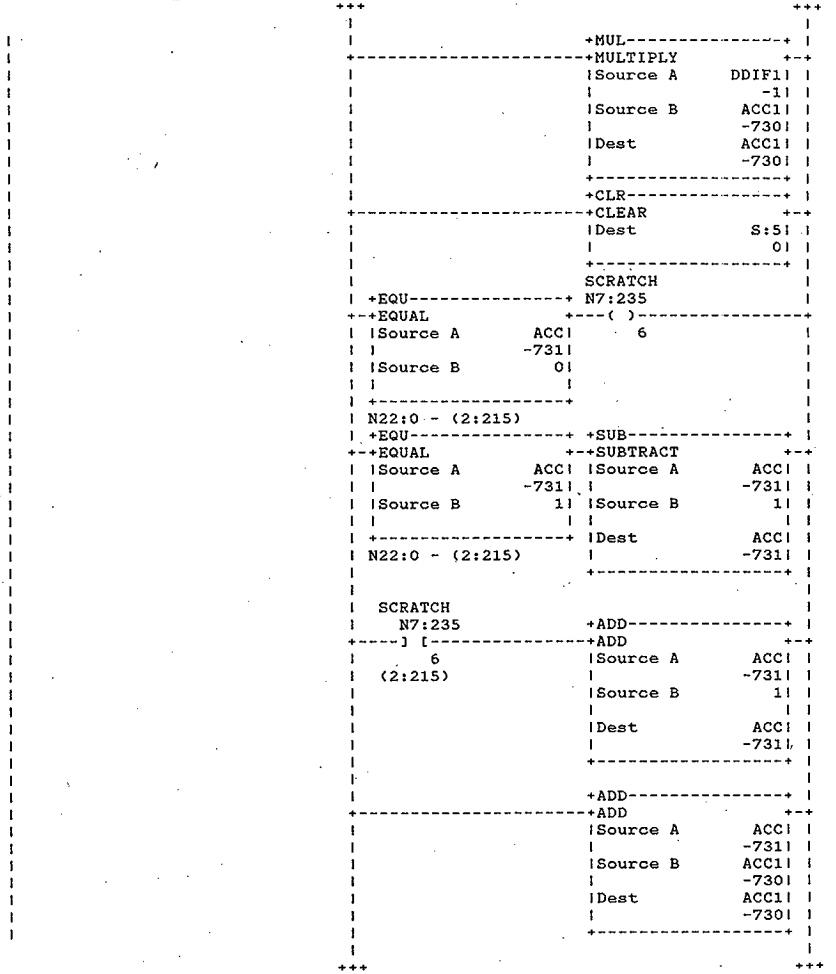


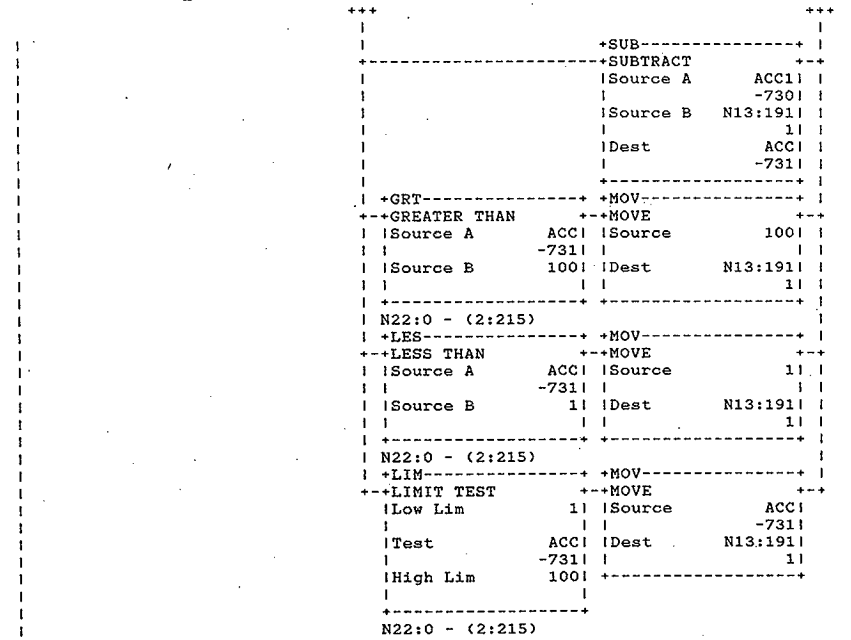
Rung 2:475

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_170V
-9
Source B DIF2_170V
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_170V
-9
Dest DIF2_170V
0
SUB
SUBTRACT
Source A DIF1_170V
-9
Source B
9
Dest DIF1_170V
-9
MUL
MULTIPLY
Source A DIF1_170V
-9
Source B DIF1_170V
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_170V
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

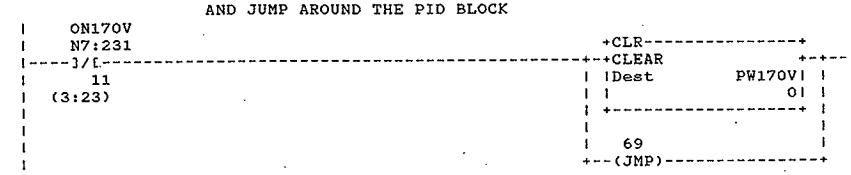

MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH N7:235
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
6
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH N7:235
6 (2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730



Rung 2:476

Rung 2:477

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:478

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|    AM170V                                                          PID170V/1
|     N7:231                                                         N13:180
|----]/[-------------------------------------------------------------( )-------
|       10                                                             1
|   (3:23)
```

Rung 2:479

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE               +---
|                                                          |Source     SET170V|
|                                                          |                  0|
|                                                          |Dest      PIDSP170V|
|                                                          |                  0|
|                                                          +-------------------+
```

Rung 2:480

```
|                                                +PID---------------------+
|------------------------------------------------+-+PID                    +-+---
|                                                | |Control Block   PID170V| |
|                                                | |Process Variable AV170V| |
|                                                | |Control Variable CV170V| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                | +SCL----------------+       |
|                                                +-+SCALE              +-------+
|                                                | |Source      CV170V|       |
|                                                | |                  0|       |
|                                                | |Rate [/10000]   15|       |
|                                                | |                   |       |
|                                                | |Offset             0|       |
|                                                | |                   |       |
|                                                | |Dest        PW170V|       |
|                                                | |                  0|       |
|                                                | +-------------------+       |
|                                                | +CLR----------------+       |
|                                                +-+CLEAR              +-------+
|                                                  |Dest           S:5|
|                                                  |                  0|
|                                                  +-------------------+
```

Rung 2:481

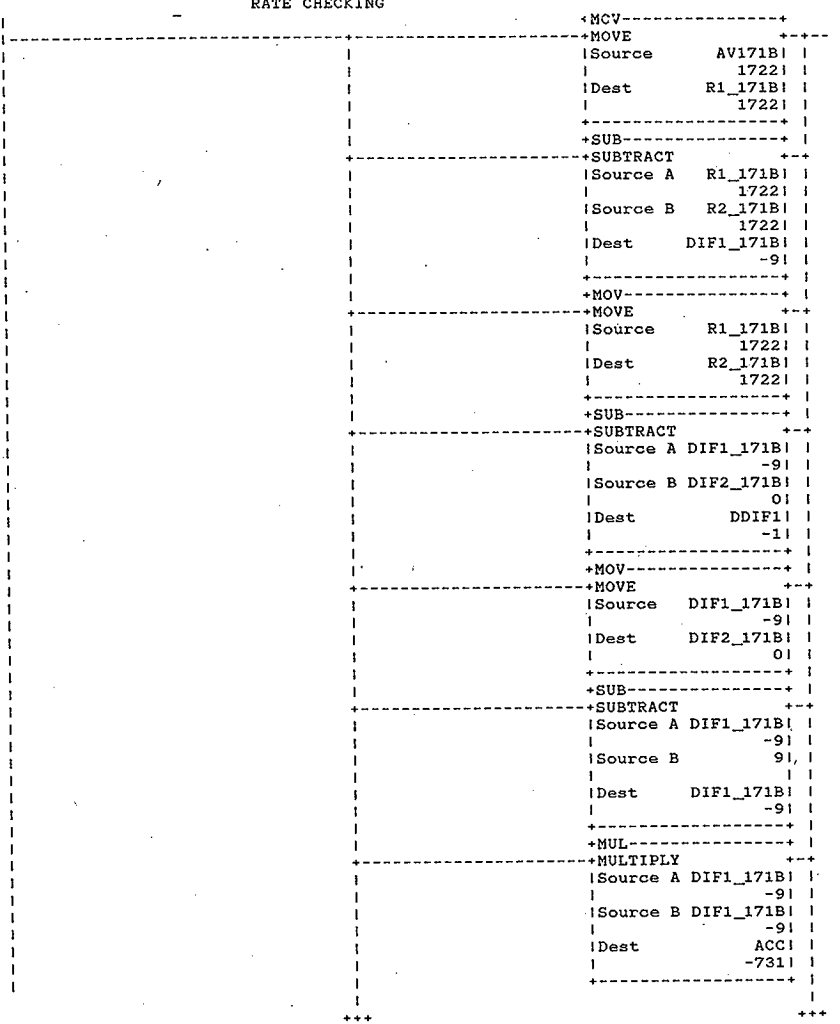
```
|   69                                                                 N7:235
|--[LBL]-------------------------------------------------------------------( )----
|                                                                        1
```

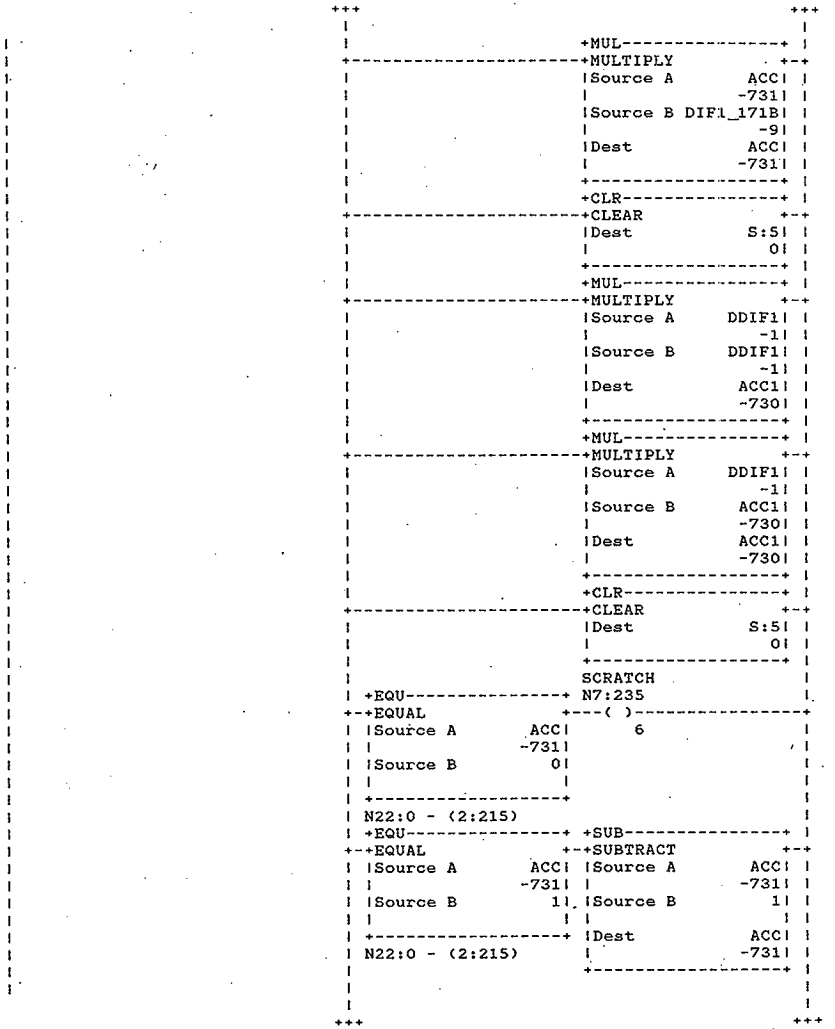
Rung 2:482

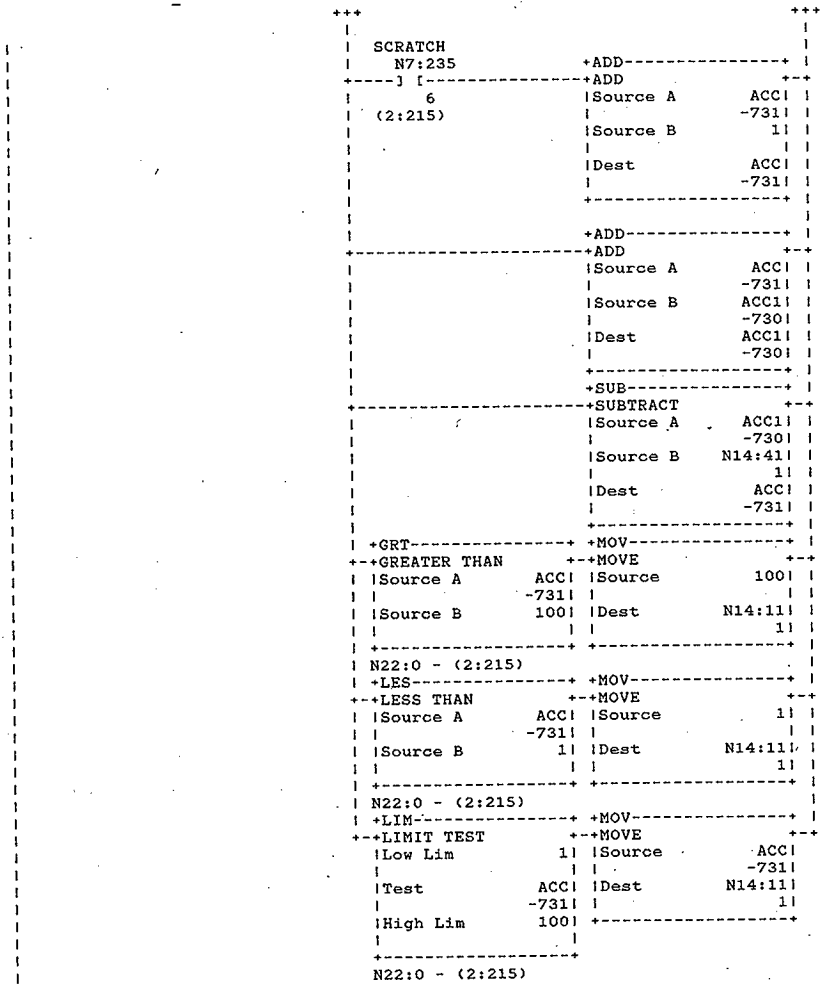
```
|                                                                      PID171B
| RT_TMR/DN                                                             30
|   T4:87                                                            (JMP)-----
|----]/[-------------------------------------------------------------------------
|      DN
|  (2:42)
```

Rung 2:483

RATE CHECKING




+MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_171B
-9
Dest ACC
-731
+CLR
CLEAR
Dest S:5
0
+MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
+EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N14:41
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N14:11
1
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
MOV
MOVE
Source 1
Dest N14:11
1
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source ACC
-731
Dest N14:11
1

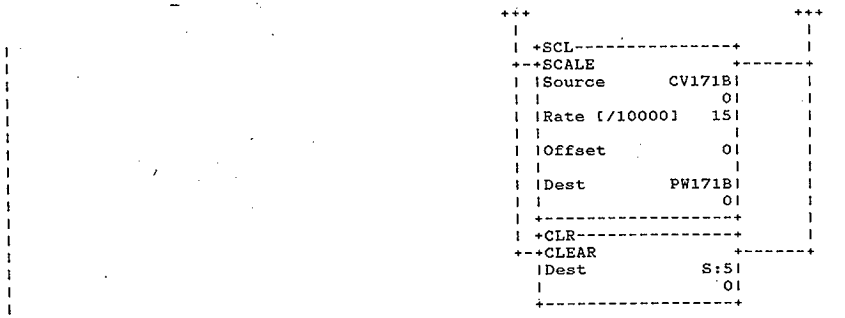
```
Rung 2:484
| PID171B
|                                                                    DUMMY30
|      30                                                            N22:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                      13

Rung 2:485
                DETECT FROM SCADA PID ON/OFF
                      IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON171B
|    N7:231                                              +CLR---------------+
|----]/[-------------------------------------------------+-+CLEAR           +-+--
|      13                                                | |Dest      PW171B| |
|  (3:23)                                                | |                0| |
|                                                        | +-----------------+ |
|                                                        |                     |
|                                                        |   70                |
|                                                        +--(JMP)--------------+
|

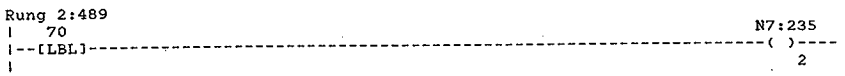
Rung 2:486
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM171B                                                          PID171B/1
|    N7:231                                                          N14:0
|----]/[-------------------------------------------------------------( )-----
|      12                                                              1
|  (3:23)

Rung 2:487
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                    +MOV---------------+
|----------------------------------------------------+-+MOVE            +--
|                                                    |Source    SET171B|
|                                                    |                0|
|                                                    |Dest     PIDSP171B|
|                                                    |                0|
|                                                    +-------------------+

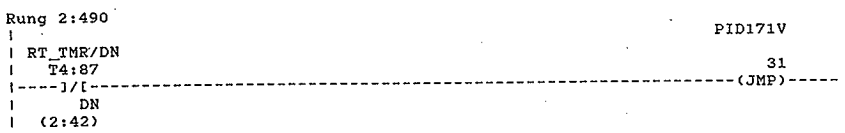
Rung 2:488
|                                                  +PID-------------------+
|--------------------------------------------------+-+PID                +-+--
|                                                  | |Control Block   PID171B| |
|                                                  | |Process Variable AV171B| |
|                                                  | |Control Variable CV171B| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  |                           |
|                                                +++                         +++
```



Rung 2:489

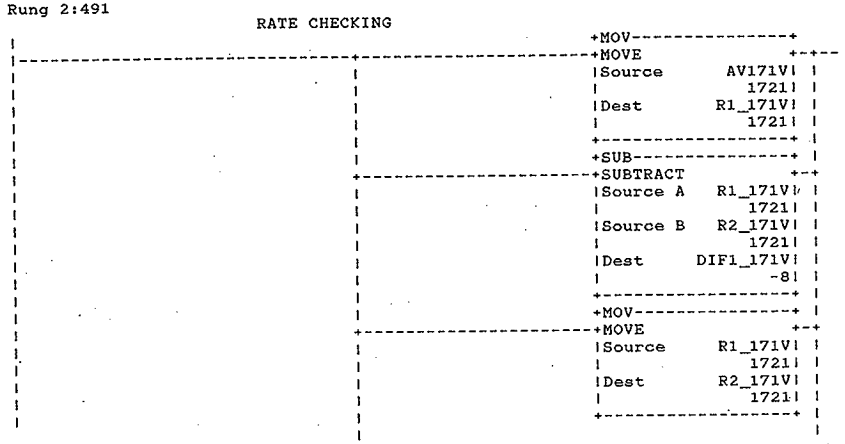


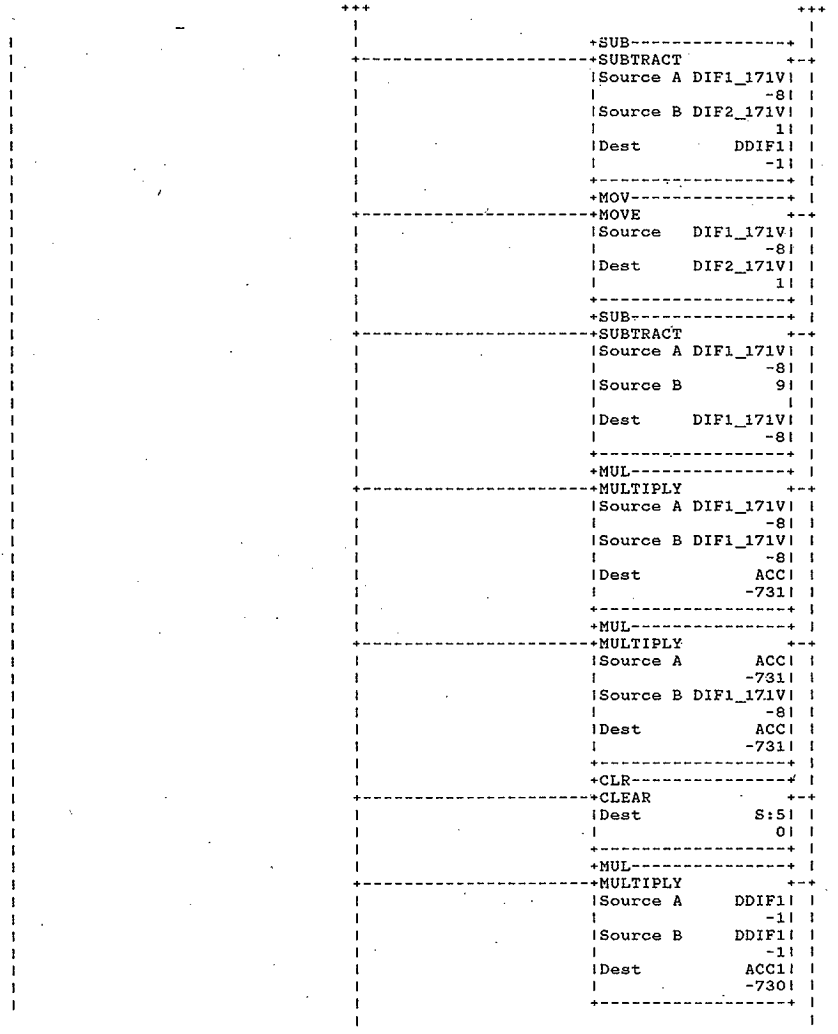
Rung 2:490

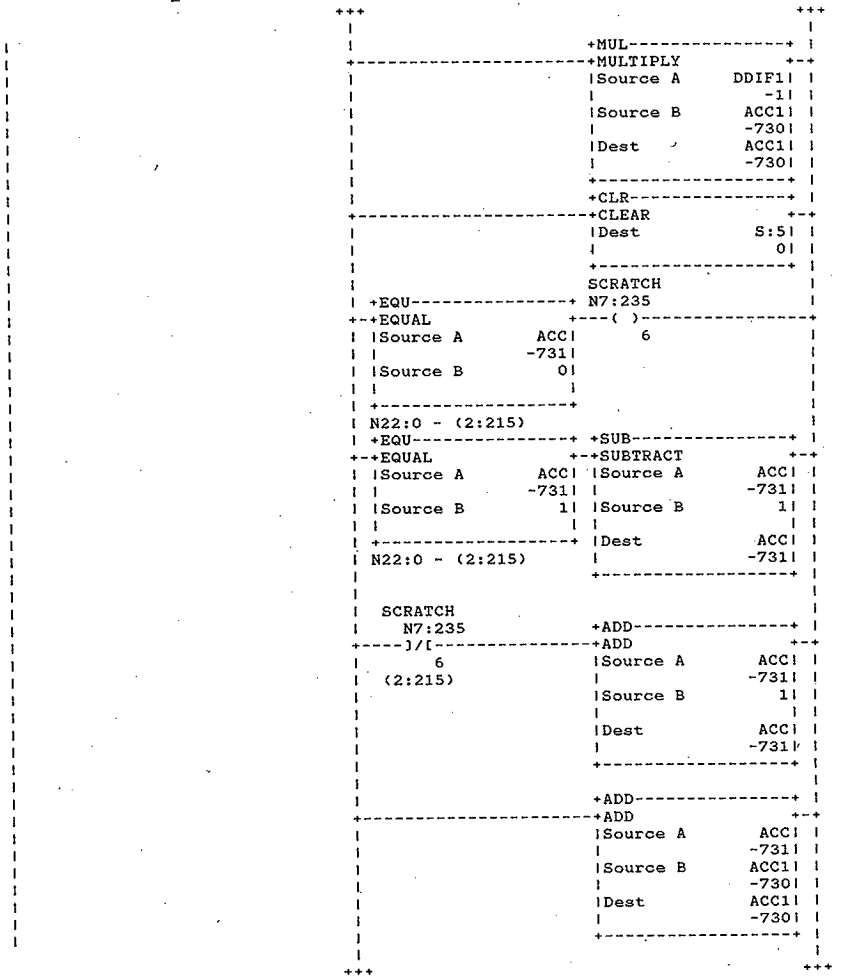


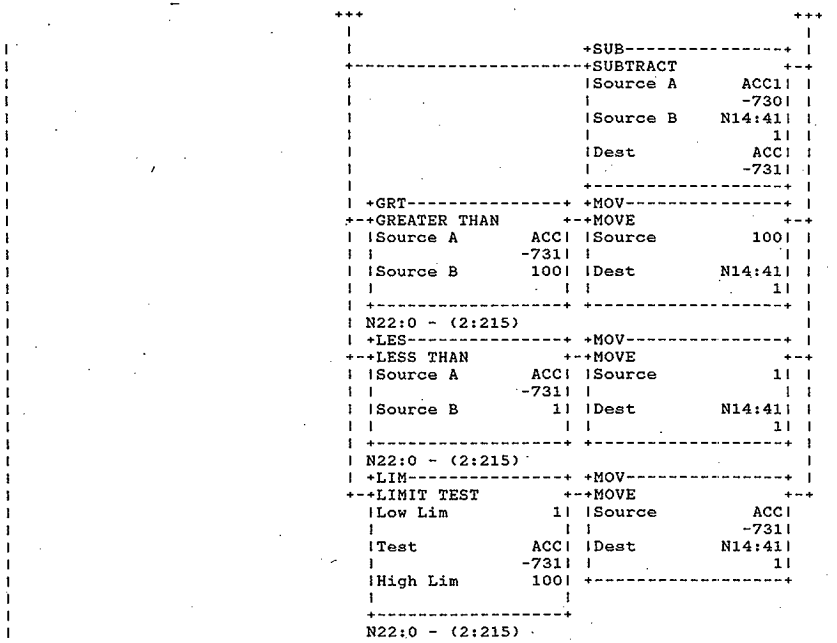
Rung 2:491

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_171V
-8
Source B DIF2_171V
1
Dest DDIF1
-1
MOV
MOVE
Source DIF1_171V
-8
Dest DIF2_171V
1
SUB
SUBTRACT
Source A DIF1_171V
-8
Source B
9
Dest DIF1_171V
-8
MUL
MULTIPLY
Source A DIF1_171V
-8
Source B DIF1_171V
-8
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_171V
-8
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

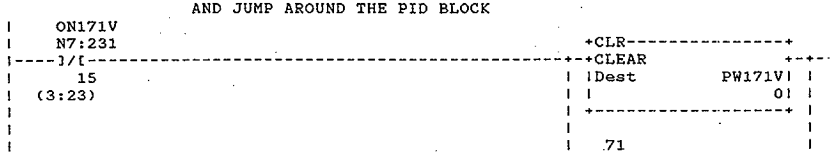

MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730



Rung 2:492
PID171V

Rung 2:493

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:494

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|    AM171V                                                          PID171V/1
|    N7:231                                                           N14:30
|----]/[-------------------------------------------------------------( )-----
|      14                                                              1
|  (3:23)
```

Rung 2:495

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE               +---
|                                                          |Source     SET171V|
|                                                          |                  0|
|                                                          |Dest      PIDSP171V|
|                                                          |                  0|
|                                                          +-------------------+
```

Rung 2:496

```
|                                                  +PID--------------------+
|--------------------------------------------------+-+PID                  +-+---
|                                                  | |Control Block   PID171V| |
|                                                  | |Process Variable AV171V| |
|                                                  | |Control Variable CV171V| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL----------------+     |
|                                                  +-+SCALE              +------+
|                                                  | |Source      CV171V|     |
|                                                  | |                  0|     |
|                                                  | |Rate [/10000]    15|     |
|                                                  | |                   |     |
|                                                  | |Offset             0|     |
|                                                  | |                   |     |
|                                                  | |Dest         PW171V|     |
|                                                  | |                  0|     |
|                                                  | +-------------------+     |
|                                                  | +CLR----------------+     |
|                                                  +-+CLEAR              +------+
|                                                    |Dest            S:5|
|                                                    |                  0|
|                                                    +-------------------+
```

Rung 2:497

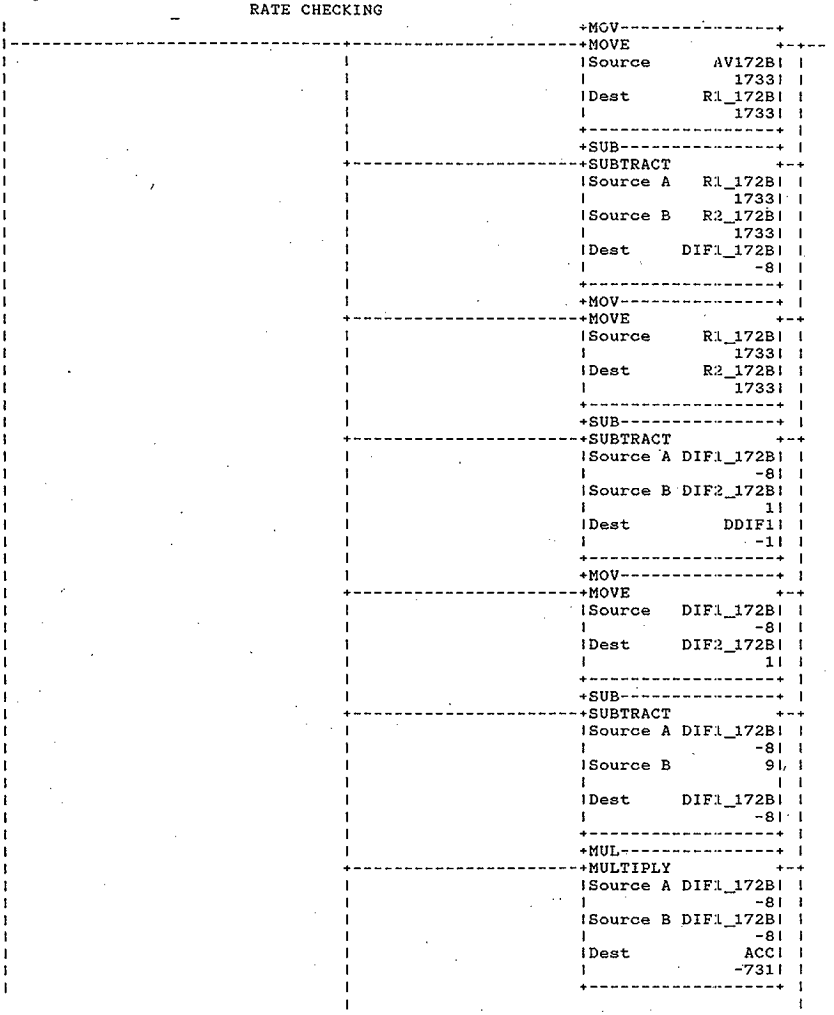
```
|   71                                                                N7:235
|--[LBL]-------------------------------------------------------------( )-----
|                                                                      3
```

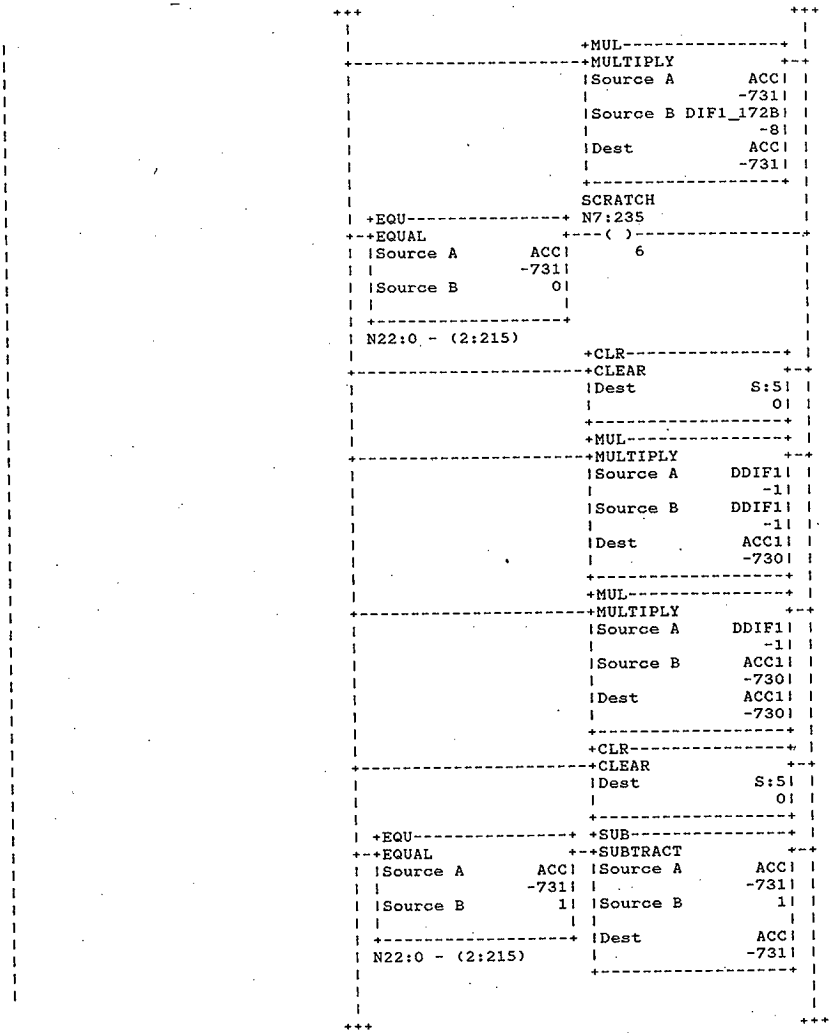
Rung 2:498

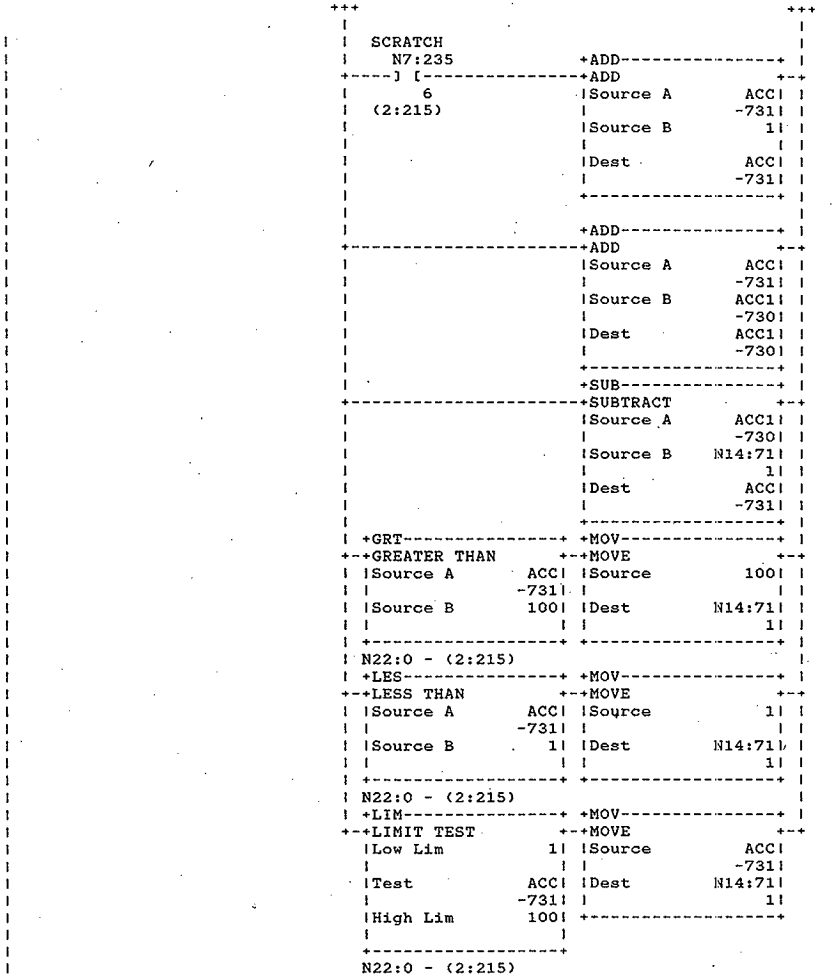
```
|                                                                    PID172B
| RT_TMR/DN                                                           32
|   T4:87                                                          (JMP)-----
|----]/[-------------------------------------------------------------
|      DN
|  (2:42)
```

Rung 2:499

RATE CHECKING




+MUL
+MULTIPLY
Source A ACC
-731
Source B DIF1_172B
-8
Dest ACC
-731
SCRATCH
+EQU
+EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
N7:235
( )
6
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
+EQU
+EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
+SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A
ACC
-731
Source B
1
Dest
ACC
-731
ADD
Source A
ACC
-731
Source B
ACC1
-730
Dest
ACC1
-730
SUB
SUBTRACT
Source A
ACC1
-730
Source B
N14:71
1
Dest
ACC
-731
GRT
GREATER THAN
Source A
ACC
-731
Source B
100
N22:0 - (2:215)
MOV
MOVE
Source
100
Dest
N14:71
1
LES
LESS THAN
Source A
ACC
-731
Source B
1
N22:0 - (2:215)
MOV
MOVE
Source
1
Dest
N14:71
1
LIM
LIMIT TEST
Low Lim
1
Test
ACC
-731
High Lim
100
N22:0 - (2:215)
MOV
MOVE
Source
ACC
-731
Dest
N14:71
1

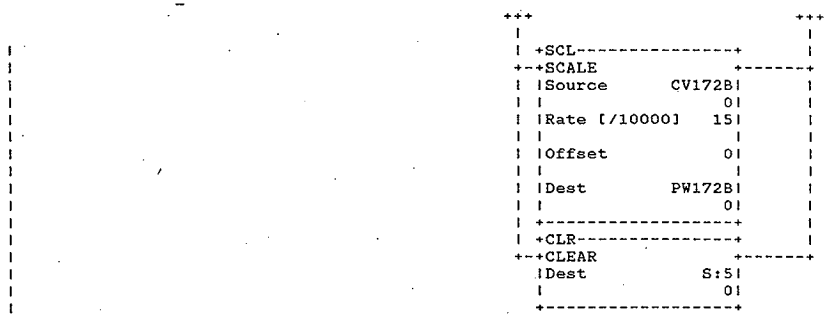
```
Rung 2:500
| PID172B
|                                                                    DUMMY32
|      32                                                             N22:8
|---[LBL]-------------------------------------------------------------( )----
|                                                                       15

Rung 2:501
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON172B
|    N7:231                                                  +CLR---------------+
|----]/[-------------------------------------------------+-+CLEAR              +-+--
|       1                                                 | |Dest        PW172B| |
|  (3:23)                                                 | |                 0| |
|                                                         | +------------------+ |
|                                                         |                      |
|                                                         |   72                 |
|                                                         +--(JMP)---------------+
|

Rung 2:502
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM172B                                                            PID172B/1
|    N7:232                                                             N14:60
|----]/[-------------------------------------------------------------( )-----
|       0                                                                  1
|  (3:24)

Rung 2:503
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|-------------------------------------------------------+MOVE                +--
|                                                          |Source     SET172B|
|                                                          |                 0|
|                                                          |Dest     PIDSP172B|
|                                                          |                 0|
|                                                          +------------------+

Rung 2:504
|                                                     +PID--------------------+
|-----------------------------------------------+-+PID                      +-+--
|                                               | |Control Block   PID172B| |
|                                               | |Process Variable AV172B| |
|                                               | |Control Variable CV172B| |
|                                               | |Control Block Length 23| |
|                                               | +----------------------+ |
|                                               |                          |
                                              +++                        +++
```

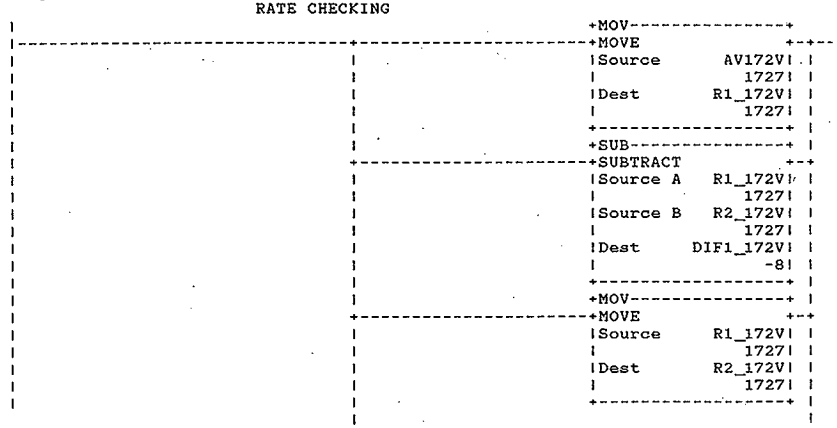


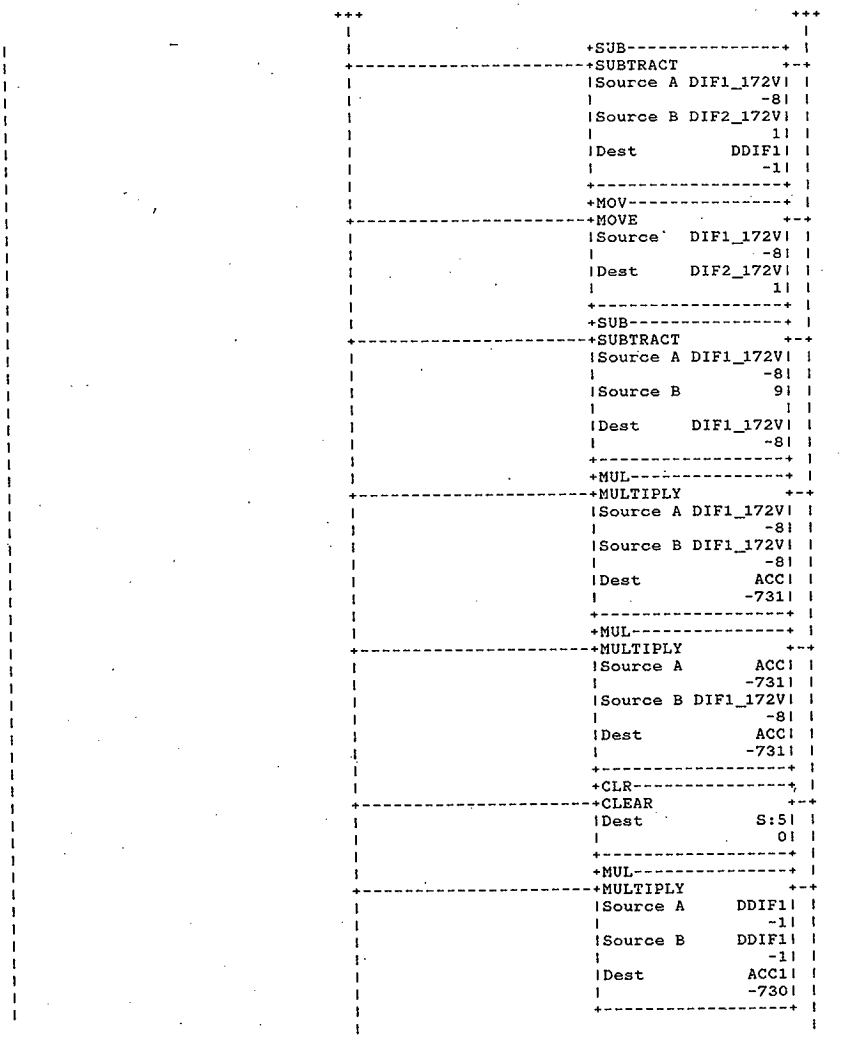
```
                                                  +++                                  +++
                                                   |                                    |
|                                                  | +SCL---------------+               |
|                                                  +-+SCALE             +-------+
|                                                  | |Source      CV172B|               |
|                                                  | |                 0|               |
|                                                  | |Rate [/10000]   15|               |
|                                                  | |                  |               |
|                                                  | |Offset           0|               |
|                                                  | |                  |               |
|                                                  | |Dest        PW172B|               |
|                                                  | |                 0|               |
|                                                  | +------------------+               |
|                                                  | +CLR---------------+               |
|                                                  +-+CLEAR             +-------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

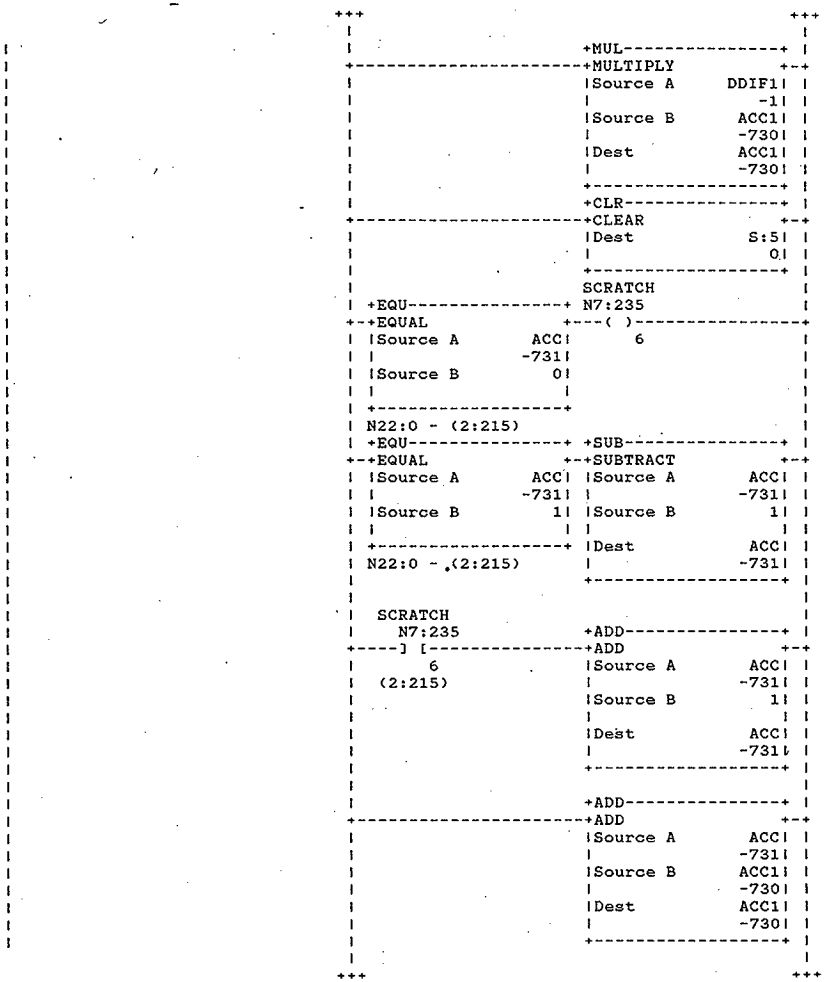
Rung 2:505
|   72                                                                    N7:235
|--[LBL]-----------------------------------------------------------------( )----
|                                                                            4

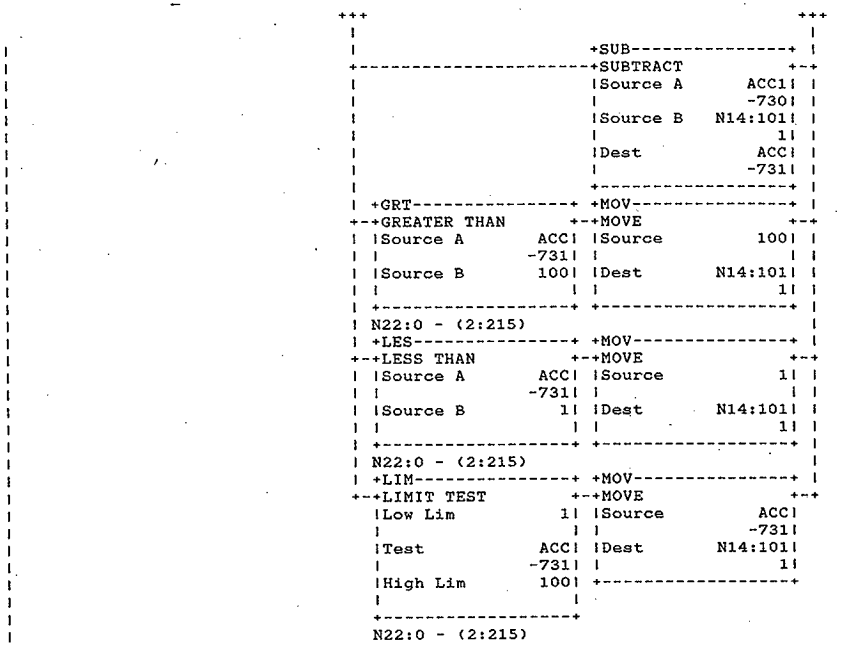
Rung 2:506
|                                                                    PID172V
| RT_TMR/DN
|   T4:87                                                                  33
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)

Rung 2:507
                         RATE CHECKING
|                                                  +MOV---------------+
|-------------------------------+-----------------+MOVE              +-+--
|                               |                 |Source      AV172V| |
|                               |                 |              1727| |
|                               |                 |Dest       R1_172V| |
|                               |                 |              1727| |
|                               |                 +------------------+ |
|                               |                 +SUB---------------+ |
|                               +-----------------+SUBTRACT          +-+
|                               |                 |Source A   R1_172V| |
|                               |                 |              1727| |
|                               |                 |Source B   R2_172V| |
|                               |                 |              1727| |
|                               |                 |Dest     DIF1_172V| |
|                               |                 |                -8| |
|                               |                 +------------------+ |
|                               |                 +MOV---------------+ |
|                               +-----------------+MOVE              +-+
|                               |                 |Source     R1_172V| |
|                               |                 |              1727| |
|                               |                 |Dest       R2_172V| |
|                               |                 |              1727| |
|                               |                 +------------------+ |
|                               |                                      |
                               +++                                    +++
```




SUB
SUBTRACT
Source A DIF1_172V
-8
Source B DIF2_172V
1
Dest DDIF1
-1
MOV
MOVE
Source DIF1_172V
-8
Dest DIF2_172V
1
SUB
SUBTRACT
Source A DIF1_172V
-8
Source B
9
1
Dest DIF1_172V
-8
MUL
MULTIPLY
Source A DIF1_172V
-8
Source B DIF1_172V
-8
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_172V
-8
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

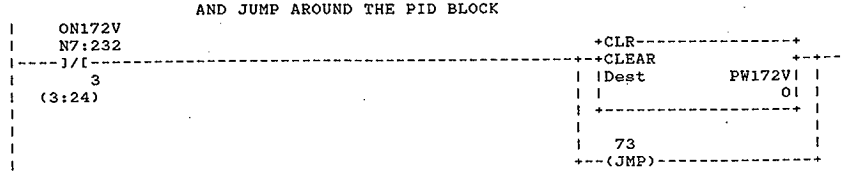

+MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
+EQU
EQUAL
Source A ACC
-731
Source B 0
( )
6
N22:0 - (2:215)
+EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
+ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730



Rung 2:508

Rung 2:509

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:510

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|    AM172V                                                          PID172V/1
|    N7:232                                                           N14:90
|----]/[-------------------------------------------------------------( )-----
|       2                                                              1
|  (3:24)
```

Rung 2:511

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                    +MOV---------------+
|----------------------------------------------------+MOVE              +---
|                                                    |Source     SET172V|
|                                                    |                 0|
|                                                    |Dest      FIDSP172V|
|                                                    |                 0|
|                                                    +------------------+
```

Rung 2:512

```
|                                          +PID-------------------+
|------------------------------------------+-+PID                 +-+--
|                                          | |Control Block   PID172V| |
|                                          | |Process Variable AV172V| |
|                                          | |Control Variable CV172V| |
|                                          | |Control Block Length 23| |
|                                          | +-----------------------+ |
|                                          | +SCL----------------+     |
|                                          +-+SCALE              +-----+
|                                            |Source       CV172V|     |
|                                            |                  0|     |
|                                            |Rate [/10000]    15|     |
|                                            |                   |     |
|                                            |Offset            0|     |
|                                            |                   |     |
|                                            |Dest         PW172V|     |
|                                            |                  0|     |
|                                            +-------------------+     |
|                                            +CLR----------------+     |
|                                          +-+CLEAR              +-----+
|                                            |Dest            S:5|
|                                            |                  0|
|                                            +-------------------+
```

Rung 2:513

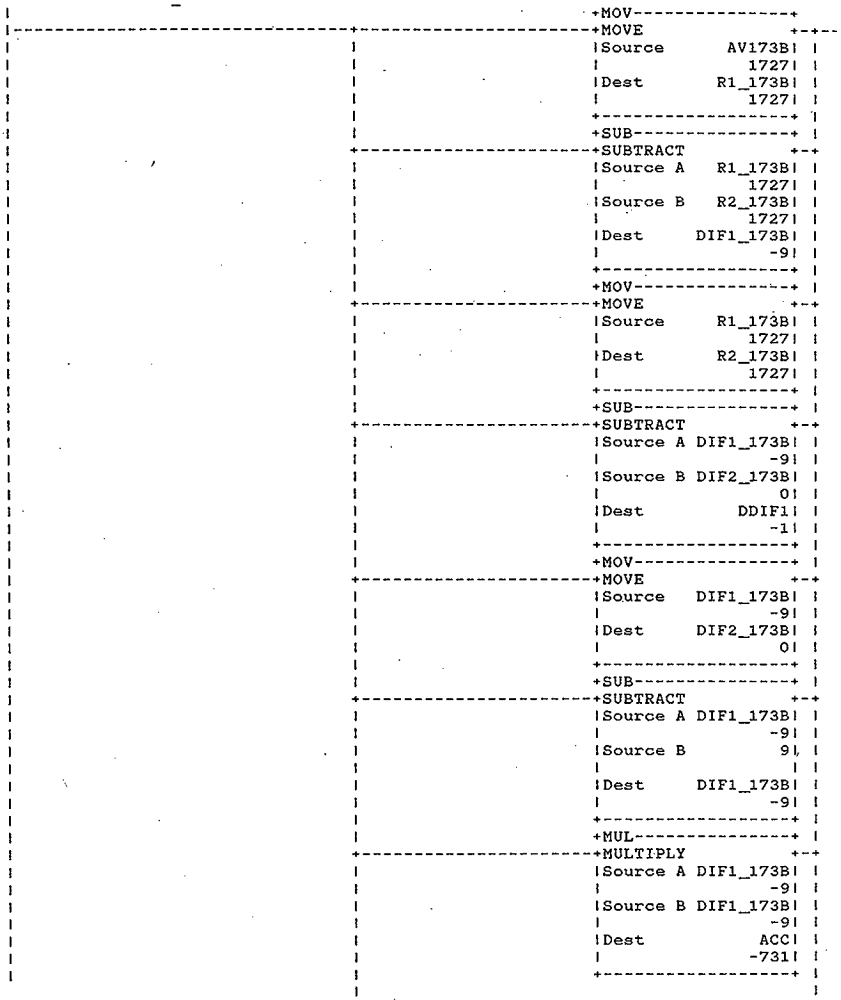
```
|   73                                                                N7:235
|--[LBL]-------------------------------------------------------------( )-----
|                                                                      5
```

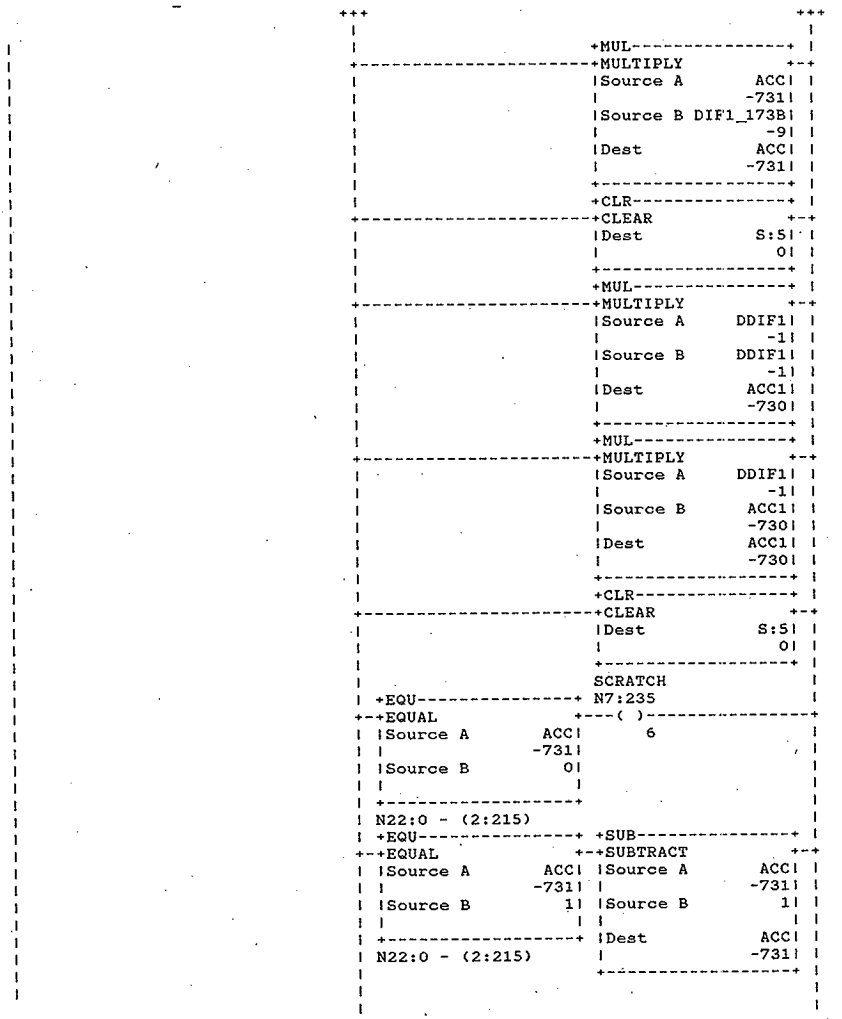
Rung 2:514

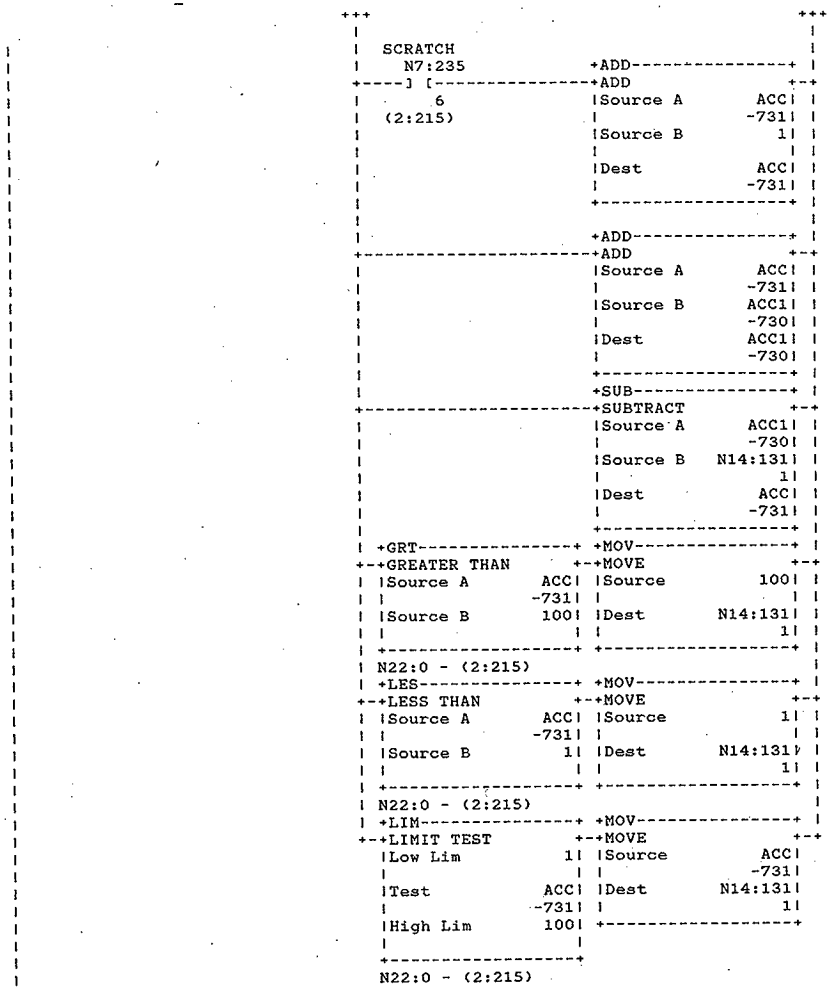
```
|                                                                   PID173B
| RT_TMR/DN                                                           34
|   T4:87                                                          (JMP)-----
|----]/[-------------------------------------------------------------
|      DN
|  (2:42)
```

Rung 2:515

RATE CHECKING



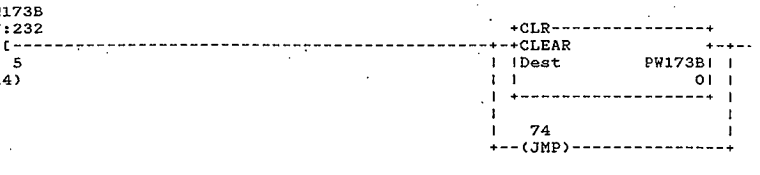

MUL
MULTIPLY
Source A ACC -731
Source B DIF1_173B -9
Dest ACC -731
CLR
CLEAR
Dest S:5 0
MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730
MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
6
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUBTRACT
Source A ACC1
-730
Source B N14:131
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
MOV
MOVE
Source 100
Dest N14:131
1
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
MOV
MOVE
Source 1
Dest N14:131
1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
MOV
MOVE
Source ACC
-731
Dest N14:131
1
N22:0 - (2:215)

