CHECKOUT/DEMONSTRATION APPLICATION PROGRAM
FOR THE
SEL 840MP MULTI-PROCESSING CONTROL SYSTEM -
VERSION I (MPCS/1)

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Prepared for:

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PREFACE

This document summarizes the characteristics of the application program developed to verify and demonstrate the SEL 840MP Multi-Processing Control System - Version I (MPCS/1).

The application program emphasizes the display support (using the SEL 810B) and task control (using SEL 840MP) capabilities provided in MPCS/1.

The application program is further intended to be used as an aid to familization with MPCS/1. It complements the information provided in the MPCS/1 Users Guide, Volume I and II.

The application program and MPCS/1 were developed by M&S Computing under contract No. NAS8-27359 for NASA/MSFC.

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1. MPCS CHECKOUT-DEMONSTRATION APPLICATION

1.1 Introduction

During the development of the Multi-Processor Control System (MPCS) it became apparent that the sample application programs used for system checkout could, if properly organized, provide the means for demonstrating system capabilities. As a result, a group of application programs (tasks) and a supporting library of CRT displays have been developed to fulfill the dual functions of system checkout and demonstration. These programs and displays, called the MPCS Checkout-Demonstration Application (CDA), are documented herein.

The CDA is user oriented and is designed for user control via the display console. With the help of the tutorial displays, the user can select other displays and initiate application tasks which will exercise particular system facilities. In this manner the user can observe not only the real-time operating capabilities of MPCS, but also typical application examples to assist him in applying MPCS facilities to his particular needs.

A useful by-product of the CDA is its adaptability for use as a teaching aid. It will provide the user with visual examples as well as a vehicle for hands-on operational practice with the display console. As such it is a helpful supplement to the "MPCS User's Guide".

1.2 Scope

The CDA is designed to demonstrate the major capabilities added to the baseline operating system (CHANE) to provide effective use of a multiprocessor configuration. In particular it includes explicit demonstrations for the following:

a) MPCS task control capabilities,

b) Real-time display support capabilities, and

c) Display library generation capabilities.

Multitasking can be demonstrated using a single SEL 840 processor and the SEL 810B, or with additional processors when available. Multijobbing can be demonstrated by using one processor for the CDA and by using the remaining processors to execute other applications such as assemblies or Fortran compilations.

Other MPCS features are (or at least can be) demonstrated...
implicitly by the CDA. For example, Cross-Task Communication is utilized to pass display console input data to an application task. Likewise, Cross-Processor Communication is inherently demonstrated if the CDA is executed in a processor other than the one to which I/O devices are attached. In such a case, I/O between the Display Controller in the 840 and the Display Processor in the 810 is handled by MPCS using Cross-Processor Communication between the 840 in which the CDA is executing and the 840 to which the 810 interface is attached.

The remaining system features such as the CHANE Command Language and I/O support for standard peripheral devices can be easily demonstrated using other applications. An example would be execution of an assembly by one processor with simultaneous execution of the FORTRAN compiler by another processor.
2. ORGANIZATION

2.1 System Configuration

The Checkout-Demonstration Application (CDA) is a software application which executes in the SEL 840MP under control of the Multi-Processor Control System (MPCS) and supported by the MPCS Display Processor executing in the SEL 810B. It utilizes the following hardware components:

a) One SEL 840 processor
b) SEL 840 console typewriter
c) SEL 810B processor
d) SEL 810 console typewriter
e) SEL 816 computer graphics system (attached to the 810)
f) Disk storage unit (attached to the 810)
g) SEL 840/810 interface

CDA/MPCS/hardware interfaces are illustrated in Figure 2-1.

2.2 Software Configuration

The CDA consists of a series of displays and a group of application tasks (programs).

2.2.1 CDA Displays

Figure 2-2 depicts the "display tree" for the CDA and, to a limited degree, shows the interrelationship of the individual displays within the overall structure.

Table 2-1 lists the displays of the CDA along with the next display and the next task requirements of the compose fields and pen options which exist within each display.

The printed listings of all of the displays as produced by the display librarian are presented in Section 4 and the listings of the librarian input control cards are shown in Appendix A.
SYSTEM CONFIGURATION

SEL 840
CDA Application Tasks

SEL 810
MPCS Display Processor

MPCS

Typewriter

CRT

Typewriter

CDA Displays

Figure 2-1
DISPLAY ORGANIZATION

Figure 2-2
<table>
<thead>
<tr>
<th>Display Number</th>
<th>Display Title</th>
<th>Compose Fields</th>
<th>Pen Options</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Displays</td>
<td>Tasks</td>
</tr>
<tr>
<td>8900</td>
<td>Multi-Processor Control System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8910</td>
<td>Display Library Generation Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8911</td>
<td>Display Librarian Language Source Records</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8912</td>
<td>Display Librarian Language Source Record Formats 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8913</td>
<td>Display Librarian Language Source Record Formats 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8914</td>
<td>Display Librarian Language Source Record Formats 3</td>
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<td></td>
</tr>
<tr>
<td>8915</td>
<td>Display Librarian Language Source Record Formats 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8920</td>
<td>Display Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8920</td>
<td>Display Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8930</td>
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<tr>
<td>8930</td>
<td>Display Facilities</td>
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</tr>
<tr>
<td>8930</td>
<td>Display Facilities</td>
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</tbody>
</table>

Table 2-1
### DISPLAY SUMMARY
(continued)

<table>
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<tr>
<th>Display Number</th>
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<th>Compose Fields</th>
<th>Pen Options</th>
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<td></td>
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<td>Input Data Checking</td>
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<td>8933</td>
<td>Display Facilities</td>
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<td>DPT3</td>
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<td>Light Pen Option Selection</td>
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<td>Same</td>
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<td></td>
<td>Function Switch</td>
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</tr>
<tr>
<td></td>
<td>Program Activation</td>
<td>8940</td>
<td></td>
</tr>
<tr>
<td>8940</td>
<td>Display Facilities</td>
<td>Same</td>
<td>DPT4</td>
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<td>Program Tabular Data Display</td>
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<td>Same</td>
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<td>8941</td>
<td>Display Facilities</td>
<td>Same</td>
<td>DPT4</td>
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<tr>
<td></td>
<td>Program Data Cursor Control</td>
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<td>Same</td>
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<td>8942</td>
<td>Display Facilities</td>
<td>Same</td>
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<td></td>
<td>Program One-Line Message Display</td>
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<td>DPT3</td>
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<td>Program New Display Request</td>
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<td>DPT3</td>
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<td>Program Function Switch Attach/Detach</td>
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<td>Operating System Facilities</td>
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<tr>
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<td>Operating System Task Scheduling Demonstration</td>
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<td></td>
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<td></td>
<td>8900</td>
<td>DTS0</td>
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<tr>
<td>9050</td>
<td>Special Displays</td>
<td>Same</td>
<td>DTS1</td>
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</tbody>
</table>

Table 2-1 (continued)
2.2.2 CDA Tasks

The tasks which make up the CDA are listed in Table 2-2. This table also shows all sources of activation for each task. Program listings for the tasks are presented in Section 5 with flowcharts in Appendix B.

Control cards used to build the Job Task Table for the CDA are listed in Appendix C.
## TASK SUMMARY

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Task Description</th>
<th>Scheduled By</th>
<th>Option</th>
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<td>Initialization</td>
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<td>DPT1</td>
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<td>Special Character Tabular Data Display</td>
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</tr>
<tr>
<td></td>
<td>DPT2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sample Compose Field Processor</td>
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<td>8920</td>
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<tr>
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<td>DPT3</td>
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</tr>
<tr>
<td></td>
<td>Function Switch Attach/Detach</td>
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<td>Function Switch Processor</td>
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<td>DTS 0</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Task Scheduling Stop</td>
<td>DPT0</td>
<td>8951</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8900</td>
</tr>
</tbody>
</table>

* This task will be executed whenever an ATTACHED function switch is raised regardless of which display is active.

Table 2-2
<table>
<thead>
<tr>
<th>Task Name</th>
<th>Task Description</th>
<th>Scheduled By</th>
<th>Task</th>
<th>Display</th>
<th>Compose Field</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTS1</td>
<td>Task Scheduling Option Processor</td>
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<td></td>
<td></td>
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<td>DTS2</td>
<td>Task Scheduling Compose Field Processor</td>
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<td></td>
<td></td>
<td>8951</td>
<td>1-7</td>
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<tr>
<td>DTSA</td>
<td>Sample Task #1 (Periodic)</td>
<td>DTS1</td>
<td></td>
<td></td>
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<tr>
<td>DTSB</td>
<td>Sample Task #2 (Periodic)</td>
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<td>DTSC</td>
<td>Sample Task #3 (Periodic)</td>
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<td>DTSD</td>
<td>Sample Task #4</td>
<td>DTS1</td>
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<td>Sample Task #5</td>
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<td>DTSF</td>
<td>Sample Task #6</td>
<td>DTS1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2-2 (continued)
3. UTILIZATION

3.1 System Initialization

Before the CDA can be exercised, the CDA displays must be generated and loaded into the library disk storage attached to the 810B. If the displays are not in the existing library, they can be created with the CDA Display Source Deck via the library generation and loading procedures discussed in the "MPCS User's Guide".

Assuming the existence of the displays in the library, the MPCS Display Processor is first initialized in the 810B in the manner described in the "MPCS User's Guide". Next the CDA tasks are loaded and activated in the desired 840. Simplified instructions for initializing the CDA are provided in Appendix D.

3.2 User Operation

Once activated, the CDA executes under full control of the user. The initial CDA task automatically loads the first display which contains self-explanatory options. All subsequent functions are activated by the user via the light pen to select options, the display console keyboard to enter compose field data, and the function switches to activate tasks.
4. CDA DISPLAY LISTINGS
DISPLAY 8900

MULTI-PROCESSOR CONTROL SYSTEM

MPCS DEMONSTRATION

MPCS HAS BEEN DESIGNED TO PROVIDE FACILITIES FOR CONCURRENT EXECUTION OF JOB COMPONENTS (TASKS) BY MULTIPLE PROCESSORS. THESE FACILITIES INCLUDE SYSTEM SERVICES FOR TASK CONTROL, CROSS-PROCESSOR COMMUNICATION, AND CRT DISPLAY SUPPORT IN ADDITION TO THE CAPABILITIES PROVIDED BY THE CHANE OPERATING SYSTEM.

THIS DEMONSTRATION HAS BEEN ORGANIZED INTO SEVERAL SECTIONS EACH OF WHICH CAN BE USED INDEPENDENTLY BY SELECTING THE APPROPRIATE LIGHT PEN OPTION BELOW.

<» DISPLAY LIBRARY GENERATION FACILITIES
<» REAL-TIME DISPLAY FACILITIES
<» OPERATING SYSTEM FACILITIES

NOTE - IN ORDER TO SELECT AN OPTION, TOUCH THE LIGHT PEN BEAM TO ONE OF THE ASTERISK SYMBOLS AND DEPRESS THE BUTTON ON THE SIDE OF THE LIGHT PEN.

<» TERMINATE DEMONSTRATION

RETURN TO PRIOR LEVEL
(THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES)

--- NEXT DISPLAY NAMES ---
DISPLAY 8910

8910  DISPLAY LIBRARY GENERATION FACILITIES

There are four basic steps in generating the display library for application programs.

1. Define the displays necessary for the application or applications.

2. Using the display librarian language (DLL), code the display formatting information and punch this information in source cards.

3. Input the source cards to the display librarian program which in turn will create a magnetic tape containing the display library.

4. Transfer the display library from magnetic tape (hard storage) to the 8108 disk for on-line execution.

The display library is created by the display librarian program using the DLL coded input. DLL is an easy to use coding language consisting of eleven operators.

