DEC 14 1995 (21) Sta. 21

ENGINEERING DATA TRANSMITTAL

1. EDT № 612362

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Remote Systems and Sensor Applications, 8A800	Remote System and Sensor Applications, 8A800	None
5. Proj./Prog./Dept./Div.: LDUA	6. Cog. Engr.: J.D. Potter	7. Purchase Order No.: N/A
8. Originator Remarks: Release new procedure for Calibration, Grooming and Alignment of the LDUA Purge Air Supply		9. Equip./Component No.: LDUA/5230
		10. System/Bldg./Facility: LDUA/4706/400
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: 12/20/95

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-TC-071		0	Test Procedure for CG&A of the LDUA Purge Air Supply	N/A	2	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. J.D. Potter	J D Potter	12/12/95	N1-21						
1	1	Cog. Mgr. D.S. Dutt	D S Dutt	12/13/95	N1-21						
3		QA M.E. Riste			N2-11						
3		Safety T.M. Amundson			N2-10						
1	1	B.A. Carteret	B A Carteret	12/13/95	N1-21						
1	1	G.R. Kiebel	G R Kiebel	12/12/95	N1-21						

18. J.D. Potter — Signature of EDT Originator — Date: 12/12/95

19. D.S. Dutt — Authorized Representative for Receiving Organization — Date

20. D.S. Dutt — Cognizant Manager — Date: 12-13-95

21. DOE APPROVAL (if required) Ctrl. No.
- [] Approved
- [] Approved w/comments
- [] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

Test Procedure for Calibration, Grooming and Alignment of the LDUA Purge Air Supply

J.D. Potter
Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: EDT 612362 UC: 2060
Org Code: 8A800 Charge Code: H1E02
B&R Code: EW4010000 Total Pages: 20

Key Words: LDUA, Purge, PASS, Compressor, Procedure, Calibration

Abstract: The Light Duty Utility Arm (LDUA) is a remotely operated manipulator used to enter into underground waste tanks through one of the tank risers. National Electric Code requirements mandate that the in-tank portions of the LDUA be maintained at a positive pressure for entrance into a flammable atmosphere. The LDUA Purge Air Supply System (PASS) is a small, portable air compressor, which provides a constant low flow of instrument grade air for this purpose. This procedure is used to assure that the instrumentation and equipment comprising the PASS is properly adjusted in order to achieve its intended functions successfully.

Karen L. Noland 12/14/95
Release Approval Date

Release Stamp

Approved for Public Release

TEST PROCEDURE

for

CALIBRATION, GROOMING AND ALIGNMENT OF THE LDUA Purge Air Supply

(LDUA System 5230)

December 12, 1995

by

J.D. POTTER

Remote System and Sensor Applications

Westinghouse Hanford Company
Richland, Washington

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Test Procedure for Calibration, Grooming and Alignment of the LDUA Purge Air Supply

Test Procedure for Calibration, Grooming and Alignment of the LDUA Purge Air Supply

1.0 TEST ITEM IDENTIFICATION

The LDUA Purge Air Supply System (PASS) provides a constant low flow of instrument grade (clean, low moisture) air to enable the in-tank portions of the LDUA to comply with National Electric Code requirements for operation in Class 1, Division 1, Group B flammable atmospheres by maintaining the internal pressure of the end effector, LDUA, and VPM above the pressure of the external atmosphere. This pressure differential also keeps the interior surfaces of these components from becoming contaminated in the event of seal leakage. In addition, the PASS will provide limited compressed air at the LDUA Tool Interface Plate (TIP) for use by some end effectors requiring low demand pneumatics. Excessively low purge pressure will result in emergency shutdown of the LDUA, with arm becoming limp. The PASS is a separate stand-alone subsystem of the LDUA. Sensors, alarms, and controls responding to low LDUA purge pressure, are part of the LDUA I&C and are not included in the PASS.

