PP COMPASS

Instructor Guide

CONTROL DATA
CORPORATION

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INTRODUCTION

PP COMPASS PRETEST

ALS COURSE 53

1. The name of the routine which handles unit record equipment is ________________.

2. All jobs input to scope are placed ________________ before actual execution.

3. SCOPE uses the Exchange Package to:
   a. Store a job's time limit
   b. Store a job's name
   c. Exchange a job's execution sequence
   d. Store a job's registers

4. What routine(s) are in general control of the SCOPE operating system disk input/output.
   a. JANUS
   b. INTERCOM
   c. PFCCP
   d. 1SP

5. SCOPE system to user communication is provided:
   a. In CMR
   b. In labeled COMMON
   c. On Disk
   d. In RA+0 thru RA+77

6. SCOPE system routines are kept in one or more libraries.
   a. True
   b. False

7. The SCOPE system uses the FNT for:
   a. Storing information about a job while it is in execution
   b. Storing information about an executing job's files
   c. An input queue
   d. An output queue
   e. All of the above

8. What are the Pseudo channels used for? ________________

9. What is the EST in SCOPE? ________________

10. SCOPE uses two software packages to control system operation. One is pp code and the other is cp code. What are their names? ________________ ________________

PP COMPASS PRETEST

ALS COURSE 53

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   b. Storing information about an executing job's files
   c. An input queue
   d. An output queue
   e. All of the above

8. What are the Pseudo channels used for? CMR Table interlocks

9. What is the EST in SCOPE? Equipment Status Table

10. SCOPE uses two software packages to control system operation. One is pp code and the other is cp code. What are their names? MTR CPMTR

FOREWORD

This book is written to serve as a guide for a PP COMPASS {ALS Course No. 53}. This class should be of one week's duration with a maximum of sixteen students. This book contains many study questions which serve as learning stimuli. Included are copies of visuals which should be discussed during the class periods. Maximum benefits from this material is received when assigned problems are completed.

This course is intended for the student with an intensive background in computer systems but does begin with the basic concepts so as not to exclude a beginner.

GENERAL DESCRIPTION

Course Title: SCOPE 3.4 PP COMPASS

Course Number: 53

Course Length: 5 Days

Course Size: 16 Maximum

DESCRIPTION:

This course is designed to prepare the student for writing code for the Peripheral Processors of Control Data's CYBER and 6000 product lines. This code is used in the SCOPE operating system. This is a lecture plus laboratory course on theory and technique of SCOPE system programming.

PREREQUISITES:

To attend this course the student should have successfully completed the following courses:

SCOPE 3.4 Job Control	No. 22
Central Processor COMPASS	No. 32
SCOPE 3.4 Advanced Coding	No. 50
SCOPE 3.4 Analysis	No. 52

In lieu of attending these classes, a PP COMPASS Pre-test has been provdided to evaluate if pre-requisite classes should be waived.

COURSE OBJECTIVE:

The objective of this course is to prepare the student for writing PP programs which will interface with the SCOPE Operating System. To do this the student must demonstrate his ability to:

1. Understand the System Monitor
2. Understand the System PP resident routines
3. Use the Sysbem Symbols
4. Use the System MACROS
5. Understand External Input/Output

by performing satisfactorily on all exercises and examinations.

RESOURCE DATA

Instructional Materials

PP COMPASS Instructor/Student Guide
System Programmers Reference, Pub. No. 60306500
Instruction Description Reference Volume II, Pub. No. 60347300J

Student Materials

PP COMPASS Student Guide
System Programmers Reference, Pub. No. 60306500
Instruction Description Reference, Pub. No. 60347300

Computer Time

Normal time requirements are one half hour of dedicated time each day for five days.

COURSE OBJECTIVES

Upon successful completion of this course the student should be capable of accomplishing the following:

1. Understand and be capable of explaining the main functions of the SCOPE System monitors MTR and CPMTR. He should know how to make requests and receive replies from either monitor.

2. Describe the software functions performed by the Resident Routines of the pool processors. Be capable of using the resident routines to perform often used software functions.

3. Describe the purpose of using the System Symbols in writing PP code. Should be able to list several advantages of following System Symbol Convention. Should know the source of the System Symbols and should be capable of changing System Symbols.

4. Take full advantage of system Macros to perform often used pre-described programming functions. Should be able to change an existing macro or be able to add macros to the system definitions.

5. Describe the sequence of steps taken by a PP in performing input/output operations to peripheral equipment such as tape drives, line printers, or other equipment.

6. Should be able to add, delete, or change any existing PP system program in the system.

HOUR	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
1	INTRODUCTION LANGUAGE ELEMENTS	CODING CONVENTIONS	PP RESIDENT {cont'd}	EXTERNAL INPUT-OUTPUT	DEADSTART
2	SYSTEM OVERVIEW	PP MACROS			RELOCATABLE OVERLAYS
3	HARDWARE OVERVIEW	SYSTEM TABLES	MONITOR FUNCTIONS		
4	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
5	INSTRUCTIONS	PP RESIDENT	MONITOR FUNCTIONS {cont'd}	EXTERNAL I/O {cont'd} {SAMPLE I/O PROGRAMS}	RELOCATABLE OVERLAYS {cont'd}
6					SAMPLE PP PROGRAMS
7	PROBLEM 1 LAB	PROBLEM 1 LAB	PROBLEM 2 LAB	PROBLEM 2 LAB	FINAL EXAM EXTRA LAB

I. Introduction

- o Table of contents
- o Forward
- o General Description
- o Resourse Data
- o Course Objectives
- o Course Chart
- o Course Outline
- o Learning Objectives

II. LANGUAGE Elements — 1 Hr.

- o The communications challenge
- o PP COMPASS Definition
- o PP COMPASS Simplicity
- o Coding Formats
- o Setting up a PP program

III. System Overview — 1/2 Hr.

- o Basic job flow
- o Control Point Concept
- o Exchange Package
- o Example PP Coding control cards
- o Example CP job for calling PP program

IV. Hardware Overview — 1 Hr.

- o General Overview
- o Barrel and slot
- o PP Registers
- o A register arithmetic
- o PP Memory
- o Hardware features

V. Instructions 2 1/2 hrs.

- o Formats
- o Examples
- o Addressing Modes Summary
- o Addressing Modes Detail
- o Instruction categories
- o Load and Store
- o Add and subtract
- o Replace add
- o Logical
- o Shift
- o Jump
- o Instruction Problem Set 1
- o Instruction Problem Set 2
- o Instruction Problem Set 3
- o Instruction Set Answers {1-3}
- o Coding examples {12}
- o Central memory read & write
- o CRD
- o CRM
- o Instruction Problem Set 4

VI. Coding Conventions 1 Hr.

- o System symbol definitions
- o Examples of code using system symbols
- o Symbols come from system texts
- o System texts
- o Prog. Name Conventions

VII. PP MACROS 1 Hr.

- o PPENTRY
- o ENM
- o UJK
- o LDCA
- o CRI
- o BIT
- o LDK
- o ADK
- o SBK

VIII. System tables and pointers 1 Hr.

- o CMR Summary
- o CMR Table format description {prose}
- o CMR Pointer Area {Table} 1
- o CMR Pointer area {Table} 2
- o CMR Pointer area {Table} 3
- o CMR Pointer Area {Table} 4
- o Control Point Area {Table} 1
- o Control Point Area {Table} 2
- o Control Point Area Field definition
- o System Exchange package area {Tables}
- o PP Communications Areas {Description}
- o PP Communications Areas tables 1
- o PP Communications Areas tables 2
- o RA Communications areas

IX. PP Resident 4 1/2 Hrs.

- o Introduction
- o Structure
- o Transient secondary overlay

- o Functions
- o {1} Communication MTR - PGM
  {2} Loads transient Programs
- o Resident Routines {Individual Descriptions}
- o Resident Routines {Flow Charts}
- o Resident Routines Actual Code
- o Study Questions {Needs work}

X. Monitor Functions — 3 1/2 Hrs.

- o Monitor{s} defined
- o Two monitors {visual}
- o List of monitor functions
- o Detailed CPMTR functions
- o Detailed MTR functions
- o Monitor Request Processing {visual}

XI. External Input/Output — 5 1/2 Hrs.

- o The channel hardware concepts
- o CYBER Data channel {V}
- o Two types of I/O devices {V}
- o Channel communication

  Select
  Connect
  Function
  Example
- o How data input works
- o How data output works
- o How status request works
- o Channel characteristics
- o Channel I/O instruction list
- o Modes of channel functions

- o Modes of function codes
- o Programming the PP using function codes
- o How to request a channel {1}
- o How to request a channel {2}
- o How to request a channel {3}
- o How to drop a channel
- o How to request alternate channels {1}
- o How to request alternate channels {2}
- o How to request alternate channels {3}
- o Input/Output software subsystems

XII. Deadstart — 1 1/2 Hrs.

- o Master clear
- o Hardware boot
- o Software boot
- o Software boot flowcharts

XIII. Relocatable overlays — 2 Hr.

- o Relocatable overlay concepts
- o Relocatable overlay Macro for addresses
- o Flow description of relocation code.
- o Alternate method of relocating addresses

XIV. Sample PP Programs — 1 1/2 Hrs.

- o PP Prog Example code
- o CP Prog example code
- o Copy of card deck - PPTEST
- o Test error processing - bad address
- o Auto recall error
- o PP call error
- o Hung in auto recall

- o Hang PP
- o Assembly error - MJN won't reach
- o Abort

XV. Lab Problems plus Final Exam 3 Hrs.

LEARNING OBJECTIVES

LANGUAGE ELEMENTS

{1} To describe the communication challenge between man and computer showing the difficulty of task.

{2} To preview the simplicity of PP Compass in meeting the communication challenge

{3} Introduce PP Compass program structure.

{4} Use the various language elements to define major parts of a program.

SYSTEM OVERVIEW

{1} To describe the basic job flow through the SCOPE system

{2} To describe the "accounting" technique of control points

{3} To give students initial knowledge of entering PP programs into system using control cards

{4} To describe the process of calling a PP program from a CP program.

HARDWARE OVERVIEW

{1} To present an overview of the CYBER systems unique hardware.

{2} To introduce the programmable hardware features of the PP.

{3} To present the PP memory allocation concepts

{4} To present the additional system hardware features.

INSTRUCTIONS

{1} To present detailed information about programming the PP.

{2} To present central memory to PP Input Output instructions.

{3} To present sufficient coding examples and exercises to aid student in learning details of PP coding.

CODING CONVENTIONS

{1} To present the SCOPE System Symbol coding conventions

{2} To introduce freedom from hand coding by using symbols.

{3} To introduce SCOPE System Texts.

{4} To introduce SCOPE PP Programming naming conventions.

PP MACROS

(1) To present the MACRO as a time saving, error reducing programming aid.

(2) To present pre-defined programming concepts using MACROS.

(3) To introduce generalized coding techniques.

(4) To prepare student to write simple PP Macros.

SYSTEM TABLES AND POINTERS

(1) To present the necessary source information for coding system PP Programs.

(2) To present the normal methods of information exchange between user programs and system PP programs.

(3) To define a technique where the information desired by the PP programmer can be located although it may not be specifically described.

PP RESIDENT

(1) To present the detailed functions of PP Resident in order that the PP programmer may take full advantage of its functions.

(2) To present the interdependencies of the PP resident routines.

(3) To introduce the PP programmer to actual system code - STL.

MONITOR FUNCTIONS

(1) To define the SCOPE 3.4 System Monitor(s).

(2) To define methods for users to make requests of MTR or CPMTR

(3) To discuss specific MTR and CPMTR functions

(4) To discuss MTR and CPMTR request processing techniques (details)

EXTERNAL INPUT/OUTPUT

(1) To present the external I/O hardware used by the CYBER computers.

(2) To introduce the methods used by system I/O drivers in performing I/O.

(3) To present enough details on external I/O to allow coding of a simple PP program which will input some data from a peripheral device.

DEADSTART

{1} To present the sequence of events from the time the deadstart button is pushed.

{2} To give an overview of the software routines in the deadstart package.

{3} To present enough details of the deadstart matrix switch program to allow the system programmer to change tape channel selection for deadstarting.

RELOCATABLE OVERLAY

{1} To present the techniques and requirements for using relocating PP code.

{2} To present enough details of PP program relocation for the student to be able to follow some system routines which use the relocation techniques.

SAMPLE PP PROGRAMS

{1} To illustrate by example the usual methods of program structure.

{2} To illustrate by example the methods of PP programmer message transmission to dayfile.

{3} To illustrate by example error messages issued by system.

{4} To introduce the PP programmer to a PP dump.

{5} To introduce the PP program - 1RN.

PROBLEM GUIDE

The assigned problems are:

Problem 1 - due at end of second day
Problem 2 - due at end of fourth day

The problem statements may be found in Section XV.

Please work these problems individually and test them during the Lab periods.

There are optional problem statements for the ambitions students.

LANGUAGE ELEMENTS

PP COMPASS LANGUAGE ELEMENTS

Lesson Guide

REFERENCES:

PP Compass Student Guide Section II

TRAINING:

Visuals VALS-53-2-3 thru VALS-53-2-7

ASSIGNMENTS:

Study Questions Section II

OBJECTIVES:

{1} To describe the communication challenge between man and computer showing the difficulty of task.

{2} To preview the simplicity of PP Compass in meeting the communication challenge.

{3} Introduce PP Compass program structure.

{4} Use the various language elements to define major parts of a program.

PP COMPASS LANGUAGE ELEMENTS

Lesson Outline

II. LANGUAGE Elements

A. The communications challenge
- o Cultural language
- o Compiler language
- o Assembler language
- o Machine language

B. PP Compass Definition
- o Assembler
- o Comprehensive
- o For peripheral Processors

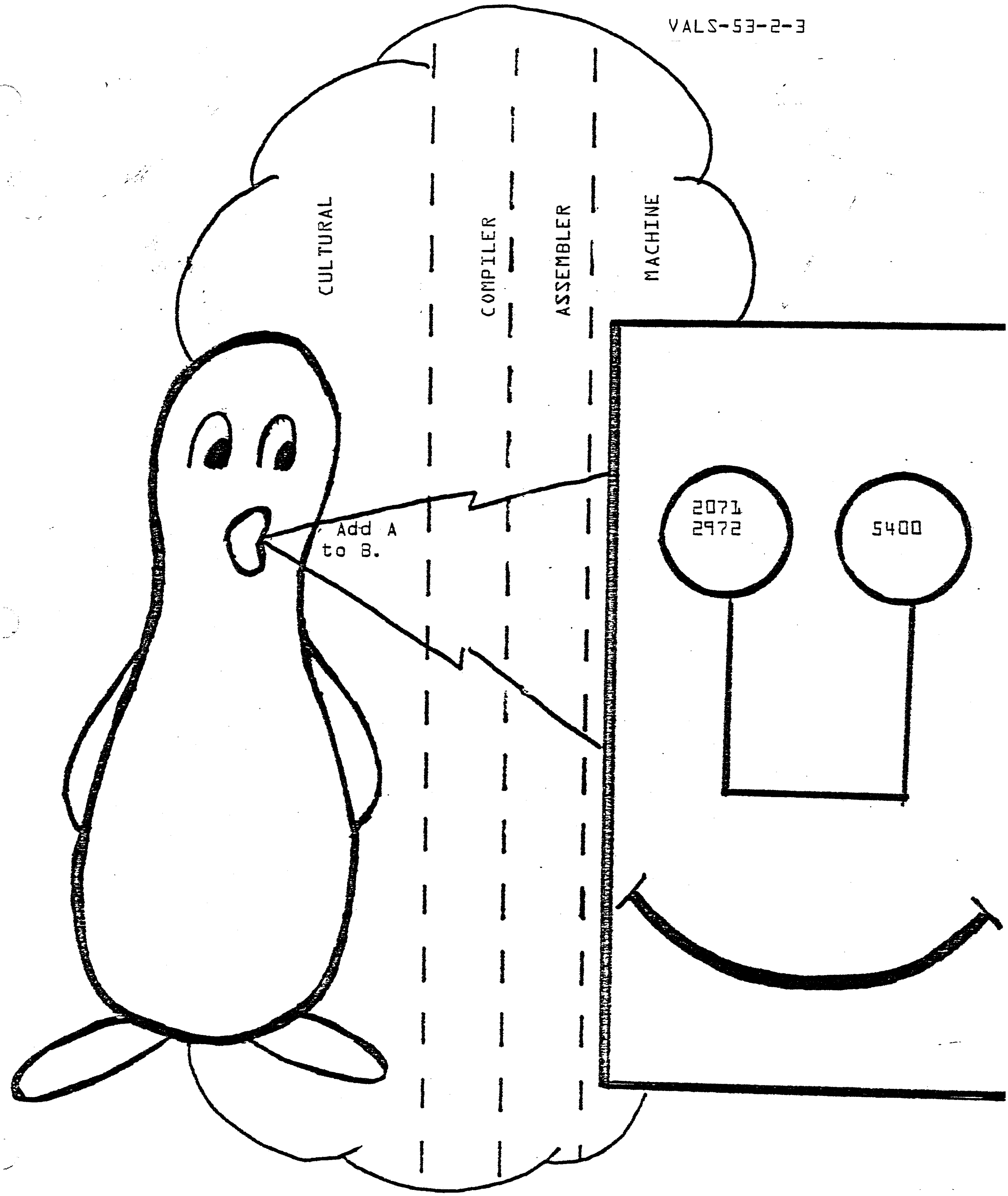
C. PP Compass Simplicity
- o Uses Symbolic Notation
- o Is easily modified
- o One to one instruction coorelation

D. Coding Formats
- o Program Limits definition
- o Program entry definition
- o Program exit procedure
- o Program documentation

E. Setting up a PP Program {Using system routines}
- o For identification
- o For ease in coding
- o For pre defined functions

THE COMMUNICATION CHALLENGE

VALS-53-2-3



PP COMPASS

Assembler

Comprehensive

Peripheral Processor

Assembler

- Language Processor
- Generates binary object code

Comprehensive

- Extensive language elements
- Control Data 6000, 7000, CYBER 70 and CYBER 170 machines
- PP or CP Code
- SCOPE or other Operating Systems
- Modular Data Control

PP (Peripheral Processor)

- 6000, CYBER 70, CYBER 170 PP
- 7000, CYBER 70, CYBER 170 PPU

PP COMPASS Simplicity

```
A = B + C          LDD   B          3010
                   ADD   C          3111
                   STD   A          3412
```

- Uses Symbolic notation
- Relieves the programmer of housekeeping chores
- Has one to one instruction code to machine code correlation
- May provide documentation
- Provides debugging aids
- Is easily modified

CODING FORMATS

```
1         11        18                       36
          IDENT     PGM, START
          PERIPH
          SST
          ORG       START

****           This is a comments section to describe
*              the function of this PP program
*
*              Written by John Doe,
*              Dec. 25, 1802
*
START     ______      Do housekeeping chores
          ______      Get Input Data
          ______
          ______
          ______      Solve Problem
          LJM       R.IDLE                   Get Out
          END
```

SETTING UP THE PP PROGRAM

```
                                    program name
              IDENT       PGM,C.PPFWA
pp code   →   PERIPH                     address to start
get system →  SST
symbols
              ORG         C.PPFWA
            → PPENTRY     D.PPIRB,D.TO
set up                                  used by R.RAFL
Direct Cells
               code                PP Input Register Buffer
                                   in the PP

              RJM         R.RAFL
                                         RAFL's and TAFL's
                                         as needed to access
                                         CM field
              RJM         R.TAFL

              LDN         M.DPP     ←   drop me code
              RJM         R.MTR     ←   go do it
              LJM         R.IDLE    ←   go to idle loop

              END
```

STUDY QUESTIONS

LANGUAGE ELEMENTS-SECTION II

1. Name four levels of man-machine communications languages.

   (1) ____________________

   (2) ____________________

   (3) ____________________

   (4) ____________________

2. The PP Compass Assembler generates ________________ code.

3. Why do system programmers use PP Compass?

4. A PP Compass program is identified as PP code by ______________

   ______________.

5. PP Compass is a

   (a) Machine language

   (b) Compiler language

   (c) High Level Language

   (d) Assembler language

STUDY QUESTIONS

LANGUAGE ELEMENTS-SECTION II

1. Name four levels of man-machine communications languages.

{1} Cultural
{2} Compiler
{3} Assembler
{4} Machine

2. The PP Compass Assembler generates binary object code.

3. Why do system programmers use PP Compass?

• to do Input/Output
• the system is mostly PP code.