They are:

1. Output Option -O-
2. Input Option -I-
3. Name -N-
4. Pen -P-
5. Compose -C-
6. Legality -X-
7. Line -L-
8. Text Control -T-
9. Text -T-
10. End -E-
11. Delete -D-

Display 8911 gives a functional explanation of these source records.

<Select 8911>
DISPLAY 8911

8911 DISPLAY LIBRARIAN LANGUAGE SOURCE RECORDS

DLL SOURCE RECORDS ARE OF THREE TYPES.

1. RECORDS REQUIRED TO INPUT PROGRAM OPTION SELECTIONS AND CONTROL PARAMETERS TO THE LIBRARIAN PROGRAM. RECORDS OF THIS TYPE ARE THE OUTPUT OPTION, INPUT OPTION, NAME, TEXT CONTROL, END, AND DELETE RECORDS.

2. CONTROL PAGE RECORDS WHICH CONTAIN CONTROL INFORMATION REQUIRED FOR EXECUTION OF THE DISPLAY OPTIONS BY THE ON-LINE DISPLAY PROGRAM. THE DISPLAY OPTIONS FOR WHICH CONTROL INFORMATION IS INPUT BY THESE RECORDS ARE KEYBOARD DATA ENTRY, LIGHT PEN OPTION, AND LINE VECTOR DISPLAY. RECORDS OF THIS TYPE ARE THE PEN, COMPOSE, LEGALITY, AND LINE RECORDS.

3. TEXT RECORDS WHICH DEFINE THE DATA THAT IS TO APPEAR ON THE DISPLAY. TEXT RECORDS ALSO DEFINE THE AREAS ON THE DISPLAY WHERE THE DISPLAY OPTIONS ARE TO APPEAR, AND THEY CONTAIN DATA TO DEFINE APPLICATION PROGRAM FILL-IN AREAS ON THE DISPLAY.

DISPLAYS 8912-8915 GIVE FORMAT ILLUSTRATIONS OF THE DLL SOURCE RECORDS.

<SELECT 8912> 8912

RETURN TO PRIOR LEVEL
(THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES) PREV SAME
DISPLAY 8912

8912 DISPLAY LIBRARIAN LANGUAGE - SOURCE RECORD FORMATS -1-

The coded Dll source records are input to the display librarian
program on 80 column punched cards and each record requires an
identifier character in card column 1.

OUTPUT OPTION CARD -O-

O.S.P.L
- Optional control card, if not included
  in input deck the display librarian will
  assume the 'P' option was selected.
- SPList source cards
- P=Output printed displays to line printer
- LWriTe-Add displays to display library

INPUT OPTION CARD -I-

I,1
- Input normally is from cards, for card image
  magnetic tape input, this option card is used.

NAME CARD -N-

N,.xxx
- XXXX is the display name tag, it can be any four
digit number from 0001 through 9999, display name
tags from 0001 through 9999 will be used for normal
displays and display name tags from 9000 through
9999 will be used for special displays.
For a description of special displays, select the
9050 option which follows <select 9050>.

For format illustrations of the remaining dll source records select
8913.
<select 8913>

RETURN TO PRIOR LEVEL
(this line reserved for application program's one line messages)
DISPLAY 8913

8913 DISPLAY LIBRARY LANGUAGE - SOURCE RECORD FORMATS -2-

PEN CARD -P-
P, XXXX, YYYY - XXXX=NAME TAG OF THE DISPLAY TO BE LOADED WHEN THE OPTION IS SELECTED. 0001-9999 'SAME' WILL CAUSE THE CURRENT DISPLAY TO BE RETAINED. 'PREV' WILL CAUSE THE PREVIOUS DISPLAY TO BE LOADED YYYY=NAME OF THE TASK TO BE SCHEDULED WHEN THE OPTION IS SELECTED. THIS PARAMETER IS OPTIONAL.

COMPOSE CARD -C-
C, UU, VV, XXXX, YYYY - UU=NUMBER OF SUBFIELDS IN THIS COMPOSE FIELD, CAN BE A ONE OR TWO DIGIT NUMBER VV=NUMBER OF CHARACTERS IN THIS COMPOSE FIELD, CAN BE A ONE OR TWO DIGIT NUMBER XXXX=NEXT DISPLAY NAME TAG SAME AS PEN CARD YYYY=NEXT TASK NAME SAME AS PEN CARD EXCEPT IT IS REQUIRED FOR THE COMPOSE CARD

LEGALITY CARD -X-
X(L1T1R1)(L2T2R2)...,(LNTNRMN) - L=NUMBER OF RESTRICTION CHARACTERS T=TYPE OF RESTRICTION DATA
O=OCTAL B=BINARY D=DECIMAL A=ALPHABETIC X=NO CHECKING S=SPECIAL=DEFINITION OF SPECIAL CHARACTERS WILL BE SHOWN IN ON-LINE DISPLAY FACILITIES; DISPLAY 8914 R=RESTRICTION DATA -EXPLICIT MAGNITUDE, MAGNITUDE RANGE, OR BOTH ALLOWED

FORMAT ILLUSTRATIONS CONTINUE ON DISPLAY 8914. <SELECT 8914>

RETURN TO PRIOR LEVEL <PREV>
(THE LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES) <SAME>
8914: DISPLAY LIBRARIAN LANGUAGE = SOURCE RECORD FORMATS -3-

LINE CARD -L-
LINE VECTORS AND TEXT UNDERLINES CAN BE INCLUDED IN THE DISPLAY.
THERE ARE TWO FORMATS:

1. L,C,III,JJJJ,KKKK,LLLL - C=LINE VECTOR SPECIFIED
   III=FROM X ORIGINATE JJJJ=FROM Y ORIGINATE
   KKKK=10 X ORIGINATE LLLL=10 Y ORIGINATE

2. L,L,MM,NN,00,PP - L=TEXT UNDERLINE SPECIFIED
   MM=FROM CHARACTER NUMBER NN=FROM LINE NUMBER.
   PP=TO CHARACTER NUMBER PP=TO LINE NUMBER

SHOWN BELOW ARE EXAMPLES OF LINE VECTOR AND TEXT UNDERLINE USAGE:

THE LINES SHOWN AT THE RIGHT WERE SPECIFIED
IN TEXT UNDERLINE FORMAT BY-
*SELECT H*SELECT LOW*
*SELECT S*SELECT END*

L,L,4/18,70,18 AND L,L,78,17,58,19
HOWEVER, THEY COULD HAVE BEEN SPECIFIED IN
LINE VECTOR FORMAT BY-
L,C,610,407,84,407 AND L,C,742,431,742,383

THE LINES NOW SHOWN IN THE EXAMPLE AT RIGHT,
WERE SPECIFIED BY-
L,C,632,313,828,193
L,C,632,193,828,313

FORMAT ILLUSTRATIONS ARE CONCLUDED ON DISPLAY 8915.  <SELECT 8915>
RETURN TO PRIOR LEVEL
(THE LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES) <**> SAME
DISPLAY 8915

8915 DISPLAY LIBRARIAN LANGUAGE - SOURCE RECORD FORMATS #4-

TEXT CONTROL CARD **

- THIS CONTROL CARD IS USED TO ADVISE THE DISPLAY LIBRARIAN PROGRAM THAT ALL CONTROL PAGE SOURCE RECORDS FOR THE DISPLAY HAVE BEEN INPUT.
- IT MUST IMMEDIATELY FOLLOW THE LAST CONTROL PAGE SOURCE CARD IN THE INPUT DECK.

TEXT CARD - T -
T, JJJJ, ........, JJJJ - THE J'S REPRESENT TEXT DATA, EACH RECORD WILL DEFINE ONE LINE OF TEXT ON THE DISPLAY AND MAY CONTAIN UP TO SEVENTY-FIVE TEXT CHARACTERS. A MAXIMUM OF THIRTY-FIVE TEXT RECORDS ARE ALLOWED FOR A NORMAL DISPLAY. ALL TEXT RECORDS MUST FOLLOW THE TEXT CONTROL CARD IN THE INPUT STREAM, AND MUST BE IN THE ORDER THE TEXT IS TO APPEAR ON THE DISPLAY.
- CHARACTERS THAT WILL HAVE SPECIAL MEANING IN THE TEXT DATA ARE # AND # INDICATING A PEN OPTION, THE # INDICATING A COMPLETE FIELD OR SUBFIELD, AND THE # INDICATING AN APPLICATION PROGRAM FILL-IN FIELD.

END CARD - E -
END - INDICATES END OF INPUT DATA FOR A DISPLAY.

DELETE CARD - U -
D, XXX - XXX=DISPLAY NAME TAG, DELETES DISPLAY XXX FROM THE DISPLAY LIBRARY FILE.

<END OF SECTION> <CONTINUE> 8900, 8920

RETURN TO PRIOR LEVEL <PREV>
THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES <SAME>
DISPLAY 8920

8920 DISPLAY FACILITIES

DISPLAY CONSOLE OPERATOR CONTROL CAPABILITIES

- KEYBOARD DATA ENTRY
- LIGHT PEN OPTION SELECTION
- FUNCTION SWITCH PROGRAM ACTIVATION

APPLICATION PROGRAM DISPLAY CAPABILITIES

- TABULAR DATA (FILL-IN) DISPLAY
- DATA CURSOR CONTROL
- ONE-LINE MESSAGE DISPLAY
- NEW DISPLAY REQUEST
- FUNCTION SWITCH ATTACH-DETACH

TO OBTAIN DETAILED ILLUSTRATIONS OF ANY OF THESE FACILITIES, USE THE LIGHT PEN TO SELECT THE APPROPRIATE OPTION.

RETURN TO PRIOR LEVEL

(This line reserved for application program's one line messages)
DISPLAY 8930

8930 DISPLAY FACILITIES - KEYBOARD DATA ENTRY

The console keyboard can be used to enter data into pre-defined compose fields in a display and to cause the entered data to be passed to an application program for processing.

The compose fields appear on the screen as slash characters. They are replaced with input data as it is received. A data cursor appears on the screen to indicate where the next input character will be placed. It can be positioned at any compose field character desired by the operator.

After all desired data has been entered for a given compose field, the operator can use the "return" key to pass the data to an application program. When the "return" key is depressed, the task associated with the compose field is scheduled for execution in the 840 and one of the following will appear on the screen depending on how the compose field was defined.

1. A new display
2. The same display (refreshed to original form)
3. The same display (unrefreshed)

<CONTINUE> 8931

RETURN TO PRIOR LEVEL
(this line reserved for application program's one line messages)
DISPLAY 8931

DISPLAY FACILITIES = KEYBOARD DATA ENTRY

DATA CURSOR CONTROL IS PROVIDED THROUGH THE USE OF SEVERAL SPECIAL KEYS.

KEY FUNCTION
SEMI-COLON CURSOR RIGHT
DELETE CURSOR LEFT
COLON CURSOR UP
LINE FEED CURSOR DOWN
"AI" SIGN CURSOR HOME (FIRST COMPOSE FIELD)

THE VALID DATA ENTRY KEYS INCLUDE
ALPHABETIC A-Z
NUMERIC 0-9
SPECIAL . , ? " ' ( ) # = + - # # BLANK
ALL OTHER CHARACTERS WILL BE IGNORED.

USE THE FOLLOWING SAMPLE COMPOSE FIELDS TO GET THE FEEL OF DATA ENTRY
AND CURSOR MANIPULATION.

COMPOSE FIELD A DATE = // / // // (MONTH DAY YEAR) SAME
COMPOSE FIELD B VELOCITY = // / // // (FEET PER SECOND) SAME
COMPOSE FIELD C // // SAME

THE DATA YOU HAVE ENTERED WILL BE RE-DISPLAYED IN THE ONE-LINE MESSAGE
AT THE BOTTOM OF THE SCREEN.