Rung 2:516

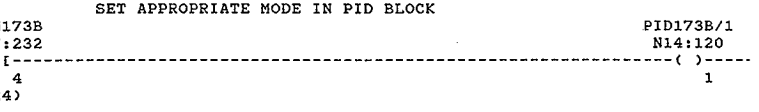
Rung 2:517

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



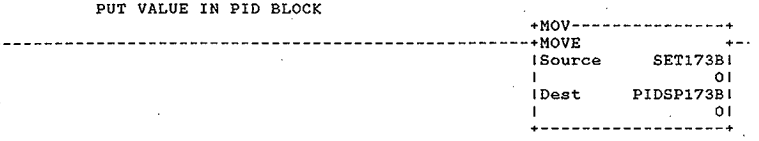
Rung 2:518

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

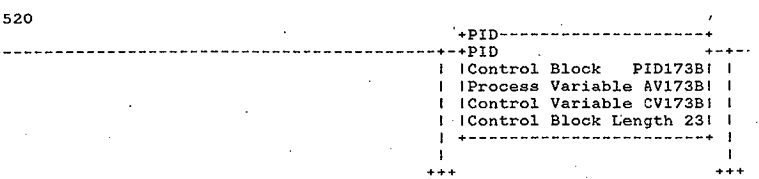


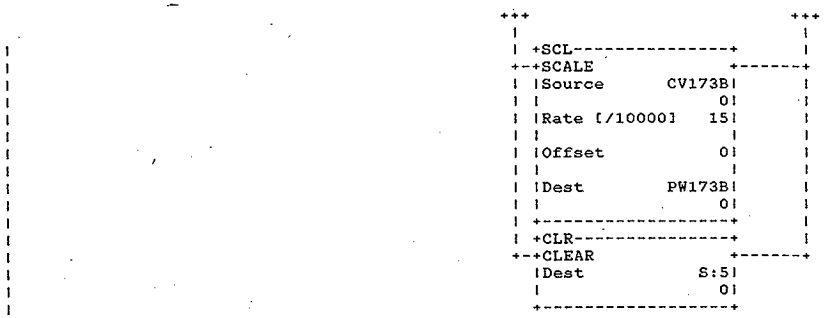
Rung 2:519

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

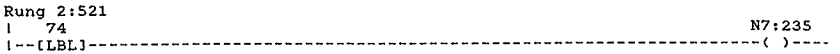


Rung 2:520

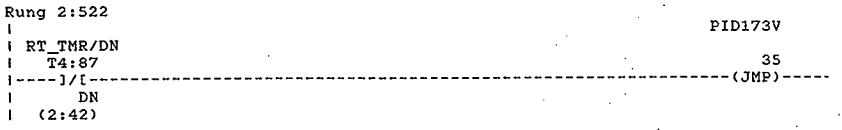




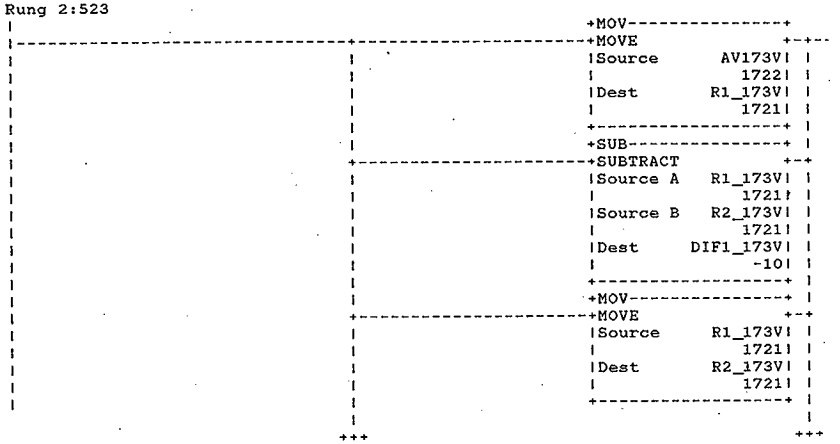
Rung 2:521

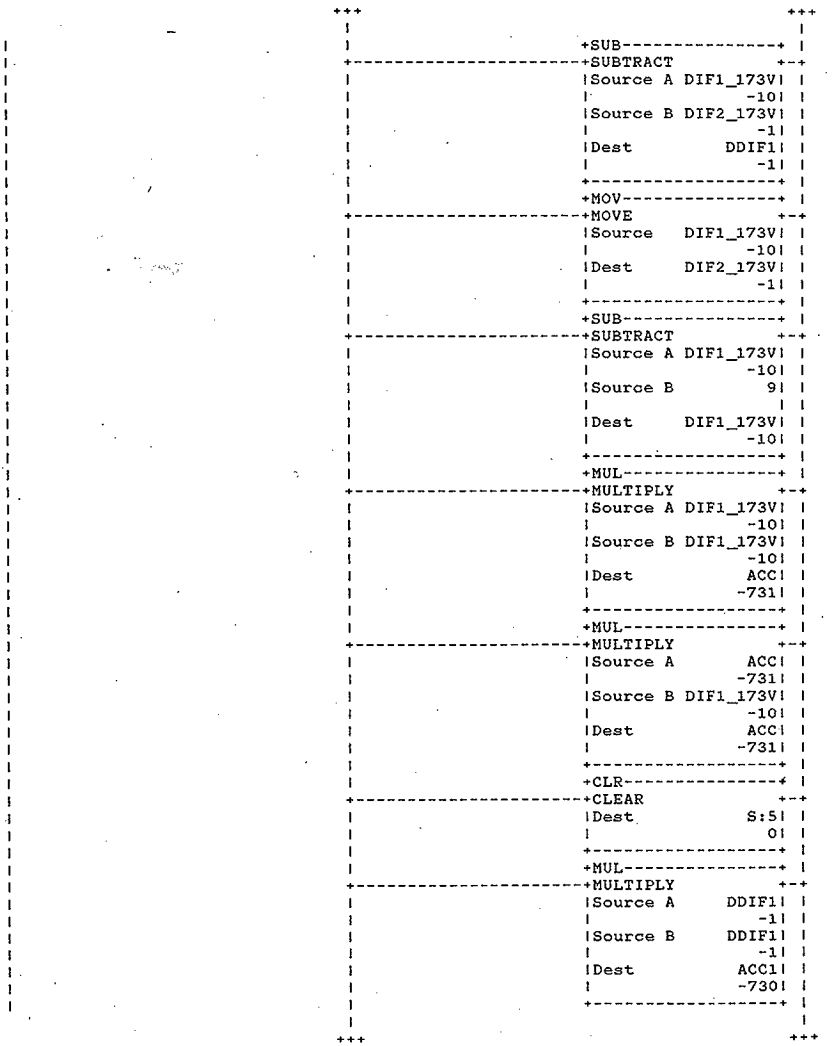


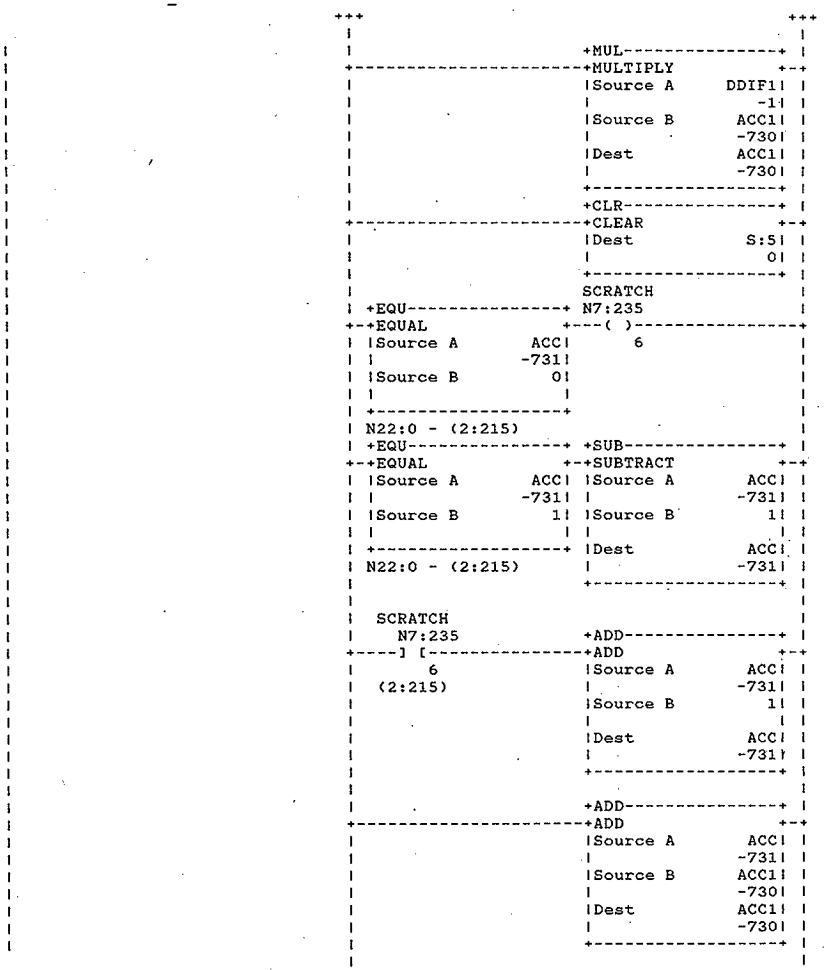
Rung 2:522

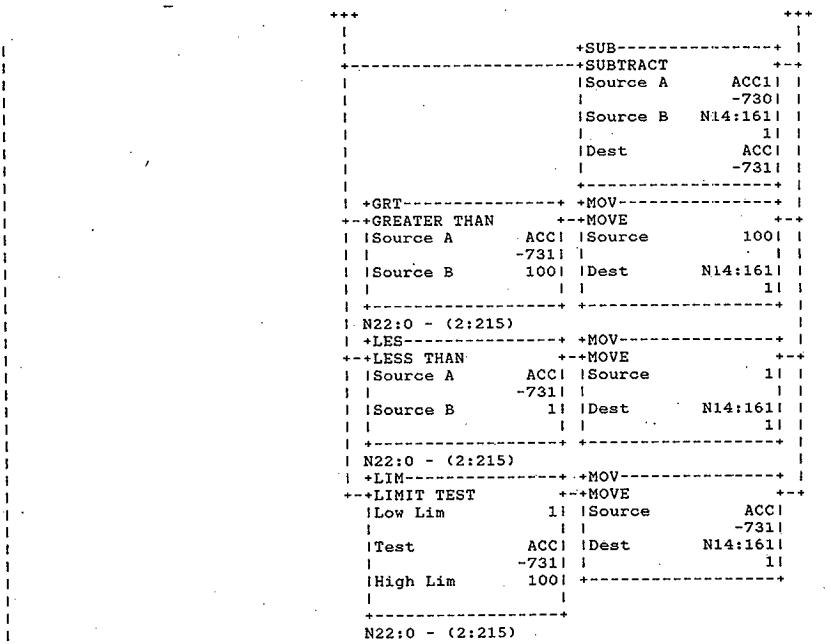


Rung 2:523




SUB
SUBTRACT
Source A DIF1_173V[-10]
Source B DIF2_173V[-1]
Dest DDIF1[-1]
MOV
MOVE
Source DIF1_173V[-10]
Dest DIF2_173V[-1]
SUB
SUBTRACT
Source A DIF1_173V[-10]
Source B 9
Dest DIF1_173V[-10]
MUL
MULTIPLY
Source A DIF1_173V[-10]
Source B DIF1_173V[-10]
Dest ACC[-731]
MUL
MULTIPLY
Source A ACC[-731]
Source B DIF1_173V[-10]
Dest ACC[-731]
CLR
CLEAR
Dest S:5[0]
MUL
MULTIPLY
Source A DDIF1[-1]
Source B DDIF1[-1]
Dest ACC1[-730]

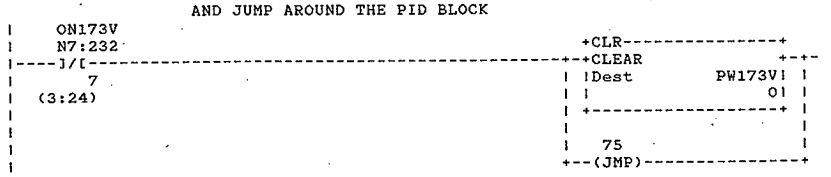

+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
+EQU
+EQUAL
N7:235
( )
Source A ACC
-731
6
Source B
0
N22:0 - (2:215)
+EQU
+EQUAL
+SUB
+SUBTRACT
Source A ACC
-731
Source B
1
Dest ACC
-731
N22:0 - (2:215)
SCRATCH
N7:235
+ADD
+ADD
6
(2:215)
Source A ACC
-731
Source B
1
Dest ACC
-731
+ADD
+ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730



Rung 2:524

Rung 2:525

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:526
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM173V                                                          PID173V/1
|    N7:232                                                           N14:150
|----]/[-------------------------------------------------------------( )----
|       6                                                                  1
|  (3:24)

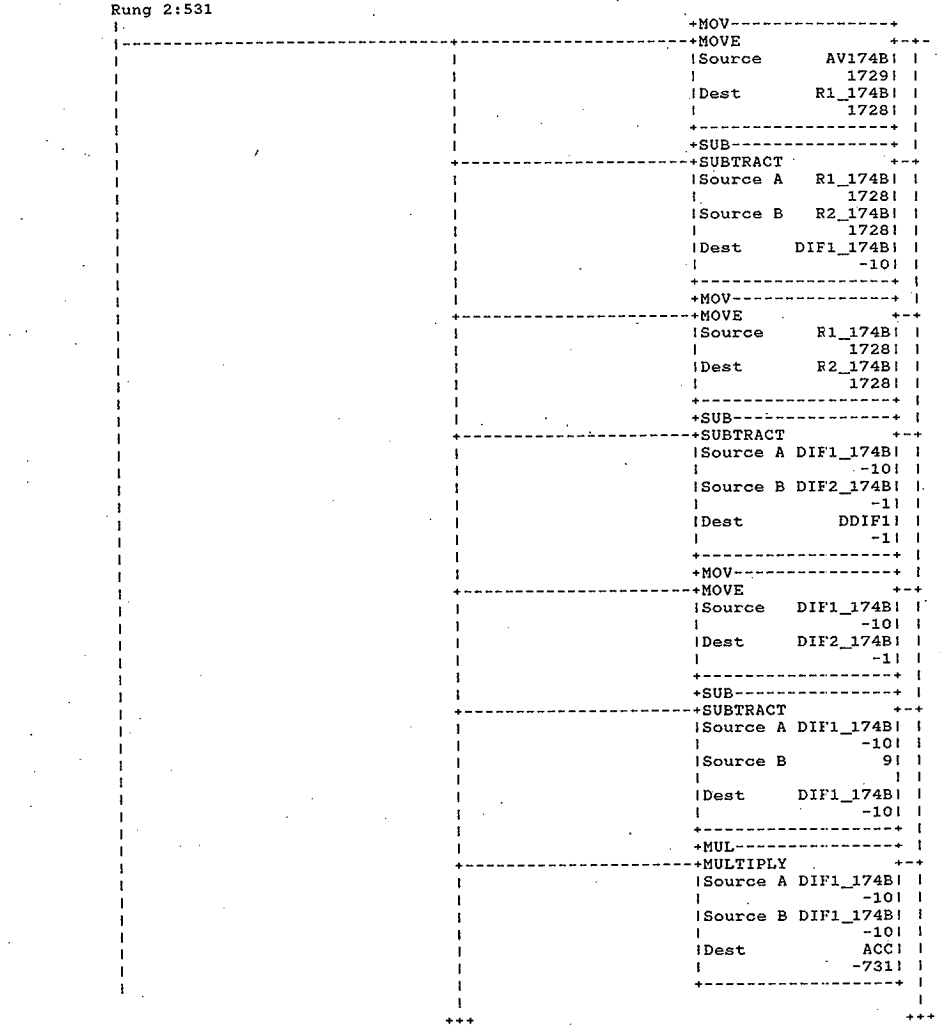
Rung 2:527
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                        +MOV---------------+
|-------------------------------------------------------+MOVE              +-
|                                                        |Source     SET173V|
|                                                        |                 0|
|                                                        |Dest     PIDSP173V|
|                                                        |                 0|
|                                                        +------------------+

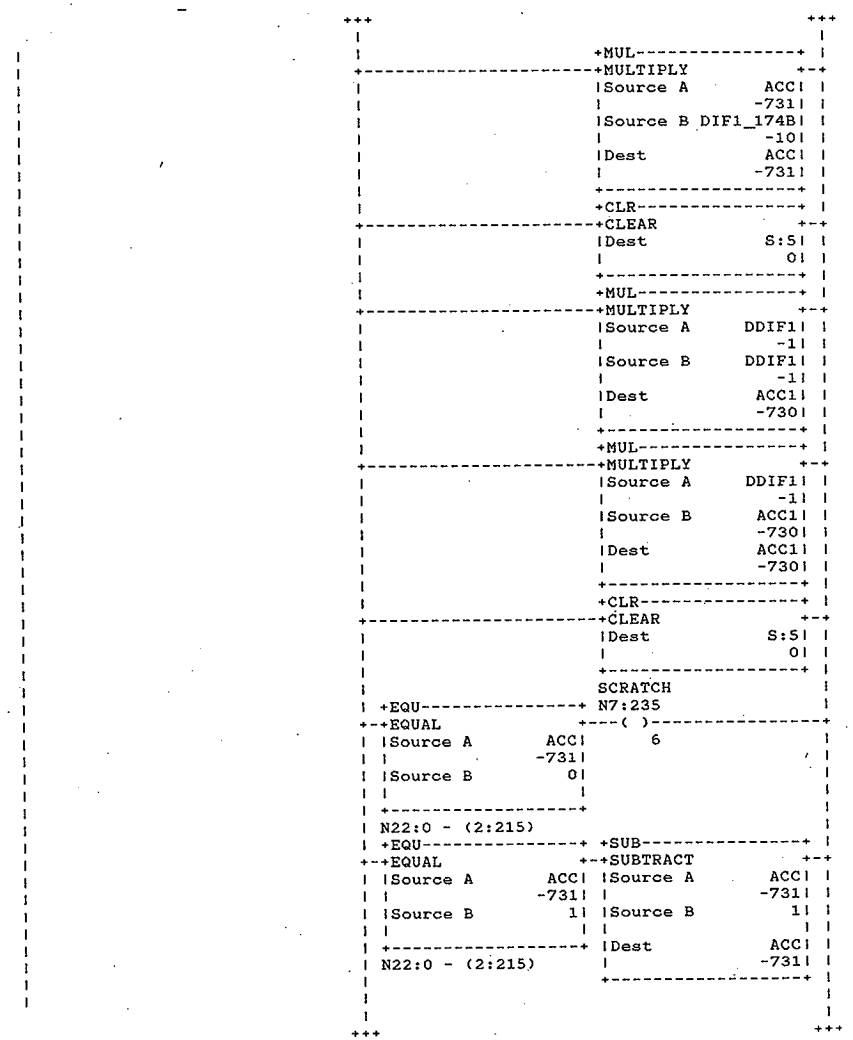
Rung 2:528
|                                                  +PID--------------------+
|-------------------------------------------------+-+PID                   +-+-
|                                                | |Control Block   PID173V| |
|                                                | |Process Variable AV173V| |
|                                                | |Control Variable CV173V| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                | +SCL---------------+      |
|                                                +-+SCALE             +------+
|                                                | |Source      CV173V|      |
|                                                | |                 0|      |
|                                                | |Rate [/10000]   15|      |
|                                                | |                  |      |
|                                                | |Offset           0|      |
|                                                | |                  |      |
|                                                | |Dest        PW173V|      |
|                                                | |                 0|      |
|                                                | +------------------+      |
|                                                | +CLR---------------+      |
|                                                +-+CLEAR             +------+
|                                                  |Dest           S:5|
|                                                  |                 0|
|                                                  +------------------+

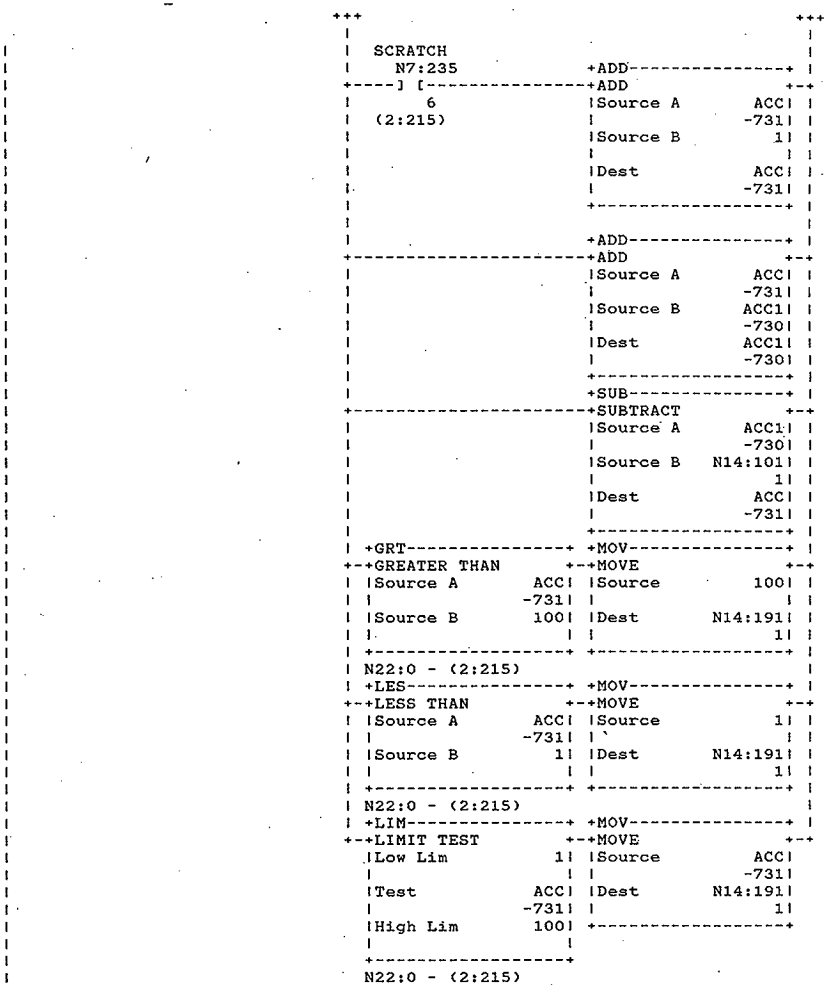
Rung 2:529
|   75                                                                 N7:235
|--[LBL]-------------------------------------------------------------( )---
|                                                                          8

Rung 2:530
|                                                                    PID174B
| RT_TMR/DN
|   T4:87                                                                 36
|----]/[-------------------------------------------------------------(JMP)----
|      DN
|  (2:42)
```

Rung 2:531


MOV
MOVE
Source AV174B 1729
Dest R1_174B 1728
SUB
SUBTRACT
Source A R1_174B 1728
Source B R2_174B 1728
Dest DIF1_174B -10
MOV
MOVE
Source R1_174B 1728
Dest R2_174B 1728
SUB
SUBTRACT
Source A DIF1_174B -10
Source B DIF2_174B -1
Dest DDIF1 -1
MOV
MOVE
Source DIF1_174B -10
Dest DIF2_174B -1
SUB
SUBTRACT
Source A DIF1_174B -10
Source B 9
Dest DIF1_174B -10
MUL
MULTIPLY
Source A DIF1_174B -10
Source B DIF1_174B -10
Dest ACC -731


+MUL
+MULTIPLY
Source A ACC
-731
Source B DIF1_174B
-10
Dest ACC
-731
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N7:235
+EQU
+EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
( )
6
+EQU
+EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
+SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N14:101
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
MOV
MOVE
Source 100
Dest N14:191
1
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
MOV
MOVE
Source 1
Dest N14:191
1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
MOV
MOVE
Source ACC
-731
Dest N14:191
1
N22:0 - (2:215)

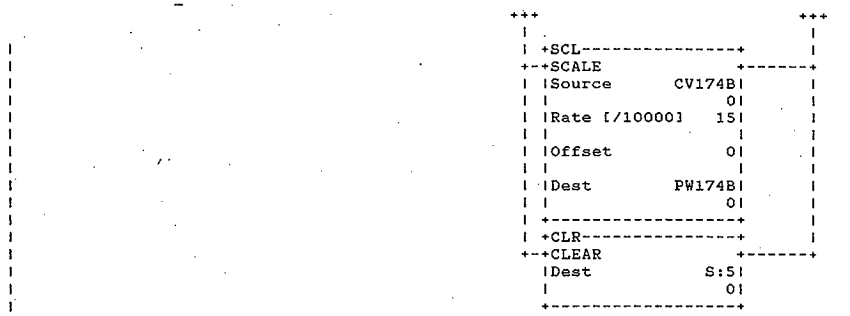
```
Rung 2:532
| PID174B
|                                                                    DUMMY36
|      36                                                             N22:9
|---[LBL]-------------------------------------------------------------( )----
|                                                                        3

Rung 2:533
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON174B                                                  +CLR---------------+
|    N7:232                                                 +-+CLEAR             +-+--
|----]/[-------------------------------------------------+-+ |Dest        PW174B| |
|       9                                                 | |                 0| |
|  (3:24)                                                 | +------------------+ |
|                                                         |                      |
|                                                         |   76                 |
|                                                         +--(JMP)---------------+
|

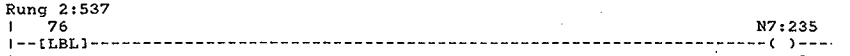
Rung 2:534
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM174B                                                            PID174B/1
|    N7:232                                                             N14:180
|----]/[-------------------------------------------------------------( )-----
|       8                                                                  1
|  (3:24)

Rung 2:535
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                          |Source     SET174B|
|                                                          |                 0|
|                                                          |Dest     PIDSP174B|
|                                                          |                 0|
|                                                          +------------------+

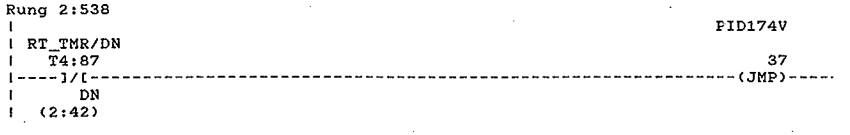
Rung 2:536
|                                                    +PID--------------------+
|-------------------------------------------------+-+PID                    +-+--
|                                                 | |Control Block   PID174B| |
|                                                 | |Process Variable AV174B| |
|                                                 | |Control Variable CV174B| |
|                                                 | |Control Block Length 23| |
|                                                 | +-----------------------+ |
|                                                 |                           |
|                                                +++                         +++
```



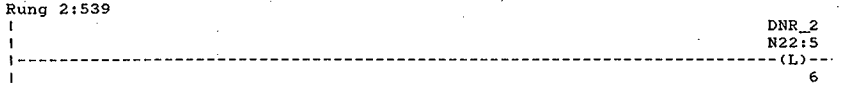
Rung 2:537



Rung 2:538

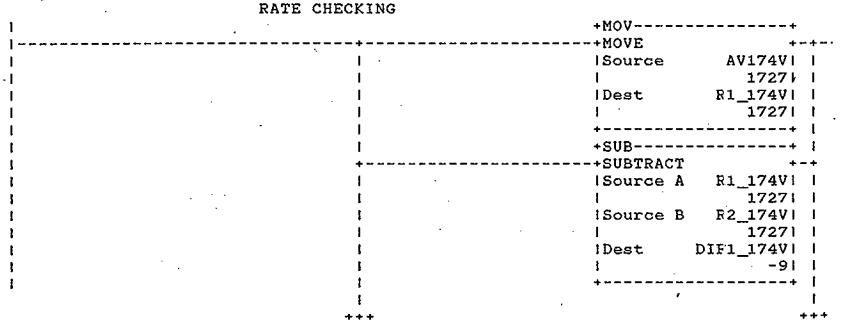


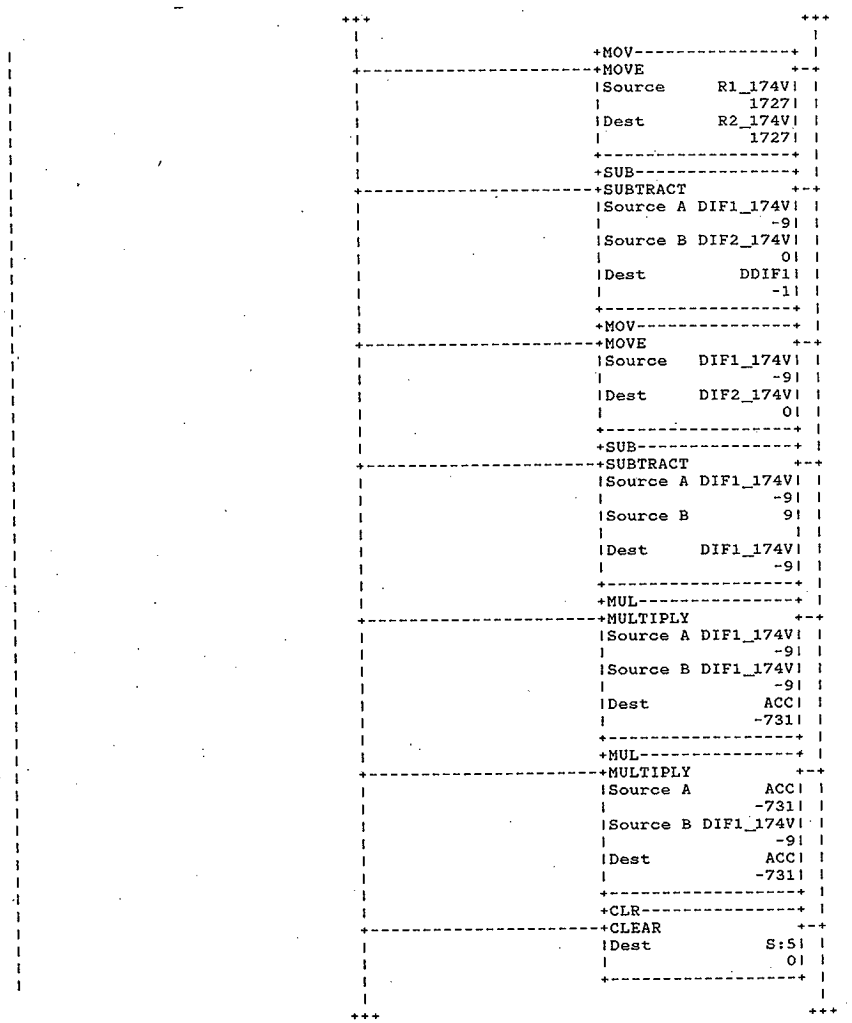
Rung 2:539

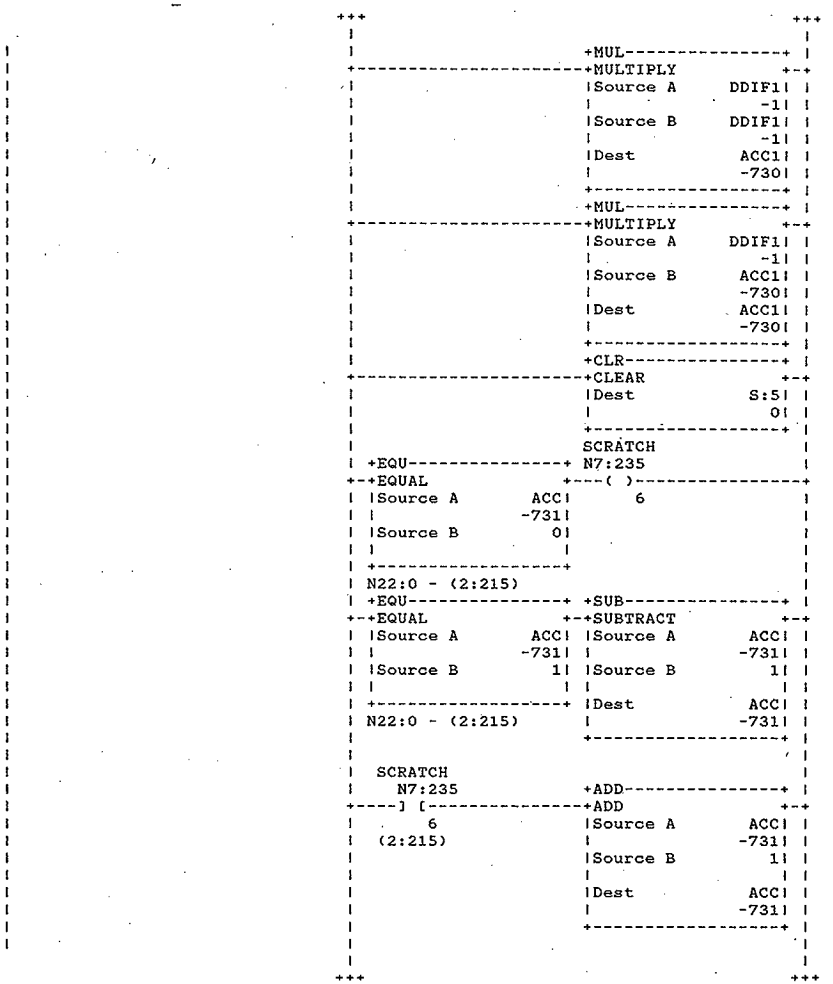


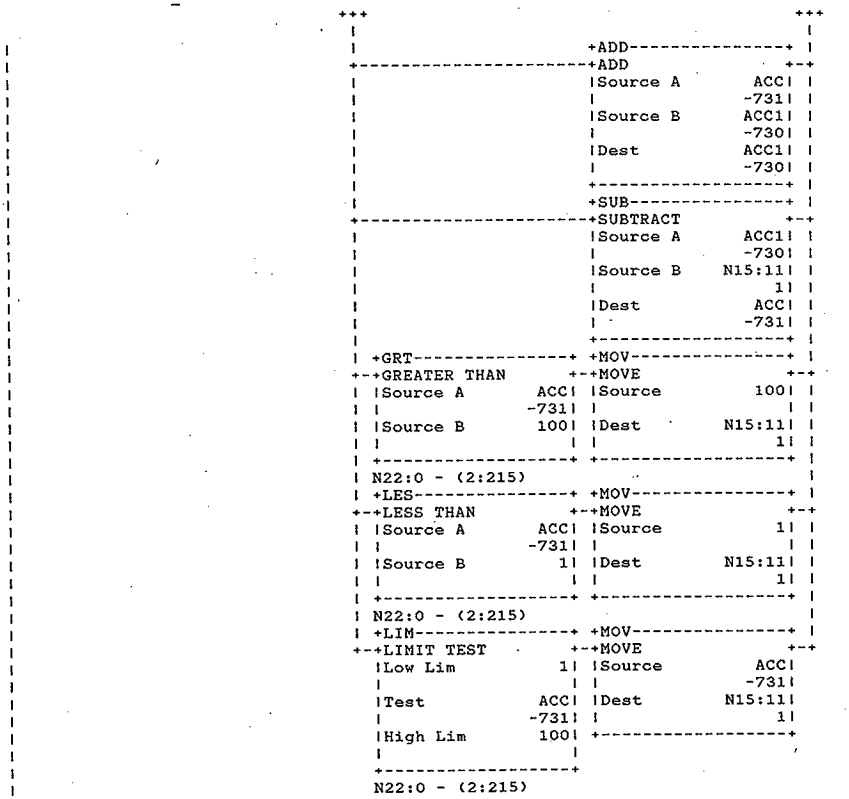
Rung 2:540

RATE CHECKING




+MOV
+MOVE
Source R1_174V 1727
Dest R2_174V 1727
+SUB
+SUBTRACT
Source A DIF1_174V -9
Source B DIF2_174V 0
Dest DDIF1 -1
+MOV
+MOVE
Source DIF1_174V -9
Dest DIF2_174V 0
+SUB
+SUBTRACT
Source A DIF1_174V -9
Source B 9
Dest DIF1_174V -9
+MUL
+MULTIPLY
Source A DIF1_174V -9
Source B DIF1_174V -9
Dest ACC -731
+MUL
+MULTIPLY
Source A ACC -731
Source B DIF1_174V -9
Dest ACC -731
+CLR
+CLEAR
Dest S:5 0


MUL
MULTIPLY
Source A DDIF1 -1
Source B DDIF1 -1
Dest ACC1 -730
MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731



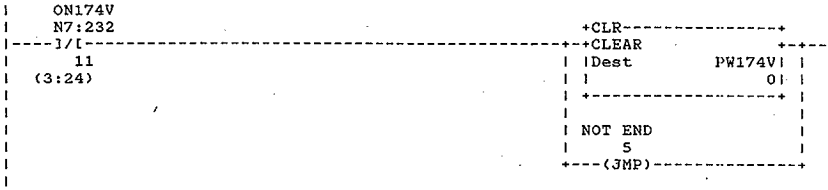
Rung 2:541
PID174V

37 [LBL]

DUMMY37
N22:9
( )
4

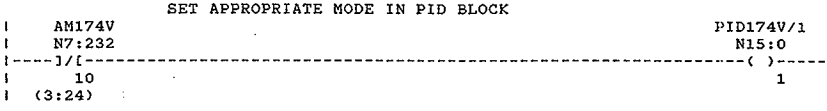
Rung 2:542

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



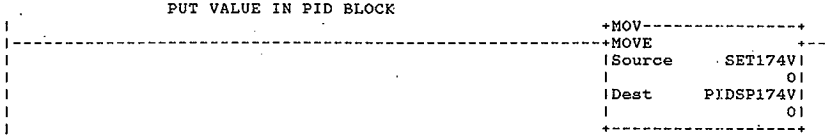
Rung 2:543

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

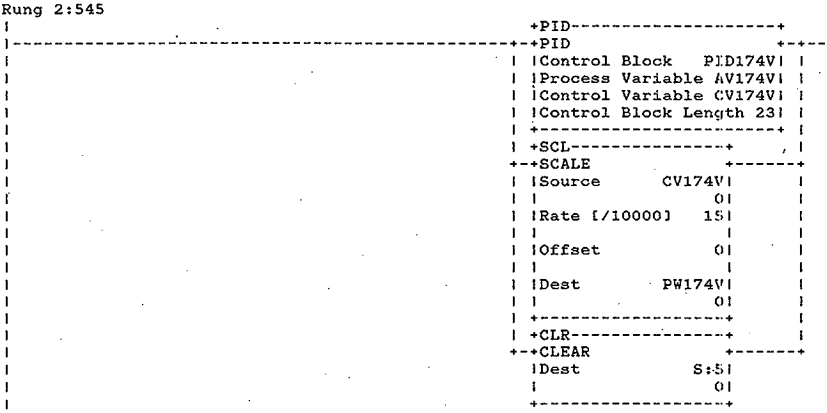


Rung 2:544

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



Rung 2:545



```
Rung 2:546
|                                                                    NOT END
|                                                                        5
|-------------------------------------------------------------------(JMP)-----
|

Rung 2:547
*******************************************************************************
                        BEGIN SECTION 3
| MD3
|                                                                    DUMMY14
|     3                                                               N22:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                        13

Rung 2:548
|                                                                      DN_3
|                                                                      N22:5
|-------------------------------------------------------------------(L)---
|                                                                          3

Rung 2:549
*******************************************************************************
  READ EACH THERMOCOUPLE AND STORE EACH TE'S VALUE IN ITS OWN MEMORY REGISTER
*******************************************************************************
|                                                          +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                          |Source A   TC175B1|
|                                                          |               727|
|                                                          |Source B      1000|
|                                                          |                  |
|                                                          |Dest        C175B1|
|                                                          |              1727|
|                                                          +------------------+

Rung 2:550
| +GRT---------------+                                     +MOV---------------+
|-+GREATER THAN      +-------------------------------------+MOVE              +--
| |Source A    C175B1|                                     |Source       16383|
| |              1727|                                     |                  |
| |Source B     16383|                                     |Dest        C175B1|
| |                  |                                     |              1727|
| +------------------+                                     +------------------+
| N7:49 - (2:549)

Rung 2:551
|                                                          +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                          |Source A   TC175B2|
|                                                          |               728|
|                                                          |Source B      1000|
|                                                          |                  |
|                                                          |Dest        C175B2|
|                                                          |              1728|
|                                                          +------------------+
```

```
Rung 2:552
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C175B2|                                  |Source       16383|
| |              1728|                                  |                  |
| |Source B     16383|                                  |Dest        C175B2|
| |                  |                                  |              1728|
| +------------------+                                  +------------------+
| N7:50 - (2:551)

Rung 2:553
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC175V1|
|                                                       |               724|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C175V1|
|                                                       |              1724|
|                                                       +------------------+

Rung 2:554
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C175V1|                                  |Source       16383|
| |              1724|                                  |                  |
| |Source B     16383|                                  |Dest        C175V1|
| |                  |                                  |              1724|
| +------------------+                                  +------------------+
| N7:51 - (2:553)

Rung 2:555
|
|                                                       +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                       |Source A   TC175V2|
|                                                       |               722|
|                                                       |Source B      1000|
|                                                       |                  |
|                                                       |Dest        C175V2|
|                                                       |              1722|
|                                                       +------------------+

Rung 2:556
|
| +GRT---------------+                                  +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C175V2|                                  |Source       16383|
| |              1722|                                  |                  |
| |Source B     16383|                                  |Dest        C175V2|
| |                  |                                  |              1722|
| +------------------+                                  +------------------+
| N7:52 - (2:555)
```

```
Rung 2:557
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC176B1|
|                                                                  |               711|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C176B1|
|                                                                  |              1711|
|                                                                  +------------------+

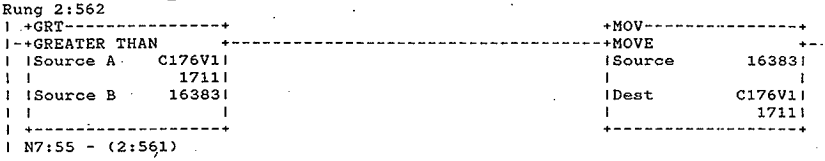
Rung 2:558
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C176B1|                                             |Source       16383|
| |              1711|                                             |                  |
| |Source B     16383|                                             |Dest        C176B1|
| |                  |                                             |              1711|
| +------------------+                                             +------------------+
| N7:53 - (2:557)

Rung 2:559
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC176B2|
|                                                                  |               713|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C176B2|
|                                                                  |              1713|
|                                                                  +------------------+

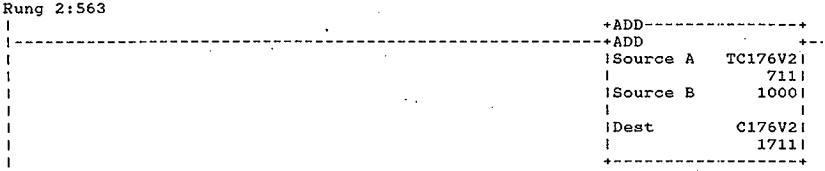
Rung 2:560
| +GRT---------------+                                             +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE              +--
| |Source A    C176B2|                                             |Source       16383|
| |              1713|                                             |                  |
| |Source B     16383|                                             |Dest        C176B2|
| |                  |                                             |              1713|
| +------------------+                                             +------------------+
| N7:54 - (2:559)

Rung 2:561
|                                                                  +ADD---------------+
|-----------------------------------------------------------------+ADD               +--
|                                                                  |Source A   TC176V1|
|                                                                  |               711|
|                                                                  |Source B      1000|
|                                                                  |                  |
|                                                                  |Dest        C176V1|
|                                                                  |              1711|
|                                                                  +------------------+
```

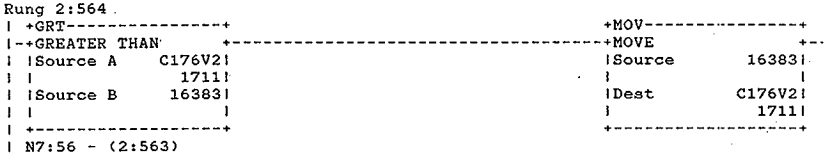
Rung 2:562



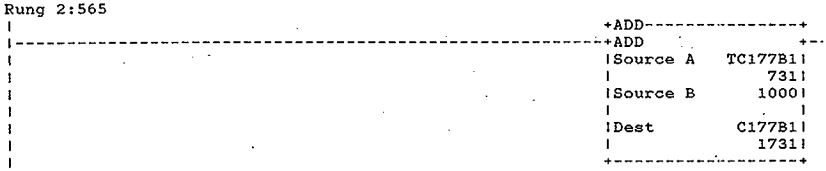
Rung 2:563



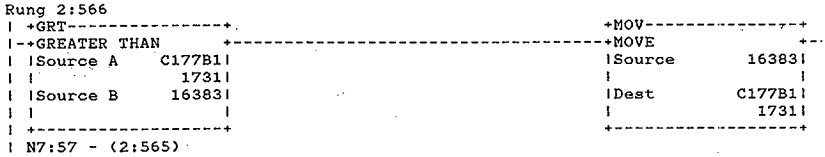
Rung 2:564



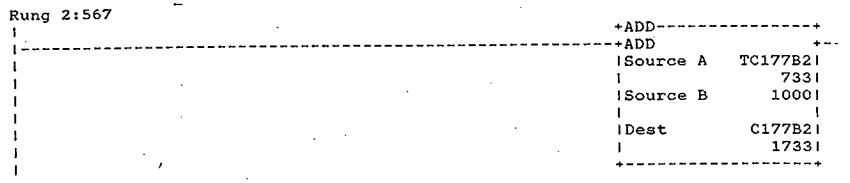
Rung 2:565



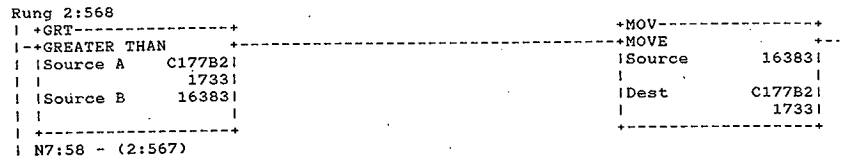
Rung 2:566



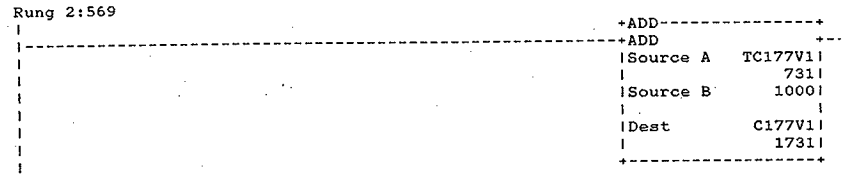
Rung 2:567



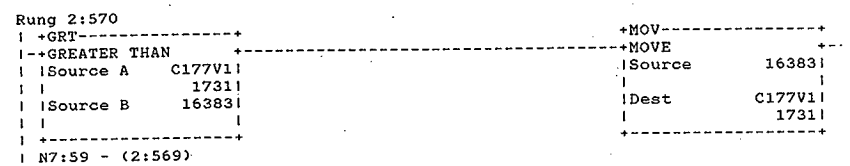
Rung 2:568



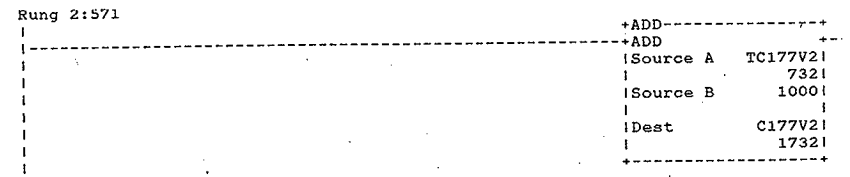
Rung 2:569



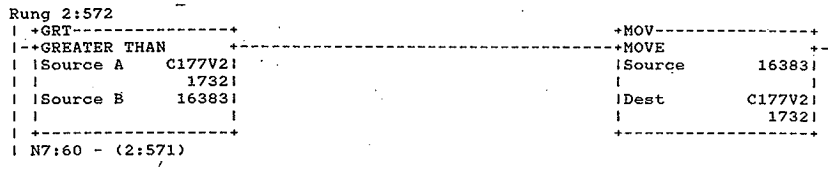
Rung 2:570



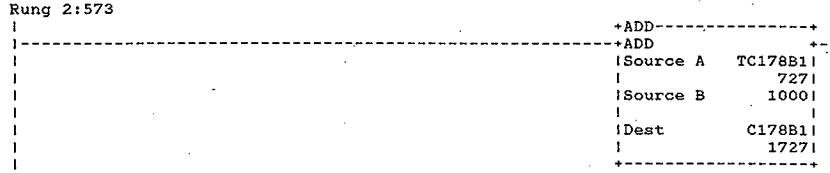
Rung 2:571



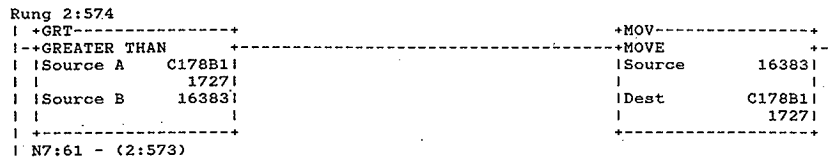
Rung 2:572



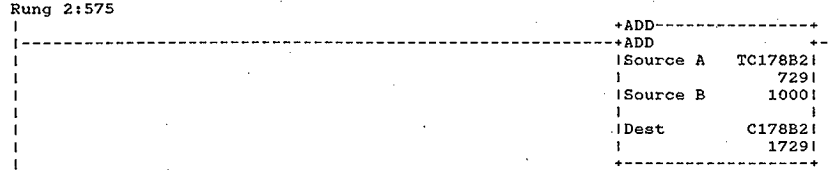
Rung 2:573



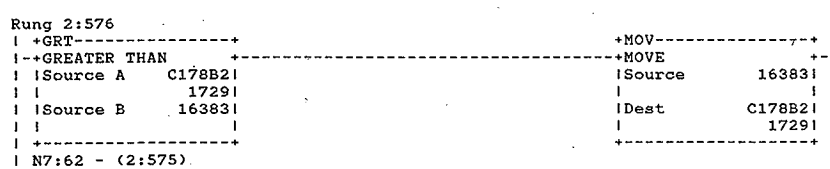
Rung 2:574



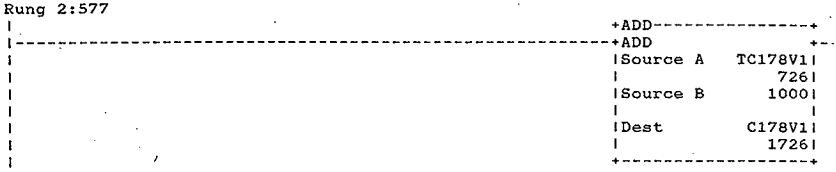
Rung 2:575



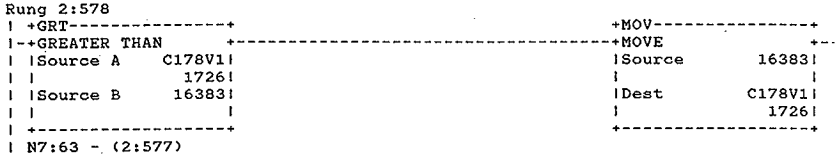
Rung 2:576



Rung 2:577

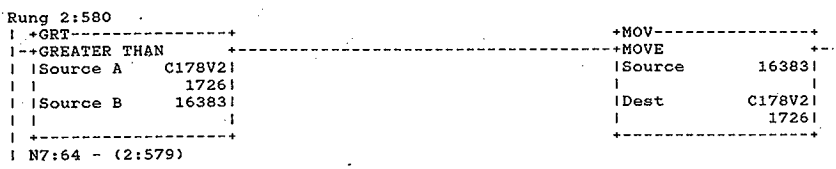


Rung 2:578

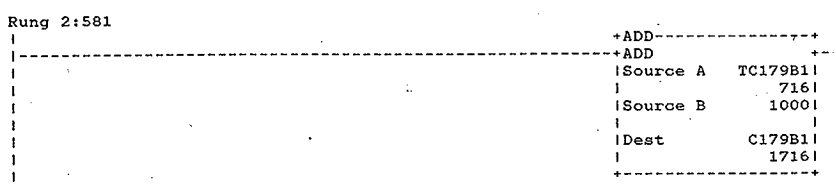


Rung 2:579

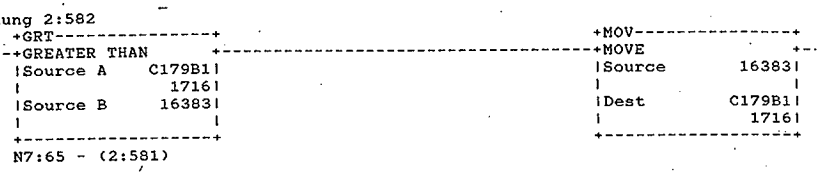
Rung 2:580



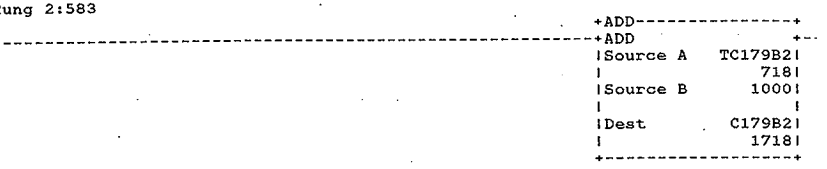
Rung 2:581



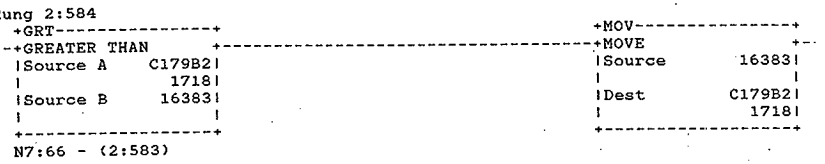
Rung 2:582



Rung 2:583



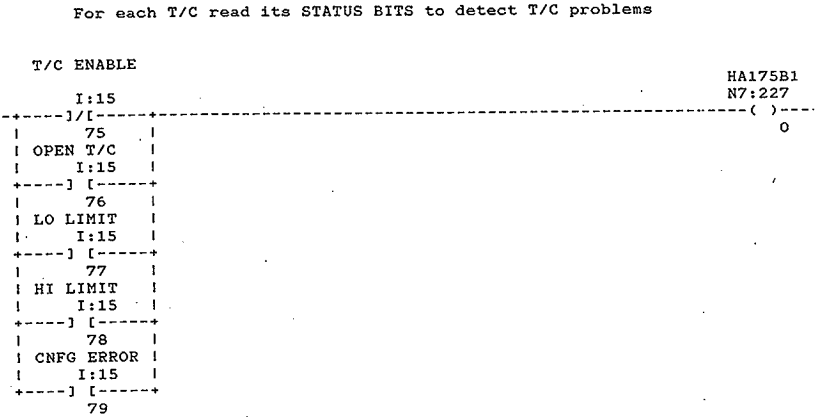
Rung 2:584



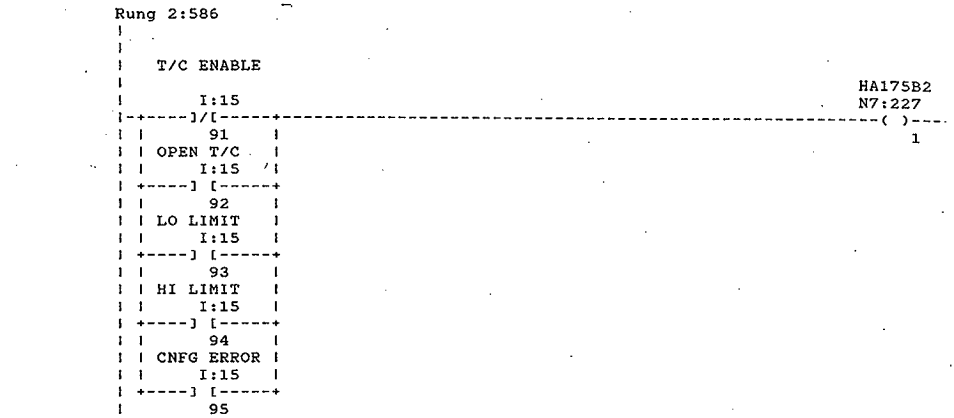
Rung 2:585

** Alarms **

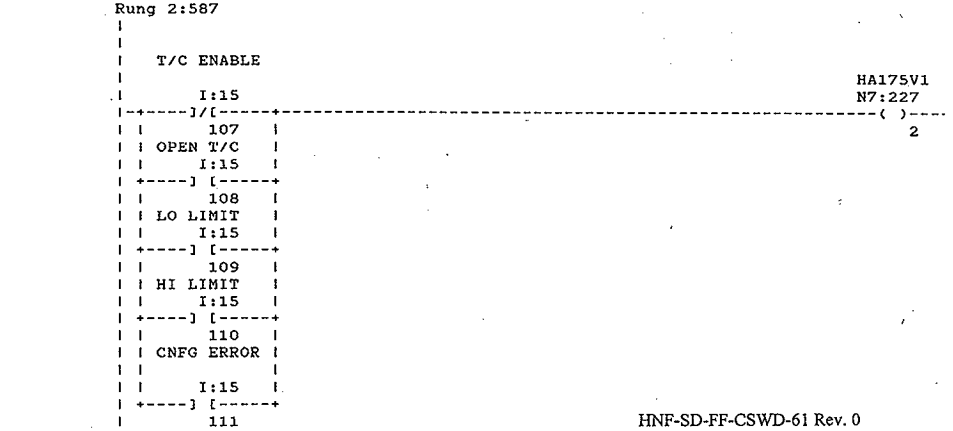
For each T/C read its STATUS BITS to detect T/C problems



Rung 2:586



Rung 2:587



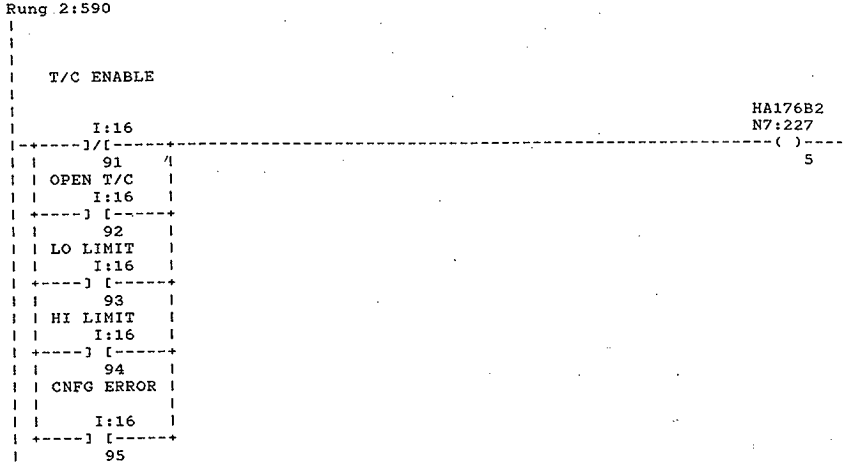
Rung 2:588

```
|
|
|
|   T/C ENABLE
|
|                                                                    HA175V2
|       I:15                                                         N7:227
|-+----]/[-----+-------------------------------------------------------( )---
| |       123  |                                                          3
| | OPEN T/C   |
| |      I:15  |
| +----] [-----+
| |       124  |
| | LO LIMIT   |
| |      I:15  |
| +----] [-----+
| |       125  |
| | HI LIMIT   |
| |      I:15  |
| +----] [-----+
| |       126  |
| | CNFG ERROR |
| |            |
| |      I:15  |
| +----] [-----+
|         127
```

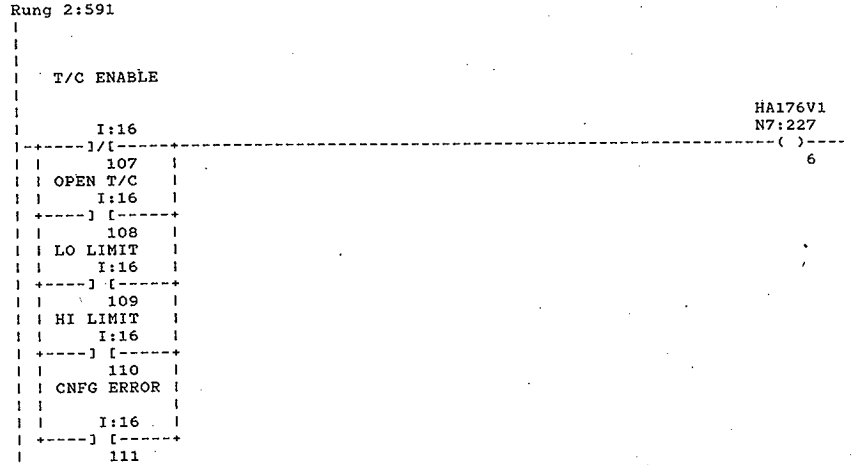
Rung 2:589

```
|
|
|
|   T/C ENABLE
|
|                                                                    HA176B1
|       I:16                                                         N7:227
|-+----]/[-----+-------------------------------------------------------( )---
| |       75   |                                                          4
| | OPEN T/C   |
| |      I:16  |
| +----] [-----+
| |       76   |
| | LO LIMIT   |
| |      I:16  |
| +----] [-----+
| |       77   |
| | HI LIMIT   |
| |      I:16  |
| +----] [-----+
| |       78   |
| | CNFG ERROR |
| |            |
| |      I:16  |
| +----] [-----+
|         79
```

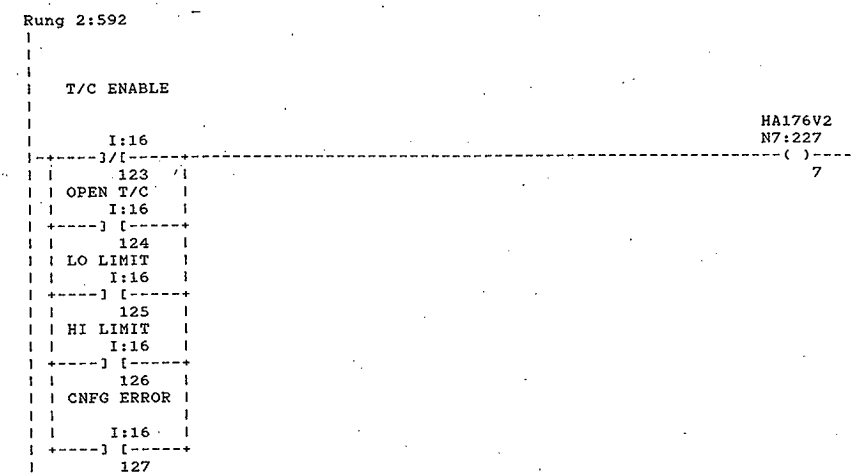
Rung 2:590



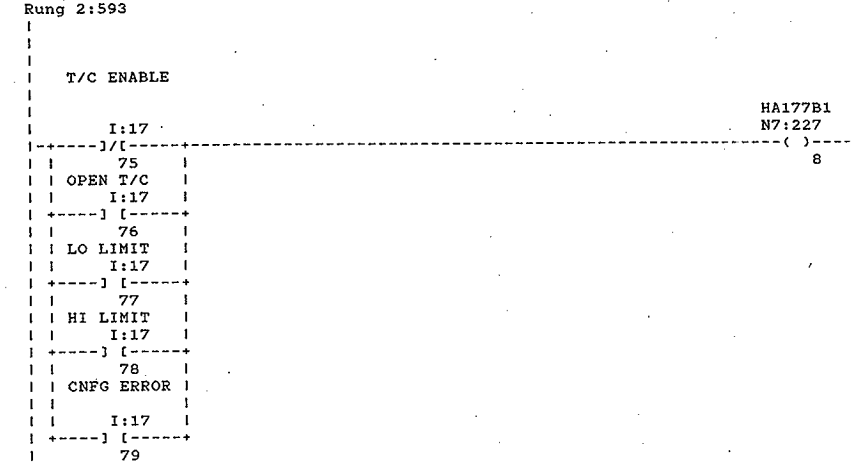
Rung 2:591



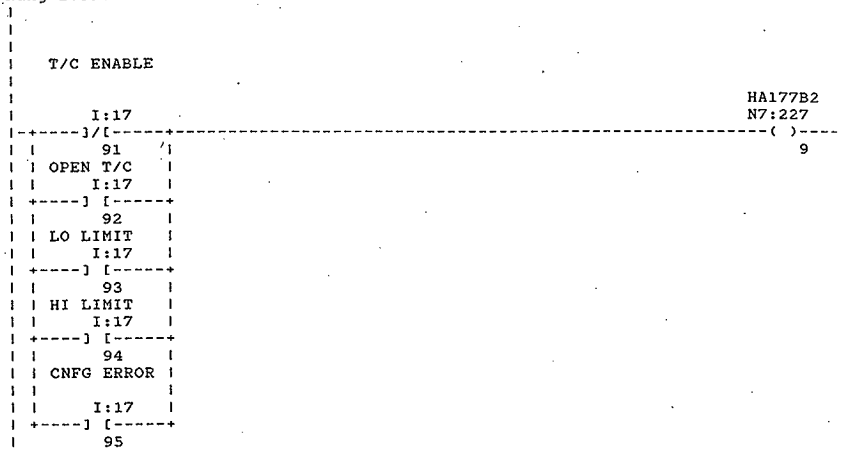
Rung 2:592



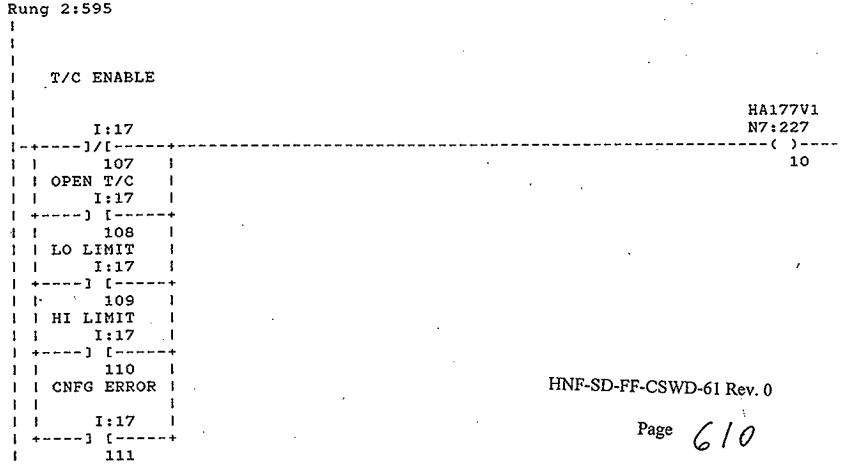
Rung 2:593



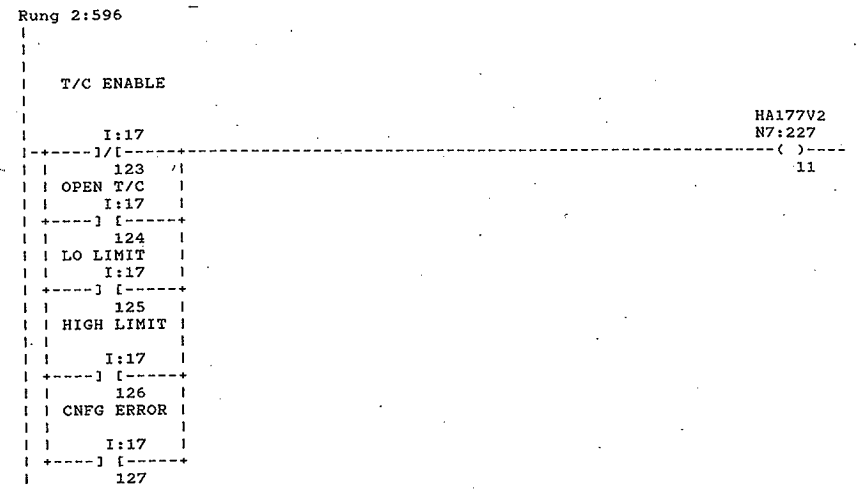
Rung 2:594



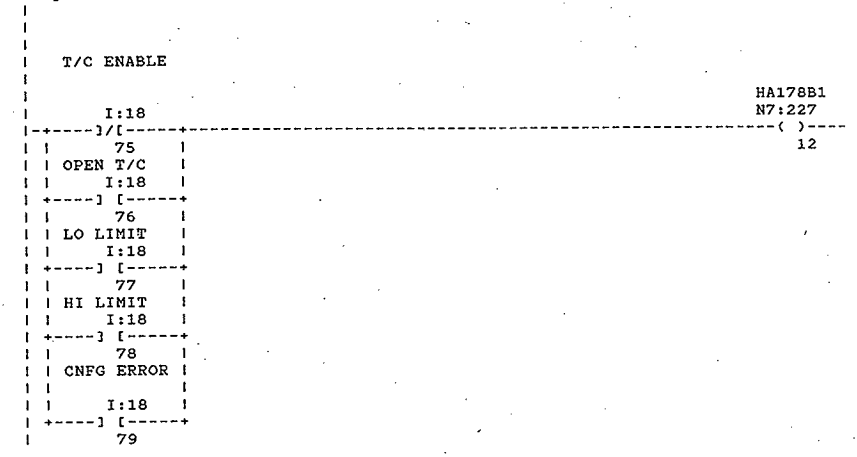
Rung 2:595



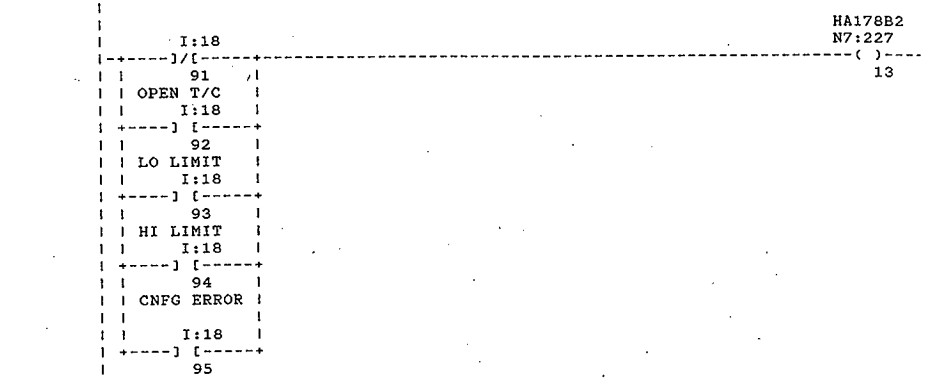
Rung 2:596



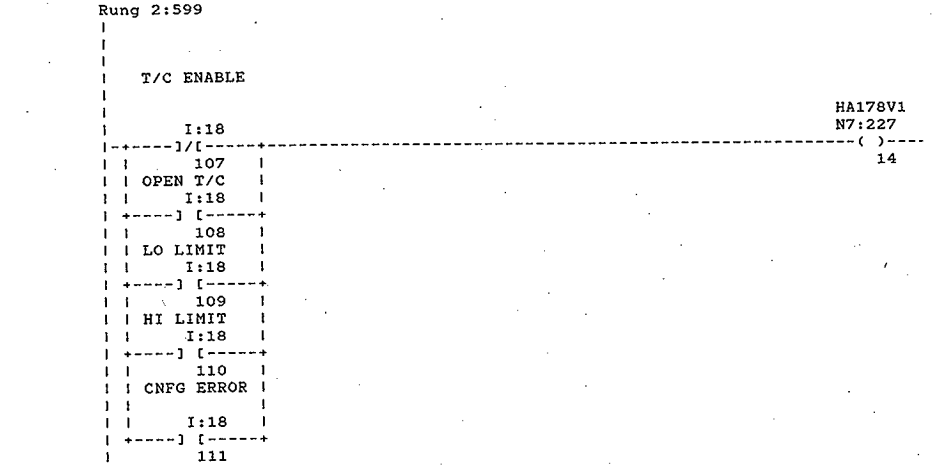
Rung 2:597



Rung 2:598

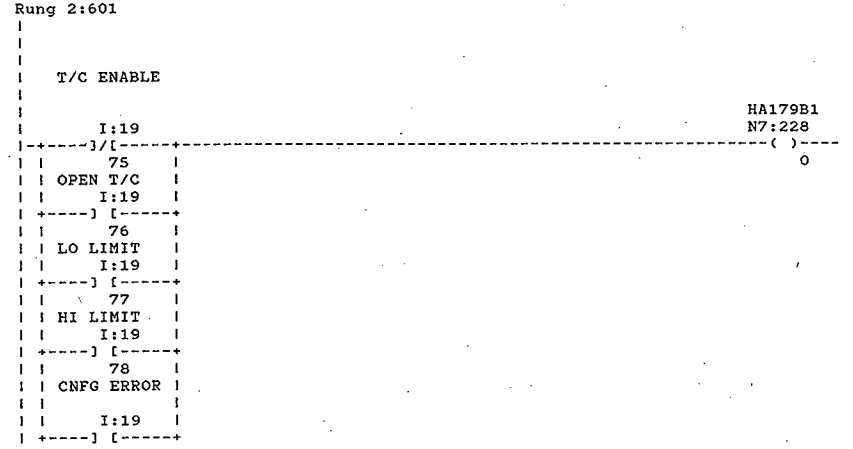


Rung 2:599

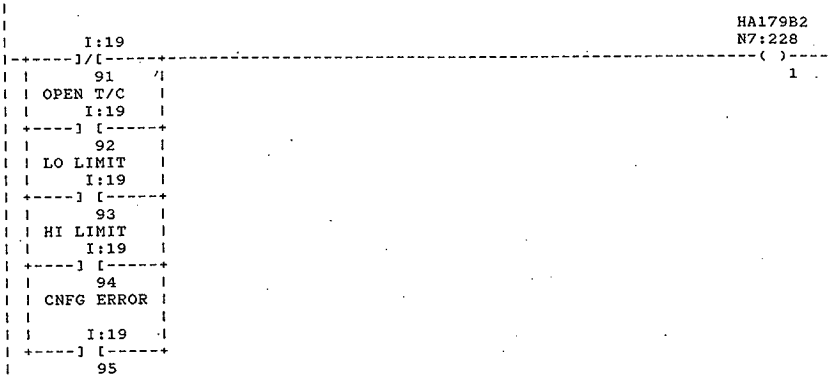


Rung 2:600

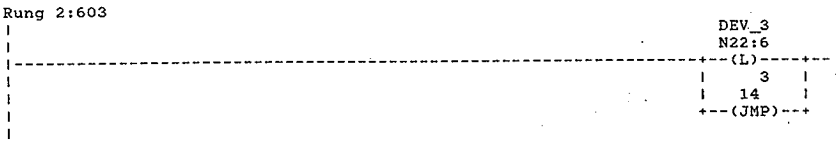
Rung 2:601



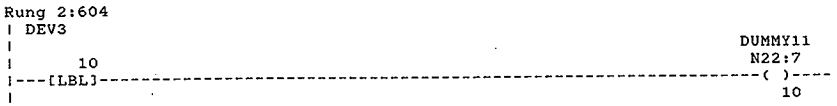
Rung 2:602



Rung 2:603



Rung 2:604



Rung 2:605

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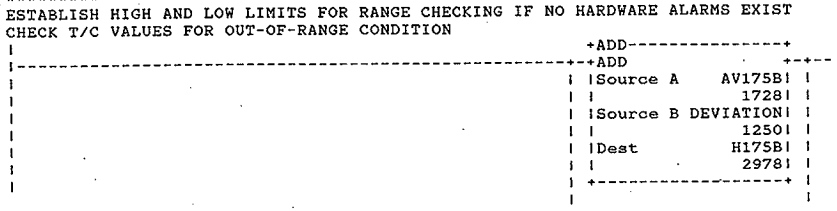
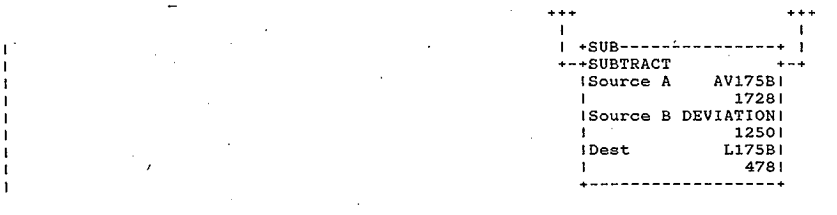
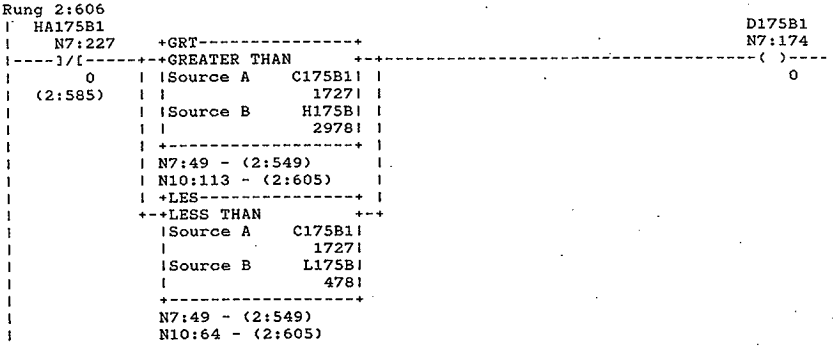
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```

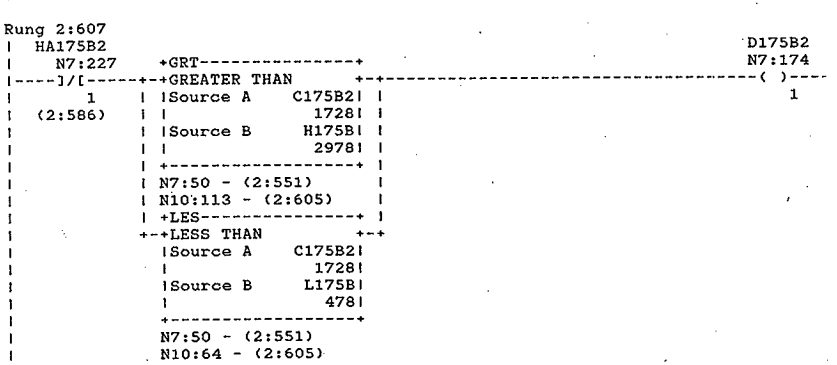




Rung 2:606



Rung 2:607



