

TSS DISPLAY DRIVER

Operators Guide

I. Introduction

The TSS display driver is designed for two purposes. The first of these is the need for system-operator interaction and the availability of important system information. The second is the obvious usefulness of the display as a debugging aid.

Three types of displays are currently available. The first of these are the core/ecs displays. These display the contents of core and extended core. The second type are the 'user' displays. These displays are driven by programs inside the system and will be used for system-operator interaction. The last display type consists of screens composed of ECS System statistics read directly by the FPU. These statistics are such things as clocks, ECS space and error information.

In addition to the displays, the display driver implements another useful device called a logical keyboard. Logical keyboards are used for transmitting operator messages to programs outside the display driver. Since the display driver knows nothing about tapes or other equipment, this provision is a necessary one. Since it is envisioned that most of the system-operator interaction will use this path, the typing necessary to send these messages should be as simple as possible. Some distinction must also be made between these messages and those which the PPU should ^{interpret} ~~interpret~~. For these reasons, the following restrictions

are made. All lines beginning with the character '/' will be ~~intrepted~~^{interpreted} by the PPU as display commands. Any line not beginning with '/' will be sent to the current default keyboard. There is also provision for sending a message to a keyboard other than the default keyboard and for sending a message beginning with '/'.

II. Operator Commands

Send a message to logical keyboard- Sending a message to a logical keyboard can be accomplished in two ways. As previously mentioned, any line not beginning with '/' is sent to the current default keyboard. The alternate method of sending a message is by using the following command:

```
/N.=msg
```

Where N is a legal logical keyboard name, and msg is the literal text to be sent. (NOTE: it is assumed throughout that all lines end in carriage return.) An error message will be given if N is not a legal name. Also, if no program desires a message from that keyboard at that time, the message is saved in a buffer (actually an event channel). When a buffer becomes full, a message indicating lost data will be given.

Change default keyboard name- The default keyboard may be changed by using the following command:

```
/USE,N
```

Where N is the same as above.

Changing displays- The current display on either screen may be changed by typing:

`/L,R`

Where both L and R must be legal display names, and are the desired left and right screen displays, respectively.

Either L or R may be omitted, however, if R is omitted, the comma may also be omitted. If one of them is omitted, the corresponding screen display is unchanged.

Modifying core/ECS displays- Core displays are made up of four groups of eight consecutive core or ECS words each. The area displayed by these displays may be changed by using the following command:

`/I,address-expression`

Where I is actually an address expression with certain restrictions which will be made clear. An address-expression is a string of octal digits, treated as a 60 bit quantity, which may be followed by one of the following characters; 'C', 'E', '+', or '-'. 'C' makes the number a CM address, while 'E' refers to an ECS address. 'C' is assumed. '+' is ignored, while '-' results in the number being complemented. Thus, in this syntax, only 'E' and 'C' have any logical interpretation, while '+' is ignored and '-' will produce strange results. I is analyzed as an address expression, but only the following results are allowed. They are listed with their affect.

- 0-3 set the appropriate eight word group to display the address given by the address expression
- 4 set all four groups to display consecutive words starting at the address given
- 5 add the expression to the current starting address of each group, select repeat mode.

It should be noted that in applications not requiring an address, 'E' or 'C' are ignored. Thus

/4E,1

is the same as

/4,1

while

/4-,1

is illegal.

Operator date and time- Date and time are entered in the following formats;

/DATE,MM/DD/YY

/TIME,HH.MM.SS.

Clear and restore system protection- To enter password:

/PASS

The PPU will then accept a three character password.

/RSP

restores system protection

NOTE: THE FOLLOWING COMMANDS REQUIRE THAT THE SYSTEM BE UNPROTECTED.

Lock and unlock CPU-

/LOCK

and

/UNLOCK

When lock is entered, the display driver interrupt code will not give up the central processor until unlock is entered.

CM/ECS store- The contents of CM or ECS may be altered:

/address-expression=value

address-expression has been previously discussed. Again, however, value is treated as an address expression where 'E' and 'C' are ignored. It is a 60 bit quantity.

General comments- It should be noted that blanks are ignored except in the case of user messages and text commands such as 'PASS', 'LOCK', and 'DATE'.

III. Special Keys

Some keys on the console have special functions. Backspace and carriage return both do the obvious things. The blank key to the left of '=' clears the current line.. The blank key to the right of '=' is the 'restore' key. It causes the PPU to return to an initial state defined at deadstart time. This is necessary since, in the event of a system crash, the PPU may be waiting for an event which will never occur, thus causing some part of its program to halt. The operator should never need this key,

but it has proved useful in debugging.

IV. Screen Headers

The screen headers contain some useful information. Both left and right headers contain a title and the name of the current display for that screen. In addition, the left header displays the current default logical keyboard, and the characters '*UNP*' when the system is unprotected. The right header displays the central processor P-counter, and the system state flags. The channel statuses will be displayed somewhere soon. The system state flags may be interpreted as follows:

- W idle
- U user running
- S system running for user
- P ECS swap in progress
- B swapper calculations
- I interrupt code running

V. Display Assignments

Currently the displays are named as follows:

- A-D core/ECS displays
- E-L user displays
- M ECS System statistics

The M display consists of the major system clocks, the amount of ECS space remaining, and some error statistics. These error statistics are the total number of ecs errors since deadstart, the number of ECS recovery re-tries, and, in the event of a system disaster, the address of the jump to disaster +1. In addition, if the disaster was due to an ECS error, the absolute ECS address of the first bad word in the unsuccessful transfer is displayed.