IT SHOULD BE NOTED THAT ONLY ONE COMPOSE FIELD CAN BE PROCESSED AT A
TIME. WHENEVER THE CURSOR IS MOVED TO A NEW COMPOSE FIELD, THE INPUT
BUFFER IS RE-INITIALIZED WITH BLANKS.

<CONTINUE> 8932

RETURN TO PRIOR LEVEL
THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES
DISPLAY 8932

8932 DISPLAY FACILITIES - INPUT DATA CHECKING

Data entered via the console keyboard can be examined for validity automatically through the use of pre-defined legality data. This data can specify validity checks to be made on both type and magnitude of the input data. For purposes of validity checking, a compose field can be broken down into subfields with a data type and one or more sets of limits specified for each subfield. These legality checks, if specified, are performed when the operator depresses the "return" key. If an error is detected, a message is displayed at the bottom of the screen and the cursor is positioned to the invalid character or to the subfield which is out of limits.

The legality specifications for the following compose fields are shown below. Care to try?

Compose field a = // // // // (month day year)
11 12 3333

Subfield 1 = Alphabetic with values limited to Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec
Subfield 2 = Decimal with values limited to 01-31
Subfield 3 = Decimal with values limited to 2001

Compose field b = // // //
4 5 677

Subfield 4 = Alphabetic with values limited to x, y, z
Subfield 5 = Special with values limited to *.,,,
Subfield 6 = Special with values limited to *.,,,blank
Subfield 7 = Octal with no limits

Note that legality checking subfields do not necessarily have to have a one-for-one correspondence to the subfield divisions on the screen.

<CONTINUE> 8933
PREV
SAME
RETURN TO PRIOR LEVEL
(this line reserved for application program's one line messages)
DISPLAY 8933

8933  DISPLAY FACILITIES - LIGHT PEN OPTION SELECTION

THE LIGHT PEN CAN BE USED TO SELECT AN OPTION FROM ONE OR MORE PRE-
DEFINED OPTIONS IN A DISPLAY.

OPTIONS APPEAR ON THE SCREEN ENCLOSED BETWEEN LESS-THAN ( < ) AND GREATER-
THAN ( > ) CHARACTERS.

WHEN AN OPTION IS SELECTED BY THE OPERATOR, THE TASK ASSOCIATED WITH
THE OPTION (IF ONE WAS PRE-DEFINED) WILL BE SCHEDULED FOR EXECUTION
IN THE B4D AND ONE OF THE FOLLOWING WILL APPEAR ON THE SCREEN DEPENDING
ON HOW THE OPTION WAS DEFINED.

1. A NEW DISPLAY
2. THE SAME DISPLAY (REFRESHED TO ORIGINAL FORM)
3. THE SAME DISPLAY (UNREFRESHED)

NOTE THAT OPTIONS DIFFER FROM COMPOSE FIELDS IN THAT A TASK MAY OR MAY
NOT BE SCHEDULED, THIS IS BECAUSE THERE IS NO OTHER OPERATOR-ENTERED
DATA ASSOCIATED WITH AN OPTION WHICH REQUIRES PROCESSING BY A TASK.

TWO STANDARD OPTIONS EXIST AT THE BOTTOM OF THE SCREEN FOR EVERY DISPLAY.
THE FIRST PROVIDES THE CAPABILITY TO RETURN THE PRECEDING DISPLAY TO
THE SCREEN. NO TASK GETS SCHEDULED BY SELECTION OF THIS OPTION. THE
SECOND STANDARD OPTION IS ASSOCIATED WITH THE ONE-LINE MESSAGE, USUALLY,
SELECTION OF THIS OPTION WILL NOT CAUSE EITHER A NEW DISPLAY TO BE
LOADED OR A TASK TO BE SCHEDULED. HOWEVER, THE CAPABILITY EXISTS TO
ALLOW APPLICATION PROGRAMS TO SPECIFY A DISPLAY AND/OR A TASK TO BE
ASSOCIATED WITH THE OPTION.

<CONTINUE> 8934

RETURN TO PRIOR LEVEL
(THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES) 8934

<prev> 9994
<same>
DISPLAY 8934

8934 DISPLAY FACILITIES - FUNCTION SWITCH PROGRAM ACTIVATION

THE FUNCTION SWITCHES LOCATED ON EACH SIDE OF THE SCREEN CAN BE USED TO ACTIVATE APPLICATION PROGRAMS. HOWEVER, BEFORE THEY CAN BE UTILIZED, AN APPLICATION PROGRAM MUST HAVE ATTACHED TASKS TO THE ASSOCIATED SWITCHES. REFER TO THE APPLICATION PROGRAM DISPLAY CAPABILITIES.

THE TASK CURRENTLY ATTACHED TO A GIVEN SWITCH WILL BE SCHEDULED FOR EXECUTION EACH TIME THE SWITCH IS RAISED.

FOR PURPOSES OF DEMONSTRATION, USE THE LIGHT PEN TO SELECT ONE OR MORE SWITCHES TO BE ATTACHED. THEN RAISE THE SWITCHES TO ACTIVATE THE ASSOCIATED TASK(S).

<1> # # <9> # # SAME, SAME
<2> # # <10> # # SAME, SAME
<3> # # <11> # # SAME, SAME
<4> # # <12> # # SAME, SAME
<5> # # <13> # # SAME, SAME
<6> # # <14> # # SAME, SAME
<7> # # <15> # # SAME, SAME
<8> # # <16> # # SAME, SAME

(END OF SECTION)

RETURN TO PRIOR LEVEL
(TWO LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES)
8910 DISPLAY FACILITIES - PROGRAM TABULAR DATA DISPLAY

APPLICATION PROGRAMS EXECUTING IN THE 840 CAN DISPLAY DATA IN PRE-DEFINED
FIELDS WHICH APPEAR ON THE SCREEN AS POUND SIGNS WHEN A GIVEN DISPLAY
IS INITIALLY LOADED. THE POUND SIGNS ARE REPLACED WITH THE TABULAR
DATA AS IT IS RECEIVED FROM APPLICATION PROGRAMS.
CAPABILITIES ARE PROVIDED TO ENABLE APPLICATION PROGRAMS TO ADD TO
PREVIOUSLY DISPLAYED DATA, DELETE PREVIOUSLY DISPLAYED DATA, OR UPDATE
PREVIOUSLY DISPLAYED DATA. USE THE LIGHT PEN OR KEYBOARD TO ACTIVATE
DEMONSTRATIONS OF THESE CAPABILITIES.

1. ADD 3 CHARACTERS EACH TIME SELECTED
2. DELETE ALL PREVIOUSLY DISPLAYED TABULAR DATA
3. UPDATE CHARACTERS 5-7 EACH TIME SELECTED
4. UPDATE STARTING AT CHARACTER // WITH // // //

SUBFIELD A = DECIMAL VALUE FROM 01-48
SUBFIELD B = ANY DISPLAYABLE CHARACTERS

<CONTINUE>
DISPLAY 0941

DISPLAY FACILITIES - PROGRAM DATA CURSOR CONTROL

Application programs executing in the 640 can move the data cursor to
the beginning of any compose field in the current display. This capa-
bility should be used with discretion since it re-initializes the keyboard
input buffer with blanks. If the console operator has just keyed in a
lengthy compose field, he won't appreciate having his data destroyed.

For demonstration purposes, use the light pen to select a compose field
in which the cursor shall be moved. You still have the capability to
control the cursor from the keyboard.

1 / / / / / / / <1>
2 / / / <2>
3 / / / <3>
1 / / / / / / <4>

<CONTINUE> 0942

RETURN TO PRIOR LEVEL
(This line reserved for application programs and LINE MESSAGES)
DISPLAY 8942

8942 DISPLAY FACILITIES - PROGRAM ONE-LINE MESSAGE DISPLAY

APPLICATION PROGRAMS EXECUTING IN THE 840 CAN DISPLAY MESSAGES IN THE
SPECIAL ONE-LINE MESSAGE AREA AT THE BOTTOM OF THE SCREEN. IN ADDITION,
THE CAPABILITY EXISTS TO SPECIFY A DISPLAY TAG AND A TASK NAME TO BE
ATTACHED TO THE LIGHT PEN OPTION ASSOCIATED WITH THE ONE-LINE MESSAGE.

IT SHOULD BE NOTED THAT THE MESSAGE AREA IS UNPROTECTED IN THE SENSE
THAT A MESSAGE MAY BE REPLACED WITH A MESSAGE FROM THE SYSTEM OR FROM
ANOTHER APPLICATION PROGRAM BEFORE IT CAN BE READ BY THE OPERATOR.

WHEN YOU SELECT THIS DISPLAY A TASK WAS SCHEDULED WHICH ISSUED THE
MESSAGE SHOWN BELOW.

RETURN TO PRIOR LEVEL
(THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES)
DISPLAY 8943

8943 DISPLAY FACILITIES - PROGRAM NEW DISPLAY REQUEST

APPLICATION PROGRAMS EXECUTING IN THE 840 CAN REQUEST A NEW DISPLAY TO APPEAR ON THE SCREEN WITH OR WITHOUT THE SCHEDULING OF A NEW TASK. SUCH A REQUEST CAN BE MADE IN ONE OF TWO MODES.

1. AUTOMATIC MODE - THE NEW DISPLAY IS LOADED IMMEDIATELY AND THE TASK, IF SPECIFIED, IS SCHEDULED FOR EXECUTION.


WHEN YOU SELECTED THIS DISPLAY A TASK WAS SCHEDULED WHICH ISSUED A DELAYED MODE REQUEST FOR THE NEXT DISPLAY IN THE DEMONSTRATION. PROCEED AT WILL.

RETURN TO PRIOR LEVEL
(This line reserved for application programs one line messages)
8944 DISPLAY FACILITIES - PROGRAM FUNCTION SWITCH ATTACH-DETACH

APPLICATION PROGRAMS EXECUTING IN THE 840 MUST ATTACH TASKS TO THE DISPLAY CONSOLE FUNCTION SWITCHES (ONE TASK PER SWITCH FOR ANY NUMBER OF SWITCHES) BEFORE THE SWITCHES CAN BE UTILIZED. ONCE A TASK IS ATTACHED TO A SWITCH, IT IS SCHEDULED FOR EXECUTION EACH TIME THE SWITCH IS RAISED BY THE OPERATOR.

APPLICATION PROGRAMS CAN ALSO DETACH TASKS FROM FUNCTION SWITCHES WHEN IT IS NECESSARY TO STOP THE FUNCTION SWITCH SCHEDULING PROCESS.

THE EFFECTS OF THE ATTACH-DETACH FACILITY ARE ILLUSTRATED IN THE SECTION OF THE DEMONSTRATION PERTAINING TO CONSOLE OPERATOR CAPABILITIES.

FUNCTION SWITCH DEMO 8934

END OF SECTION 8920 8950

RETURN TO PRIOR LEVEL
(This line reserved for application program's one-line messages)
DISPLAY 0950

0950 OPERATING SYSTEM FACILITIES

OPERATING SYSTEM SERVICES ARE AVAILABLE TO USERS THROUGH THE FOLLOWING EXECUTIVE CALLS.