4. A PP Compass program is identified as PP code by the PERIPH statement

5. PP Compass is a

{a} Machine language
{b} Compiler language
{c} High Level Language
{d} Assembler language

SYSTEM OVERVIEW

SYSTEM OVERVIEW

Lesson Guide

REFERENCES:

PP Compass Student Guide Section III

TRAINING AIDS:

Visuals VALS-53-3-3 thru VALS-53-3-5, VALS-53-3-7 thru VALS-53-3-8

ASSIGNMENTS:

Study questions Section III

OBJECTIVES:

(1) To describe the basic job flow through the SCOPE system.

(2) To describe the "accounting" technique of control points.

(3) To introduce the storage locations used as exchange packages.

(4) To give students initial knowledge of entering PP programs into system using control cards.

(5) To describe the process of calling a PP program from a CP program.

SYSTEM OVERVIEW

Lesson Outline

III. SYSTEM OVERVIEW

A. Basic Job Flow

- o Job deck thru JANUS to Input Queue
- o Input Queue to CM
- o CM to Output Queue
- o Output Queue thru JANUS to Printer

B. Control Point Concept

- o An "accounting" technique
- o Field associated with a control point
- o Information relating to a control point
- o Relative addresses
- o Length of field
- o Order of control point

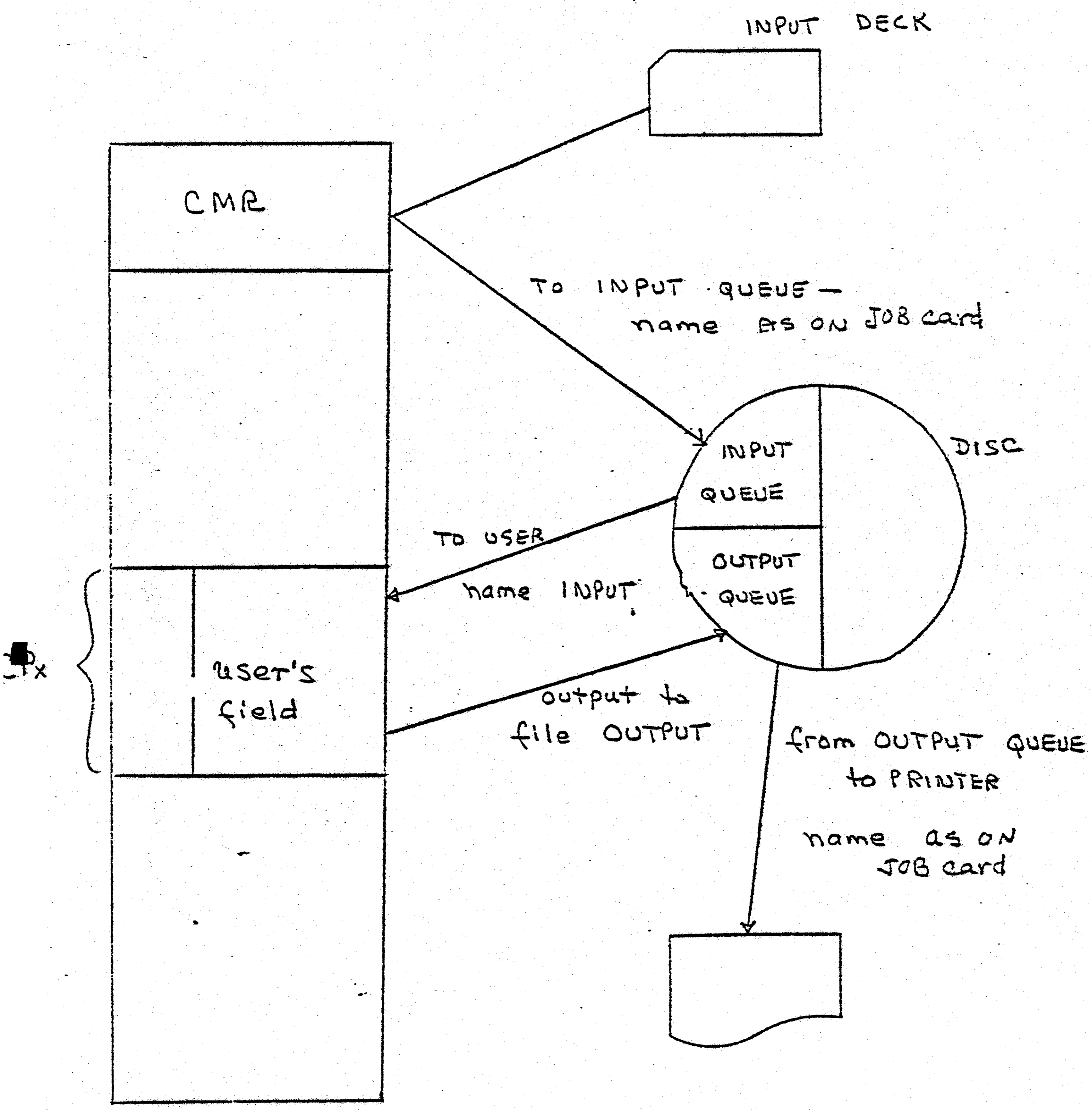
C. Exchange Package

- o Definition - storage locations
- o Method of exchange
- o Managed by Monitor

D. Example PP Coding Control Cards

- o Compiling a PP job
- o Entering code into system
- o Testing your PP code
- o Demonstrate calling CP program
- o Restoring system to condition before your PP code test.
- o Sample CP "calling program"

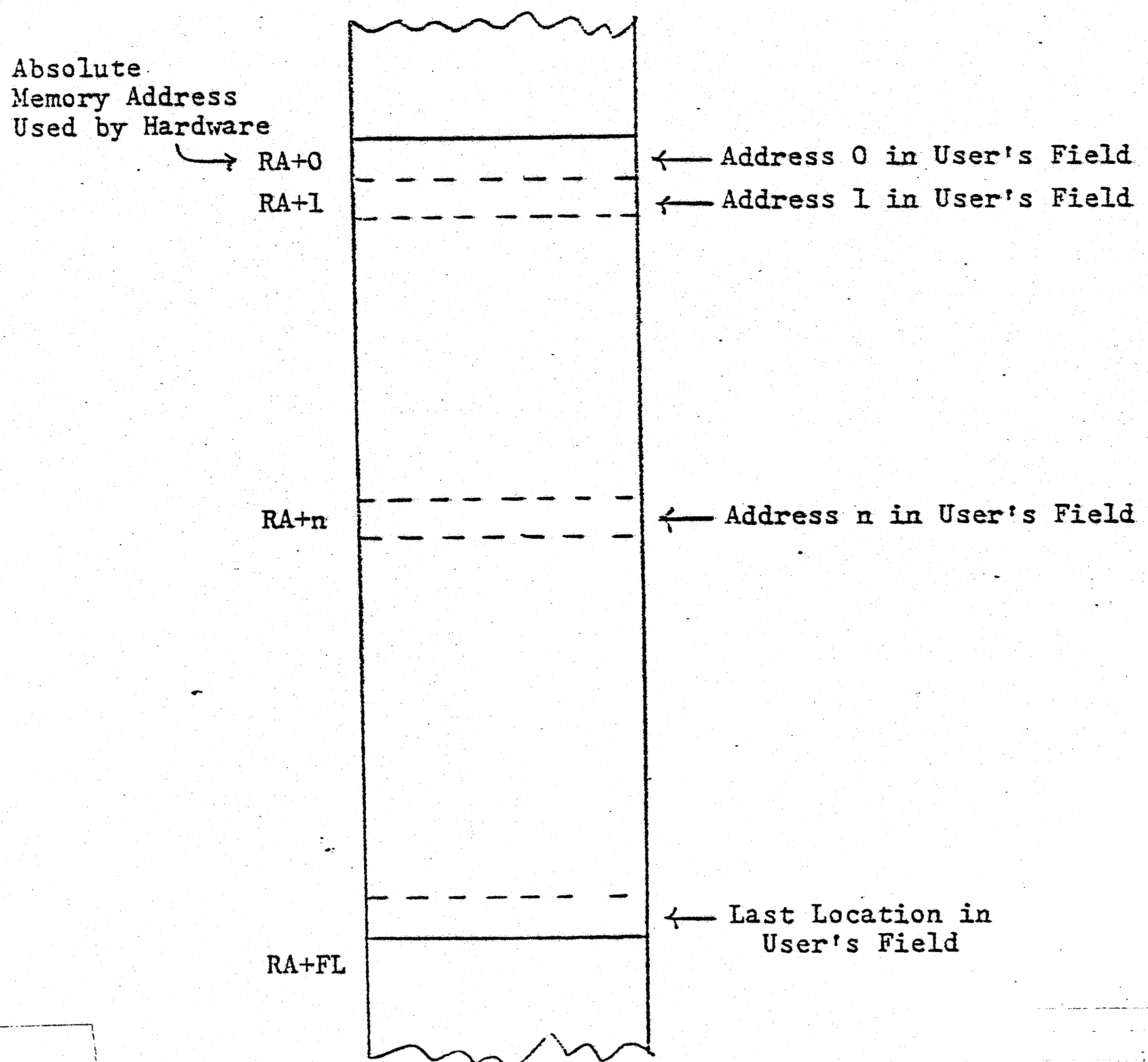
BASIC JOB FLOW



CONTROL POINT CONCEPT

- A USER PROGRAM WILL BE ASSIGNED TO A CONTROL POINT IN CENTRAL MEMORY
- THE CONTROL POINT IS A FIELD WHICH
  - BEGINS AT A REFERENCE ADDRESS 'RA' AND
  - IS OF A DEFINED LENGTH (IN WORDS) 'FL'

** . ALL ADDRESSES IN THE USER'S FIELD ARE RELATIVE TO RA ***



EXCHANGE PACKAGE

			WORD
Program Address(P)	A0(Address Registers)	B0	1
Reference Address(RA)	A1	B1(Increment Registers)	2
Field Length(FL)	A2	B2	3
Exit Mode(EM)	A3	B3	4
RA - ECS	A4	B4	5
FL - ECS	A5	B5	6
Mtr. Exchange Address	A6	B6	7
	A7	B7	8
X0(Operand Registers)			9
X1			10
X2			11
X3			12
X4			13
X5			14
X6			15
X7			16

SAMPLE EXCHANGE PACKAGE DUMP

DMPX.

P	000000	A0	050000	B0	000000
RA	061600	A1	000100	B1	000001
FL	050000	A2	000066	B2	047777
EM	070000	A3	044006	B3	047777
RE	000000	A4	042471	B4	000000
FE	000000	A5	043465	B5	043476
MA	002070	A6	000001	B6	042472
		A7	047777	B7	000101

X0	4000	0000	0000	0000	0000
X1	4000	0000	0000	0000	0000
X2	4000	0000	0000	0000	0000
X3	7776	0000	0000	0000	0000
X4	0000	0000	0000	0000	1000
X5	7777	7777	7777	7777	7000
X6	0002	0000	0000	0000	0000
X7	0000	0000	0000	0000	0004

PP Coding Control Cards

The following deck is an example method of:

1. Compiling your PP COMPASS job

2. Making your PP Code part of the system

3. Testing your PP Code (using a CP COMPASS calling program)

4. Restoring the system to the condition before your PP Code was added.

```
YOURJOB¬T100•

COMPASS {B= CPBIN¬ S = SCPTEXT}

COMPASS { B = PPBIN¬ S = SCPTEXT}

REWIND {PPBIN}

EDITLIB {SYSTEM}

LOAD {CPBIN}

EXECUTE {TEST}

DMP•

DMP {100¬400}

EDITLIB {SYSTEM¬RESTORE}

EXIT•

DMP {100¬400}

EDITLIB {SYSTEM¬ RESTORE}

♪   EOR    Place your CP program after This card

♪   EOR    Place your PP code after this card

♪   EOR    EDITLIB Directives after this card

READY {SYSTEM¬ OLD}

ADD {*¬ PPBIN}

COMPLETE•

ENDRUN•

♪   EOR

‡   EOF
```

SETTING UP THE CALLING CP PROGRAM

```
         IDENT    CPPGM
         ENTRY    TEST
TEST
          code

         SA1      CALL          put call in RA+1
         BX6      X1
         SA6      1
WT       SA1      1             wait till picked up
                                by MTR
         NZ       X1,WT
          code

                            pp program name
                                 recall bit if desired
         ENDRUN
CALL     VFD      24/4LPGMP,36/PARAM
                                      address in CM for
                                      pp program to
                                      find parameters or
                                      set complete bit
PARAM    BSSZ     1             PARAM in this case is a
                                fake FET in which the PP pgm
                                can set the complete bit to
                                bring the CP out of recall.

                                It may be any group of words,
                                such as a FET for I/O

         END      TEST
```

STUDY QUESTIONS

SYSTEM OVERVIEW - SECTION III

1. Before a job is executed by SCOPE it is first placed ________ ____________________.

2. A control Point is
   (a) a hardware concept
   (b) a software program
   (c) an accounting technique
   (d) system entry point

3. The users field length begins at ____________________.

4. The users field length ends at ____________________.

5. EDITLIB is a system routine to ____________________.

6. PP Programs are usually set into execution by ____________ ____________________.

7. What is RECALL?

STUDY QUESTIONS

SYSTEM OVERVIEW - SECTION III

1. Before a job is executed by SCOPE it is first placed on disk.

2. A control Point is
   - {a} a hardware concept
   - {b} a software program
   - {c} an accounting technique
   - {d} system entry point

3. The users field length begins at RA.

4. The users field length ends at RA + FL.

5. EDITLIB is a system routine to modify the system.

6. PP Programs are usually set into execution by RA + 1 call.

7. What is RECALL?

Drop the CP, restart when function completed.

HARDWARE OVERVIEW

HARDWARE OVERVIEW

Lesson Guide

REFERENCES:

PP Compass Student Guide Section IV

TRAINING AIDS:

Visuals VALS-53-4-4 thru VALS-53-4-9

ASSIGNMENTS:

Study Questions Section IV

OBJECTIVES:

{1} To present an overview of the CYBER systems unique hardware.

{2} To introduce the programable hardware features of the PP.

{3} To present the PP memory allocation concepts.

{4} To present the additional system hardware features.