The PASS is designed for outdoor use and has wheels and a handle for easy portability. See figure 1, for a schematic showing the mechanical relationship of the components comprising the PASS, with an electrical schematic as shown in figure 2. The PASS features a 20 gallon ASME coded receiver with a continuous duty, oil-less compressor, which supplies at least 5.0 SCFM air to the LDUA at 80 to 100 psig. A filter removes particles of 0.5 micron or larger and an air drier assures that the air will not condense at LDUA operating temperatures as cold as -20 °F. Pressure differentials across The filter can be locally monitored, as can the air delivery pressure. A 50 foot long power cord is used to furnish electrical power of 115 vac, 60 Hz, 22 amp to the compressor motor. A 25 foot long air hose is used for attachment to the purge inlet of the LDUA using color coded, keyed, double end shut-off quick connects to assure proper connections. A check valve (CV-2) at the end of the air hose protects against contamination which potentially may backflow from the LDUA when the system is depressurized. The PASS has the capability to be operated either in a "continuous run" mode or a "start/stop" mode, as determined by the position of hand valve (HV-1). To select the "continuous run" mode the operator closes hand valve (HV-1) to isolate pressure switch (PS-1), thereby allowing an offloader valve (PR-1) to control the output pressure between 80 to 110 psig. When the hand valve (HV-1) is open, the pressure switch will control the output pressure between 80 to 100 psig. Only the "continuous run" mode will be utilized for normal LDUA operations.

At present, two identical PASS units have been fabricated and are to be tested per this procedure. Each of the two PASS units were designed and fabricated in accordance with PR 414302, by Portland Compressor, Portland, Oregon (503) 235-0200. For parts list and equipment arrangement of the PASS see drawing H-6-14099, LDUA Purge Air Supply. In the as-received condition there were no unique vendor serial numbers assigned to these units to differentiate between them. Unique serial numbers were arbitrarily assigned by WHC and an identification plate added to each unit to permit differentiation.

2.0 GENERAL DESCRIPTION

The ability of the PASS to supply purge air to the LDUA at the required pressure and flow rate is essential for assurance that the sensors of the LDUA do not initiate emergency shutdown of the LDUA because of low purge pressure. Therefore the objective of this test is to test each PASS to verify that it does deliver adequate flow at the proper pressures (see section 3.0, below) at its point of interface with the LDUA, and that system pressure control and pressure relief valves function as designed. The filter and dryer supplied with the units are standard commercial components and will not be tested for verification of air supply quality (i.e. particulates and dew point).

In general, testing will consist of five portions: 1) removal of the pressure relief valve (RV-1), verification of its proper relief pressure followed by its re-installation; 2) operation of the PASS in both the "continuous run" mode and the "start/stop" mode and observing the upper and lower boundaries of the pressure in the air receiver tank; 3) measurement of the pressure and flow at the end of the air hose at high and low pressure ranges; 4) removal of the check valve (CV-2), performance of reverse pressure leak check followed by its re-installation; 5) chilling down the heat strip thermostat with ice and verifying operation of heat strip. Adjustments will be made (if required) to pressure control components in accordance with manufacturers instructions.

3.0 TEST CONDITION LIMITS

The parameters, and their allowable limits, applicable to this procedure are listed below:

• Pressure relief valve setting	Relief valve (RV-1) shall crack (begin opening) at 120 to 144 psig.
• Continuous run mode pressure	In the continuous run mode the offloader valve shall control the pressure in the receiver to be between 80 to 110 psig.
• Start/stop mode pressure	In the start/stop mode the offloader pressure switch shall control the pressure in the receiver to be between 80 to 100 psig.
• Flow rate	The flow rate at the end of the purge supply hose shall be at least 5.0 SCFM at a pressure of 80 to 100 psig.
• Thermostat setting	The heat strip thermostat shall turn on the heat strip at temperature of 32 °F or higher.

4.0 INSTRUMENTS AND CALIBRATION

The instruments listed below are to be in proper calibration for their usage in this test. valid calibration data supplied by either WHC Calibration Services or the manufacturer of the instrument is acceptable.

• Flowmeter	The flowmeter shall be capable of measuring air flow rates from 1.0 to 6.0 SCFM at pressures between 80 to 110 psig, with an accuracy of ±10% or better.
• Pressure gage	Pressure gage with range of 0 to 200 psig, with an accuracy of 0.5% or better.
• Pressure gage	Pressure gage with range of 0 to 10 inches water, with an accuracy of 0.1 inches or better.