TASK SCHEDULING
   PERIODIC
      SINGLE-ENTRY
      MULTIPLE-ENTRY
      PRIORITY(NON-PERIODIC)
      SINGLE-ENTRY
      MULTIPLE-ENTRY
      NEXT TASK

TASK SUSPENSION
   SPECIFIED PERIOD
   INDEFINITELY

TASK TERMINATION

TASK DELETION

CHECK TASK STATUS

CROSS-TASK COMMUNICATION
   INITIALIZE PARAMETERS-BUFFERS
   TRANSMIT-RECEIVE

CROSS-PROCESSOR COMMUNICATION

THIS LIST OF SERVICES INCLUDES ONLY THOSE UNIQUELY SUPPLIED BY HPCS.
ALSO AVAILABLE ARE THE SERVICES PROVIDED BY CHASE INCLUDING THOSE FOR PROCESSING I-O.

<CONTINUE> 0951  <*> PREV  <*> SAME

RETURN TO PRIOR LEVEL
(THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES)  <*> SAME
### DISPLAY 0951

**OPERATING SYSTEM = TASK SCHEDULING DEMONSTRATION**

Six tasks have been pre-defined for use in demonstrating the scheduling capabilities of the operating system. This display contains compose fields and light pen options to be used by you in specifying certain parameters and activating stopping certain functions. This enables you to control the demonstration and to experiment with various task configurations.

<table>
<thead>
<tr>
<th>TASK</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>PER</td>
<td>PER</td>
<td>PER</td>
<td>NON-PER</td>
<td>NON-PER</td>
<td>NON-PER</td>
</tr>
<tr>
<td>RATE</td>
<td>10 SEC</td>
<td>100 MIL</td>
<td>///</td>
<td>///</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIORITY</td>
<td>03</td>
<td>09</td>
<td>13</td>
<td>01</td>
<td>06</td>
<td>12</td>
</tr>
<tr>
<td>STATUS</td>
<td>&lt;0&gt;</td>
<td>##</td>
<td>##</td>
<td>##</td>
<td>##</td>
<td>##</td>
</tr>
<tr>
<td>SCHEDULE</td>
<td>&lt;A&gt;</td>
<td>&lt;B&gt;</td>
<td>&lt;C&gt;</td>
<td>&lt;D&gt;</td>
<td>&lt;E&gt;</td>
<td>&lt;F&gt;</td>
</tr>
<tr>
<td>SUSPEND MINUTES</td>
<td>//</td>
<td>//</td>
<td>//</td>
<td>//</td>
<td>//</td>
<td>//</td>
</tr>
<tr>
<td>INDEF</td>
<td>&lt;A&gt;</td>
<td>&lt;B&gt;</td>
<td>&lt;C&gt;</td>
<td>&lt;D&gt;</td>
<td>&lt;E&gt;</td>
<td>&lt;F&gt;</td>
</tr>
<tr>
<td>DELETE</td>
<td>&lt;A&gt;</td>
<td>&lt;B&gt;</td>
<td>&lt;C&gt;</td>
<td>&lt;D&gt;</td>
<td>&lt;E&gt;</td>
<td>&lt;F&gt;</td>
</tr>
<tr>
<td>TERMINATE</td>
<td>&lt;D&gt;</td>
<td>&lt;E&gt;</td>
<td>&lt;F&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TASK DATA**

**<END OF DEMONSTRATION>**

**RETURN TO PRIOR LEVEL**

(This line reserved for application program's one line messages)

**8900**

**PREV**

**SAME**
SPECIAL DISPLAYS

SPECIAL DISPLAYS, CHARACTORIZED BY TAGS RANGING FROM 9000 - 9999, ARE UNIQUE IN THAT THEY MAY CONTAIN ONLY TEXT INFORMATION. NO COMPOSE FIELDS, TABULAR DATA, OR LIGHT PEN OPTIONS ARE PERMITTED IN THEM.

THEY ARE DISPLAYED FROM AN AUXILIARY BUFFER WHILE THE PRECEDING DISPLAY IS RETAINED IN THE COMPUTER FOR RETRANSMIT TO THE OPERATOR. USES THE LIGHT PEN TO RETURN TO PRIOR LEVEL. ALL DISPLAYS FROM EITHER THE KEYBOARD OR 840 APPLICATION PROGRAMS WILL BE USED TO UPDATE THE PRECEDING NORMAL DISPLAY RATHER THAN THE SPECIAL DISPLAY.

SPECIAL DISPLAYS ARE DESIGNED FOR USE WHEN IT IS NECESSARY TO EXPLAIN SOMETHING IN MORE DETAIL THAN IS POSSIBLE IN A ONE-LINE MESSAGE, PERHAPS AN ERROR CONDITION. THEY ARE LIMITED TO 12 LINES OF TEXT.

RETURN TO PRIOR LEVEL
(THIS LINE RESERVED FOR APPLICATION PROGRAM'S ONE LINE MESSAGES)
5. CDA TASK LISTINGS
SUBROUTINE DPTO


ENTRY CONDITIONS: SCHEDULED BY SYSTEM AS INITIAL TASK

INPUTS: NONE

EXTERNAL CALLS: M$23 (NEW DISPLAY REQUEST)

EXIT: M$06 - TERMINATE

COMMON ITAB(6,6)
DIMENSION NAME(6)
DATA NAME(1),NAME(2),NAME(3),NAME(4),NAME(5),NAME(6)/
1 4HDTSA, 4HDTSB, 4HDTSC, 4HDTSD, 4HDTSE, 4HDTSF/

10 IF ITAB(1,3) = NAME(1)
    ITAB(1,4) = 2
    ITAB(1,5) = 10
    ITAB(2,4) = 1
    ITAB(2,5) = 100
    CALL M$23 (IRC, -2, 8900, 4HDTSD, 5900)
    CALL M$06
    900 CALL ARENP(IRC,1)
END

NO ERRORS
SUBROUTINE DPT1

FUNCTION: inserts the special characters <, >, / into displays which could not contain them originally because of their special significance to the librarian as pen option and compose field definition characters.

ENTRY CONDITIONS: called by task DPT2
activated from display console as follows
option 9 of display 8914
option 2 of display 8920
option 1 of display 8930
option 1 of display 8931

INPUT: display tag and option no./compose field no. to identify activation source.

EXTERNAL CALLS:
M$20 - tabular data display request
M$06 - terminate

COMMON /DXT1/IN(3)
ICDT = IN(1) + 1
N = 3
IF (IN(1),EQ., 8920) ICDT = 8933
IF (ICDT,EQ., 8932) N = 2
CALL M$20 (IRC,ICDT,-1,N,3H/<>/,$900)
CALL M$06
900 CALL ABEND(IRC,2)
END

NO ERRORS

-37-
SUBROUTINE DPT2
C FUNCTION: ACCEPTS COMPOSE FIELD INPUT DATA AND DISPLAYS IT VIA THE ONE-LINE MESSAGE FACILITY.
C ENTRY CONDITIONS: ACTIVATED FROM DISPLAY CONSOLE AS FOLLOWS,
    COMPOSE FIELDS 1-3 OF DISPLAY 8931
    COMPOSE FIELDS 1,2 OF DISPLAY 8932
    COMPOSE FIELDS 1-4 OF DISPLAY 8941
C INPUT: DISPLAY TAG, NO. OF INPUT WORDS FROM COMPOSE FIELD, AND COMPOSE FIELD CHARACTERS ENTERED BY OPERATOR.
C EXTERNAL CALLS: M$22 - ONE-LINE MESSAGE DISPLAY REQUEST
C EXIT: M$06 - TERMINATE

EXTERNAL CALLS:
M$22 - ONE-LINE MESSAGE DISPLAY REQUEST
M$06 - TERMINATE
DPT1

DIMENSION IMSG(50)
DATA IMSG(1), IMSG(2), IMSG(3), IMSG(4)/4 INPUT, 4 HT RE, 4 HCEIV, 4 HED =/ I = IN(3)
D 10 J = 1, I
10 IMSG(J+4) = IN(J+3)
CALL M$22 (IRC, -1, -1, 0, 4*(I+4), IMSG(1), $900)
IF (IN(1), NE, 8932) CALL M$06
INX(1) = 8931
CALL DPT1
900 CALL ABEND(IRC, 3)
END

NO ERRORS
SUBROUTINE DPT3

FUNCTION: ATTACHES OR DETACHES TASK DPTB TO THE SPECIFIED FUNCTION SWITCH. THE FUNCTION PERFORMED FOR A GIVEN SWITCH DEPENDS ON THE CURRENT STATUS OF THE SWITCH. IF IT IS CURRENTLY ATTACHED, IT WILL BE DETACHED AND VICE VERSA. THIS MODULE ALSO DISPLAYS THE ATTACH/DETACH STATUS (1/0 RESPECTIVELY) FOR ALL 16 FUNCTION SWITCHES.

ENTRY CONDITIONS: ACTIVATED FROM DISPLAY CONSOLE AS FOLLOWS.

OPTION 3 OF DISPLAY 8920
OPTION 1 OF DISPLAY 8933
OPTION 1 OF DISPLAY 8944
OPTION 1-16 OF DISPLAY 8934

INPUT: DISPLAY TAG AND OPTION NUMBER

EXTERNAL CALLS: M$20 - TABULAR DATA DISPLAY REQUEST
M$24 - FUNCTION SWITCH ATTACH/DETACH

EXIT: M$06 - TERMINATE

COMMON /DPT3/IN(3)
DIMENSION IFS(16),MFS(4)
DATA IFS(1),IFS(2),IFS(3),IFS(4),IFS(5),IFS(6),IFS(7),IFS(8),
IFS(9),IFS(10),IFS(11),IFS(12),IFS(13),IFS(14),IFS(15),IFS(16)/,
20,0,0,0,0,0,0,0,0,0,0,0,0,0,0/
DATA KC0,KC1,KCO/1H0,1H1,4H0000/
IF (IN(1),NE, 8934) G0 T0 30
I = IN(2)/
K = I/2
K1 = K + 1
IF (2*K,EQ, 1) K1 = K1 + 7
IF (IFS(1),EQ, 0) G0 T0 10
IFS(1) = 0
K1 = -K1
K2 = KC0
G0 T0 20
10 IFS(1) = 1
K2 = KC1
20 CALL M$24 (4HDPtB, K1, $900)
CALL M$20 (IRC,8934,-I,1,K2,$900)
CALL M$06
30 DO 35 I = 1, 4
35 MFS(I) = K4C0 * IFS(4*I-3)*2**18 + IFS(4*I-2)*2**12
   + IFS(4*I-1)*2**6 + IFS(4*I)
CALL M$20 (IRC, 8934, -1, 16, MFS(1), $900)
CALL M$06
900 CALL ABEND(IRC,4)
END

NO ERRORS
SUBROUTINE DPT4

FUNCTION:  RESPONSUS TO DISPLAY CONSOLE COMMANDS AS FOLLOWS.
            1. ISSUES TABULAR DATA DISPLAY REQUESTS FOR DISPLAY 8940.
            2. ISSUES CURSOR MOVE REQUESTS FOR DISPLAY 8941.
            3. ISSUES A ONE-LINE MESSAGE REQUEST FOR DISPLAY 8942.
            4. ISSUES A NEW DISPLAY REQUEST FOR DISPLAY 8943.

