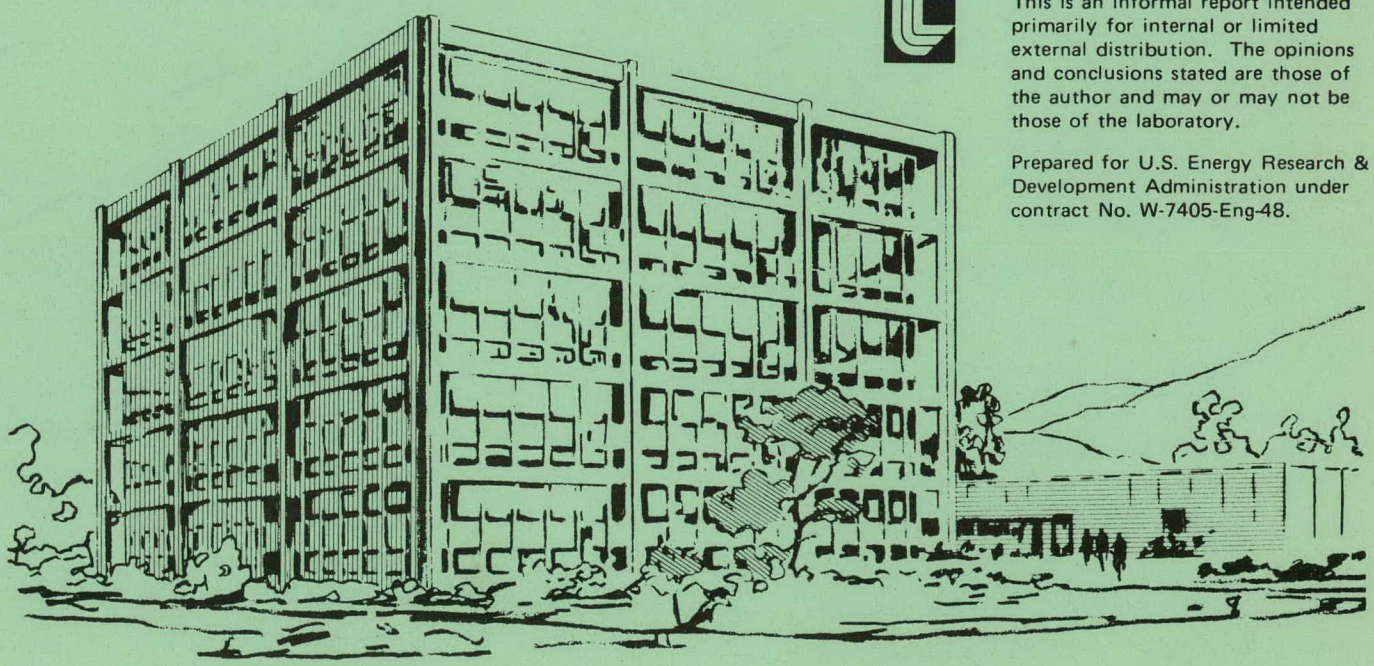
UCID-17132

Lawrence Livermore Laboratory

MCS80 MACRO ASSEMBLER FOR THE 8080 CPU

W. L. Benge
T. G. Allison

November 20, 1974



Prepared for U.S. Energy Research & Development Administration under contract No. W-7405-Eng-48.

DISCLAIMER

REFER QUESTIONS TO:
W. L. Benge
T. G. Allison

LAWRENCE LIVERMORE LABORATORY

ELECTRONICS ENGINEERING
REPORT
LIVERMORE, CALIFORNIA

UNIVERSITY OF CALIFORNIA

LER 74-101304

ORIG Benge/Allison

APPROVED

MCS80 MACRO ASSEMBLER FOR THE 8080 CPU

DATE 11/20/74

REV.

1.0 INTRODUCTION

The 8080 Macro Assembler is now available on the LLL 7600 system. This report is a user's manual for executing the 8080 assembler on the 7600 computers.

The MCS80 program accepts as input programs written in Intel 8080 CPU assembly language (Ref. Intel Corp. 8080 Assembly Manual, Volume 1 and 2). The program will write a magnetic tape in Intel BNPF format or BIN DEC binary format which can be used to punch a paper tape utilizing the CDC 160A computer in Building 117.

2.0 READING MCS80 FROM PHOTOSTORE

The MCS80 program is stored in the elephant photostore under the "take" directory: 558850:NEWINTEL.

After logging onto the Octopus System on a CDC-7600 computer system read MCS80 from the photostore as follows:

Note: In the following examples, lines prefixed with a right arrow (→) are those typed by the user. All others are typed by the program.

```
→ELF/.5.1

→.RDS .558850: NEWINTEL: MCS80

→.END

RDS

ALL DONE
```

After the above operations, the assembler program will exist on disk file available for use as described in the following section.

3.0 CREATING AN INPUT FILE

Before running MCS80, an ASCII disk file containing the 8080 program in the 8080 symbolic assembly language must be available. This data file can be created in a number of ways.

For example, cards can be punched and read onto disk through an online card reader or RJET, or one of the Octopus editor routines (TRIX, NAB, MICROPUS) can be used for illustrative purposes. Figure 1 shows a data file created with TRIX:

```
TRIX AC / .5 .1
.C(TEST2)
.EL1
&       LXI SP,1ØØO
&;  SAMPLE PROGRAM FOR 8Ø8Ø PROCESSOR
&START: MVI L,2ØØ
&       MVI H,Ø
&LOOP:  MOV A,M
&       CPI 46
&       JZ FOUND
&       CALL INCR
&       MOV A,L
&       CPI 22Ø
&       JNZ LOOP
&FOUND: HLT
&INCR:  INR L
&       RNZ
&       INR H
&       RET
&       END
&.
.END

 ALL DONE
```

Figure 1.