5.0 FACILITIES, EQUIPMENT, AND MATERIALS

Testing will be conducted on the mezzanine (cranebay room 500) at the 42'-6" elevation of building 427 (FMEF). The following facilities and equipment will be required for the performance of the test:

- Electrical power — 120 vac/60Hz, single-phase, 30 amp
- Flowmeter — (see section 4.0)
- Pressure gages — (see section 4.0)
- Hand pump — capable of generating a pressure of up to 10 inches water
- Ice Pack — common household type ice pack
- Hand valve — 1/2" hand valve, rated for 150 psig operating pressure, or greater
- Miscellaneous — hand tools, duct tape, 1/2 inch pipe fittings, pipe thread sealant tape

6.0 SAFETY

The following safety considerations, warnings and cautions pertaining to personnel hazards and equipment damage should be observed and adhered to during the performance of this testing:

- Equipment shall be operated in accordance with WHC-CM-1-10, Safety Manual.
- The electrical power cord shall be unplugged from its socket whenever doing maintenance or other servicing of the PASS or test equipment for which the compressor is not required to be running.
- The free end of the purge supply hose shall be tethered to a rigid support before initiating air flow through it.
- Before breaking any pipe or tube fittings all pressure must be verified removed from the receiver and plumbing by opening the test hand valve (TV-2) at the end of the hose, opening hand valve (HV-2), and observing no pressure remaining on receiver gage (PI-1). Note: the quick disconnects have double-end shutoffs and must be mated together before flow can occur through them.

- Before beginning a task, the Cognizant Test Engineer (CTE) is responsible to assure that all personnel taking part in the test have been briefed for their tasks and that they understand the procedure section being performed and any hazards associated with the task.

7.0 MAINTENANCE AND FAILURES

The CTE shall maintain a log book to document daily test activities, all test anomalies, test deviations, and equipment failures. Care shall be taken to assure that reference is made to the unique serial number of each respective PASS unit when making entries. The log book shall include the immediate resolution of anomalies and equipment failure, and the proposed long term resolution (if different than the immediate resolution). The CTE shall sign and date each entry made in the log book.

There are no components within the PASS which should require maintenance during the period of test performance. Any PASS component which fails and must be removed or replaced shall be subject to a repeat of those portions of this procedure to which the component has been previously subjected to.

8.0 TEST DATA

Acceptable test completion is indicated by the signature of the CTE at the end of each respective section. A separate copy of the procedure, with data sheets, will be maintained for each of the PASS units. Data will be recorded on the data sheets provided in section 12.0 and will reference the serial number of the PASS unit tested. The person entering the data in the data sheets shall sign and date at the time entry is made.

9.0 PERSONNEL REQUIREMENTS

No special training, beyond that normally provided to WHC technicians, is required to perform these tests. The testing and work performed per this procedure will be accomplished by Engineers and technicians of WHC Remote System and Sensor Applications, under direction of the WHC Cognizant Test Engineer (CTE). One engineer and one technician will be required. Those persons designated as CTE's for this task are: J.D. Potter, C.M. Smith and K.E. Bennett.

10.0 PROCEDURE

In general, the sequence of testing will be performed in the order in which it is presented in this section of the procedure. However, the CTE may authorize deviation from this test sequence at his discretion, providing he signs in the appropriate space indicated at the beginning of the test section to be performed. The CTE may also eliminate or add other steps to the test procedure at his discretion, providing they are of a non-hazardous nature. Such deviation from the procedure must be clearly red-lined into the procedure at the place where the change is to occur, and signed and dated by the CTE prior to its implementation.

Color videos and color stills may be made of each test setup at the CTEs discretion.

NOTE: While operating the PASS do not manually turn off the compressor at the main switch while the motor is running. Return to the start/stop mode if necessary and allow the pressure switch to turn the unit off before turning main switch off. Failing to do so will not allow the pressure release valve (SV-1) to vent pressure from cylinder head, resulting in possible failure of compressor to restart. It may then be necessary to vent receiver tank to ambient before attempting restart.