```
Rung 2:608
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV175V| |
|                                                       | |              1723| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H175V| |
|                                                       | |              2973| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV175V|
|                                                         |              1723|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L175V|
|                                                         |               473|
|                                                         +------------------+

Rung 2:609
|  HA175V1                                                                  D175V1
|    N7:227     +GRT---------------+                                        N7:174
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       2    | |Source A    C175V1| |                                        2
|  (2:587)   | |              1724| |
|            | |Source B     H175V| |
|            | |              2973| |
|            | +------------------+ |
|            | N7:51 - (2:553)      |
|            | N10:114 - (2:608)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C175V1|
|              |              1724|
|              |Source B     L175V|
|              |               473|
|              +------------------+
|              N7:51 - (2:553)
|              N10:65 - (2:608)

Rung 2:610
|
|  HA175V2                                                                  D175V2
|    N7:227     +GRT---------------+                                        N7:174
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       3    | |Source A    C175V2| |                                        3
|  (2:588)   | |              1722| |
|            | |Source B     H175V| |
|            | |              2973| |
|            | +------------------+ |
|            | N7:52 - (2:555)      |
|            | N10:114 - (2:608)    |
|            |                      |
            +++                    +++
```

```
            +++                     +++
             |                       |
|            |                       |
|            | +LES---------------+  |
|            +-+LESS THAN         +-+
|              |Source A    C175V2|
|              |               1722|
|              |Source B     L175V|
|              |                473|
|              +-------------------+
|              N7:52 - (2:555)
|              N10:65 - (2:608)
```

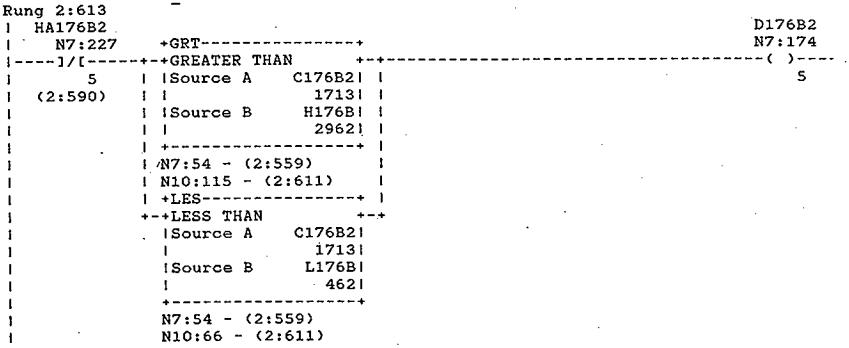
Rung 2:611

```
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A    AV176B| |
|                                                       | |              1712| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H176B| |
|                                                       | |              2962| |
|                                                       | +-------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV176B|
|                                                         |              1712|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L176B|
|                                                         |               462|
|                                                         +-------------------+
```

Rung 2:612

```
|  HA176B1                                                                  D176B1
|    N7:227     +GRT---------------+                                        N7:174
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       4    | |Source A    C176B1| |                                        4
|  (2:589)   | |               1711| |
|            | |Source B     H176B| |
|            | |               2962| |
|            | +-------------------+ |
|            | N7:53 - (2:557)       |
|            | N10:115 - (2:611)     |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C176B1|
|              |               1711|
|              |Source B     L176B|
|              |                462|
|              +-------------------+
|              N7:53 - (2:557)
|              N10:66 - (2:611)
```

Rung 2:613



Rung 2:614

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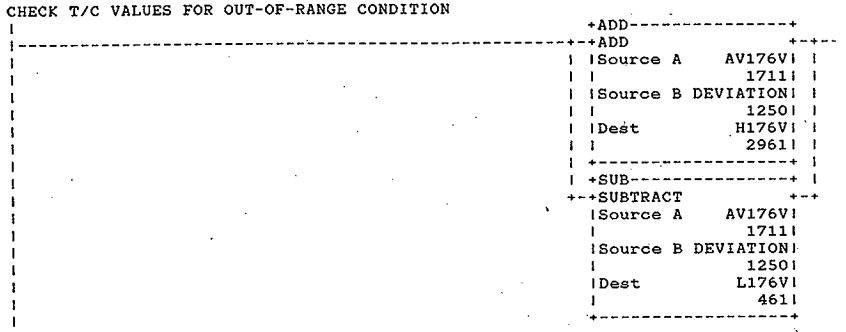
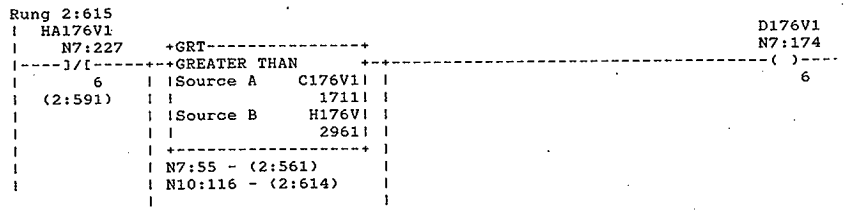
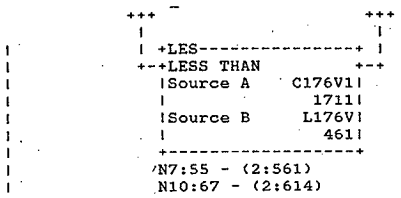
**********************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```

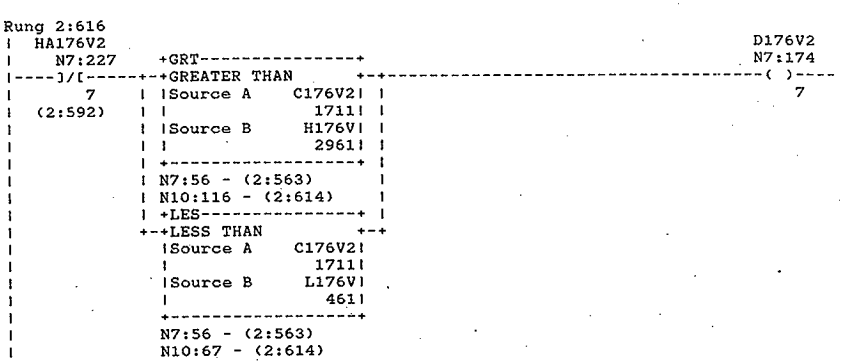


Rung 2:615



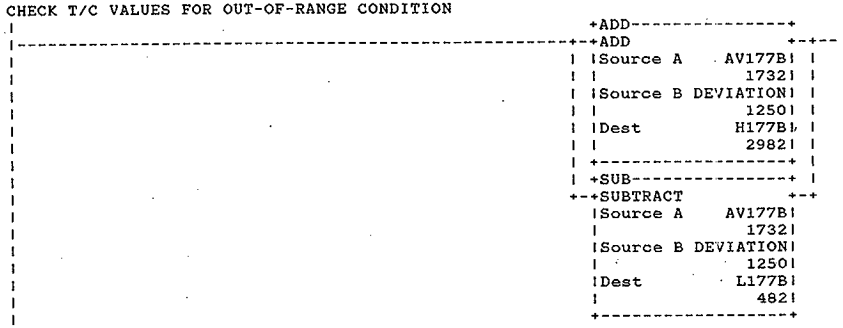


Rung 2:616

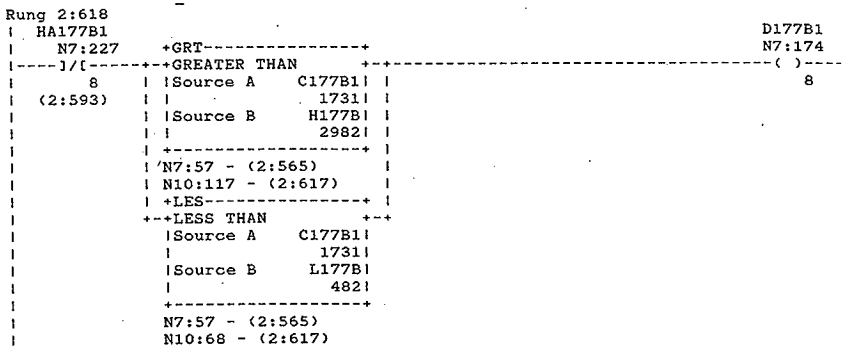


Rung 2:617

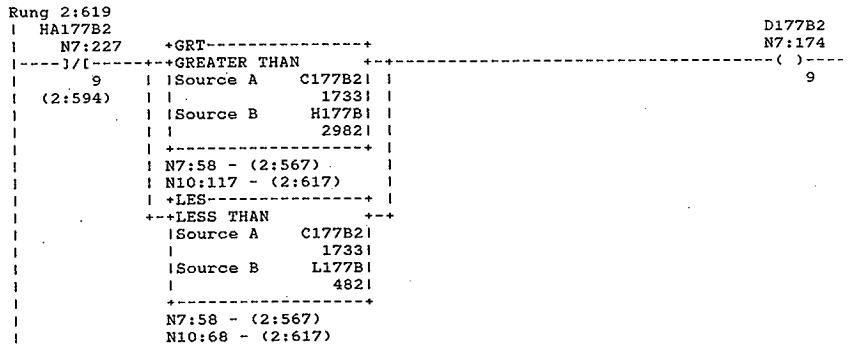
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



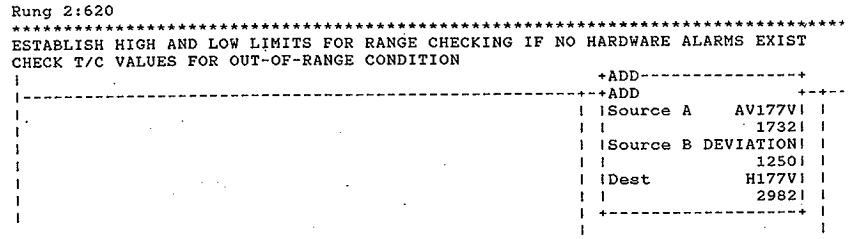
Rung 2:618



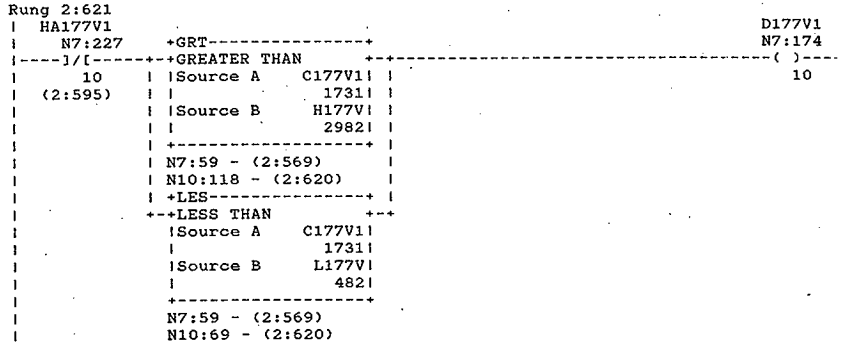
Rung 2:619



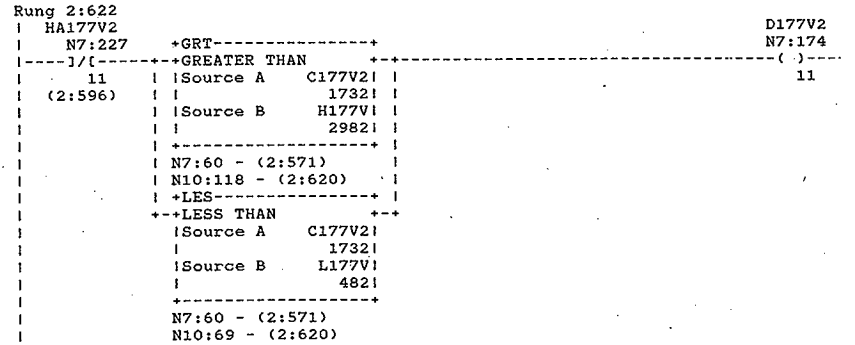
Rung 2:620



Rung 2:621



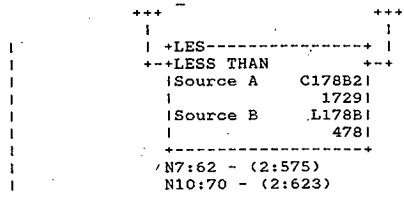
Rung 2:622



```
Rung 2:623
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+--
|                                                       | |Source A    AV178B| |
|                                                       | |              1728| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H178B| |
|                                                       | |              2978| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV178B|
|                                                         |              1728|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L178B|
|                                                         |               478|
|                                                         +------------------+

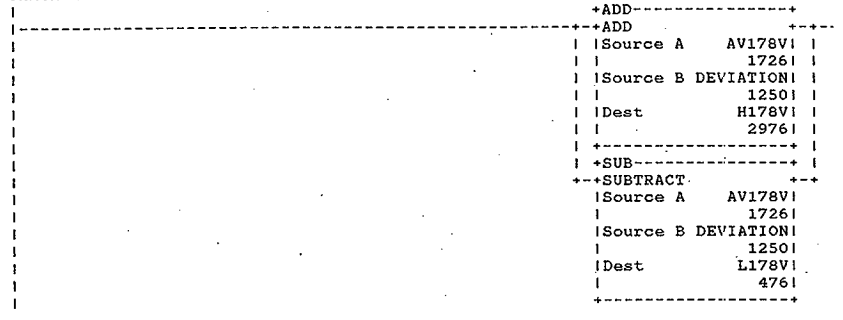
Rung 2:624
|  HA178B1                                                                  D178B1
|    N7:227     +GRT---------------+                                        N7:174
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      12    | |Source A    C178B1| |                                        12
|  (2:597)   | |              1727| |
|            | |Source B     H178B| |
|            | |              2978| |
|            | +------------------+ |
|            | N7:61 - (2:573)      |
|            | N10:119 - (2:623)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C178B1|
|              |              1727|
|              |Source B     L178B|
|              |               478|
|              +------------------+
|              N7:61 - (2:573)
|              N10:70 - (2:623)

Rung 2:625
|  HA178B2                                                                  D178B2
|    N7:227     +GRT---------------+                                        N7:174
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      13    | |Source A    C178B2| |                                        13
|  (2:598)   | |              1729| |
|            | |Source B     H178B| |
|            | |              2978| |
|            | +------------------+ |
|            | N7:62 - (2:575)      |
|            | N10:119 - (2:623)    |
             |                      |
            +++                    +++
```

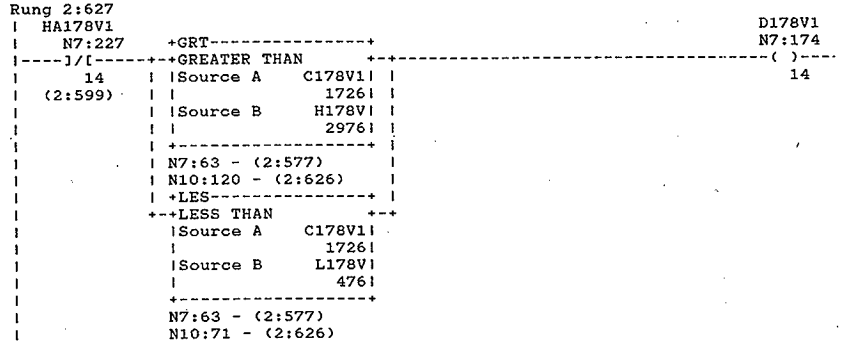


Rung 2:626

ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION



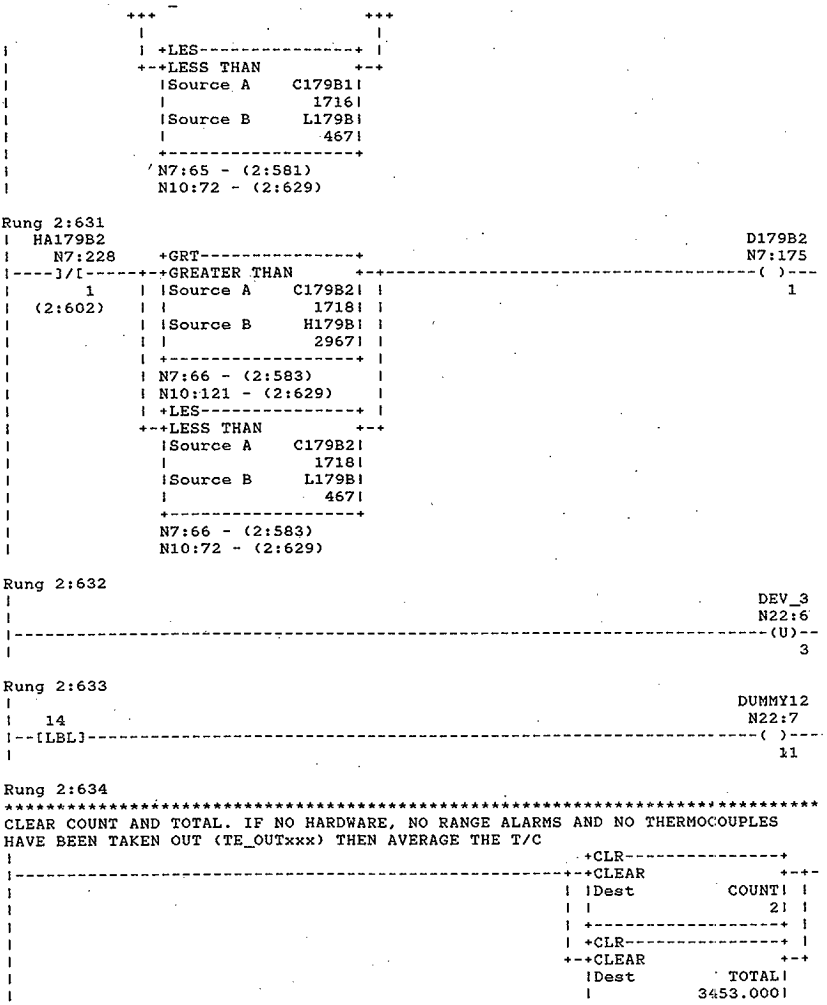
Rung 2:627



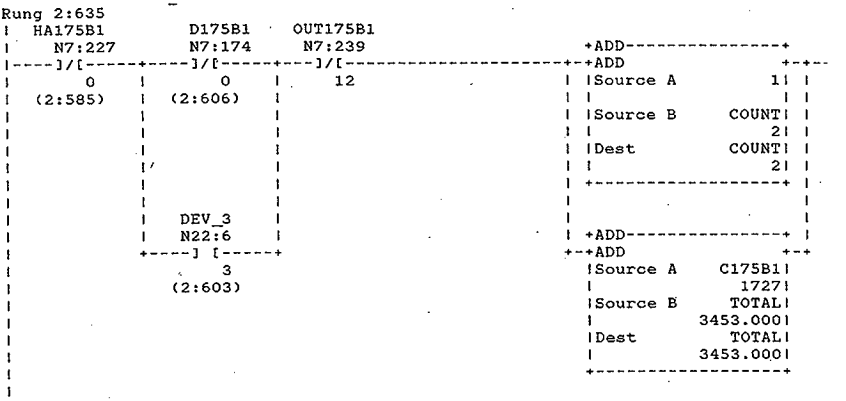
```
Rung 2:628
|  HA178V2                                                                  D178V2
|    N7:227     +GRT---------------+                                        N7:174
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      15    | |Source A    C178V2| |                                        15
|  (2:600)   | |               1726| |
|            | |Source B     H178V| |
|            | |               2976| |
|            | +------------------+ |
|            | N7:64 - (2:579)      |
|            | N10:120 - (2:626)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C178V2|
|              |               1726|
|              |Source B     L178V|
|              |                476|
|              +------------------+
|              N7:64 - (2:579)
|              N10:71 - (2:626)

Rung 2:629
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A    AV179B| |
|                                                       | |               1717| |
|                                                       | |Source B DEVIATION| |
|                                                       | |               1250| |
|                                                       | |Dest          H179B| |
|                                                       | |               2967| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV179B|
|                                                         |               1717|
|                                                         |Source B DEVIATION|
|                                                         |               1250|
|                                                         |Dest          L179B|
|                                                         |                467|
|                                                         +------------------+

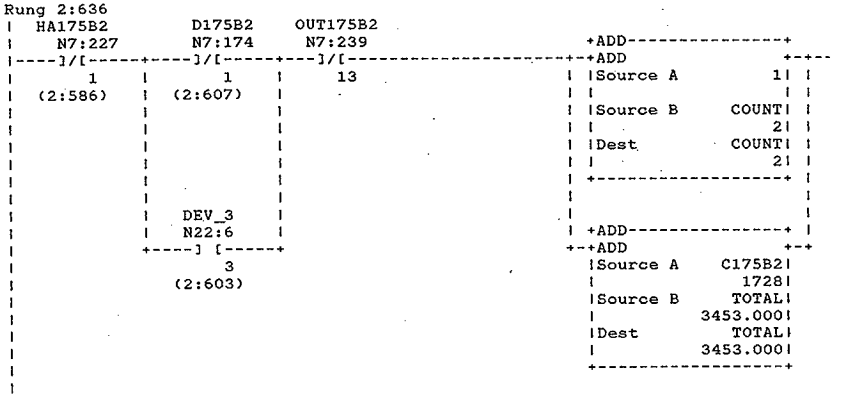
Rung 2:630
|  HA179B1                                                                  D179B1
|    N7:228     +GRT---------------+                                        N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       0    | |Source A    C179B1| |                                         0
|  (2:601)   | |               1716| |
|            | |Source B     H179B| |
|            | |               2967| |
|            | +------------------+ |
|            | N7:65 - (2:581)      |
|            | N10:121 - (2:629)    |
             |                      |
            +++                    +++
```


+LES
LESS THAN
Source A C179B1
1716
Source B L179B
467
N7:65 - (2:581)
N10:72 - (2:629)
Rung 2:631
HA179B2
N7:228
1
(2:602)
+GRT
GREATER THAN
Source A C179B2
1718
Source B H179B
2967
N7:66 - (2:583)
N10:121 - (2:629)
+LES
LESS THAN
Source A C179B2
1718
Source B L179B
467
N7:66 - (2:583)
N10:72 - (2:629)
D179B2
N7:175
1
Rung 2:632
DEV_3
N22:6
(U)
3
Rung 2:633
14
LBL
DUMMY12
N22:7
11
Rung 2:634
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
CLR
CLEAR
Dest COUNT
2
CLR
CLEAR
Dest TOTAL
3453.000

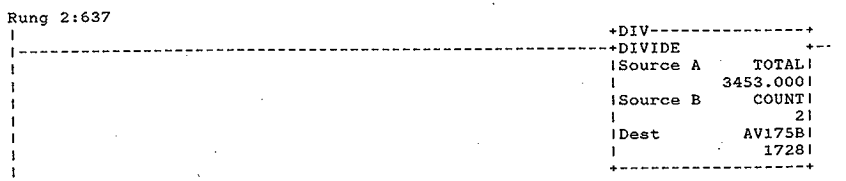
Rung 2:635



Rung 2:636

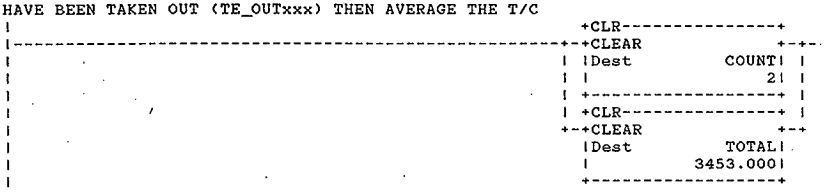


Rung 2:637

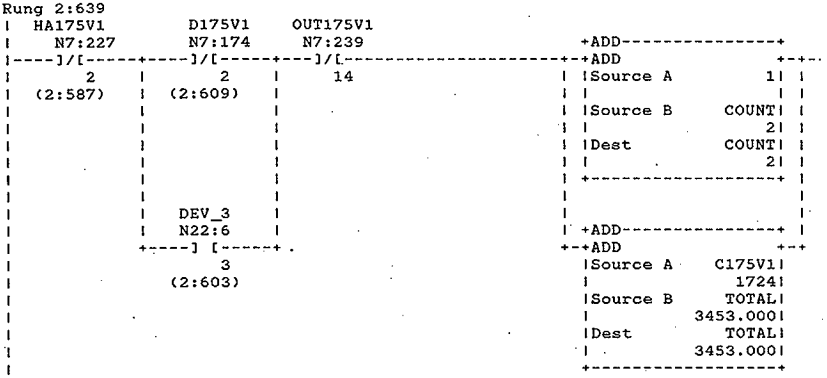


Rung 2:638

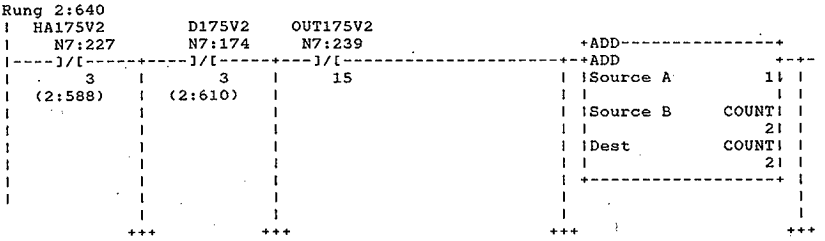
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



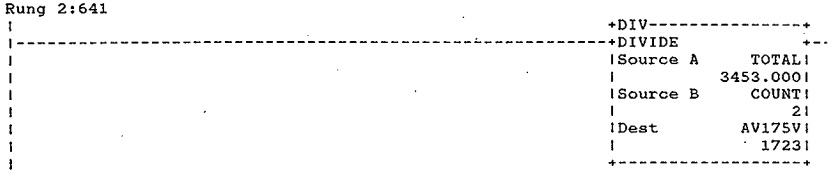
Rung 2:639



Rung 2:640

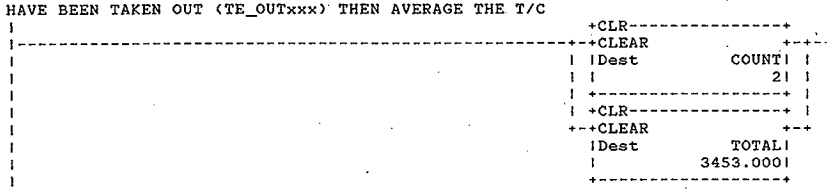


Rung 2:641

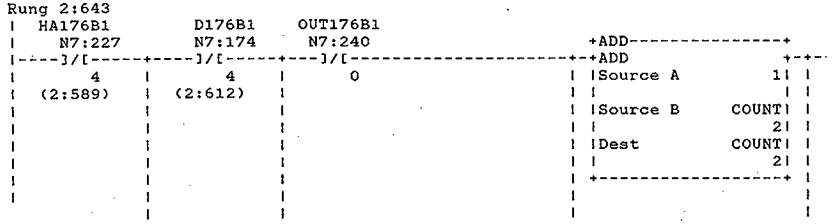


Rung 2:642

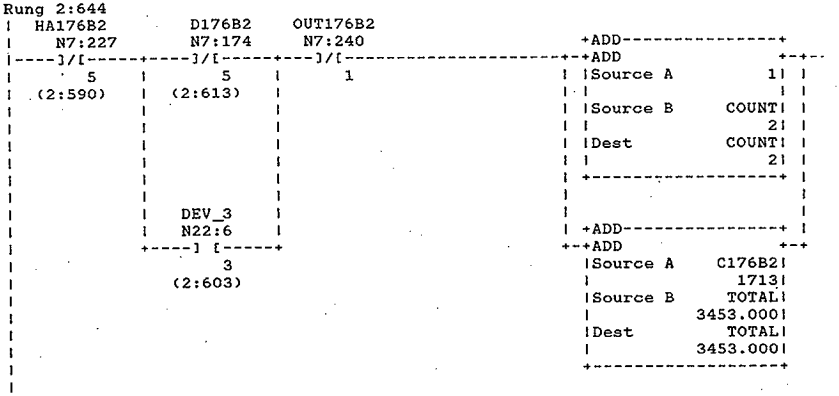
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



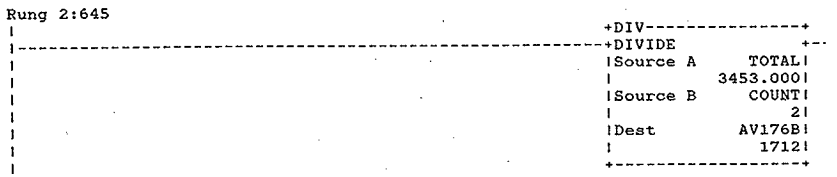
Rung 2:643



Rung 2:644

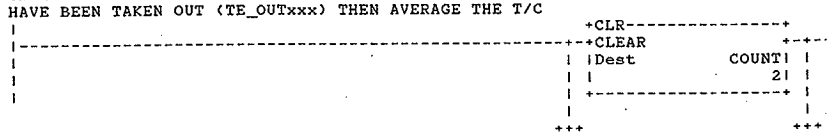


Rung 2:645

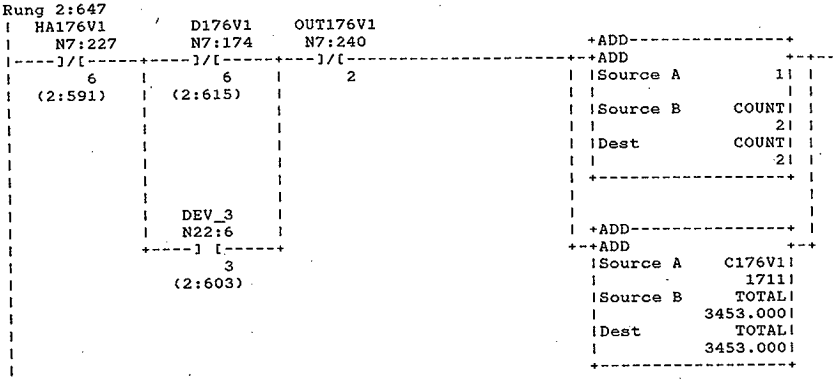


Rung 2:646

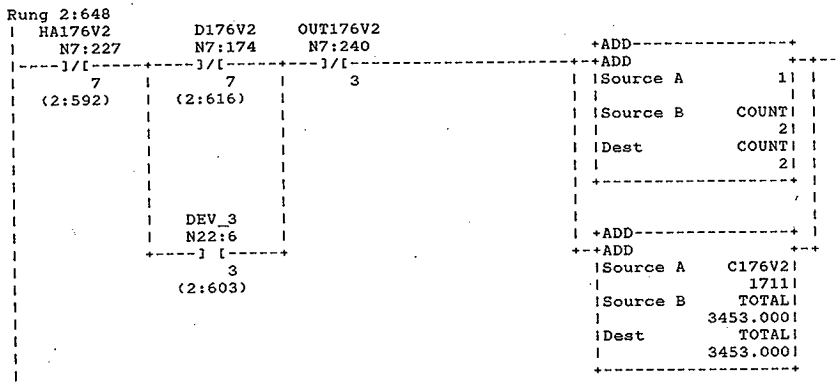
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



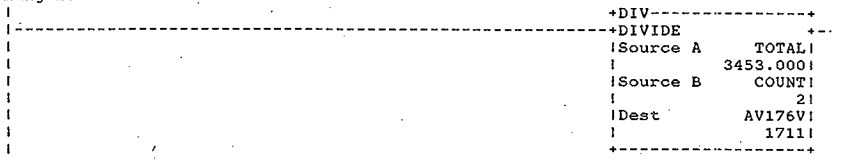
Rung 2:647



Rung 2:648

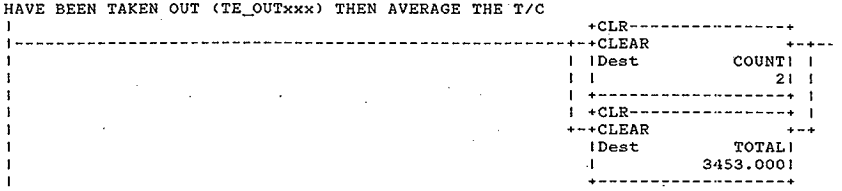


Rung 2:649

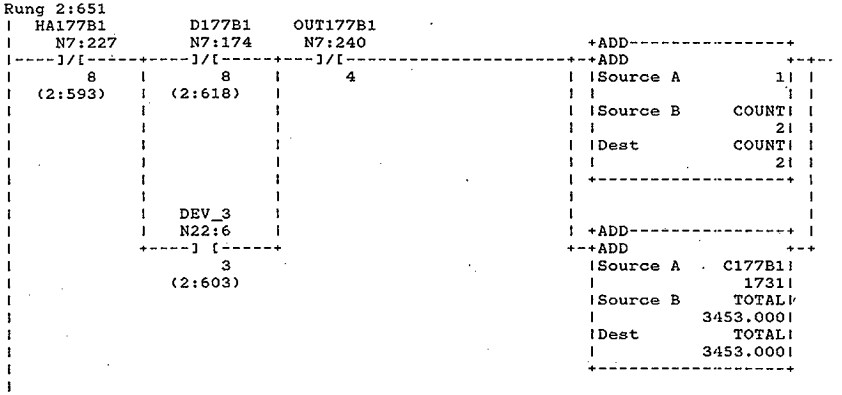


Rung 2:650

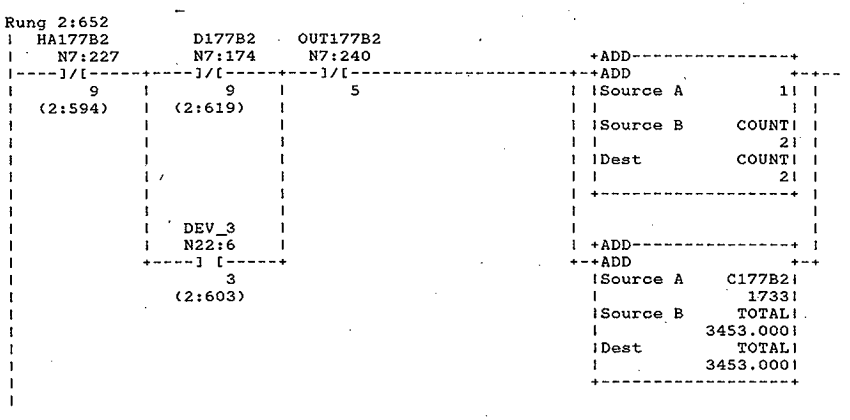
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



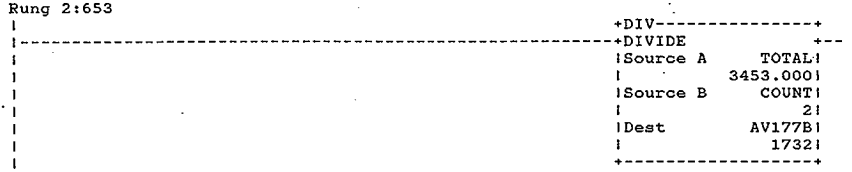
Rung 2:651



Rung 2:652



Rung 2:653



Rung 2:654

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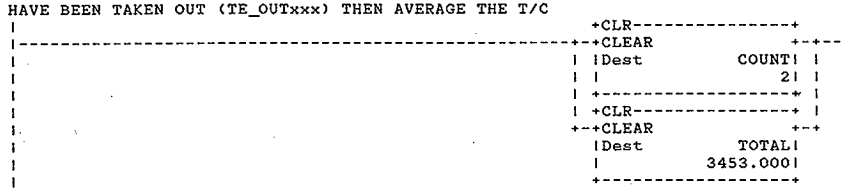
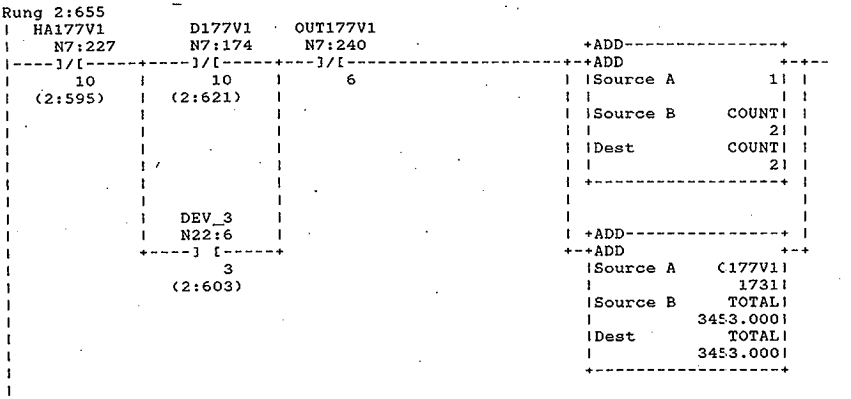
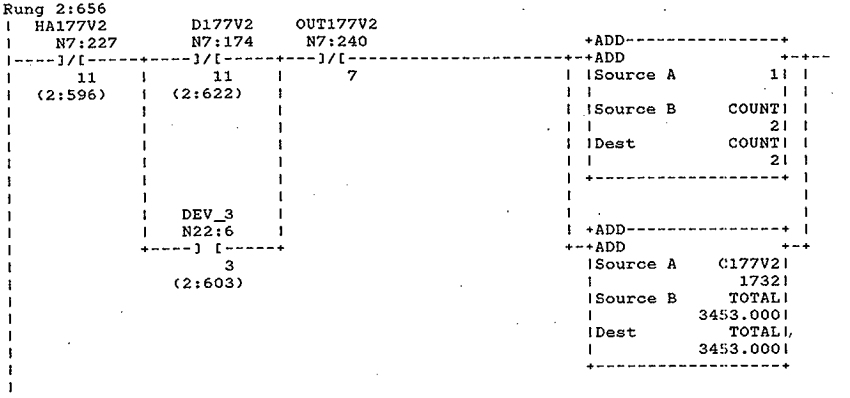
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



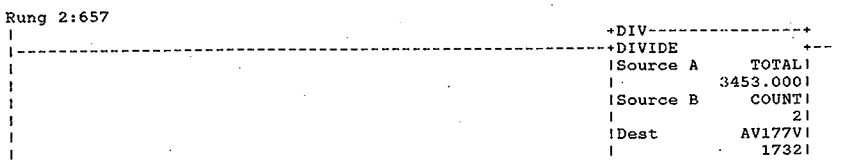
Rung 2:655



Rung 2:656

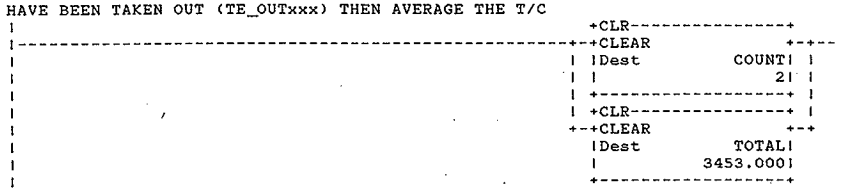


Rung 2:657

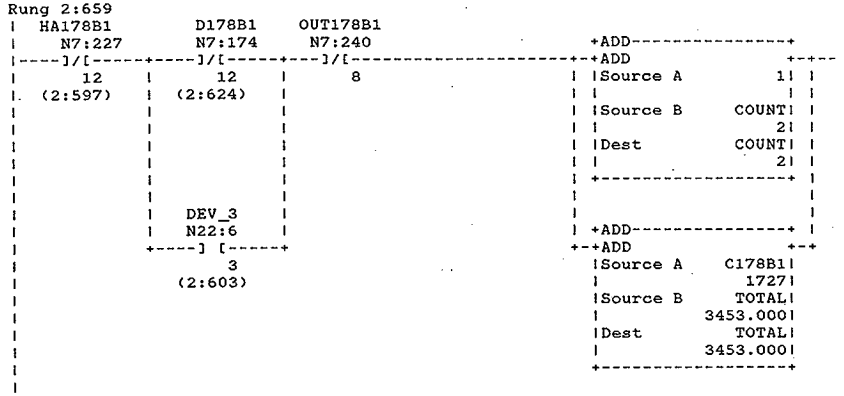


Rung 2:658

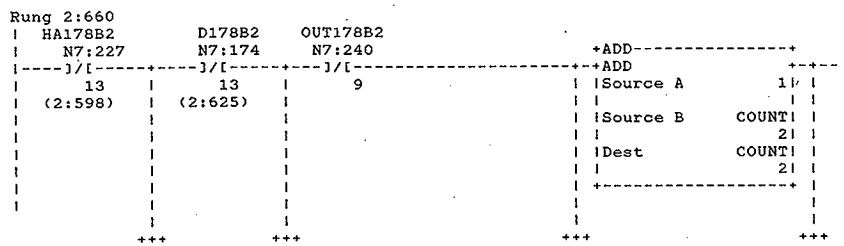
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



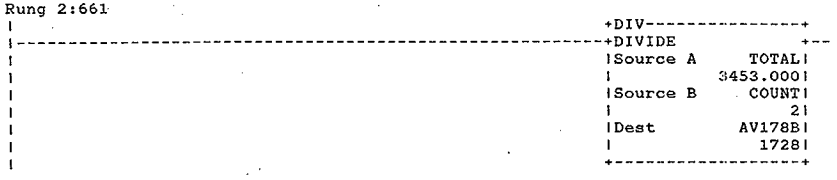
Rung 2:659



Rung 2:660

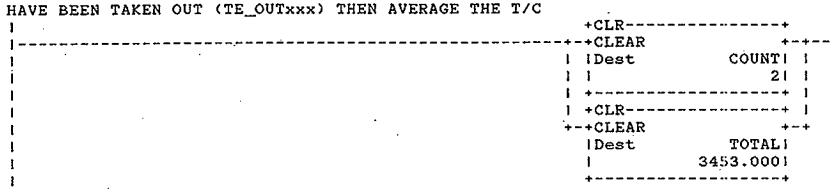


Rung 2:661

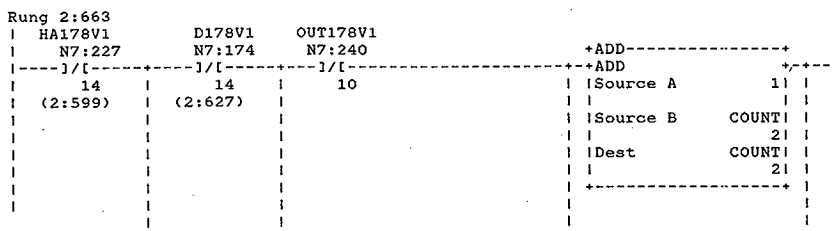


Rung 2:662

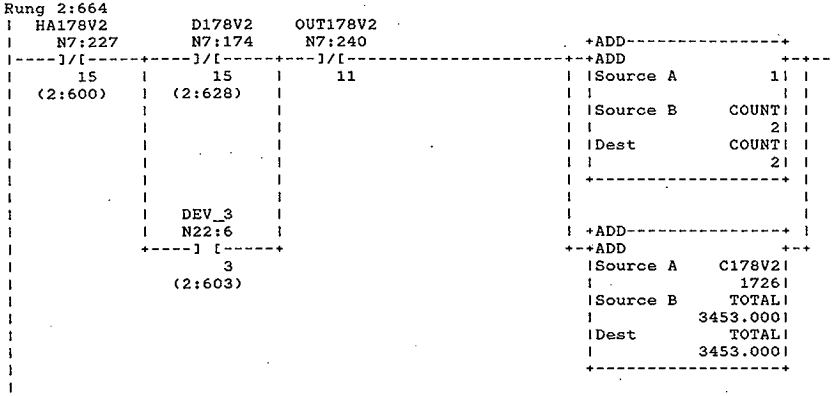
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



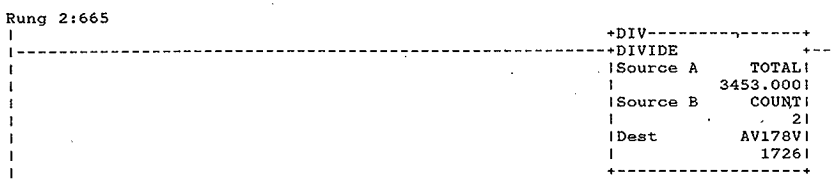
Rung 2:663



Rung 2:664

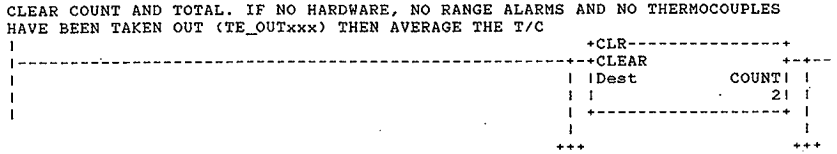


Rung 2:665

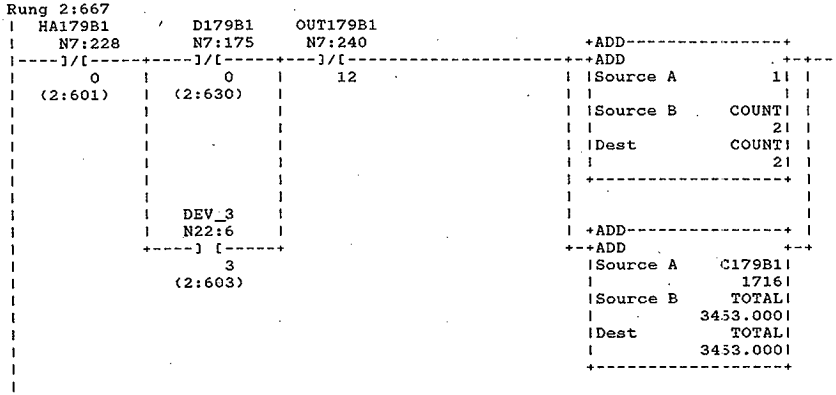


Rung 2:666

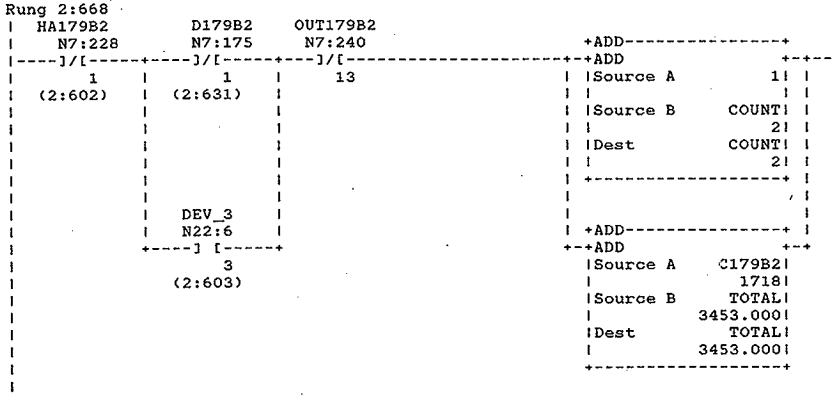
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



Rung 2:667



Rung 2:668



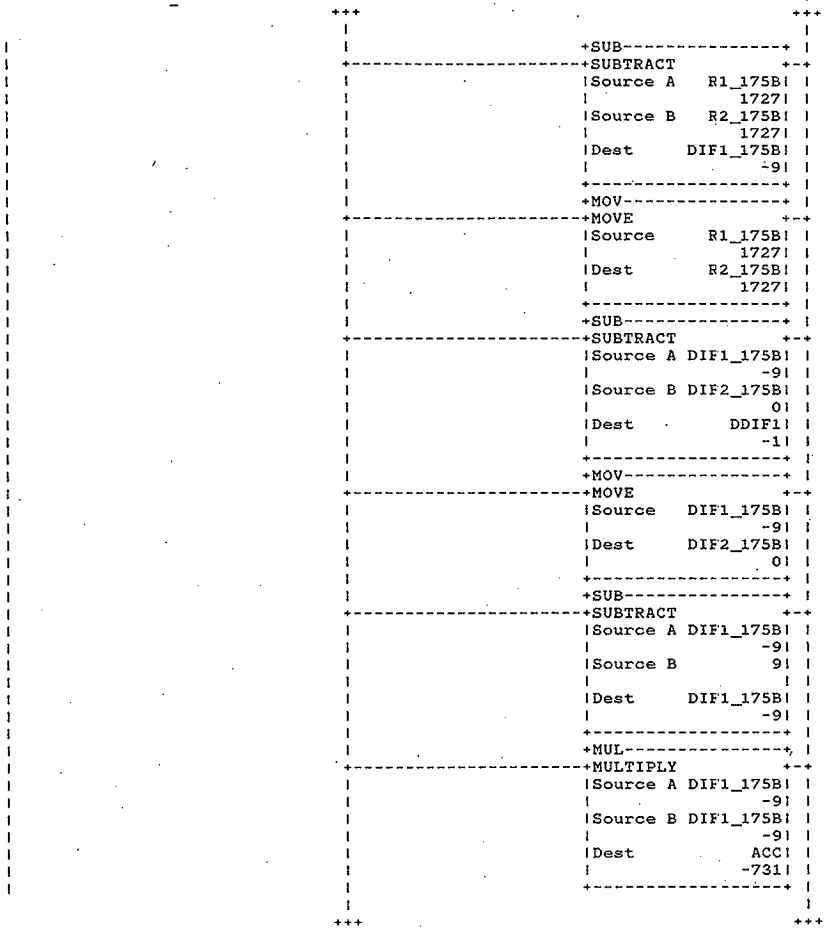
```
Rung 2:669
|                                                          +DIV---------------+
|-------------------------------------------------------+DIVIDE             +--
|                                                          |Source A     TOTAL|
|                                                          |          3453.000|
|                                                          |Source B     COUNT|
|                                                          |                 2|
|                                                          |Dest        AV179B|
|                                                          |              1717|
|                                                          +------------------+

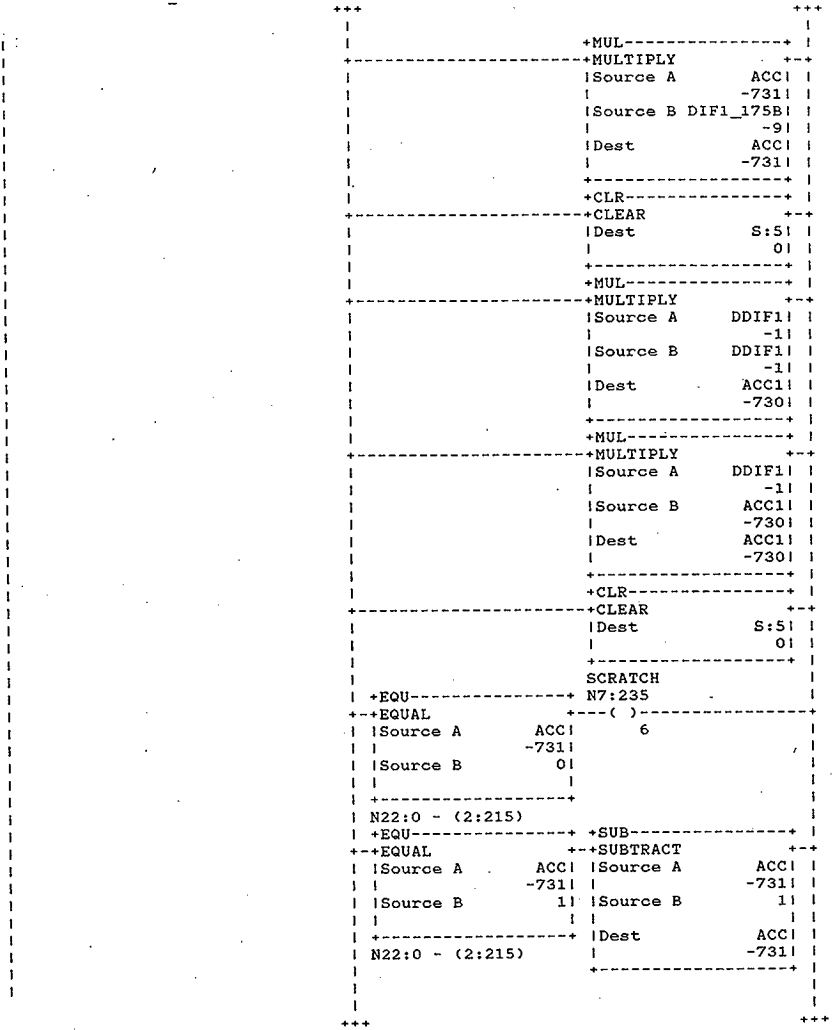
Rung 2:670
*******************************************************************************
IF DEVIATION SET FOR SECTION 3 THEN GO THERE AND CALCULATE DEVIATION
|                                                                     DEV3
|   DEV_3
|   N22:6                                                                10
|----] [-------------------------------------------------------------(JMP)-----
|       3
|  (2:603)

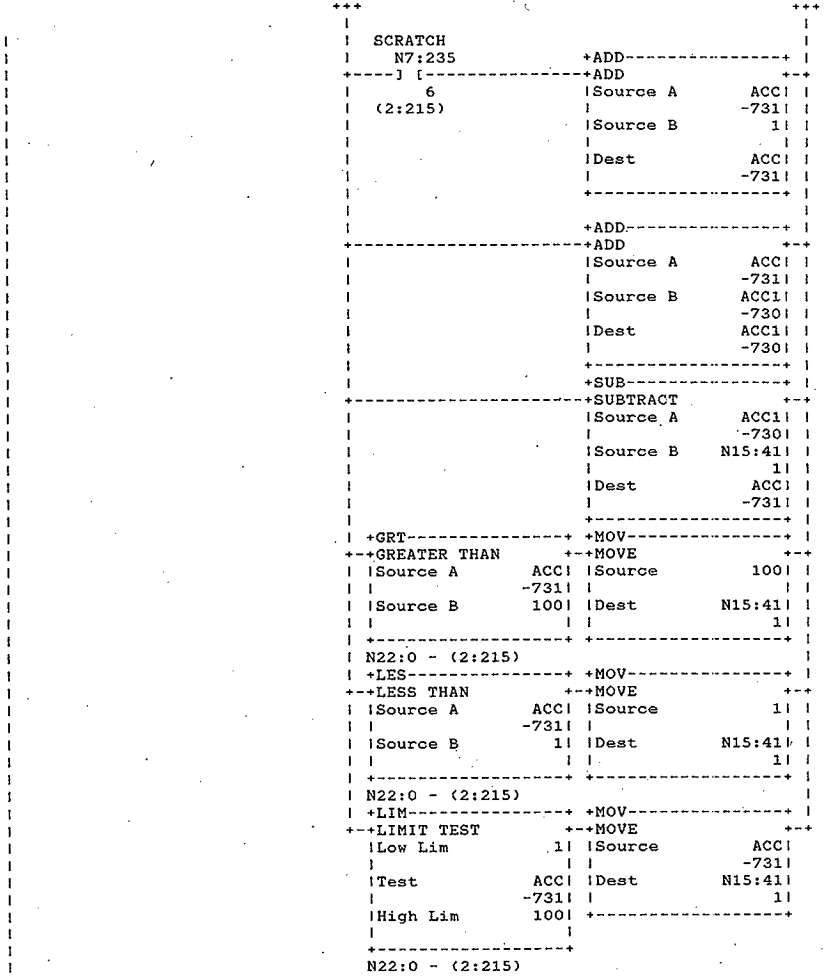
Rung 2:671
*******************************************************************************
JUMPS TO SECTION 3 IF DN_3 IS NOT LATCHED DN_3 GETS LATCHED WHEN THE SECTION IS
ENTERED
|                                                                     MD4
|     DN_3
|   N22:5                                                                4
|----]/[-------------------------------------------------------------(JMP)-----
|       3
|  (2:40)

Rung 2:672
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                     PID175B
| RT_TMR/DN
|   T4:87                                                                38
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)

Rung 2:673
                         RATE CHECKING
|                                                          +MOV---------------+
|-------------------------------+-----------------------+MOVE              +-+--
|                               |                          |Source      AV175B| |
|                               |                          |              1728| |
|                               |                          |Dest       R1_175B| |
|                               |                          |              1727| |
|                               |                          +------------------+ |
|                               |                                               |
                               +++                                             +++
```


SUB
SUBTRACT
Source A R1_175B[1727]
Source B R2_175B[1727]
Dest DIF1_175B[-9]
MOV
MOVE
Source R1_175B[1727]
Dest R2_175B[1727]
SUB
SUBTRACT
Source A DIF1_175B[-9]
Source B DIF2_175B[0]
Dest DDIF1[-1]
MOV
MOVE
Source DIF1_175B[-9]
Dest DIF2_175B[0]
SUB
SUBTRACT
Source A DIF1_175B[-9]
Source B 9
Dest DIF1_175B[-9]
MUL
MULTIPLY
Source A DIF1_175B[-9]
Source B DIF1_175B[-9]
Dest ACC[-731]


+MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_175B
-9
Dest ACC
-731
+CLR
CLEAR
Dest S:5
0
+MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
CLEAR
Dest S:5
0
SCRATCH
+EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
N7:235
( )
6
+EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUBTRACT
Source A ACC1
-730
Source B N15:41
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
MOV
MOVE
Source 100
Dest N15:41
1
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
MOV
MOVE
Source 1
Dest N15:41
1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
MOV
MOVE
Source ACC
-731
Dest N15:41
1
N22:0 - (2:215)

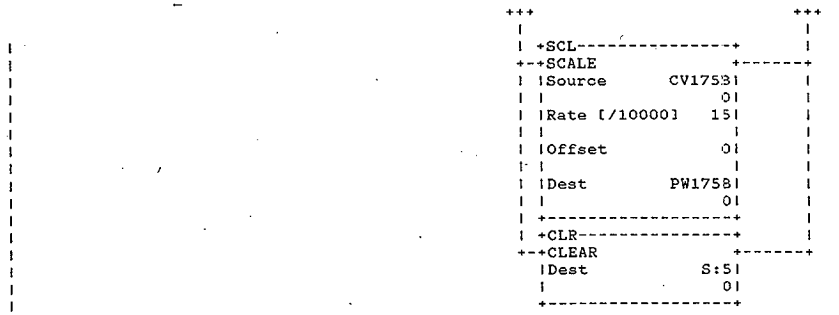
```
Rung 2:674
| PID175B
|                                                                    DUMMY38
|      38                                                             N22:9
|---[LBL]-------------------------------------------------------------( )----
|                                                                        5

Rung 2:675
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON175B
|    N7:232                                                  +CLR---------------+
|----]/[-------------------------------------------------+-+CLEAR             +-+--
|      13                                                 | |Dest        PW175B| |
|  (3:24)                                                 | |                 0| |
|                                                         | +------------------+ |
|                                                         |                      |
|                                                         |   77                 |
|                                                         +--(JMP)---------------+
|

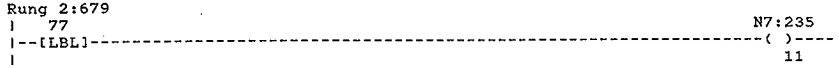
Rung 2:676
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM175B                                                           PID175B/1
|    N7:232                                                            N15:30
|----]/[-------------------------------------------------------------( )-----
|      12                                                                 1
|  (3:24)

Rung 2:677
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                            +MOV---------------+
|-------------------------------------------------------------+MOVE              +--
|                                                            |Source     SET175B|
|                                                            |                 0|
|                                                            |Dest     PIDSP175B|
|                                                            |                 0|
|                                                            +------------------+