HARDWARE OVERVIEW
Lesson Outline

IV. Hardware Overview

A. Conceptional relationships
- o I/O devices fixed to one or more channels.
- o bi-directional channels
- o Freedom of pool PP's
- o Monitor in PP0
- o DSD in PP1
- o Any PP may access all channels
- o PP to PP communication over any channel
- o I/O thru PP to central Memory
- o I/O thru CM to ECS
- o I/O thru PP to ECS via DDP
- o Expandability of channels
- o Expandability of PPs

B. Barrel and Slot
- o Time shared instruction control
- o PP hardware register overview
- o Read pyramid
- o Write pyramid
- o Channel access

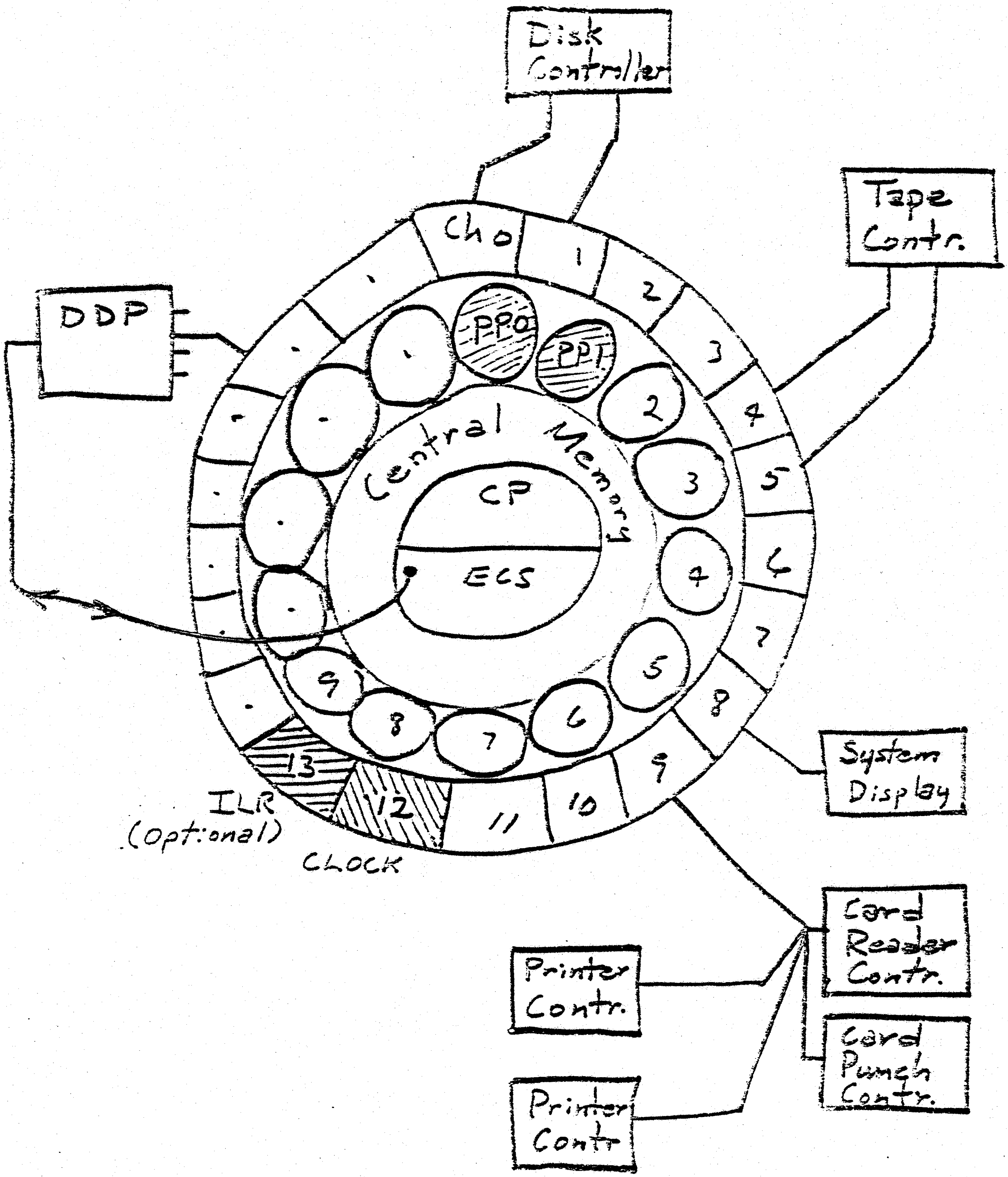
C. Registers
- o A-Arithmetic
- o P-Program
- o Q-Holding
- o K-Op code + trip count
- o Internal Arithmetic

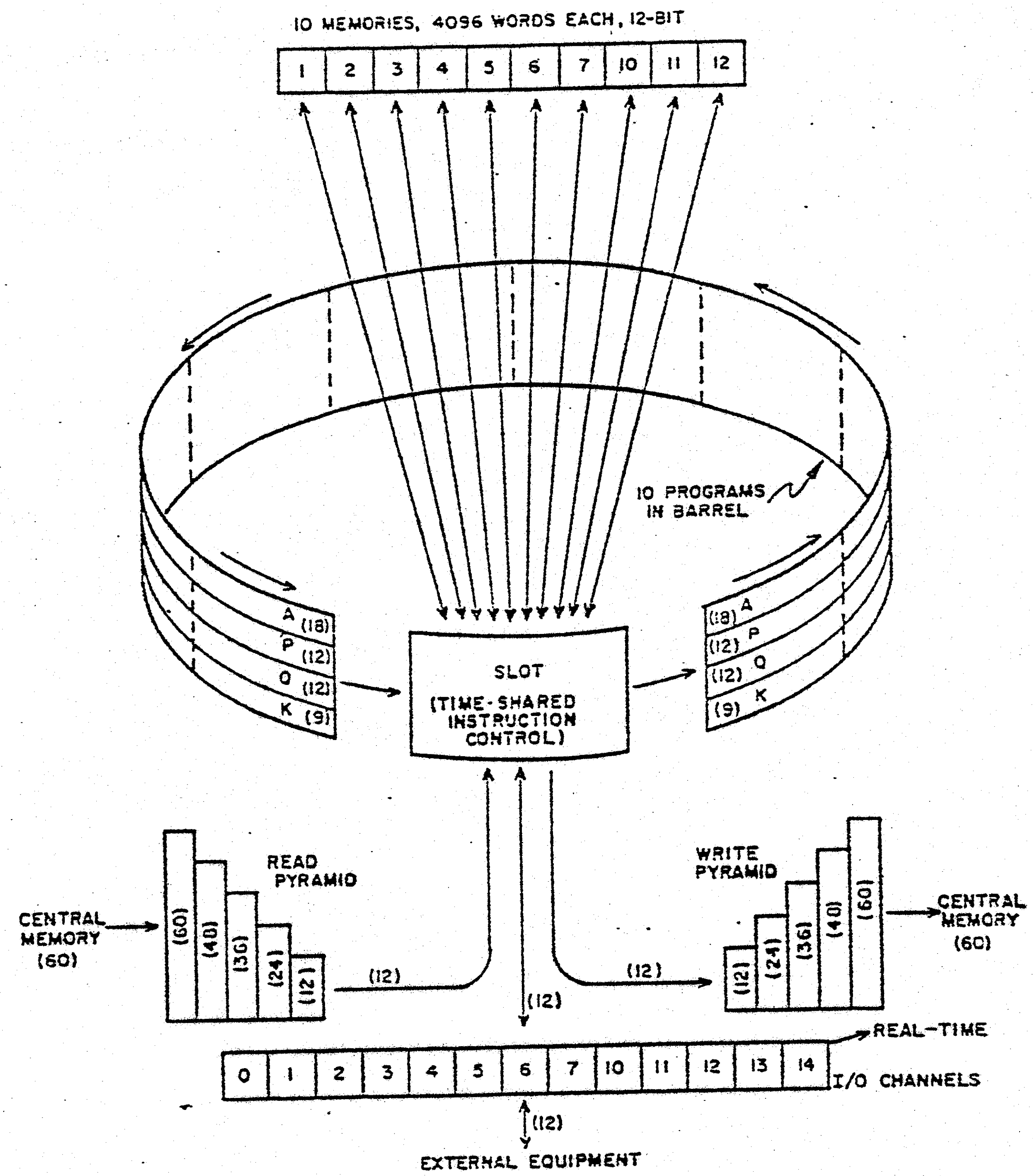
D. PP Memory
- o Direct Cells
- o User Memory

E. Additional Hardware

o	CEJ/MEJ	Central Exchange Jum
o	CMM	Compare Move Unit
o	DDP	Distribute Data Path

- ILR Interlock Register
- CMAP Central Memory Access Priority


Disk Controller
Tape Contr.
DDP
Cho
1
2
3
4
5
6
7
8
9
10
11
12
13
PPO
PP1
Central Memory
CP
ECS
ILR (Optional)
CLOCK
System Display
Card Reader Contr.
Card Punch Contr.
Printer Contr.
Printer Contr



Peripheral and Control Processors

REGISTERS

A

18 BITS

- MAIN ARITHMETIC REGISTER (ALSO ADDER)
  NO SIGN EXTENSION
  UPPER BITS ARE ZERO WHEN PP 12-BIT OR 6-BIT QUANTITIES ARE PUT THERE
- ALSO USED IN SOME I/O
  AND SHIFT, LOGICAL, INSTRUCTIONS
- HOLDS 18-BIT CM ADDRESSES (ABSOLUTE) FOR CENTRAL I/O

P

12 BITS

- HOLDS ADDRESS OF CURRENT INSTRUCTION
- ALSO USED IN I/O
  (TO HOLD DATA ADDRESS OF WHERE IN THE PP
  DATA IS GOING TO OR FROM)

Q

12 BITS - HOLDING REGISTER

- HOLDS ADDRESS
  - DELTA OF A 12-BIT INSTRUCTION
  - ADDRESS FROM DELTA FOR INDIRECT ADDRESSING
- HOLDS DELTA OF OTHER INSTRUCTIONS
- ALSO AN ADDER (ADDS +1 or -1 TO ITSELF)

K

9 BITS

- OP CODE - UPPER 6 BITS
- TRIP COUNT - LOWER 3 BITS
  (WHICH TRIP THE INSTRUCTION IS ON, AROUND THE BARREL)

OTHER REGISTERS:
- I/O CHANNEL REGISTERS
- READ/WRITE PYRAMID REGISTERS

* ONLY THE A REGISTER IS PROGRAMMABLE *

ADDER

- BOTH OPERANDS ARE COMPLEMENTED GOING INTO THE ADDER
- THE ANSWER IS RECOMPLEMENTED COMING OUT

ie ADD 3+4

```
 original       complemented                              recomplemented
  number          numbers                                     answer

  0003  ------->   7774
 +0004  ------->  +7773
                   7767
                      1
                   7770  ----------------------------------->  0007
```

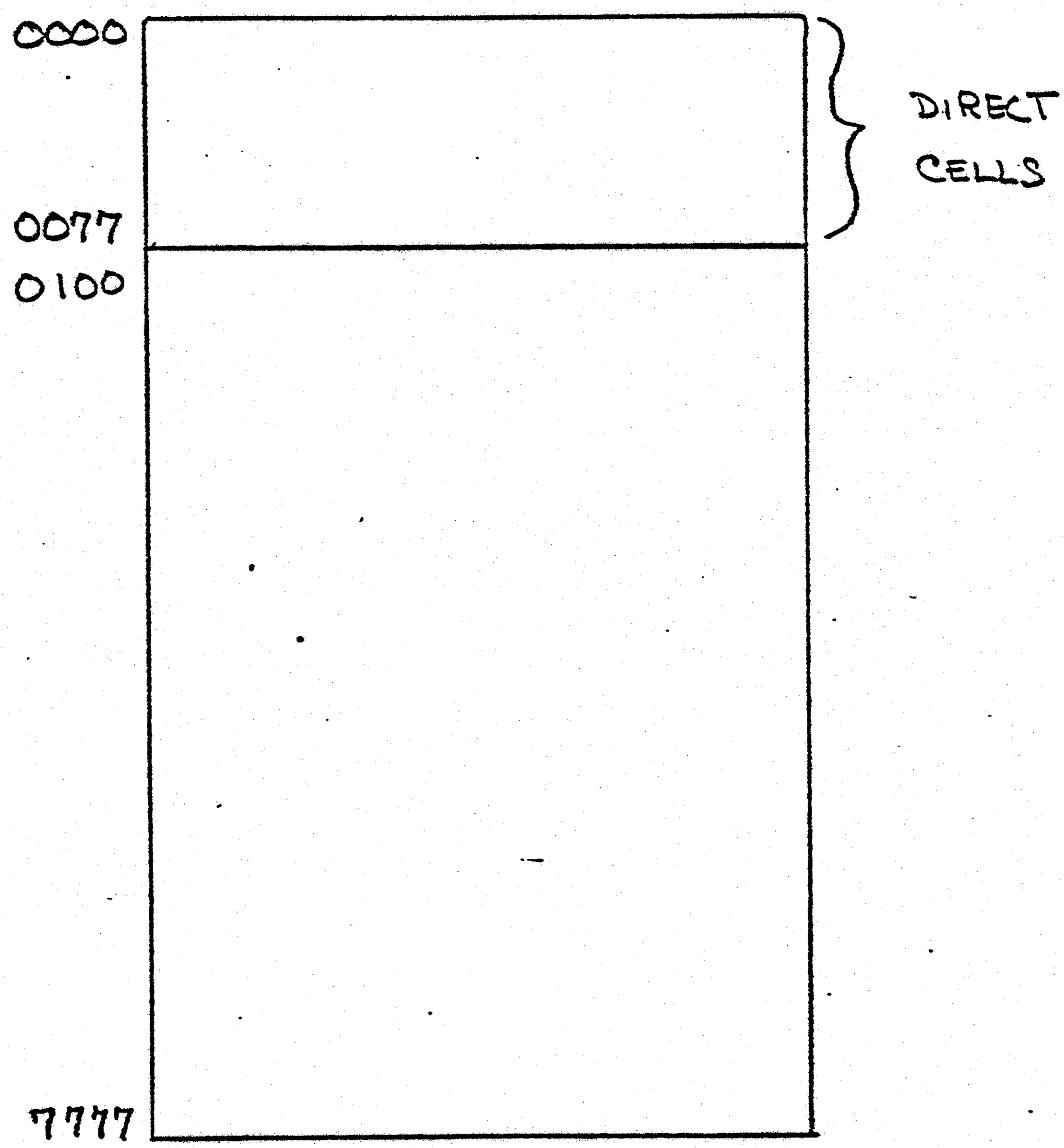
ie SUBTRACT 3-4

```
  0003  ------->   7774              7774
 -0004  ------->  -7773  ------->   +0004

                                     0000
          To subtract,                  1
          complement                 0001  ------------------>  7776
          and add
```

ie ADD +3 and -3

```
  0003  ------->   7774
 +7774  ------->  +0003
                   7777  ----------------------------------->  0000

                                           Note a +0 is
                                           returned by the adder
```

PP MEMORY



Hardware Features
{New Options}

o	CEJ/MEJ	Central Exchange Jump Monitor Exchange Jump
o	CMM	Compare Move Unit
o	DDP	Distributive Data Path
o	ILR	Interlock Register
o	CMAP	Central Memory Access Priorty

Note: These hardware features are discussed further in Appendix A.

CYBER 70 HARDWARE FEATURES {What makes them diffrrent from 6000's}

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{THE FOLLOWING SET OF PAGES IS EXTRACTED FROM THE SCOPE 3.4 IMS, M665

INTRODUCTION

The CDC CYBER 70 series computers have several new hardware features which were not available or optional on the 6000 series machines. Among these new features are the Central Exchange Jump/Monitor Exchange Jump (CEJ/MEJ) capability, the Compare/Move Unit (CMU), the Distributive Data Path (DDP), and the Interlock Register. All these hardware features are supported by the SCOPE 3.4 Operating System, and a thorough knowledge of their concepts is essential for full utilization of the CYBER series computers and their associated software.

This chapter is intended as an introduction to these hardware features and the software instructions that use them.

CENTRAL EXCHANGE JUMP/MONITOR EXCHANGE JUMP (CEJ/MEJ)

BACKGROUND REVIEW

In most 6000 systems operated under SCOPE 3.3 or older, Monitor runs in a dedicated PP(PP0). A job accesses or relinquishes the Central Processor each time Monitor issues an exchange jump instruction (EXN). This is done when a job has used the Central Processor for the maximum interval allowed by SCOPE. Each time the EXN instruction is executed, any job using the Central Processor is interrupted and the job with the next highest priority has access to the Central Processor. When an active job is interrupted, all pertinent information about the job (register contents, RA, FL, etc.) are saved in a 16 word exchange package where they can be picked up later for execution again by another EXN instruction issued by Monitor.

CEJ/MEJ

In the CYBER series computer, however, a new type of exchange jump is available with the CEJ/MEJ hardware and the SCOPE 3.4 Operating system. In the CYBER series machine, the Central Processor has, in the Central Memory control section, a Monitor mode flag bit. The flag is cleared by Deadstart. Thereafter, it can be set or cleared only by the Monitor exchange jump (MXN) or the central exchange jump (XJ) instructions supplied by SCOPE 3.4. There is no instruction with which to test the status of this flag directly or independently. We can now distinguish two types of Central Processor operations. The CPU executes in either Monitor Mode or User Mode depending on whether this Monitor Mode flag is set or clear. All user programs, as well as many system programs, run in User Mode. The only programs that do run in Monitor Mode are CP Monitor, SPM, and CPCIO. Programs running in User Mode can be interrupted at any time, either because the CPU is needed by a Monitor Mode program or upon the expiration of the time slice. In Monitor Mode, however, the CPU is not interruptable and is permitted to execute until a task has been completed.

To utilize fully the CEJ/MEJ hardware and to provide Monitor with a processor more powerful than a PPU, the Monitor in SCOPE 3.4 is divided into two separate parts, a CP Monitor and a PP Monitor, with each performing different functions. CP Monitor, which resides in Central Memory Resident, controls CPU Monitor Mode execution and CPU scheduling. PP Monitor, which is in general control of the system, operates in PP0. (For details, please refer to the chapter on Monitor.)

When a User Mode program has used up its time slice, or when a PP (e.g., PP Monitor or other PP routine) needs the CP Monitor to perform a certain task it initiates an MXN exchange jump instruction. This will activate the CP Monitor immediately if the Central Processor is running in User Mode. The job that was running is forced to relinquish the CPU to CP Monitor. At the same time the Monitor Mode flag is set putting the CPU in Monitor Mode execution. If, however, the CPU is already in Monitor Mode when MXN is initiated by a PP, it will be ignored and treated as a PASS instruction. The CPU is allowed to execute without interruption until a task is completed.

The Central Exchange Jump instruction (XJ) is used in conjunction with MXN. As mentioned before, the CPU is not interruptable while in Monitor Mode. Hence, the Monitor Mode program must exit itself. When a task is completed, the Monitor Mode program initiates an XJ exchange jump. This will release the Central Processor to a User Mode job and at the same time clear the Monitor Mode flag returning the computer to normal program mode execution. When a User Mode CP program needs the CP Monitor, it too can initiate an XJ. This will activate the CP Monitor immediately (as in the case of the MXN for a PP program) and put the computer in Monitor Mode. Hence, the mode of execution of the Central Processor changes every time upon the completion of the XJ exchange jump.

The CEJ/MEJ hardware operation is enabled or disabled by a control switch on the deadstart panel. If it is enabled, the CEJ/MEJ feature will operate as above. However, if it is disabled or in an installation without the MXN/XJ instruction set, the EXN instruction is used. This is a PP initiated exchange jump which occurs independently of the mode of the CPU and has no effect on the Monitor Mode. PP Monitor is the only program that may perform an EXN. In fact, it simulates the MXN for all PPs in the system and also simulates XJ for the Central Processor as SCOPE 3.3.