ENTRY CONDITIONS: ACTIVATED FROM DISPLAY CONSOLE AS FOLLOWS.
            OPTIONS 6, 7 OF DISPLAY 8920
            OPTIONS 1-3 OF DISPLAY 8940
            COMP腁SE FIELD 1 OF DISPLAY 8940
            OPTIONS 1-5 OF DISPLAY 8941
            ONE-LINE MESSAGE OPTION OF DISPLAY 8942

INPUT:   DISPLAY TAG AND OPTION NUMBER

EXTERNAL CALLS:
            M$20 - TABULAR DATA DISPLAY REQUEST
            M$21 - CURSOR MOVE DISPLAY REQUEST
            M$22 - ONE-LINE MESSAGE DISPLAY REQUEST
            M$23 - NEW DISPLAY REQUEST

EXIT:
            M$06 - TERMINATE

COMM:  1)X74/IN(6)
            IF (IN(1) ,EQ. 8941 ,AND. IN(2) ,LE. 4) GO TO 100
            IF (IN(1) ,EQ. 8941 ,AND. IN(2) ,EQ. 5 .OR. IN(1) ,EQ. 8920 .AND. IN(2) ,EQ. 6) GO TO 200
            IF (IN(1) ,EQ. 8942 .OR. IN(1) ,EQ. 8920 .AND. IN(2) ,EQ. 7) GO TO 300
            I = IN(2)
            IF (IN(3) ,EQ. 0) GO TO (10,20,30), I
            WRITE (0,1) IN(4)
    1 FORMAT (A2)
    2 FORMAT (12)
    CALL M$20 (IRC, 8940, -N, 5, IN(5), $900)
            GO TO 40
    10 CALL M$20 (IRC, 8940, 3, 3, 3HABC,$900)
            GO TO 40
    20 CALL M$20 (IRC, 8940, 0, 0, 0,$900)
            GO TO 40
    30 CALL M$20 (IRC, 8940, -5, 3, 3HXYZ,$900)
    40 CALL M$06
    100 CALL M$21 (IRC, 8941, IN(2),$900)
    CALL M$06
    200 CALL M$22 (IRC, 8942, 8943, 4HDPT4, 72, 72HAPPLICATION PROGRAM MESSAGE,
                1 SELECT OPTION AT RIGHT TO CONTINUE TO 8943 ,$900)
    CALL M$06
    300 CALL M$23 (IRC, 8943, 8944, 0,$900)
    CALL M$06
    900 CALL ABEND(IRC,5)
END

N? ERRORS

-40-
SUBROUTINE DPT8

C FUNCTION DETERMINES WHICH FUNCTION SWITCH ACTIVATED IT AND
C DISPLAYS AN APPROPRIATE ONE-LINE MESSAGE WHICH
C IDENTIFIES THE SWITCH.

C INPUT:
C FUNCTION SWITCH SETTING

C ENTRY CONDITIONS:
C SCHEDULED IN RESPONSE TO THE SETTING OF ANY ATTACHED
C CONSole FUNCTION SWITCH.

C EXTERNAL CALLS:
M$22 - ONE-LINE MESSAGE DISPLAY REQUEST

C EXIT:
M$06 - TERMINATE

COMMON /DXTB/IN(3)
DIMENSION M(8)
DATA M(1), M(2), M(3), M(4), M(6), M(7), M(8) /4HFUNC, 4HTI0N, 4HSWI, 4HTCH
1, 4HAS BEEN, 4HEEN, 4HSET /
DATA J/4H00 H/
I = IN(2)
IF (I .GT. 9) I = I - 10 + 2*6
M(5) = J + I*2*12
CALL M$22 (IRC, -1, -1, 0, 32, M(1), $900)
CALL M$06
900 CALL ABEND(IRC, 6)
END

NO ERRORS
SUBROUTINE DTSD

FUNCTION:
INITIALIZE THE CONTROL TABLE USED IN THE TASK SCHEDULING PORTION OF THE DEMONSTRATION. IF ANY OF THE TASKS CONTROLLED VIA THE TABLE ARE NOT INACTIVE, THEY ARE DELETED. THE TABLE CONTAINS THE FOLLOWING ITEMS FOR EACH OF THE SIX TASKS USED TO DEMONSTRATE TASK SCHEDULING FACILITIES.

1. TASK CURRENT STATUS (NOT SYSTEM STATUS)
   +1 ACTIVE
   0 INACTIVE
   -1 SUSPENDED

2. SUSPENSION PERIOD IN MINUTES (0 = INDEFINITE)

3. TASK NAME

4. PERIODIC TASK RATE UNITS
   1 MILISECONDS
   2 SECONDS
   3 MINUTES

5. PERIODIC TASK RATE

6. EXECUTION PASS COUNT

ENTRY CONDITIONS:
SCHEDULED IN RESPONSE TO OPTION 4 OF DISPLAY 8900.
SCHEDULED IN RESPONSE TO OPTION 23 OF DISPLAY 8951.
SCHEDULED AS A RESULT OF THE IMMEDIATE-MODE NEW DISPLAY REQUEST ISSUED BY DPT0.

INPUT:
NONE

EXTERNAL CALLS:
M$05 = DELETE TASK
M$06 = TERMINATE

COMMON ITAB(6,6)
COMMON /DXSO/IN(3)
IF (IN(1), EQ, 8900, AND, IN(2), EQ, 4) CALL EXIT
DO 10 I = 1, 6
   ITAB(I, 6) = 0
   IF (ITAB(I, 1), EQ, 0) GO TO 10
   ITAB(I, 1) = 0
   CALL M$05 (ITAB(I, 3), IRC, $100)
   GO TO 10
100 IF (IRC, EQ, 1) GO TO 900
10 CONTINUE
   ITAB(3, 4) = 3
   ITAB(3, 5) = 1
   CALL M$06
900 CALL ABEND(IRC, 7)
END

NO ERRORS

-42-
SUBROUTINE DTS1

C FUNCTION: SERVICES THE OPTION SELECTIONS FOR THE TASK SCHEDULING DISPLAY (8951) AS FOLLOWS.

1. FOR OPTION 1 OBTAINS AND DISPLAYS THE SYSTEM STATUS FOR ALL 6 SAMPLE TASKS.

2. FOR OPTIONS 2-7 SCHEDULES THE SPECIFIED TASK FOR EXECUTION.

3. FOR OPTIONS 8-13 SETS THE CONTROL TABLE ENTRY FOR THE SPECIFIED TASK TO CAUSE THE TASK TO SUSPEND ITSELF INDEFINITELY.

4. FOR OPTIONS 14-19 DELETES THE SPECIFIED TASK.

5. FOR OPTIONS 20-22 SETS THE CONTROL TABLE ENTRY FOR THE SPECIFIED TASK TO CAUSE THE TASK TO TERMINATE ITSELF.

ENTRY CONDITIONS: SCHEDULED IN RESPONSE TO OPTIONS 1-27 OF DISPLAY 8951.

INPUT: OPTION NUMBER

EXTERNAL CALLS:

M$01 - SCHEDULE PERIODIC TASK
M$02 - SCHEDULE NON-PERIODIC TASK
M$05 - DELETE TASK
M$07 - CHECK TASK STATUS
M$20 - TABULAR DATA DISPLAY REQUEST

EXIT: M$06 - TERMINATE

COMMON ITAB(6,6)
COMMON /DXS1/IN(3)
DIMENSION JST(6),MST(3)
DATA KST/4H0000/
I = 1 + (IN(2) + 4) / 6
J = IN(2) - 6* (I - 1) + 5
G0 10 (100, 200, 300, 400, 500), I

100 DO 110 I = 1, 6
   CALL M$07 (ITAB(I,3),IST,$900)
110 JST(I) = 6* (IST/8) + IST - 8*(IST/8)
   DO 120 I = 1, 3
120 MST(I) = KST + 2*12*JST(2*I-1) + JST(2*I)
   CALL M$20 (IRC, 8951, -1, 12, MST(I), $900)
   CALL M$06

200 IF (J ..GE. 3) G0 T0 250
   CALL M$01 (ITAB(J,3),ITAB(J,4),ITAB(J,5),1,IRC,$270)
   G0 T0 260
250 CALL M$02 (ITAB(J,3),IRC,$270)
260 ITAB(J,1) = 1
   G0 T0 100
270 IF (IRC .EQ, 2) G0 T0 100
   G0 T0 900
300 ITAB(J,1) = -1
   ITAB(J,2) = 0
   G0 T0 100
400 CALL M$05 (ITAB(J,3),IRC,$490)
410 ITAB(J,1) = 0
   G0 T0 100

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490 IF (IRC .EQ. 1) GO TO 900
   GO TO 410
500 ITAB (J+3,1) = 0
   GO TO 100
900 CALL AREND(IRC,8)
END

NO ERRORS
SUBROUTINE DTS2
C
C FUNCTION: PROCESS THE COMPOSE FIELD INPUT FOR THE TASK SCHED-
ULING DISPLAY (8951) AS FOLLOWS,
C
C 1. FOR COMPOSE FIELD 1 SETS THE PERIODIC RATE
AND UNITS IN THE CONTROL TABLE ENTRY FOR
TASK DTSC,
C
C 2. FOR COMPOSE FIELDS 2-7 SETS THE CONTROL
TABLE ENTRY FOR THE CORRESPONDING TASK TO
CAUSE THE TASK TO SUSPEND ITSELF FOR THE
SPECIFIED NUMBER OF MINUTES.
C
C ENTRY CONDITIONS: SCHEDULED IN RESPONSE TO COMPOSE FIELDS 1-7 OF
DISPLAY 8951.
C
C INPUT: COMPOSE FIELD NUMBER AND DATA ENTERED BY OPERATOR.
C
C EXTERNAL CALLS: NONE
C
C EXIT: MS06 - TERMINATE
C
COMMON ITAB(6,6)
COMMON /UXS2/IN(5)
DIMENSION KUNIT(3)
DATA KUNIT(1),KUNIT(2),KUNIT(3)/4HMIN ,4HSEC ,4HMIN /
IF (IN(2) ,GT. 1) GO TO 100
10 I = 1, 3
IF (IN(5) ,EQ. KUNIT(1)) GO TO 20
CONTINUE
20 ITAB(3,4) = 1
WRITE (0,30) IN(4)
30 FORMAT (A3)
READ (0,40) ITAB(3,5)
40 FORMAT (13)
CALL MS06
100 I = IN(2) - 1
ITAB(I,1) = -1
WRITE (0,110) IN(4)
110 FORMAT (A2)
READ (0,120) ITAB(1,2)
120 FORMAT (12)
CALL MS06
END
NO ERRORS
SUBROUTINE DTS1

TASK SCHEDULING DEMONSTRATION DUMMY TASK

TASK TYPE: PERIODIC, RATE = 10 SECONDS

FUNCTION: INCREMENTS AN EXECUTION PASS COUNT AND DISPLAYS THIS COUNT IN THE PROPER "TASK DATA" FIELD OF DISPLAY 8951.

IF THE CONTROL TABLE INDICATES THAT THE TASK IS TO BE SUSPENDED, IT SUSPENDS ITSELF FOR THE SPECIFIED NUMBER OF MINUTES OR INDEFINITELY.

IF AN ERROR RETURN CODE INDICATES THAT DISPLAY 8951 IS NO LONGER ACTIVE, THE TASK WILL DELETE ITSELF.

ENTRY CONDITIONS: SCHEDULED BY TASK DTS1.