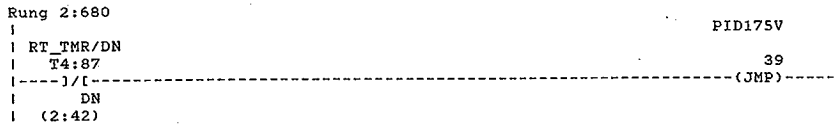
Rung 2:678
|                                                       +PID--------------------+
|-----------------------------------------------------+-+PID                   +-+--
|                                                     | |Control Block   PID175B| |
|                                                     | |Process Variable AV175B| |
|                                                     | |Control Variable CV175B| |
|                                                     | |Control Block Length 23| |
|                                                     | +-----------------------+ |
|                                                     |                           |
                                                     +++                         +++
```



Rung 2:679

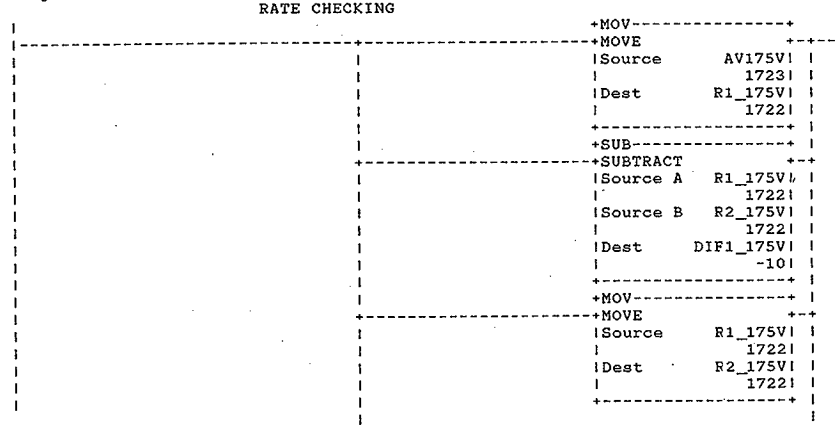


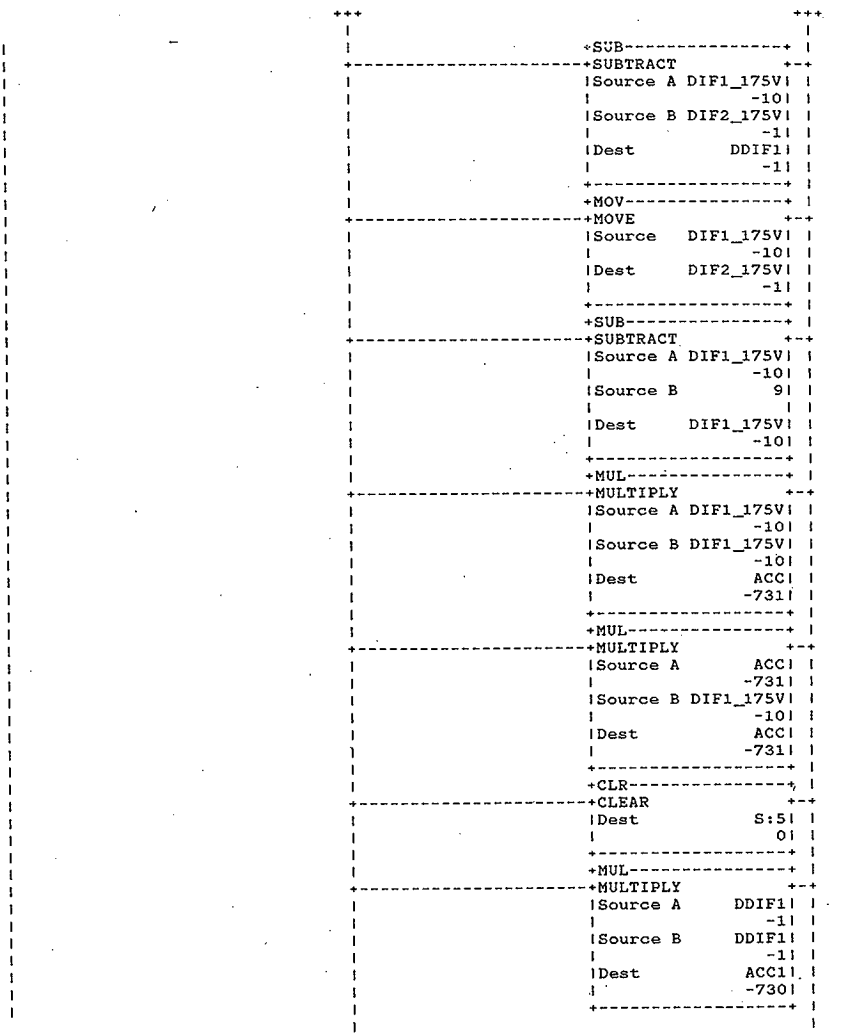
Rung 2:680

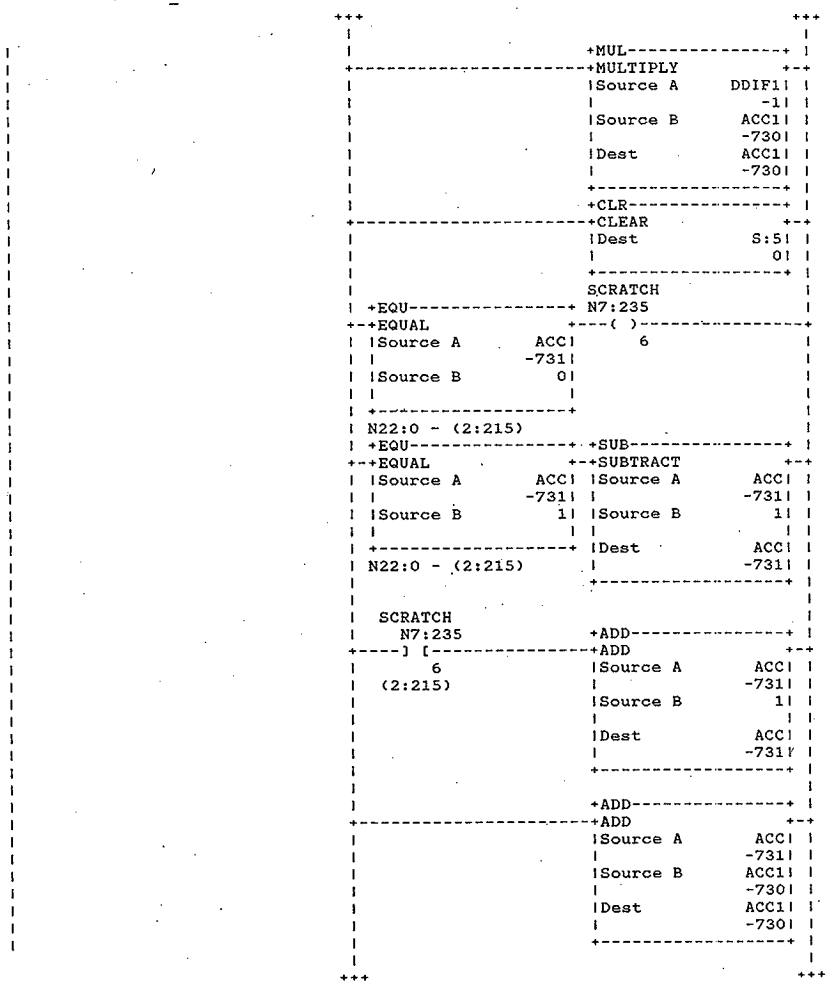


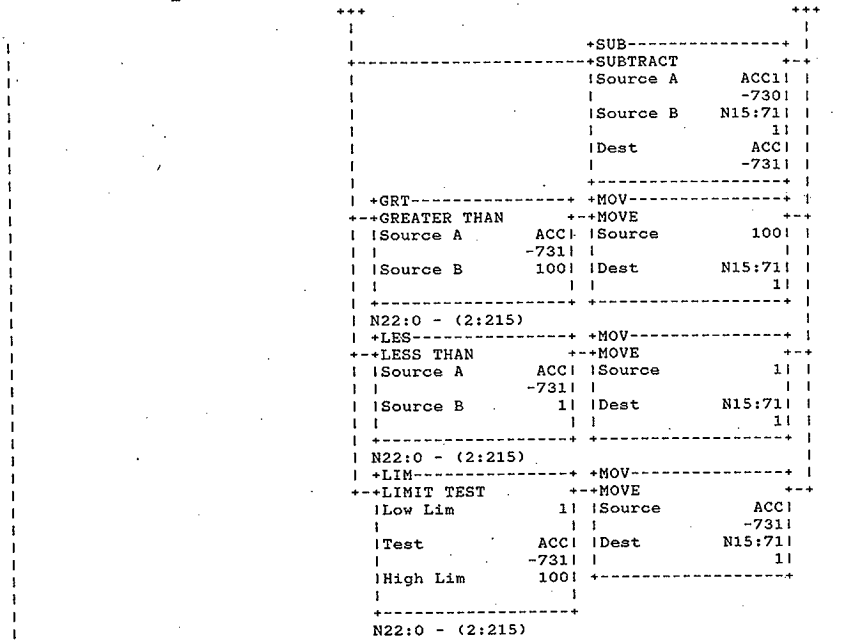
Rung 2:681

RATE CHECKING

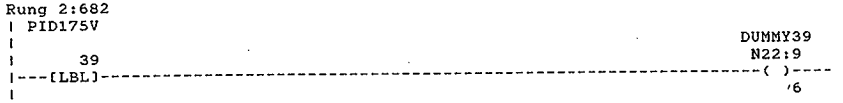



SUB
SUBTRACT
Source A DIF1_175V
-10
Source B DIF2_175V
-1
Dest DDIF1
-1
MOV
MOVE
Source DIF1_175V
-10
Dest DIF2_175V
-1
SUB
SUBTRACT
Source A DIF1_175V
-10
Source B
9
Dest DIF1_175V
-10
MUL
MULTIPLY
Source A DIF1_175V
-10
Source B DIF1_175V
-10
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_175V
-10
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730


+MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
+CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
+EQU
EQUAL
Source A ACC -731
Source B 0
( )
6
N22:0 - (2:215)
+EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
+ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
+ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730

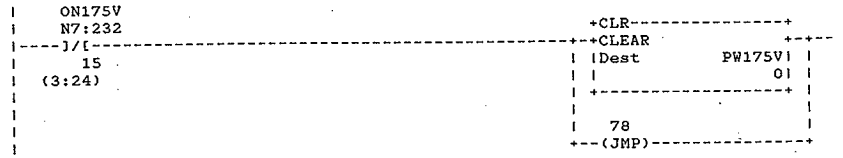


Rung 2:682



Rung 2:683

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:684

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|    AM175V                                                    PID175V/1
|    N7:232                                                     N15:60
|----]/[-------------------------------------------------------( )-------
|      14                                                         1
|  (3:24)
```

Rung 2:685

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                  +MOV---------------+
|--------------------------------------------------+MOVE               +---
|                                                  |Source     SET175V|
|                                                  |                 0|
|                                                  |Dest      PIDSP175V|
|                                                  |                 0|
|                                                  +------------------+
```

Rung 2:686

```
|                                                +PID-------------------+
|------------------------------------------------+-+PID                 +-+---
|                                                | |Control Block   PID175V| |
|                                                | |Process Variable AV175V| |
|                                                | |Control Variable CV175V| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                | +SCL---------------+      |
|                                                +-+SCALE             +------+
|                                                | |Source      CV175V|      |
|                                                | |                 0|      |
|                                                | |Rate [/10000]   15|      |
|                                                | |                  |      |
|                                                | |Offset           0|      |
|                                                | |                  |      |
|                                                | |Dest        PW175V|      |
|                                                | |                 0|      |
|                                                | +------------------+      |
|                                                | +CLR---------------+      |
|                                                +-+CLEAR             +------+
|                                                  |Dest           S:5|
|                                                  |                 0|
|                                                  +------------------+
```

Rung 2:687

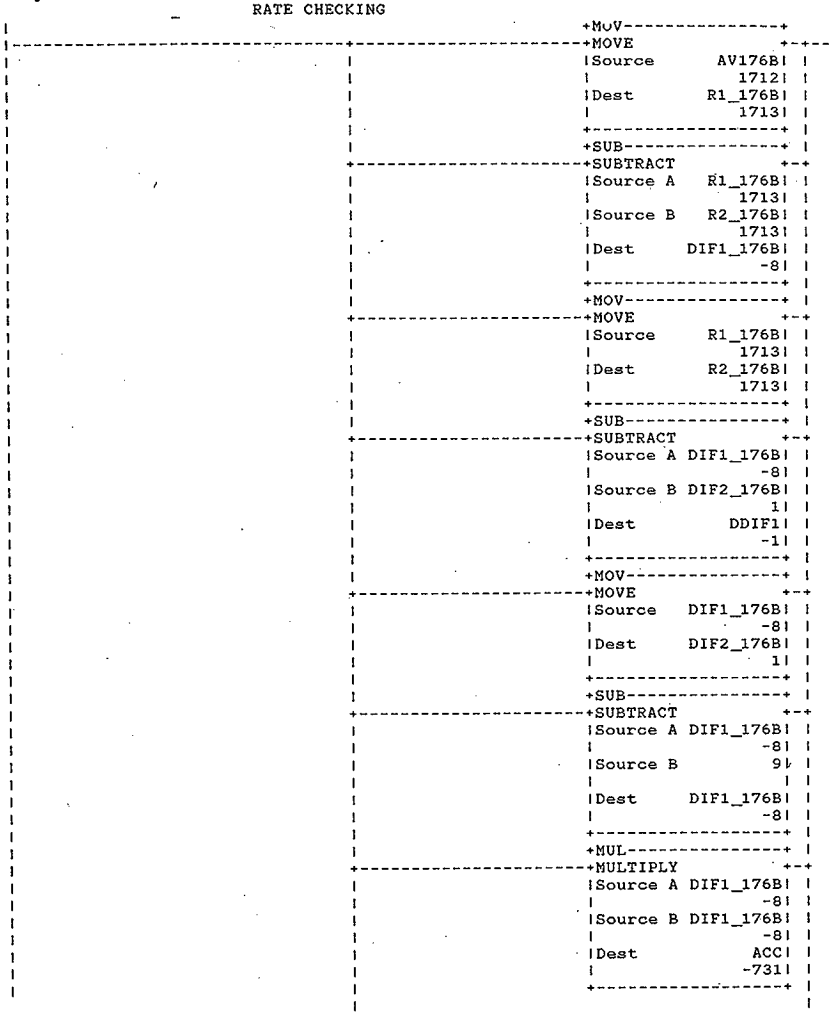
```
|   78                                                          N7:235
|--[LBL]-------------------------------------------------------( )-----
|                                                                12
```

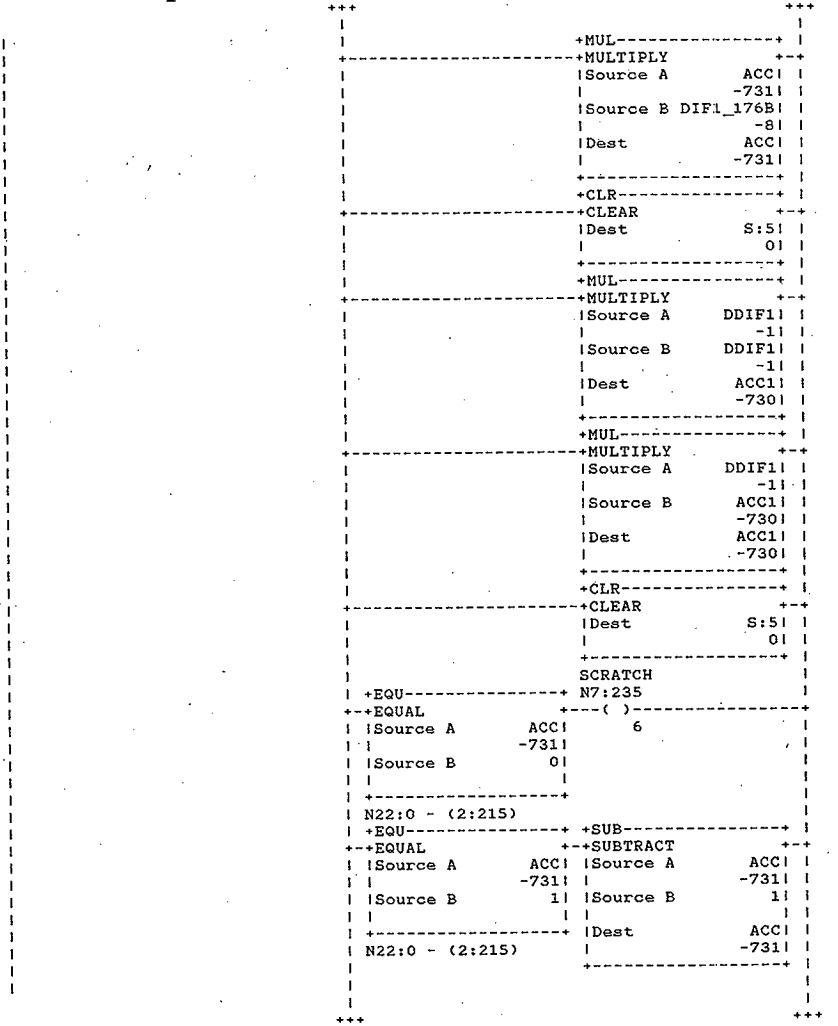
Rung 2:688

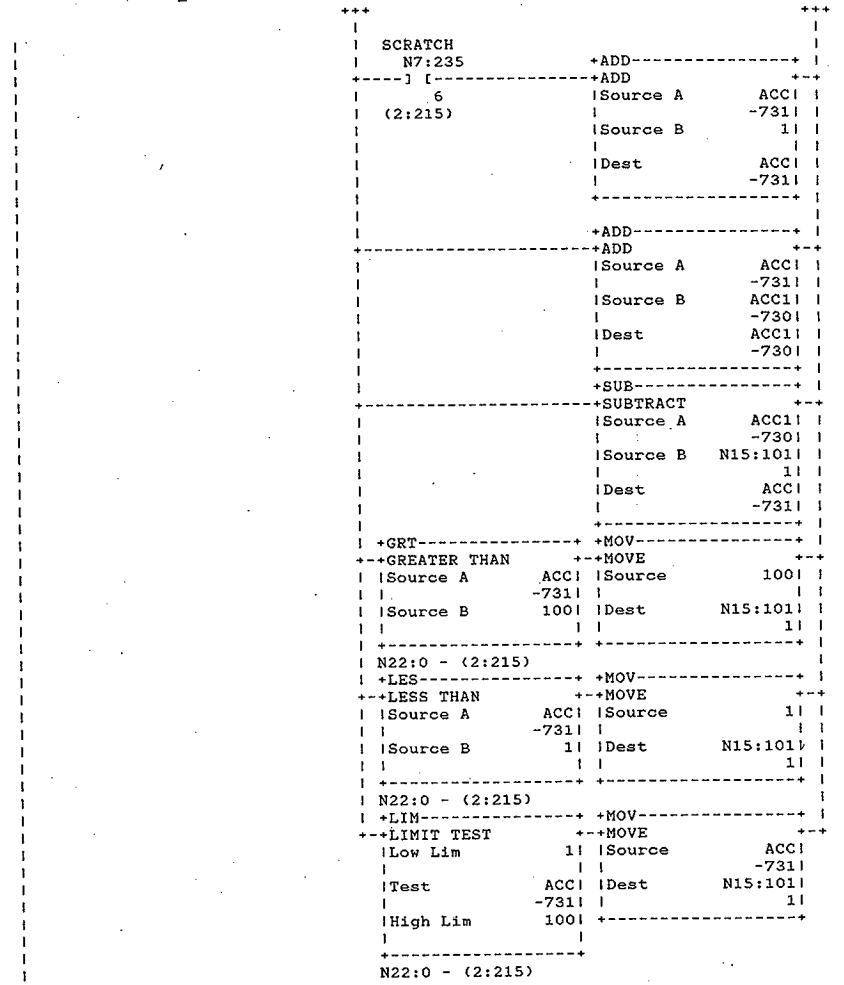
```
|                                                               PID176B
| RT_TMR/DN                                                      40
|   T4:87                                                     (JMP)-----
|----]/[-------------------------------------------------------
|      DN
|  (2:42)
```

Rung 2:689

RATE CHECKING




MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_176B
-8
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A
ACC
-731
Source B
1
Dest
ACC
-731
ADD
Source A
ACC
-731
Source B
ACC1
-730
Dest
ACC1
-730
SUB
SUBTRACT
Source A
ACC1
-730
Source B
N15:101
1
Dest
ACC
-731
GRT
GREATER THAN
Source A
ACC
-731
Source B
100
N22:0 - (2:215)
MOV
MOVE
Source
100
Dest
N15:101
1
LES
LESS THAN
Source A
ACC
-731
Source B
1
N22:0 - (2:215)
MOV
MOVE
Source
1
Dest
N15:101
1
LIM
LIMIT TEST
Low Lim
1
Test
ACC
-731
High Lim
100
N22:0 - (2:215)
MOV
MOVE
Source
ACC
-731
Dest
N15:101
1

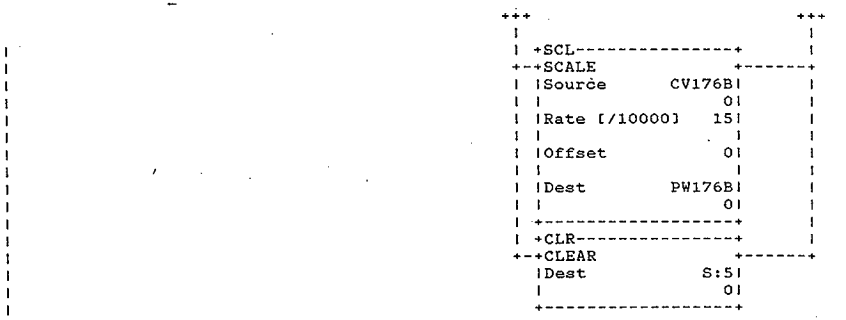
```
Rung 2:690
| PID176B
|                                                                    DUMMY40
|      40                                                             N22:9
|---[LBL]-------------------------------------------------------------( )----
|                                                                        7

Rung 2:691
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON176B
|    N7:233                                                  +CLR---------------+
|----]/[-------------------------------------------------+--+CLEAR             +-+--
|       1                                                 | |Dest        PW176B| |
|  (3:25)                                                 | |                0| |
|                                                         | +------------------+ |
|                                                         |                      |
|                                                         |   79                 |
|                                                         +--(JMP)---------------+
|

Rung 2:692
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM176B                                                          PID176B/1
|    N7:233                                                           N15:90
|----]/[-------------------------------------------------------------( )-----
|       0                                                                1
|  (3:25)

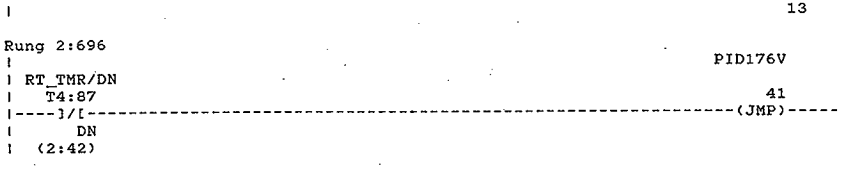
Rung 2:693
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                          |Source     SET176B|
|                                                          |                 0|
|                                                          |Dest     PIDSP176B|
|                                                          |                 0|
|                                                          +------------------+

Rung 2:694
|                                                     +PID--------------------+
|-----------------------------------------------+--+PID                    +-+--
|                                                | |Control Block   PID176B| |
|                                                | |Process Variable AV176B| |
|                                                | |Control Variable CV176B| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                |                           |
                                               +++                         +++
```



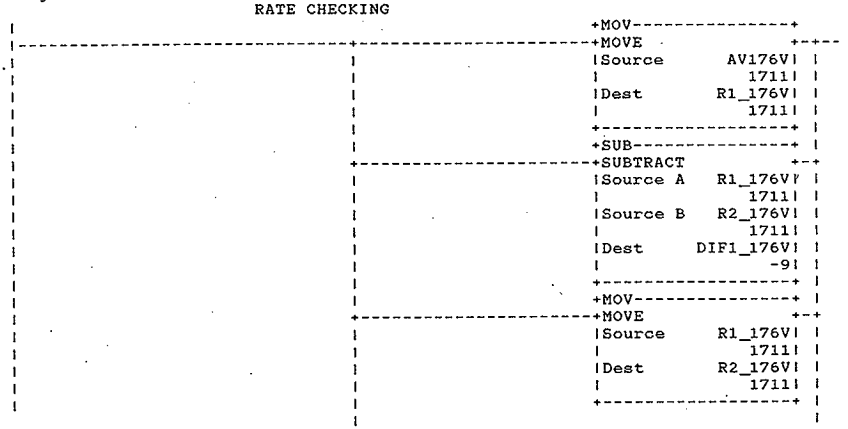
Rung 2:695

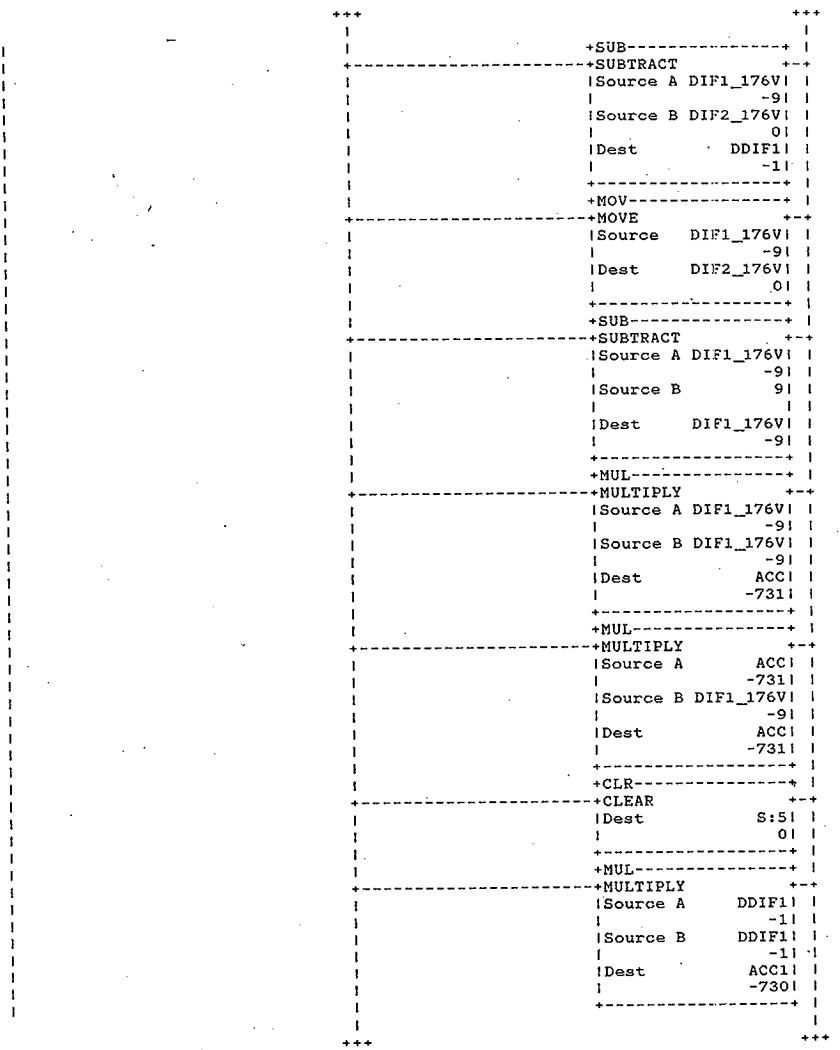
Rung 2:696

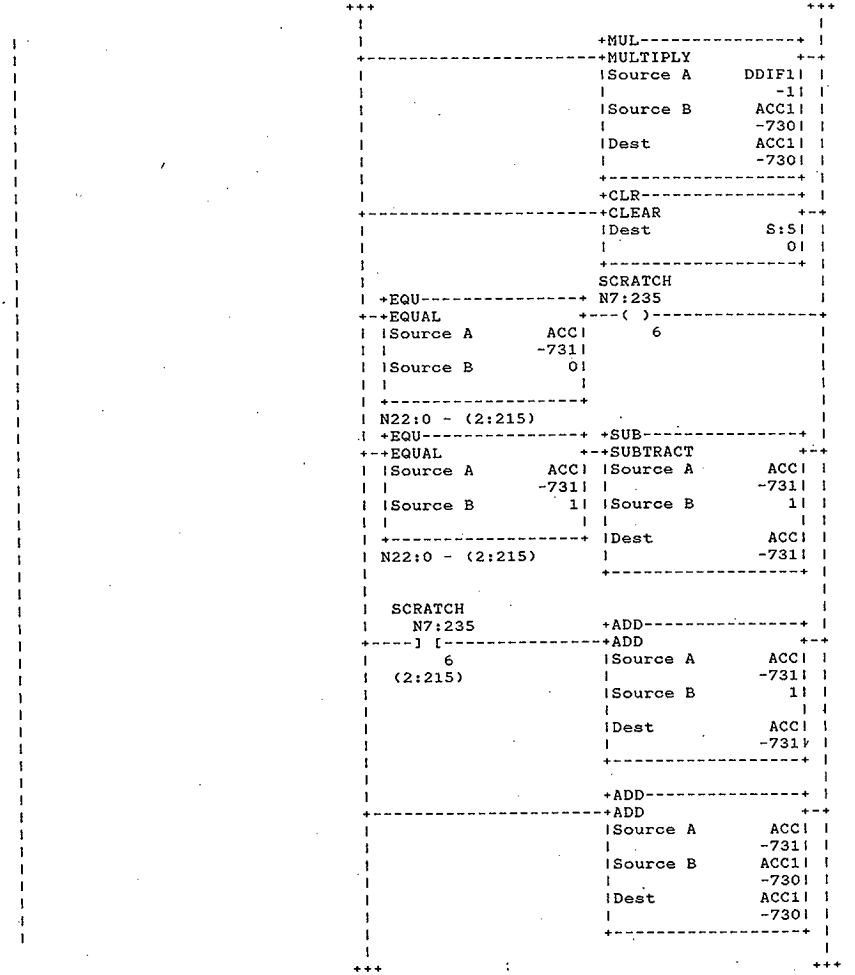


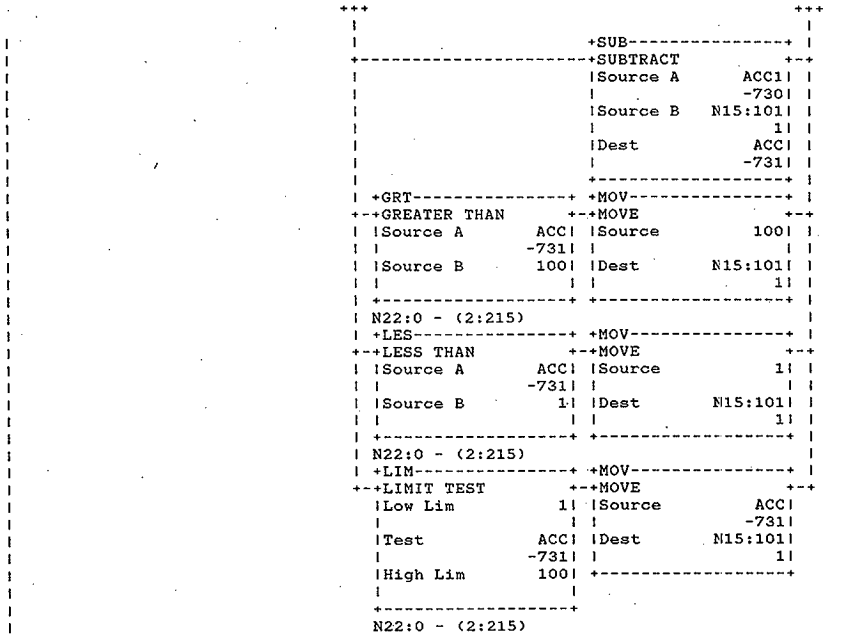
Rung 2:697

RATE CHECKING




+SUB
+SUBTRACT
Source A DIF1_176V
-9
Source B DIF2_176V
0
Dest DDIF1
-1
+MOV
+MOVE
Source DIF1_176V
-9
Dest DIF2_176V
0
+SUB
+SUBTRACT
Source A DIF1_176V
-9
Source B
9
Dest DIF1_176V
-9
+MUL
+MULTIPLY
Source A DIF1_176V
-9
Source B DIF1_176V
-9
Dest ACC
-731
+MUL
+MULTIPLY
Source A ACC
-731
Source B DIF1_176V
-9
Dest ACC
-731
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

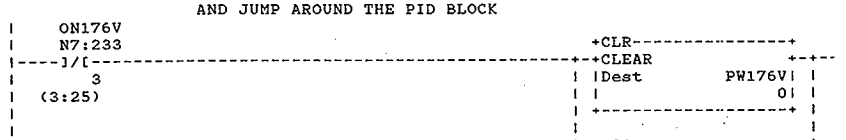

MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
( )
6
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730



```
                                  +++                                                  +++
                                   |                                                    |
|                                  |                        +SUB---------------+ |
|                                  +----------------------+SUBTRACT          +-+
|                                  |                        |Source A      ACC1| |
|                                  |                        |              -730| |
|                                  |                        |Source B   N15:101| |
|                                  |                        |                 1| |
|                                  |                        |Dest           ACC| |
|                                  |                        |              -731| |
|                                  |                        +------------------+ |
|                                  | +GRT---------------+ +MOV---------------+ |
|                                  +-+GREATER THAN      +-+MOVE              +-+
|                                  | |Source A       ACC| |Source         100| |
|                                  | |              -731| |                  | |
|                                  | |Source B       100| |Dest       N15:101| |
|                                  | |                  | |                 1| |
|                                  | +------------------+ +------------------+ |
|                                  | N22:0 - (2:215)                            |
|                                  | +LES---------------+ +MOV---------------+ |
|                                  +-+LESS THAN         +-+MOVE              +-+
|                                  | |Source A       ACC| |Source           1| |
|                                  | |              -731| |                  | |
|                                  | |Source B         1| |Dest       N15:101| |
|                                  | |                  | |                 1| |
|                                  | +------------------+ +------------------+ |
|                                  | N22:0 - (2:215)                            |
|                                  | +LIM---------------+ +MOV---------------+ |
|                                  +-+LIMIT TEST        +-+MOVE              +-+
|                                    |Low Lim          1| |Source         ACC|
|                                    |                  | |              -731|
|                                    |Test           ACC| |Dest       N15:101|
|                                    |              -731| |                 1|
|                                    |High Lim       100| +------------------+
|                                    |                  |
|                                    +------------------+
|                                    N22:0 - (2:215)
```

```
Rung 2:698
| PID176V
|                                                                          DUMMY41
|      41                                                                   N22:9
|---[LBL]-------------------------------------------------------------------( )----
|                                                                            8
```

```
Rung 2:699
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON176V
|    N7:233                                                  +CLR---------------+
|----]/[-----------------------------------------------+-+CLEAR             +-+--
|       3                                              | |Dest        PW176V| |
|  (3:25)                                              | |                0| |
|                                                      | +------------------+ |
|                                                      |                      |
|                                                      |   80                 |
|                                                      +--(JMP)---------------+
|
```



```
Rung 2:700
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM176V                                                          PID176V/1
|    N7:233                                                          N15:120
|----]/[-------------------------------------------------------------( )-----
|       2                                                                1
|  (3:25)

Rung 2:701
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                        +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                        |Source     SET176V|
|                                                        |                 0|
|                                                        |Dest     PIDSP176V|
|                                                        |                 0|
|                                                        +------------------+

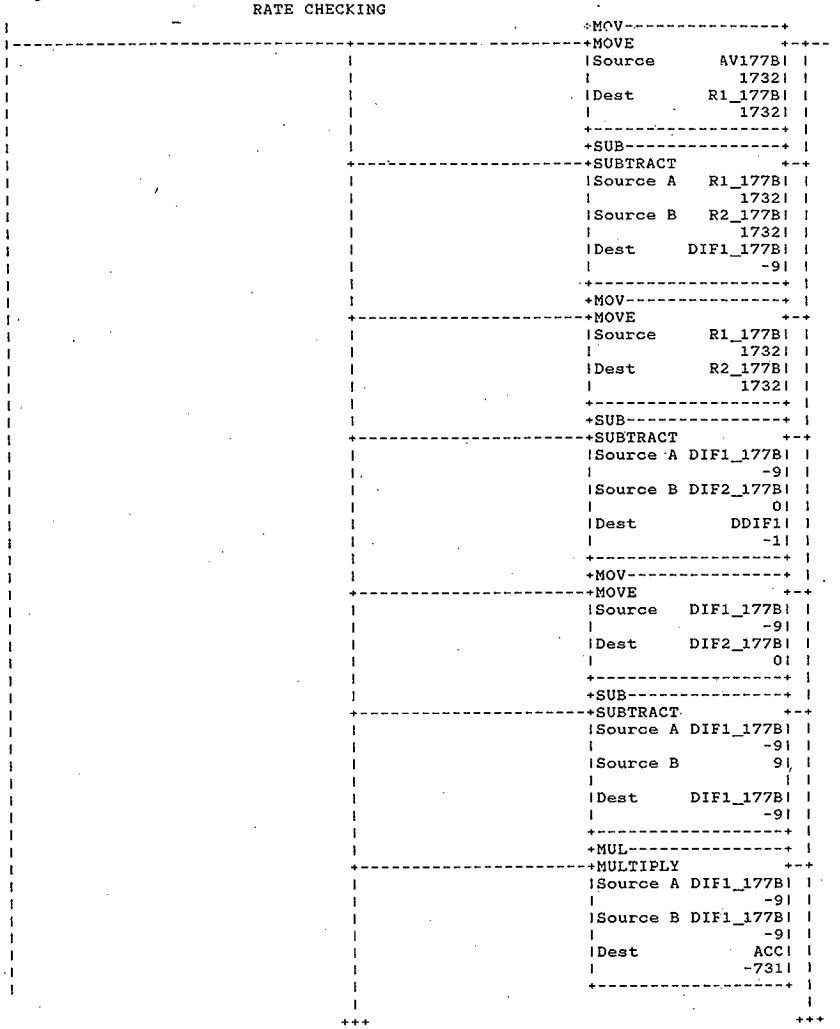
Rung 2:702
|                                                  +PID--------------------+
|-------------------------------------------------+-+PID                   +-+--
|                                                 | |Control Block   PID176V| |
|                                                 | |Process Variable AV176V| |
|                                                 | |Control Variable CV176V| |
|                                                 | |Control Block Length 23| |
|                                                 | +----------------------+ |
|                                                 | +SCL---------------+      |
|                                                 +-+SCALE             +------+
|                                                 | |Source      CV176V|      |
|                                                 | |                 0|      |
|                                                 | |Rate [/10000]   15|      |
|                                                 | |                  |      |
|                                                 | |Offset           0|      |
|                                                 | |                  |      |
|                                                 | |Dest        PW176V|      |
|                                                 | |                 0|      |
|                                                 | +------------------+      |
|                                                 | +CLR---------------+      |
|                                                 +-+CLEAR             +------+
|                                                   |Dest           S:5|
|                                                   |                 0|
|                                                   +------------------+

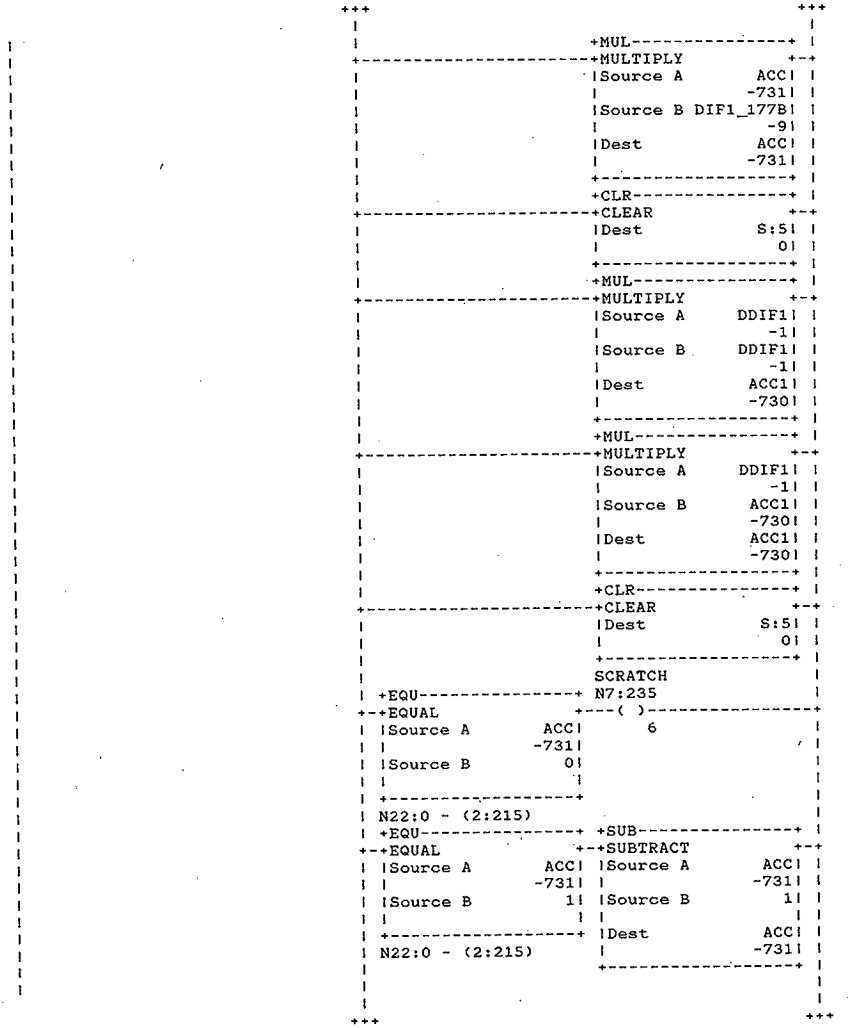
Rung 2:703
|   80                                                                  N7:235
|--[LBL]-------------------------------------------------------------( )-----
|                                                                          14

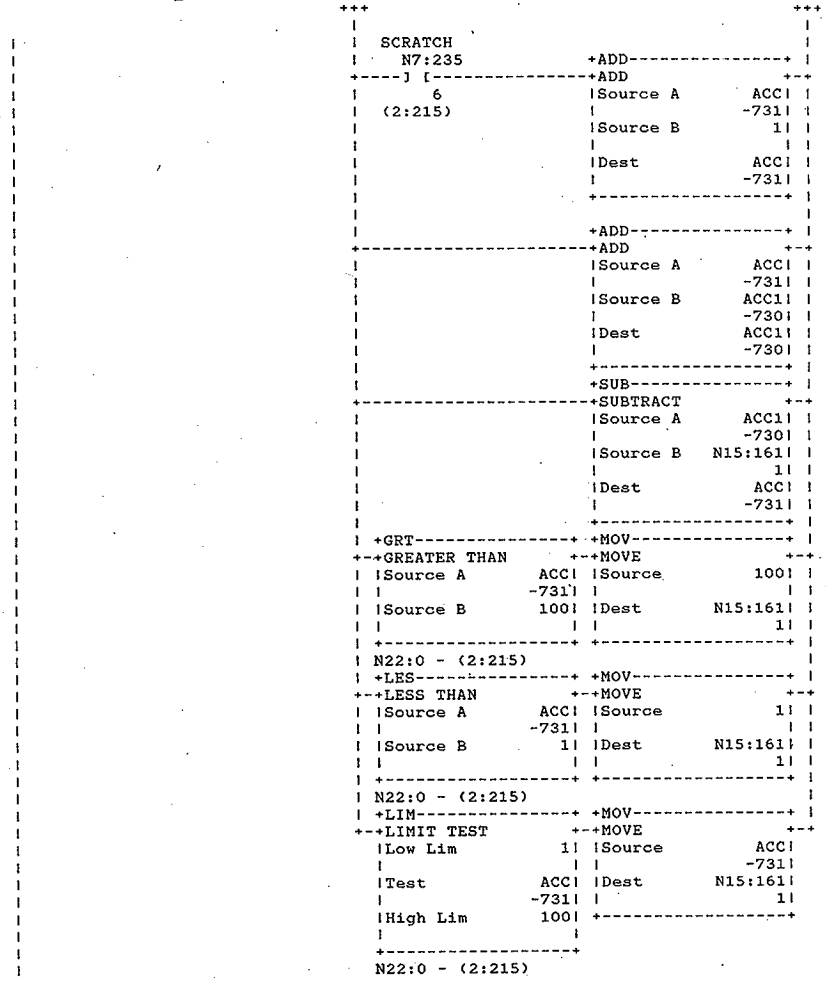
Rung 2:704
|                                                                    PID177B
| RT_TMR/DN
|   T4:87                                                                42
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

Rung 2:705

RATE CHECKING



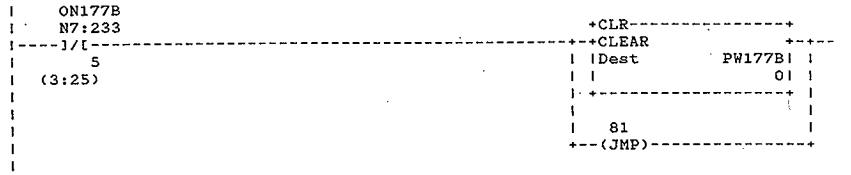

+MUL
+MULTIPLY
Source A ACC
-731
Source B DIF1_177B
-9
Dest ACC
-731
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N7:235
6
+EQU
+EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+EQU
+EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
+SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N15:161
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N15:161
1
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
MOV
MOVE
Source 1
Dest N15:161
1
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source ACC
-731
Dest N15:161
1

Rung 2:706

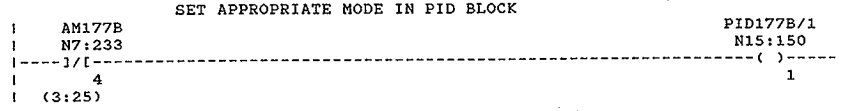
Rung 2:707

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



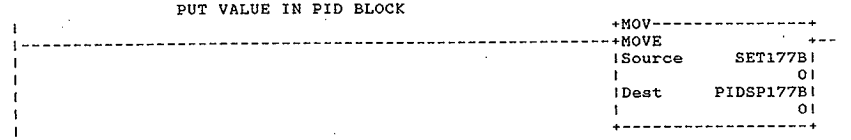
Rung 2:708

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

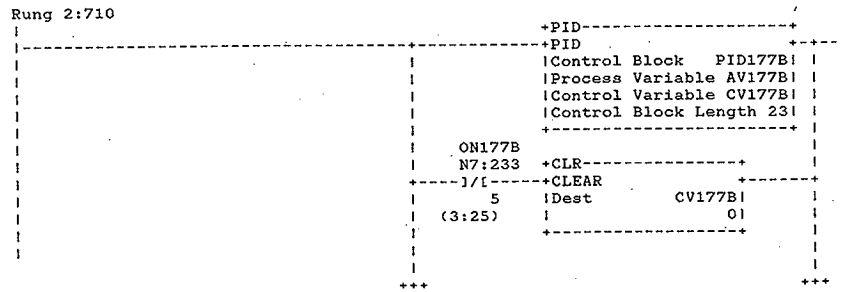


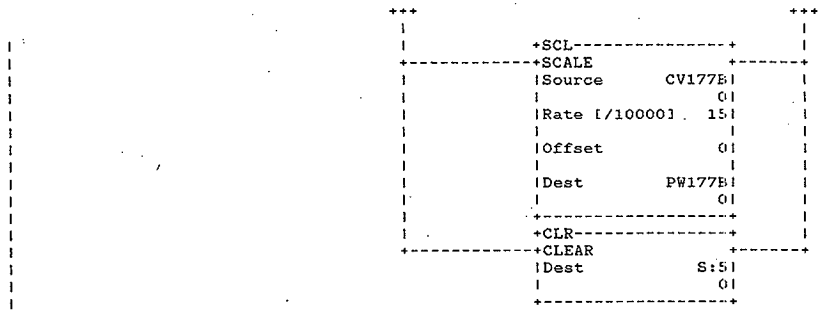
Rung 2:709

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

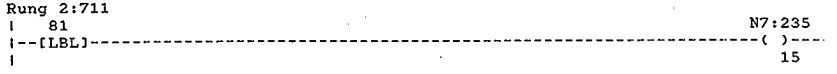


Rung 2:710

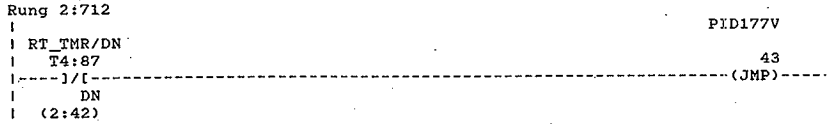




Rung 2:711

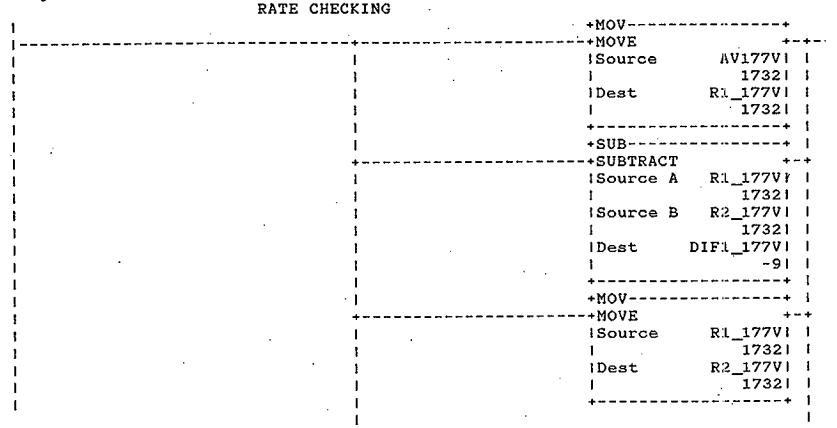


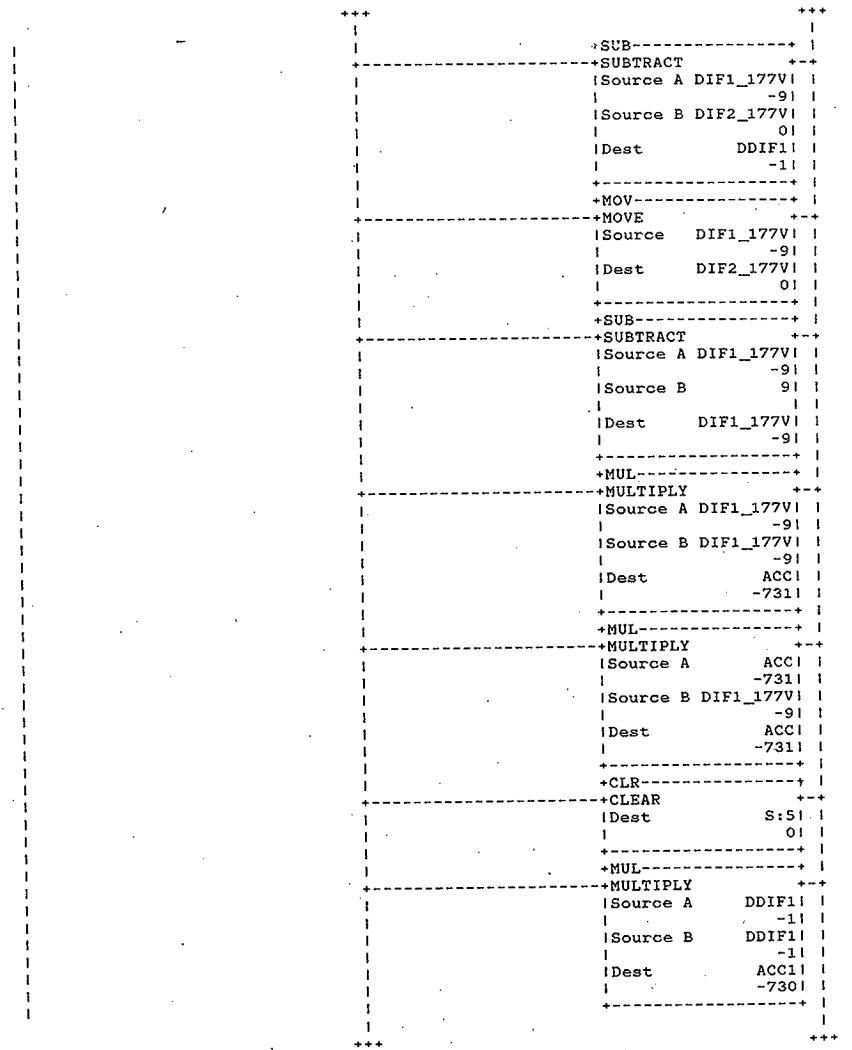
Rung 2:712

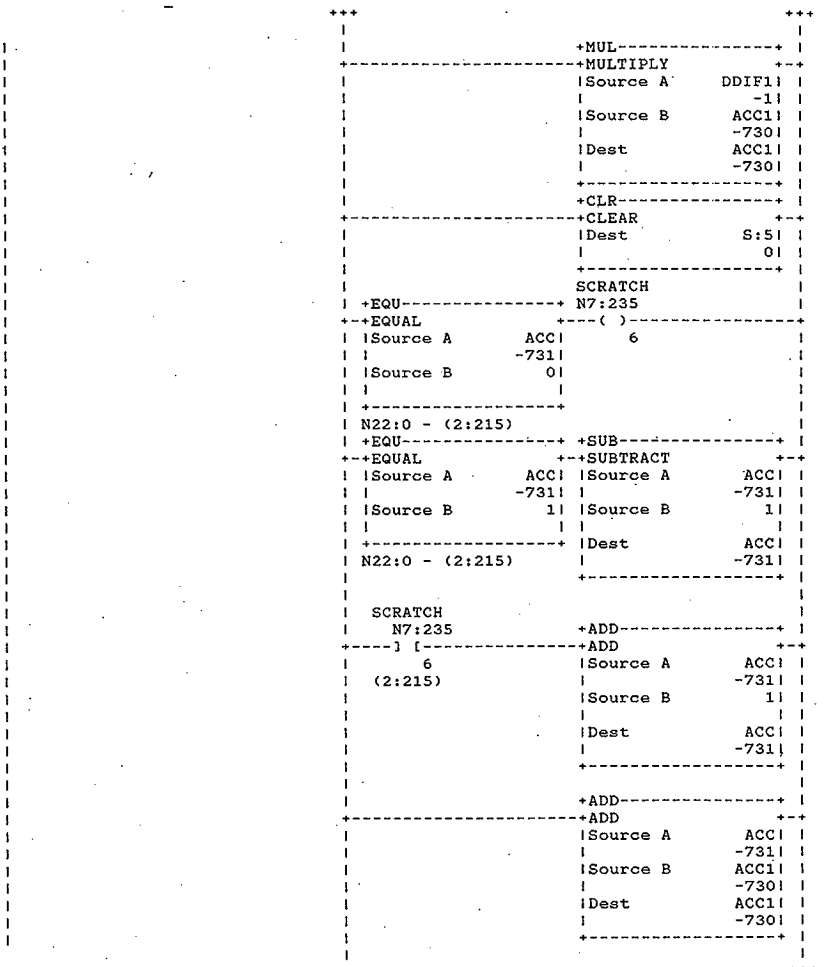


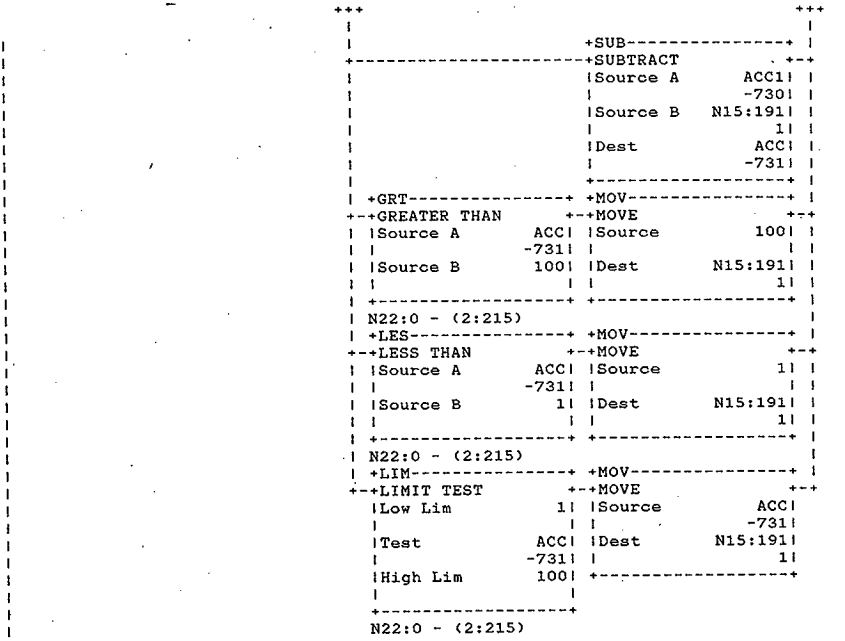
Rung 2:713

RATE CHECKING

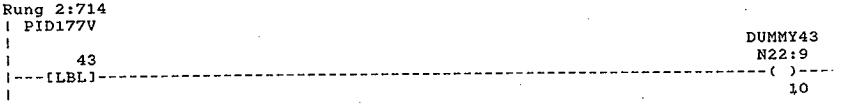



SUB
SUBTRACT
Source A DIF1_177V
-9
Source B DIF2_177V
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_177V
-9
Dest DIF2_177V
0
SUB
SUBTRACT
Source A DIF1_177V
-9
Source B
9
Dest DIF1_177V
-9
MUL
MULTIPLY
Source A DIF1_177V
-9
Source B DIF1_177V
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_177V
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730


+MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
+CLR
CLEAR
Dest S:5 0
SCRATCH N7:235
+EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
6
+EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
+SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH N7:235
6 (2:215)
+ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
+ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730

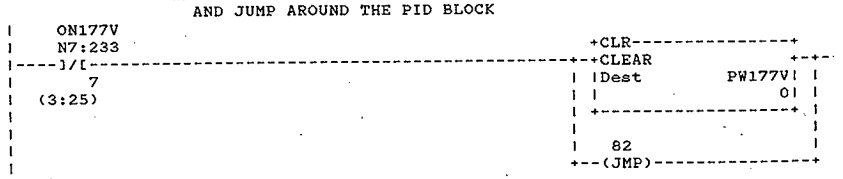


Rung 2:714



Rung 2:715

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:716
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM177V                                                          PID177V/1
|    N7:233                                                           N15:180
|----]/[-------------------------------------------------------------( )-----
|       6                                                                1
|  (3:25)

Rung 2:717
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                   +MOV---------------+
|-------------------------------------------------------+MOVE            +--
|                                                   |Source     SET177V|
|                                                   |                 0|
|                                                   |Dest     PIDSP177V|
|                                                   |                 0|
|                                                   +------------------+

Rung 2:718
|                                                +PID--------------------+
|-------------------------------------+----------+PID                   +-+--
|                                     |          |Control Block   PID177V| |
|                                     |          |Process Variable AV177V| |
|                                     |          |Control Variable CV177V| |
|                                     |          |Control Block Length 23| |
|                                     |          +----------------------+ |
|                                     |   ON177V                          |
|                                     |   N7:233 +CLR---------------+     |
|                                     +----]/[-----+CLEAR            +-----+
|                                     |       7  |Dest        CV177V|     |
|                                     |  (3:25)  |                 0|     |
|                                     |          +------------------+     |
|                                     |                                   |
|                                     |          +SCL---------------+     |
|                                     +----------+SCALE            +-----+
|                                     |          |Source      CV177V|     |
|                                     |          |                 0|     |
|                                     |          |Rate [/10000]   15|     |
|                                     |          |                  |     |
|                                     |          |Offset           0|     |
|                                     |          |                  |     |
|                                     |          |Dest        PW177V|     |
|                                     |          |                 0|     |
|                                     |          +------------------+     |
|                                     |          +CLR---------------+     |
|                                     +----------+CLEAR            +-----+
|                                                |Dest           S:5|
|                                                |                 0|
|                                                +------------------+