Sample data file created using Trix.

The details of this use of TRIX are referenced at the end of this report; TRIX is by far the most powerful editor on the Octopus system. It is well worth the user's time to learn how to use it.

4.0 RUNNING MCS80 FROM A TELETYPE

Once we have obtained MCS80 from the photostore and have created a data file we are able to run MCS80. To start the program into execution:

```
→MCS80/.5.1

TYPE INPUT FILE AND OUTPUT TAPE

TEST 2 *OTAPE

8080 MACRO ASSEMBLER, VER 1.1

NO PROGRAM ERRORS

ALL DONE
```

WHERE: TEST 2 = Input Data File

*OTAPE = Output Tape, *is a message to label and hang a classified tape called OTAPE.

During execution two disk files are created. They are:

MCS BIN - The formatted object code in BNPF or DEC binary format, as shown in Figure 2 below.

```
001 BLOCK01 0
002 A      000070
003 B      000000
004 C      000010
005 D      000020
006 E      000030
007 FOUND  000260
008 H      000040
009 INCR   000270
010 L      000050
011 LOOP   000070
012 M      000060
013 PSW    000060
014 SP     000060
015 START  000030
$
 0 BNNPPNNNPF  BNPNNNNNNF  BNNNNNNNNF  BNNPNPPPNF
 4 BPPNNPNNNF  BNNPNNPPNF  BNNNNNNNNF  BNPPPPPPNF
 8 BPPPPPPPNF  BNNPNPPPNF  BPPNNPNPNF  BNNNPNPPNF
12 BNNNNNNNNF  BPPNNPPNPF  BNNNPNPPPF  BNNNNNNNNF
16 BNPPPPPNPF  BPPPPPPPNF  BPPNPPPNNF  BPPNNNNPNF
20 BNNNNNPPPF  BNNNNNNNNF  BNPPPNPPNF  BNNPNPPNNF
24 BPPNNNNNNF  BNNPNNPNNF  BPPNNPNNPF
$
```

Figure 2. Sample MCS BIN disk file BNPF format.

MCS OUT - Standard output which contains a symbol table and source and object code, as shown in Figure 3 below:

```
1
8080 MACRO ASSEMBLER, VER 1.1  ERRORS = 0 PAGE 1

   0000   314000          LXI SP,1000
                      ;  SAMPLE PROGRAM FOR 8080 PROCESSOR
   0003   2EC8       START: MVI L,200
   0005   2600              MVI H,0
   0007   7E         LOOP:  MOV A,M
   0008   FE2E              CPI 46
   000A   CA1600            JZ FOUND
   000D   CD1700            CALL  INCR
   0010   7D                MOV A,L
   0011   FEDC              CPI 220
   0013   C20700            JNZ LOOP
   0016   76         FOUND: HLT
   0017   2C         INCR:  INR L
   0018   C8                RNZ
   0019   24                INR H
   001A   C9                RET
                            END
NO PROGRAM ERRORS
```

```
1
8080 MACRO ASSEMBLER, VER 1.1  ERRORS = 0 PAGE 2

                        SYMBOL TABLE

 * 01

 A       0007      B       0000      C       0001      D       0002
 E       0003      FOUND   0016      H       0004      INCR    0017
 L       0005      LOOP    0007      M       0006      PSW     0006
 SP      0006      START   0003 *
```

Figure 3. Sample MCS OUT disk file.

IF A LINEFEED COMMAND IS USED IN PLACE OF INPUT TAPE AT RUN TIME NO MAGNETIC TAPE WILL BE CREATED.

Note: Output tape will be in DEC binary format unless specified otherwise in the assembly format.

5.0 OBTAINING AN OUTPUT LISTING

To obtain an output listing of your program, type:

ALLOUT PRINTER MSC OUT BOX nn NAME/.2.1

WHERE: nn = Your box number

NAME = Your name

6.0 PUNCHING PAPER TAPE

The CDC-160A computer in Building 117 is used for punching a paper tape using the magnetic tape. The instruction book at the CDC-160A tells how to use the computer; LER71-10506 "Preparing and Verifying Punched Paper Types for the CLI Program." also contains instructions for preparing a paper tape.

7.0 NEED HELP?

If you need help in running the MCS80 assembler or the CDC-160A please contact Walter Benge or Terry Allison.

WALTER L. BENGE
Electronics Engineering Department

TERRY G. ALLISON
Computations Department

srm

Distribution:

T. Allison (10)
K. A. Bear
W. Benge (40)
S. A. Nielsen
L. Zevanove

Patent Engineering
EEIC

UCID-17132
LER 74-1013-04

DISTRIBUTION

LLL Internal Distribution:

TID File	15

External Distribution:

TIC	27
Robert Swartz Highland Park Illinois 60035	1

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy $ *; Microfiche $2.25

*Pages	NTIS Selling Price
1-50	$4.00
51-150	$5.45
151-325	$7.60
326-500	$10.60
501-1000	$13.60

Technical Information Department
LAWRENCE LIVERMORE LABORATORY
University of California | Livermore, California | 94550