SCOPE 3.4 requires either the combination of MXN/XJ or EXN to run.

The different exchange jumps are summarized below:

NAME	INSTRUCTION CODE
PPU Regular Exchange Jump - EXN	260d
PPU Monitor Exchange Jump - MXN	261d
CPU Central Exchange Jump - XJ	013jk

Table 1 summarizes the operational differences between the Normal exchange jump instruction (260) and the Monitor and Central Exchange jumps (261 and 013).

EXCHANGE INSTRUCTION DIFFERENCES

INSTRUCTION	CONDITIONAL/ UNCONDITIONAL	OPERATIONAL DIFFERENCES	
		Effect on Monitor Flag Bit	Location of Starting Address of Exchange
260 (Normal Peripheral Processor Exchange Jump)	Unconditional	No effect on Flag	Peripheral Processor A Register
261 (Peripheral Processor Monitor Exchange Jump)	Conditional (occurs only if Monitor Flag bit is clear; passes if flag is set)	Sets Flag	Peripheral Processor A Register
013 (Central Exchange Jump) with Monitor Flag bit clear	Unconditional	Sets Flag	Central Processor Monitor Address Register
013 (Central Exchange Jump) with Monitor Flag bit set	Unconditional	Clears Flag	Address formed by K+(Bj)

TABLE 1

Their instruction formats are as follows:

OPERATION	VARIABLE	DESCRIPTION	SIZE	OCTAL CODE
EXN	d	Exchange jump tp CPU d	12 bits	260d
MXN	d	Monitor exchange jump CPU d to {A}	12 bits	261d
MAN	d	Monitor exchange jump CPU d to {MA}	12 bits	262d
XJ		Exchange jump to MA if in Program Mode	30 bits	01300 00000
XJ	Bj	Exchange jump to {Bj}; flag set	30 bits	013j0 00000
XJ	K	Exchange jump to K; flag set	30 bits	0130K
XJ	BJ+K	Exchange jump to {BJ+K; flag set	30 bits	013jK

In 6500 or 6700 systems {or CYBER 70/Model 72-2Z, 73-2Z, or 74-2Z} with dual Central Processors, d can be 0 or 1 and specifies which CPU the exchange jump will interrupt. In single processor systems, this value is not interpreted.

Please also note that the assembler forces upper before and after assembling an XJ instruction.

OTHER EXCHANGE JUMP

Besides the MXN/XJ and EXN exchange jump, two other exchange jump instructions are available.

1. MAN

The MAN exchange jump {octal code 262} is a PPU instruction that executes just like the MXN. However, the exchange package address is taken from the 18 bit Monitor Address {MA} Register in the CPU rather than the A register of a PP. Which instruction is set to use {MXN/XJ or MAN/XJ} is determined by an installation parameter {IP.XJ}.

2. Program Stop/Error Exit Operation

The Program Stop instruction PS could execute an exchange jump on the CEJ/MEJ panel switch.

The DISABLE position disables the Central exchange jump or the Monitor exchange jump. In this case, PS halts the Central Processor unit at the current step in the program. An exchange jump is necessary to restart the Central Processor unit. The

ENABLE position enables the jump capabilities. In this case, PS causes an exchange jump to monitor address (MA) in the exchange package.

The contents of the location field become a sub-subtitle on the assembler listing. The assembler forces upper before and after assembling a PS instruction.

Instruction Format:

OPERATION	VARIABLE	DESCRIPTION	SIZE	OCTAL CODE
PS		Program stop or exchange jump to (MA)	30 bits	00000 00000
PS	K	Program stop or exchange jump to (MA)	30 bits	0000K

Its operation is summarized as follows (CEJ/MEJ enabled):

Monitor Flag Clear	Store P+1 at RA Clear P Exchange Jump to (MA) Set Monitor Flag
Monitor Flag Set	Store P+1 at RA Clear P Stop CPU Monitor Flag Remains Set

Program errors can also cause an Exchange Jump to happen. Hardware action during an attempted execution of an illegal instruction will effect the following (CEJ/MEJ switch enabled):

Monitor Flag Clear	Store P+1 at RA Clear P Exchange Jump to (MA) Set Monitor Flag
Monitor Flag Set	Store P+1 at RA Clear P Stop the CPU

COMPARE MOVE UNIT (CMU)

The Compare Move Unit is a standard CPU hardware component of the CYBER 70 series Model 72 and 73 and optional on the Model 76 computer system. It provides the capability to move and compare data fields in storage without having to use the registers.

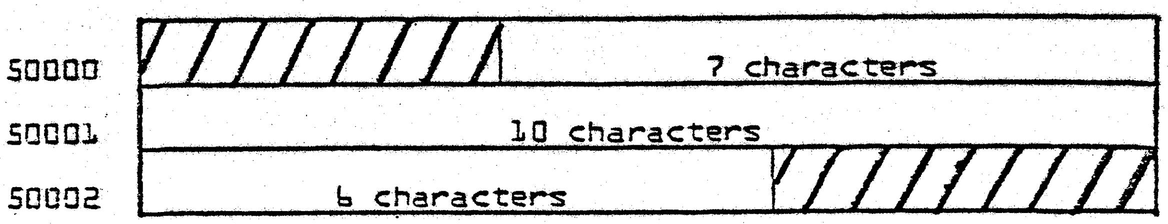
There are ten 6-bit character positions in each 60-bit word. These positions are numbered 0 through 9 from left to right respectively. The 4-bit character addresses of these positions are (in binary) 0000, 0001, ..., 1000, and 1001. Character addresses 1010 through 1111 are illegal and cause the instructions to give an address out of range condition.

0	1	2	3	4	5	6	7	8	9
59									0

STORAGE WORD

Data fields may span word boundaries and may start or end at any position in a 60-bit word.

Example:



The field above starts at character 3 in word 50000 and ends with character 5 in word 50002. The field has a length of 23_{10} characters. One limitation for using the CMU is that the data field must not be in an operating register or in ECS/LCM.

COMPASS 3.0 provides symbolic forms of four CMU instructions. They are:

1. Indirect Move - IM
2. Direct Move - DM
3. Compare Collated - CC
4. Compare Uncollated - CU

Of the above, only the Indirect Move (IM) instruction has the same type of syntax and semantics as other CPU instructions. The others are treated as pseudo instructions by COMPASS.

INDIRECT MOVE (IM)

This is a 30-bit instruction that moves the content of a data field to another data field according to a descriptor word. Maximum length of the data field that could be moved by this instruction is 8191_{10} characters. The descriptor word contains the length and addresses of the data fields. COMPASS forces the instruction to the upper left of a word because it is executed as a pass by the hardware if it is not the first instruction of a word. The next instruction is also forced upper in the next word, because the lower half of a word containing an indirect move is not executed.

Format:

OPERATION	VARIABLE	DESCRIPTION	SIZE	OCTAL CODE
IM	Bj	Move per descriptor at Bj	30 bits	464j000000
IM	K	Move per descriptor at K	30 bits	4640K
IM	Bj±K	Move per descriptor at Bj±K	30 bits	464jK

Execution: The descriptor word is fetched from storage location (Bj)±K. If the data field length is zero, the instruction is executed as a pass but the execution time is longer. Otherwise, the content of the source field is moved to the destination field. If the two fields overlap, the results are undefined. The X0 register is used for intermediate storage during execution of the instruction and is cleared upon completion of the instruction.

A pseudo instruction MD is used to generate a descriptor word for use by the indirect move instruction. The MD instruction has the following format:

LOCATION	OPERATION	VARIABLE
locsym	MD	L, K_S, C_S, K_D, C_D

L is the absolute address expression; its value, in the range $0 \leq L \leq 8191$, is the data field length in characters. The upper 9 bits are placed in bits 56-48 of the descriptor word while the lower 4 bits are placed in bits 29-26.

K_S is any expression, the first word address of the source field.

C_S is the absolute expression, the starting character position of the source field within the word at location K_S.

K_D is any expression, the first word address of the destination field.

C_D is the absolute expression, the starting character position of the destination field within the word at location K_D.

Indirect Move Descriptor Word Format:

59	56	47	29	25	21	17 … 0
0	L_U	K_S	L_L	C_S	C_D	K_D

Where:

L_u: Upper 9 bits of value of L.

L_L: Lower 4 bits of value of L.

DIRECT MOVE (DM)

The direct move pseudo instruction generates a CMU instruction that moves a data field in storage to another location in storage. This instruction differs from the indirect move in several ways. It is a 60-bit instruction that cannot be split between words and the descriptor word is part of the instruction. Furthermore, the length of the data field it can move is limited to a maximum of 127_{10} characters.

Instruction Format:

LOCATION	OPERATION	VARIABLE
locsym	DM	L, K_S, C_S, K_D, C_D

59	50	47	29	25	21	17 0
465	L_u	K_S	L_L	C_S	C_D	K_D

L is the absolute address expression; its value, in the range $0 \leq L \leq 127$, is the data field length in characters.

L_u is the upper 3 bits of the value of L.

L_L, K_S, C_S, K_D, C_D: Same as in the MD instruction.

Execution: Same as IM, except that the descriptor is in the instruction word itself.

COMPARE COLLATED (CC)

The compare collated instruction compares the contents of two data fields, one character at a time, from left to right, until a pair of corresponding characters are found to have unequal collating values, or until the data fields are exhausted. It is a 60-bit instruction that occupies one full word (it cannot be split between two words) and contains its own data field descriptor.

It uses register A0 to contain the first word address of a table in storage that contains the collating values to be used in comparing characters. The result of the comparison is placed in register X0.

Format:

LOCATION	OPERATION	VARIABLE
locasym	CC	L, K_A, C_A, K_B, C_B

59	50	47	29	25	21	17 0
466	L_U	K_A	L_L	C_A	C_B	K_B

L, L_U, L_L are same as in the DM instruction.

K_A is any expression, the first word address of the first data field.

C_A is the absolute expression, the starting character position of the first data field within the word at location K_A.

K_B is any expression, the first word address of the second data field.

C_B is the absolute expression, the starting character position of the second data field within the word at location K_B.

Execution: The first word address of the collating table is obtained from register A0. The contents of the data fields are compared from left to right, one character at a time from each field, until two unequal characters are found. The collating value of each character is obtained from the collating table. If these values are equal, the compare continues until another character pair is unequal or until all characters have been compared. If the collating values are unequal, the two data fields are unequal and the field with a larger collating value is the greater of the two fields. The collating values are treated as 6-bit unsigned integers.

Note that two unequal characters could have the same collating value and would compare equal. Upon completion, register X0 contains a 60-bit signed integer as follows:

$X0 = L - N > 0$ if field A > field B

$X0 = +0$ if field A = field B

$X0 = N - L < 0$ if field A < field B

where N is the number of pairs of characters that compared equal.

f L=0, then X0=+0.

The format of the collating table is as follows:

	59	53	47	41	35	29	23	17	11 — 0
(A0)	00	01	02	03	04	05	06	07	
(A0) +1	10	11	12	13	14	15	16	17	
. . .									
(A0) +7	70	71	72	73	74	75	76	77	

COMPARE UNCOLLATED (CU)

The compare uncollated instruction compares the contents of two data ields, one character at a time, from left to right, until a pair of corresponding characters are found to have unequal values, or until the data fields are exhausted. It is a 60-bit instruction that occupies one full word (it cannot be split between two words) and contains its own data field descriptor. The result of the comparison is placed in register X0,

Format:

LOCATION	OPERATION	VARIABLE
locasym	CU	L, K_A, C_A, K_B, C_B

59	50	47	29	25	21	17 — 0
467	L_U	K_A	L_L	C_A	C_B	K_B

Execution: Same as the CC instruction except that A0 and the collating table are not used. Instead, the characters are compared directly with each character regarded as a 6-bit unsigned binary integer. Register X0 is set in the same manner as by the CC instruction.

DISTRIBUTIVE DATA PATH - DDP

PHILOSOPHY

The Distributive Data Path is a new hardware feature designed to increase the performance and throughput of systems equipped with Extended Core Storage (ECS). If DDP is not available, data transfers between ECS and peripheral equipment must pass through central memory using a system double buffer. (For a description of ECS I/O buffering please see the chapter on ECS Extensions.) The Distributive Data Path provides a data path between a PPU and ECS, allowing direct PPU to/from ECS data transfers. The DDP utilizes one access of an ECS controller to communicate with ECS. A PPU in turn communicates with the DDP via I/O data channels. Data is transferred across this channel in 12-bit bytes at a maximum rate of up to one million bytes per second.

The DDP is expandable from one to a maximum of four identical PPU data channel interfaces. Each of these PPU interfaces, called ports, operated independently while sharing a common ECS interface. The first interface is part of the DDP. The second, third, and fourth interfaces are the optional DDPRI's. These interfaces each contain a buffer which is used to assemble 12-bit bytes into an ECS record or to disassemble an ECS record. When 480 bits of the buffer are available, a request for ECS transfer is made. An equal-priority scanner monitors the four Port-ECS-Request signals and connects a requesting port to the ECS Controller interface for an ECS transfer. At the completion of one ECS Record transfer, the scanner moves on to check for a request from the next port.

It takes at least 40 microseconds to transfer a 480-bit ECS record between a PPU and a DDP port. The DDP port has buffering to allow the data channel to maintain its one mega-byte per second transfer rate while data is being transferred between the port and ECS, if no more than two devices are actively accessing ECS. For example, two DDP ports can maintain a one mega-byte rate if nothing else is accessing ECS; one DDP port can maintain a one mega-byte rate if no more than one other ECS controller access is busy, such as, if the CPU is accessing ECS.

Restrictions on the DDP port are that it must be either the first or the second device out of a data channel to maintain a one MHZ transfer rate and it must be the last device on a data channel.

DDP PROGRAMMING

FUNCTION CODES

The DDP is controlled via functions from the PPU I/O channel. Function codes are sent to the DDP PPU port with the upper three bits containing the equipment select code (5), and the remaining bits designating the function to be performed. Functions are sent out on an inactive channel by the PPU and the DDP responds to valid functions by disconnecting the data channel. The function codes used to control a DDP port are:

5001 - ECS Read
5002 - ECS Write
5004 - Status
5010 - Clear Port

All other function codes are either illegal or ignored by the DDP. The DDP will respond to all function codes with the correct equipment select code and the remainder of the upper eight bits equal to zero. The remaining four bits of the function code must have only one bit set to select the required function. More than one bit set is illegal and the results of such a condition are undefined.

5001 - ECS READ

This function causes the DDP port to read data from ECS and to present this data to the I/O channel for input to the PPU. The DDP responds to this function by disconnecting the data channel. When the channel is activated by the PPU, the DDP requires an output of two 12-bit bytes from the channel. These bytes are loaded into the 24-bit address register, with the first byte going into the upper twelve bits of the register and the second byte into the lower twelve bits. The address register now designates the ECS address of the first 60-bit word to be presented to the PPU.

The ECS read function has three selectable modes.

A. The first mode is referred to as Block Read Mode. In this mode a new request to ECS is made whenever a sufficient amount of buffer register space is available for a new ECS Record. The DDP increments the address register once for each 60-bit word it receives such that each subsequent request is made at the next higher ECS record address. The DDP will continue to make these requests until the data channel is made inactive.

B. The second mode of operation is the Read 1 Mode. In the read 1 mode, a second ECS request is never made. The purpose of this mode is to eliminate the wasteful second request that would be made to ECS under a Block Read when data from only one ECS record is needed. This mode is terminated when the data channel goes inactive.

c. The third ECS Read mode does not cause data to be read from ECS. This mode is called Function Flag Register mode. When this mode is selected, the DDP sends the contents of the address register to ECS and terminates the ECS read condition within the DDP. The PPU must disconnect the data channel. This is the manner in which a flag register operation is performed.

The selection of these modes of ECS Read is determined by the two most significant bits (2^{23} and 2^{22}) of the ECS address given to the DDP at the start of the ECS Read. Any time bit 2^{23} is a "1", Function Flag Register mode is selected. If bit 2^{23} is a "0" and 2^{22} is a "1", then Read 1 mode is selected. If both 2^{23} and 2^{22} are "0", a Block Read is performed.

Graphically, this is:

2^{23}	2^{22}	Mode
0	0	Block Read
0	1	Read 1
1	0	Function Flag Register
1	1	Function Flag Register

As stated in the descriptions of the three modes of an ECS Read, this function is terminated by the data channel going inactive. The channel can be disconnected by either the PPU or the DDP. In the Block Read and Read 1 modes, two error conditions exist that will cause the DDP to disconnect the data channel. They are:

ECS Abort
ECS Parity Error

If either of these two conditions is received from the ECS Controller in response to an ECS request for data, then the DDP will disconnect the data channel after the last byte of the previous ECS Record has been transferred to the PPU and when the data channel is in the Empty state. The disconnect signal is sent out by the DDP on an Empty channel rather than a Full and data. This is done to give the PPU the ability to determine whether the DDP is going to send a disconnect or not. If the channel is Full, the PPU can send a disconnect without risking a hang-up condition. If the channel is Empty, a PPU-generated disconnect is illegal on the basis that the DDP may disconnect.

When the data channel is disconnected by the DDP, the status word must be read to determine the reason for the disconnect. In the case of Parity Error, the PPU may issue a Read 1 function in Maintenance Mode to input the data contained in the buffer register. The only way to read more data beyond that is to issue a new "ECS Read" function. Note that any ECS Read function must have an address sent to the DDP before data can be input by the PPU.

The issuance of a Read 1 in Maintenance Mode causes the data in the buffers to be presented to the data channel for input by the PPU without sending a request to ECS. Maintenance Mode is selected by setting bit 2^{21} of the address to a logical "1".

The upper three bits of the Address Register provide these variations of the "ECS Read" function.

2^{23}	2^{22}	2^{21}	Function
0	0	0	ECS Block Read
0	0	1	Block Read in Maintenance Mode
0	1	0	ECS Read 1
0	1	1	Read 1 in Maintenance Mode
1	0	0	Function Flag Register - Ready Select
1	0	1	Function Flag Register - Selective Set
1	1	0	Function Flag Register - Status
1	1	1	Function Flag Register - Selective Clear

These various modes are selected or deselected according to the most recent address sent to the DDP.