Rung 2:719
|   82                                                                N7:236
|--[LBL]-------------------------------------------------------------( )---
|                                                                        0
```

Rung 2:720

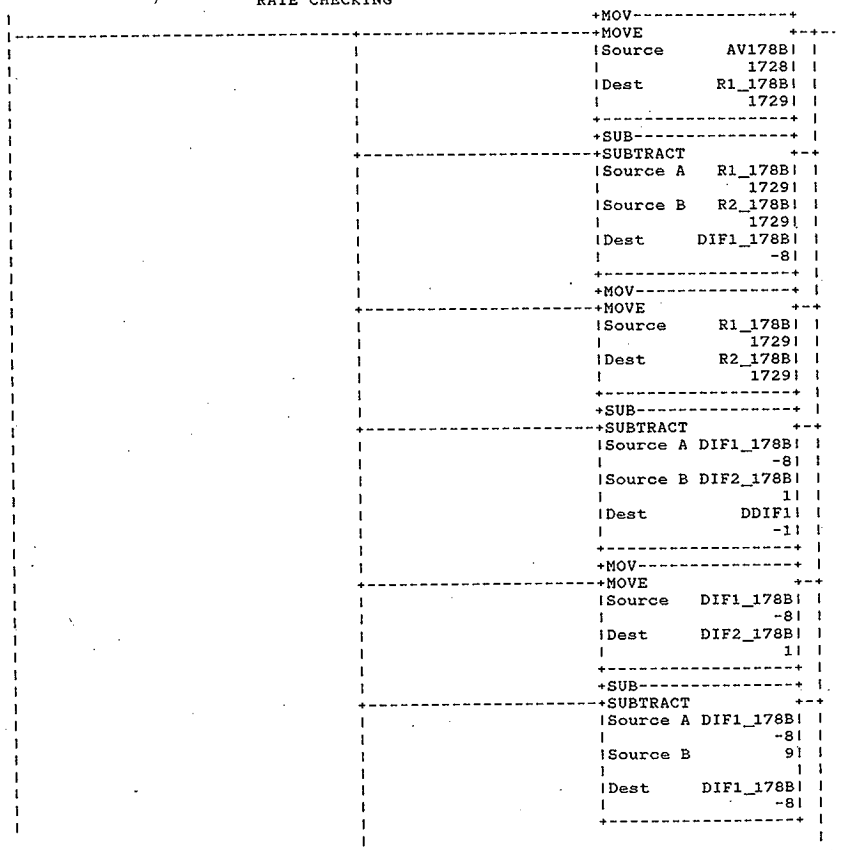
PID178B

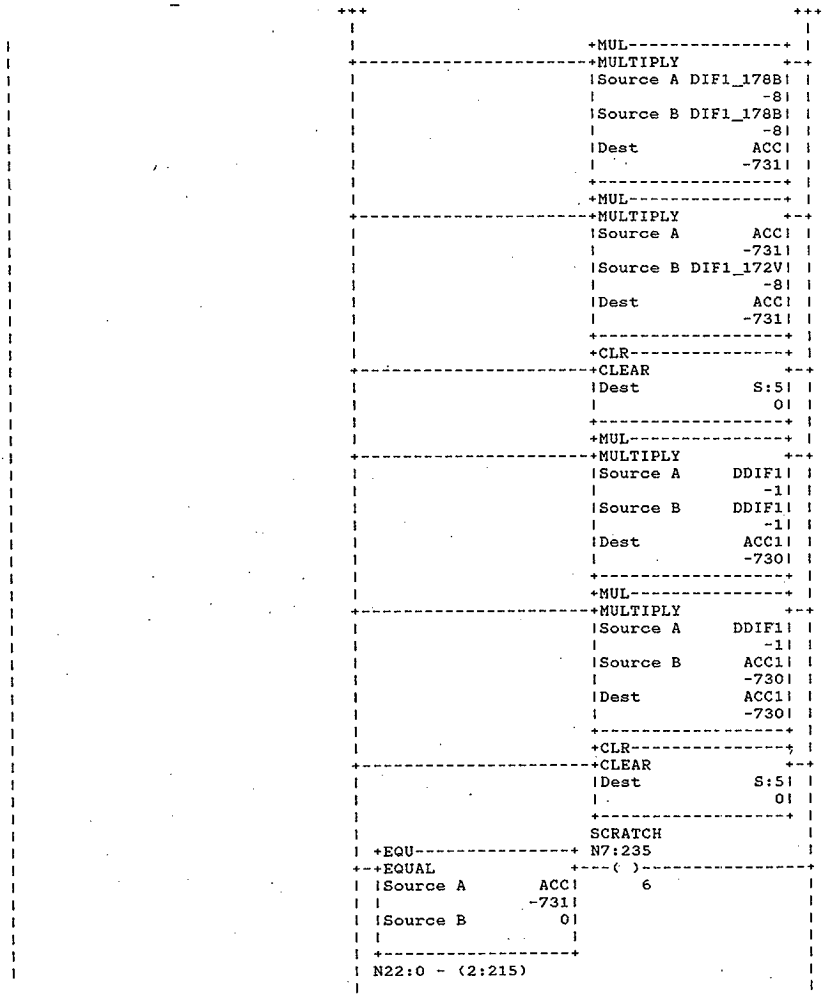
RT_TMR/DN
T4:87
DN
(2:42)

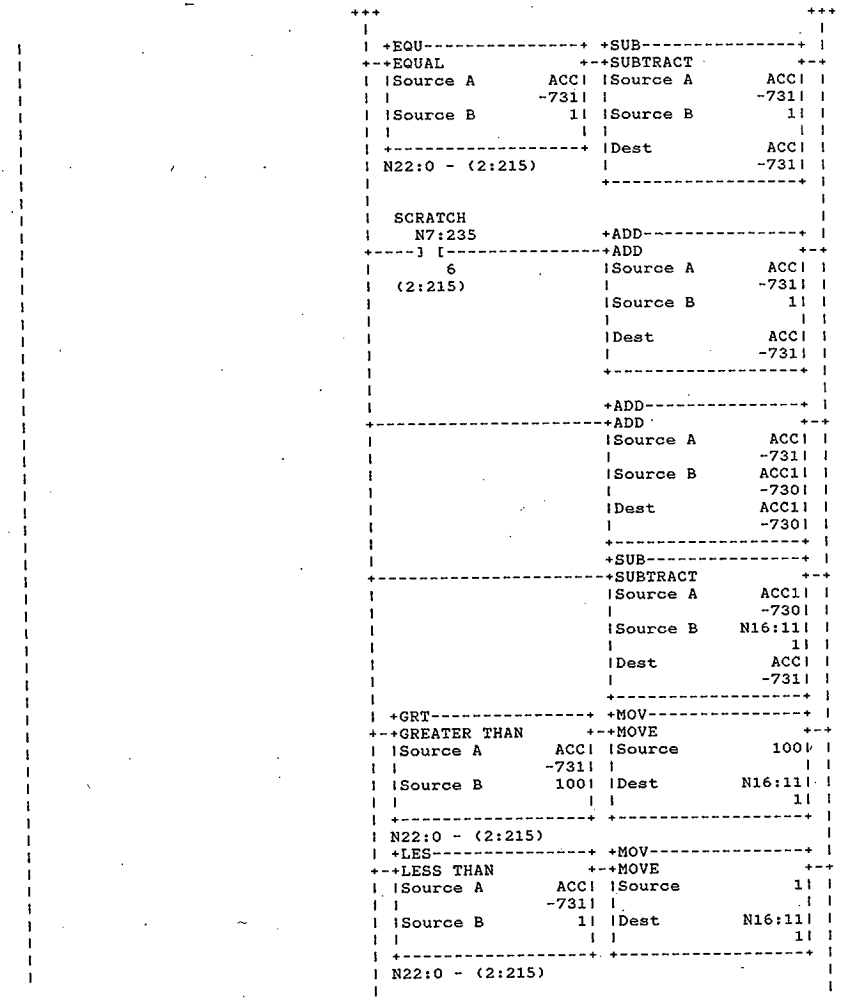
(JMP) 44

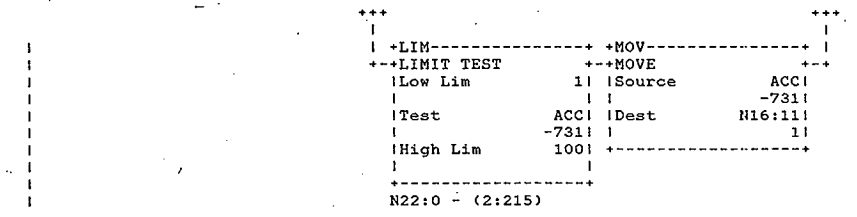
Rung 2:721

RATE CHECKING




+MUL
+MULTIPLY
Source A DIF1_178B
-8
Source B DIF1_178B
-8
Dest ACC
-731
+MUL
+MULTIPLY
Source A ACC
-731
Source B DIF1_172V
-8
Dest ACC
-731
+CLR
+CLEAR
Dest S:5
0
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N7:235
6
+EQU
+EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)

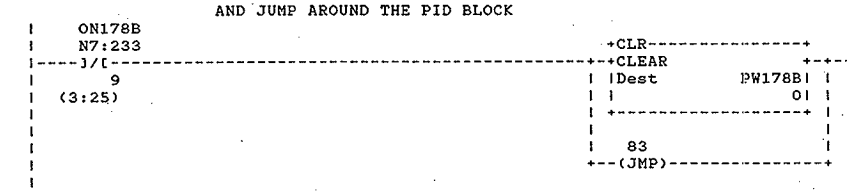

EQU
EQUAL
Source A
ACC
-731
Source B
1
N22:0 - (2:215)
SUB
SUBTRACT
Source A
ACC
-731
Source B
1
Dest
ACC
-731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A
ACC
-731
Source B
1
Dest
ACC
-731
ADD
ADD
Source A
ACC
-731
Source B
ACC1
-730
Dest
ACC1
-730
SUB
SUBTRACT
Source A
ACC1
-730
Source B
N16:11
1
Dest
ACC
-731
GRT
GREATER THAN
Source A
ACC
-731
Source B
100
N22:0 - (2:215)
MOV
MOVE
Source
100
Dest
N16:11
1
LES
LESS THAN
Source A
ACC
-731
Source B
1
N22:0 - (2:215)
MOV
MOVE
Source
1
Dest
N16:11
1



Rung 2:722

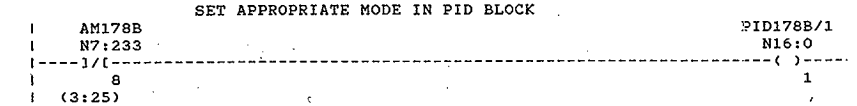
Rung 2:723

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



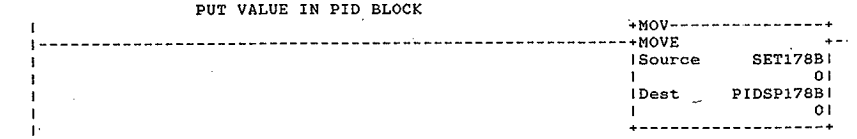
Rung 2:724

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

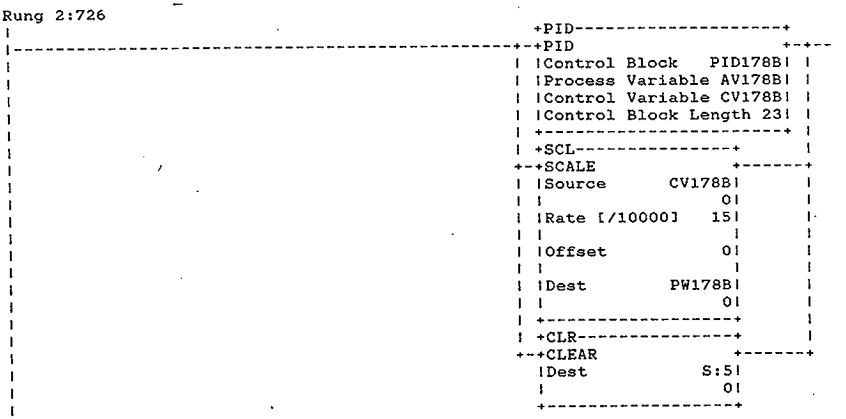


Rung 2:725

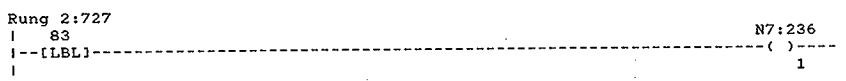
DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



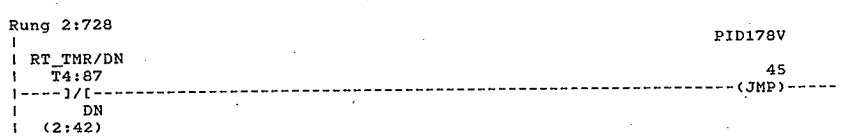
Rung 2:726



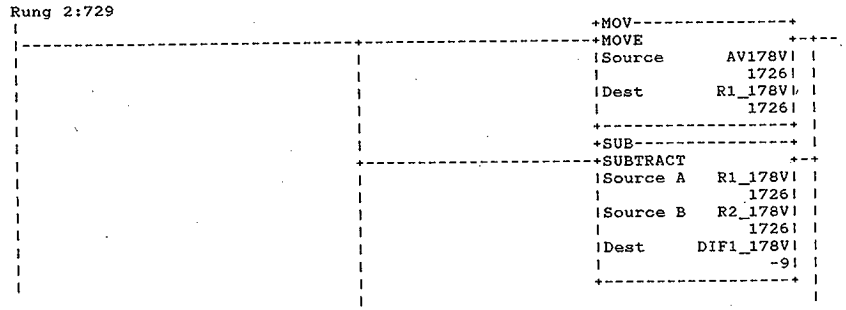
Rung 2:727

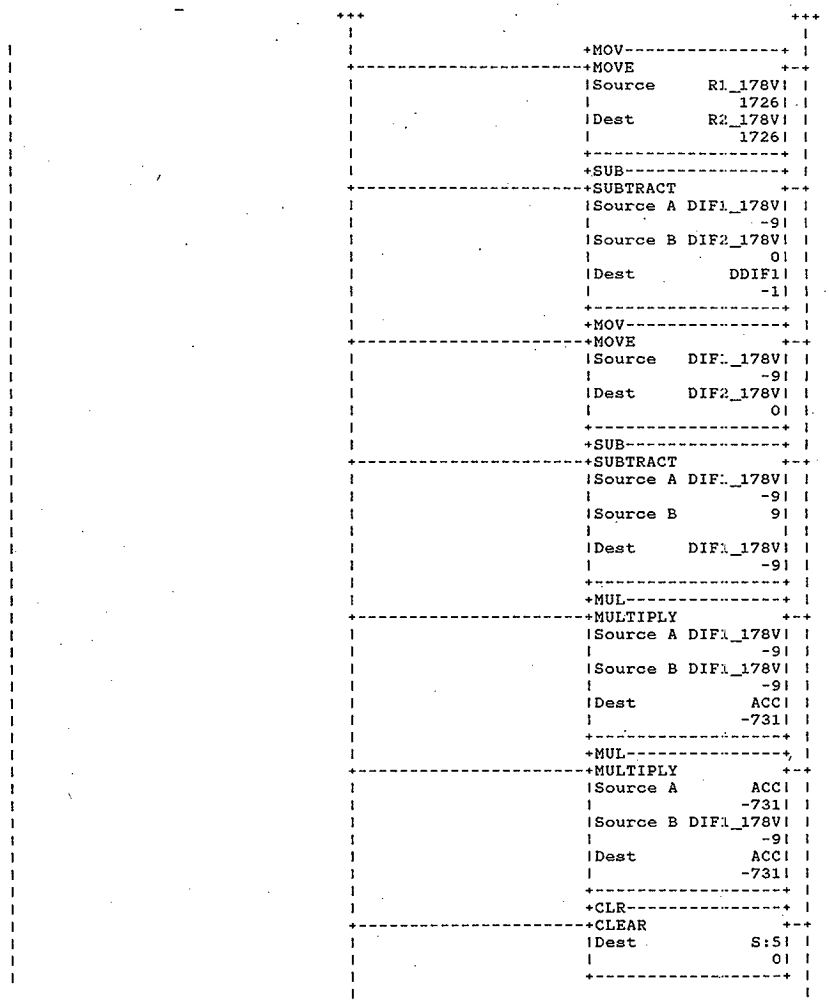


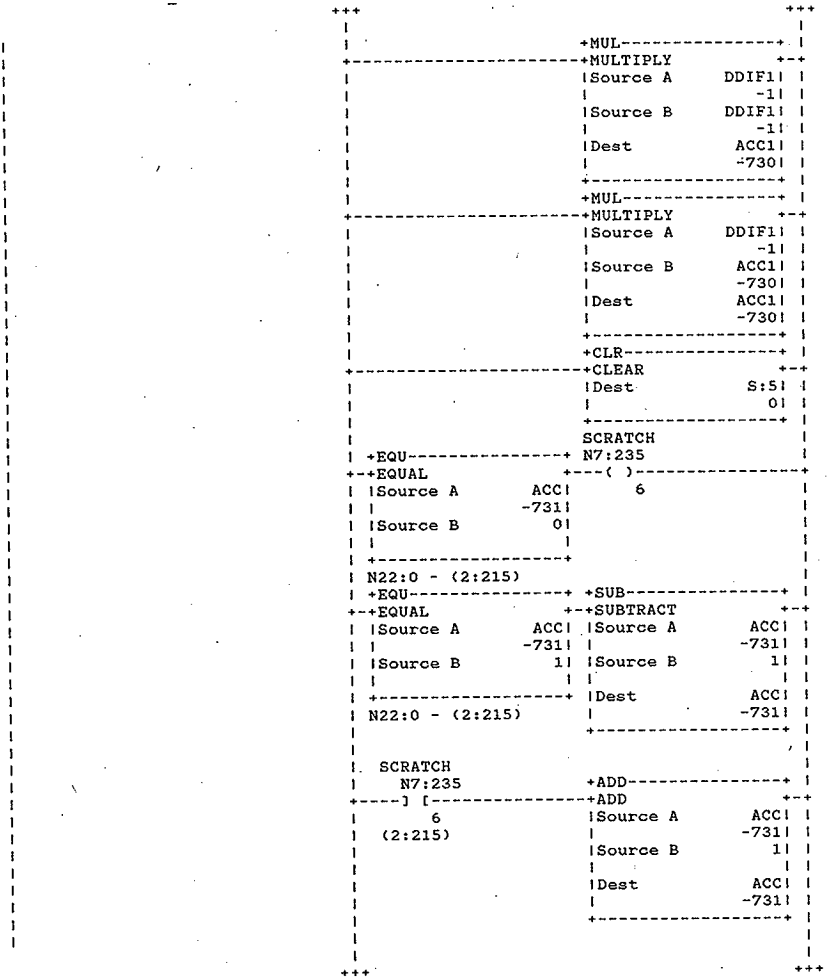
Rung 2:728

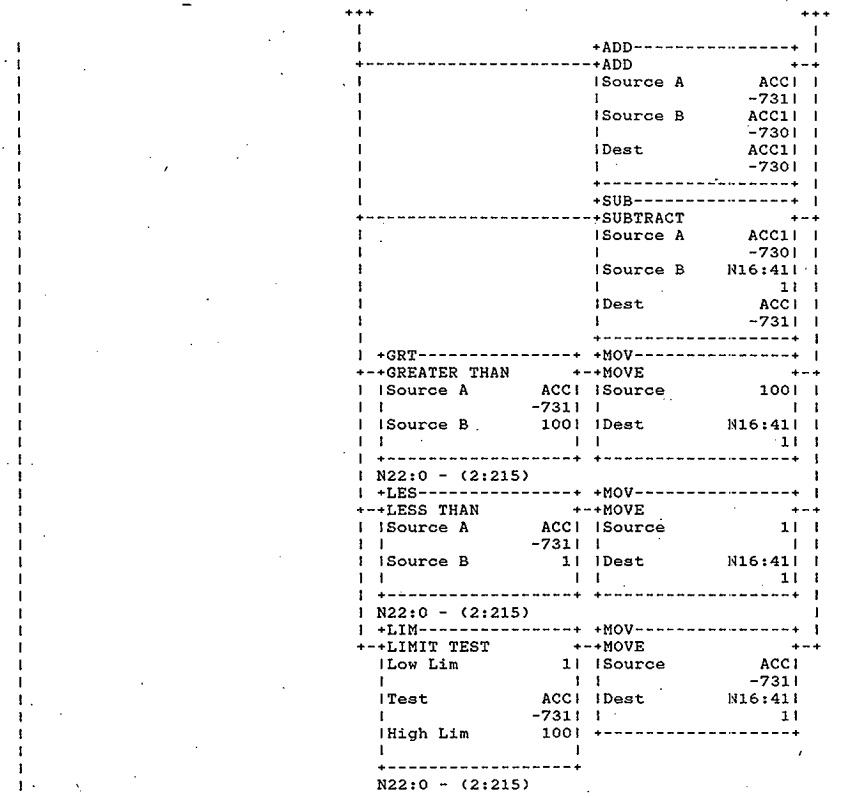


Rung 2:729




MOV
MOVE
Source R1_178V1
1726
Dest R2_178V1
1726
SUB
SUBTRACT
Source A DIF1_178V1
-9
Source B DIF2_178V1
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_178V1
-9
Dest DIF2_178V1
0
SUB
SUBTRACT
Source A DIF1_178V1
-9
Source B
9
Dest DIF1_178V1
-9
MUL
MULTIPLY
Source A DIF1_178V1
-9
Source B DIF1_178V1
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_178V1
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0


+MUL
+MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N7:235
+EQU
+EQUAL
Source A ACC
-731
Source B
0
N22:0 - (2:215)
6
+EQU
+EQUAL
Source A ACC
-731
Source B
1
N22:0 - (2:215)
+SUB
+SUBTRACT
Source A ACC
-731
Source B
1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
+ADD
+ADD
Source A ACC
-731
Source B
1
Dest ACC
-731

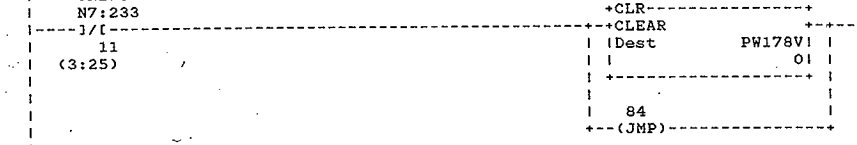


Rung 2:730
PID178V

45 DUMMY45
[LBL] N22:9
12

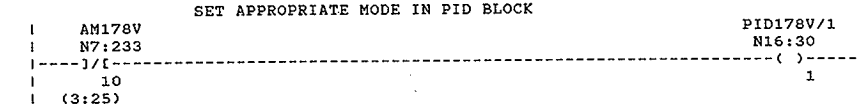
Rung 2:731

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



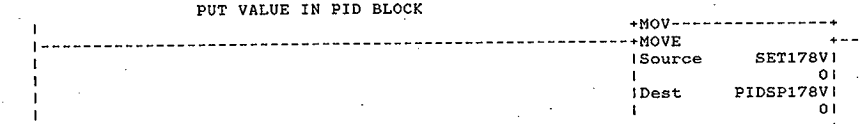
Rung 2:732

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

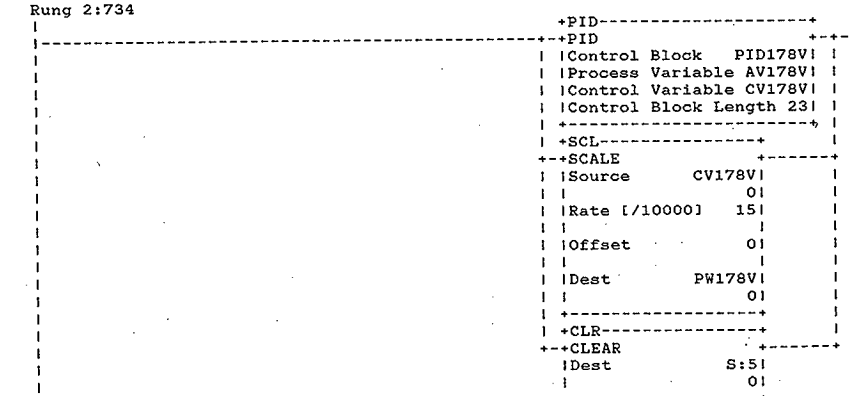


Rung 2:733

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



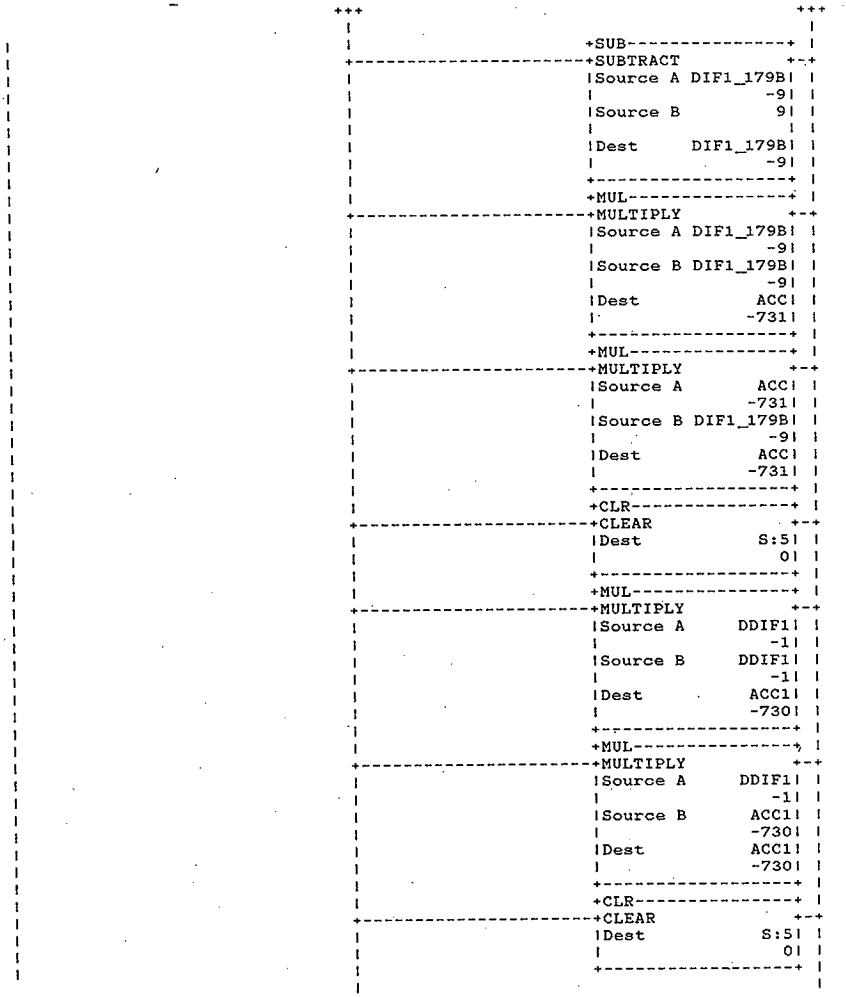
Rung 2:734

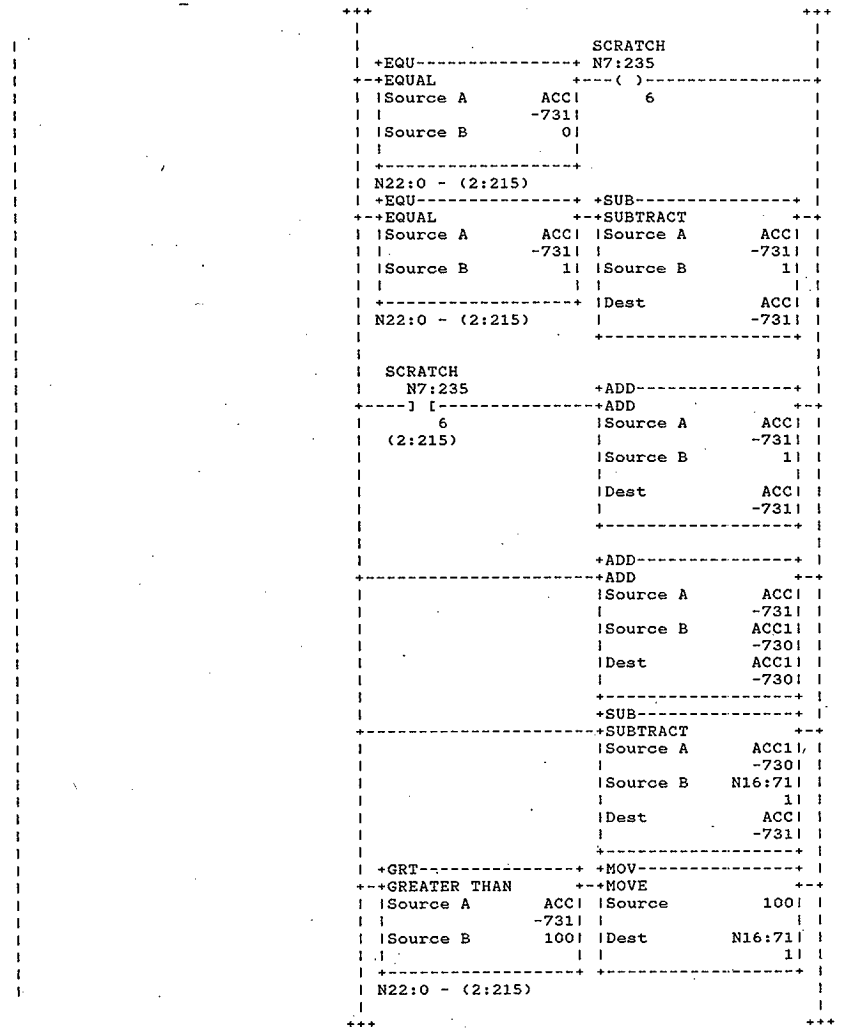


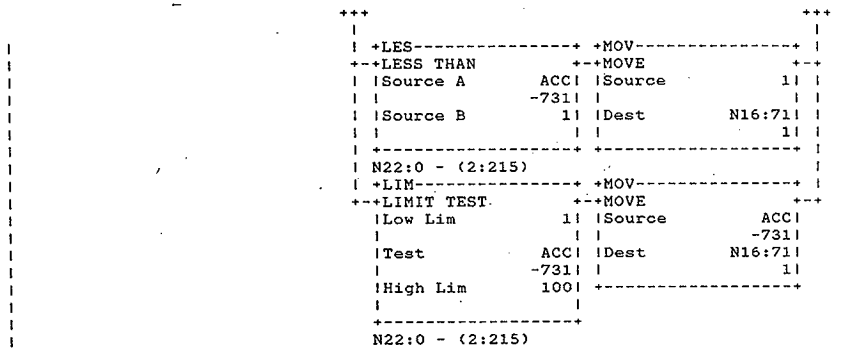
```
Rung 2:735
|   84                                                                  N7:236
|--[LBL]-------------------------------------------------------------------( )----
|                                                                            2

Rung 2:736
|                                                                    PID179B
| RT_TMR/DN
|   T4:87                                                                 46
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)

Rung 2:737
|                                                        +MOV---------------+
|-------------------------------+-----------------------+MOVE              +-+--
|                               |                       |Source      AV179B| |
|                               |                       |              1717| |
|                               |                       |Dest       R1_179B| |
|                               |                       |              1718| |
|                               |                       +------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A   R1_179B| |
|                               |                       |              1718| |
|                               |                       |Source B   R2_179B| |
|                               |                       |              1718| |
|                               |                       |Dest     DIF1_179B| |
|                               |                       |                -9| |
|                               |                       +------------------+ |
|                               |                       +MOV---------------+ |
|                               +-----------------------+MOVE              +-+
|                               |                       |Source     R1_179B| |
|                               |                       |              1718| |
|                               |                       |Dest       R2_179B| |
|                               |                       |              1718| |
|                               |                       +------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A DIF1_179B| |
|                               |                       |                -9| |
|                               |                       |Source B DIF2_179B| |
|                               |                       |                 0| |
|                               |                       |Dest         DDIF1| |
|                               |                       |                -1| |
|                               |                       +------------------+ |
|                               |                       +MOV---------------+ |
|                               +-----------------------+MOVE              +-+
|                               |                       |Source   DIF1_179B| |
|                               |                       |                -9| |
|                               |                       |Dest     DIF2_179B| |
|                               |                       |                 0| |
|                               |                       +------------------+ |
|                               |                                            |
                                +++                                         +++
```

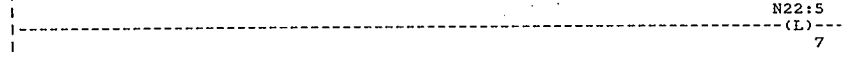

SUB
SUBTRACT
Source A DIF1_179B
-9
Source B
9
Dest DIF1_179B
-9
MUL
MULTIPLY
Source A DIF1_179B
-9
Source B DIF1_179B
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_179B
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0


EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
SCRATCH N7:235
( )
6
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH N7:235
6
(2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730
SUB
SUBTRACT
Source A ACC1 -730
Source B N16:71 1
Dest ACC -731
GRT
GREATER THAN
Source A ACC -731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N16:71 1



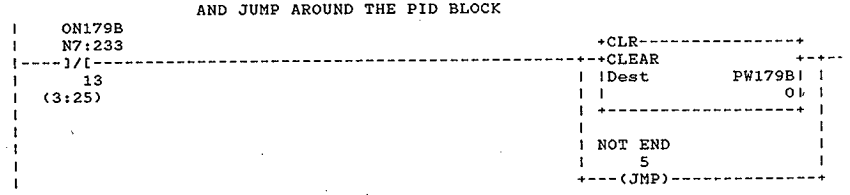
Rung 2:738

Rung 2:739



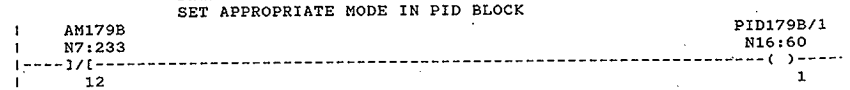
Rung 2:740

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:741

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



```
Rung 2:742
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source     SET179B|
|                                                          |                 0|
|                                                          |Dest     PIDSP179B|
|                                                          |                 0|
|                                                          +------------------+

Rung 2:743
|                                                    +PID--------------------+
|--------------------------------------------------+-+PID                   +-+--
|                                                  | |Control Block   PID179B| |
|                                                  | |Process Variable AV179B| |
|                                                  | |Control Variable CV179B| |
|                                                  | |Control Block Length 23| |
|                                                  | +----------------------+ |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                  | |Dest        CV179B|      |
|                                                  | |                 0|      |
|                                                  | +------------------+      |
|                                                  | +SCL---------------+      |
|                                                  +-+SCALE             +------+
|                                                  | |Source      CV179B|      |
|                                                  | |                 0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                  |      |
|                                                  | |Offset           0|      |
|                                                  | |                  |      |
|                                                  | |Dest        PW179B|      |
|                                                  | |                 0|      |
|                                                  | +------------------+      |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

Rung 2:744
|                                                                  NOT END
|                                                                      5
|-------------------------------------------------------------------(JMP)-----
|

Rung 2:745
*******************************************************************************
                        BEGIN SECTION 4
| MD4
|                                                                    DUMMY15
|     4                                                               N22:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                        14
```

```
Rung 2:746
|                                                                          DN_4
|                                                                          N22:5
|--------------------------------------------------------------------------(L)---
|                                                                            4

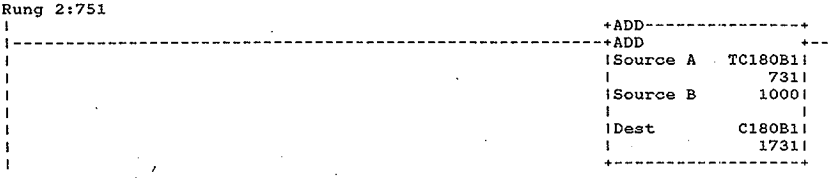
Rung 2:747
*****************************************************************************
  READ EACH THERMOCOUPLE AND STORE EACH TE'S VALUE IN ITS OWN MEMORY REGISTER
*****************************************************************************
|                                                          +ADD---------------+
|----------------------------------------------------------+ADD               +--
|                                                          |Source A   TC179V1|
|                                                          |                716|
|                                                          |Source B      1000|
|                                                          |                  |
|                                                          |Dest       C179V1|
|                                                          |                1716|
|                                                          +------------------+

Rung 2:748
| +GRT---------------+                                     +MOV---------------+
|-+GREATER THAN      +-----------------------------------+ +MOVE              +--
| |Source A    C179V1|                                    |Source       16383|
| |               1716|                                   |                  |
| |Source B    16383|                                    |Dest       C179V1|
| |                  |                                    |                1716|
| +------------------+                                    +------------------+
| N7:67 - (2:747)

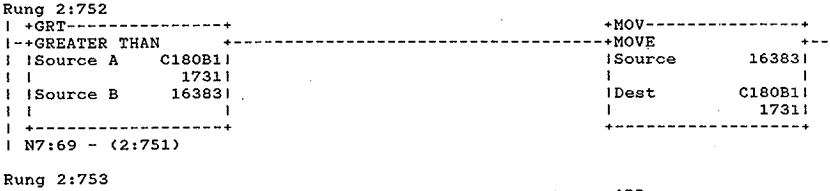
Rung 2:749
|                                                          +ADD---------------+
|----------------------------------------------------------+ADD               +--
|                                                          |Source A   TC179V2|
|                                                          |                716|
|                                                          |Source B      1000|
|                                                          |                  |
|                                                          |Dest       C179V2|
|                                                          |                1716|
|                                                          +------------------+

Rung 2:750
| +GRT---------------+                                     +MOV---------------+
|-+GREATER THAN      +-----------------------------------+ +MOVE              +--
| |Source A    C179V2|                                    |Source       16383|
| |               1716|                                   |                  |
| |Source B    16383|                                    |Dest       C179V2|
| |                  |                                    |                1716|
| +------------------+                                    +------------------+
| N7:68 - (2:749)
```

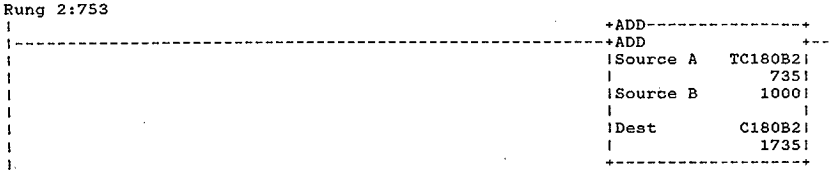
Rung 2:751



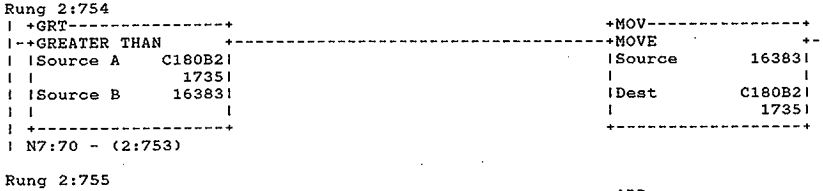
Rung 2:752



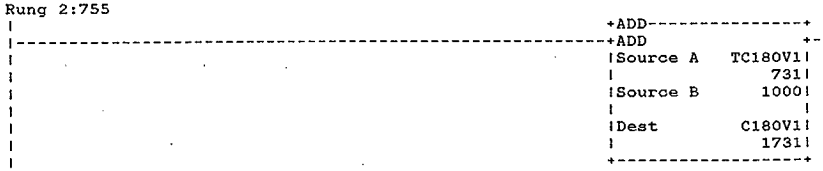
Rung 2:753



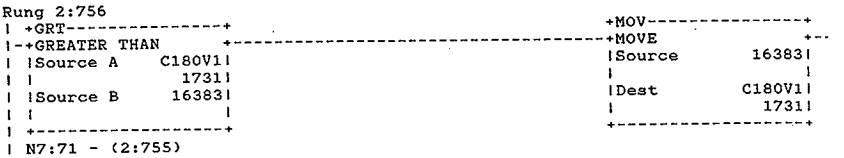
Rung 2:754



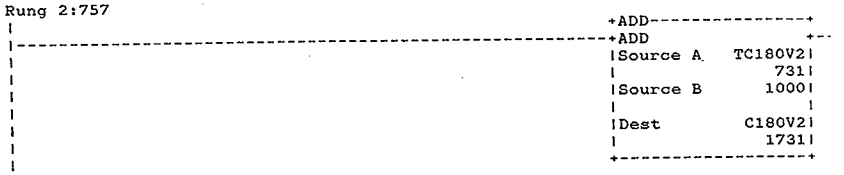
Rung 2:755



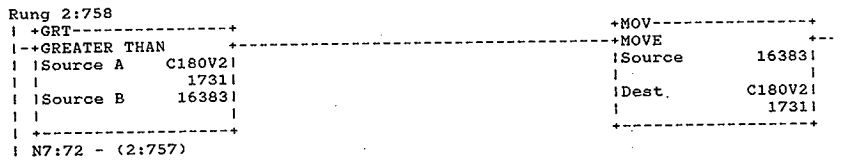
Rung 2:756



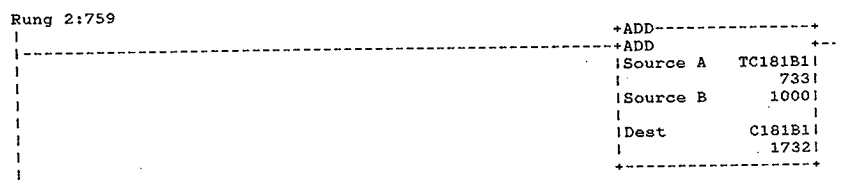
Rung 2:757



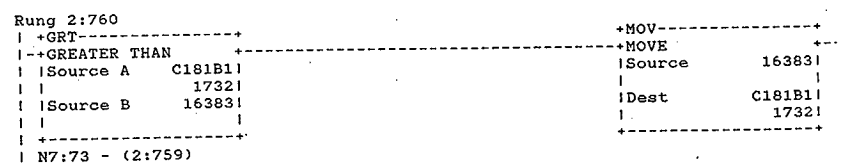
Rung 2:758



Rung 2:759



Rung 2:760



```
Rung 2:761
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD                +--
|                                                                |Source A   TC181B2|
|                                                                |               732|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C181B2|
|                                                                |              1732|
|                                                                +------------------+

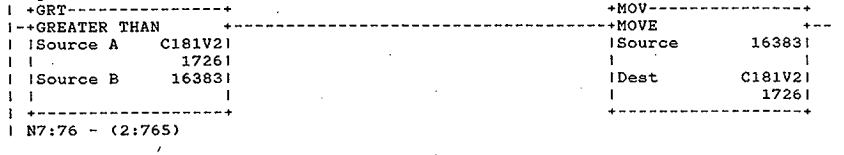
Rung 2:762
| +GRT---------------+                                          +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE               +--
| |Source A    C181B2|                                          |Source       16383|
| |              1732|                                          |                  |
| |Source B     16383|                                          |Dest        C181B2|
| |                  |                                          |              1732|
| +------------------+                                          +------------------+
| N7:74 - (2:761)

Rung 2:763
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD                +--
|                                                                |Source A   TC181V1|
|                                                                |               728|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C181V1|
|                                                                |              1728|
|                                                                +------------------+

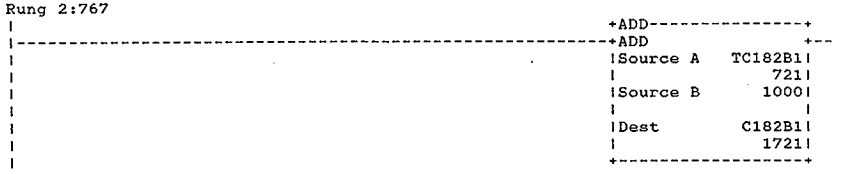
Rung 2:764
| +GRT---------------+                                          +MOV---------------+
|-+GREATER THAN      +-----------------------------------------+MOVE               +--
| |Source A    C181V1|                                          |Source       16383|
| |              1728|                                          |                  |
| |Source B     16383|                                          |Dest        C181V1|
| |                  |                                          |              1728|
| +------------------+                                          +------------------+
| N7:75 - (2:763)

Rung 2:765
|                                                                +ADD---------------+
|-------------------------------------------------------------+ADD                +--
|                                                                |Source A   TC181V2|
|                                                                |               726|
|                                                                |Source B      1000|
|                                                                |                  |
|                                                                |Dest        C181V2|
|                                                                |              1726|
|                                                                +------------------+
```

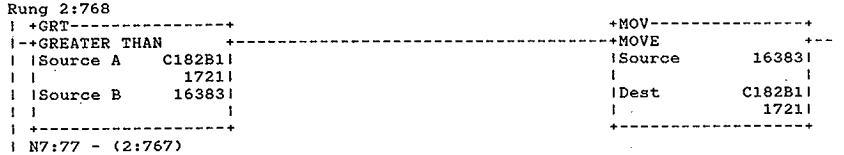
Rung 2:766



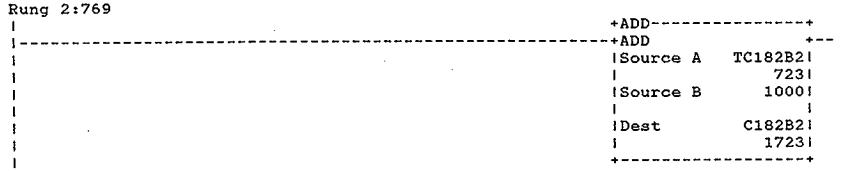
Rung 2:767



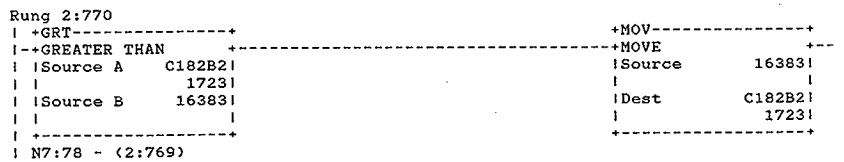
Rung 2:768



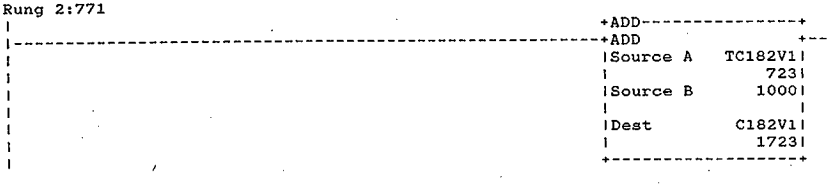
Rung 2:769



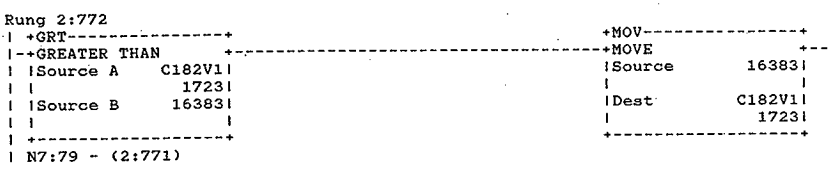
Rung 2:770



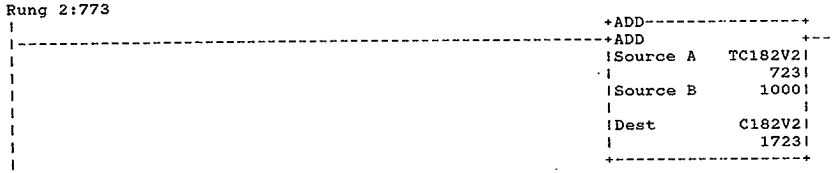
Rung 2:771



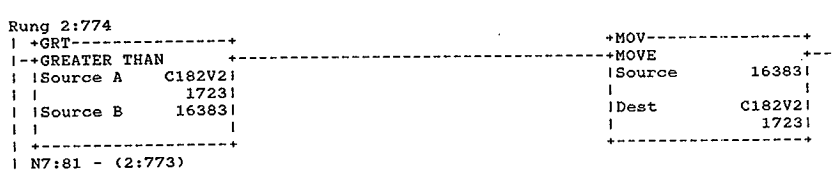
Rung 2:772



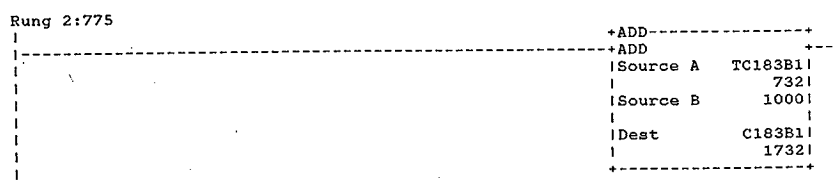
Rung 2:773



Rung 2:774



Rung 2:775



```
Rung 2:776
| +GRT---------------+                                    +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C183B1|                                   |Source       16383|
| |              1732|                                   |                  |
| |Source B     16383|                                   |Dest        C183B1|
| |                  |                                   |              1732|
| +------------------+                                   +------------------+
| N7:80 - (2:775)

Rung 2:777
|                                                        +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                        |Source A   TC183B2|
|                                                        |               733|
|                                                        |Source B      1000|
|                                                        |                  |
|                                                        |Dest        C183B2|
|                                                        |              1733|
|                                                        +------------------+

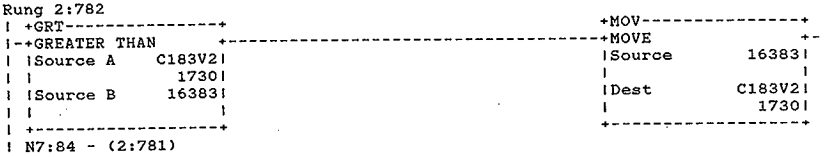
Rung 2:778
| +GRT---------------+                                    +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C183B2|                                   |Source       16383|
| |              1733|                                   |                  |
| |Source B     16383|                                   |Dest        C183B2|
| |                  |                                   |              1733|
| +------------------+                                   +------------------+
| N7:82 - (2:777)

Rung 2:779
|                                                        +ADD---------------+
|-------------------------------------------------------+ADD               +--
|                                                        |Source A   TC183V1|
|                                                        |               730|
|                                                        |Source B      1000|
|                                                        |                  |
|                                                        |Dest        C183V1|
|                                                        |              1730|
|                                                        +------------------+

Rung 2:780
| +GRT---------------+                                    +MOV---------------+
|-+GREATER THAN      +-----------------------------------+MOVE              +--
| |Source A    C183V1|                                   |Source       16383|
| |              1730|                                   |                  |
| |Source B     16383|                                   |Dest        C183V1|
| |                  |                                   |              1730|
| +------------------+                                   +------------------+
| N7:83 - (2:779)
```

Rung 2:781

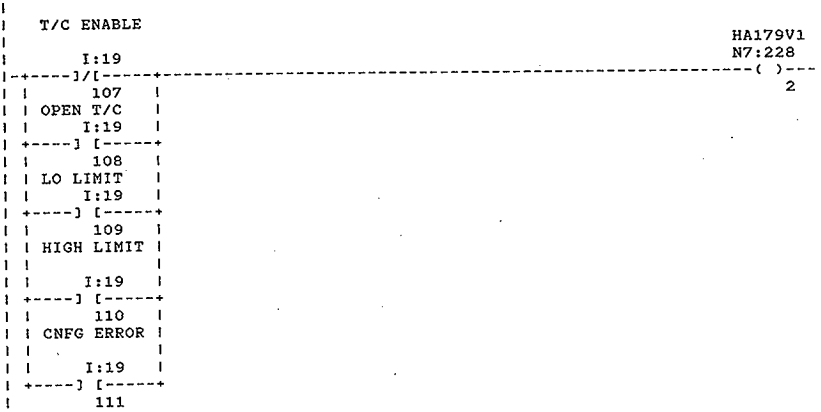
Rung 2:782



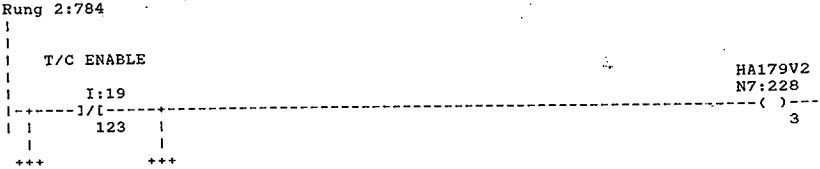
Rung 2:783

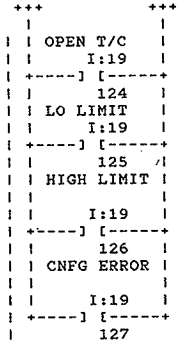
** Alarms **

For each T/C read its STATUS BITS to detect T/C problems

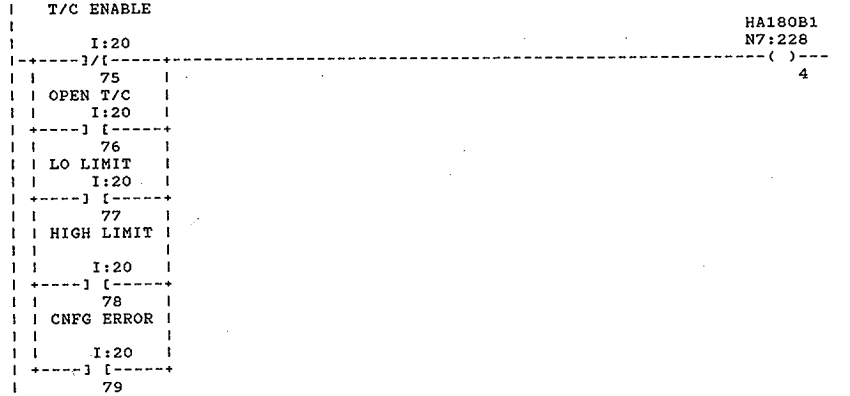


Rung 2:784

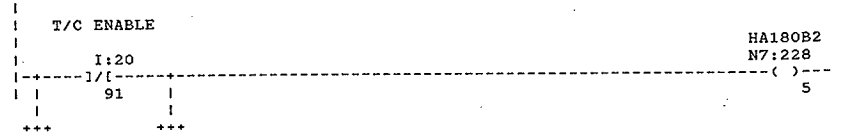


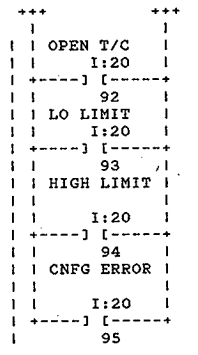


Rung 2:785

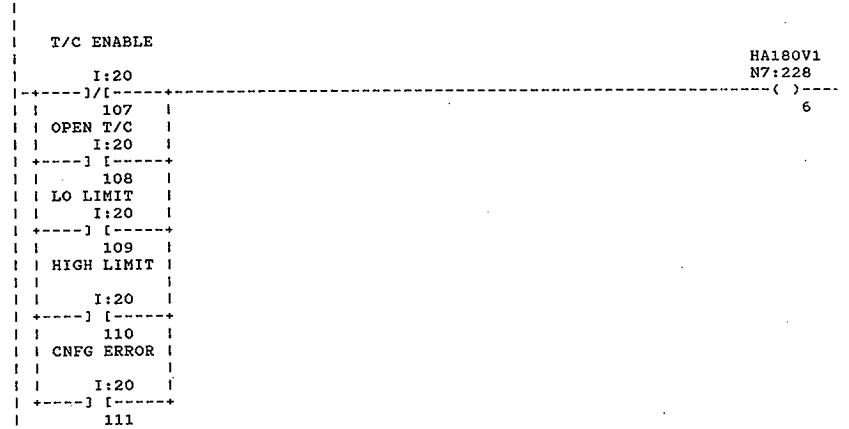


Rung 2:786

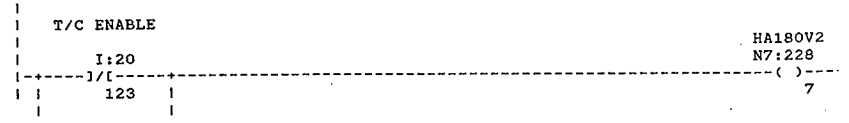


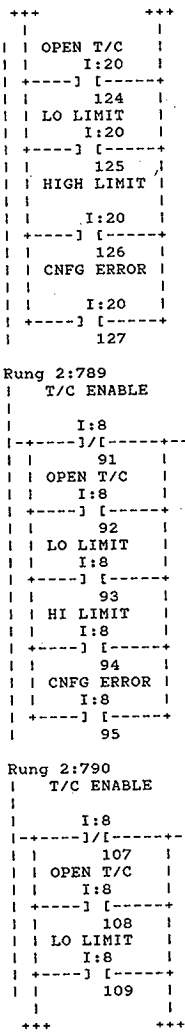


Rung 2:787

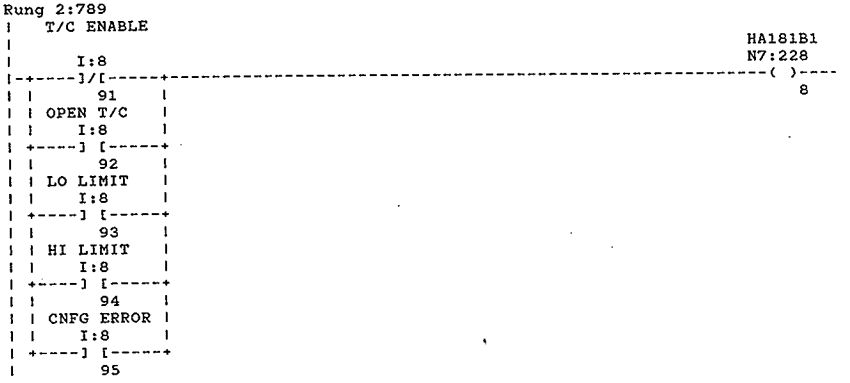


Rung 2:788

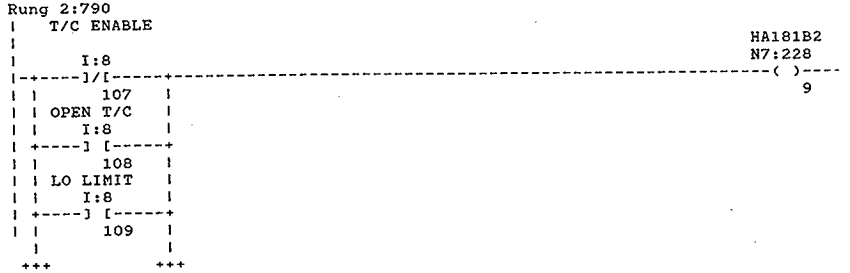


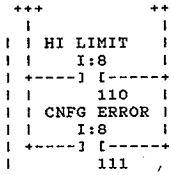


Rung 2:789

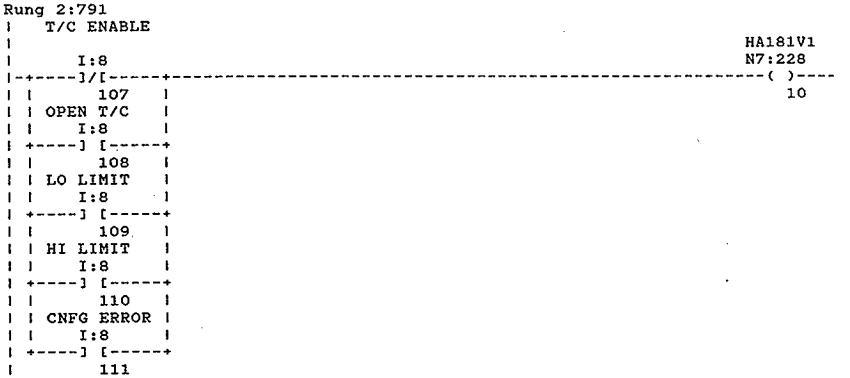


Rung 2:790

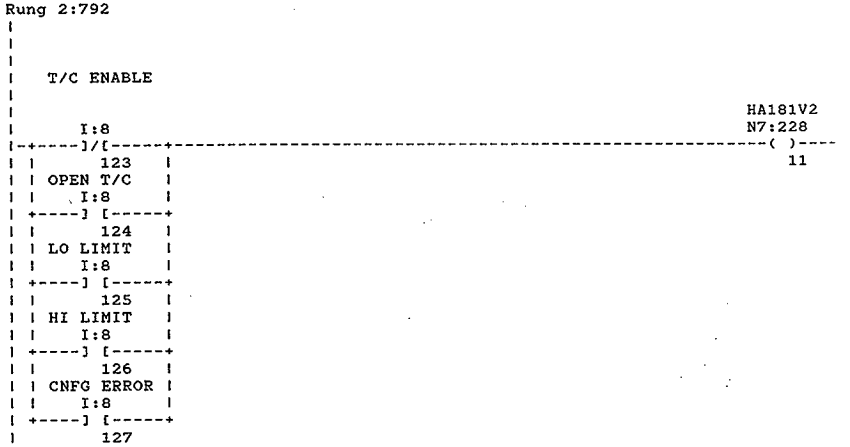




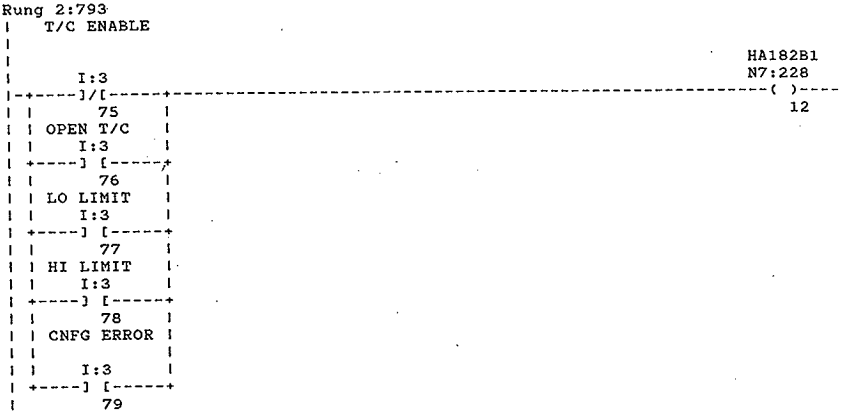
Rung 2:791



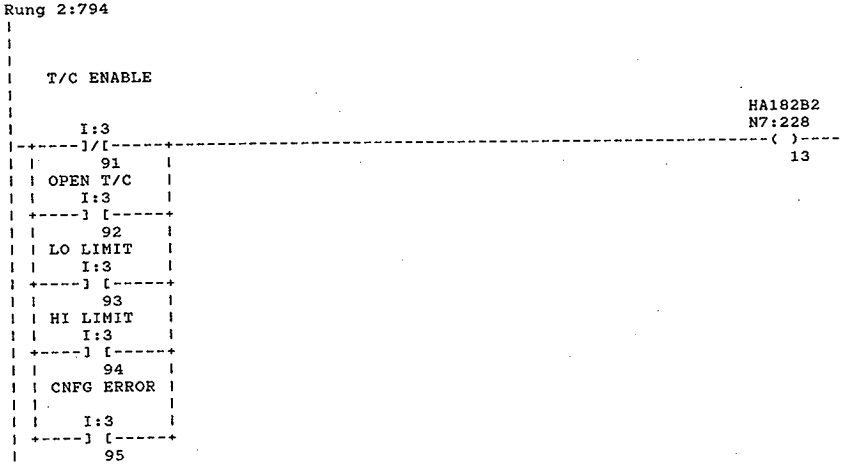
Rung 2:792



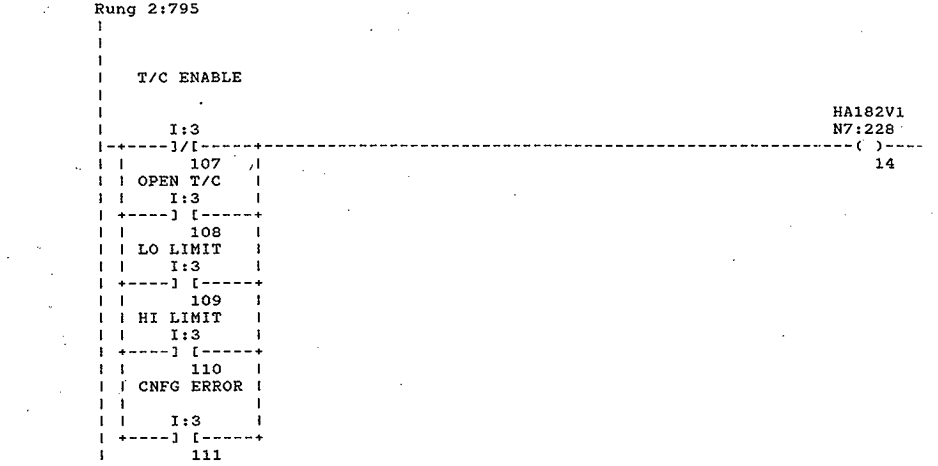
Rung 2:793



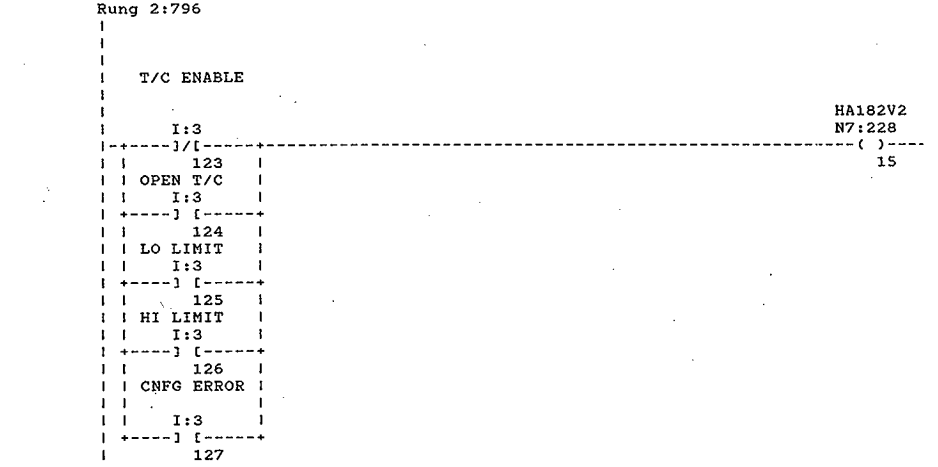
Rung 2:794



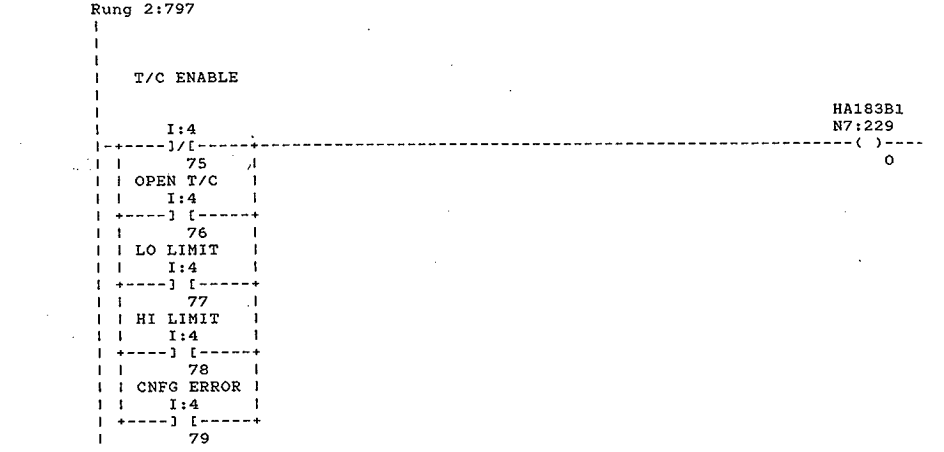
Rung 2:795



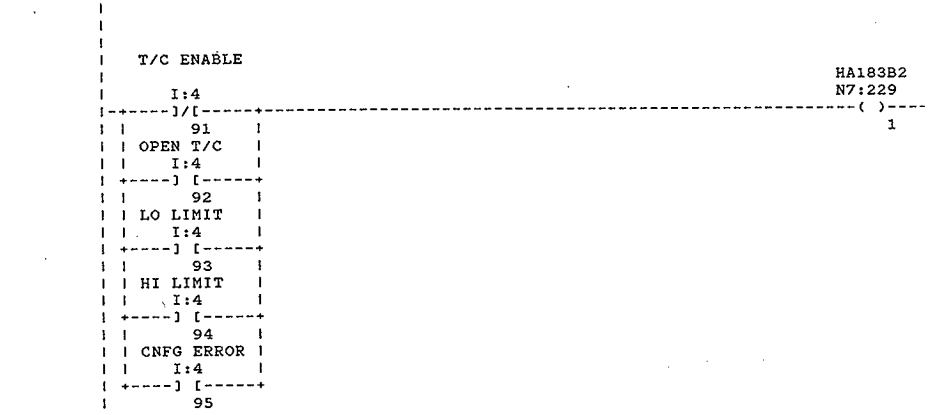
Rung 2:796



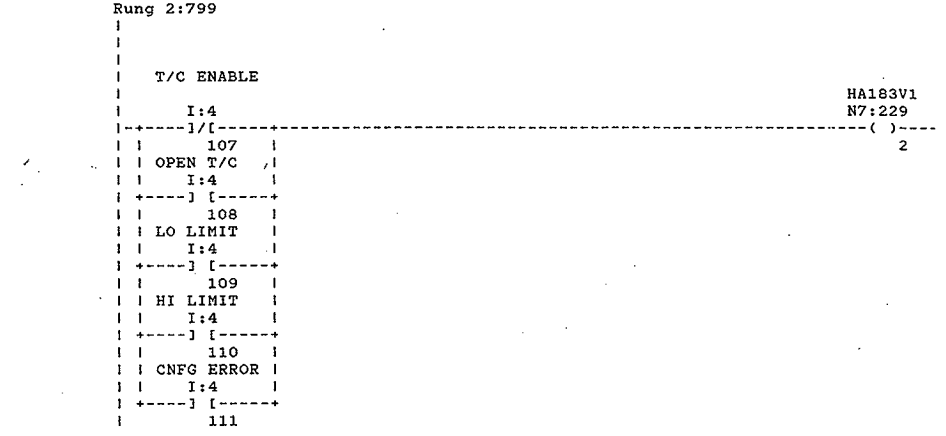
Rung 2:797



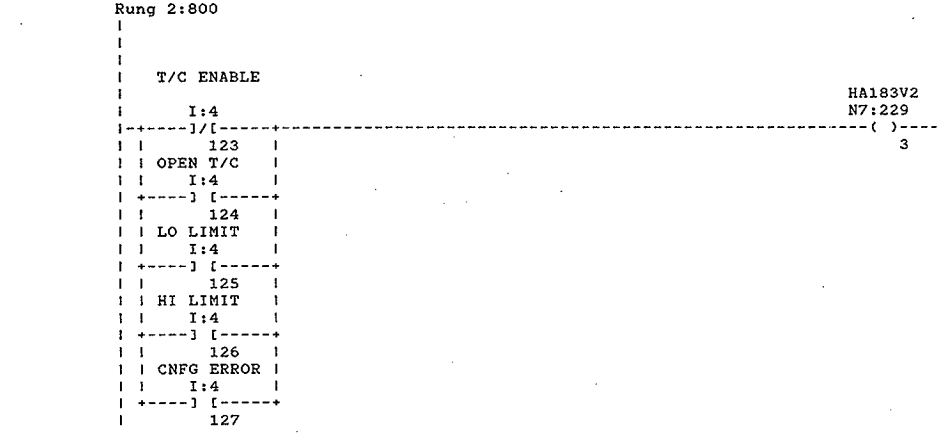
Rung 2:798



Rung 2:799



Rung 2:800



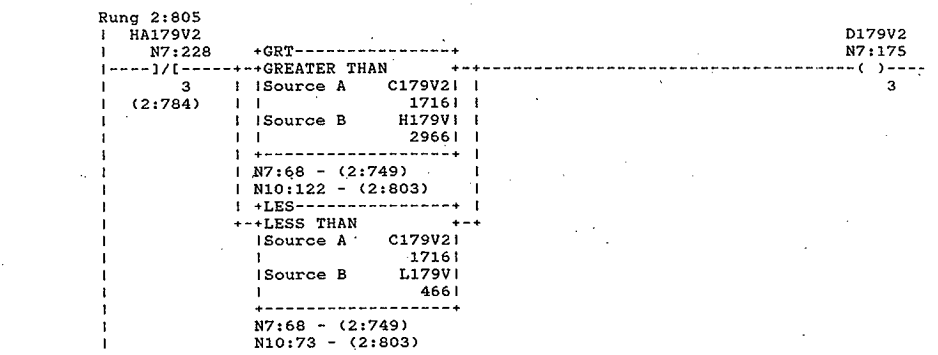
Rung 2:801

```
Rung 2:802
| DEV4
|                                                                    DUMMY13
|      11                                                             N22:7
|---[LBL]-------------------------------------------------------------( )----
|                                                                       12

Rung 2:803
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                      +ADD---------------+
|-----------------------------------------------------+-+ADD               +-+--
|                                                     | |Source A    AV179V| |
|                                                     | |              1716| |
|                                                     | |Source B DEVIATION| |
|                                                     | |              1250| |
|                                                     | |Dest         H179V| |
|                                                     | |              2966| |
|                                                     | +------------------+ |
|                                                     | +SUB---------------+ |
|                                                     +-+SUBTRACT          +-+
|                                                       |Source A    AV179V|
|                                                       |              1716|
|                                                       |Source B DEVIATION|
|                                                       |              1250|
|                                                       |Dest         L179V|
|                                                       |               466|
|                                                       +------------------+

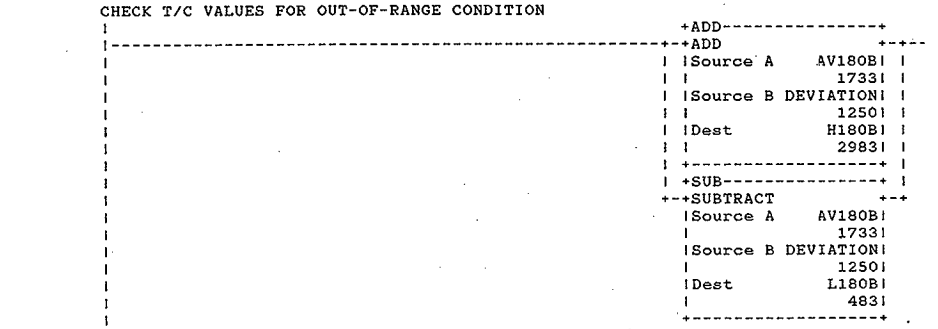
Rung 2:804
|  HA179V1                                                                D179V1
|    N7:228     +GRT---------------+                                      N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|       2    | |Source A    C179V1| |                                       2
|  (2:783)   | |              1716| |
|            | |Source B     H179V| |
|            | |              2966| |
|            | +------------------+ |
|            | N7:67 - (2:747)      |
|            | N10:122 - (2:803)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C179V1|
|              |              1716|
|              |Source B     L179V|
|              |               466|
|              +------------------+
|              N7:67 - (2:747)
|              N10:73 - (2:803)
```

Rung 2:805

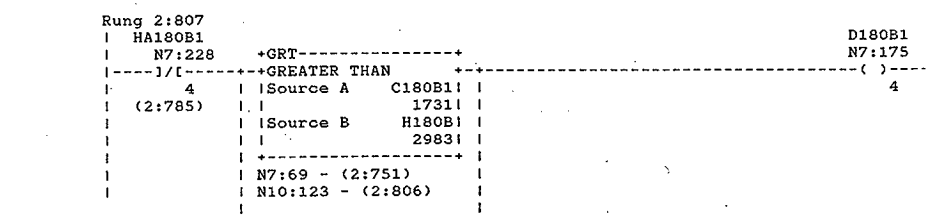


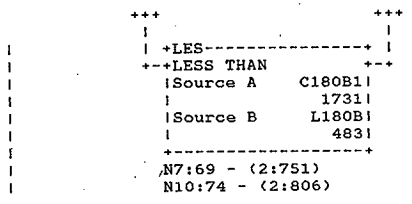
Rung 2:806

```
**********************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```