NOTE: Before starting this test procedure, each PASS unit should be verified to be permanently marked with the following information as a minimum:

H-6-14099-1 LDUA Purge Air Supply
LDUA System Number 5230
Serial Number XXX

where XXX is a unique three digit number assigned by the CTE, the first number being 001, then 002, 003, etc.

10.1 RELIEF VALVE TEST

This section of the procedure is performed to assure that the PASS relief valve (RV-1) will provide its function as a backup safety device to protect against overpressurization of the air receiver tank. This section of the procedure must be successfully completed before operating the compressor.

Perform this section: _____ _____
(Signature of CTE) (Date)

1) Remove pressure relief valve (RV-1) from the PASS.

2) Send the relief valve to the WHC Calibration Services (372-0072) to verify/adjust its cracking pressure to be between 120 to 144 psig. Record its final cracking pressure in the appropriate block provided in the data sheet.

3) Reinstall the relief valve.

Above section completed: _____ _____
(signature of CTE) (date)

10.2 OPERATING PRESSURE TEST, START/STOP MODE

This section of the procedure is performed to verify/adjust the Pressure Switch (PS-1) as required to maintain the air receiver pressure within proper limits when the PASS is operating in the Start/Stop mode.

Perform this section:_____ _____
(Signature of CTE) (Date)

1) Verify/attach the air hose to the outlet of the compressor unit (use quick connects already installed on hose and compressor unit).

2) Remove the quick connect from the free end of the hose and attach a tee fitting with a test hand valve on one leg of the tee, and a 0 to 200 psig test gage on the other leg. Close the test hand valve. tether the end of the hose to a rigid structure for flow.

3) Open hand valves (HV-1) and (HV-2). NOTE: Opening hand valve (HV-1) will place the PASS in the start/stop mode of operation.

4) Turn on the air compressor and observe pressure gage (PI-1) and the test gage when the pressure switch (PS-1) actuates, stopping the compressor motor. Enter the readings of both pressure gages in the block provided on the data sheet. The pressure switch shall actuate at 100 psig, or less, as indicated on the test gage.

5) Slightly open the test hand valve and observe pressure gage (PI-1) and the test gage when the pressure switch (PS-1) actuates, starting the compressor motor. Close the test hand valve. Enter the readings of both pressure gages in the block provided on the data sheet. The pressure switch should actuate at 80 psig, or more, as indicated on the test gage.

6) Repeat above steps 4) and 5) two additional times, entering the gage readings into the data sheets. If the pressure switch (PS-1) does not actuate within the specified limits it shall be re-adjusted per manufacturers instructions to be within limits, and steps 4), 5), and 6) repeated.

7) Turn off the compressor and bleed off air receiver pressure to zero, by opening the test hand valve.

8) Close hand valve (HV-2) and the test hand valve. Remove the test hand valve, the pressure gage, and the tee fitting from the end of the hose.

Above section completed:_____ _____
(signature of CTE) (date)

10.3 OPERATING PRESSURE TEST, CONTINUOUS RUN MODE

This section of the procedure is performed to verify/adjust the offloader valve (PR-1) as required to maintain the air receiver pressure within proper limits when the PASS is operating in the Continuous Run mode.

Perform this section:_____ _____
(Signature of CTE) (Date)

1) Verify/attach the air hose to the outlet of the compressor unit (use quick connects already installed on hose and compressor unit).

2) Remove the quick connect from the free end of the hose and attach a tee fitting with a test hand valve on one leg of the tee, and a 0 to 200 psig test gage on the other leg. close the test hand valve. tether the end of the hose to a rigid structure for flow.

3) Close hand valve (HV-1) and open hand valve (HV-2). NOTE: closing hand valve (HV-1) will place the PASS in the continuous run mode of operation.

4) Turn on the air compressor and observe pressure gage (PI-1) and the test gage when the Offloader (PR-1) actuates, stopping the pressure buildup. Enter the readings of both pressure gages in the block provided on the data sheet. The Offloader shall actuate at 110 psig, or less, as indicated on the test gage.