INPUT: NONE

EXTERNAL CALLS: M$20 - TABULAR DATA DISPLAY REQUEST
M$05 - DELETE TASK
M$10 - SUSPEND TASK INDEFINITELY
M$12 - SUSPEND TASK FOR A SPECIFIED TIME

EXIT: M$06 - TERMINATE

COMMON ITAB(6,6)
DIMENSION IKOUNT(2)
I = 1
ITAB(I,6) = ITAB(I,6) + 1
WRITE (0,10) ITAB(I,6)
10 FORMAT (1B)
READ (0,20) IKOUNT
20 FORMAT (2A4)
CALL M$20 (IRC,8951,-5-8*I,8,IKOUNT(I),$500)
IF (ITAB(I,1)) 100, 200, 200
100 IF (ITAB(I,2) ,EQ, 0) G0 TO 150
CALL M$12 (3, ITAB(I,2))
G0 10 160
150 CALL M$10
160 IF (ITAB(I,1) .LT. 0) ITAB(I,1) = 1
200 CALL M$06
500 IF (IRC .NE. 1) G0 TO 900
CALL M$05 (ITAB(I,3), IRC, $590)
510 ITAB(I,1) = 0
CALL M$06
590 IF (IRC .NE. 1) G0 TO 510
900 CALL ABEND(IRC,9)
END

NO ERRORS
SUBROUTINE DTSB

C C C TASK SCHEDULING DEMONSTRATION DUMMY TASK
C C TASK TYPE: PERIODIC, RATE = 100 MILLI-SECONDS
C C FUNCTIONALLY, THIS TASK IS THE SAME AS DTSA

COMMON ITAB(6,6)
DIMENSION IKOUNT(2)

I = 2
ITAB(I,6) = ITAB(I,6) + 1
WHILE (U,10) ITAB(I,6)

10 FORMAT (18)
READ (0,20) IKOUNT
20 FORMAT (2A4)
CALL MS20 (IRC,8951,-5-8*1,8,IKOUNT(1),$500)
IF (ITAB(I,1)) 100, 200, 200

100 IF (ITAB(I,2),EQ, 0) G0 TO 150
CALL M$12 (3, ITAB(I,2))
G0 TO 160

150 CALL M$10
160 IF (ITAB(I,1),LT, 0) ITAB(I,1) = 1
200 CALL M$06
500 IF (IRC .NE. 1) G0 TO 900
CALL M$05 (ITAB(I,3), IRC, $590)
510 ITAB(I,1) = 0
CALL M$06
590 IF (IRC .NE. 1) G0 TO 510
900 CALL AREND(IRC,10)
END
SUBROUTINE DISC

TASK SCHEDULING DEMONSTRATION DUMMY TASK

TASK TYPE: PERIODIC, RATE = 1 MINUTE (DEFAULT)

FUNCTIONALLY, THIS TASK IS THE SAME AS DTSA

COMMON ITAB(6,6)
DIMENSION IKOUNT(2)

I = 3
ITAB(I,6) = ITAB(I,6) + 1
WRITE (0,10) ITAB(I,6)
10 FORMAT (I8)
READ (0,20) IKOUNT

20 FORMAT (2A4)
CALL M$20 (IRC,8951,-5=8*I,8,IKOUNT(1),$500)
IF (ITAB(I,1)) 100, 200, 200
100 IF (ITAB(I,2) .EQ. 0) G0 TO 150
CALL M$12 (3, ITAB(I,2))
G0 TO 160
150 CALL M$10
160 IF (ITAB(I,1) .LT. 0) ITAB(I,1) = 1
200 CALL M$06
500 IF (INC .NE. 1) G0 TO 900
CALL M$05 (ITAB(I,3), IRC, $590)
510 ITAB(I,1) = 0
CALL M$06
590 IF (IRC .NE. 1) G0 TO 510
900 CALL AREND(IRC,11)
END

NO ERRORS

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SUBROUTINE DTSD

TASK SCHEDULING DEMONSTRATION DUMMY TASK

TASK TYPE: NON-PERIODIC

FUNCTION: INCREMENTS AN EXECUTION PASS COUNT AND DISPLAYS THIS COUNT IN THE PROPER "TASK DATA" FIELD OF DISPLAY 8951.
IF THE CONTROL TABLE INDICATES THAT THE TASK IS TO BE SUSPENDED, IT SUSPENDS ITSELF FOR THE SPECIFIED NUMBER OF MINUTES OR INDEFINITELY.
IF AN ERROR RETURN CODE INDICATES THAT DISPLAY 8951 IS NO LONGER ACTIVE, THE TASK WILL TERMINATE.
IF THE CONTROL TABLE INDICATES THAT THE TASK IS TO BE DELETED, IT WILL TERMINATE ITSELF.

ENTRY CONDITIONS: SCHEDULED BY TASK DTS1.

INPUT: NONE

EXTERNAL CALLS:
MS20 - TABULAR DATA DISPLAY REQUEST
MS10 - SUSPEND TASK INDEFINITELY
MS12 - SUSPEND TASK FOR A SPECIFIED TIME

EXIT:
MS06 - TERMINATE

COMMON ITAB(6,6)
DIMENSION IKOUNT(2)
I = 4
1 ITAB(I,6) = ITAB(I,6) + 1
WRITE (0,10) ITAB(I,6)
10 FORMAT (18)
READ (0,20) IKOUNT
20 FORMAT (2A4)
CALL MS20 (IRC,8951,-5-8*I,8,IKOUNT(1),$500)
 IF (ITAB(I,1)) 100, 200, 1
100 IF (ITAB(I,2) .EQ. 0) G0 TO 150
CALL MS12 (3, ITAB(I,2))
G0 TO 160
150 CALL MS10
160 IF (ITAB(I,1) .LT. 0) ITAB(I,1) = 1
G0 TO 1
500 IF (IRC .NE. 1) G0 TO 900
ITAB(I,1) = 0
200 CALL MS06
900 CALL ABEND(IRC,12)
END

NO ERRORS
SUBROUTINE DTSE

TASK SCHEDULING DEMONSTRATION DUMMY TASK

TASK TYPE: NON-PERIODIC

FUNCTIONALLY, THIS TASK IS THE SAME AS DISD

COMMON ITAB(6,6)
DIMENSION IKOUNT(2)

I = 5

ITAB(I,6) = ITAB(I,6) + 1
WHITE (0,10) ITAB(I,6)

10 FORMAT (18)
READ (0,20) IKOUNT

20 FORMAT (2A4)
CALL M$20 (IRC,8951,-5-8*1,8,IKOUNT(1),$500)
IF (ITAB(I,1)) 100, 200, 1

100 IF (ITAB(I,2),EQ, 0) G0 T0 150
CALL M$12 (3, ITAB(I,2))
GO T0 160

150 CALL M$10

160 IF (ITAB(I,1),LT, 0) ITAB(I,1) = 1
GO T0 1

500 IF (IRC,NE, 1) G0 T0 900
ITAB(I,1) = 0

200 CALL M$06

900 CALL ABEND(IRC,13)
END

NO ERRORS
SUBROUTINE DTSF

C TASK SCHEDULING DEMONSTRATION DUMMY TASK
C TASK TYPE: NON-PERIODIC
C FUNCTIONALLY, THIS TASK IS THE SAME AS DTSO

C
COMMON ITAB(6,6)
DIMENSION IKOUNT(2)
I = 6
1 ITAB(1,6) = ITAB(1,6) + 1
WHITE (0,10) ITAB(1,6)
10 FORMAT (18)
READ (0,20) IKOUNT
20 FORMAT (2A4)
CALL M$20 (IRC,B951,-5-B*1,8,IKOUNT(1),$500)
IF (ITAB(I,1)) 100, 200,1
100 IF (ITAB(I,2),EQ,0) GO TO 150
CALL M$12 (3, ITAB(I,2))
G2 TO 160
150 CALL M$10
160 IF (ITAB(I,1),LT,0) ITAB(I,1) = 1
G0 TO 1
500 IF (IRC,NE,1) GO TO 900
ITAB(I,1) = 0
200 CALL M$06
900 CALL AREND(IRC,14)
END

NO ERRORS
APPENDIX A - CDA Display Librarian Input Control Cards
MULTI-PROCESSOR CONTROL SYSTEM

MPCS DEMONSTRATION

T, MPCS HAS BEEN DESIGNED TO PROVIDE FACILITIES FOR CONCURRENT EXECUTION
T, OF JOB COMPONENTS (TASKS) BY MULTIPLE PROCESSORS. THESE FACILITIES
T, INCLUDE SYSTEM SERVICES FOR TASK CONTROL, CROSS-PROCESSOR COMMUNICATION
T, AND CRT DISPLAY SUPPORT IN ADDITION TO THE CAPABILITIES PROVIDED BY
T, THE CHAME OPERATING SYSTEM.

T, THIS DEMONSTRATION HAS BEEN ORGANIZED INTO SEVERAL SECTIONS EACH OF
T, WHICH CAN BE USED INDEPENDENTLY BY SELECTING THE APPROPRIATE LIGHT PEN
T, ON
T, OPTION BELOW.

T,  <**> DISPLAY LIBRARY GENERATION FACILITIES
T,  <**> REAL-TIME DISPLAY FACILITIES
T,  <**> OPERATING SYSTEM FACILITIES

T, NOTE - IN ORDER TO SELECT AN OPTION, TOUCH THE LIGHT PEN BEAM TO ONE
T, OF THE ASTERISK SYMBOLS AND DEPRESS THE BUTTON ON THE SIDE OF
T, THE LIGHT PEN.

T,  <**> TERMINATE DEMONSTRATION

SSSSSS DISPLAY 8900 HAS BEEN ADDED TO LIBRARY SSSSSS

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DISPLAY LIBRARY GENERATION FACILITIES

There are four basic steps in generating the display library for application programs.

1. Define the displays necessary for the application or application unit.
2. Using the display librarian language (DLL), code the display formatting information and punch this information into source cards.
3. Input the source cards to the display librarian program which in turn will create a magnetic tape containing the display library.
4. Transfer the display library from magnetic tape (hard storage) to the 810B disk for on-line execution.

The display library is created by the display librarian program using the DLL coded input. DLL is an easy to use coding language consisting of eleven operators. They are:

- Output option -O-
- Input option -I-
- Name -N-
- Pen -P-
- Compose -C-
- Text -T-
- Legality -X-
- Line -L-
- Delete -D-
- Text control -E-

DISPLAY 8911 gives a functional explanation of these source records.

<SELECT 8911>

$$$$$$$ DISPLAY 8910 HAS BEEN ADDED TO LIBRARY $$$$$$$
DISPLAY LIBRARIAN LANGUAGE SOURCE RECORDS

DLL SOURCE RECORDS ARE OF THREE TYPES.

1. RECORDS REQUIRED TO INPUT PROGRAM OPTION SELECTIONS AND CONTROL PARAMETERS TO THE LIBRARIAN PROGRAM. RECORDS OF THIS TYPE ARE THE INPUT OPTION, INPUT OPTION, NAME, TEXT CONTROL, END, AND DELETE RECORDS.

2. CONTROL PAGE RECORDS WHICH CONTAIN CONTROL INFORMATION REQUIRED FOR EXECUTION OF THE DISPLAY OPTIONS BY THE ON-LINE DISPLAY PROGRAM. THE DISPLAY OPTIONS FOR WHICH CONTROL INFORMATION IS INPUT BY THESE RECORDS ARE KEYBOARD DATA ENTRY, LIGHT PEN OPTION, AND LINE VECTOR DISPLAY. RECORDS OF THIS TYPE ARE THE PEN, COMPOSE, LEGALITY, AND LINE RECORDS.

3. TEXT RECORDS WHICH DEFINE THE DATA THAT IS TO APPEAR ON THE DISPLAY. TEXT RECORDS ALSO DEFINE THE AREAS ON THE DISPLAY WHERE THE DISPLAY OPTIONS ARE TO APPEAR, AND THEY CONTAIN DATA TO DEFINE APPLICATION PROGRAM FILL-IN AREAS ON THE DISPLAY.

DISPLAYS 8912-8915 GIVE FORMAT ILLUSTRATIONS OF THE DLL SOURCE RECORDS.

<SELECT 8912>

$$$$$$ DISPLAY BY11 HAS BEEN ADDED TO LIBRARY$$$$$$
THE CODED DLL SOURCE RECORDS ARE INPUT TO THE DISPLAY LIBRARIAN PROGRAM ON 80 COLUMN PUNCHED CARDS AND EACH RECORD REQUIRES AN IDENTIFIER CHARACTER IN CARD COLUMN 1.