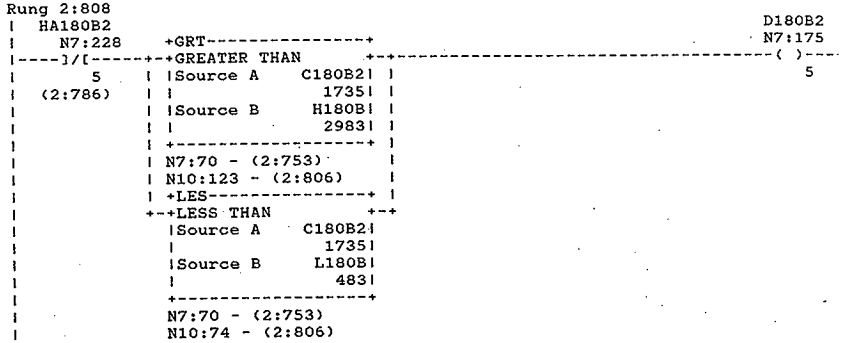


Rung 2:807

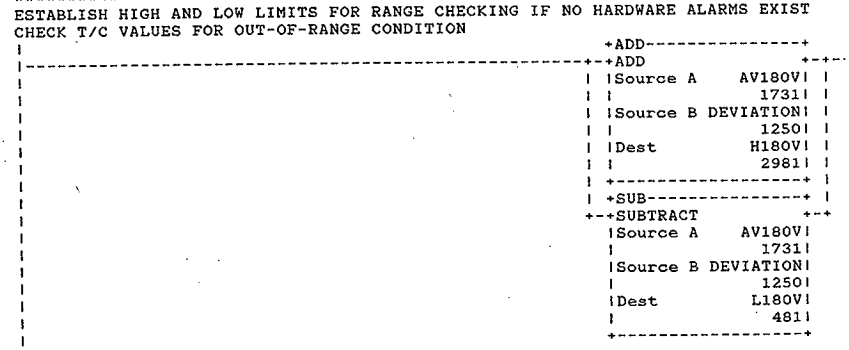




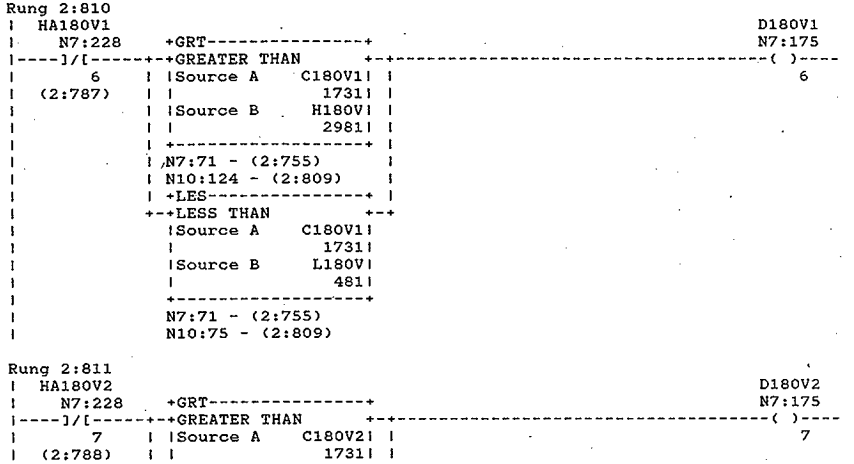
Rung 2:808



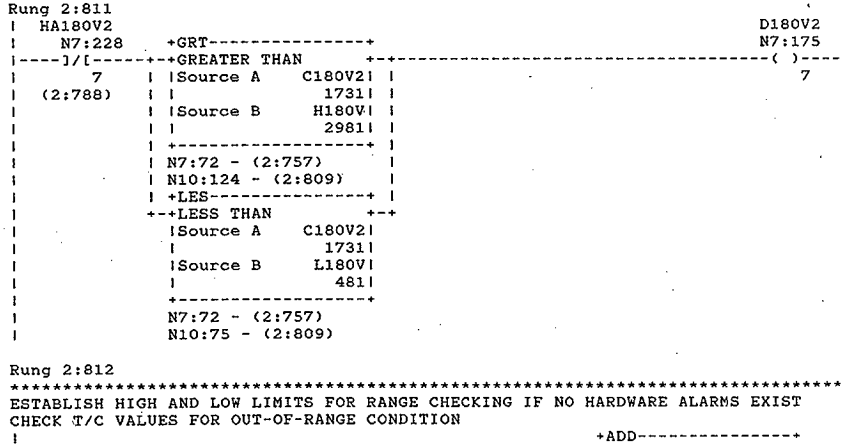
Rung 2:809



Rung 2:810

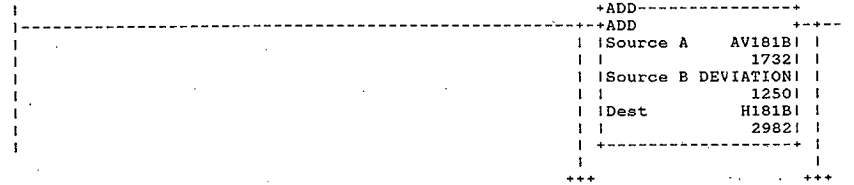


Rung 2:811

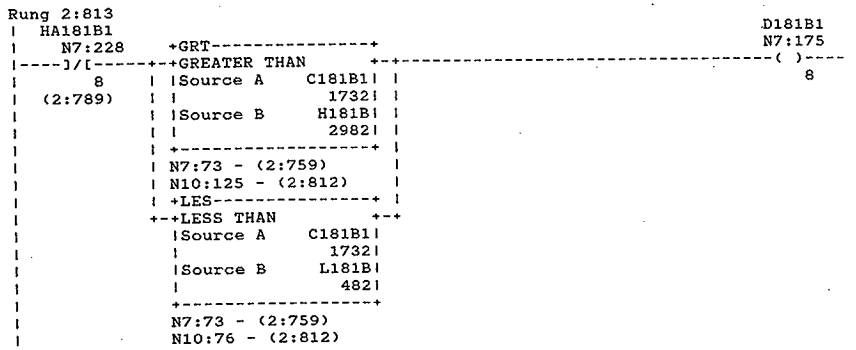


Rung 2:812

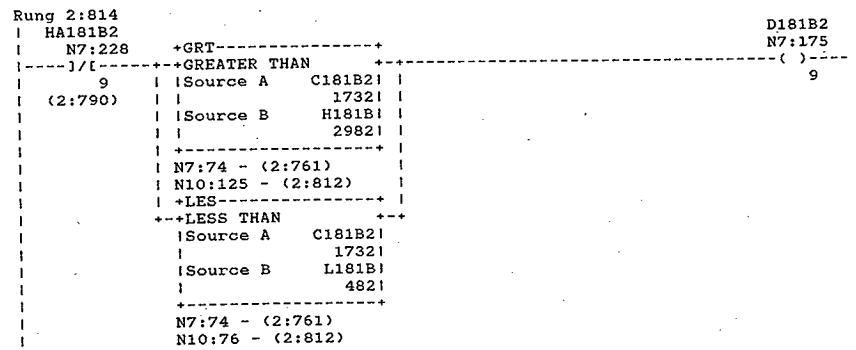
```
********************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
```



Rung 2:813



Rung 2:814



```
Rung 2:815
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                          +ADD---------------+
|-------------------------------------------------------+-+ADD               +-+-
|                                                       | |Source A    AV181V| |
|                                                       | |              1727| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H181V| |
|                                                       | |              2977| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV181V|
|                                                         |              1727|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L181V|
|                                                         |               477|
|                                                         +------------------+

Rung 2:816
|  HA181V1                                                                  D181V1
|    N7:228     +GRT---------------+                                        N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      10    | |Source A    C181V1| |                                        10
|  (2:791)   | |              1728| |
|            | |Source B     H181V| |
|            | |              2977| |
|            | +------------------+ |
|            | N7:75 - (2:763)      |
|            | N10:126 - (2:815)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C181V1|
|              |              1728|
|              |Source B     L181V|
|              |               477|
|              +------------------+
|              N7:75 - (2:763)
|              N10:77 - (2:815)

Rung 2:817
|  HA181V2                                                                  D181V2
|    N7:228     +GRT---------------+                                        N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      11    | |Source A    C181V2| |                                        11
|  (2:792)   | |              1726| |
|            | |Source B     H181V| |
|            | |              2977| |
|            | +------------------+ |
|            | N7:76 - (2:765)      |
|            | N10:126 - (2:815)    |
             |                      |
            +++                    +++
```

```
            +++                     +++
             |                       |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C181V2|
|              |               1726|
|              |Source B     L181V|
|              |                477|
|              +------------------+
|              N7:76 - (2:765)
|              N10:77 - (2:815)
```

Rung 2:818

```
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A    AV182B| |
|                                                       | |               1722| |
|                                                       | |Source B DEVIATION| |
|                                                       | |               1250| |
|                                                       | |Dest          H182B| |
|                                                       | |               2972| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV182B|
|                                                         |               1722|
|                                                         |Source B DEVIATION|
|                                                         |               1250|
|                                                         |Dest          L182B|
|                                                         |                472|
|                                                         +------------------+
```

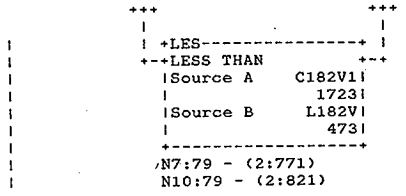
Rung 2:819

```
|  HA182B1                                                                  D182B1
|    N7:228     +GRT---------------+                                        N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      12    | |Source A    C182B1| |                                        12
|  (2:793)   | |               1721| |
|            | |Source B     H182B| |
|            | |               2972| |
|            | +------------------+ |
|            | N7:77 - (2:767)      |
|            | N10:127 - (2:818)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C182B1|
|              |               1721|
|              |Source B     L182B|
|              |                472|
|              +------------------+
|              N7:77 - (2:767)
|              N10:78 - (2:818)
```

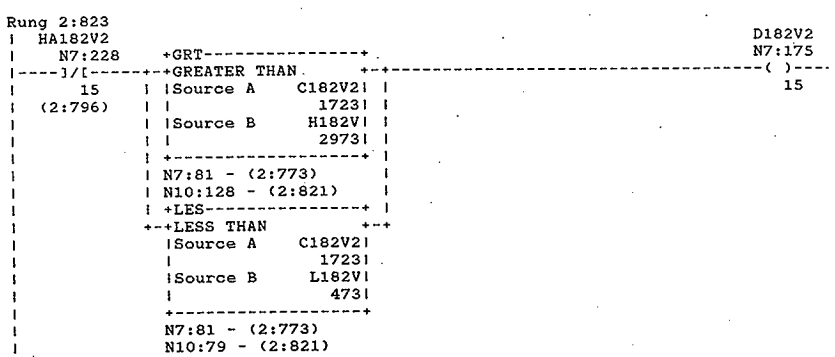
```
Rung 2:820
|  HA182B2                                                                  D182B2
|    N7:228    +GRT---------------+                                         N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      13    | |Source A    C182B2| |                                        13
|  (2:794)   | |              1723| |
|            | |Source B     H182B| |
|            | |              2972| |
|            | +------------------+ |
|            | N7:78 - (2:769)      |
|            | N10:127 - (2:818)    |
|            | +LES---------------+ |
|            +-+LESS THAN         +-+
|              |Source A    C182B2|
|              |              1723|
|              |Source B     L182B|
|              |               472|
|              +------------------+
|              N7:78 - (2:769)
|              N10:78 - (2:818)

Rung 2:821
*******************************************************************************
ESTABLISH HIGH AND LOW LIMITS FOR RANGE CHECKING IF NO HARDWARE ALARMS EXIST
CHECK T/C VALUES FOR OUT-OF-RANGE CONDITION
|                                                        +ADD---------------+
|-------------------------------------------------------+-+ADD              +-+--
|                                                       | |Source A    AV182V| |
|                                                       | |              1723| |
|                                                       | |Source B DEVIATION| |
|                                                       | |              1250| |
|                                                       | |Dest         H182V| |
|                                                       | |              2973| |
|                                                       | +------------------+ |
|                                                       | +SUB---------------+ |
|                                                       +-+SUBTRACT          +-+
|                                                         |Source A    AV182V|
|                                                         |              1723|
|                                                         |Source B DEVIATION|
|                                                         |              1250|
|                                                         |Dest         L182V|
|                                                         |               473|
|                                                         +------------------+

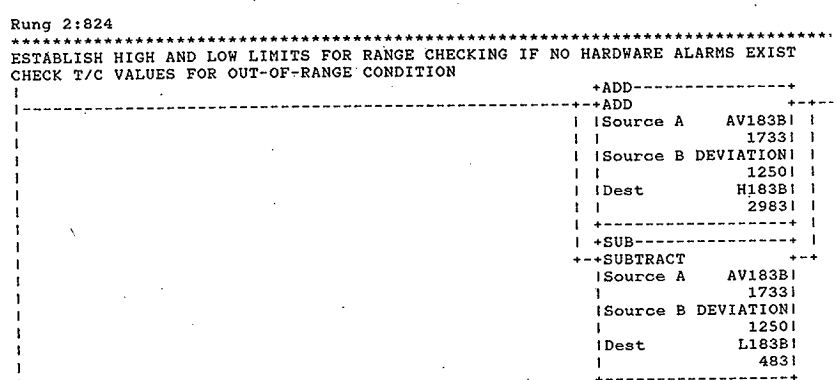
Rung 2:822
|  HA182V1                                                                  D182V1
|    N7:228    +GRT---------------+                                         N7:175
|----]/[-----+-+GREATER THAN      +-+-----------------------------------( )----
|      14    | |Source A    C182V1| |                                        14
|  (2:795)   | |              1723| |
|            | |Source B     H182V| |
|            | |              2973| |
|            | +------------------+ |
|            | N7:79 - (2:771)      |
|            | N10:128 - (2:821)    |
             |                      |
            +++                    +++
```



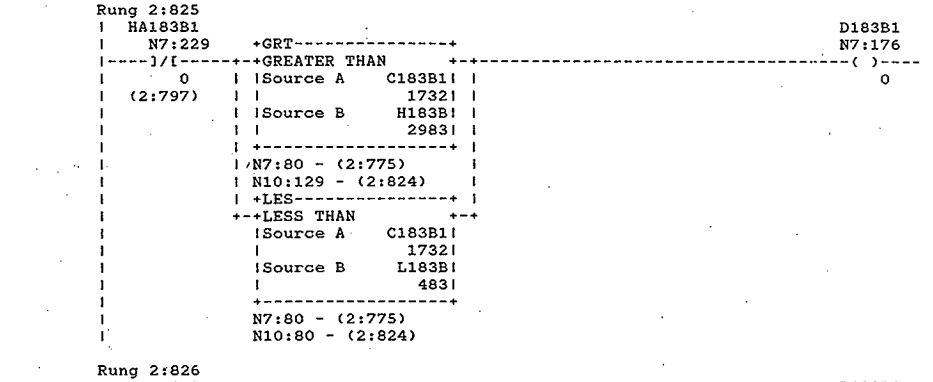
Rung 2:823



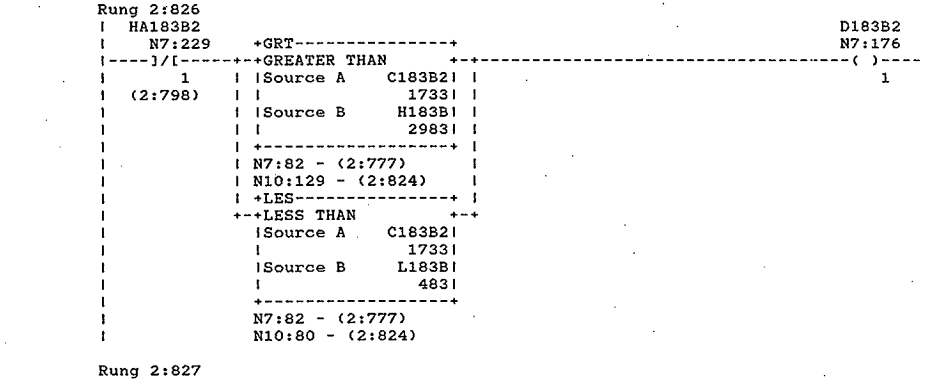
Rung 2:824



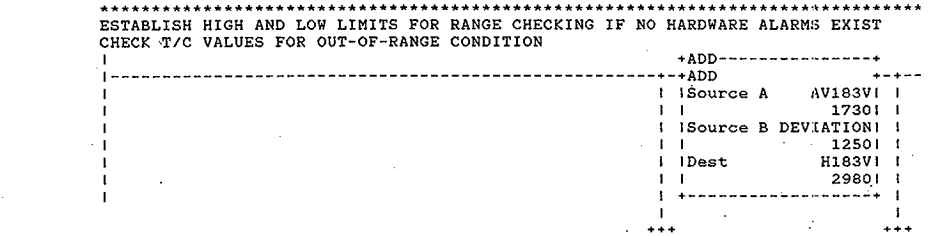
Rung 2:825



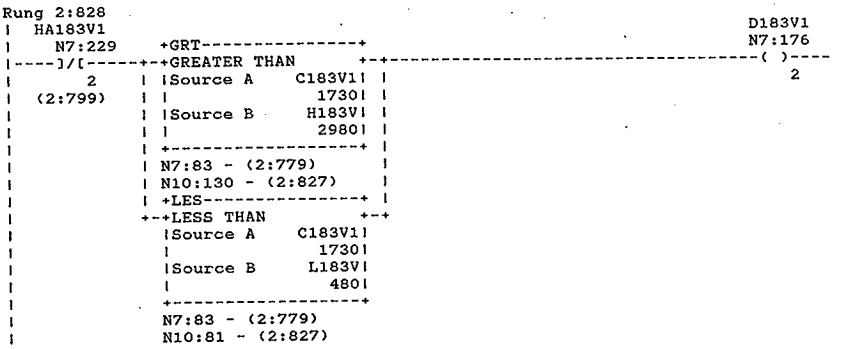
Rung 2:826



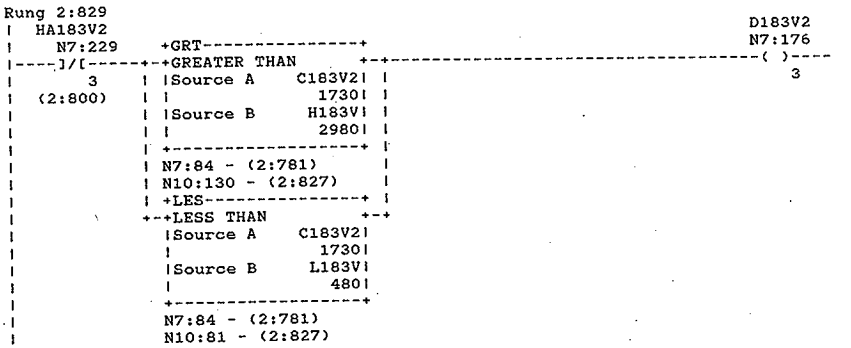
Rung 2:827



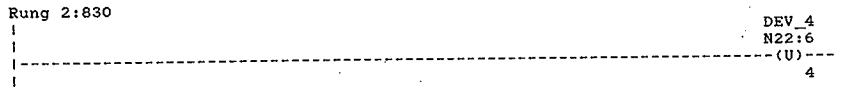
Rung 2:828



Rung 2:829



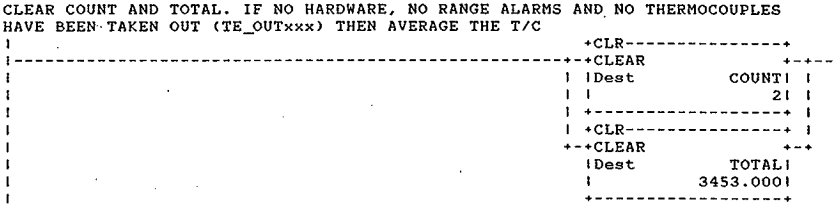
Rung 2:830



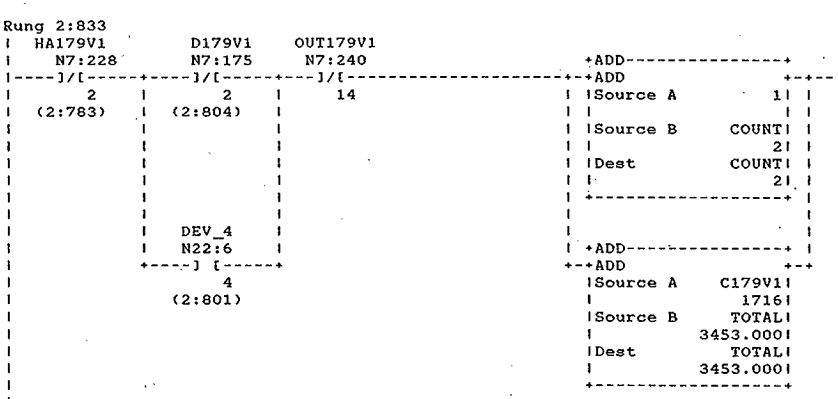
Rung 2:831

Rung 2:832

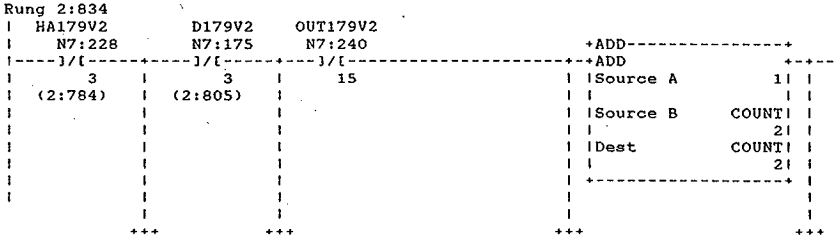
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



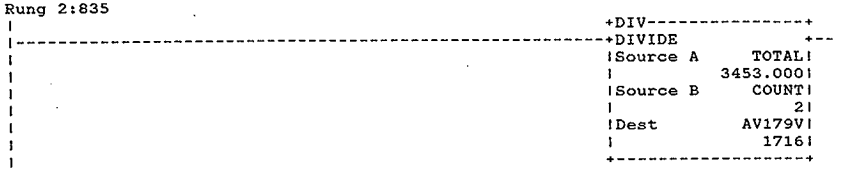
Rung 2:833



Rung 2:834



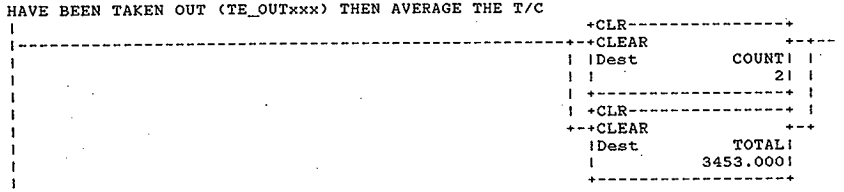
Rung 2:835



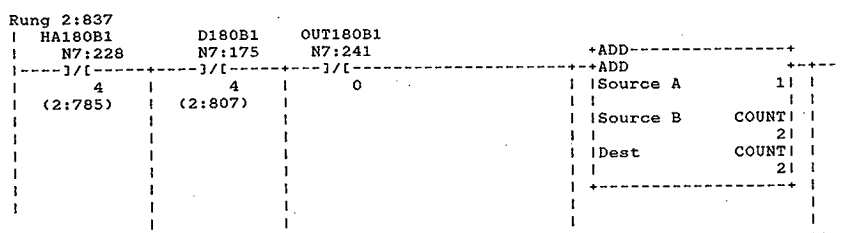
Rung 2:836

****

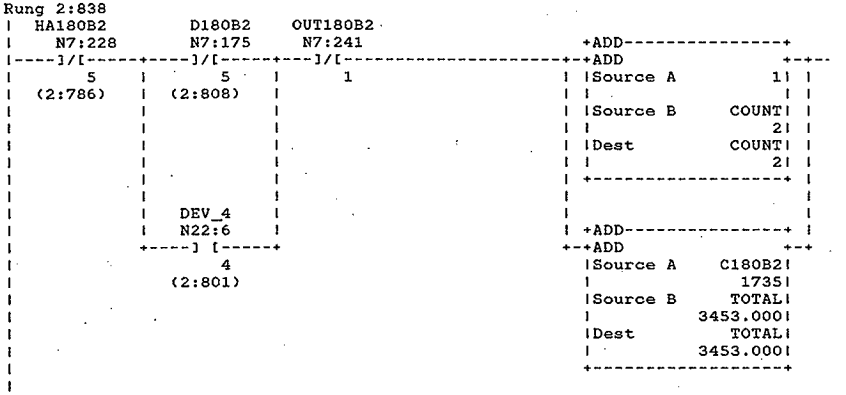
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



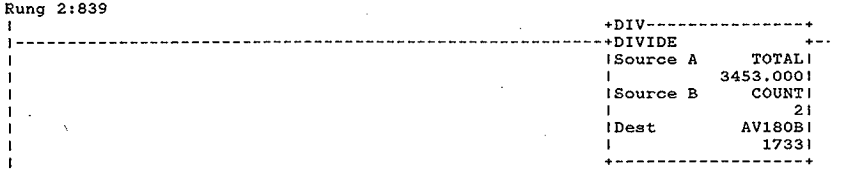
Rung 2:837



Rung 2:838



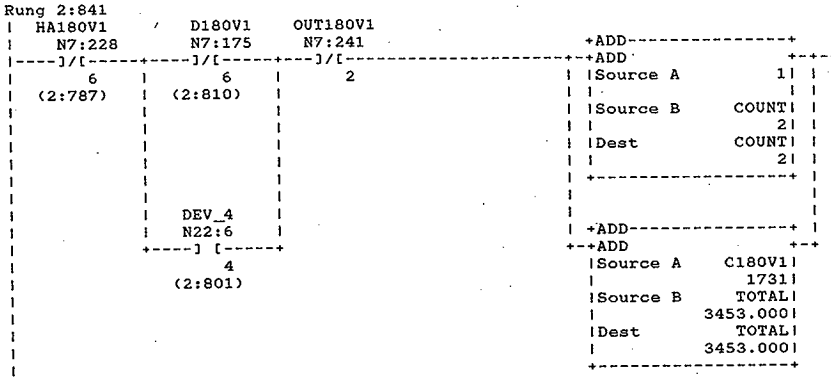
Rung 2:839



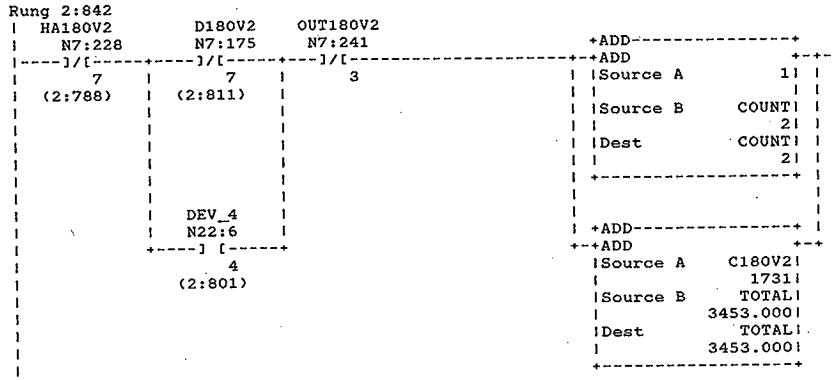
Rung 2:840

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C

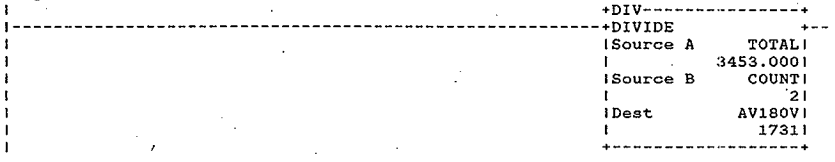
Rung 2:841



Rung 2:842



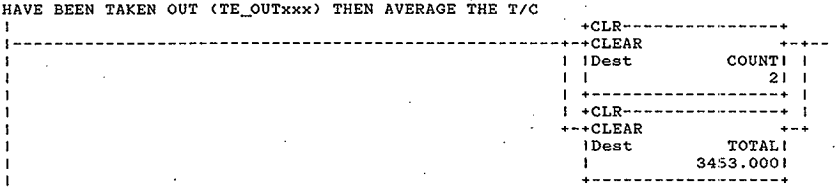
Rung 2:843



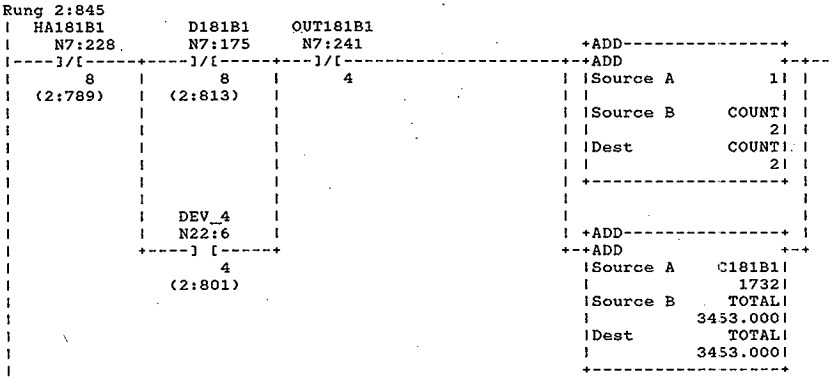
Rung 2:844

****

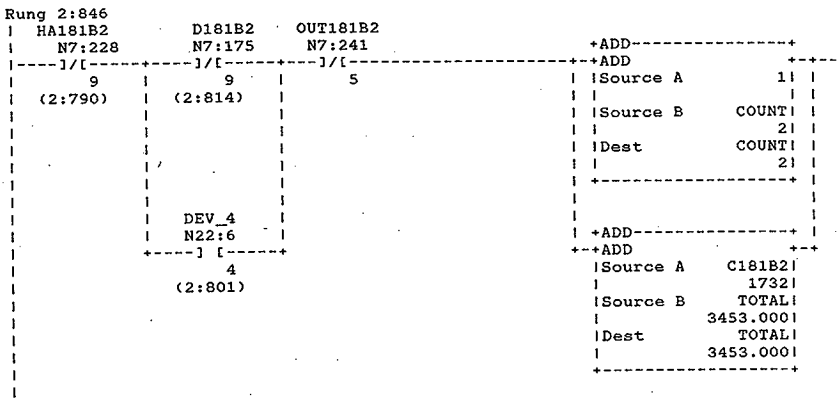
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



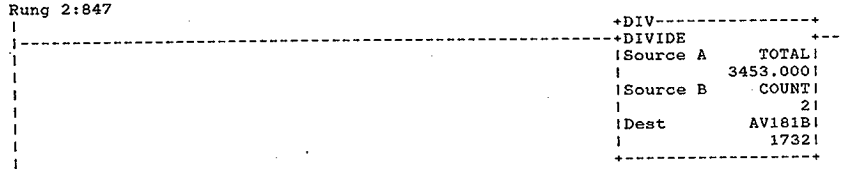
Rung 2:845



Rung 2:846

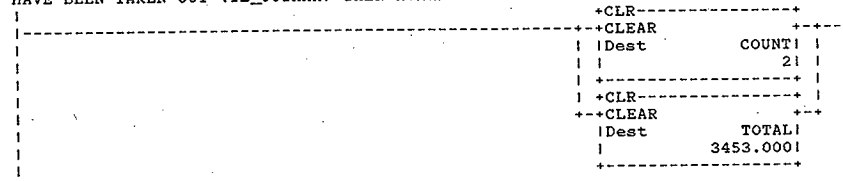


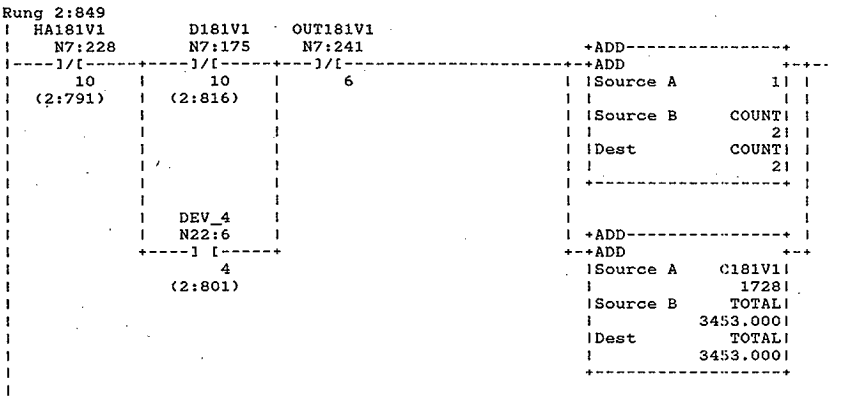
Rung 2:847

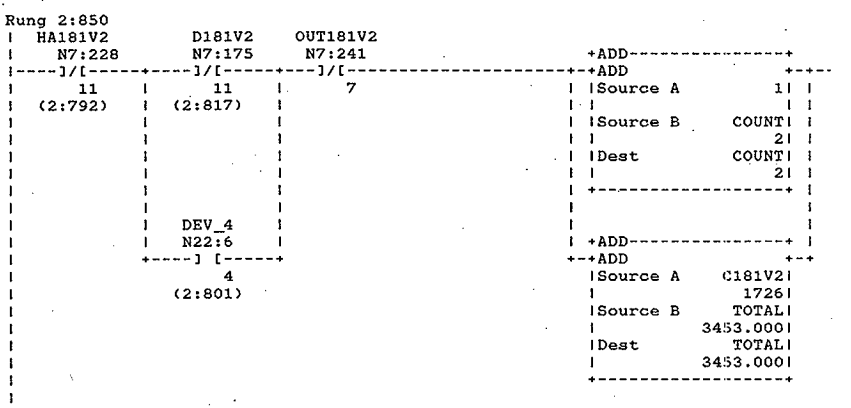


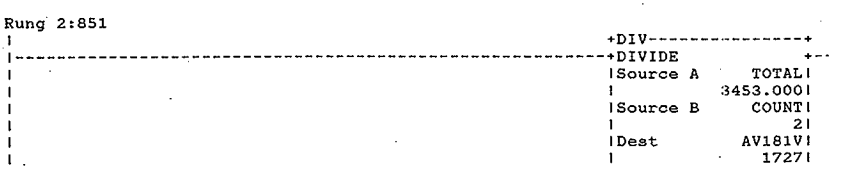
Rung 2:848

CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C




Rung 2:849
HA181V1
N7:228
10
(2:791)
D181V1
N7:175
10
(2:816)
OUT181V1
N7:241
6
DEV_4
N22:6
4
(2:801)
ADD
Source A 1
Source B COUNT
2
Dest COUNT
2
ADD
Source A C181V1
1728
Source B TOTAL
3453.000
Dest TOTAL
3453.000


Rung 2:850
HA181V2
N7:228
11
(2:792)
D181V2
N7:175
11
(2:817)
OUT181V2
N7:241
7
DEV_4
N22:6
4
(2:801)
ADD
Source A 1
Source B COUNT
2
Dest COUNT
2
ADD
Source A C181V2
1726
Source B TOTAL
3453.000
Dest TOTAL
3453.000

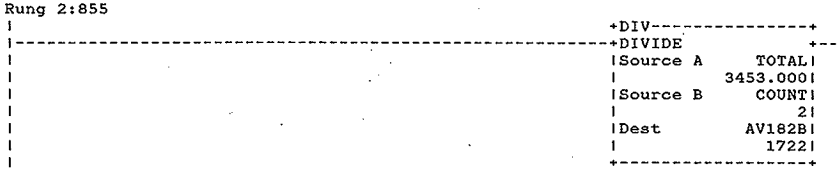

Rung 2:851
DIV
DIVIDE
Source A TOTAL
3453.000
Source B COUNT
2
Dest AV181V1
1727

```
Rung 2:852
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
|                                                          +CLR---------------+
|-------------------------------------------------------+-+CLEAR             +-+--
|                                                       | |Dest         COUNT| |
|                                                       | |                 2| |
|                                                       | +------------------+ |
|                                                       | +CLR---------------+ |
|                                                       +-+CLEAR             +-+
|                                                         |Dest         TOTAL|
|                                                         |          3453.000|
|                                                         +------------------+

Rung 2:853
|  HA182B1        D182B1    OUT182B1
|    N7:228       N7:175     N7:241                        +ADD---------------+
|----]/[-----+----]/[-----+---]/[---------------------+-+ADD               +-+--
|      12    |      12    |      8                    | |Source A         1| |
|  (2:793)   |  (2:819)   |                           | |                  | |
|            |            |                           | |Source B     COUNT| |
|            |            |                           | |                 2| |
|            |            |                           | |Dest         COUNT| |
|            |            |                           | |                 2| |
|            |            |                           | +------------------+ |
|            |            |                           |                      |
|            |   DEV_4    |                           |                      |
|            |   N22:6    |                           | +ADD---------------+ |
|            +----] [-----+                           +-+ADD               +-+
|                   4                                  |Source A    C182B1|
|               (2:801)                                |               1721|
|                                                      |Source B     TOTAL|
|                                                      |          3453.000|
|                                                      |Dest         TOTAL|
|                                                      |          3453.000|
|                                                      +------------------+
|

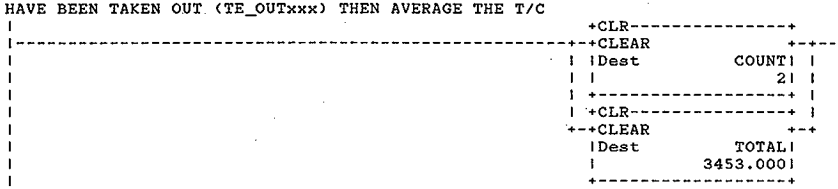
Rung 2:854
|  HA182B2        D182B2    OUT182B2
|    N7:228       N7:175     N7:241                        +ADD---------------+
|----]/[-----+----]/[-----+---]/[---------------------+-+ADD               +-+--
|      13    |      13    |      9                    | |Source A         1| |
|  (2:794)   |  (2:820)   |                           | |                  | |
|            |            |                           | |Source B     COUNT| |
|            |            |                           | |                 2| |
|            |            |                           | |Dest         COUNT| |
|            |            |                           | |                 2| |
|            |            |                           | +------------------+ |
|            |            |                           |                      |
|            |            |                           |                      |
|           +++          +++                         +++                    +++
```

Rung 2:855

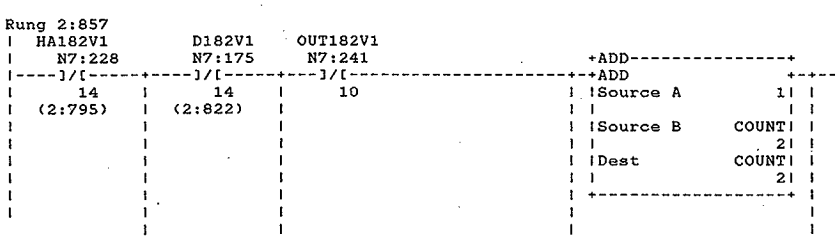


Rung 2:856

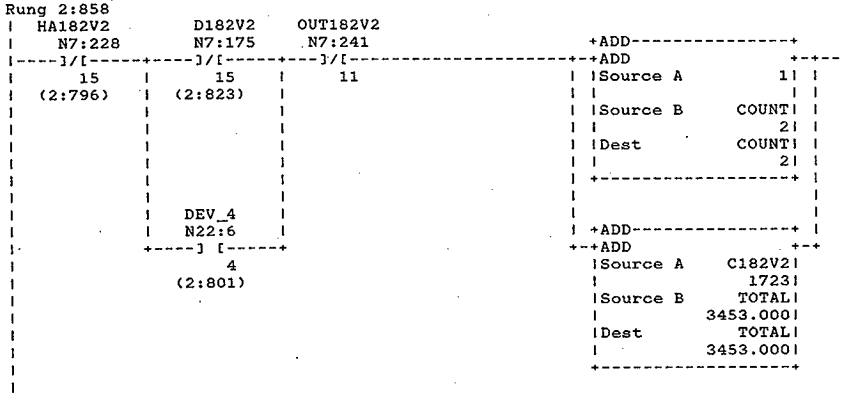
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



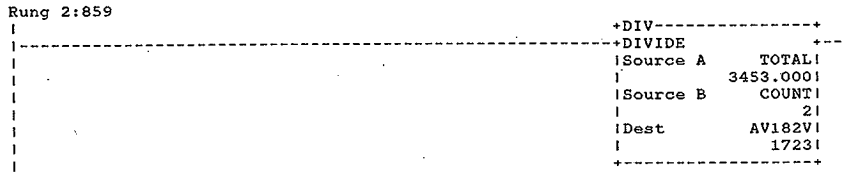
Rung 2:857



Rung 2:858

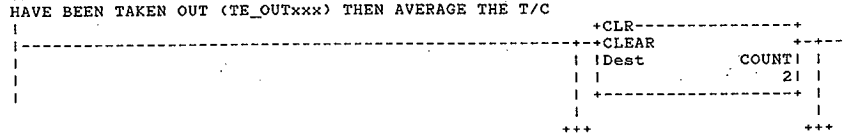


Rung 2:859

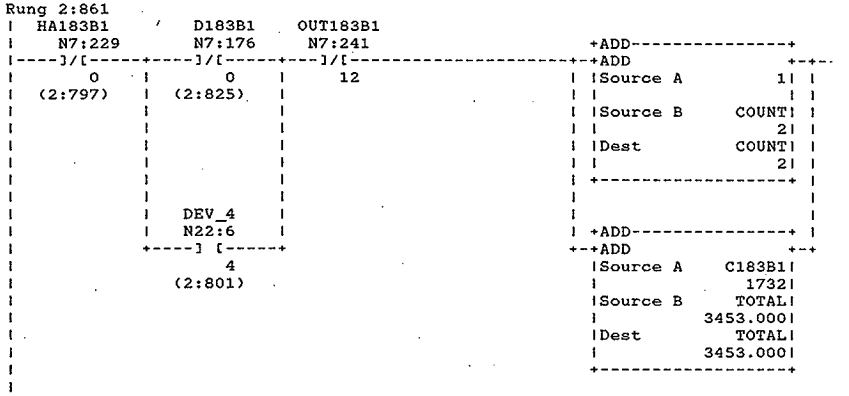


Rung 2:860

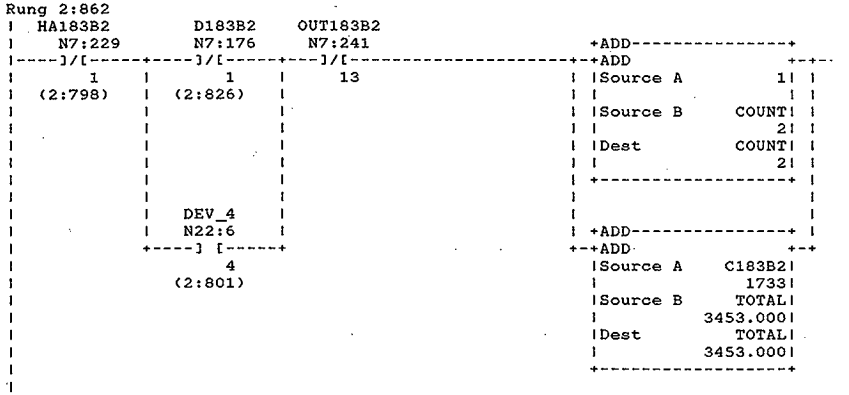
```
*******************************************************************************
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES
HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C
```



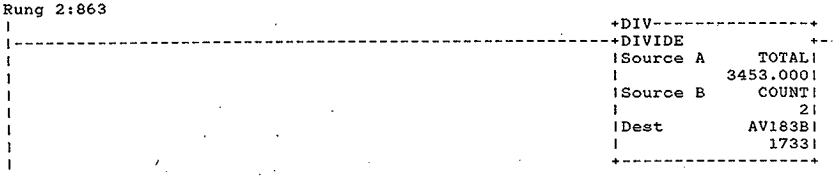
Rung 2:861



Rung 2:862



Rung 2:863



Rung 2:864

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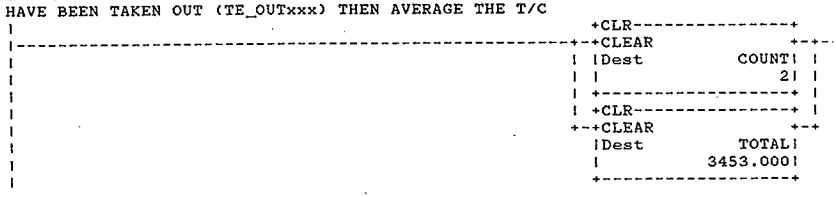
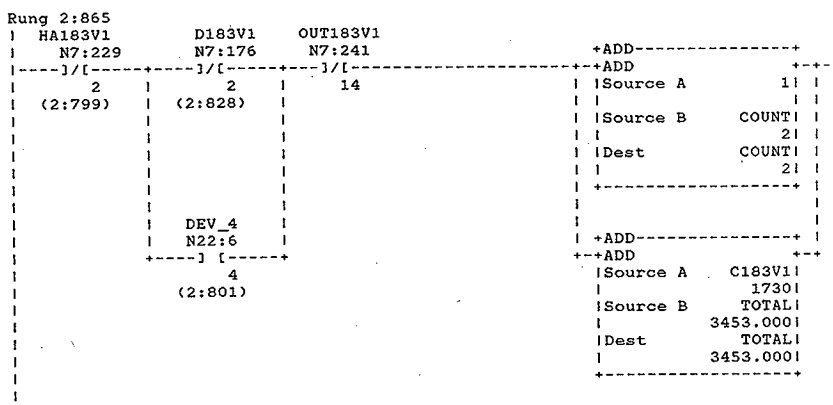
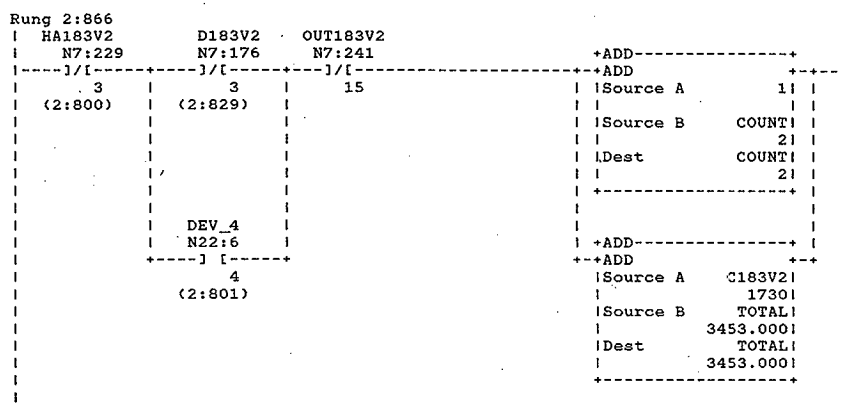
CLEAR COUNT AND TOTAL. IF NO HARDWARE, NO RANGE ALARMS AND NO THERMOCOUPLES HAVE BEEN TAKEN OUT (TE_OUTxxx) THEN AVERAGE THE T/C



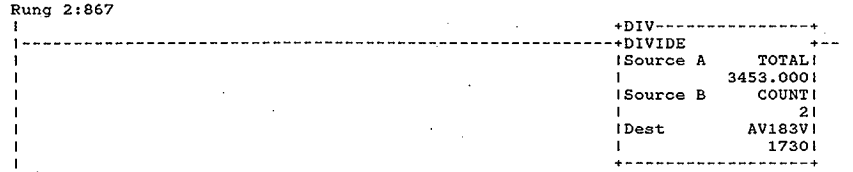
Rung 2:865



Rung 2:866



Rung 2:867



Rung 2:868

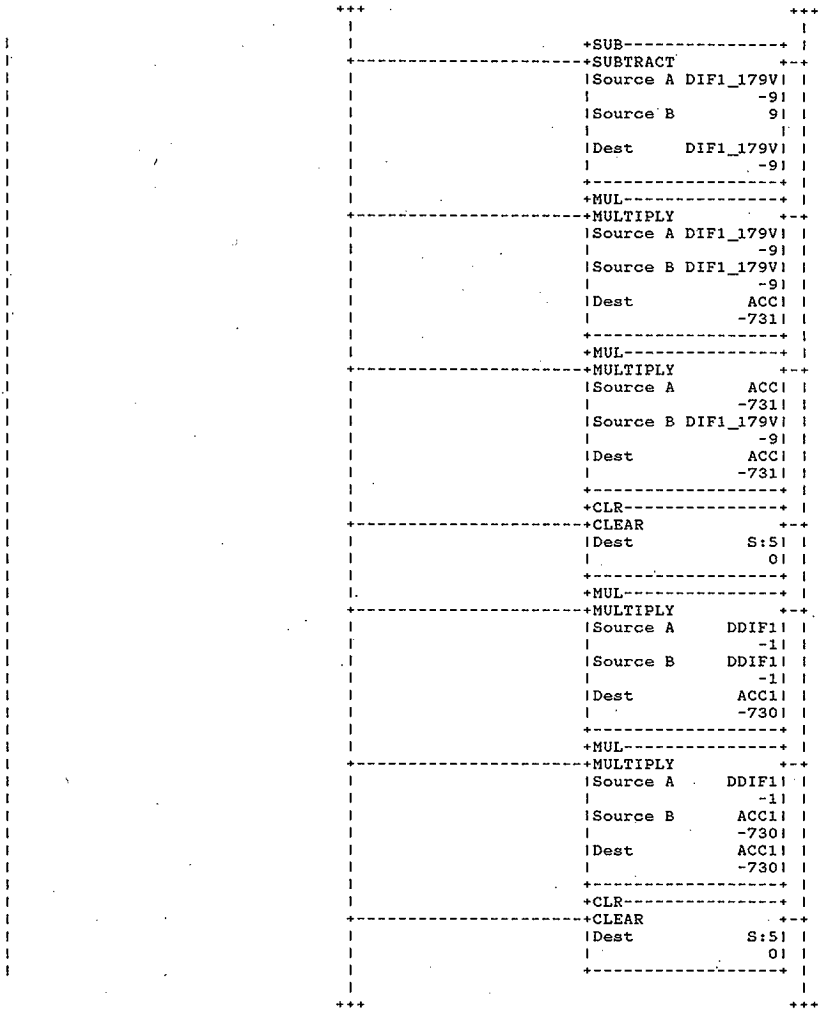
```
*******************************************************************************
        IF DEVIATION SET FOR SECTION 4 THEN GO THERE AND CALCULATE DEVIATION
|                                                                       DEV4
|   DEV_4
|   N22:6                                                                11
|----] [-------------------------------------------------------------(JMP)-----
|       4
|  (2:801)
```

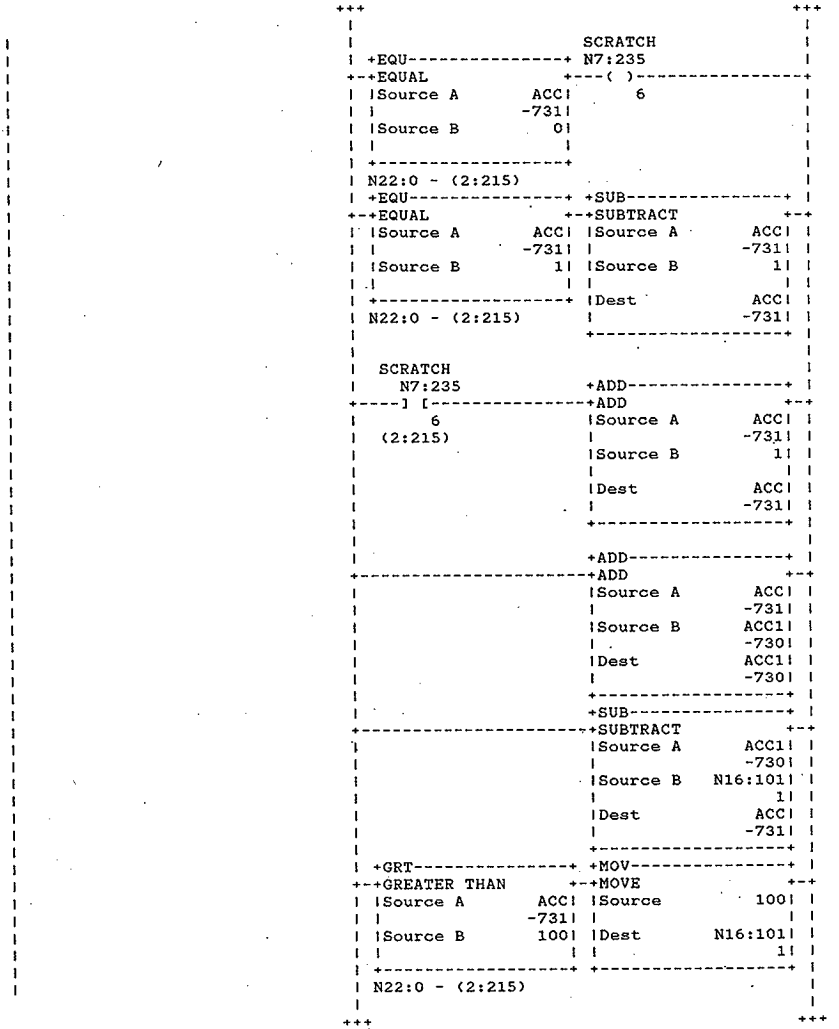
Rung 2:869

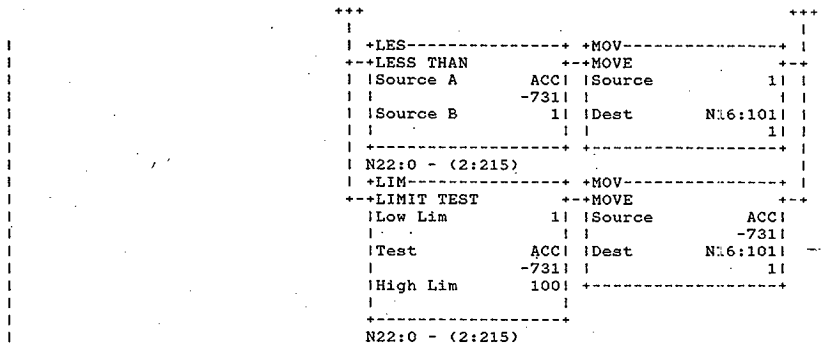
```
|                                                                      END
|     DN_4
|   N22:5                                                               6
|----]/[-------------------------------------------------------------(JMP)-----
|       4
|  (2:43)
```

```
Rung 2:870
*******************************************************************************
        IF RATE CALCULATIONS ARE FINISHED THEN GO TO THE PID BLOCK
|                                                                   PID179V
| RT_TMR/DN
|   T4:87                                                                47
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)

Rung 2:871
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+-----------------------+MOVE              +-+--
|                               |                       |Source      AV179V| |
|                               |                       |              1716| |
|                               |                       |Dest       R1_179V| |
|                               |                       |              1716| |
|                               |                       +------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A   R1_179V| |
|                               |                       |              1716| |
|                               |                       |Source B   R2_179V| |
|                               |                       |              1716| |
|                               |                       |Dest     DIF1_179V| |
|                               |                       |                -9| |
|                               |                       +------------------+ |
|                               |                       +MOV---------------+ |
|                               +-----------------------+MOVE              +-+
|                               |                       |Source     R1_179V| |
|                               |                       |              1716| |
|                               |                       |Dest       R2_179V| |
|                               |                       |              1716| |
|                               |                       +------------------+ |
|                               |                       +SUB---------------+ |
|                               +-----------------------+SUBTRACT          +-+
|                               |                       |Source A DIF1_179V| |
|                               |                       |                -9| |
|                               |                       |Source B DIF2_179V| |
|                               |                       |                 0| |
|                               |                       |Dest         DDIF1| |
|                               |                       |                -1| |
|                               |                       +------------------+ |
|                               |                       +MOV---------------+ |
|                               +-----------------------+MOVE              +-+
|                               |                       |Source   DIF1_179V| |
|                               |                       |                -9| |
|                               |                       |Dest     DIF2_179V| |
|                               |                       |                 0| |
|                               |                       +------------------+ |
|                               |                                            |
                               +++                                          +++
```


SUB
SUBTRACT
Source A DIF1_179V
-9
Source B
9
Dest DIF1_179V
-9
MUL
MULTIPLY
Source A DIF1_179V
-9
Source B DIF1_179V
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_179V
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0

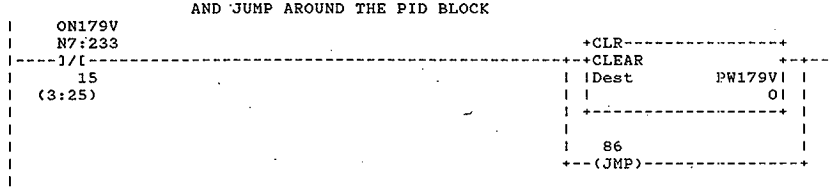

EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
SCRATCH N7:235
6
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH N7:235
6
(2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730
SUB
SUBTRACT
Source A ACC1 -730
Source B N16:101 1
Dest ACC -731
GRT
GREATER THAN
Source A ACC -731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N16:101 1



Rung 2:872

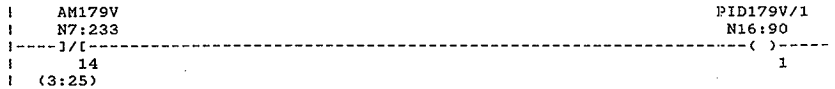
Rung 2:873

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:874

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK



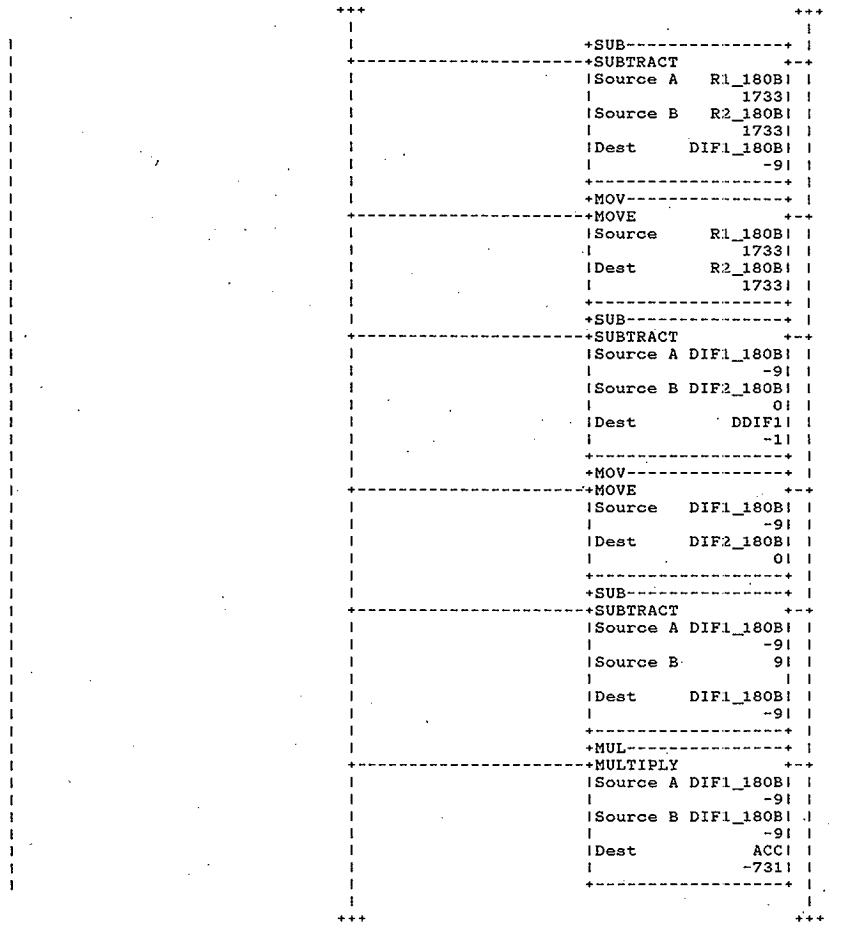
```
Rung 2:875
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +-
|                                                          |Source     SET179V|
|                                                          |                 0|
|                                                          |Dest     PIDSP179V|
|                                                          |                 0|
|                                                          +------------------+

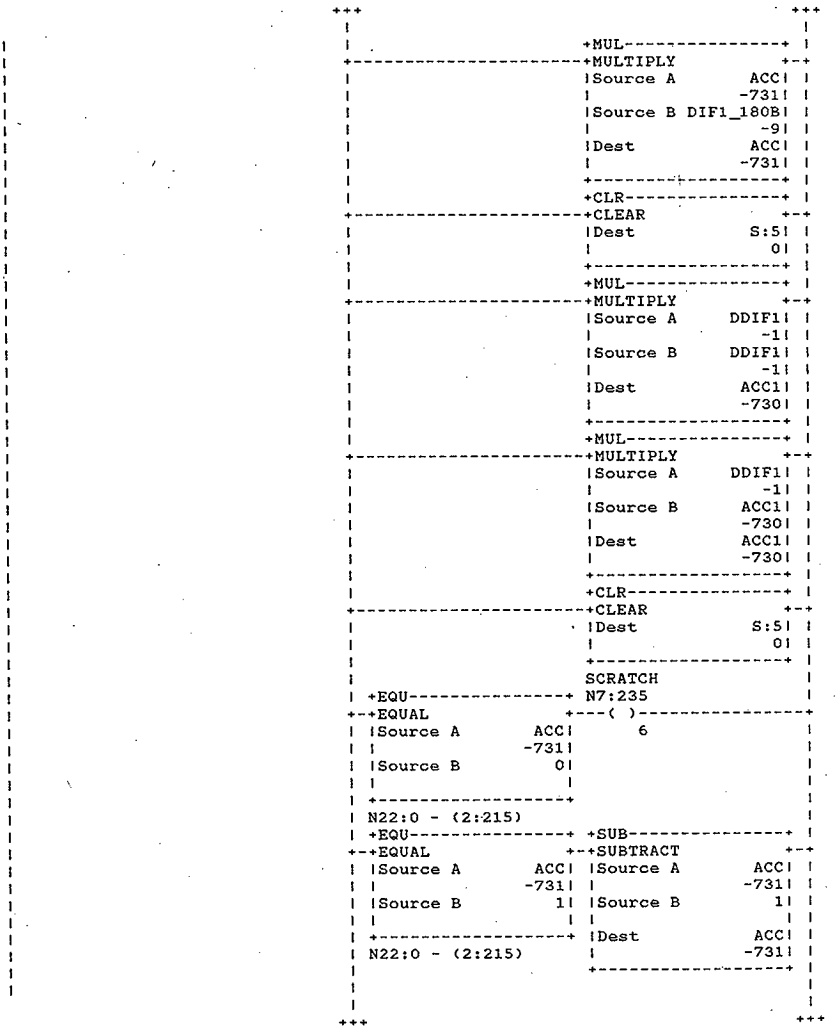
Rung 2:876
|                                                    +PID--------------------+
|----------------------------------------------------+-+PID                  +-+-
|                                                  | |Control Block   PID179V| |
|                                                  | |Process Variable AV179V| |
|                                                  | |Control Variable CV179V| |
|                                                  | |Control Block Length 23| |
|                                                  | +-----------------------+ |
|                                                  | +SCL---------------+      |
|                                                  +-+SCALE             +------+
|                                                  | |Source      CV179V|      |
|                                                  | |                 0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                  |      |
|                                                  | |Offset           0|      |
|                                                  | |                  |      |
|                                                  | |Dest        PW179V|      |
|                                                  | |                 0|      |
|                                                  | +------------------+      |
|                                                  | +CLR---------------+      |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

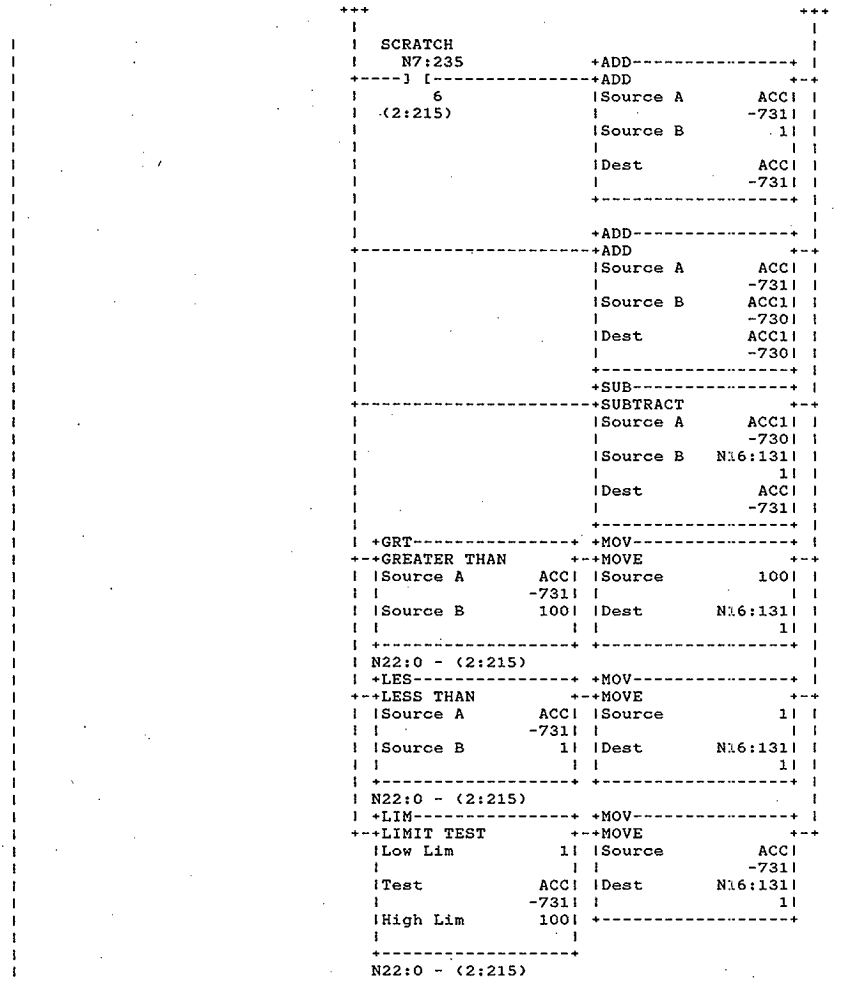
Rung 2:877
|   86                                                                  N7:236
|--[LBL]-------------------------------------------------------------------( )---
|                                                                          4

Rung 2:878
|                                                                    PID180B
| RT_TMR/DN
|   T4:87                                                                 48
|----]/[-------------------------------------------------------------(JMP)----
|      DN
|  (2:42)

Rung 2:879
                        RATE CHECKING
|                                                          +MOV---------------+
|--------------------------------+-----------------------+MOVE              +-+-
|                                |                       |Source      AV180B| |
|                                |                       |              1733| |
|                                |                       |Dest       R1_180B| |
|                                |                       |              1733| |
|                                |                       +------------------+ |
|                                |                                          |
                                +++                                        +++
```


SUB
SUBTRACT
Source A R1_180B
1733
Source B R2_180B
1733
Dest DIF1_180B
-9
MOV
MOVE
Source R1_180B
1733
Dest R2_180B
1733
SUB
SUBTRACT
Source A DIF1_180B
-9
Source B DIF2_180B
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_180B
-9
Dest DIF2_180B
0
SUB
SUBTRACT
Source A DIF1_180B
-9
Source B
9
Dest DIF1_180B
-9
MUL
MULTIPLY
Source A DIF1_180B
-9
Source B DIF1_180B
-9
Dest ACC
-731

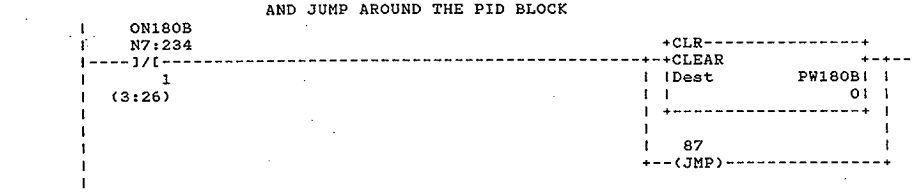

MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_180B
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC
-731
Source B
0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B
1
N22:0 - (2:215)
6
SUB
SUBTRACT
Source A ACC
-731
Source B
1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B
1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N16:131
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
MOV
MOVE
Source 100
Dest N16:131
1
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
MOV
MOVE
Source 1
Dest N16:131
1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
MOV
MOVE
Source ACC
-731
Dest N16:131
1
N22:0 - (2:215)

