## IDENTIFICATION

Product Code:      DEC-08-LHAA-D

Product Name:      "HELP" LOADER

Date Created:      April 1, 1967

Maintainer:        Software Service Group

1.    ABSTRACT

The "HELP" Loader loads the standard version of the RIM and BIN Loaders into the PDP-8, in less than 90 seconds, replacing manual procedures which required several minutes.

2.    PRELIMINARY REQUIREMENTS

Teletype Model ASR33 a standard PDP-8 or 8/S

3.    LOADING PROCEDURE

a.  Load the following routine starting at Loc. 27:

```
27/   6031        GO,   KSF
      5027              JMP.-1
      6036              KRB
      7450              SNA
      5027              JMP 27
      7012              RTR
      7010              RAR
      3007              DCA 7
      2036              ISZ 36
      5027              JMP 27
```

b.  Place "HELP" tape into ASR33 Reader

c.  Set Reader switch to START

d.  Load SWITCH REGISTER with 27

e.  Depress LOAD ADDRESS switch

f.  Depress START switch

4.    STORAGE

Loader uses $26_{10}$ locations (5-36). These should be octal.

5.    DETAILS OF STORAGE AND OPERATION

a.  The source tape, called the "Help Generator," is a two part program and functions in a straight forward way. Part 1 punches out part 2 which becomes part of the load routine when read in. Behind this are the RIM and Binary Loaders.

b.  Each of the first 21 lines on the "HELP" Bootstrap Tape becomes an instruction which will comprise a new loader which in turn loads the rest of the tape.

The 17th line loaded into the AC becomes a JMP 10 instruction which is loaded in location 27. Now, notice how control is switched from the program entered by the switches to the newly loaded program.

```
37/  ISZ   36
40/  JMP   27
```

When the instruction JMP 27 in location 40 is executed, the PC goes to 10, which contains the first instruction of the newly loaded loader. This new loader now loads the rest of the tape in a format where a 12-bit word is contained on <u>two</u> lines of tape.

The first 12-bit word formed in the new format is 3407, this is loaded into location 23. Location 23 previously contained the instruction DCA 23. This means that our new loader has been modified so that the rest of the data to be loaded will be deposited indirectly through location 7.

At the moment, location 7 contains the number 6. The next two lines read contain the number 7402 which will then be deposited into location 6. This HLT instruction will be the one which halts the machine when loading is complete.

The new loader modifies location 7 to contain 7, which will be the address of the next 12-bit word. The number 7577 will then be loaded into location 7. This effectively switches the loading point to the starting address minus 1 of the binary loader.

When the modified program has loaded the first 23 lines, pertinent core locations look like this:

```
 7/  5
10/  KSF
11/  JMP   10
12/  KRB
13/  RTL
14/  RTL
15/  RTL
16/  DCA    5
17/  KSF
20/  JMP   17
21/  KRB
22/  TAD    5
23/  DCA   23    /Used to load DCA 17
24/  ISZ    7
25/  JMP   10
26/  JMP    6
27/  JMP   10    /Formerly a KSF
30/  JMP   27
31/  KRB
32/  SNA
33/  JMP   27
```

The rest of the bootstrap tape contains the RIM and BIN Loaders which are about to be loaded at this point.

When these two loaders are stored in the proper core positions, the content of location 7 reaches zero. When it reaches zero, the instruction 5301, i.e., JMP 7701, is loaded into core location 7777. This is the last instruction to be loaded and therefore the loading process halts.

When location 7 reaches zero the program skips the instruction following the ISZ 7 in location 24. From location 26, the program branches to location 6 which contains the HLT.

### Core Space Required

The actual bootstrap loader takes up locations 5 through 36 ($26_{10}$) to load the RIM and BIN Loaders into the last page in memory.

Execution time is approximately 90 seconds.

c. To get the Bootstrap Loader tape from the HELP generator BIN object tape.

(1) Using the BIN Loader, load the HELP GENERATOR program into core.

(2) Turn on the punch on the ASR33.

(3) Start the generator program at 7400.

NOTE: The RIM and BIN loaders punched on the Bootstrap Loader Tape are the ones currently in the machine.

