TIO   (TELETYPE INPUT OUTPUT)

TIO   (Teletype Input Output)

GENERAL INFORMATION

This program must be loaded via one of the bootstrap loaders in 40. The specific bootstrap loader with which a TIO tape must be loaded is specified on the leader of the TIO tape.

The TIO program occupies and uses from 5400 to 7440.

It starts at 5400.

The program has two purposes:

1.   listing other programs
2.   examining and/or changing individual
     registers of core

The TIO program also has two formats for data input and output.

1.   Regular Mode - interpreting the octal contents
     of registers as central processor commands.

2.   Increment Mode - interpreting the octal contents
     memory as display operate commands or increment
     mode commands.

     Type "CR" R to enter regular mode and "CR" I to
     enter increment mode.

* CR is carriage return
  ⌣ is space

LISTING

To list the addresses and contents of registers 2542 through 2674 interpreted as central processor orders type:

```
"CR"                          (reinitializes program)
 R                            (enters regular mode)
LIST⌣2542⌣TO⌣2674⌣
```

Typing CR will abort the listing.

EXAMINING AND CHANGING MEMORY LOCATIONS

To examine locations 23, 24 and 25 and interpret their contents in regular mode type:

```
"CR"
 R
23⌣(computer types contents of 23)
    then type . (period)

    (computer types CR-LF 24 and its contents)
    type . (period)

    (computer types CR-LF 25 and its contents)
```

To change the contents of location 20 to $123456_{(8)}$ type:

```
"CR"
 R
20⌣(computer types contents of 20)
    then type 123456.

    (Computer stores 123456
```

(Computer stores $123456_{(8)}$ in location 20 and types next address, 21, and its contents)

CHANGING THE CONTENTS OF MEMORY LOCATIONS

The contents of memory locations can only be changed after
the computer has typed out the present contents of that
location and is waiting for input. The new contents can be
inputted in any one of several different forms depending on
what mode the computer is in.

Either mode

> * =(octal no.). [(octal no.) becomes the new contents
> of the current location]

Regular mode

> * (octal no.). [(octal no.) becomes the new contents
> of the current location]

Any assembler opcode, with or without an address,
may also be inputted.

```
      DAC    324.     ⎫
      CLA    .        ⎬
  I   SAM    10.      ⎬  all valid
  D   NOP    .        ⎬
  D   LXA    6000.    ⎭
```

> *(addresses for addressable instructions must be
> octal numbers)

* preceding zeros need not be typed in an octal no.   3 and
000003 are equivalent

INCREMENT MODE

DISPLAY OPERATE INSTRUCTIONS
(these are micro instructions and can be combined in any
amount or order)

```
↑.    gets    D  IYM = 004400
].     "      D  DYM = 004100
<.     "      D  DXM = 004200
>.     "      D  IXM = 005000
I.     "      D  DSP = 004020
G.     "      D  RJM = 004040
```

* DRAWING INSTRUCTIONS
(these are 8 bit instructions and should be combined 2 per word)

E   enter *drawing mode (only valid in left half of word)

N   exit *drawing mode, zero least significant bits (LSB)

R   exit *drawing mode, zero LSB, return from D JMS

F   exit *drawing mode, zero LSB, return from D JMS,
     move to next character position

A 324 use the octal no. as the contents of this byte

P   pause

B   beam on (stored as mode) turn beam on for the
     following increment bytes

D   beam off (stored as mode) turn beam off for the
     following increment bytes

+,-,0,1,2,3 used in forming a drawing byte

*drawing mode is usually called increment mode elsewhere in
PDS-1 documentation

```
E      B30.
3-2    P  .        ⎫
D-12   F  .        ⎬  valid input
 E A  123.         ⎭
 N     N  .
```