5) Slightly open the test hand valve and observe pressure gage (PI-1) and the test gage when the Offloader (PR-1) actuates, starting the pressure buildup. Close the test hand valve. Enter the readings of both pressure gages in the block provided on the data sheet. The Offloader should actuate at 80 psig, or more, as indicated on the test gage.

6) Repeat above steps 4) and 5) two additional times, entering the gage readings into the data sheets. If the Offloader does not actuate within the specified limits it shall be re-adjusted per manufacturers instructions to be within limits, and steps 4), 5), and 6) repeated.

7) Turn off the compressor and bleed off air receiver pressure to zero, by opening the test hand valve.

8) Close hand valve (HV-2) and the test hand valve. Remove the test hand valve, the pressure gage, and the tee fitting from the end of the hose.

Above section completed:_____ _____
(signature of CTE) (date)

10.4 FLOW TEST

This section of the procedure determines the capability for the PASS to deliver the required amount of air flow at the end of its supply hose.

Perform this section:_____ _____
(Signature of CTE) (Date)

1) Install a flowmeter to the outlet of the check valve (CV-2) located at the free end of the hose. Close test hand valve (TV-2) and open test hand valve (TV-1). Setup the flowmeter for measuring approximately 6.0 SCFM air.

2) Close hand valve (HV-1) to setup the compressor for continuous run mode. Open hand valve (HV-2).

3) Turn the air compressor motor on. Air flow should be detected at flow meter.

4) Slowly adjust the test hand valve (TV-1) until the test gage stabilizes between 80 to 85 psig, record pressure in data sheet. Read the air flow rate on the flowmeter and record reading in the appropriate block in the data sheet. Flow should not be less than 5.0 SCFM.

5) Slowly adjust the test hand valve (TV-1) until the test gage stabilizes near the maximum setting of the Offloader valve (ref section 10.3, step 4). Record pressure in data sheet. Read the air flow rate on the flowmeter and record reading in the appropriate block in the data sheet.

6) Shut off the air compressor motor and allow the air receiver pressure to bleed down to zero.

7) Close hand valve (HV-2) and remove the flowmeter from the check valve (CV-2) at the end of the hose.

Above section completed:_____ _____
(signature of CTE) (date)

10.5 CHECK VALVE TEST

This section of the procedure performs a reverse flow leakage test on the check valve (CV-2) located at the end of the air supply hose.

Perform this section: _____ _____
(Signature of CTE) (Date)

1) Verify/turn off the compressor and vent all pressure to ambient, as indicated on gage PV-1, by opening hand valve (HV-2) and opening the test hand valve at the end of the air supply hose.

2) Remove the check valve (CV-2) from the end of the air supply hose, and leak check it as follows:

   a) Apply a 0 to 10 inch water manometer and a hand operated pressure pump to the outlet side of the check valve.

   b) Apply a piece of tape over the inlet side of the check valve and puncture a small hole in the tape.

   c) Using the hand pump, apply a pressure of 1 to 2 inches of water to the outlet of the check valve. After waiting for at least one minute, check for leakage at the inlet of the check valve using soap solution. Record observations of any visible leakage in the appropriate block of the data sheet.

3) Remove the tape, manometer, and pump from the check valve and re-install the check valve to the end of the air supply hose. The flow direction arrow on the check valve must point away from the compressor.

Above section completed: _____ _____
(signature of CTE) (date)

10.6 HEAT STRIP THERMOSTAT TEST

This section of the procedure verifies proper operation of the PASS heat strip and its thermostat.

Perform this section: _____ _____
(Signature of CTE) (Date)

1) Verify/plug-in the power cord of the PASS heat strip to an appropriate electrical outlet.

2) After waiting at least five minutes for temperature stabilization, feel the heat strip to see if it is warm. It should not be on.

3) Fill ice pack with ice and apply directly to the thermostat of the PASS heat strip. Allow temperature of thermostat to stabilize. Feel the heat strip to see if it is warm. It should now be on. Indicate whether or not heat strip came on in the appropriate block of the data sheet.