It can be seen from the above chart that when bit 2^{23} is set, Maintenance Mode is not selected. 2^{23} dictates a Flag Register operation and Maintenance Mode does not exist for a Flag Register operation.

An instruction sequence to do an ECS Read is:

```
    FCN     5001
    ACN
    OAM     XXXX, Where (A) = 2
    IAM     XXXX, Where (A) = 12-bit byte count
    NJN     Error:  Channel disconnected via DDP:  Read Status
            (See para. 3.2.1.5.5)
B   IJM     A }  Wait for change from Active and
    EJM     B }  Empty State
    DCN
A   XXX
```

The ECS Read condition within the DDP may be cleared out by a PPU disconnect, a DDF disconnect, a power-on Master Clear, a dead-start Master Clear, or by a functioned port clear.

FUNCTION FLAG REGISTER

This function is performed any time bit 2^{23} of the Address Register is set when the address for an ECS Read is loaded into the DDP. The Flag Register in the ECS Controller cannot be read directly but may be interrogated and/or written into.

Interrogation is accomplished by selecting and reading status from the DDP after the Function Flag Register operation has been performed. The status word shows whether an Abort or an Accept has been received from the ECS Controller in response to the Flag Register word.

Four Flag Register operations may be performed with the three most significant bits of the Address Register {N} determining which operation is to be performed.

The Flag Word Format is:

2^{23} 2^{21}	2^{20} 2^{18}	2^{17} 2^{0}
N	NOT USED	FLAG WORD

The possible operations are:

<u>N=4 {Ready Select}</u>

A bit by bit comparison is made in the ECS Controller of the lower eighteen bits of the Flag Register in the ECS Controller and the Flag Word received from the DDP. If all bits set in the Flag Word are clear in the Flag Register, then the ECS Controller responds with an Accept to the DDP and enters the set Flag Word bits into the Flag Register. The clear bits in the Flag Word have no effect on the Flag Register.

If any of the bits set in the Flag Word are set in the Flag Register, then the ECS Controller responds with an Abort and does not modify the Flag Register.

Examples, using only three bits, are:

Flag Register = 010

Flag Word = 101

Result: Accept and Flag Register = 111

Flag Register = 010

Flag Word = 011

Result: Abort and Flag Register = 010

N=5 (Selective Set)

Selectively sets bits in the Flag Register from bits set in the Flag Word. The only response is an Accept.

N=6 (Status)

Same as Ready Select, except that the contents of the Flag Register are not changed. (NOTE: This is a Flag Register Status and has nothing to do with DDP Status, function code 5004.)

N=7 (Selective Clear)

Selectively clears bits in the Flag Register from bits set in the Flag Word. The only response is an Accept.

5002 - ECS Write

This function causes the DDP port to assemble bytes from the data channel and to write data in ECS. The DDP responds to an ECS Write function by disconnecting the data channel. When the channel is activated by the PPU, the DDP will begin accepting data from the PPU. The first two 12-bit bytes received from the channel must be the address at which the first ECS Record is to be written. These bytes are loaded into the 24-bit Address Register. The bytes that come after the second byte are regarded as data and sent to ECS.

The first byte received by the DDP is put into the upper twelve bits of the Address Register. The second byte is put into the lower half. The Address Register now designates the address of the first 60-bit word to be written into ECS. This address is presented to the ECS Controller along with a request signal after the buffer in the DDP is filled by the PPU or after a disconnect is received from the PPU. The Address Register is incremented as the buffer empties into ECS. Unless an error condition is encountered, data will continue to be transmitted in this fashion. A disconnect from the PPU will cause accumulated data to be written into ECS, and the ECS Write condition within the DDP to clear out. If the PPU disconnects the DDP with less than an integer multiple of 60-bit words assembled in the DDP buffer registers, then the partial 60-bit word will be written into ECS with zeros in the missing byte(s).

A program sequence such as the following will produce a partial ECS Write with zero fill.

```
FNC     ECS Write

ACN

LDC     20₁₀

OAM
```

Only one error condition is possible on ECS Write. If the ECS Controller returns an Abort signal to the DDP, the DDP will disconnect the I/O channel. This disconnect will be sent to the I/O channel in the place of an Empty response to a Full signal from the data channel. This will eliminate the possibility of hanging the channel when the PPU performs a disconnect. However, if an Abort comes after the PPU disconnects the channel, the only way to detect it is to do a status check after the disconnect, waiting for the Write status to drop.

An instruction sequence to do an ECS Write is:

FNC	5002	ECS Write
OAM	XXXX	Where {A}=2 + the number of 12-bit bytes of data to be sent {first 2 words are address}
NJN	Error:	Channel disconnected via DDP: Read Status
DCN		Keeping in mind that the channel must be Empty.
FCN		Read Status: Check for Abort or Accept: continue to read status until one or the other is detected {may take as long as 50 microseconds}.

5004 - Select Status

This function makes the status of a port available for PPU input after the channel is activated by the PPU. The DDP responds to this function code by disconnecting the data channel. The PPU then activates the channel and inputs a 12-bit word. Status may be repeated at this point simply by doing another input. When it is desired terminate the reading of status, the PPU must issue a disconnect to the data channel.

Status bits are assigned to indicate the following

2^0	ECS Abort
2^1	ECS Accept
2^2	ECS Parity Error
2^3	ECS Write

2^0 - ECS Abort

This status bit indicates that an Abort signal has been received from ECS.

2^1 - ECS Accept

This status bit indicates that an Accept signal has been received from ECS

2^2 - ECS Parity Error

This status bit indicates that a Parity Error signal has been received from ECS.

2^3 - ECS Write

This status bit indicates that the DDP port is busy with a write to ECS. When the write terminates, this status bit will clear out.

Besides being cleared by a port or master clear, the status bits (Abort, Accept, and Parity Error) are cleared out either by a new request to ECS or by reading status. Status must be read to clear out a DDP generated disconnect due to an ECS Abort or an ECS Parity Error.

5010 - Port Clear

This function is a programmable master clear for the data buffers and control logic within the DDP associated with the port to which this function is issued. This function, as does Deadstart Master Clear, clears only that DDP port to which the clear is issued.

INTERLOCK REGISTER - ILR

INTRODUCTION

The Interlock Register (ILR) is another new hardware feature that is available on all CYBER 70 machines. It is a 64-bit register which could be expended to 128 bits. It can be accessed by the PPU's through two data paths. An Interlock (channel 15_8) will be added to each set of 10 PPU's to enable up to 20 PPU's to access the ILR. Initial software utilization of the ILR will include primarily I/O channels and pseudo-channels interlocking.

Interlock Register

*					**					
Word 10	Word 9	Word 8	Word 7	Word 6	Word 5	Word 4	Word 3	Word 2	Word 1	Word 0

127 119 107 95 83 71 63 59 47 35 23 11 0

* - Word 10 is 8 bits.
** - Word 5 is 4 bits in the 64-bit Interlock Register.

OPERATIONS

Eight operations can be performed on the Interlock Register from the PPU.

1. Set

   Sets a bit specified by the octal translations $0 \gg 77_8$ or $0 \gg 177_8$.

2. Clear

Clears a bit specified by the octal translations $0 \geq 77_8$ or $0 \geq 177_8$.

3. Test

Checks a bit specified by the octal translations $0 \geq 77_8$ or $0 \geq 177_8$ and sends the PPU a status of "1" or "0", depending on if the bit is set or clear. The status bit will be located in the bit zero position in the 12-bit word. The other 11 bits in the status word will be zero.

4. Read

One of the 6 or 11 words specified by the octal translations $0 \geq 5_8$ or $0 \geq 12$ are read into the PPU. The upper four bits will be zero if word 10 is read. The upper eight bits will be zero if word 5 is read in a 64-bit register.

5. External Set or Clear

Sets or clears one of the lower 13 bits from external sources. In the 128-bit register, bits 64 - 76 may also be set from external sources. Bit 0 will be assigned as the "power off bit" and will set when the input power to the MG drops. The power to the computer will drop approximately 500 milliseconds after bit 0 sets.

6. Clear All

Clears all 64 or 128 bits.

7. Test All

Tests all 64 or 128 bits and sends the PPU a status of "1" if one or more bits are set.

8. Simultaneous Operations

Test/Set	A test is made on the bit with the bit ending up set.
Test/Clear	A test is made on the bit with the bit ending up clear.

INSTRUCTION FORMATS

Instruction Format		Instruction Code	
LDC	2000	0XXX	Read
	XXXX	1XXX	Test
OAN	7215	2XXX	Clear
IAN	7015	3XXX	Test/Clear
		4XXX	Set
		5XXX	Test/Set
		6XXX	Clear All
		7XXX	Test All

Where XXXX is the descriptor word:

Instruction Code			N.U.	N.U.	Octal Translations						
11	10	9	8	7	6	5	4	3	2		0

Bits 7 and 8 of the Descriptor Word are reserved for future enhancements and should be zero.

On the Set, Clear, and Clear All operations, zero is returned to the PPU.

The only way bits can be cleared in the Interlock Register is by doing a 2XXX, 3XXX, or a 6XXX.

CMAP's Effect on ECS Transfer

The Central Memory Access Priority (CMAP) is another standard hardware feature on the CYBER 70 machines models 72,73 and 74. Its primary function is to improve CM-ECS transfer rate by allowing only "priority" CM accesses (read/write) by a PPU to be honored during an ECS transfer. It thus ensures that CM-ECS transfers are maintained at the maximum rate for a given configuration. Without CMAP, any PPU CM request can interrupt an ECS transfer. A maximum of one PPU request can be honored every ECS record or eight CM words. This could reduce the transfer rate of a large ECS system up to 75 percent, although a small (125K) system is not affected.

CMAP prevents non-priority reads or writes from entering the read or write pyramid while ECS is active. But when ECS becomes active, it is possible that some writes could be trapped in the write pyramid. This writes that are hung in the write pyramid will not be serviced until ECS transfer is complete. However, if a priority write appears during this time, CMAP will interrupt the ECS transfer and the priority write as well as any non-priority writes that were trapped in the write pyramid will be serviced.

CMAP's Effect on PPU Read/Write

By allowing only priority read/write to access central memory, CMAP provides a PPU with an opportunity to access CM at a much improved rate during an ECS transfer. When ECS is inactive, CMAP allows a PPU to place a reservation for the read/write pyramid if it failed to gain access to the pyramid on its initial request. This ensures that a PPU with a priority request will gain entrance to the pyramid within a few major cycles (microseconds). To achieve this, a basic change is made to the read pyramid to allow data to flow unrestricted through the pyramid and give all PPU an equal chance of getting into the read pyramid. This change applies to both priority and non-priority CM accesses.

CMAP's Effect on SCOPE 3.4

The SCOPE 3.4 rotating mass storage device stack processor (1SP/1EP) uses CMAP priority for one word CM accesses within certain time critical loops. Such priority CM accesses may interrupt an ECS transfer, but will not delay it significantly, since only a single word is being read/written. At the same time, the stack processor can continue executing, rather than waiting for the ECS transfer to complete. The stack processor would be required to wait unnecessarily if CMAP priority was not used for the CRD/CWD instructions.

The stack processor does not use priority for CM block transfers. This means that CMAP will prevent stack processor CRM/CUM instructions from starting if an ECS transfer is in progress. The reasoning here is that if the PPU CM block transfer and the ECS transfer were allowed to occur simultaneously, both would be slowed and lost disk revolutions would probably result. It is more efficient to allow the ECS transfer to complete, and then honor the PPU CM block transfer.

STUDY QUESTIONS
HARDWARE OVERVIEW - SECTION IV

1. The minimum standard number of PPs on a CYBER is ______________.

2. The number of PPs on a CYBER may be expanded to ______________.

3. Any PP may talk to any other PP on any channel.

   (a) True

   (b) False

4. PPs may execute concurrently with the CP(s).

   (a) True

   (b) False

5. PPs may execute concurrently with other PPs.

   (a) True

   (b) False

6. A PP must do all Input/Output for SCOPE.

   (a) True

   (b) False

7. The read pyramid allows input to the PP. ______________bits of data may be input during one time in the slot.

8. Direct calls are used like special registers

   (a) True

   (b) False

9. The system Monitor resides ________________________________.

10. What does CMAP allow?

STUDY QUESTIONS

HARDWARE OVERVIEW - SECTION IV

1. The minimum standard number of PPs on a CYBER is 7.

2. The number of PPs on a CYBER may be expanded to 20.

3. Any PP may talk to any other PP on any channel.
   (a) True
   (b) False

4. PPs may execute concurrently with the CP(s).
   (a) True
   (b) False

5. PPs may execute concurrently with other PPs.
   (a) True
   (b) False

6. A PP must do all Input/Output for SCOPE.
   (a) True
   (b) False

7. The read pyramid allows input to the PP. 12 bits of data may be input during one time in the slot.

8. Direct c~~a~~ells are used like special registers
   (a) True
   (b) False

9. The system Monitor resides in PPO.

10. What does CMAP allow?

Allows certain PPs to have priority access to central memory.

INSTRUCTIONS

INSTRUCTIONS

Lesson Guide

REFERENCES:

PP Compass Student Guide Section V

Instruction Description Ref. Vol. II

TRAINING AIDS:

Visuals VALS-53-5-27 thru VALS-53-5-29

ASSIGNMENTS:

Instruction Problem Set 1
Instruction Problem Set 2
Instruction Problem Set 3
Coding Examples 1 thru 12
Instruction Problem Set 4

OBJECTIVES:

(1) To present detailed information about programming the PP.

(2) To present central memory to PP Input Output instructions.

(3) To present sufficient coding examples and exercises to aid student in learning details of PP coding.

INSTRUCTION

Lesson Outline

V. Instructions

A. Formats

- o One word
- o Two words
- o Components
- o Examples

B. Modes

- o No address
- o Constant
- o Direct
- o Memory
- o Indexed Memory

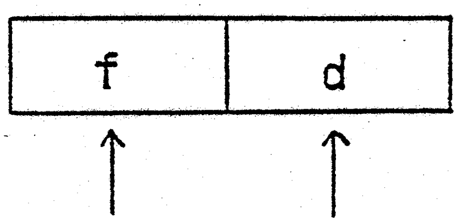
C. Classifications

- o Loads and stores
- o Adds and subtracts
- o Replace adds
- o Shift
- o Logicals
- o Jumps
- o Miscellaneous
- o Central Read/Write
- o Peripheral Input/Output

D. Exercises

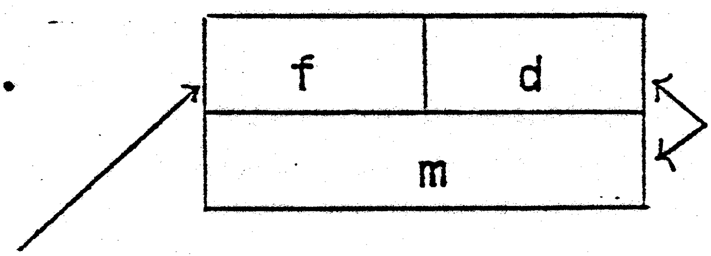
INSTRUCTION FORMATS

INSTRUCTIONS OCCUPY ONE OR TWO WORDS

1. 

OP CODE — DELTA: OPERAND OR OPERAND ADDRESS

THESE ARE FOR INSTRUCTIONS CONTAINING
SMALL CONSTANTS OR
REFERENCING DIRECT CELLS

2. 

OP CODE

- 18-BIT OPERAND <u>OR</u>
- OPERAND ADDRESS:
  - DELTA = 0
    M IS DIRECT ADDRESS
  - DELTA ≠ 0
    D CELL CONTAINS
    INDEX FOR ADDRESS M

INSTRUCTION EXAMPLES

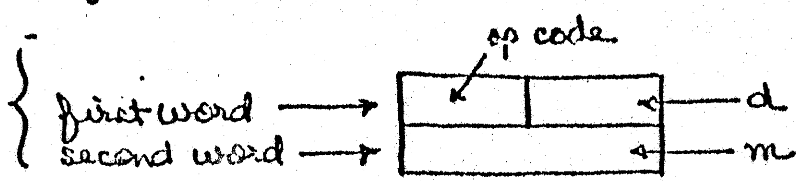
Instruction word	Mnemonic	Operand
14 12	LDN	10
30 02	LDD	2
40 20	LDI	20B
20 12 / 3456	LDC	123456B
20 00 / 0012	LDC	10
50 00 / 0773	LDM	773B
50 00 / 0074	LDM	74B
50 70 / 0773	LDM	773B,70B

ADDRESSING MODES

MODE	OPERAND ADDRESS	OPERAND	EXAMPLE		
NO ADDRESS	P lower 6 bits	d	LDN 2	14 | 02	number 2 → A
CONSTANT	P lower 6 bits and P+1	d+m	LDC 123456B	20 | 12 3456	number 123456B → A
DIRECT	d	(d)	LDD 74B	30 | 74	contents of loc 74 → A
MEMORY d=0	m	(m)	LDM 773B	50 | 00 0773	contents of loc 773 → A
MEMORY INDEXED d≠0 *	m+(d)	(m+(d))	LDM 773B,70B	50 | 70 0773	if contents of loc 70 is 1, then contents of loc 774 → A
INDIRECT **	(d)	((d))	LDI 20B	40 | 20	if contents of loc 20 is 1500, then contents of loc 1500 → A

* indexing is only thru direct cells and only on memory mode || there is no indexed
** indirect addressing is only thru direct cells + only one level || indirect addressing

instruction format



Address Modes

- 5 modes of addressing
- difference is
  "where the operand comes from"

N - **N**o address - one word

LDN 2

f	d
LDN	02

6 bits

operand is in delta

N mode is for small constants (6 bits)

C - **C**onstant mode - two words

LDC 123456B

f	d
LDC	12
3456	

m

18 bits

operand is in d+m

C mode is for up to 18-bit constants

D - <u>D</u>irect - one word

LD<u>D</u> 74B

f	d
LDD	74

delta is the address of the operand
(contents of loc 7~~5~~4 goes into A)

D mode is for loading
from the direct cells

M - <u>M</u>emory mode - two words

LDM 773B

f	d
LDM	00
0773 (m)	

m is the address of the operand
(contents of loc 773 goes into A)

* address 7777B may not be addressed *
(the instruction is assembled, but
is a NØP at execution time)

indexed memory mode:

LDM 773B, 70B

f	d
LDM	70
0773 (m)	

d is a direct cell - 70 -
its contents are added to 773
to get address of operand

ie if (70) = 1
load will be from 774

I - Indirect - one word

LDI 20B

f	d
LDI	20

d is the address of the address of op.

d is a direct cell - it contains addr.
ie if (20) is 1500
load will be from 1500

* Indirect addressing goes only thru direct cells
* it is not chained (only one level)

INSTRUCTIONS

Loads and Stores

LDN LCN
LDC
LDD STD
LDM STM
LDI STI

Adds and Subtracts

ADN SBN
ADC
ADD SBD
ADM SBM
ADI SBI

Replace Adds

RAD AOD SOD
RAM AOM SOM
RAI AOI SOI

Shift

SHN

Logicals

LMN LPN SCN
LMC LPC
LMD
LMM
LMI

Jumps

UJN ZJN
LJM NJN
RJM PJN
MJN

Miscellaneous

PSN
EXN
MXN
RPN

MAN (Cybers only)

Central Memory Reads/Writes

Peripheral I/O

LOAD AND STORE INSTRUCTIONS

LDN - load a 6-bit constant into A

LCN - load a 6-bit (complemented) constant into A

LDC - load an 18-bit constant into A

LDD - load contents of direct cell into A

STD - store contents of A into direct cell

LDM - load contents of memory cell into A

STM - store contents of A into memory cell

LDI - load contents of any cell into A, indirectly thru a direct cell

STI - store contents of A into any cell, indirectly thru a direct cell

ADD and SUBTRACT INSTRUCTIONS

ADN	SBN
ADC	
ADD	SBD
ADM	SBM
ADI	SBI

Adds:

a 6-, 12-, or 18-bit number
is added to the contents of A

Subtracts:

a 6- or 12-bit number
is subtracted from A

* 18-bit arithmetic is used *

REPLACE ADD INSTRUCTIONS

RAD	AOD	SOD
RAM	AOM	SOM
RAI	AOI	SOI

- a 12-bit number (unsigned)
  may be added to the A register
  and to the memory location
- the number 1
  may be added to or subtracted from
  the A register
  and the memory location

* 18-bit arithmetic is used *

* the result is in A and memory *

LOGICAL INSTRUCTIONS

LMN	LPN	SCN
LMC	LPC	
LMD		
LMM		
LMI		

exclusive or:

a 6-, 12, or 18-bit number
may be exclusive ored with A

and:

only a 6- or 18-bit constant
may be anded with A

selective clear:

a 6-bit constant
may selectively clear bits in A

SHIFT INSTRUCTION

SHN

LEFT shifts:

- end-around
- ie SHN 6
  shifts A left 6 bits

```
before:  (A) = 000005
after:   (A) = 000500
```

RIGHT shifts:

- end-off
  no sign extension
- ie SHN -6
  shifts A right 6 bits
  zeroes are filled in from the left

```
before:  (A) = 777774
after:   (A) = 007777   ← note!
```

JUMP INSTRUCTIONS

unconditional:

UJN - jumps up to 37_8 locations forward or backward

LJM - jumps any number of locations forward or backward

RJM - jumps to any location
plants return address there
executes instruction in next word

conditional:

ZJN - jumps if A is +0

NJN - jumps if A is not +0

PJN - jumps if A is positive

MJN - jumps if A is negative

* conditional jumps are up to 37_8 locations forward or backward

* address field may contain a number
(jump is to P+n)

or a location symbol
(jump is to the location)

Instruction Problem Set 1

Contents of the following core locatiors are given.

All numbers are in $\boxed{\text{octal.}}$

(0025) = 1234
(0034) = 1111
(0100) = 1111
(0125) = 2222
(1111) = 7777
(1234) = 4321
(1334) = 3333
(1361) = 1234
(2345) = 4444

Work each question indeoently.

Show the contents of the A register after the instruction has been executed.

			(A) Register
1)	LDN	25	________
2)	LDD	25	________
3)	LDM	100	________
4)	LDM	100,25	________
5)	LDI	25	________
6)	LDM	0,25	________
7)	LDC	-100	________
8)	LDN	-25	________
9)	LDM	1111,25	________
10)	LCN	25	________

11. How many words of code do the above instructions generate? ________

On the following store instructions, indicate:

The contents of the A register after the store

The contents of the core location

The location at which the data is stored

```
12)  LDC  1234568        (A)   = ____________
     STD  258            (loc) = ____________
                         loc is  ____________

13)  LDC  1234568        (A)   = ____________
     STM  10008          (loc) = ____________
                         loc is  ____________

14)  LDC  1234568        (A)   = ____________
     STI  258            (loc) = ____________
                         loc is  ____________

15)  LDC  1234568        (A)   = ____________
     STM  10008,258      (loc) = ____________
                         loc is  ____________

16)  LDD  258            (A)   = ____________
     ADN  258            (A)   = ____________
```

Instruction Problem Set 2

Use the data given in Problem Set 1

Work each problem independently

(Note that each problem has several instructions to be worked cumulatively)

Indicate the contents of A after each instruction is executed

(The problems are numbers 17-33 on the following page)

```
17}  LDI   34B                    {A} = ____________
     SBN   6                      {A} = ____________

18}  LDM   100B                   {A} = ____________
     ADD   100B                   {A} = ____________

19}  LDD   34B                    {A} = ____________
     SBD   34B                    {A} = ____________

20}  LDM   1234B                  {A} = ____________
     ADI   25B                    {A} = ____________
     SBI   34B                    {A} = ____________

21}  LDM   1234B,34B              {A} = ____________
     ADC   123456B                {A} = ____________
     STM   25B                 {loc} = ____________

22}  LDM   100B                   {A} = ____________
     ADM   100B                   {A} = ____________
     ADM   100B,25B               {A} = ____________

23}  LDM   125B,25B               {A} = ____________
     SBM   125B                   {A} = ____________
     SBM   100B,25B               {A} = ____________

24}  LDC   123456B                {A} = ____________
     SHN   14B                    {A} = ____________
     SHN   -11B                   {A} = ____________
     SHN   36B                    {A} = ____________

25}  LDM   1361B                  {A} = ____________
     LMN   46B                    {A} = ____________

26}  LDC   2345B                  {A} = ____________
     LPN   1234B                  {A} = ____________

27}  LDI   25B                    {A} = ____________
     SCN   25B                    {A} = ____________

28}  LDC   123456B                {A} = ____________
     LMD   25B                    {A} = ____________

29}  LDN   22B
     SHN   14B
     ADN   55B
     LMI   34B                    {A} = ____________

30}  LDC   123456B
     SHN   -6
     LPC   123456B                {A} = ____________

31}  LDC   123456B
     SHN   -11B
     LMC   123456B                {A} = ____________

32}  LDM   100B
     SHN   6
     LMM   34B                    {A} = ____________

33}  LDM   100B,25B
     SHN   6
     STM   34B,25B                {A} = ____________
```

Instruction Problem Set 3

Use the data given in the core locations in Problem Set 1.

The A register contains $\boxed{123456_8}$

Work each problem independently.

Indicate the contents of the core location and A register after each instruction is executed.

1.	RAD	34B	{34} = ________	{A} = ________	
2.	AOD	34B	{34} = ________	{A} = ________	
3.	SOD	25B	{25} = ________	{A} = ________	
4.	RAI	25B	{loc} = ________	{A} = ________	
			loc is ________		
5.	AOI	34B	{loc} = ________	{A} = ________	
			loc is ________		
6.	SOI	34B	{loc} = ________	{A} = ________	
			loc is ________		
7.	RAM	1234B	{1234} = ________	{A} = ________	
8.	AOM	1234B	{1234} = ________	{A} = ________	
9.	SOM	1111B	{1111} = ________	{A} = ________	
10.	RAM	100B,25B	{loc} = ________	{A} = ________	
			loc is ________		
11.	AOM	253,34B	{loc} = ________	{A} = ________	
			loc is ________		

SET #1

1.	25	16.	1234
2.	1234		1261
3.	1111		
4.	3333		
5.	4321		
6.	4321		
7.	777~~767~~677		
8.	error		
9.	4444		
10.	777752		
11.	15		
12.	123456		
	3456		
	loc 25		
13.	123456		
	3456		
	loc 1000		
14.	123456		
	3456		
	in 1234		
15.	123456		
	3456		
	loc 2234		

SET #2

17.	008888	25.	001234
	007771		001272
18.	001111	26.	002345
	error		error
19.	001111	27.	004321
	000000		004300
20.	004321	28.	123456
	010642		122662
	000643	29.	227722
21.	004444	30.	001014
	130122	31.	123575
	0122 in loc 25		
22.	001111	32.	110011
	002222	33.	333300
	005555		3300 in 1270
23.	001234		
	777011		
	773456		
24.	123456		
	561234		
	000561		
	610005		

SET #3

1.	4567	124567	7.	7777	127777
2.	1112	001112	8.	4322	004322
3.	1233	001233	9.	7776	007776
4.	7777	127777	10.	7011	127011
	1234	~~010000~~		loc 1334	
5.	0000	010000	11.	?	(1136+1)
	loc 1111			loc 1136	
6.	7776	007776			
	loc 1111				

CODING EXAMPLES

1\. What does this code do?

```
         MJN     ABT
       code
       100
       instruction
       words
ABT      -
         -
```

2\. How to fix a jump that won't reach:

```
         PJN     *+3
         LJM     ABT
       code:
       100
       words
ABT
```

3\. HOW THE RETURN JUMP INSTRUCTION WORKS:

```
         ORG     1000B
         LDN     1
         STD     4 sub
         RJM     TAG,4
         -
         -
         -
sub
TAG      DATA    100
         DATA    0
```

a. {TAG} = ____________

b. {TAG+1} = ____________

c. Where does execution continue? ____________

d. Why is P+2 the return address?

____

4\. Where does the STM store?

```
         -
         STM     *+3
         LJM     TAG
         -
```

____

5. HOW TO MAKE A LOOP

```
        LDN     4
        STD     14B
LP      -
        -
        SOD     14B
        NJN     LP
```

How many times is this loop executed?

____

6. HOW NOT TO MAKE A LOOP

```
        LCN     4
        STD     10B
LP      -
        -
        AOD     10B
        NJN     LP
```

Why is this a hung loop?

____

____

7. HOW TO MOVE CORE

Given: {15} = 1000B
{17} = 2000B

```
a.          LDM     0,15B
            STM     1000B,15B

b.          LDI     15B
            STI     17B

c.          LDC     1000B
            STD     1
     LOOP   LDI     1
            STM     1000B,1
            AOD     1
            ADC     -1077B
            MJN     LOOP
```

In each example, how many words are moved, and from what locations to where?

a. ______________________

b. ______________________

c. ______________________

8. HOW TO MAKE AN INCLUSIVE OR

```
          LDM     TAG1
          STM     AND+1
          LDM     TAG
AND       LPC     **
          STD     2
          LDM     TAG
          LMM     TAG1
          ADD     2
            ⌇
TAG       DATA    1264B
TAG1      DATA    4444B
```

a. What is the inclusive OR of 1264 and 4444?

____

b. Is it necessary to load TAG1 and store it in the LPC instruction? _______

c. What value does ** assemble as?

____

9. HOW TO ADD 18-BIT NUMBERS

Given:

(IN)= 0012
(IN+1)= 7756

IN and IN+1 represent an 18-bit relative CM address which must be updated

```
          LDC     100B
          RAM     IN+1
          SHN     -12
          RAM     IN
```

(ie 127756 + 100 = 130056 ← 100_8 is 64_{10} 1 pru)

13. ALGORITHM FOR WORKING WITH 12-BIT SIGNED NUMBERS IN MEMORY

a.
```
DATA1     DATA    1234B,7643B,0005B
DATA2     DATA    2000B,7523B,7766B
ANSWER    BSSZ    3
          }
          LDN     2
          STD     2
ADD       LDC     770000B
          ADM     DATA1,2
          ADM     DATA2,2
          STM     ANSWER,2
          SOD     2
          PJN     ADD
```

b.
```
X         VFD     12/DATA1
Y         VFD     12/DATA2
Z         VFD     12/ANSWER
          }
          DUP     3,7
          LDC     770000B
          ADI     X
          ADI     Y
          STI     Z
          AOD     X
          AOD     Y
          AOD     Z
          }
DATA1     DATA    1234B,7643B,0005B
DATA2     DATA    2000B,7523B,7766B
ANSWEF    BSSZ    3
```

Question: What type of numbers are in:

DATA1 ____________ ____________ ____________
DATA2 ____________ ____________ ____________
ANSWER ____________ ____________ ____________

11. INTEGER MULTIPLY

```
        LDC     800
        STD     1
        SHN     4
        SBD     1
        SBD     1
        SBD     1
        STM     ANS+1
        SHN     -12
        STM     ANS
         ~
ANS     BSSZ    2
```

a. What are the numbers multiplied?

____

b. How many words of core does this code occupy?

____

12. INTEGER DIVIDE

```
DVDN    EQU     10B
DVSR    EQU     11B
ANS     EQU     12B
REM     EQU     13B
         ~
        LDN     0
        STD     ANS
DIV     LDD     DVDN
        SBD     DVSR
        MJN     OUT
        STD     DVDN
        AOD     ANS
        UJN     DIV
OUT     ADD     DVSR
        STD     REM
         ~
DVDN    DATA    30
DVSR    DATA    13
ANS     BSSZ    1
REM     BSSZ    1
```

a. What numbers are divided?

____

b. What is the answer?

____

c. What is the remainder?

____

{10} = 30
{11} = 13

ANSWERS TO CODING EXAMPLES

1. Assembly error.
   ABT is too far away.

2. The PJN jumps around the LJM.
   The LJM can reach ABT.

3. a. 100
   b. 1004
   c. TAG+2
   d. RJM is two words

4. Second word of LJM instruction.

5. four

6. The AOD in this case always leaves (A) $\neq$ 0

7. a. one word -
   from 1000 to 2000
   b. one word -
   from 1000 to 2000
   c. 77_8 words -
   from 1000+ to 2000+

8. a. 5664
   b. yes -
   there is no LPM instruction
   c. 0

9. -

10.

```
+1234    -0134    +0005
+2000    -0254    -0011
+3234    -0410    -0004
```

Solution formula:

```
770000   770000   770000
 +1234    +7643    +0005
------   ------   ------
771234   777643   770005
 +2000    +7523    +7766
------   ------   ------
773234   007366   777773
              1
         ------
         007367
```

11. a. 800 x 13
    b. 12

12. a. 30 ÷ 13
    b. 2
    c. 4

FORMAT OF THE CRD

1. Reserve a PP buffer to read the data into:

   (Locations 10-14 will be used)

2. Load CM absolute address into A:

   LDC 123400B

3. Execute the Central Read instruction:

   CRD 10B

   PP memory location 10
   is beginning of a
   5-word PP buffer
   to contain 1 CM word

* After the Read, (A) is not destroyed *

(in this case, 123400_8)

CENTRAL MEMORY

READ and WRITE INSTRUCTIONS

CRD - reads one word

CRM - reads a block

CWD - writes one word

CWM - writes a block

FORMAT OF THE CRM

1. Reserve a PP buffer to read the data into:

```
BUF     BSSZ    20
```

2. Store the block length (CM words) in a direct cell:

```
        LDN     4
        STD     10B
```

3. Load the absolutized CM address in A

```
        LDC     123400B
```

4. Execute the Central Read instruction:

```
        CRM     BUF,10B
```

PP Buffer to read into

Direct Cell containing CM word count

* After the Read, (A) is CM LWA+1 *

(in this case, 123404_8)

Instruction Problem Set #4

1.
```
        LDC     400B
        CRD     50B
```
a. (A) = ______________

b. What does this code do?

____

2.
```
        LDC     60000B
        CWD     10B
```
a. (A) = ______________

b. What does this code do?

____

3.
```
        LDN     16
        STD     2
        LDC     400B
        CRM     BUF,2
          }
BUF     BSS     80
```
When the Read is finished, but before the original P is restored, what is:

(A) = ______________

(Q) = ______________

(P) = ______________

(loc 0) = ______________

4.
```
ADDR    DATA    0021B,2222B
          }
        LDN     5
        STD     2
        LDM     ADDR
        SHN     12
        ADM     ADDR+1
        CWM     BUF,2
          }
BUF     BSS     25
```
What does this code do?

CODING CONVENTIONS

CODING CONVENTIONS
Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section VI

TRAINING AIDS:

Visuals VALS-53-6-3, VALS-53-6-10

ASSIGNMENTS:

Study questions Section VI

OBJECTIVES:

(1) To present the SCOPE System Symbol coding conventions

(2) To introduce freedom from hand coding by using symbols.

(3) To introduce SCOPE System Texts.

(4) To introduce SCOPE PP Programming naming conventions.