Rung 2:880

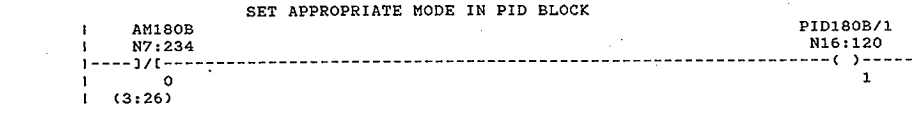
Rung 2:881

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



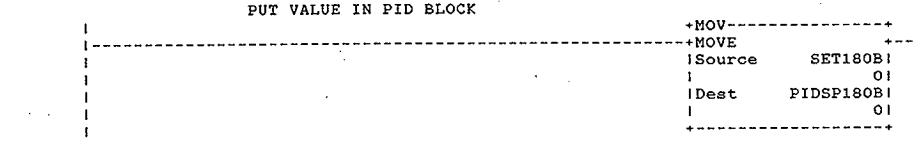
Rung 2:882

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

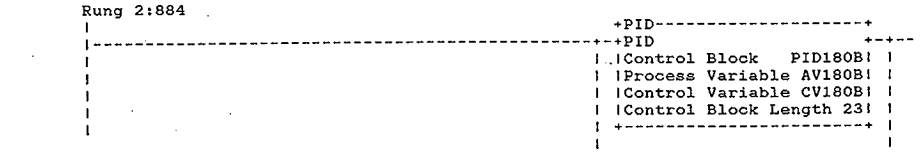


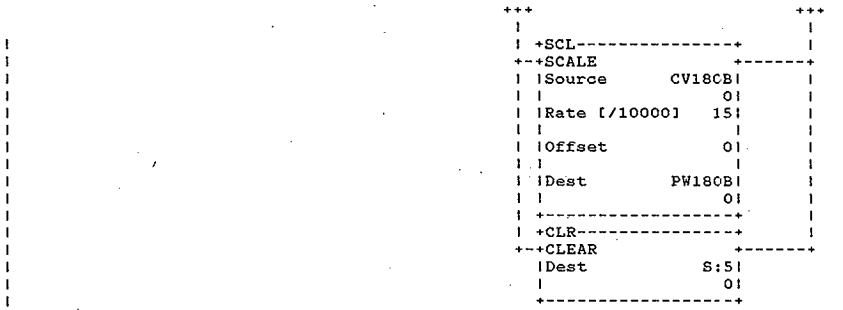
Rung 2:883

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



Rung 2:884



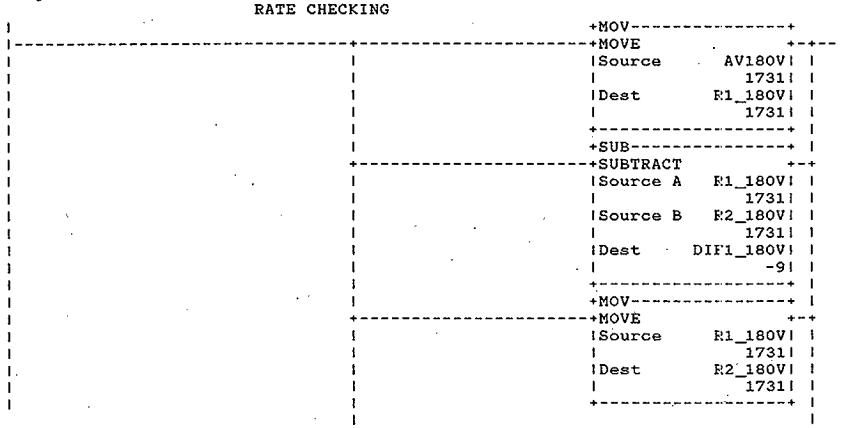


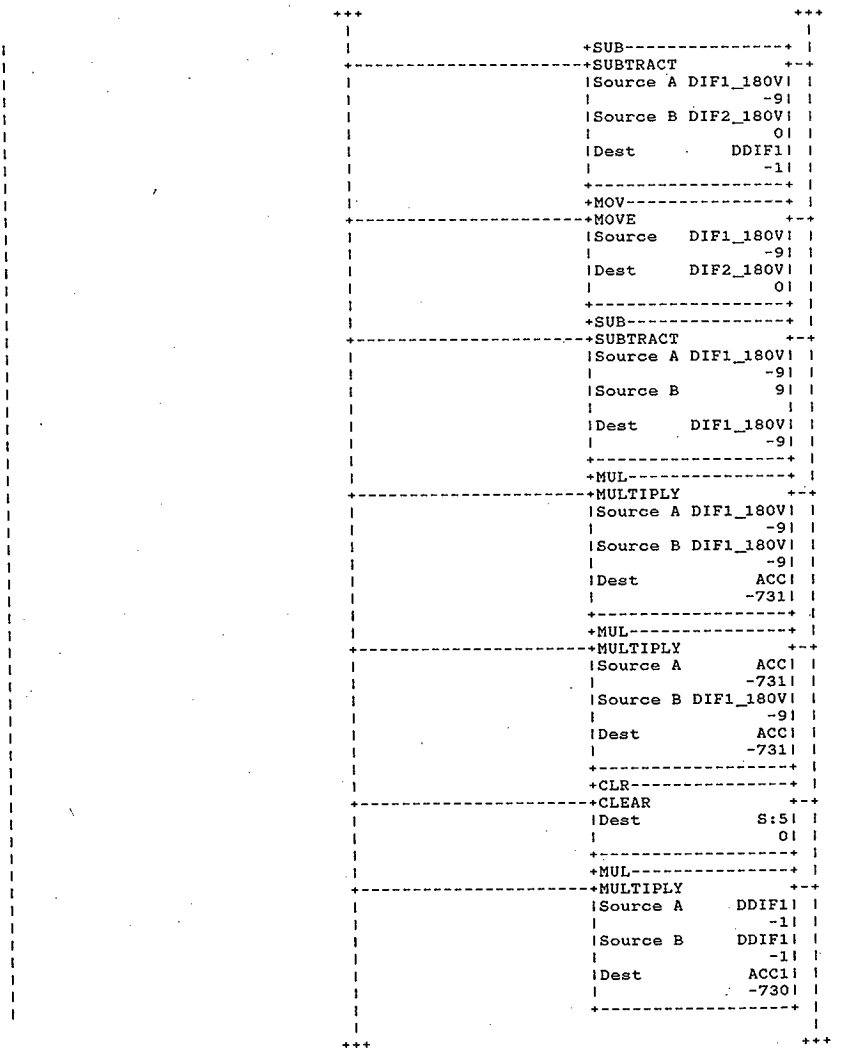
```
                                                  +++                          +++
                                                   |                            |
|                                                  | +SCL---------------+       |
|                                                  +-+SCALE             +------+
|                                                  | |Source      CV18CB|       |
|                                                  | |                 0|       |
|                                                  | |Rate [/10000]   15|       |
|                                                  | |                  |       |
|                                                  | |Offset           0|       |
|                                                  | |                  |       |
|                                                  | |Dest        PW180B|       |
|                                                  | |                 0|       |
|                                                  | +------------------+       |
|                                                  | +CLR---------------+       |
|                                                  +-+CLEAR             +------+
|                                                    |Dest           S:5|
|                                                    |                 0|
|                                                    +------------------+

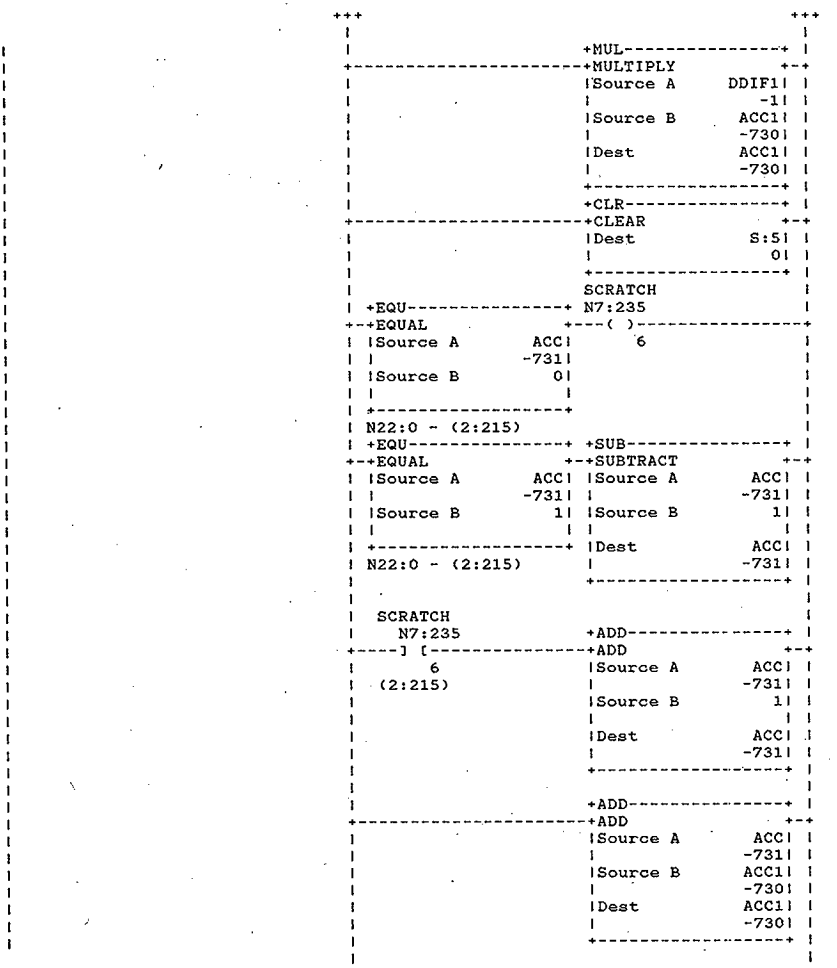
Rung 2:885
|   87                                                                  N7:236
|--[LBL]-----------------------------------------------------------------( )----
|                                                                          5

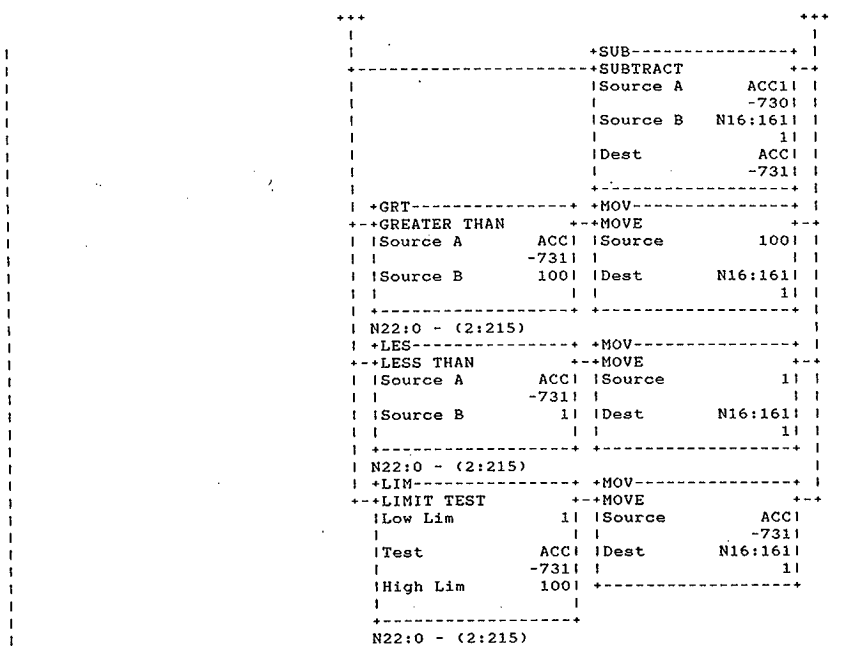
Rung 2:886
|                                                                   PID180V
| RT_TMR/DN
|   T4:87                                                                 49
|----]/[-----------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)

Rung 2:887
                          RATE CHECKING
|                                                        +MOV---------------+
|-------------------------------+----------------------+MOVE              +-+--
|                               |                      |Source      AV180V| |
|                               |                      |              1731| |
|                               |                      |Dest       R1_180V| |
|                               |                      |              1731| |
|                               |                      +------------------+ |
|                               |                      +SUB---------------+ |
|                               +----------------------+SUBTRACT          +-+
|                               |                      |Source A   R1_180V| |
|                               |                      |              1731| |
|                               |                      |Source B   R2_180V| |
|                               |                      |              1731| |
|                               |                      |Dest     DIF1_180V| |
|                               |                      |                -9| |
|                               |                      +------------------+ |
|                               |                      +MOV---------------+ |
|                               +----------------------+MOVE              +-+
|                               |                      |Source     R1_180V| |
|                               |                      |              1731| |
|                               |                      |Dest       R2_180V| |
|                               |                      |              1731| |
|                               |                      +------------------+ |
|                               |                                           |
                               +++                                         +++
```

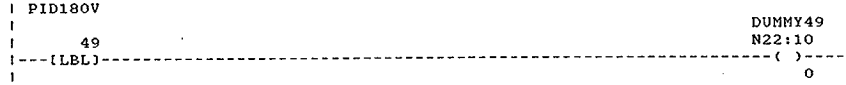



SUB
SUBTRACT
Source A DIF1_180V
-9
Source B DIF2_180V
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_180V
-9
Dest DIF2_180V
0
SUB
SUBTRACT
Source A DIF1_180V
-9
Source B
9
Dest DIF1_180V
-9
MUL
MULTIPLY
Source A DIF1_180V
-9
Source B DIF1_180V
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_180V
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730


+MUL
+MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
+CLR
+CLEAR
Dest S:5
0
SCRATCH
N7:235
+EQU
+EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
+EQU
+EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
+SUB
+SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
+ADD
+ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
+ADD
+ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730

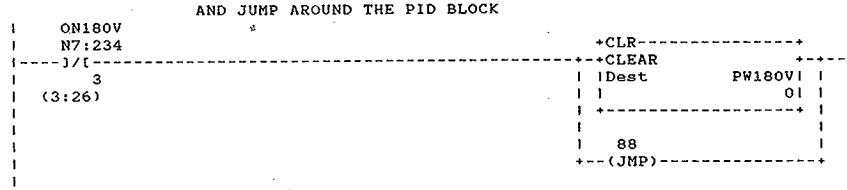


Rung 2:888



Rung 2:889

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



```
Rung 2:890
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM180V                                                          PID180V/1
|    N7:234                                                           N16:150
|----]/[-------------------------------------------------------------( )-----
|       2                                                                1
|  (3:26)

Rung 2:891
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                        +MOV---------------+
|-------------------------------------------------------+MOVE              +--
|                                                        |Source     SET180V|
|                                                        |                 0|
|                                                        |Dest     PIDSP180V|
|                                                        |                 0|
|                                                        +------------------+

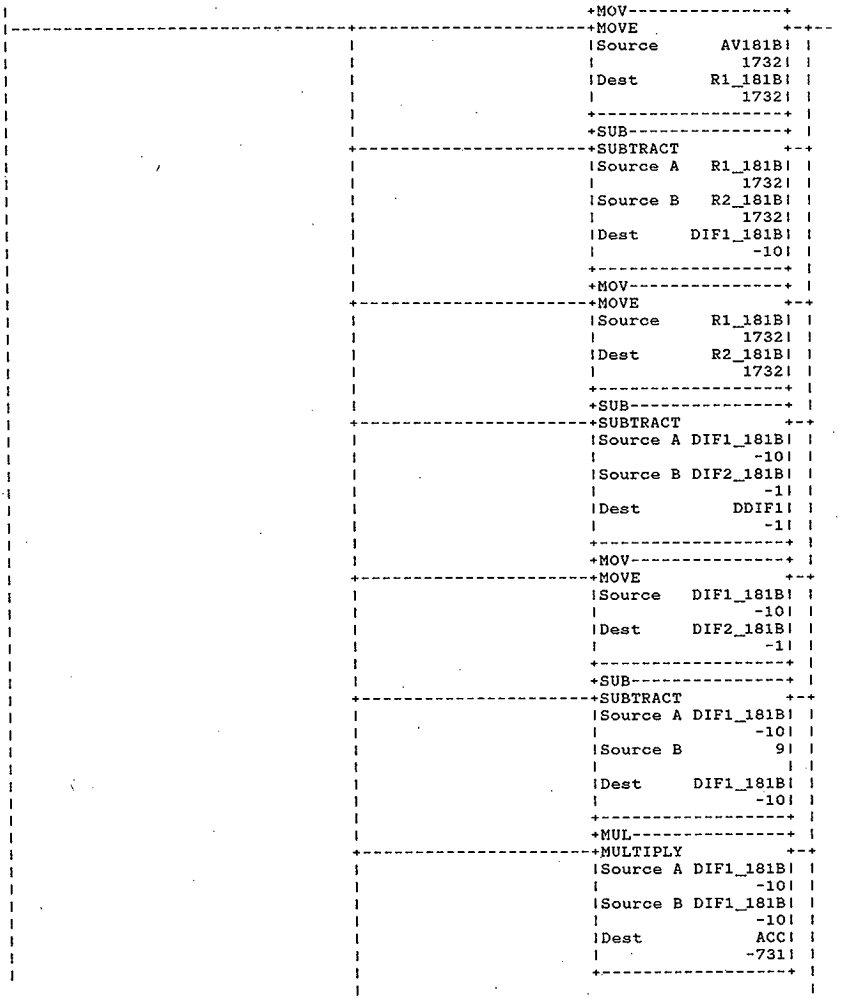
Rung 2:892
|                                                  +PID--------------------+
|-------------------------------------------------+-+PID                   +-+--
|                                                | |Control Block   PID180V| |
|                                                | |Process Variable AV180V| |
|                                                | |Control Variable CV180V| |
|                                                | |Control Block Length 23| |
|                                                | +-----------------------+ |
|                                                | +SCL---------------+      |
|                                                +-+SCALE             +------+
|                                                | |Source      CV180V|      |
|                                                | |                 0|      |
|                                                | |Rate [/10000]   15|      |
|                                                | |                  |      |
|                                                | |Offset           0|      |
|                                                | |                  |      |
|                                                | |Dest        PW180V|      |
|                                                | |                 0|      |
|                                                | +------------------+      |
|                                                | +CLR---------------+      |
|                                                +-+CLEAR             +------+
|                                                  |Dest           S:5|
|                                                  |                 0|
|                                                  +------------------+

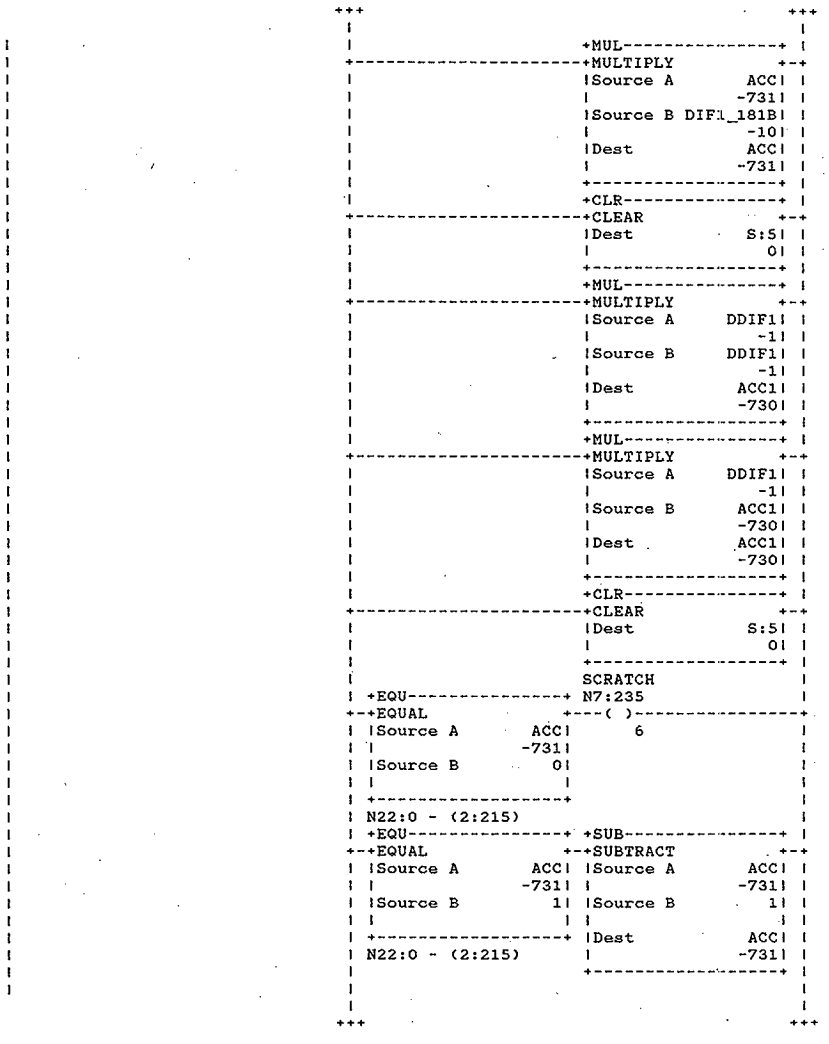
Rung 2:893
|   88                                                                 N7:236
|--[LBL]-------------------------------------------------------------( )----
|                                                                         6

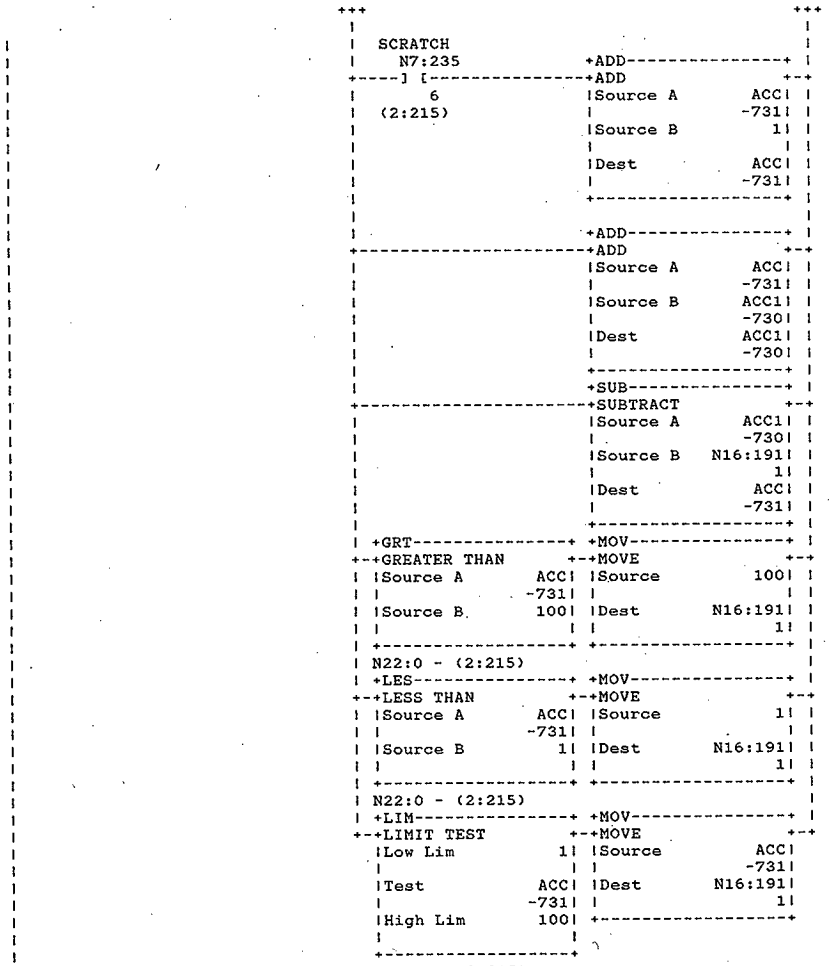
Rung 2:894
|                                                                    PID181B
| RT_TMR/DN
|   T4:87                                                                50
|----]/[-------------------------------------------------------------(JMP)-----
|      DN
|  (2:42)
```

Rung 2:895

RATE CHECKING




MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_181B
-10
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N16:191
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N16:191
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
MOV
MOVE
Source 1
Dest N16:191
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source ACC
-731
Dest N16:191
1

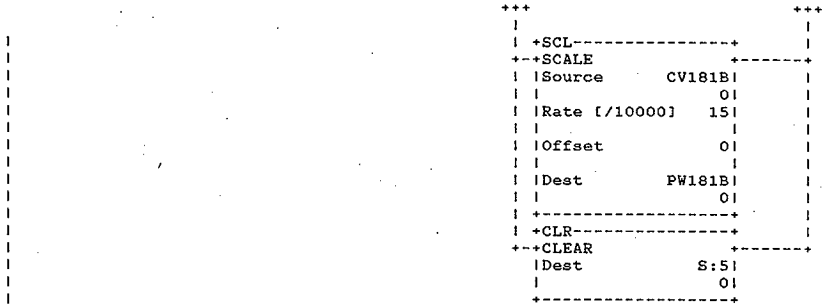
```
Rung 2:896
| PID181B
|                                                                    DUMMY50
|      50                                                            N22:10
|---[LBL]-------------------------------------------------------------( )----
|                                                                        1

Rung 2:897
                DETECT FROM SCADA PID ON/OFF
                        IF PID OFF
                THEN ZERO PW FOR ZERO OUTPUT AT SCR
                  AND JUMP AROUND THE PID BLOCK
|    ON181B
|    N7:234                                                  +CLR---------------+
|----]/[-----------------------------------------------+-+CLEAR              +-+--
|       5                                              | |Dest         PW181B| |
|  (3:26)                                              | |                  0| |
|                                                      | +------------------+ |
|                                                      |                      |
|                                                      |   89                 |
|                                                      +--(JMP)---------------+
|

Rung 2:898
                DETECT AUTO/MANUAL FROM SCADA
                SET APPROPRIATE MODE IN PID BLOCK
|    AM181B                                                          PID181B/1
|    N7:234                                                           N16:180
|----]/[-------------------------------------------------------------( )-----
|       4                                                                1
|  (3:26)

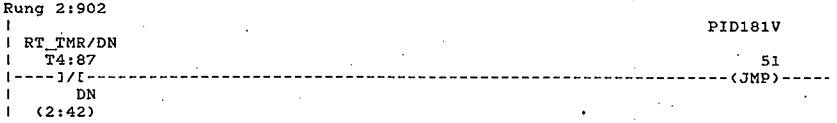
Rung 2:899
                DETECT SETPOINT VALUE FROM SCADA
                PUT VALUE IN PID BLOCK
|                                                          +MOV---------------+
|-------------------------------------------------------+MOVE               +--
|                                                          |Source      SET181B|
|                                                          |                  0|
|                                                          |Dest      PIDSP181B|
|                                                          |                  0|
|                                                          +------------------+

Rung 2:900
|                                                    +PID--------------------+
|-----------------------------------------------+-+PID                     +-+--
|                                               | |Control Block   PID181B| |
|                                               | |Process Variable AV181B| |
|                                               | |Control Variable CV181B| |
|                                               | |Control Block Length 23| |
|                                               | +-----------------------+ |
|                                               |                           |
                                               +++                         +++
```

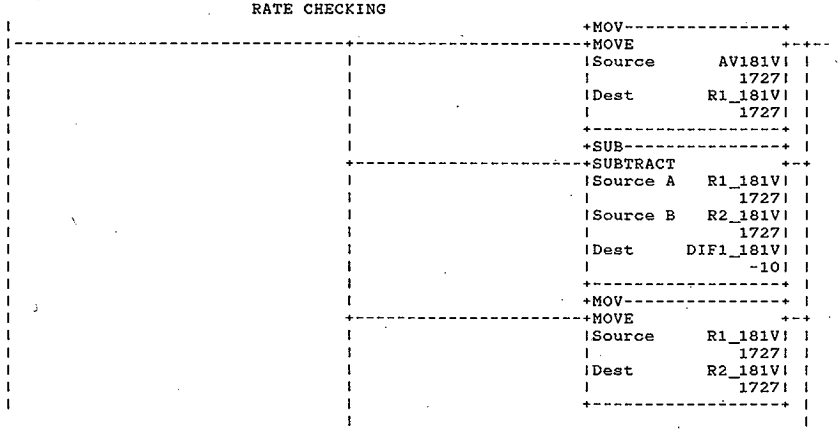


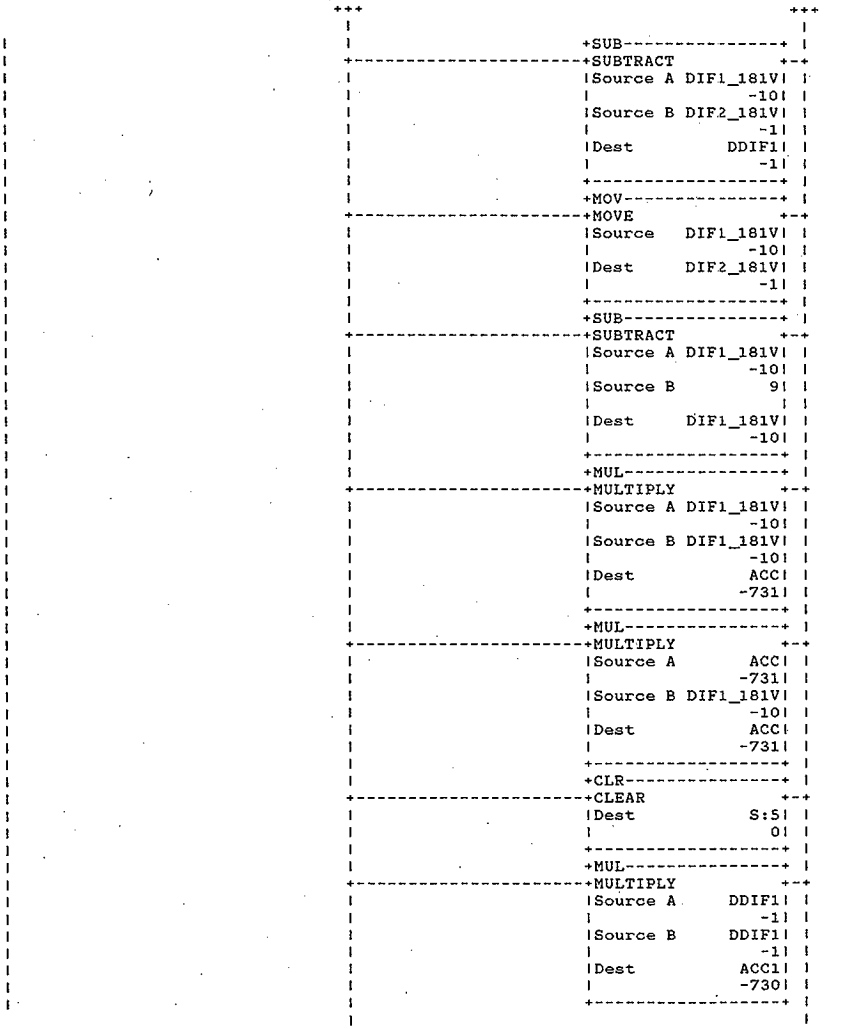
Rung 2:901

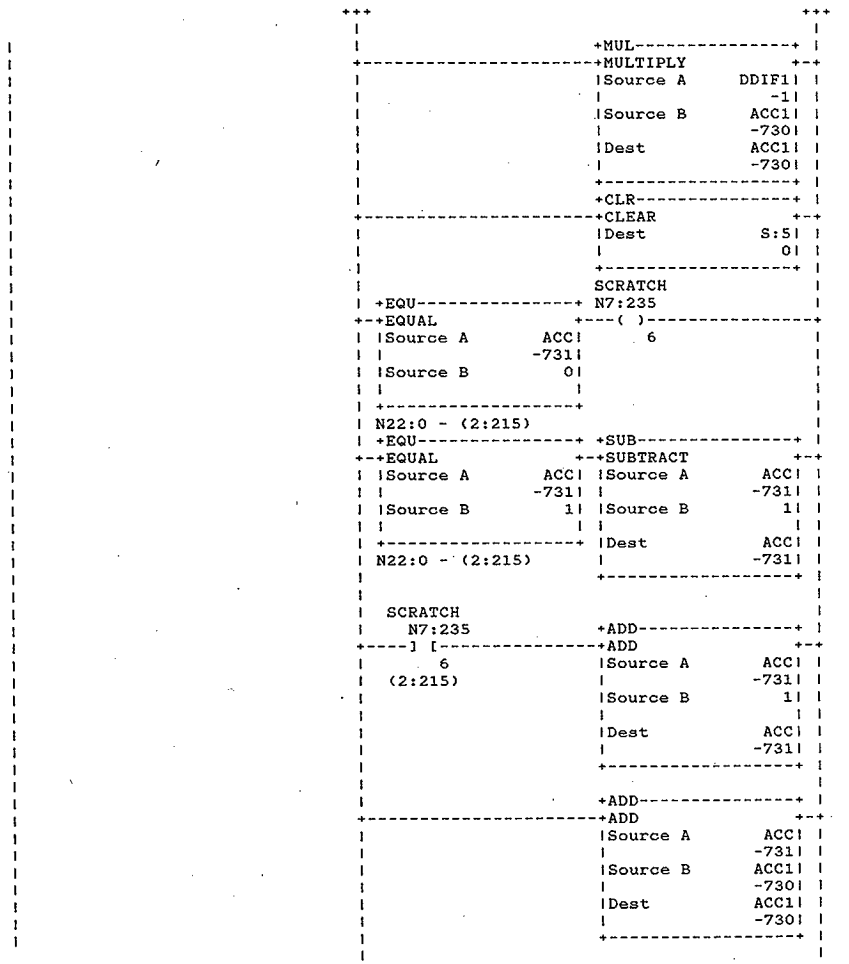
Rung 2:902

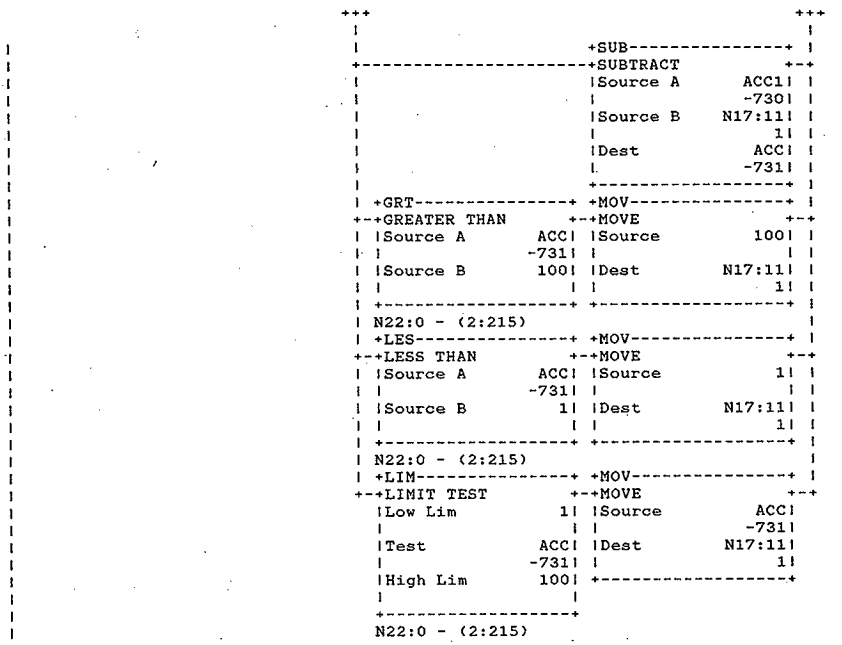


Rung 2:903




+SUB
SUBTRACT
Source A DIF1_181V
-10
Source B DIF2_181V
-1
Dest DDIF1
-1
+MOV
MOVE
Source DIF1_181V
-10
Dest DIF2_181V
-1
+SUB
SUBTRACT
Source A DIF1_181V
-10
Source B
9
Dest DIF1_181V
-10
+MUL
MULTIPLY
Source A DIF1_181V
-10
Source B DIF1_181V
-10
Dest ACC
-731
+MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_181V
-10
Dest ACC
-731
+CLR
CLEAR
Dest S:5
0
+MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

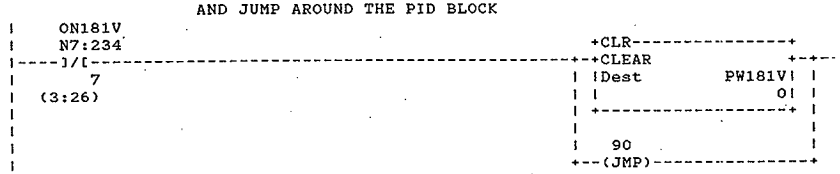

MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
( )
6
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730



Rung 2:904

Rung 2:905

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



Rung 2:906

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

```
|    AM181V                                                          PID181V/1
|    N7:234                                                           N17:0
|----]/[-------------------------------------------------------------( )----
|       6                                                              1
|  (3:26)
```

Rung 2:907

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

```
|                                                        +MOV---------------+
|--------------------------------------------------------+MOVE              +-
|                                                        |Source     SET181V|
|                                                        |                 0|
|                                                        |Dest      PIDSP181V|
|                                                        |                 0|
|                                                        +------------------+
```

Rung 2:908

```
|                                                  +PID-------------------+
|--------------------------------------------------+-+PID                 +-+-
|                                                  | |Control Block  PID181V| |
|                                                  | |Process Variable AV181V| |
|                                                  | |Control Variable CV181V| |
|                                                  | |Control Block Length 23| |
|                                                  | +----------------------+ |
|                                                  | +SCL----------------+    |
|                                                  +-+SCALE              +------+
|                                                  | |Source      CV181V|      |
|                                                  | |                  0|      |
|                                                  | |Rate [/10000]   15|      |
|                                                  | |                   |      |
|                                                  | |Offset            0|      |
|                                                  | |                   |      |
|                                                  | |Dest        PW181V|      |
|                                                  | |                  0|      |
|                                                  | +-------------------+      |
|                                                  | +CLR----------------+      |
|                                                  +-+CLEAR              +------+
|                                                    |Dest           S:5|
|                                                    |                  0|
|                                                    +-------------------+
```

Rung 2:909

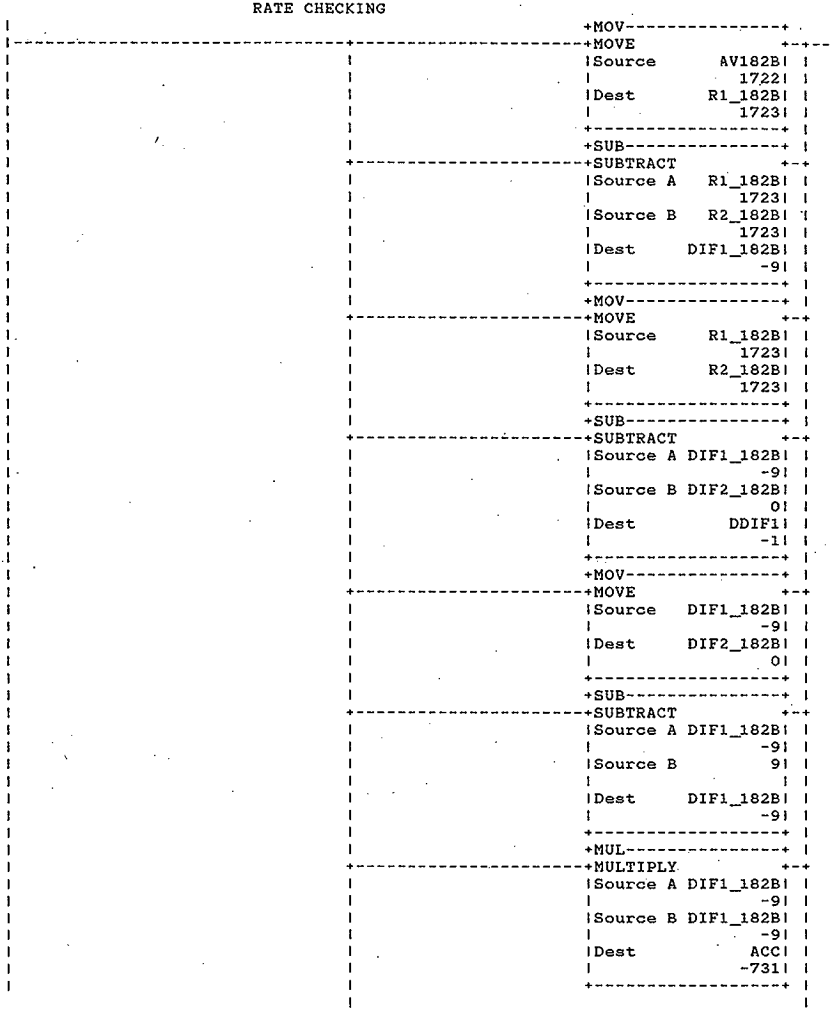
```
|   90                                                                N7:236
|--[LBL]-------------------------------------------------------------( )---
|                                                                      7
```

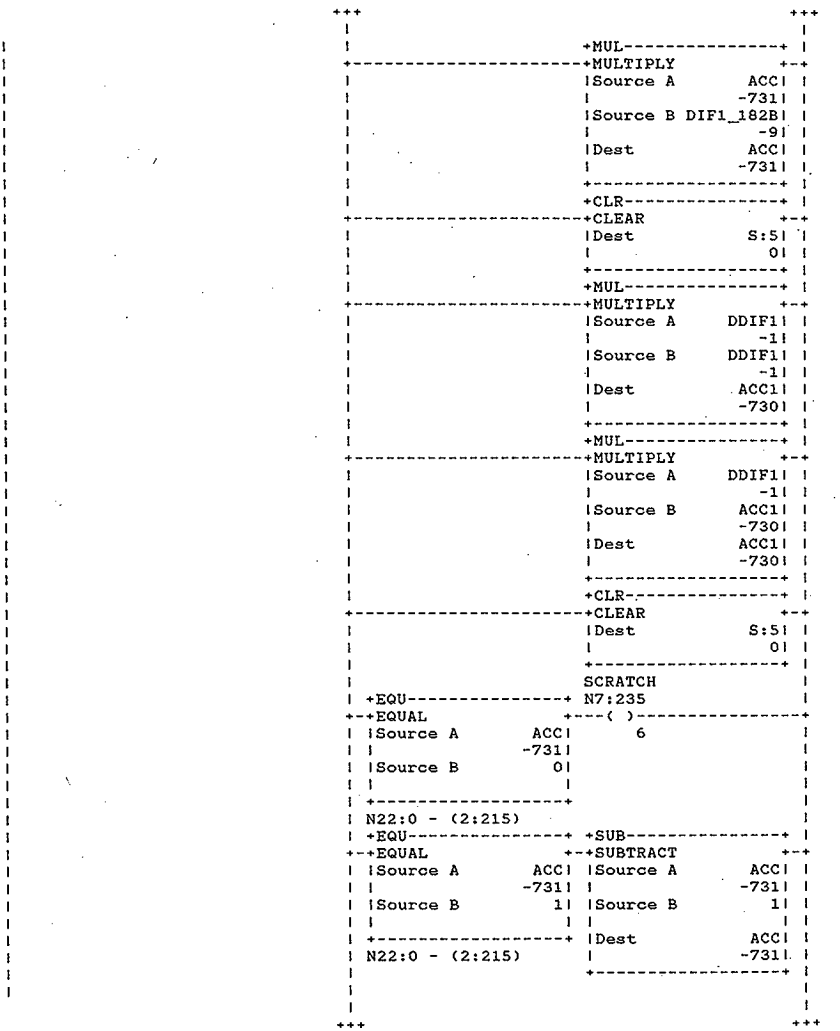
Rung 2:910

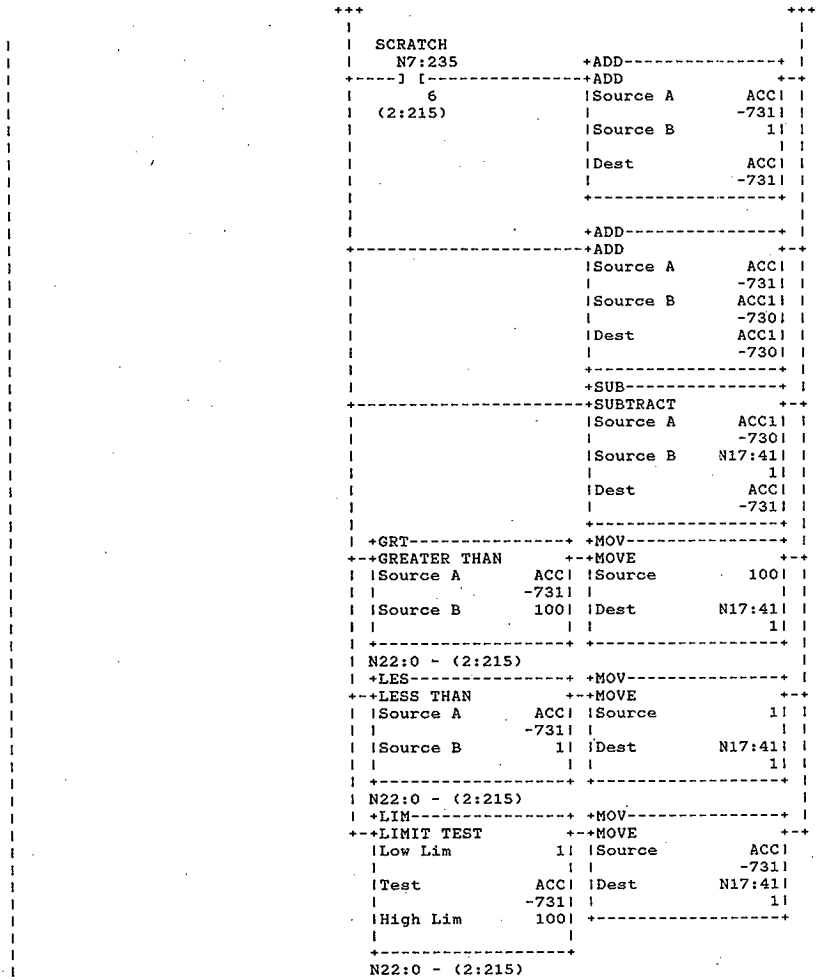
```
|                                                                     PID182B
| RT_TMR/DN                                                            52
|   T4:87                                                          (JMP)----
|----]/[-------------------------------------------------------------
|      DN
|  (2:42)
```

Rung 2:911

RATE CHECKING



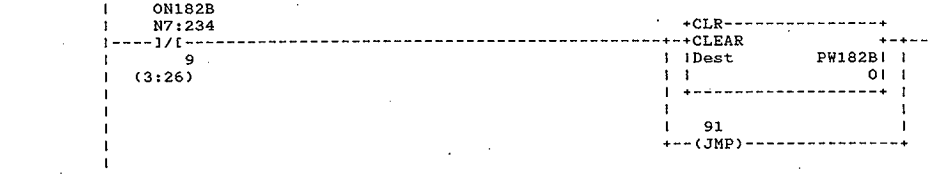

MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_182B
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
6
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B
1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUBTRACT
Source A ACC1
-730
Source B N17:41
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B
100
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B
1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim
1
Test ACC
-731
High Lim
100
N22:0 - (2:215)
MOV
MOVE
Source
100
Dest N17:41
1
MOV
MOVE
Source
1
Dest N17:41
1
MOV
MOVE
Source ACC
-731
Dest N17:41
1

Rung 2:912

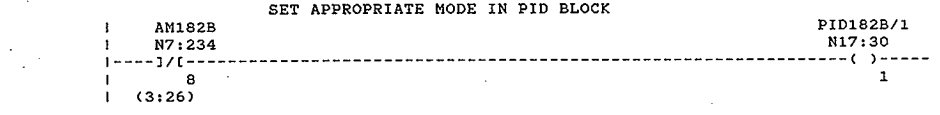
Rung 2:913

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



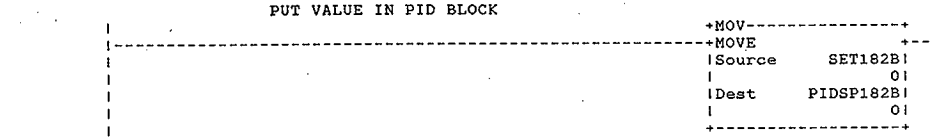
Rung 2:914

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

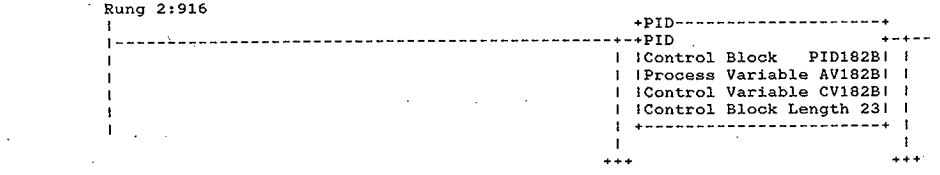


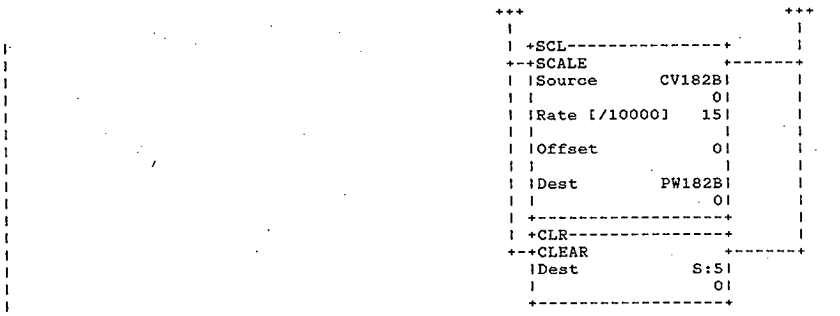
Rung 2:915

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



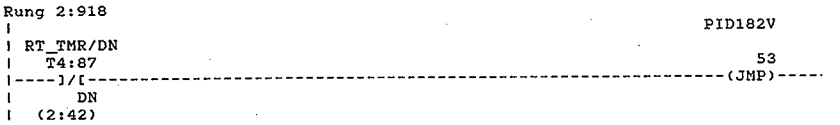
Rung 2:916





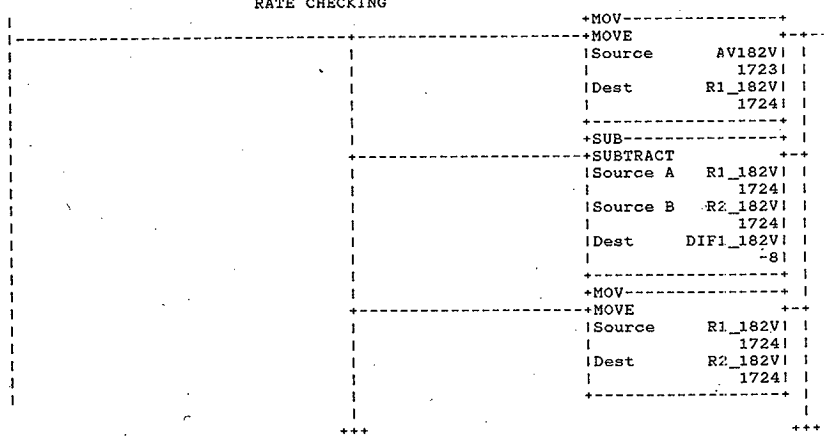
Rung 2:917

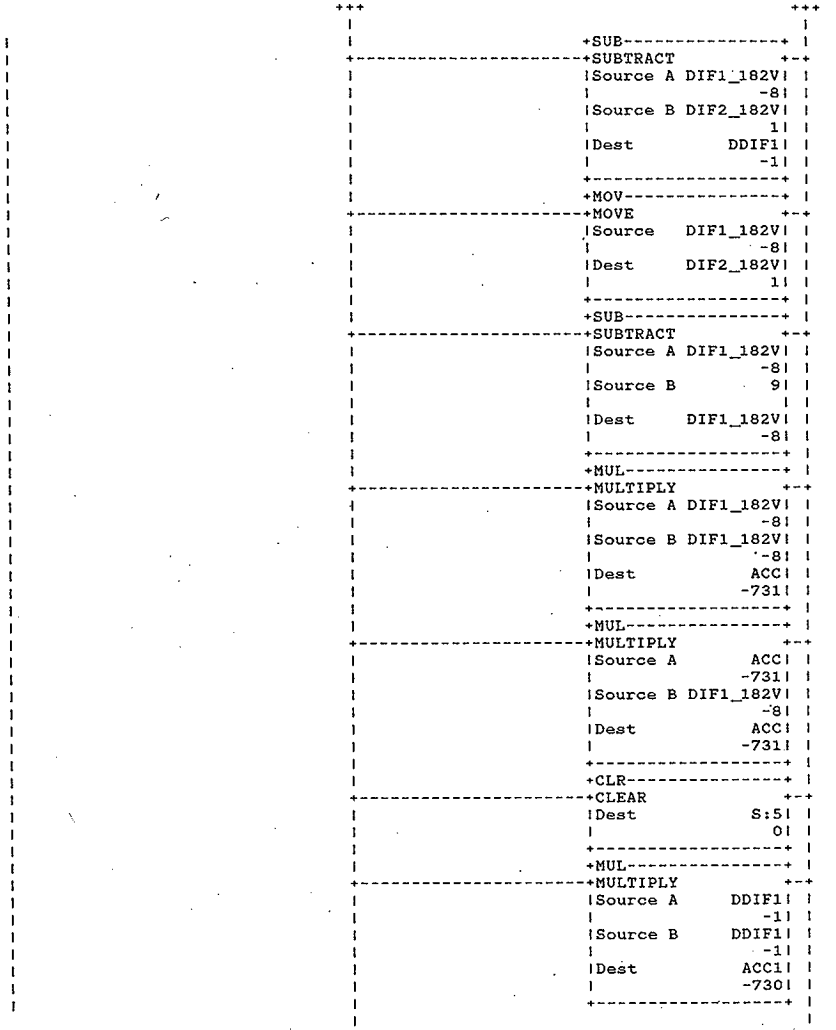
Rung 2:918

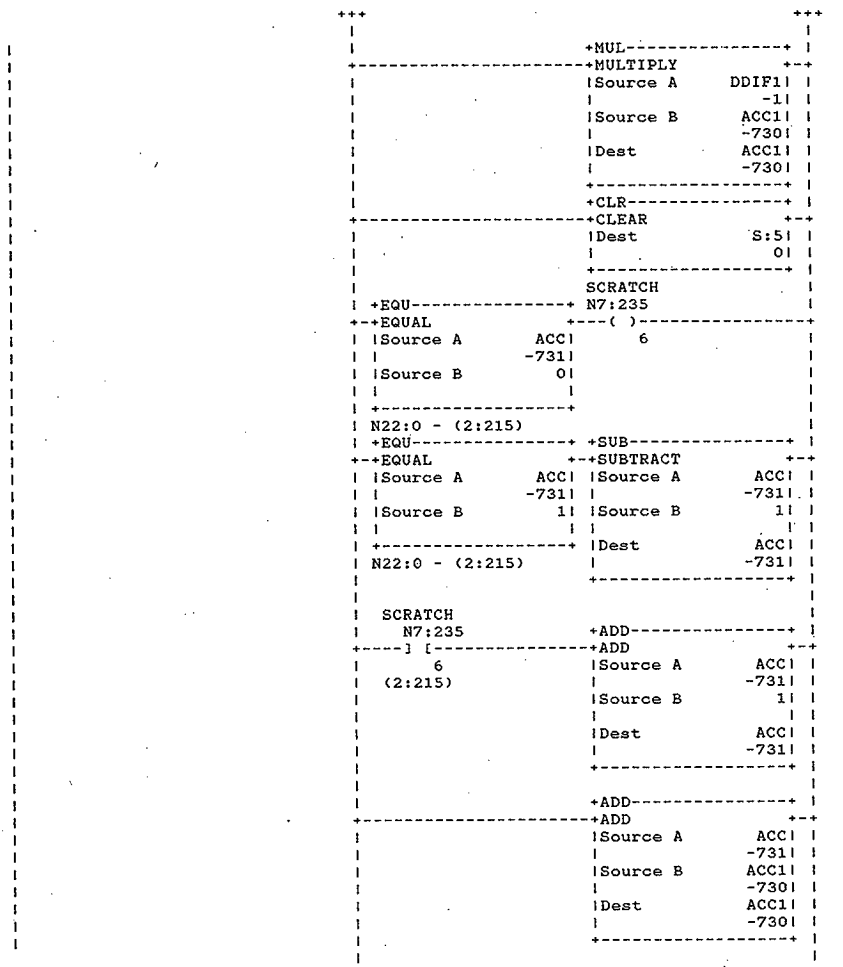


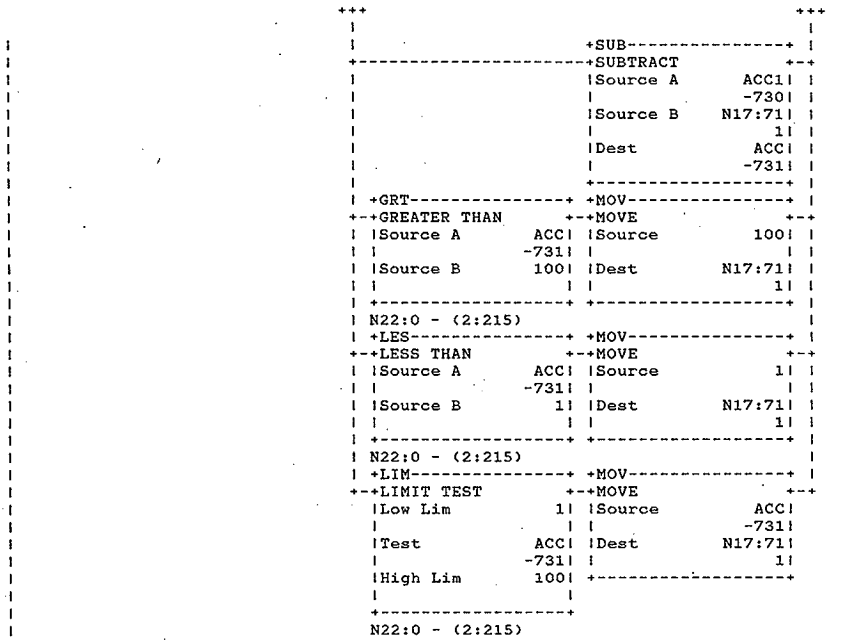
Rung 2:919

RATE CHECKING




SUB
SUBTRACT
Source A DIF1_182V
-8
Source B DIF2_182V
1
Dest DDIF1
-1
MOV
MOVE
Source DIF1_182V
-8
Dest DIF2_182V
1
SUB
SUBTRACT
Source A DIF1_182V
-8
Source B
9
Dest DIF1_182V
-8
MUL
MULTIPLY
Source A DIF1_182V
-8
Source B DIF1_182V
-8
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_182V
-8
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730

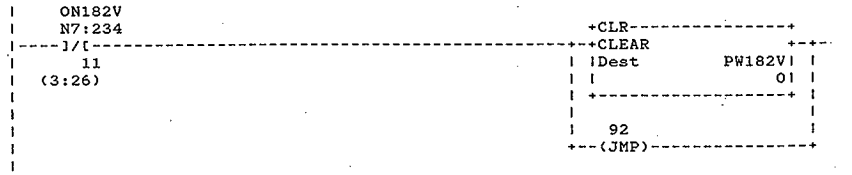

MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
6
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730



Rung 2:920

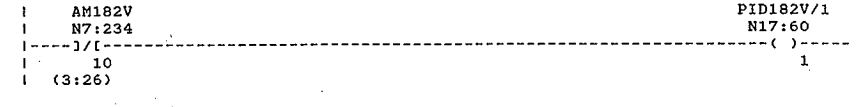
Rung 2:921

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



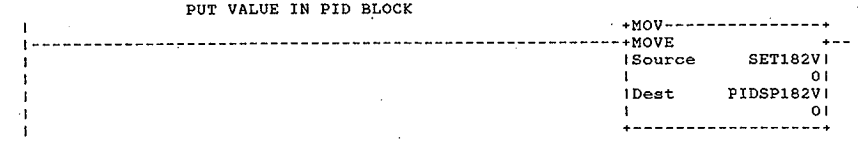
Rung 2:922

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

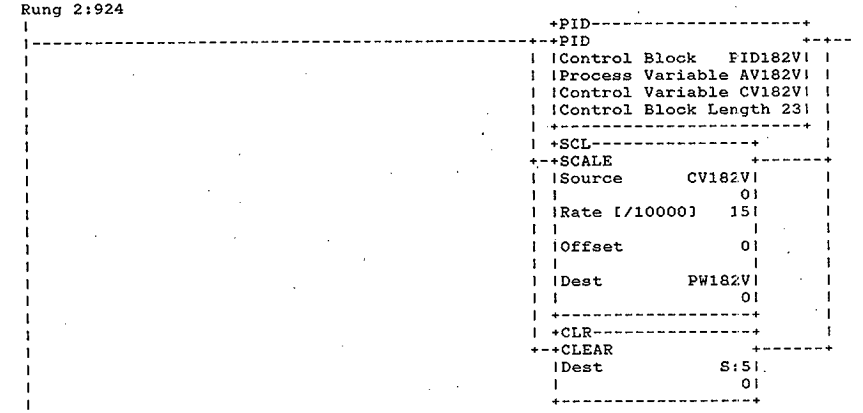


Rung 2:923

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK

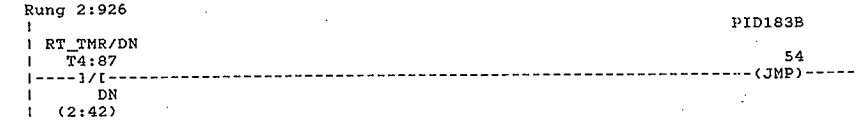


Rung 2:924



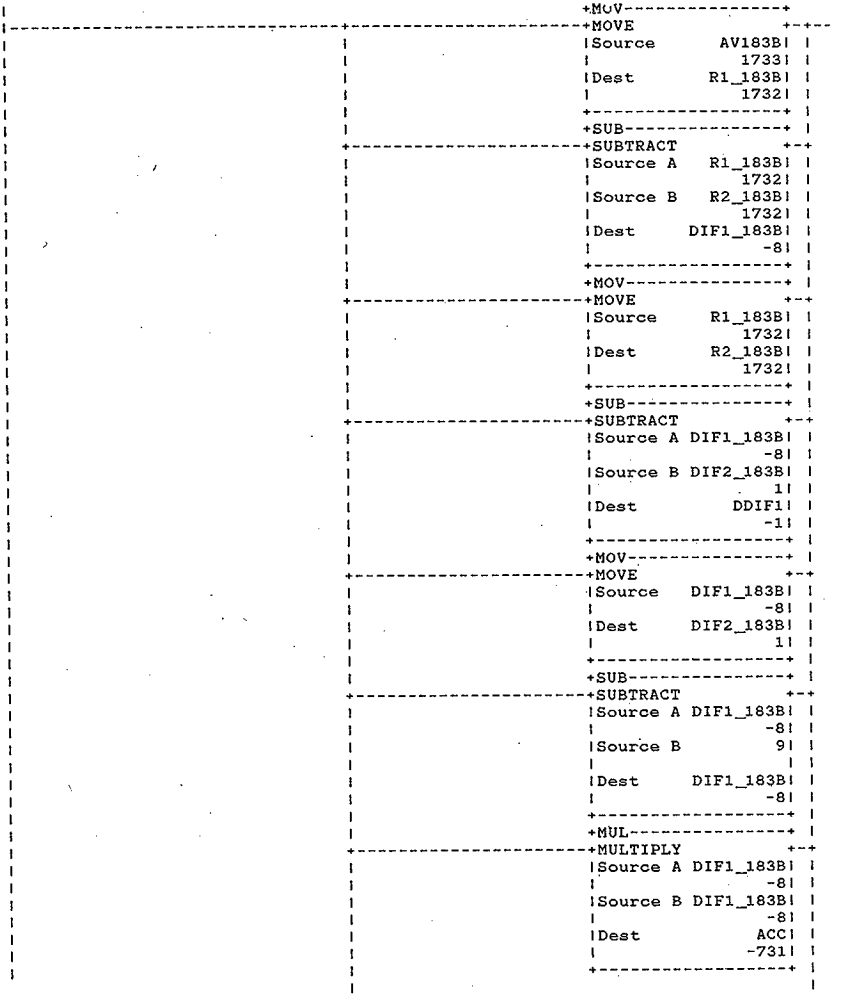
Rung 2:925

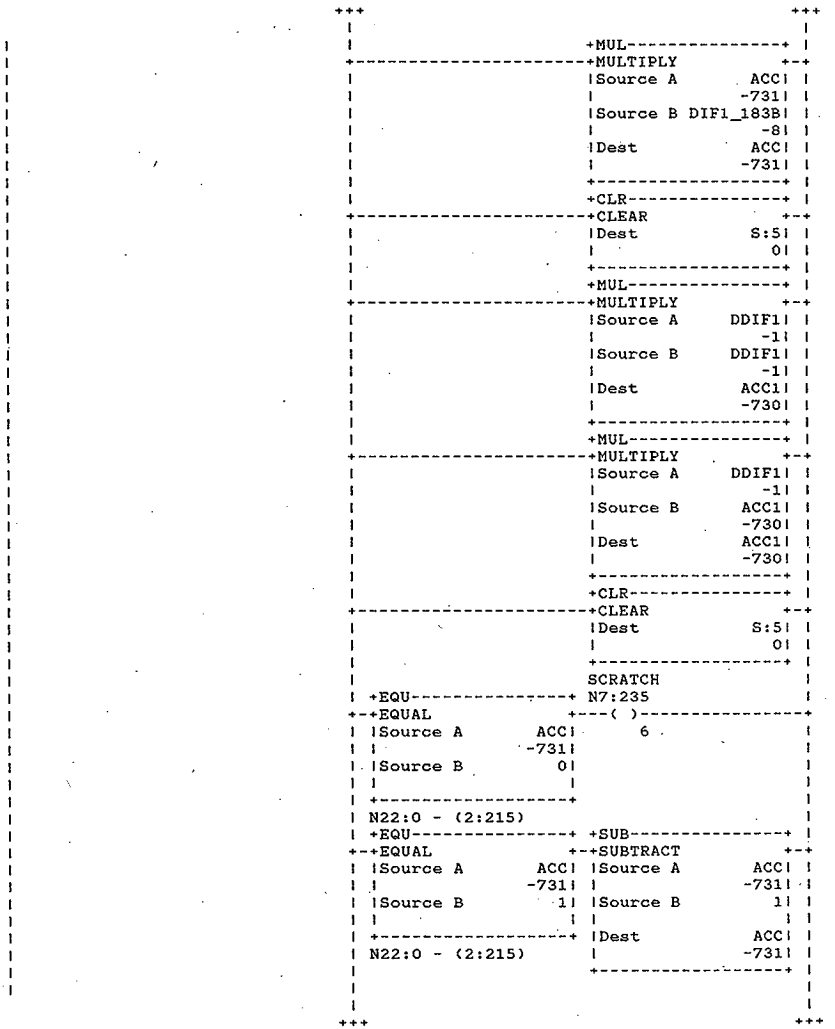
Rung 2:926

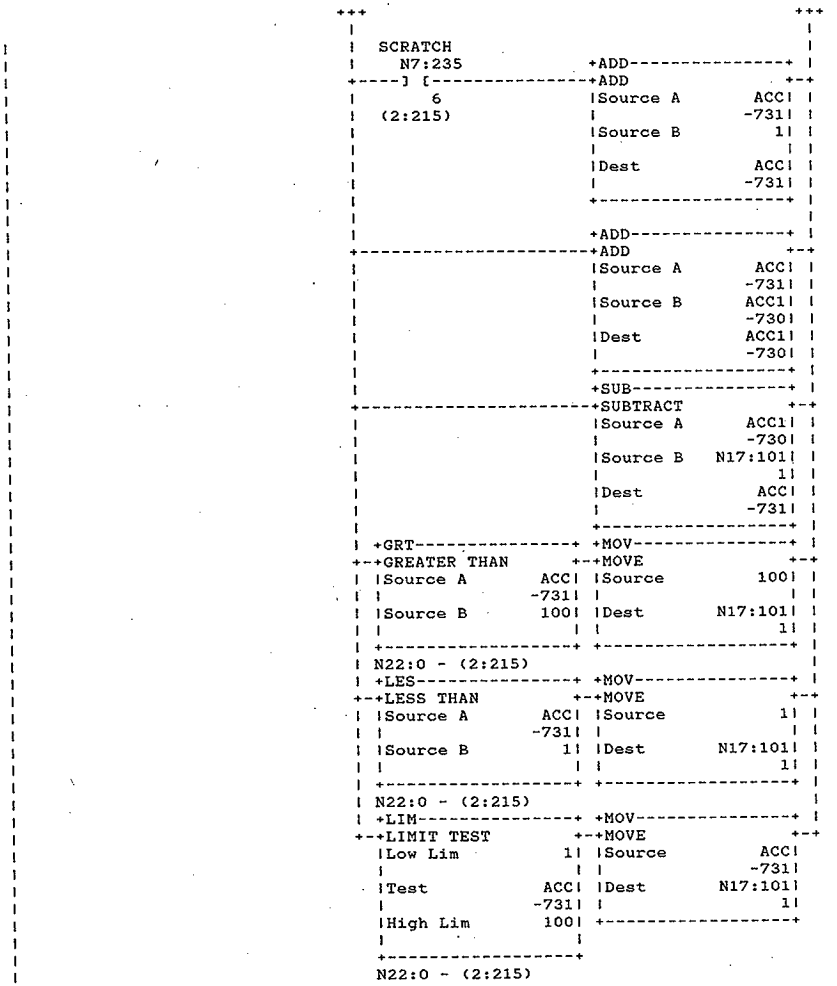


Rung 2:927

RATE CHECKING



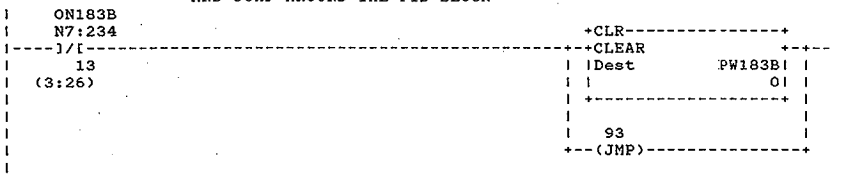

MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_183
-8
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730
MUL
MULTIPLY
Source A DDIF1
-1
Source B ACC1
-730
Dest ACC1
-730
CLR
CLEAR
Dest S:5
0
SCRATCH
N7:235
6
EQU
EQUAL
Source A ACC
-731
Source B 0
N22:0 - (2:215)
EQU
EQUAL
Source A ACC
-731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC
-731
Source B 1
Dest ACC
-731