4) Remove the ice pack and unplug the power cord of the heat strip.

Above section completed: _____ _____
(signature of CTE) (date)

10.7 POST-TEST OPERATIONS

After all testing has been completed, the PASS shall be prepared for storage in accordance with this section of the procedure.

Perform this section: _____ _____
(Signature of CTE) (Date)

1) Turn off all power to the PASS. Unplug the extension cord from the wall outlet.

2) Open hand valve (HV-2). Verify that there is no pressure on gage (PV-1) then close hand valve (HV-2).

3) Re-install the quick connect to the end of the hose.

4) Open the drain valves on the bottom of the receiver and on the bottom of the prefilter, drain all water, then close drain valves.

5) Detach the power cord and the air hose from the PASS, coil them up, and place them over the handle bar of the unit.

6) Deliver the PASS to the appropriate storage area designated by the CTE.

Above section completed: _____ _____
(signature of CTE) (date)

11.0 DISPOSITION OF TEST ITEMS

Upon completion of testing one of the PASS units will be used to support Cold Test of the LDUA in the FMEF, the other PASS unit will remain in storage as a spare.

12.0 DATA SHEETS

The data sheet, in which the CTE is to enter the test data required by the procedure (ref. section 10.0), is provided on the following page.

DATA SHEET
CG&A TESTING OF LDUA PURGE AIR SUPPLY SYSTEM (PASS)

Part Number _____ PASS Serial Number _____

Step No.	Value	Units	Name of person entering data	Date	Requirements/ Comments
10.1.3		psig			s/b 120 to 144 psig
10.2.4 run #1 run #2 run #3		 psig psig psig			s/b 100 psig max
10.2.5 run #1 run #2 run #3		 psig psig psig			s/b 80 psig min
10.3.4 run #1 run #2 run #3		 psig psig psig			s/b 110 psig max
10.3.5 run #1 run #2 run #3		 psig psig psig			s/b 80 psig min
10.4.4		psig SCFM			 s/b 5.0 SCFM min
10.4.5		psig SCFM			
10.5.2.c	N/A	N/A			observation:
10.6.3		yes/no			heat strip should come on