CODING CONVENTION

Lesson Outline

VI. CODING CONVENTIONS

A. System Symbols
- o Definitions
- o Examples
- o As system communication aids

B. System Texts
- o Provide commonly used MACROS
- o Provide commonly used MICROS
- o Provide commonly used Symbol Definitions
- o From Libraries
- o Called from COMPASS control card
- o Classified into functional modules

C. PP Program Naming Conventions
- o Three Alpha characters
- o Most names already used
- o Number signifies where loaded
- o Some reserved for user

SYMBOL DEFINITIONS

		EXAMPLE
D.XX	A DIRECT CELL IN PP MEMORY	D.FFO is loc 50 D.PPIRB is loc 50
R.XX	A PP RESIDENT ROUTINE	R.IDLE is loc 103
M.XX	A MONITOR FUNCTION	M.DPP is 12 M.ABORT is 13
T.XX	A SYSTEM TABLE IN CMR	T.FNT is FILE NAME TABLE
P.XX	A POINTER IN CMR TO A TABLE	P.FNT byte 0 is ADDRESS OF FNT
C.XX	A BYTE IN A CMR WORD (0-4)	C.CPRA is 3
	or	
	A PP CONSTANT	C.PPFWA is 1000
L.XX	LENGTH OF A CMR TABLE	L.TAPES is LENGTH of TAPES TABLE
	or	
	A PP LENGTH CONSTANT	L.PPHDR is 5
W.XX	A WORD IN CMR:	
	PP COMMUNICATION AREA	W.PPMES1 is WORD 2 of PP COMM AREA
	CONTROL POINT AREA	W.CPSTAT is WORD 20 of CP AREA
F.XX	AN ERROR FLAG VALUE	F.ERPP is 3 (PP Abort code passed by M.ABORT)

EXAMPLES OF GOOD CODE

1. HOW TO READ THE PP INPUT REGISTER FROM CENTRAL MEMORY AND GET THE CP NUMBER AND CP AREA ADDRESS

```
LDD     D,PPIR
CRD     D,PPIRB
LDD     D.PPIRB+1
LPN     7
SHN     7
STD     D.CPAD
```

2. HOW TO GET RA AND FL AND BRING THEM INTO THE PP

```
LDD     D.CPAD
ADN     W.CPSTAT
CRD     D.TO
LDD     D.TO+C.CPRA
STD     D.RA
LDD     D.TO+C.CPFL
STD     D.FL
```

3. HOW TO ABSOLUTIZE A CENTRAL MEMORY ADDRESS

```
LDD     D.IN
SHN     6
ADD     D.RA
SHN     6
ADD     D.IN+1
```

6. HOW TO WRITE A PP BUFFER TO CENTRAL MEMORY
- 32 PP WORDS -

```
          LDN     7
          STD     7
          LDN     0
          STM     IN+32
          STM     IN+33
          STM     IN+34
          LDD     D.IN
          SHN     6
          ADD     D.RA
          SHN     6
          ADD     D.IN+1
          CWM     IN,7
          LDN     7
          RAD     D.IN+1
          SHN     -12
          RAD     D.IN

IN        BSS     35
```

The above code wrote 35 PP words, which is 7 CM words, to Central Mempry. The last 3 bytes were zero, because only whole CM words may be written.

The code also updates the IN pointer.

4. HOW TO CLEAR 5 PP WORDS

```
        LDN     P.ZERO                CM ADDR 0 CONTAINS 0
        CRD     D.TO                  CLEAR D.TO-D.T4
```

This is faster and uses less code than:

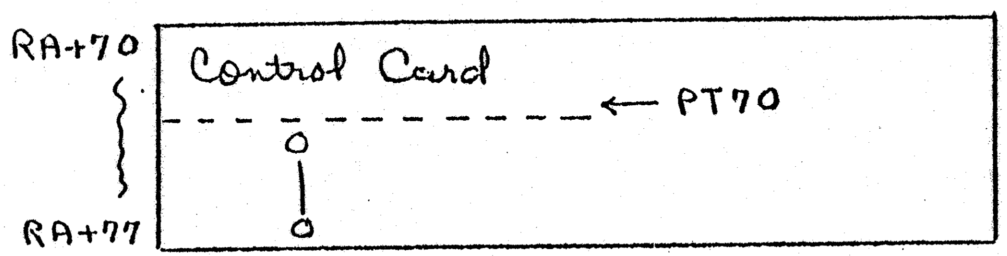
```
        LDN     0
        STD     D.TO
        STD     D.T1
        STD     D.T2
        STD     D.T3
        STD     D.T4
```

5. HOW TO CHECK TO SEE IF THE CPU IS RUNNING:

```
        RPN
        STD     2
        RPN
        LPC     7777B
        SBD     2
        NJN     OK
        LJM     TIMOUT
   OK
```

Given: PT70 contains a number in the range 70-77. IAJ has just moved a control card into the RA+70 area. Examine the following code to see how IAJ clears the rest of the area. PT70 contains the pointer to the last word stored.

GOOD CODE TO STUDY
(also Study R.DFM)




```
1400               LDN   P.ZERO        CLEAR REST OF RA+70B AREA     1AJ
6010               CRD   D.T0                                        1AJ
3665    UNP6       ADD   PT70                                        1AJ
1377               SCN   77B                                         1AJ
0506               NJN   UNP5                                        1AJ
3455               LDD   D.RA                                        1AJ
1006               SHN   6                                           1AJ
3165               ADD   PT70                                        1AJ
6210               CWD   D.T0                                        1AJ
0370               UJN   UNP6                                        1AJ
```

SCOPE 3.3 & 3.4

Given: (A) contains a flag and a message buffer address: | 0X | loc. |

flag — message address in PP

R.DFM moves the message to pp locs 13+. It then moves 5 pp words (1 CM word) at a time to the PPMES area in Central Memory. Study the code.

```
                                  *    R.DFM     TRANSMIT DAYFILE MESSAGE                            STL   580
                                  *                                                                  STL   581
                                  *    CALLING SEQUENCE                                              STL   582
                                  *                                                                  STL   583
                                  *    LOAD      (FLAG)LOCATION OF MESSAGE                           STL   584
                                  *    RJM       R.DFM                                               STL   585
                                  *                                                                  STL   586
                                  *    ACTIONS                                                       STL   587
                                  *                                                                  STL   588
                                  *    TRANSMIT MESSAGE TO PP MESSAGE AREA                           STL   589
                                  *    CALL MONITOR FUNCTION M.DFM.(FLAG)                            STL   590
                                  *                                                                  STL   591

 0664                   R.DFM      ENM     *                                                         STL   593
 0665     3410                     STD     D.T0       LOCATION OF MESSAGE                            STL   594
 0667     1063                     SHN     -12                                                       STL   595
 0670     3411                     STD     D.T1       STORE FLAG                                     STL   596
 0671     2375                     LDD     D.PPMES1                                                  STL   597
 0672     3412                     STD     D.T2       SET STORAGE (+1) ADDRESS                       STL   598
 0673     1413          DFM2       LDN     D.T3                                                      STL   599
 0674     3400                     STD     0          SET ASSEMBLY ADDRESS                           STL   600
 0675     4010          DFM1       LDI     D.T0       MOVE BYTE                                      STL   601
 0676     4400                     STI     0          TO ASSEMBLY AREA                               STL   602
 0677     0402                     ZJN     *+2        SENSE END OF MESSAGE                           STL   603
 0700     3410                     AOD     D.T0       ADVANCE IN MESSAGE                             STL   604
 0701     3500                     AOD     0          AND ASSEMBLY AREA                              STL   605
 0702     1125                     LMN     D.T3+5                                                    STL   606
 0703     0571                     NJN     DFM1       SENSE ASSEMBLY NOT FULL                        STL   607
 0704     3012                     LDD     D.T2                                                      STL   608
 0705     6213                     CWD     D.T3       WRITE ASSEMBLY TO MESSAGE AREA                 STL   609
 0706     3412                     AOD     D.T2       ADVANCE STORAGE ADDRESS                        STL   610
 0707     1207                     LPN     7                                                         STL   611
 0710     0403                     ZJN     DFM3       JUMP IF END OF MESSAGE AREA                    STL   612
 0711     3117                     LDD     D.T3+4                                                    STL   613
 0712     0565                     NJN     DFM2       LOOP IF NOT END OF MESSAGE AREA                STL   614
                                                                                                     STL   615
 0713     1401          DFM3       LDN     M.DFM                                                     STL   616
 0714     0200 2516                RJM     R.MTP      SEND DAYFILE MESSAGE                           STL   617
 0716     0345                     UJN     R.DFMX                                                    STL   618
```

8-9

SCOPE SYMBOL DEFINITION B

SCOPE Text (SCPTEXT) contains system macros, micros, and symbols used by COMPASS CPU and PPU programs that comprise the SCOPE operating system. SCPTEXT contains the following common decks:

ACTCOM	CPU program system action request macros
COMAFET	File Environment Table generation macros
COMSRAS	System communication (RA) symbols
CPSYS	CPU input/output macros using the Central Program Control (CPC) library routines
PPSYS	PPU program system macros, micros, and symbols.

SCPTEXT is made up of CPCTEXT and PPTEXT. CPCTEXT may be used when only user-mode CPU programs are assembled, and PPTEXT may be used when only PPU programs are assembled.

Common deck COMSRAS contains definitions of symbols of the form RA.xxx which are addresses of words in the communication area (RA+0 through RA+100).

A listing of system symbols can be obtained with the following job deck:

```
job card (including a request for MTO1
REQUEST(OLDPL,E,HY) SCOPEPL1
UPDATE(Q)
COMPASS(S=0,I=COMPILE)
7/8/9
*COMPILE PPTEXT
6/7/8/9
```

PPSYS IDENTIFIERS

Common deck PPSYS contains definitions of symbols of the form:

i.mn

i	Identifier; one or two alphabetic characters specifying the category to which the symbol belongs.	
	C	Byte number in CM word (0-4). C identifiers are used for flags and parameters of 12 bits or less.
	CH	Pseudo channel assignments
	D	Direct cells
	EX	M.ICE parameter values
	F	Error flag values
	L	Lengths
	LE	Length of table entries
	M	PPU request of monitor
	O	Stack processor orders
	OV	PPU overlays; mnemonic is the overlay name
	P	CM location of pointer words
	R	PPU resident entry points
	S	Number of bits to right shift a parameter to right justify it in a PPU word. Some symbols, notably those related to the scheduler, are the number of bits to right shift a parameter to right justify it in a CM word.
	T	First word address of CM tables. The system programmer should use the P. definition rather than access the table directly with the T. definition.
	W	Relative positions in CM tables
mn	Mnemonic; one to six alphanumeric symbols suggesting the use of the symbol. For example, P.ZERO identifies CMR pointer area word 0, which contains binary zeros.	

SCOPE
3.4

SYSTEM TEXTS

System texts provide commonly used macro, micro, and symbol definitions for use in COMPASS source programs. SCOPE provides several text overlays which are loaded by COMPASS from the system libraries when specified by S parameters on the COMPASS control statement. S parameters can also be used on FTN control statements when FORTRAN source programs contain intermixed COMPASS subprograms. Up to seven system texts can be specified, each by a different S parameter, for a given assembler run. The system texts are made up of UPDATE common decks described below.

COMMON DECKS

System Action Request Macros: ACTCOM

IXi Xj*Xk	DISPOSE	RECOVR
IXi Xj/Xk	ENDRUN	REQUEST
IXi Xj/Xk,Bn	FILESTAT	RTIME
ABORT	JDATE	SYSCOM
CHECKPT	LOADREQ	SYSTEM
CLOCK	MEMORY	TIME
CONTRLC	MESSAGE	TRANSR
DATE	RECALL	

Input/Output Macros using CPC: CPSYS

BKSP	READIN	SKIPF
BKSPRU	READN	UNLOAD
CLOSE	READNS	WPHR
CLOSER	READSKP	WRITE
EVICT	REWIND	WRITEC
FILEB	REWRITE	WRITEN
FILEC	REWRITEF	WRITEF
LABEL	REWRITER	WRITER
OPEN	RFILEB	WRITIN
POSMF	RFILEC	WRITOUT
READ	RPHR	
READC	SKIPB	

Record Manager Internal Text: RMCOM

Contains macro, micro, and symbol definitions used within Record Manager modules.

Installation Parameters: IPARAMS

Contains installation parameters as symbol and micro definitions.

Loader Request Macros: LMACOM

Contains two macros: LOADER and LDREQ.

Permanent File Macros: PFCOM

ALTER	EXTEND	PURGE
ATTACH	FDB	RENAME
CATALOG	PERM	SETP

Peripheral Processor System Definitions: PPSYS

Contains many system symbols and micros, and the following macros:

ADK	CRI	LDK
BIT	ENM	PPENTRY
CEQU	JOBCARD	SBK
CMICRO	LDCA	UJK

Integrated Scheduler Macros: SCHCOM

CISO	SCHLOK	SCHSTOR
ENTRY34	SCHSAVE	STREQ
LDW		

Indexed Sequential Interface Macros: SISICOM

ACCESSK	OPENOLD	SETBLKI
ACCESSN	REPLACE	SETCOLL
DELETE	REPOS	SETERR
FORCEW	SEEKL	SETFET
INSERT	SEEKS	SETKEY
OPENNEW	SETBLKD	TERMNAT

Record Manager Definitions: 6RMCOM

Contains macro, micro, and symbol definitions for user programs that use the Record Manager.

SCOPE
3.4

TEXT OVERLAYS

The SCOPE system text overlays contain various combinations of the common decks, as shown below:

CPCTEXT System text for central processor programs using CPC. Common decks ACTCOM, CPSYS, and SISICOM.

IOTEXT System text for central processor programs using Record Manager. Common decks ACTCOM and 6RMCOM.

IPTEXT Installation parameter system text. Contains a single macro, IPARAMS, whose body is the IPARAMS common deck.

LDRTEXT System text for central processor programs using Loader. Common deck LMACOM.

PFMTEXT System text for central processor programs using permanent files. Common deck PFCOM.

PPTEXT System text for peripheral processor programs. Common deck PPSYS.

SCHTEXT System text for central and peripheral processor programs interfacing with the Integrated Scheduler. Common deck SCHCOM.

SCPTEXT System text for central and peripheral processor programs in SCOPE. Common decks ACTCOM, CPSYS, and PPSYS.

SYSTEXT System text for central processor programs. This is the default system text used by COMPASS when no S or G parameters are specified. It can be identical to either CPCTEXT or IOTEXT, at installation option. In the released system, SYSTEXT is equal to IOTEXT.

TXT6RM System text for Record Manager modules. Common decks ACTCOM and RMCOM.

In addition to the above system texts provided by SCOPE, the following system texts are provided by product set members.

ALGTEXT Contains COMPASS coded macros used to expand application areas of ALGOL-60.

FTNMAC Contains macros used by COMPASS object programs produced by the FORTRAN Extended compiler (FTN).

SMTEXT Contains macros for central processor programs that call the SORT/MERGE system.

TEXT	ACTCOM	BRMCOM	CPSYS	IPARAMS	LDRCOM	PFCOM	PPSYS	SCHCOM	SMCOM	RMCOM	SISICOM	ALGTEXT
IOTEXT	X	X										
CPCTEXT	X		X								X	
SYSTEXT	X X	X	user selected SYSTEXT=IOTEXT or system default X	user selected SYSTEXT=CPCTEXT							X	
IPTEXT				X								
LDRTEXT					X							
PFMTEXT						X						
PPTEXT							X					
SCHTEXT								X				
SCPTEXT	X		X				X					
SMTEXT									X			
TXTBRM	X									X		
ALGTEXT			X									X

SYSTEM TEXT

COMMON DECKS

PP PROGRAM NAME RESERVATIONS

Routine Name	Description
A†	Stack processor segment
ABS	Dump CM – absolute address
ACE	Advance control card
ACT	Helper for program ACCOUNT
ADS	ADDSET processor – add member to PF set
AUX	Utility helper
CCP	7000 station routine
CEA	Deadstart PP0 save program
CED	Deadstart PP control program
CEJ	MTS coldstart bootstrap
CEM	Central error manager for ECS
CEY	MTS coldstart bootstrap
CIO	Circular I/O processor
CKP	Saves information necessary to restart a checkpoint job
CLO	Dummy program used to call CIO
COM	Deadstart option matrix
CON	INTERCOM connect file to remote terminal
CP1	C.E. 415 card punch test
CR1	C.E. 405 card reader test
CY1	Resets FNT of file being processed by restart
D†	Deadstart dump
D00	Diagnostic for COBOL
DF4	C.E.-3234 test
DF7	C.E.-3553 test
DF8	C.E.-808 test
DIS	Console display program for a control point
DLE	C.E. diagnostics
DLM	DELSET processor – delete member from PF set
DMP	Dump CM
DMT	Deadstart dump for 60x, 65x drivers
DSD	System display
DSM	Dismount pack
DSP	ROUTE/DISPOSE function processor
DTS	Deadstart dump for 66x drivers
EKG	Private pack closing 1EJ
EPF	Send audit information to CM
ESB	Reconfiguration cleanup
EST	Deadstart equipment configuration
FAD	INTERCOM
FNT	INTERCOM-FNT alter routine
GBJ	INTERCOM-274 Graphics begin job
GEJ	INTERCOM-274 Graphics end job
GPF	GETPF(MMF)
HDS	Help deadstart

†Zero-filled.