OUTPUT OPTION CARD -O-
- OPTIONAL CONTROL CARD, IF NOT INCLUDED IN INPUT DECK THE DISPLAY LIBRARIAN WILL ASSUME THE 'P' OPTION WAS SELECTED.
- S=LIST SOURCE CARDS
- P=OUTPUT PRINTED DISPLAYS TO LINE PRINTER
- L=WRITE-ADD DISPLAYS TO DISPLAY LIBRARY

INPUT OPTION CARD -I-
- INPUT NORMALLY IS FROM CARDS, FOR CARD MAGNETIC TAPE INPUT, THIS OPTION CARD IS USED

NAME CARD -N-
- XXXX IS THE DISPLAY NAME TAG, IT CAN BE ANY FOUR DIGIT NUMBER FROM 0001 THROUGH 9999. DISPLAY NAME TAGS FROM 0001 THROUGH 8999 WILL BE USED FOR NORMAL DISPLAYS AND DISPLAY NAME TAGS FROM 9000 THROUGH 9999 WILL BE USED FOR SPECIAL DISPLAYS. FOR A DESCRIPTION OF SPECIAL DISPLAYS, SELECT THE 9050 PEN OPTION WHICH FOLLOWS <SELECT 9050>

FOR FORMAT ILLUSTRATIONS OF THE REMAINING DLL SOURCE RECORDS SELECT <SELECT 8913>

$$$$ DISPLAY 8912 HAS BEEN ADDED TO LIBRARY $$ $$ $$ 
DISPLAY 8913 HAS BEEN ADDED TO LIBRARY $$$$$$
DISPLAY LIBRARIAN LANGUAGE = SOURCE RECORD FORMATS -3-

1. LINE CARD =L-

LINE VECTORS AND TEXT UNDERLINES CAN BE INCLUDED IN THE DISPLAY.

THERE ARE TWO FORMATS-

1. L,C,III,JJJJ,KKKK,LLLL = LINE VECTOR SPECIFIED

III=FROM X ORIGINATE JJJJ=FROM Y ORIGINATE

KKKK=TO X ORIGINATE LLLL=TO Y ORIGINATE

2. L,L,MM,NN,00,PP = TEXT UNDERLINE SPECIFIED

MM=FROM CHARACTER NUMBER NN=FROM LINE NUMBER

00=TO CHARACTER NUMBER PP=TO LINE NUMBER

SHOWN BELOW ARE EXAMPLES OF LINE VECTOR AND TEXT UNDERLINE USAGE-

THE LINES SHOWN AT THE RIGHT WERE SPECIFIED IN TEXT UNDERLINE FORMAT BY-

*SELECT Hi**SELECT LOW* 

*SELECT Hi**SELECT LOW* 

THEREFORE, THEY COULD HAVE BEEN SPECIFIED IN LINE VECTOR FORMAT BY-


THE LINES NOW SHOWN IN THE EXAMPLE AT RIGHT, WERE SPECIFIED BY-


THE FORMAT ILLUSTRATIONS ARE INCLUDED ON DISPLAY 8915. <SELECT 8915>

END

$$$$$$ DISPLAY 8914 HAS BEEN ADDED TO LIBRARY $$$$$
DISPLAY LIBRARIAN LANGUAGE - SOURCE RECORD FORMATS -4-

TEXT CONTROL CARD - T -

- THIS CONTROL CARD IS USED TO ADVISE THE DISPLAY LIBRARIAN PROGRAM THAT ALL CONTROL PAGE SOURCE RECORDS FOR THE DISPLAY HAVE BEEN INPUT.

- IT MUST IMMEDIATELY FOLLOW THE LAST CONTROL PAGE SOURCE CARD IN THE INPUT DECK.

TEXT CARD - T -

- THE J'S REPRESENT TEXT DATA. EACH RECORD WILL DEFINE ONE LINE OF TEXT ON THE DISPLAY AND MAY CONTAIN UP TO SEVENTY-FIVE TEXT CHARACTERS. A MAXIMUM OF THIRTY-FIVE TEXT RECORDS ARE ALLOWED FOR A NORMAL DISPLAY.

- ALL TEXT RECORDS MUST FOLLOW THE TEXT CONTROL CARD IN THE INPUT STREAM, AND MUST BE IN THE ORDER THE TEXT IS TO APPEAR ON THE DISPLAY.

- CHARACTERS THAT WILL HAVE SPECIAL MEANING IN THE TEXT DATA ARE - # AND # INDICATING A PEN OPTION, THE * INDICATING A COMPOSE FIELD OR SUBFIELD, AND THE # INDICATING AN APPLICATION PROGRAM FILL-IN FIELD.

END CARD - E -

- INDICATES END OF INPUT DATA FOR A DISPLAY.

DELETE CARD - D -

- XXXX = DISPLAY NAME TAG. DELETES DISPLAY XXXX FROM THE DISPLAY LIBRARY TAPE.

END

$$$$$$ DISPLAY 8915 HAS BEEN ADDED TO LIBRARY$$$$$$
DISPLAY FACILITIES

DISPLAY CONSOLE OPERATOR CONTROL CAPABILITIES

- **<< KEYBOARD DATA ENTRY**
- **<< LIGHT PEN VERSION SELECTION**
- **<< FUNCTION SWITCH PROGRAM ACTIVATION**

APPLICATION PROGRAM DISPLAY CAPABILITIES

- **<< TABULAR DATA (FILL-IN) DISPLAY**
- **<< DATA CURSOR CONTROL**
- **<< ONE-LINE MESSAGE DISPLAY**
- **<< NEW DISPLAY REQUEST**
- **<< FUNCTION SWITCH ATTACH-DETACH**

To obtain detailed illustrations of any of these facilities, use the light pen to select the appropriate option.

END

$SSSSSS DISPLAY 8920 HAS BEEN ADDED TO LIBRARY $SSSSSS

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DISPLAY FACILITIES - KEYBOARD DATA ENTRY

The console keyboard can be used to enter data into pre-defined compose fields in a display and to cause the entered data to be passed to an application program for processing.

The compose fields appear on the screen as slash characters. They are replaced with input data as it is received. A data cursor appears on the screen to indicate where the next input character will be placed.

It can be positioned at any compose field character desired by the operation.

After all desired data has been entered for a given compose field, the operation can use the "return" key to pass the data to an application program. When the "return" key is depressed, the task associated with the compose field is scheduled for execution in the 840 and one of the following will appear on the screen depending on how the compose field was defined.

1. A new display
2. The same display (refreshed to original form)
3. The same display (unrefreshed)

$$DISPLAY 8930 HAS BEEN ADDED TO LIBRARY$$
DISPLAY FACILITIES - KEYBOARD DATA ENTRY

1. A CURSOR CONTROL IS PROVIDED THROUGH THE USE OF SEVERAL SPECIAL KEYS.

<table>
<thead>
<tr>
<th>KEY</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEMI-COLON</td>
<td>CURSOR RIGHT</td>
</tr>
<tr>
<td>DELETE</td>
<td>CURSOR LEFT</td>
</tr>
<tr>
<td>CYLON</td>
<td>CURSOR UP</td>
</tr>
<tr>
<td>LINE FEED</td>
<td>CURSOR DOWN</td>
</tr>
<tr>
<td>&quot;AT&quot; SIGN</td>
<td>CURSOR HOME (FIRST COMPOSE FIELD)</td>
</tr>
</tbody>
</table>

THE VALID DATA ENTRY KEYS INCLUDE:

- ALPHABETIC A-Z
- NUMERIC 0-9
- SPECIAL . , ? ' ( ) # # = + - * # # BLANK

ALL OTHER CHARACTERS WILL BE IGNORED.

USE THE FOLLOWING SAMPLE COMPOSE FIELDS TO GET THE FEEL OF DATA ENTRY AND CURSOR MANIPULATION.

1. COMPOSE FIELD A: DATE = /// /// /// (MONTH DAY YEAR)
2. COMPOSE FIELD B: VELOCITY = /// /// /// (FEET PER SECOND)
3. COMPOSE FIELD C: \
   
THE DATA YOU HAVE ENTERED WILL BE RE-DISPLAYED IN THE ONE-LINE MESSAGE AT THE BOTTOM OF THE SCREEN.

IT SHOULD BE NOTED THAT ONLY ONE COMPOSE FIELD CAN BE PROCESSED AT A TIME. WHENEVER THE CURSOR IS MOVED TO A NEW COMPOSE FIELD, THE INPUT BUFFER IS RE-INITIALIZED WITH BLANKS.

END

$\text{DISPLAY 8931 HAS BEEN ADDED TO LIBRARY}$
DISPLAY FACILITIES - INPUT DATA CHECKING

DATA ENTERED VIA THE CONSOLE KEYBOARD CAN BE EXAMINED FOR VALIDITY AUX-
TOMATICALLY THROUGH THE USE OF PRE-DEFINED LEGALITY DATA. THIS DATA CAN
SPECIFY VALIDITY CHECKS TO BE MADE ON BOTH TYPE AND MAGNITUDE OF
THE INPUT DATA. FOR PURPOSES OF VALIDITY CHECKING, A COMPOSE FIELD
CAN BE BROKEN DOWN INTO SUBFIELDS WITH A DATA TYPE AND ONE OR MORE SEX-
TS OF LIMITS SPECIFIED FOR EACH SUBFIELD. THESE LEGALITY CHECKS, IF SPEX-
IFIED, ARE PERFORMED WHEN THE OPERATOR DEPRESSES THE "RETURN" KEY. IF
AN ERROR IS DETECTED, A MESSAGE IS DISPLAYED AT THE BOTTOM OF THE SCREEN.
AND THE CURSOR IS POSITIONED TO THE INVALID CHARACTER OR TO THE SUBFIELD
WHICH IS OUT OF LIMITS.

THE LEGALITY SPECIFICATIONS FOR THE FOLLOWING COMPOSE FIELDS ARE SHOWN

<table>
<thead>
<tr>
<th>COMPOSE FIELD A</th>
<th>/// /// /// (MONTH DAY YEAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBFIELD 1</td>
<td>ALPHABETIC WITH VALUES LIMITED TO JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,DEC</td>
</tr>
<tr>
<td>SUBFIELD 2</td>
<td>DECIMAL WITH VALUES LIMITED TO 01-31</td>
</tr>
<tr>
<td>SUBFIELD 3</td>
<td>DECIMAL WITH VALUES LIMITED TO 2001</td>
</tr>
<tr>
<td>COMPOSE FIELD B</td>
<td>/// /// ///</td>
</tr>
<tr>
<td>SUBFIELD 4</td>
<td>ALPHABETIC WITH VALUES LIMITED TO X,Y,Z</td>
</tr>
<tr>
<td>SUBFIELD 5</td>
<td>SPECIAL WITH VALUES LIMITED TO ¯,#,#</td>
</tr>
<tr>
<td>SUBFIELD 6</td>
<td>SPECIAL WITH VALUES LIMITED TO *,-,BLANK</td>
</tr>
</tbody>
</table>

NOTE THAT LEGALITY CHECKING SUBFIELDS DO NOT NECESSARILY HAVE TO HAVE A ONE-TO-ONE CORRESPONDENCE TO THE SUBFIELD DIVISIONS ON THE SCREEN.
<CONNX>

DISPLAY 8932 HAS BEEN ADDED TO LIBRARY $$$$
DISPLAY FACILITIES - LIGHT PEN OPTION SELECTION

The light pen can be used to select an option from one or more pre-defined options in a display.

Options appear on the screen enclosed between less-than (#), greater-than (#) characters.