FIGURES

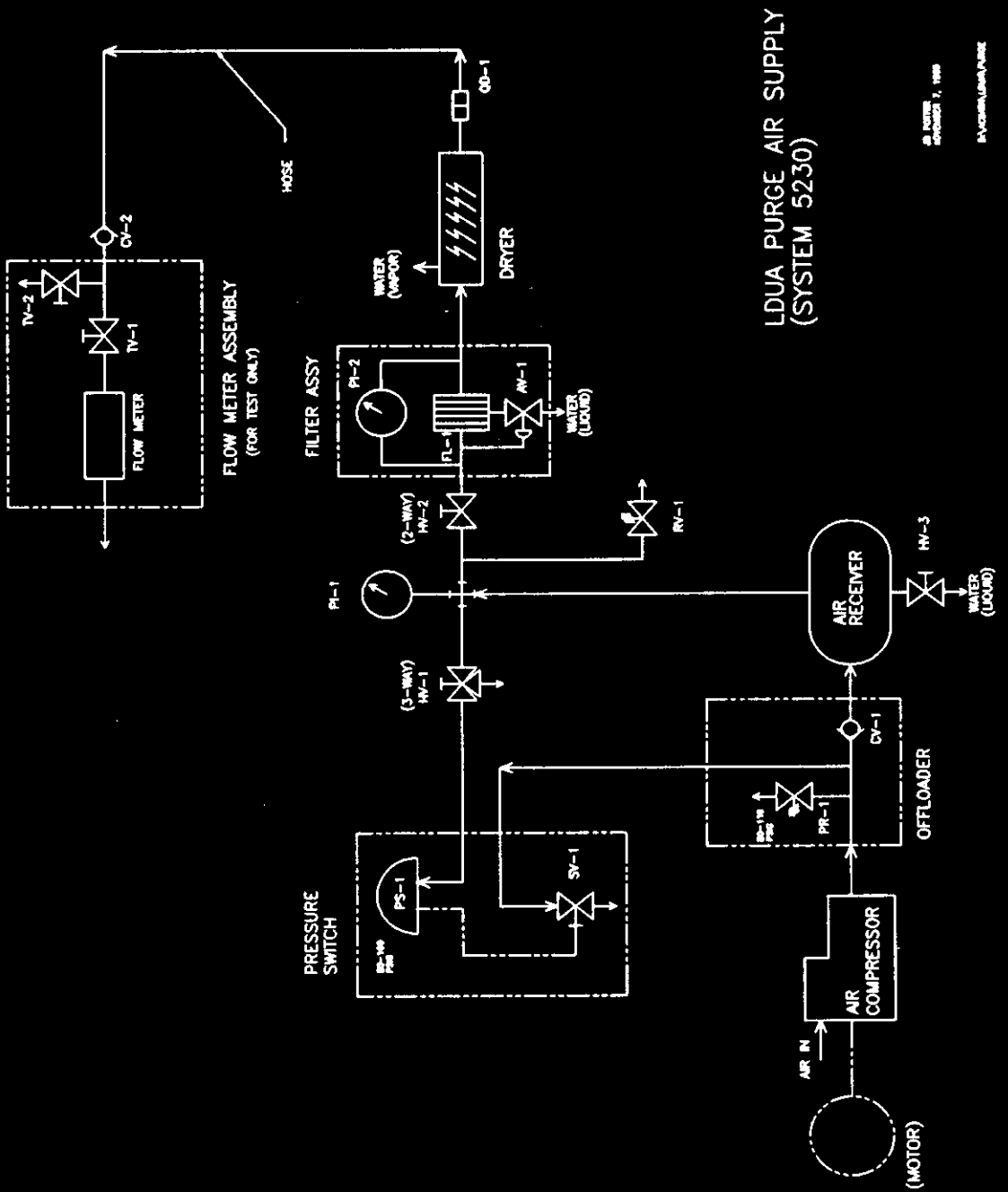
LDUA PURGE AIR SUPPLY
(SYSTEM 5230)
QD-1
HOSE
CV-2
TV-2
TV-1
FLOW METER
FLOW METER ASSEMBLY
(FOR TEST ONLY)
WATER
(VAPOR)
DRYER
FILTER ASSY
PI-2
FL-1
AV-1
WATER
(LIQUID)
(2-WAY)
AV-2
RV-1
PI-1
AIR
RECEIVER
AV-3
WATER
(LIQUID)
(3-WAY)
AV-1
CV-1
PR-1
OFFLOADER
PS-1
SV-1
PRESSURE
SWITCH
AIR
COMPRESSOR
AIR IN
(MOTOR)