SCRATCH
N7:235
6
(2:215)
ADD
Source A ACC
-731
Source B 1
Dest ACC
-731
ADD
Source A ACC
-731
Source B ACC1
-730
Dest ACC1
-730
SUB
SUBTRACT
Source A ACC1
-730
Source B N17:101
1
Dest ACC
-731
GRT
GREATER THAN
Source A ACC
-731
Source B 100
N22:0 - (2:215)
LES
LESS THAN
Source A ACC
-731
Source B 1
N22:0 - (2:215)
LIM
LIMIT TEST
Low Lim 1
Test ACC
-731
High Lim 100
N22:0 - (2:215)
MOV
MOVE
Source 100
Dest N17:101
1
MOV
MOVE
Source 1
Dest N17:101
1
MOV
MOVE
Source ACC
-731
Dest N17:101
1

Rung 2:928

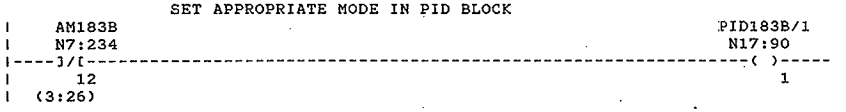
Rung 2:929

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



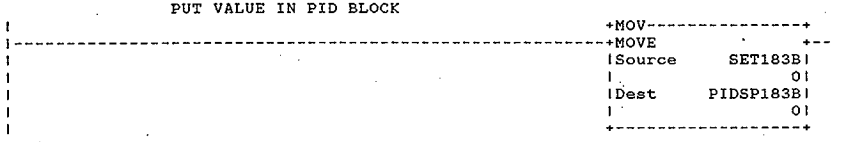
Rung 2:930

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

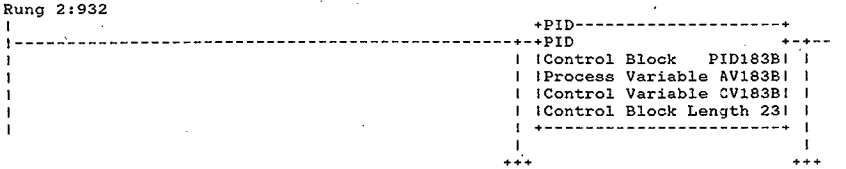


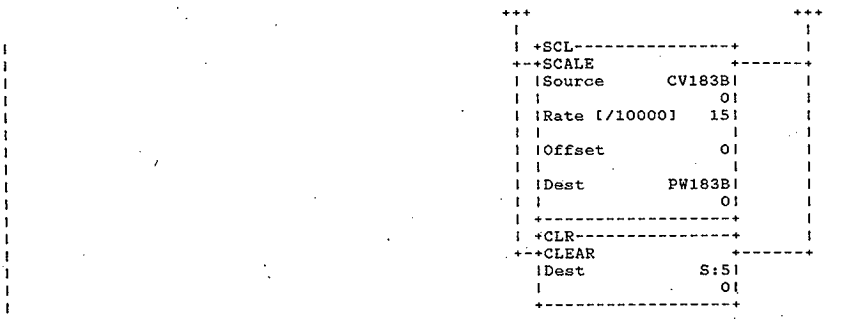
Rung 2:931

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



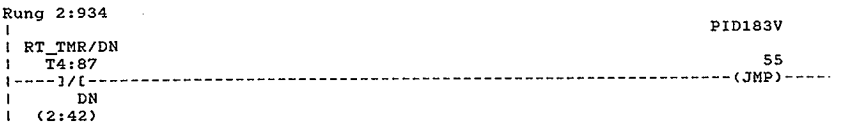
Rung 2:932



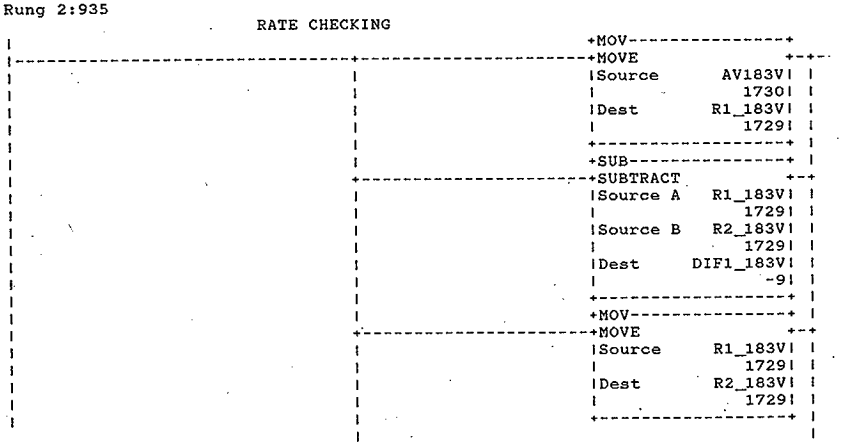


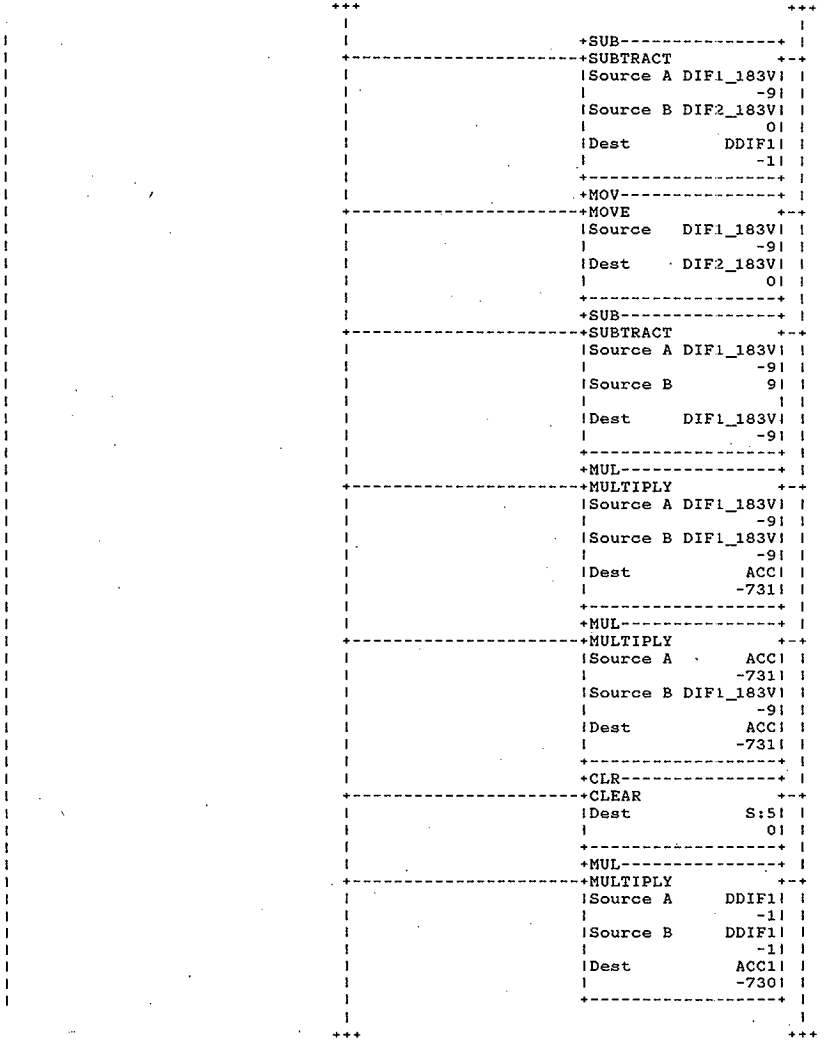
Rung 2:933

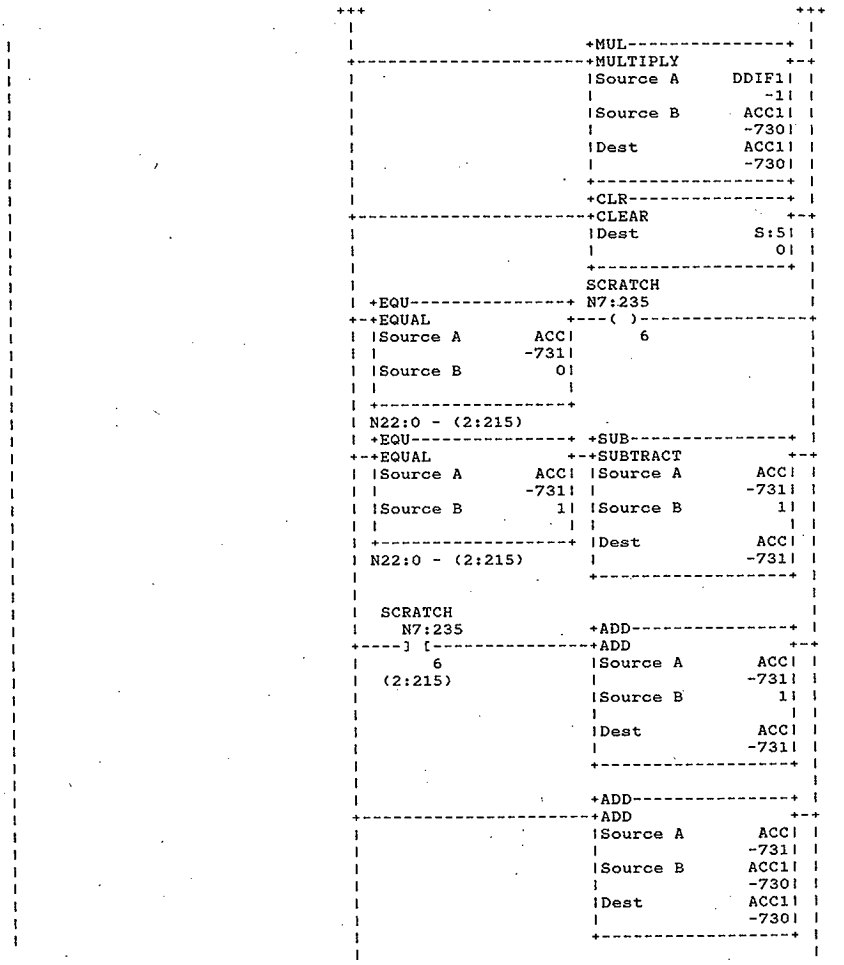
Rung 2:934

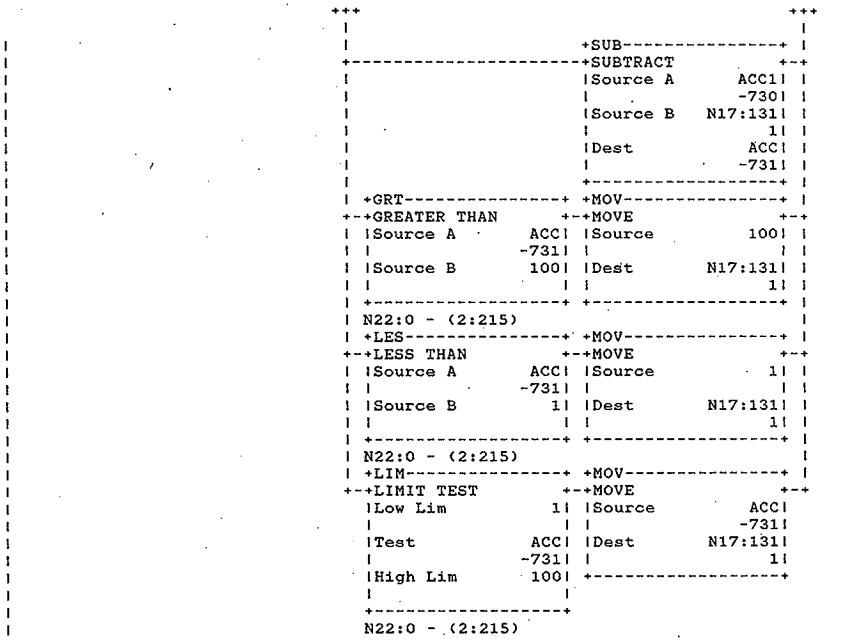


Rung 2:935




SUB
SUBTRACT
Source A DIF1_183V
-9
Source B DIF2_183V
0
Dest DDIF1
-1
MOV
MOVE
Source DIF1_183V
-9
Dest DIF2_183V
0
SUB
SUBTRACT
Source A DIF1_183V
-9
Source B
9
Dest DIF1_183V
-9
MUL
MULTIPLY
Source A DIF1_183V
-9
Source B DIF1_183V
-9
Dest ACC
-731
MUL
MULTIPLY
Source A ACC
-731
Source B DIF1_183V
-9
Dest ACC
-731
CLR
CLEAR
Dest S:5
0
MUL
MULTIPLY
Source A DDIF1
-1
Source B DDIF1
-1
Dest ACC1
-730


MUL
MULTIPLY
Source A DDIF1 -1
Source B ACC1 -730
Dest ACC1 -730
CLR
CLEAR
Dest S:5 0
SCRATCH
N7:235
EQU
EQUAL
Source A ACC -731
Source B 0
N22:0 - (2:215)
6
EQU
EQUAL
Source A ACC -731
Source B 1
N22:0 - (2:215)
SUB
SUBTRACT
Source A ACC -731
Source B 1
Dest ACC -731
SCRATCH
N7:235
6
(2:215)
ADD
ADD
Source A ACC -731
Source B 1
Dest ACC -731
ADD
ADD
Source A ACC -731
Source B ACC1 -730
Dest ACC1 -730



Rung 2:936

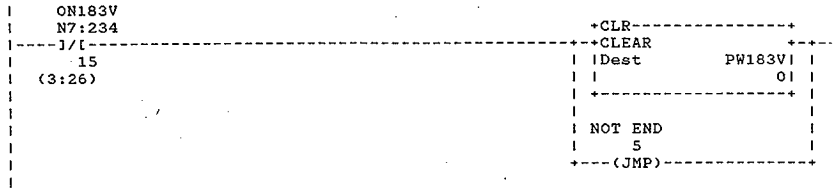
DNR_4
N22:5
(L)
8

Rung 2:937
PID183V

DUMMY55
N22:10
55
[LBL]
( )
6

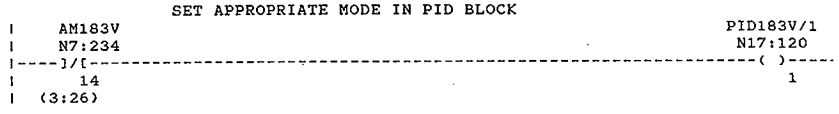
Rung 2:938

DETECT FROM SCADA PID ON/OFF
IF PID OFF
THEN ZERO PW FOR ZERO OUTPUT AT SCR
AND JUMP AROUND THE PID BLOCK



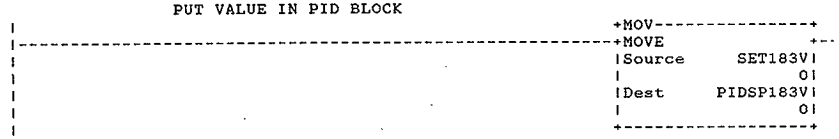
Rung 2:939

DETECT AUTO/MANUAL FROM SCADA
SET APPROPRIATE MODE IN PID BLOCK

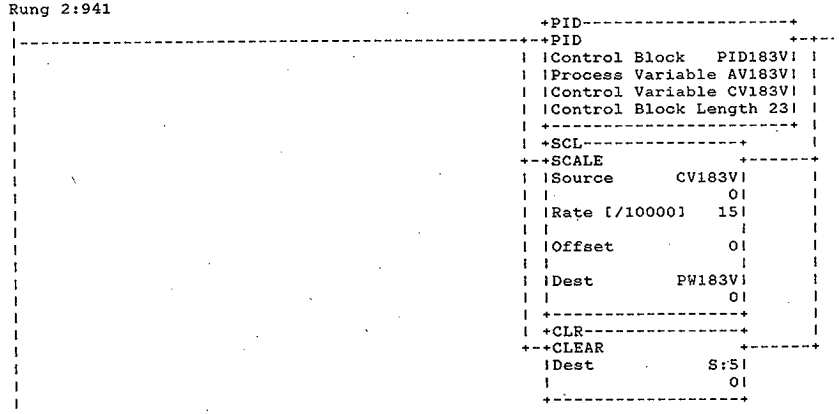


Rung 2:940

DETECT SETPOINT VALUE FROM SCADA
PUT VALUE IN PID BLOCK



Rung 2:941

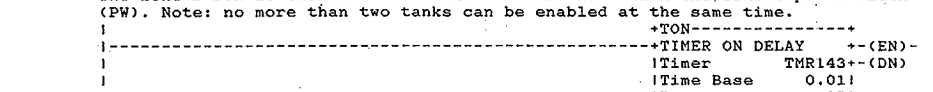


Rung 2:942

Rung 2:943

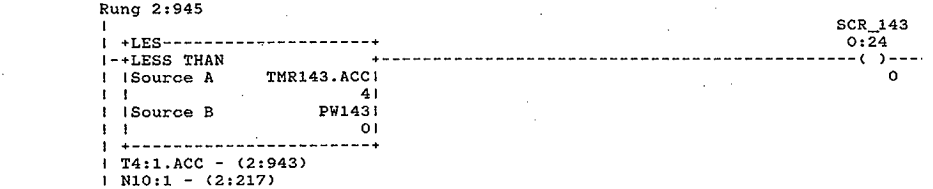
** FIRE SCRs **
PIPE ZONES

There is one timer for each zone. Each timer is reset when it reaches 200ms. The zone's SCR is turned on when the timer is less than the zone's pulse width (PW). Note: no more than two tanks can be enabled at the same time.



Rung 2:944

Rung 2:945



Rung 2:946

Rung 2:947

```
Rung 2:948
|                                                                                  SCR_144
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-----------------------------------------------------( )----
| |Source A     TMR144.ACC|                                                          1
| |                      4|
| |Source B          PW144|
| |                      0|
| +-----------------------+
| T4:2.ACC - (2:946)
| N10:2 - (2:225)

Rung 2:949
|                                                          +TON---------------+
|----------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                          |Timer       TMR150+-(DN)
|                                                          |Time Base     0.01|
|                                                          |Preset          25|
|                                                          |Accum            4|
|                                                          +------------------+

Rung 2:950
| TMR150/DN                                                                        TMR150
|     T4:3                                                                          T4:3
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:949)

Rung 2:951
|                                                                                  SCR_150
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-----------------------------------------------------( )----
| |Source A     TMR150.ACC|                                                          2
| |                      4|
| |Source B          PW150|
| |                      0|
| +-----------------------+
| T4:3.ACC - (2:949)
| N10:3 - (2:233)

Rung 2:952
|                                                          +TON---------------+
|----------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                          |Timer       TMR151+-(DN)
|                                                          |Time Base     0.01|
|                                                          |Preset          25|
|                                                          |Accum            4|
|                                                          +------------------+

Rung 2:953
| TMR151/DN                                                                        TMR151
|     T4:4                                                                          T4:4
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:952)
```

```
Rung 2:954
|                                                                                SCR_151
| +LES--------------------+                                                      0:24
|-+LESS THAN              +-----------------------------------------------( )----
| |Source A     TMR151.ACC|                                                        3
| |                      4|
| |Source B          PW151|
| |                      0|
| +-----------------------+
| T4:4.ACC - (2:952)
| N10:4 - (2:241)

Rung 2:955
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer       TMR152+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            4|
|                                                        +------------------+

Rung 2:956
| TMR152/DN                                                                    TMR152
|     T4:5                                                                      T4:5
|----] [-------------------------------------------------------------------(RES)---
|      DN
|  (2:955)

Rung 2:957
|                                                                                SCR_152
| +LES--------------------+                                                      0:24
|-+LESS THAN              +-----------------------------------------------( )----
| |Source A     TMR152.ACC|                                                        4
| |                      4|
| |Source B          PW152|
| |                      0|
| +-----------------------+
| T4:5.ACC - (2:955)
| N10:5 - (2:249)

Rung 2:958
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer       TMR153+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            4|
|                                                        +------------------+

Rung 2:959
| TMR153/DN                                                                    TMR153
|     T4:6                                                                      T4:6
|----] [-------------------------------------------------------------------(RES)---
|      DN
|  (2:958)
```

```
Rung 2:960
|                                                                                  SCR_153
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-----------------------------------------------------( )----
| |Source A     TMR153.ACC|                                                          5
| |                      4|
| |Source B          PW153|
| |                      0|
| +-----------------------+
| T4:6.ACC - (2:958)
| N10:6 - (2:257)

Rung 2:961
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer       TMR154+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            4|
|                                                        +------------------+

Rung 2:962
| TMR154/DN                                                                        TMR154
|     T4:7                                                                          T4:7
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:961)

Rung 2:963
|                                                                                  SCR_154
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-----------------------------------------------------( )----
| |Source A     TMR154.ACC|                                                          6
| |                      4|
| |Source B          PW154|
| |                      0|
| +-----------------------+
| T4:7.ACC - (2:961)
| N10:7 - (2:265)

Rung 2:964
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer       TMR160+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            4|
|                                                        +------------------+

Rung 2:965
| TMR160/DN                                                                        TMR160
|     T4:8                                                                          T4:8
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:964)
```

```
Rung 2:966
|                                                                                  SCR_160
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-----------------------------------------------------( )----
| |Source A     TMR160.ACC|                                                          7
| |                      4|
| |Source B          PW160|
| |                      0|
| +-----------------------+
| T4:8.ACC - (2:964)
| N10:8 - (2:273)

Rung 2:967
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer       TMR161+-(DN)
|                                                        |Time Base     C.01|
|                                                        |Preset          25|
|                                                        |Accum            4|
|                                                        +------------------+

Rung 2:968
| TMR161/DN                                                                        TMR161
|     T4:9                                                                          T4:9
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:967)

Rung 2:969
|                                                                                  SCR_161
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-----------------------------------------------------( )----
| |Source A     TMR161.ACC|                                                          8
| |                      4|
| |Source B          PW161|
| |                      0|
| +-----------------------+
| T4:9.ACC - (2:967)
| N10:9 - (2:281)

Rung 2:970
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer       TMR162+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            4|
|                                                        +------------------+

Rung 2:971
| TMR162/DN                                                                        TMR162
|   T4:10                                                                           T4:10
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:970)
```

```
Rung 2:972
|                                                                    SCR_162
| +LES--------------------+                                          0:24
|-+LESS THAN              +-------------------------------------------( )----
| |Source A     TMR162.ACC|                                            9
| |                     4|
| |Source B           PW162|
| |                     0|
| +----------------------+
| T4:10.ACC - (2:970)
| N10:10 - (2:290)

Rung 2:973
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR163+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            4|
|                                                  +------------------+

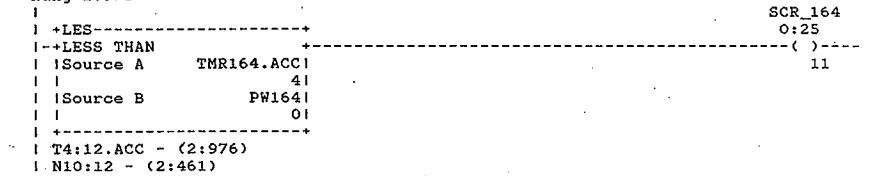
Rung 2:974
| TMR163/DN                                                          TMR163
|   T4:11                                                           T4:11
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:973)

Rung 2:975
|                                                                    SCR_163
| +LES--------------------+                                          0:24
|-+LESS THAN              +-------------------------------------------( )----
| |Source A     TMR163.ACC|                                           10
| |                     4|
| |Source B           PW163|
| |                     0|
| +----------------------+
| T4:11.ACC - (2:973)
| N10:11 - (2:453)

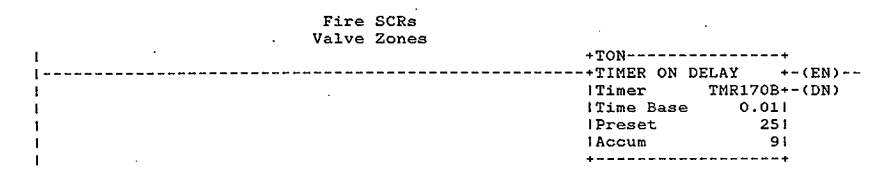
Rung 2:976
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR164+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            4|
|                                                  +------------------+

Rung 2:977
| TMR164/DN                                                          TMR164
|   T4:12                                                           T4:12
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:976)
```

Rung 2:978

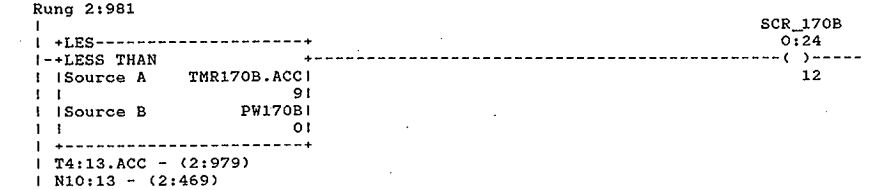


Rung 2:979

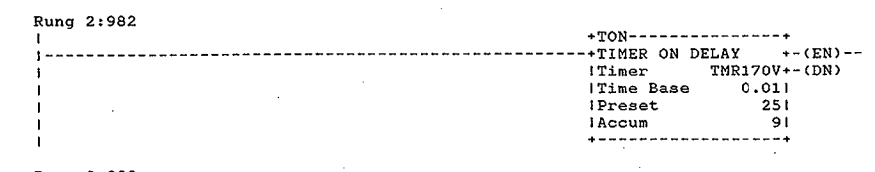


Rung 2:980

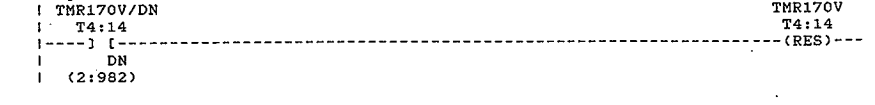
Rung 2:981



Rung 2:982



Rung 2:983



```
Rung 2:984
|                                                                                  SCR_170V
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-------------------------------------------------------( )-----
| |Source A    TMR170V.ACC|                                                          13
| |                      9|
| |Source B         PW170V|
| |                      0|
| +-----------------------+
| T4:14.ACC - (2:982)
| N10:14 - (2:477)

Rung 2:985
|                                                          +TON---------------+
|----------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                          |Timer      TMR171B+-(DN)
|                                                          |Time Base     0.01|
|                                                          |Preset          25|
|                                                          |Accum            9|
|                                                          +------------------+

Rung 2:986
| TMR171B/DN                                                                       TMR171B
|   T4:15                                                                           T4:15
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:985)

Rung 2:987
|                                                                                  SCR_171B
| +LES--------------------+                                                         0:24
|-+LESS THAN              +-------------------------------------------------------( )-----
| |Source A    TMR171B.ACC|                                                          14
| |                      9|
| |Source B         PW171B|
| |                      0|
| +-----------------------+
| T4:15.ACC - (2:985)
| N10:15 - (2:485)

Rung 2:988
|                                                          +TON---------------+
|----------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                          |Timer      TMR171V+-(DN)
|                                                          |Time Base     0.01|
|                                                          |Preset          25|
|                                                          |Accum            9|
|                                                          +------------------+

Rung 2:989
| TMR171V/DN                                                                       TMR171V
|   T4:16                                                                           T4:16
|----] [-------------------------------------------------------------------------(RES)---
|      DN
|  (2:988)
```

```
Rung 2:990
|                                                                    SCR_171V
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR171V.ACC|                                            15
| |                     9|
| |Source B         PW171V|
| |                     0|
| +----------------------+
| T4:16.ACC - (2:988)
| N10:16 - (2:493)

Rung 2:991
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR172B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:992
| TMR172B/DN                                                       TMR172B
|   T4:17                                                           T4:17
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:991)

Rung 2:993
|                                                                    SCR_172B
| +LES--------------------+                                           0:25
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR172B.ACC|                                            16
| |                     9|
| |Source B         PW172B|
| |                     0|
| +----------------------+
| T4:17.ACC - (2:991)
| N10:17 - (2:501)

Rung 2:994
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR172V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:995
| TMR172V/DN                                                       TMR172V
|   T4:18                                                           T4:18
|----] [-------------------------------------------------------------(RES)---
|      DN
|  (2:994)
```

```
Rung 2:996
|                                                                    SCR_172V
| +LES---------------------+                                          0:24
|-+LESS THAN               +-----------------------------------------( )-----
| |Source A    TMR172V.ACC|                                           17
| |                      9|
| |Source B         PW172V|
| |                      0|
| +-------------------------+
| T4:18.ACC - (2:994)
| N10:18 - (2:509)

Rung 2:997
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR173B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:998
| TMR173B/DN                                                        TMR173B
|    T4:19                                                          T4:19
|----] [-------------------------------------------------------------(RES)---
|       DN
|   (2:997)

Rung 2:999
|                                                                    SCR_173B
| +LES---------------------+                                          0:24
|-+LESS THAN               +-----------------------------------------( )-----
| |Source A    TMR173B.ACC|                                           18
| |                      9|
| |Source B         PW173B|
| |                      0|
| +-------------------------+
| T4:19.ACC - (2:997)
| N10:19 - (2:517)

Rung 2:1000
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR173V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1001
| TMR173V/DN                                                        TMR173V
|    T4:20                                                          T4:20
|----] [-------------------------------------------------------------(RES)---
|       DN
| (2:1000)
```

```
Rung 2:1002
|                                                                    SCR_173V
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR173V.ACC|                                            19
| |                     9|
| |Source B          PW173V|
| |                     0|
| +----------------------+
| T4:20.ACC - (2:1000)
| N10:20 - (2:525)

Rung 2:1003
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR174B+-(DN)
|                                                  |Time Base      0.01|
|                                                  |Preset           25|
|                                                  |Accum             9|
|                                                  +-------------------+

Rung 2:1004
| TMR174B/DN                                                        TMR174B
|   T4:21                                                            T4:21
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1003)

Rung 2:1005
|                                                                    SCR_174B
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR174B.ACC|                                            20
| |                     9|
| |Source B          PW174B|
| |                     0|
| +----------------------+
| T4:21.ACC - (2:1003)
| N10:21 - (2:533)

Rung 2:1006
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer       TMR174V+-(DN)
|                                                  |Time Base      0.01|
|                                                  |Preset           25|
|                                                  |Accum             9|
|                                                  +-------------------+

Rung 2:1007
| TMR174V/DN                                                        TMR174V
|   T4:22                                                            T4:22
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1006)
```

```
Rung 2:1008
|                                                                    SCR_174V
| +LES---------------------+                                          0:24
|-+LESS THAN               +-------------------------------------------( )-----
| |Source A    TMR174V.ACC|                                            21
| |                       9|
| |Source B          PW174V|
| |                       0|
| +------------------------+
| T4:22.ACC - (2:1006)
| N10:22 - (2:542)

Rung 2:1009
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR175B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1010
| TMR175B/DN                                                       TMR175B
|   T4:23                                                           T4:23
|----] [-----------------------------------------------------------(RES)---
|      DN
| (2:1009)

Rung 2:1011
|                                                                    SCR_175B
| +LES---------------------+                                          0:24
|-+LESS THAN               +-------------------------------------------( )-----
| |Source A    TMR175B.ACC|                                            22
| |                       9|
| |Source B          PW175B|
| |                       0|
| +------------------------+
| T4:23.ACC - (2:1009)
| N10:23 - (2:675)

Rung 2:1012
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR175V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            5|
|                                                  +------------------+

Rung 2:1013
| TMR175V/DN                                                       TMR175V
|   T4:24                                                           T4:24
|----] [-----------------------------------------------------------(RES)---
|      DN
| (2:1012)
```

```
Rung 2:1014
|                                                                    SCR_175V
| +LES--------------------+                                           0:24
|-+LESS THAN              +-----------------------------------------( )-----
| |Source A    TMR175V.ACC|                                           23
| |                     5|
| |Source B         PW175V|
| |                     0|
| +----------------------+
| T4:24.ACC - (2:1012)
| N10:24 - (2:683)

Rung 2:1015
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR176B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            5|
|                                                  +------------------+

Rung 2:1016
| TMR176B/DN                                                       TMR176B
|   T4:25                                                           T4:25
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1015)

Rung 2:1017
|                                                                    SCR_176B
| +LES--------------------+                                           0:24
|-+LESS THAN              +-----------------------------------------( )-----
| |Source A    TMR176B.ACC|                                           24
| |                     5|
| |Source B         PW176B|
| |                     0|
| +----------------------+
| T4:25.ACC - (2:1015)
| N10:25 - (2:691)

Rung 2:1018
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR176V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1019
| TMR176V/DN                                                       TMR176V
|   T4:26                                                           T4:26
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1018)
```

```
Rung 2:1020
|                                                                                SCR_176V
| +LES--------------------+                                                      0:24
|-+LESS THAN              +-------------------------------------------------( )-----
| |Source A    TMR176V.ACC|                                                      25
| |                      9|
| |Source B         PW176V|
| |                      0|
| +-----------------------+
| T4:26.ACC - (2:1018)
| N10:26 - (2:699)

Rung 2:1021
|                                                        +TON---------------+
|--------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer      TMR177B+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            9|
|                                                        +------------------+

Rung 2:1022
| TMR177B/DN                                                                   TMR177B
|   T4:27                                                                       T4:27
|----] [-------------------------------------------------------------------(RES)---
|      DN
| (2:1021)

Rung 2:1023
|                                                                                SCR_177B
| +LES--------------------+                                                      0:24
|-+LESS THAN              +-------------------------------------------------( )-----
| |Source A    TMR177B.ACC|                                                      26
| |                      9|
| |Source B         PW177B|
| |                      0|
| +-----------------------+
| T4:27.ACC - (2:1021)
| N10:27 - (2:707)

Rung 2:1024
|                                                        +TON---------------+
|--------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer      TMR177V+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum            9|
|                                                        +------------------+

Rung 2:1025
| TMR177V/DN                                                                   TMR177V
|   T4:28                                                                       T4:28
|----] [-------------------------------------------------------------------(RES)---
|      DN
| (2:1024)
```

```
Rung 2:1026
|                                                                    SCR_177V
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR177V.ACC|                                            27
| |                     9|
| |Source B          PW177V|
| |                     0|
| +------------------------+
| T4:28.ACC - (2:1024)
| N10:28 - (2:715)

Rung 2:1027
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR178B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1028
| TMR178B/DN                                                       TMR178B
|   T4:29                                                           T4:29
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1027)

Rung 2:1029
|                                                                    SCR_178B
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR178B.ACC|                                            28
| |                     9|
| |Source B          PW178B|
| |                     0|
| +------------------------+
| T4:29.ACC - (2:1027)
| N10:29 - (2:723)

Rung 2:1030
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR178V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1031
| TMR178V/DN                                                       TMR178V
|   T4:30                                                           T4:30
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1030)
```

```
Rung 2:1032
|                                                                    SCR_178V
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR178V.ACC|                                            29
| |                     9|
| |Source B          PW178V|
| |                      0|
| +-----------------------+
| T4:30.ACC - (2:1030)
| N10:30 - (2:731)

Rung 2:1033
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR179B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1034
| TMR179B/DN                                                        TMR179B
|   T4:31                                                            T4:31
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1033)

Rung 2:1035
|                                                                    SCR_179B
| +LES--------------------+                                           0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR179B.ACC|                                            30
| |                     9|
| |Source B          PW179B|
| |                      0|
| +-----------------------+
| T4:31.ACC - (2:1033)
| N10:31 - (2:740)

Rung 2:1036
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR179V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum            9|
|                                                  +------------------+

Rung 2:1037
| TMR179V/DN                                                        TMR179V
|   T4:32                                                            T4:32
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1036)
```

```
Rung 2:1038
|                                                                          SCR_179V
| +LES--------------------+                                                 0:24
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR179V.ACC|                                                 31
| |                      9|
| |Source B         PW179V|
| |                      0|
| +-----------------------+
| T4:32.ACC - (2:1036)
| N10:32 - (2:873)

Rung 2:1039
|                                                   +TON---------------+
|---------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                   |Timer      TMR180B+-(DN)
|                                                   |Time Base     0.01|
|                                                   |Preset          25|
|                                                   |Accum           13|
|                                                   +------------------+

Rung 2:1040
| TMR180B/DN                                                             TMR180B
|   T4:33                                                                 T4:33
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1039)

Rung 2:1041
|                                                                          SCR_180B
| +LES--------------------+                                                 0:25
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR180B.ACC|                                                  0
| |                     13|
| |Source B         PW180B|
| |                      0|
| +-----------------------+
| T4:33.ACC - (2:1039)
| N10:33 - (2:881)

Rung 2:1042
|                                                   +TON---------------+
|---------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                   |Timer      TMR180V+-(DN)
|                                                   |Time Base     0.01|
|                                                   |Preset          25|
|                                                   |Accum           13|
|                                                   +------------------+

Rung 2:1043
| TMR180V/DN                                                             TMR180V
|   T4:34                                                                 T4:34
|----] [-------------------------------------------------------------(RES)---
|      DN
| (2:1042)
```

```
Rung 2:1044
|                                                                    SCR_180V
| +LES--------------------+                                           0:25
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR180V.ACC|                                            1
| |                   13|
| |Source B         PW180V|
| |                    0|
| +-----------------------+
| T4:34.ACC - (2:1042)
| N10:34 - (2:889)

Rung 2:1045
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR181B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           13|
|                                                  +------------------+

Rung 2:1046
| TMR181B/DN                                                       TMR181B
|   T4:35                                                           T4:35
|----] [-----------------------------------------------------------(RES)---
|      DN
| (2:1045)

Rung 2:1047
|                                                                    SCR_181B
| +LES--------------------+                                           0:25
|-+LESS THAN              +-------------------------------------------( )-----
| |Source A    TMR181B.ACC|                                            2
| |                   13|
| |Source B         PW181B|
| |                    0|
| +-----------------------+
| T4:35.ACC - (2:1045)
| N10:35 - (2:897)

Rung 2:1048
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR181V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           13|
|                                                  +------------------+

Rung 2:1049
| TMR181V/DN                                                       TMR181V
|   T4:36                                                           T4:36
|----] [-----------------------------------------------------------(RES)---
|      DN
| (2:1048)
```

```
Rung 2:1050
|                                                                                SCR_181V
| +LES--------------------+                                                       0:25
|-+LESS THAN              +-------------------------------------------------( )-----
| |Source A    TMR181V.ACC|                                                        3
| |                     13|
| |Source B         PW181V|
| |                      0|
| +-----------------------+
| T4:36.ACC - (2:1048)
| N10:36 - (2:905)

Rung 2:1051
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer      TMR182B+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum           13|
|                                                        +------------------+

Rung 2:1052
| TMR182B/DN                                                                    TMR182B
|   T4:37                                                                        T4:37
|----] [-------------------------------------------------------------------(RES)---
|      DN
| (2:1051)

Rung 2:1053
|                                                                                SCR_182B
| +LES--------------------+                                                       0:25
|-+LESS THAN              +-------------------------------------------------( )-----
| |Source A    TMR182B.ACC|                                                        4
| |                     13|
| |Source B         PW182B|
| |                      0|
| +-----------------------+
| T4:37.ACC - (2:1051)
| N10:37 - (2:913)

Rung 2:1054
|                                                        +TON---------------+
|-------------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                        |Timer      TMR182V+-(DN)
|                                                        |Time Base     0.01|
|                                                        |Preset          25|
|                                                        |Accum           13|
|                                                        +------------------+

Rung 2:1055
| TMR182V/DN                                                                    TMR182V
|   T4:38                                                                        T4:38
|----] [-------------------------------------------------------------------(RES)---
|      DN
| (2:1054)
```

```
Rung 2:1056
|                                                                    SCR_182V
| +LES--------------------+                                           0:25
|-+LESS THAN              +-------------------------------------------( )------
| |Source A    TMR182V.ACC|                                            5
| |                    13|
| |Source B         PW182V|
| |                     0|
| +-----------------------+
| T4:38.ACC - (2:1054)
| N10:38 - (2:921)

Rung 2:1057
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR183B+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           13|
|                                                  +------------------+

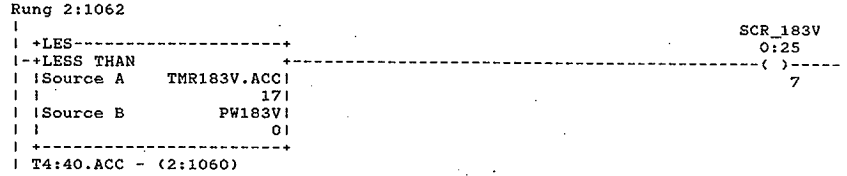
Rung 2:1058
| TMR183B/DN                                                       TMR183B
|   T4:39                                                           T4:39
|----] [-----------------------------------------------------------(RES)---
|      DN
| (2:1057)

Rung 2:1059
|                                                                    SCR_183B
| +LES--------------------+                                           0:25
|-+LESS THAN              +-------------------------------------------( )------
| |Source A    TMR183B.ACC|                                            6
| |                    13|
| |Source B         PW183B|
| |                     0|
| +-----------------------+
| T4:39.ACC - (2:1057)
| N10:39 - (2:929)

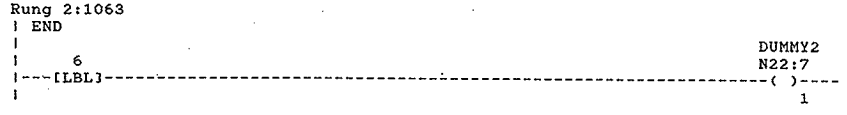
Rung 2:1060
|                                                  +TON---------------+
|--------------------------------------------------+TIMER ON DELAY    +-(EN)--
|                                                  |Timer      TMR183V+-(DN)
|                                                  |Time Base     0.01|
|                                                  |Preset          25|
|                                                  |Accum           17|
|                                                  +------------------+

Rung 2:1061
| TMR183V/DN                                                       TMR183V
|   T4:40                                                           T4:40
|----] [-----------------------------------------------------------(RES)---
|      DN
| (2:1060)
```

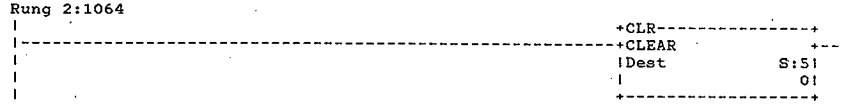
Rung 2:1062



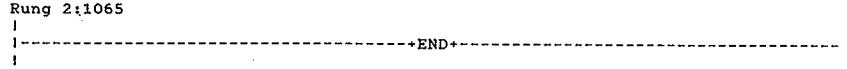
Rung 2:1063



Rung 2:1064



Rung 2:1065



Rung 3:0

```
*******************************************************************************
     Initialization Subroutine,  runs once when the PLC is started.
*******************************************************************************
       write configuration number (3393d), (b) to
       N7:0 (CONFIGURE) for use below, CONFIGURE T/C MODULES
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source        2369|
|                                                          |                  |
|                                                          |Dest     CONFIGURE|
|                                                          |               2369|
|                                                          +-------------------+
```

Rung 3:1

```
              ** CONFIGURE T/C MODULES **
Use Fill File to copy the configuration to each channel of each T/C module
                          MODULE  3
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:3.0|
|                                                          |Length          4|
|                                                          +-------------------+
```

Rung 3:2

```
                          MODULE 4
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:4.0|
|                                                          |Length          4|
|                                                          +-------------------+
```

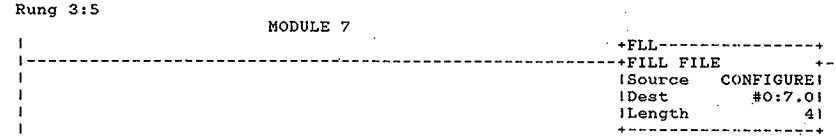
Rung 3:3

```
                          MODULE 5
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:5.0|
|                                                          |Length          4|
|                                                          +-------------------+
```

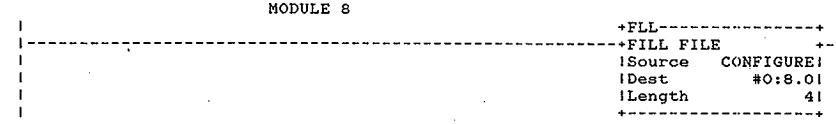
Rung 3:4

```
                          MODULE 6
|                                                          +FLL---------------+
|----------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:6.0|
|                                                          |Length          4|
|                                                          +-------------------+
```

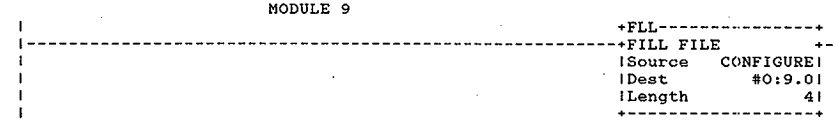
Rung 3:5



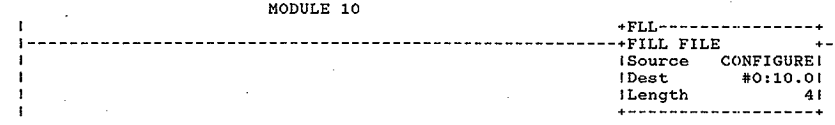
Rung 3:6



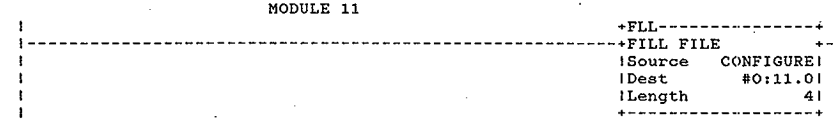
Rung 3:7



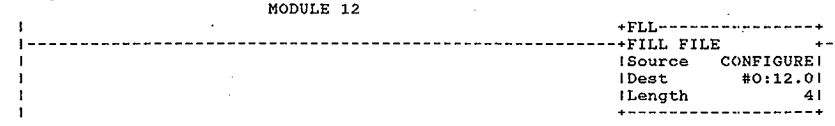
Rung 3:8



Rung 3:9



Rung 3:10



```
Rung 3:11
                        MODULE 13
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:13.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:12
                        MODULE 14
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:14.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:13
                        MODULE 15
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:15.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:14
                        MODULE 16
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:16.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:15
                        MODULE 17
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:17.0|
|                                                          |Length           4|
|                                                          +------------------+

Rung 3:16
                        MODULE 18
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE         +--
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:18.0|
|                                                          |Length           4|
|                                                          +------------------+
```

```
Rung 3:17
                        MODULE 19
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE          +-
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:19.0|
|                                                          |Length            4|
|                                                          +------------------+

Rung 3:18
                        MODULE 20
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE          +-
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:20.0|
|                                                          |Length            4|
|                                                          +------------------+

Rung 3:19
                        MODULE 21
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE          +-
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:21.0|
|                                                          |Length            4|
|                                                          +------------------+

Rung 3:20
                        MODULE 22
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE          +-
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:22.0|
|                                                          |Length            4|
|                                                          +------------------+

Rung 3:21
                        MODULE 23
|                                                          +FLL---------------+
|-------------------------------------------------------+FILL FILE          +-
|                                                          |Source   CONFIGURE|
|                                                          |Dest       #0:23.0|
|                                                          |Length            4|
|                                                          +------------------+

Rung 3:22
|                                                          +CLR---------------+
|-------------------------------------------------------+CLEAR              +-
|                                                          |Dest        N7:230|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:23
|                                                          +CLR---------------+
|-------------------------------------------------------+CLEAR              +-
|                                                          |Dest        N7:231|
|                                                          |                 0|
|                                                          +------------------+
```

Rung 3:24

```
|                                                          +CLR----------------+
|----------------------------------------------------------+CLEAR              +--
|                                                          |Dest        N7:232|
|                                                          |                  0|
|                                                          +------------------+
```

Rung 3:25

```
|                                                          +CLR----------------+
|----------------------------------------------------------+CLEAR              +--
|                                                          |Dest        N7:233|
|                                                          |                  0|
|                                                          +------------------+
```

Rung 3:26

```
|                                                          +CLR----------------+
|----------------------------------------------------------+CLEAR              +--
|                                                          |Dest        N7:234|
|                                                          |                  0|
|                                                          +------------------+
```

Rung 3:27

```
|                                                          +MOV----------------+
|----------------------------------------------------------+MOVE               +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest        PID143|
|                                                          |                 43|
|                                                          +------------------+
```

Rung 3:28

```
|                                                          +CLR----------------+
|----------------------------------------------------------+CLEAR              +--
|                                                          |Dest         N12:1|
|                                                          |                  0|
|                                                          +------------------+
```

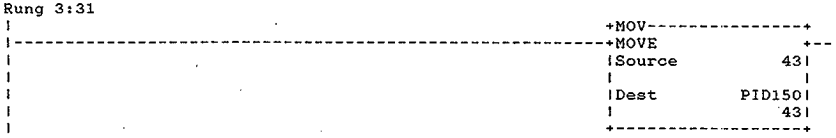
Rung 3:29

```
|                                                          +MOV----------------+
|----------------------------------------------------------+MOVE               +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest        PID144|
|                                                          |                 43|
|                                                          +------------------+
```

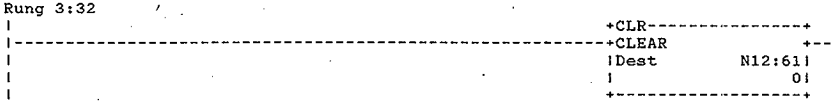
Rung 3:30

```
|                                                          +CLR----------------+
|----------------------------------------------------------+CLEAR              +--
|                                                          |Dest        N12:31|
|                                                          |                  0|
|                                                          +------------------+
```

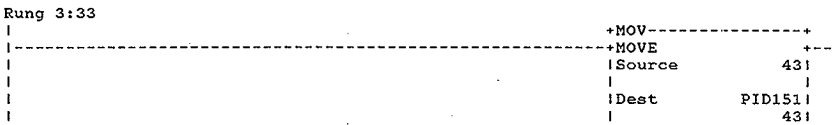
Rung 3:31



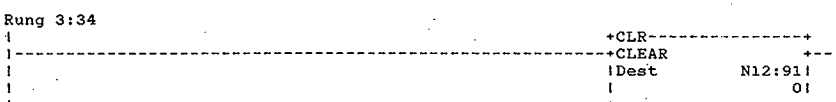
Rung 3:32



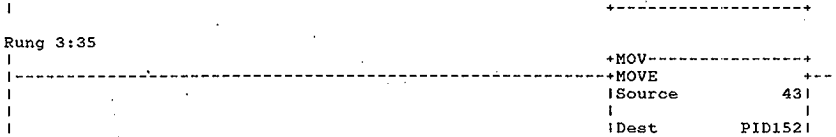
Rung 3:33



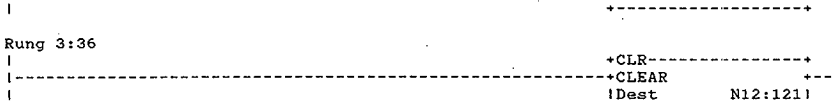
Rung 3:34



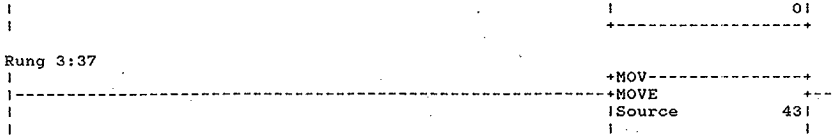
Rung 3:35



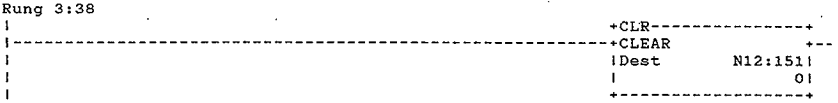
Rung 3:36



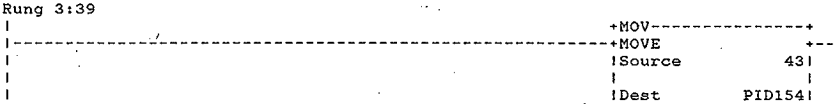
Rung 3:37



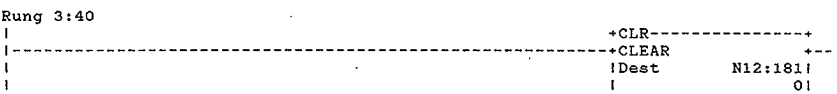
Rung 3:38



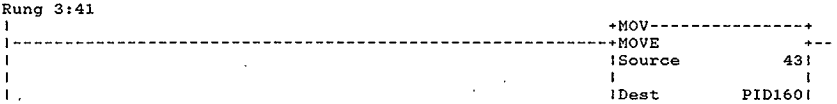
Rung 3:39



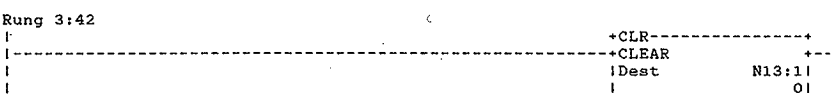
Rung 3:40



Rung 3:41

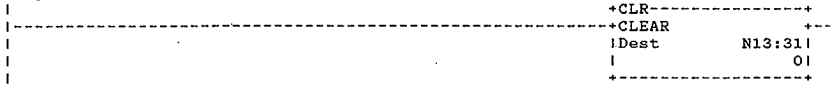


Rung 3:42



Rung 3:43

Rung 3:44



```
Rung 3:45
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest        PID162|
|                                                          |                43|
|                                                          +------------------+

Rung 3:46
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N13:61|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:47
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest        PID163|
|                                                          |                43|
|                                                          +------------------+

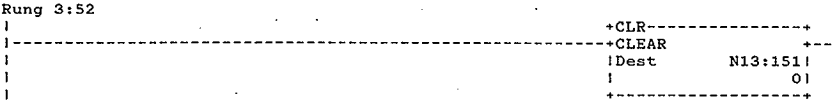
Rung 3:48
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N13:91|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:49
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest        PID164|
|                                                          |                43|
|                                                          +------------------+

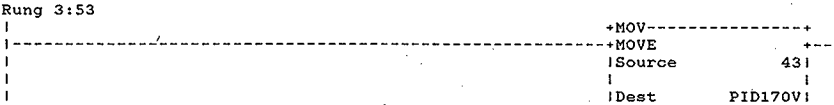
Rung 3:50
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N13:121|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:51
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID170B|
|                                                          |                43|
|                                                          +------------------+
```

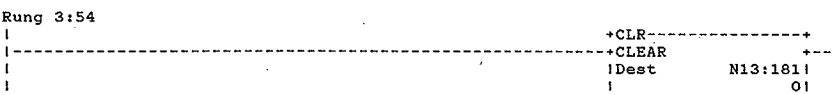
Rung 3:52



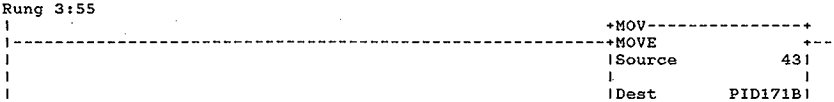
Rung 3:53



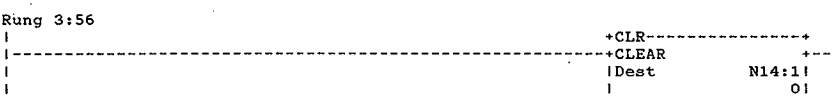
Rung 3:54



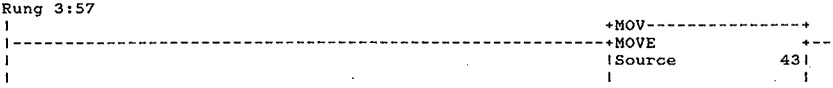
Rung 3:55



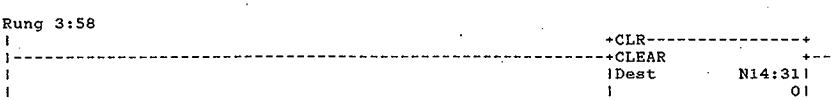
Rung 3:56



Rung 3:57



Rung 3:58



```
Rung 3:59
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID172B|
|                                                          |                43|
|                                                          +------------------+

Rung 3:60
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N14:61|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:61
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID172V|
|                                                          |                43|
|                                                          +------------------+

Rung 3:62
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N14:91|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:63
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID173B|
|                                                          |                43|
|                                                          +------------------+

Rung 3:64
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N14:121|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:65
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID173V|
|                                                          |                43|
|                                                          +------------------+
```

```
Rung 3:66
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N14:151|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:67
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID174B|
|                                                          |                43|
|                                                          +------------------+

Rung 3:68
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N14:181|
|                                                          |                 0|
|                                                          +------------------+

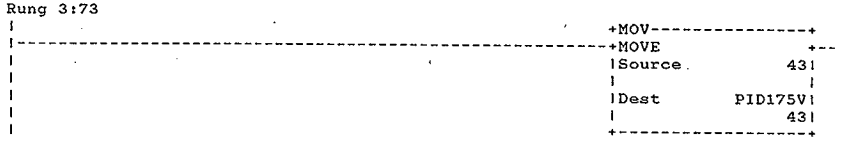
Rung 3:69
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID174V|
|                                                          |                43|
|                                                          +------------------+

Rung 3:70
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest         N15:1|
|                                                          |                 0|
|                                                          +------------------+

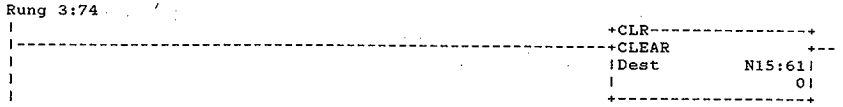
Rung 3:71
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID175B|
|                                                          |                43|
|                                                          +------------------+

Rung 3:72
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N15:31|
|                                                          |                 0|
|                                                          +------------------+
```

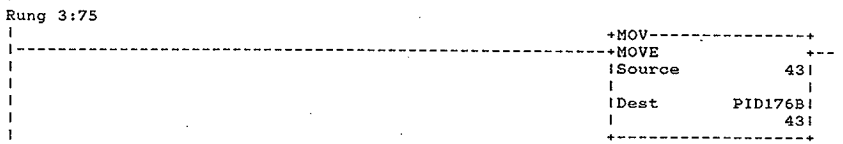
Rung 3:73



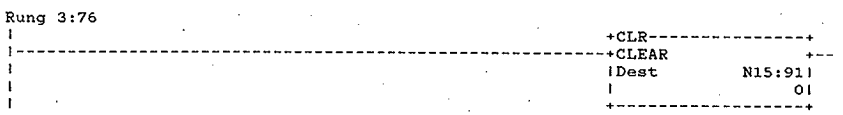
Rung 3:74



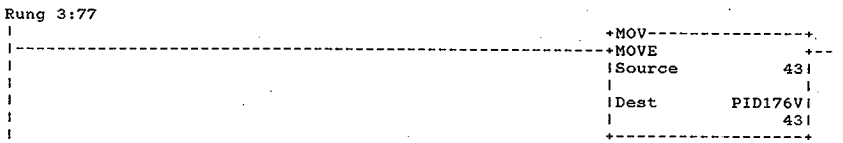
Rung 3:75



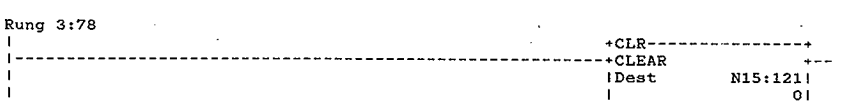
Rung 3:76



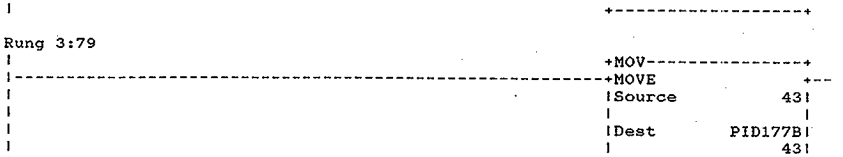
Rung 3:77



Rung 3:78



Rung 3:79



```
Rung 3:80
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N15:151|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:81
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID177V|
|                                                          |                43|
|                                                          +------------------+

Rung 3:82
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N15:181|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:83
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID178B|
|                                                          |                43|
|                                                          +------------------+

Rung 3:84
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest         N16:1|
|                                                          |                 0|
|                                                          +------------------+

Rung 3:85
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID178V|
|                                                          |                43|
|                                                          +------------------+

Rung 3:86
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N16:31|
|                                                          |                 0|
|                                                          +------------------+
```

Rung 3:87

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID179B|
|                                                          |                 43|
|                                                          +------------------+
```

Rung 3:88

```
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N16:61|
|                                                          |                  0|
|                                                          +------------------+
```

Rung 3:89

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID179V|
|                                                          |                 43|
|                                                          +------------------+
```

Rung 3:90

```
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest        N16:91|
|                                                          |                  0|
|                                                          +------------------+
```

Rung 3:91

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID180B|
|                                                          |                 43|
|                                                          +------------------+
```

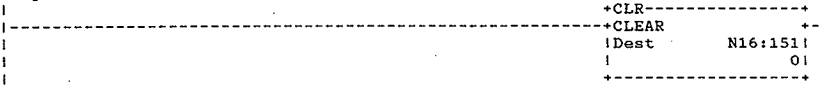
Rung 3:92

```
|                                                          +CLR---------------+
|----------------------------------------------------------+CLEAR             +--
|                                                          |Dest       N16:121|
|                                                          |                  0|
|                                                          +------------------+
```

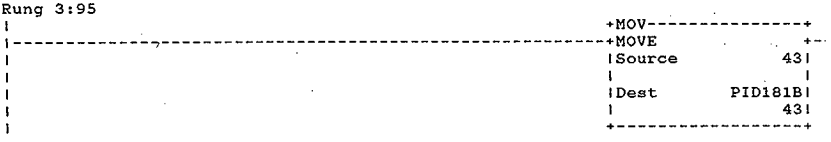
Rung 3:93

```
|                                                          +MOV---------------+
|----------------------------------------------------------+MOVE              +--
|                                                          |Source          43|
|                                                          |                  |
|                                                          |Dest       PID180V|
|                                                          |                 43|
|                                                          +------------------+
```

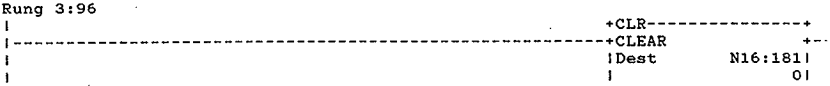
Rung 3:94



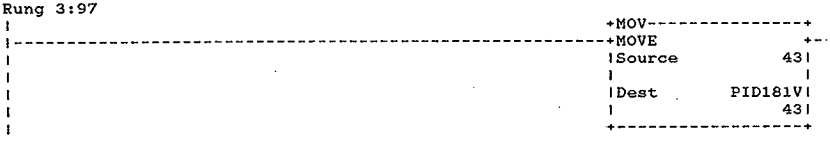
Rung 3:95



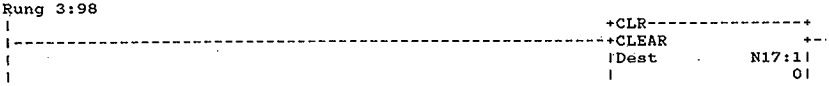
Rung 3:96



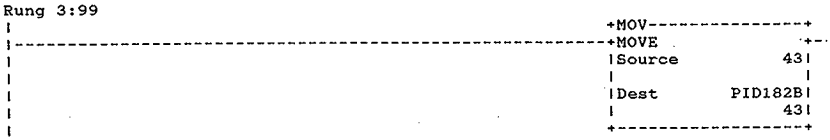
Rung 3:97



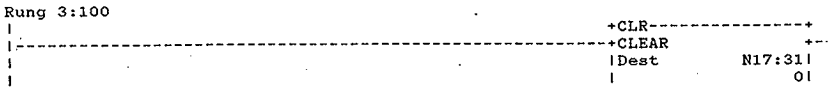
Rung 3:98



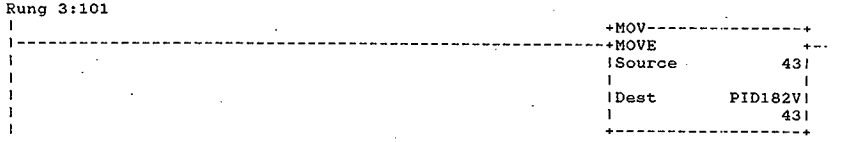
Rung 3:99



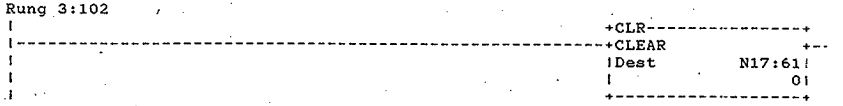
Rung 3:100



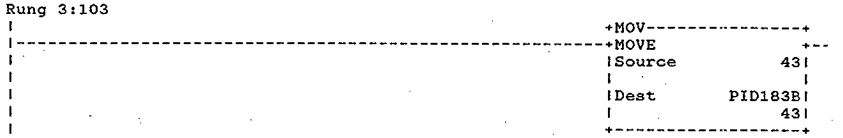
Rung 3:101



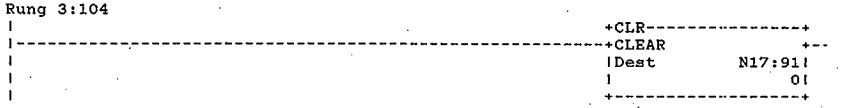
Rung 3:102



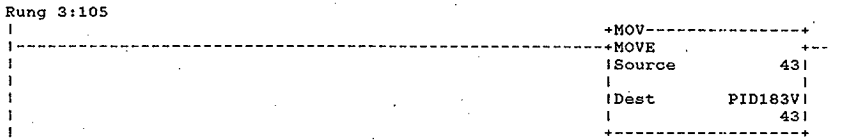
Rung 3:103



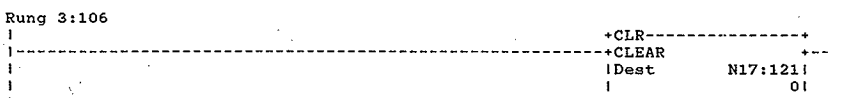
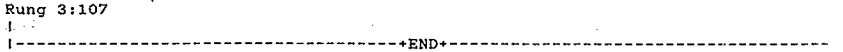
Rung 3:104



Rung 3:105



Rung 3:106



Rung 3:107