6. <u>LISTING</u>

```
                                /HELP PROGRAM
                                /NOTE: RIM AND BIN LOADER MUST BE IN CORE
                                /BEFORE USING THE SOURCE PROGRAM
                                /TO GENERATE THE BOOTSTRAP LOADER.
                    *7400
7400    7300                CLA CLL
7401    6046                TLS
7402    1253                TAD KOUNT
7403    3254                DCA KOWNT
7404    1250                TAD BGIN
7405    3256                DCA START       /CONTAINS CONTENT OF FIRST
7406    1250                TAD BGIN        /ADDRESS TO BE PUNCHED
7407    3251                DCA COUNT       /CREATE SOME BLANK TAPE
7410    4242                JMS PUNCH
7411    2251                ISZ COUNT       /DONE PUNCHING BLANK TAPE?
7412    5210                JMP .-2         /NO
7413    1656    LOOP,       TAD I START
7414    4242                JMS PUNCH
7415    2256                ISZ START       /MODIFY ADDRESS IN START
7416    2254                ISZ KOWNT       /DONE WITH FIRST SECTION?
7417    5213                JMP LOOP        /NO, GO BACK
7420    1656    LOADER,     TAD I START     /NOW START PUNCHING BINARY
7421    7012                RTR             /CONTENT ON 2 LINES OF OUTPUT
7422    7012                RTR
7423    7012                RTR
7424    0252                AND MASK        /SAVE LEFT HALF OF WORD
7425    4242                JMS PUNCH       /PUNCH IT
7426    1656                TAD I START
```

| | | | | |
|---|---|---|---|---|
| 7427 | 0252 | | AND MASK | |
| 7430 | 4242 | | JMS PUNCH | /PUNCH THE RIGHT HALF |
| 7431 | 2256 | | ISZ START | /MODIFY ADDRESS |
| 7432 | 5220 | | JMP LOADER | |
| 7433 | 1250 | | TAD BGIN | |
| 7434 | 3251 | | DCA COUNT | |
| 7435 | 1255 | | TAD COD200 | |
| 7436 | 4242 | | JMS PUNCH | /PUNCH CHANNEL 8 |
| 7437 | 2251 | | ISZ COUNT | /DONE? |
| 7440 | 5235 | | JMP .-3 | /NO |
| 7441 | 7402 | | HLT | |
| 7442 | 0000 | PUNCH, | 0 | |
| 7443 | 6041 | | TSF | |
| 7444 | 5243 | | JMP .-1 | |
| 7445 | 6046 | | TLS | |
| 7446 | 7200 | | CLA | |
| 7447 | 5642 | | JMP I PUNCH | |
| 7450 | 7551 | BGIN, | 7551 | /7551 IS USED AS A S.A. AND AS A COUNTER |
| 7451 | 0000 | COUNT, | 0 | |
| 7452 | 0077 | MASK, | 77 | |
| 7453 | 7751 | KOUNT, | -27 | /NO. OF INST. FROM 7751 TO 7577 |
| 7454 | 0000 | KOWNT, | 0 | |
| 7455 | 0200 | COD200, | 200 | |
| 7456 | 0000 | START, | 0 | |
| | | *7551 | | |
| 7551 | 0050 | | 50 | /5 (GETS PUT IN LOC. 7 AS 1ST INSTRUCTION' |
| 7552 | 0317 | | 317 | /KSF     OF NEW PROGRAM) |
| 7553 | 0102 | | 102 | /JMP 10 |
| 7554 | 0367 | | 367 | /KRB |
| 7555 | 0067 | | 67 | /RTL |
| 7556 | 0067 | | 67 | /RTL |
| 7557 | 0067 | | 67 | /RTL |
| 7560 | 0051 | | 51 | /DCA 5 |
| 7561 | 0317 | | 317 | /KSF |
| 7562 | 0172 | | 172 | /JMP 17 |
| 7563 | 0367 | | 367 | /KRB |
| 7564 | 0054 | | 54 | /TAD 5 |
| 7565 | 0231 | | 231 | /DCA 23 |
| 7566 | 0075 | | 75 | /ISZ 7 |
| 7567 | 0106 | | 106 | /JMP 10 |
| 7570 | 0066 | | 66 | /JMP 6 |
| 7571 | 0102 | | 102 | /JMP 10 (TRANSFERS CONTROL TO NEW PRO) |
| 7572 | 0034 | | 34 | |
| 7573 | 0007 | | 07 | /3407 IS A DCA I 7 |
| 7574 | 0074 | | 74 | |
| 7575 | 0002 | | 02 | /7402 IS AN HLT |
| 7576 | 0075 | | 75 | |
| 7577 | 0077 | | 77 | /7577 IS THE S.A. OF BIN LOADER-1 |

```
BGIN    7450
COD200  7455
COUNT   7451
```

```
KOUNT  7453
KOWNT  7454
LOADER 7420
LOOP   7413
MASK   7452
PUNCH  7442
START  7456
```