Figure 1

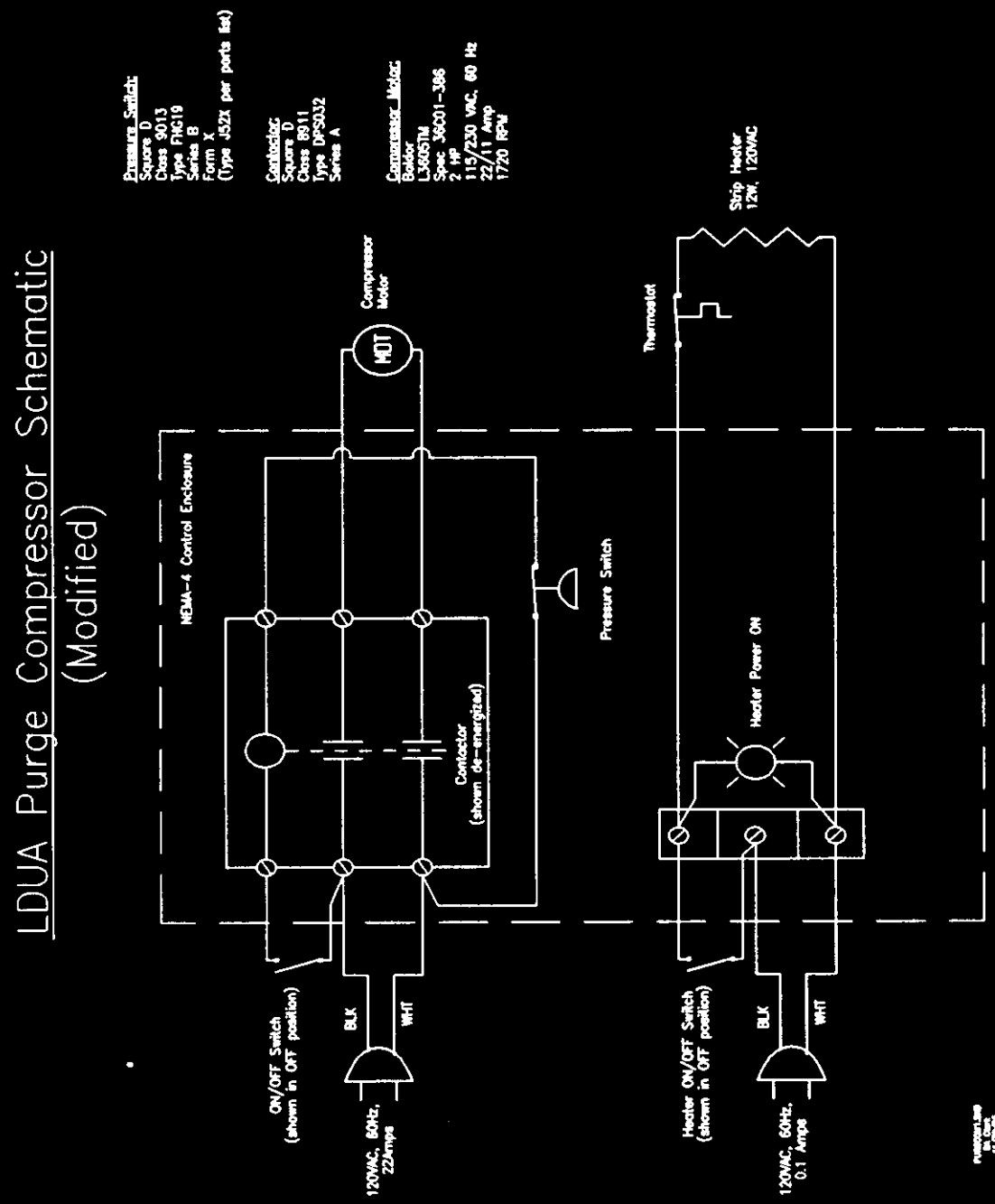
LDUA Purge Compressor Schematic
(Modified)
Pressure Switch:
Square D
Class 9013
Type FWG19
Series B
Form X
(Type J52X per parts list)
Contactor:
Square D
Class 8911
Type DPS032
Series A
Compressor Motor:
Baldor
L3605TM
Spec 36C01-386
2 HP
115/230 VAC, 60 Hz
22/11 Amp
1720 RPM
NEMA-4 Control Enclosure
Compressor Motor
MOT
Pressure Switch
Contactor
(shown de-energized)
ON/OFF Switch
(shown in OFF position)
BLK
WHT
120VAC, 60Hz,
22Amps
Thermostat
Strip Heater
12W, 120VAC
Heater Power ON
Heater ON/OFF Switch
(shown in OFF position)
BLK
WHT
120VAC, 60Hz,
0.1 Amps

Figure 2

DISTRIBUTION SHEET

To	From	Page 1 of 1
8A800	J.D. Potter	Date 12/12/95
Project Title/Work Order		EDT No. 612362
WHC-SD-WM-TC-071, Rev. 0, Test Procedure for CG&A of the LDUA Purge Air Supply		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
T.M. Amundson	N2-10	X			
K.E. Bennett	N1-21	X			
B.A. Carteret	N1-21				X
D.A. Clark	N1-21	X			
R.B. Conrad	H5-09	X			
D.S. Dutt	N1-21				X
G.R. Kiebel	N1-21	X			
A.F. Pardini	N1-21	X			
J.D. Potter (3)	N1-21	X			
M.E. Riste	N2-11	X			
C.M. Smith	K5-22	X			