When an option is selected by the operator, the task associated with the option (if one was pre-defined) will be scheduled for execution in the 840 and one of the following will appear on the screen depending on how the option was defined:

1. A NEW DISPLAY
2. THE SAME DISPLAY (REFRESHED TO ORIGINAL FORM)
3. THE SAME DISPLAY (UNREFRESHED)

Note that options differ from compose fields in that a task may or may not be scheduled. This is because there is no other operator-entered data associated with an option which requires processing by a task.

Two standard options exist at the bottom of the screen for every display:

1. The first provides the capability to return the preceding display to the screen. No task gets scheduled by selection of this option. The second standard option is associated with the one-line message, usually.

Selection of this option will not cause either a new display to be loaded or a task to be scheduled. However, the capability exists to allow application programs to specify a display and/or a task to be associated with the option.

END

$\text{DISPLAY 8933 HAS BEEN ADDED TO LIBRARY}\$
DISPLAY FACILITIES - FUNCTION SWITCH PROGRAM ACTIVATION

THE FUNCTION SWITCHES LOCATED ON EACH SIDE OF THE SCREEN CAN BE USED TO ACTIVATE APPLICATION PROGRAMS. HOWEVER, BEFORE THEY CAN BE UTILIZED, AN APPLICATION PROGRAM MUST HAVE ATTACHED TASKS TO THE ASSOCIATED SWITCHES. (REFER TO THE APPLICATION PROGRAM DISPLAY CAPABILITIES.) THE TASK CURRENTLY ATTACHED TO A GIVEN SWITCH WILL BE SCHEDULED FOR EXECUTION EACH TIME THE SWITCH IS RAISED.

FOR PURPOSES OF DEMONSTRATION, USE THE LIGHT PEN TO SELECT ONE OR MORE OF THE SWITCHES TO BE ATTACHED. THEN RAISE THE SWITCH(ES) TO ACTIVATE THE ASSOCIATED TASK(S).

END OF SECTION>
DISPLAY FACILITIES - PROGRAM TABULAR DATA DISPLAY

APPLICATION PROGRAMS EXECUTING IN THE 840 CAN DISPLAY DATA IN PRE-DEFINED
FIELDS WHICH APPEAR ON THE SCREEN AS POUND SIGNS WHEN A GIVEN DISPLAY
IS INITIALLY LOADED. THE POUND SIGNS ARE REPLACED WITH THE TABULAR
DATA AS IT IS RECEIVED FROM APPLICATION PROGRAMS.

CAPABILITIES ARE PROVIDED TO ENABLE APPLICATION PROGRAMS TO ADD TO
PREVIOUSLY DISPLAYED DATA, DELETE PREVIOUSLY DISPLAYED DATA, OR UPDATE
PREVIOUSLY DISPLAYED DATA. USE THE LIGHT PEN OR KEYBOARD TO ACTIVATE
DEMONSTRATIONS OF THESE CAPABILITIES.

1. ADD 3 CHARACTERS EACH TIME SELECTED

2. DELETE ALL PREVIOUSLY DISPLAYED TABULAR DATA

3. UPDATE CHARACTERS 5-7 EACH TIME SELECTED

4. UPDATE STARTING AT CHARACTER // WITH //////

AA  BBBBB

SUBFIELD A - DECIMAL VALUE FROM 01-48
SUBFIELD B - ANY DISPLAYABLE CHARACTERS

###  ####
###  ####
###  ####
###  ####
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<CONX

DISPLAY 8Y40 HAS BEEN ADDED TO LIBRARY $$$$$$
DISPLAY FACILITIES - PROGRAM DATA CURSOR CONTROL

APPLICATION PROGRAMS EXECUTING IN THE 84D CAN MOVE THE DATA CURSOR TO
THE BEGINNING OF ANY COMPOSE FIELD ON THE CURRENT DISPLAY. THIS CAPABILITY
SHOULD BE USED WITH DISCRETION SINCE IT RE-INITIALIZE THE KEYBOARD INPUT BUFFER WITH BLANKS. IF THE CONSOLE OPERATOR HAS JUST KEYED IN A
LENGTHY COMPOSE FIELD, HE WON'T APPRECIATE HAVING HIS DATA DESTROYED.

FOR DEMONSTRATION PURPOSES, USE THE LIGHT PEN TO SELECT A COMPOSE FIELD TO WHICH THE CURSOR SHALL BE MOVED. YOU STILL HAVE THE CAPABILITY TO
CONTROL THE CURSOR FROM THE KEYBOARD.

1 ////////////// <1>
2 // // <2>
3 // // <3>
4 ////////////// <4>

<CONX>

DISPLAY 8941 HAS BEEN ADDED TO LIBRARY $$$$
DISPLAY FACILITIES - PROGRAM ONE-LINE MESSAGE DISPLAY

Application programs executing in the 840 can display messages in the special one-line message area at the bottom of the screen. In addition,

the capability exists to specify a display tag and a task name to be attached to the light pen option associated with the one-line message.

It should be noted that the message area is unprotected in the sense that a message may be replaced with a message from the system or from another application program before it can be read by the operator.

When you selected this display a task was scheduled which issued the message shown below.

DISPLAY 8942 has been added to library $$$$$
APPLICATION PROGRAMS EXECUTING IN THE 840 CAN REQUEST A NEW DISPLAY TO APPEAR ON THE SCREEN WITH OR WITHOUT THE SCHEDULING OF A NEW TASK. SUCH A REQUEST CAN BE MADE IN ONE OF TWO MODES.

1. AUTOMATIC MODE - THE NEW DISPLAY IS LOADED IMMEDIATELY AND THE TASK, IF SPECIFIED, IS SCHEDULED FOR EXECUTION.


WHEN YOU SELECTED THIS DISPLAY A TASK WAS SCHEDULED WHICH ISSUED A DELAYED MODE REQUEST FOR THE NEXT DISPLAY IN THE DEMONSTRATION. PROCEED AT WILL.

DISPLAY 8443 HAS BEEN ADDED TO LIBRARY $S$$S$S$S$S

-70-
N, 8944
P, 8934, DPT3
P, 8920
P, 8920

1, 8944

DISPLAY FACILITIES = PROGRAM FUNCTION SWITCH ATTACH-DETACH
1.

APPLICATION PROGRAMS EXECUTING IN THE 840 MUST ATTACH TASKS TO THE
1.
DISPLAY CONSOLE FUNCTION SWITCHES (ONE TASK PER SWITCH FOR ANY NUMBER
1.
OF SWITCHES) BEFORE THE SWITCHES CAN BE UTILIZED. ONCE A TASK IS
1.
ATTACHED TO A SWITCH, IT IS SCHEDULED FOR EXECUTION EACH TIME THE
1.
SWITCH IS RAISED BY THE OPERATOR.
1.

APPLICATION PROGRAMS CAN ALSO DETACH TASKS FROM FUNCTION SWITCHES WHEN
1.
IT IS NECESSARY TO STOP THE FUNCTION SWITCH SCHEDULING PROCESS.
1.
The effects of the ATTACH-DETACH facility are illustrated in the section
1.
of the demonstration pertaining to Console Operator Capabilities.
1.

<FUNCTION SWITCHX
1,

<END OF SECTION>
1,

<CONX
1,

<END>
OPERATING SYSTEM FACILITIES

OPERATING SYSTEM SERVICES ARE AVAILABLE TO USERS THROUGH THE FOLLOWING EXECUTIVE CALLS.

- TASK SCHEDULING
  - PERIODIC
    - SINGLE-ENTRY
    - MULTIPLE-ENTRY
  - NON-PERIODIC
    - SINGLE-ENTRY
    - MULTIPLE-ENTRY
    - NEXT TASK

- TASK SUSPENSION
  - SPECIFIED PERIOD
  - INDEFINITELY

- TASK TERMINATION

- TASK DELETION

- CHECK TASK STATUS

- CROSS-TASK COMMUNICATION
  - INITIALIZE PARAMETERS-BUFFERS
  - TRANSMIT-RECEIVE

- CROSS-PROCESSOR COMMUNICATION

THIS LIST OF SERVICES INCLUDES ONLY THOSE UNIQUELY SUPPLIED BY MPCS. ALSO AVAILABLE ARE THE SERVICES PROVIDED BY CHAM INCLUDING THOSE FOR PROCESSING I-O.

DISPLAY A950 HAS BEEN ADDED TO LIBRARY
T,8951 OPERATING SYSTEM - TASK SCHEDULING DEMONSTRATION

SIX TASKS HAVE BEEN PRE-DEFINED FOR USE IN DEMONSTRATING THE SCHEDULING

CAPABILITIES OF THE OPERATING SYSTEM, THIS DISPLAY CONTAINS COMPOSE
FIELDS AND LIGHT PEN OPTIONS TO BE USED BY YOU IN SPECIFYING CERTAIN
PARAMETERS AND ACTIVATING STOPPING CERTAIN FUNCTIONS, THIS ENABLES
YOU TO CONTROL THE DEMONSTRATION AND TO EXPERIMENT WITH VARIOUS TASK
CONFIGURATIONS.

T,TASK,A,B,C,D,E,F
T,TYPE,PER,PER,PER,NON-PER,NON-PER,NON-PER
T,RATE,10 SEC,100 MIL /// ///
T,PRIORITY,05,09,13,01,06,12
T, STATUS <A> ## ## ## ## ## ## ##
T, SCHEDULE <A> <B> <C> <D> <E> <F>
T, SUSPEND
T, MINUTES // // // // // //
T, INDEF <A> <B> <C> <D> <E> <F>
T, DELETE <A> <B> <C> <D> <E> <F>
T, TERMINATE
T, TASK DATA # ###### # ###### # ###### # ###### # ###### # ###### # ###### # ###### # ###### # ###### !
T, END

<END OF DEMONSTRATION>  

$$$$$ DISPLAY BY51 HAS BEEN ADDED TO LIBRARY $$$$$
SPECIAL DISPLAYS

SPECIAL DISPLAYS, characterized by tags ranging from 9000 - 9999, are unique in that they may contain only text information. No complex tables, tabular data, or light pen options are permitted in them. They are displayed from an auxiliary buffer while the preceding display is retained in the computer for re-display when the operator uses the light pen to return to prior level. All display inputs from either the keyboard or 840 application programs will be used to update the preceding normal display rather than the special display, special displays are designed for use when it is necessary to explain something in more detail than is possible in a one-line message, perhaps an error condition. They are limited to 12 lines of text.

$\text{SSSSSS DISPLAY 9050 HAS BEEN ADDED TO LIBRARY SSSSSS}$
NOTE: Dummy tasks are:

- DTSA
- DTSB
- DTSC
- DTSD
- DTSE
- DTSF
NOTE: Dummy tasks are:
- DTSA
- DTSB
- DTSC
- DTSD
- DTSE
- DTSF
DTS2

Set control table to suspend specified task

Y
Suspension request

N

Set up specified periodic rate for task DT6C

M$06
Tasks DTSB and DTSC are similar to DTSA.
Tasks DTSE and DTSF are similar to DTSD.
APPENDIX C - CDA Job Task Table Input Control Cards
REPEETITIVE, 10 SECONDS

REPEETITIVE, 100 MILLI-SECONDS

REPEETITIVE, 1 MINUTE
APPENDIX D - Simplified CDA Initialization
Simplified CDA Initialization

Assuming that the CDA displays are contained in the 810B disk library and the CDA programs are contained in the 840MP disk library, the following steps can be used to activate the MPCS CDA. It is also assumed that the operating systems of both computers have been loaded and are awaiting input commands.

810B console keyboard

/POSF, BI, MPCSDP.
/XFER, BI, F=0, L=5000.
/GOTO, R=300.

840MP console keyboard

CP MD
EX
PC

The 810B must be initialized first. The "READY" message should appear on the CRT before the 840MP commands are entered.