PP PROGRAM NAME RESERVATIONS (CONT'D)

Routine Name	Description
IAP	INTERCOM initiate another program
IEF	Routine for CEFAP
IRP	Deadstart RMS stack processor
IUP	INTERCOM initiate user program
JAC	Job queue acquire information
JDP	Job dependency count decrementor
LBL	LABELMS header
LDC	LDCMR utility helper
LDL	Loader utility program
LDV	Loads CPU absolute overlays
LDW	Loads CPU absolute overlays in conjunction with LDV
LOC	Load octal corrections
LPF	In conjunction with LOADPF, reloads permanent files
LPT	C.E. 501 line printer test
LP1	C.E. 512 line printer test
MAC	INTERCOM
MDI	Used by EDITLIB to handle I/O involved in changing and moving directory
MDR	Deadstart 66x driver
MEM	Process memory function
MES	INTERCOM writes messages to remote terminal
MNT	MOUNT processor
MSD	Direct Access Module of Record Manager
MSG	Issues dayfile messages
MTR	Monitor
MTT	C.E. 60X tape test
MUJ	INTERCOM multi-user job
NSV	PP helper for CPVSN processor
OPE	Dummy program used to call CIO
P†	Deadstart pre-addressed 6603
PFA	Permanent file manager ATTACH function
PFC	Permanent file manager CATALOG function
PFD	Attaches Permanent File Directory to control point
PFE	Permanent file manager EXTEND function
PFP	Permanent file manager PURGE function
PFR	Permanent file manager RENAME function
PFS	Permanent file manager POSITION function
PPI	Reserved
PRM	Permission checking function
QAC	I/O queue acquire file
QAJ	Reserved
REQ	Makes non-allocatable device assignment and formats FNT entries for allocatable devices in response to REQUEST control card or a REQUEST macro call
RMS	Routine for CERMS
RPV	Reprieve central program
RST	Restores control point area of restart job

†Zero-filled

Routine Name	Description
RWE	INTERCOM Checks for INTERCOM job
SLT	Reserved
SPF	SAVEPF(MMF)
SRB	Used by EDITLIB to complete the disk address of a record
SSC	Sub-system call
SSF	Sub-system function
SSH	Station system helper
STL	Deadstart system execution PP resident
STS	Used by CP program to obtain certain status
TAT	PF set table system access
TBL	INTERCOM Get table
TDR	Deadstart MT-NT tape driver
TDS	Terminate deadstart
TPF	Transfer permanent files and permanent file table
TPT	Transfer permanent file tables
T76	INTERCOM
Uxx	Reserved for installations
VSM	STIMULATOR routine
XDQ	PP portion of dump queue
XRO	PP portion of restore queue
nUx	Reserved for installations
0ZA-0ZS	LCC drivers
0ZT-0ZZ	LCC initializer
0Z1-0Z9	LCC drivers
1AB	Identifies recovered jobs
1AJ	Advance job
1BR	INTERCOM Buffer Manager
1BT	Blank label tape routine
1CC	ESP communication processor
1CI	INTERCOM Queue Manager
1CL	Close function for all non-tape or non-permanent files
1CR	Tape read recovery – write CM for 9-track tapes
1CS	Tape read recovery – write CM for S tapes
1CT	Tape read recovery – write CM for SCOPE tapes
1C9	Write CM for tape read recovery – NT SCOPE tapes
1DA	Process private packs
1DF	Dump dayfile
1DL	Overlay loader and dayfile message processor for DSD
1DM	Device queue manager
1DS	INTERCOM H-display
1DU	DUMPF initialization
1EJ	End of job processor
1EM	Formats hardware error message for stack processor
1FC	Creates an RB entry for PFC
1GJ	INTERCOM
1GM	Issues GOOD MORNING when time changes from 23.59 to 00.00
1GR	INTERCOM
1IB	Initiate batch job from input queue

Routine Name	Description
1ID	INTERCOM Send dayfile message to terminal, complete swap
1IM	INTERCOM Send message to terminal
1IQ	Initiate JANUS control point
1IR	Main JANUS routine; drives readers punches, printers, etc.
1IS	Initialize overlay setup
1IU	Called by JANUS to backspace print file
1II	INTERCOM Initialization
1IT	Integrated tape driver for (66x) main overlay
1I1	INTERCOM Initialization
1LX	INTERCOM
1MF	Multifile positioning routine
1MH	Tape scheduling/prescheduling routine
1MM	Multi-mainframe job queue manager
1MT	Long record stranger tape driver
1N0	Tape read recovery noise record verifier
1NR	NT read driver
1NW	NT write driver
1N2	Tape noise record read recovery, read forward 1
1N3	Tape noise record read recovery, read forward 2
1NS	Notify station of SPOT completion
1OP	File open routine for non-tape files
1PC	Close permanent file mass storage
1PD	Called by PFA to either enter event stack, call another PP routine, or swap out
1PF	Permanent file error recovery
1PG	PURGE(MMF)
1PJ	INTERCOM Process job card
1PK	PF set coordinator
1PL	Dummy plot program
1PS	7000 Station routine
1PT	INTERCOM Low speed remote batch processor
1P1	Tape recovery to LGR positioning driver
1P2	Tape recovery write driver
1P3	Tape recovery verification driver
1P4	Tape recovery to LGNR positioning driver
1QF	I/O file manager
1QM	INTERCOM Check for MUJ swap-out completion
1QP	INTERCOM Quantum calculator and MUJ servicer
1RC	Restores field length of a checkpointed job
1RN	Ages queues, manages RBT chains and statuses tape drives
1RP	End of reel processor
1RQ	REQ overlay
1RS	Read stranger tape driver
1RT	Read SCOPE tape driver
1RV	Tape I/O read recovery driver initializer and terminator
1R2	Tape read recovery – tape parity error recovery 1
1R3	Tape read recovery – tape parity error recovery 2

Routine Name	Description
1R9	SCOPE tape 9 track (659) read tape driver
1SI	Routine to swap-in or roll-in a job
1SO	Swap-out or roll-out a job
1SP	Mass Storage I/O processor (stack processor)
1SX	Error message and abort function for stack processors
1S5	Load and execute 1SP or 3DO at second entry
1TF	Tape forward motion routine
1TJ	Translate job card
1TO	Tape open routine
1TS	Tape sampler
1VG	STIMULATOR routine
1WB	INTERCOM Wideband driver
1WI	SCOPE internal tape write driver
1WS	Stranger tape write driver
1W9	SCOPE tape 9 track (659) write tape driver
1XG	INTERCOM 1XP overlay used for graphics
1XP-6XP	INTERCOM High speed EXPORT processor
1ZA-1Z9	INTERCOM drivers
2CC	1CI overlay – process command
2CS	1CI overlay – create user table
2CU	1CI overlay – create user table
2GJ	INTERCOM
2IA	66x read driver for L tapes
2IB	66x write driver for L tapes
2IC	66x read driver for 7-track coded SCOPE tapes
2ID	66x write driver for 7-track coded SCOPE tapes
2IL	66x labels and tape module
2IO	Submodule for 3IO – 3IL
2IR	66x basic read overlay
2IS	Reservoir of routines for 1IS
2IW	66x basic write overlay
2IY	Modified 2IW for station write
2IZ	Modified 2IR for station read
2I1	INTERCOM overlay to 1I1
2LP	3256/3659 driver for an on-line print file
2ME	INTERCOM–Message sending routine
2PA	PFA utility processor
2PC	3446 card punch driver
2RC	3447 card reader driver
2RP	Overlay to 1RP-End-of-reel processor
2ST	MMF CIO staging processor
2TA	Automatic tape assignment overlay
2TB	All backward tape motion
2TC	Extended trailer label group processor
2VJ	Translate job card
2WB	INTERCOM overlay to 1WB

Routine Name	Description
3DO	Initialize allocatable device file
3IC	66x close processor
3IE	66x basic error processor
3IF	66x multi-file processor
3II	66x system initialization
3IL	66x label write processor
3IM	66x message processor
3IO	66x open processor
3IP	66x positioning within a logical file
3IR	66x read error recovery
3IV	66x close volume processor
3IW	66x write error recovery
3IZ	66x station header and trailer label processor
3LX	INTERCOM Overlay to 1LX
3ME	INTERCOM Overlay to 2ME
3PA	PFA swapper status check segment
3PM	Segment of IP1 used for holding code for future use
3PO	Segment of IP3 that processes uncorrectable parity error GO or RECHECK code
3PS	Segment of IP4 used for holding code for future use
3RQ	REQ overlay containing 2TACOM
3SP	Stack processor for 6603-I driver
3SQ	Stack processor for 6638 driver
3SS	Stack processor for 854 driver
3ST	Stack processor for 6603-II driver
3SV	Stack processor for 821 driver
3SW	Stack processor for 841 driver
3SY	Stack processor for 844 driver
3TT	INTERCOM Transmit data from CPU to terminal
3T1-3T2	INTERCOM Overlays to 3TT
3WB	INTERCOM overlay to 1WB
4AM	ADSETT add mumber overlay
4DO	Process device independent requests for allocatable devices
4ES	Enter stack request
4LB	ANSI standard label processor
4LC	3000 label processor
4LX	INTERCOM Overlay to 1LX
4WB	INTERCOM overlay to 1WB
5CP	IRP overlay – 6603-I driver
5CQ	IRP overlay – 6638 driver
5CS	IRP overlay – 854 driver
5CT	IRP overlay – 6603-II driver
5CV	IRP overlay – 821 driver
5CW	IRP overlay – 841 driver
5CY	IRP overlay – 844 driver
5DA	Initiate or destroy file on private pack
5LX	INTERCOM overlay to 1LX
5WB	INTERCOM overlay to 1WB
6BM	Billing message overlay

Routine Name	Description
6BR	ANSI label processor read function code overlay
6BW	4LB overlay
6CR	3000 label processor read function code overlay
6CW	3000 label processor write function code overlay
6LC	Segment of 4LB or 4LC to load conversion table into MMTC
6LM	Segment of 4LB used to construct tape label messages
6LX	INTERCOM overlay to 1LX
6L1	4LB overlay to convert PRU count
6L2	BCD conversion table overlay for 4LB
6L3	4LB overlay to check that proper conversion table is in the MMTC
6L4	4LB overlay for debug message writer
6L5	4LB overlay to format the label information
6L7	4LB overlay to pack and write label to tapes table
6MD	Dummy EDITLIB overlay
6NO	Tape error recovery debug segment assembled to give more detail about segment being read by 1NO
6PA	Prints system bulletin before header
6SI	Process swap-in parity errors
6RD	Disposed file accounting overlay
6PM	Permanent file accounting overlay
6WM	Outputs dayfile error messages for I/O requests
7EC	Generate ECS buffers
7ID	Auxiliary error processor for RMS I/O
7NO	Debug routine
7RQ	REQ Set Processor
7SN	1AJ Set Processor
7T1	ASCII/Display code conversion table
7T2	EBCDIC/Display code conversion table
7W1-7W2	Overlay for 6WM
8AA-8A9	Reserved
8BA-8B9	Reserved
8CA-8C9	C.E. Reserved names
8DA	A, I, J display overlay for DSD (dayfile buffers, REQUEST cards, JANUS)
8DB	B display overlay for DSD (control point status)
8DC	C, D, G display overlay for DSD (central memory)
8DD	Reserved for DSD
8DE	E display overlay for DSD (equipment status table)
8DF	F display overlay for DSD (file name table)
8DG	Reserved for DSD
8DH	H display for DSD (I/O queues)
8DI	Reserved for DSD
8DJ	Reserved for DSD
8DK	K display overlay for DSD (pointers and control point area)
8DL	L display overlay for DSD (central programmable)
8DM	M display overlay for DSD (PP communications area)
8DN	N display overlay for DSD (Breakpoint)
8DO	O display overlay for DSD (operator message)
8DP	P display overlay for DSD (tapes table and VSN previewing)
8DQ	Q display overlay for DSD (INTERCOM status)

Routine Name	Description
8DR	R display overlay for DSD (JDT tables and queues)
8DS	S display overlay for DSD (job control area)
8DT	T display overlay for DSD (transfer status-linked mainframe)
8DU	U display overlay for DSD (ID table)
8DV	V display overlay for DSD (RMS)
8DW	W display overlay for DSD (pack requests)
8DX	X display overlay for DSD (ECS memory)
8DY	Y display overlay for DSD (command format dictionary)
8DZ	Z display overlay for DSD (display dictionary)
8D0-8D4	DSD
8EA-8E4	DSD (Linked mainframe displays)
8FA-8PS	Reserved
8GO	Loaded by 1R3 when GO or DROP operator decision necessary during tape processing
8NO	Segment to 1N3 that writes debug messages to dayfile if IP.DBUG=1
8PT	INTERCOM Overlay to 1PT
8PU-8W9	Reserved
8T3	Overlay to load MMTC memory
8XA	Channel commands overlay for DSD
8XB	Debugging commands overlay for DSD
8XC	PPU calling control points requests commands overlay for DSD
8XD	Equipment status commands overlay for DSD
8XE	Control point commands overlay for DSD
8XF	Deadstart commands overlay for DSD
8XG	Priority and tape staging job control commands overlay for DSD
8XH	INTERCOM commands for DSD
8XI	Miscellaneous commands overlay for DSD
8XJ	Miscellaneous commands overlay for DSD
8XK	Tape scheduling commands overlay for DSD
8XL	Operator action manager commands overlay for DSD
8XM	Error flag commands overlay for DSD
8XN	CP-PP interlock commands overlay for DSD
8XO	Initiate system jobs command overlay for DSD
8XP	Tape assignment command overlay for DSD
8XQ	Bring up displays command overlay for DSD
8XR	Divert a file command overlay for DSD
8XS	Segment debug command overlay for DSD
8XT	Segment debug command overlay for DSD
8XU	RMS commands for DSD
8XV	Logical ID command overlay for DSD
8XW	ENID command overlay for DSD
8XX-8X7	Reserved for DSD
8X8	DSD command syntax table
8X9	Reserved for DSD
8YA-8Y9	DSD (Linked mainframe commands)
8ZA-8Z9	INTERCOM PP drivers
9AA-9PS	Customer Engineering
9PT	INTERCOM
9PU-9Y9	Customer Engineering
9ZA-9Z9	INTERCOM

STUDY QUESTIONS

Coding Conventions - Section VI

1. D.RA is a system symbol which defines ______________________.

2. W.PPMES4 is a system symbol which defines ______________________.

3. M.DPP is a system symbol which ______________________.

4. P.LIB is a ______________________ to the Library in SCOPE.

5. D.FL is a storage location in the PP which contains the Feild length of the job which requested the PP.

   {A} True

   {B} False

6. A system text is a source file for COMPASS.

   {A} True

   {B} False

7. System Texts contain

   {A} MACROS
   {B} MICROS
   {C} Commonly used symbols
   {D} All of the above
   {E} None of the above

8. System texts may be listed.

   {A} True
   {B} False

9. PP program names may begin with ______________________.

10. PP Program names generally indicate ______________________.

STUDY QUESTIONS

Coding Conventions - Section VI

1. D.RA is a system symbol which defines a direct cell in a PP

2. W.PPMES4 is a system symbol which defines a message buffer

3. M.DPP is a system symbol which is the code for drop PP.

4. P.LIB is a Pointer to the Library in SCOPE.

5. D.FL is a storage location in the PP which contains the Feild length of the job which requested the PP.

   {A} True
   {B} False

6. A system text is a source file for COMPASS.

   {A} True
   {B} False

7. System Texts contain

   {A} MACROS
   {B} MICROS
   {C} Commonly used symbols
   {D} All of the above
   {E} None of the above

8. System texts may be listed.

   {A} True
   {B} False

9. PP program names may begin with any alpha char.

10. PP Program names generally indicate where the PP code is to be loaded.

PP MACROS

PP MACROS

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section VII

TRAINING AIDS:

Visuals VALS-53-7-5

ASSIGNMENTS:

Study Questions Section VII

OBJECTIVES:

(1) To present the MACRO as a time saving, error reducing programming aid.

(2) To present pre-defined programming concepts using MACROS.

(3) To introduce generalized coding techniques.

(4) To prepare student to write simple PP Macros.

PP MACROS

Lesson Oultine

VII. PP MACROS

A. Definition

- o Pre-defined sequence of code
- o Generalized code

B. Source

- o SCPTEXT
- o PPTEXT
- o Your Code

C. Functions

o PPENTRY	Sets up entry
o ENM	Standard subroutine entry
o UJK	Unconditional Jump
o LDCA	Load central address
o CRI	Central Read Indirect
o BIT	Generate Symbol with Bit
o LDK	Load Constant
o ADK	Add Constant
o SBK	Subtract Constant

PP Macros

SCPTEXT MACROS

PPENTRY Macro

Used as first instruction following ORG in a primary level overlay. PPENTRY generates code to set up low core parameter as follows:

D.PPIRB through D.PPIRB+4	Input register contents
D.CPAD	Control point address
D.RA	Reference address/100B
D.FL	Field length/100B

Address field of the PPENTRY macro should contain: D.PPIRB, D.TO.

Code:

~~PPENTRY MACRO S,T~~
  LDD D.PPIR
~~ORG S~~
  IFEQ T,O.TO
~~RJM R.RAFL~~ ← note a RAFL is also done
  ELSE
~~ERR MACRO CALL ERROR~~
  ENDIF
~~PPENTRY ENDM~~

The PPENTRY macro is normally used as the first instruction in a primary overlay, for upward system compatibility.

ENM Macro

Generates standard subroutine entry and exit lines. The name of the subroutine is that declared in location field of ENM; the subroutine may be entered by an RJM to that name. If address field of ENM is blank, no exit symbol is defined; otherwise, contents of address field are appended to location symbol to generate subroutine exit symbol. (Typically, address field contains only an X) An exit from subroutine may then be made by jumping directly to the generated symbol.

Code:

```
     MACRO ENM,N,X
     IFC NE,+X++,2
N+X  LJM
     IFCP 1
     LJM
N    EQU *-1
ENM  ENDM
```

See example on next page.

HOW TO GET IN AND OUT OF A SUBROUTINE

1.
```
         RJM   SUB
          }
SUB      ENM   X   generates: { SUBX  | 0100 |
                              { SUB   | 0000 |
          }
         LJM   SUBX
```

2.
```
         RJM   SUB
          }
SUBX     LJM   **
SUB      EQU   *-1    <---- put tag SUB
          }                 on second word
                            of LJM instructio
         LJM   SUBX
```

UJK Macro

7.3.6 Generates UJN or LJM instruction, depending on length of jump. In general, the jump must be backward, since symbols used in address field must have been previously defined. Macro is useful for exiting from small subroutines subject to expansion.

Code:

~~UJK MACRO P~~
~~IFLT *-P,-63,2~~
UJN P
~~IFCP 1~~
LJM P
~~UJK ENDM~~

UJK makes a UJN or LJM

Example: UJK SUBX

LDCA Macro

Load PP A register with absolute 18-bit central address. Relative CM address is obtained from two consecutive PP low core locations, the first of which is specified in address field of LDCA macro; CM address is assumed to be right justified within these two words. Contents of D.RA are added to CM address. Macro is useful for loading many different CM addresses. Space may be conserved by using a subroutine rather than a macro if the same address is to be loaded three or more times.

Code:

~~LDCA MACRO A~~
LDD A
~~LPN 77B~~
SHN 6
~~ADD D.RA~~
SHN 6
~~ADD A+1~~
~~LDCA ENDM~~

Example:

LDCA D.IN

The relative CM address is obtained from D.IN + D.IN+1 and then absolutized

CRI Macro "Central Read Indirect"

Reads contents of a CM word the address of which is contained in a central memory pointer. Address field of CRI macro contains X, Y, and Z subfields, in that order.

X 6-bit CM pointer word address

Y First of five PP low core cells which will contain the desired CM word.

Z Byte within CM pointer word containing 12-bit CM address of desired word.

Code:

```
CRI MACRO X,Y,Z
~~LDN X~~
  CRD Y
~~LDD Y+Z~~
  CRD Y
~~CRI ENDM~~
```

Example:

CRI . P.EST, I.TO, O

The first word of the EST will be read into D.TO – D.T4. To search the EST, one can repeatedly add 1 to (A) and reread, since the CRD did not destroy the address of T.EST in A

BIT Macro

Generates no code; merely defines a symbol in the location field. Value assigned to symbol is a 1-bit mask where the bit is positioned according to the value of address field. Bits are counted from right to left, beginning with zero. Thus, the statement MASK BIT 2 would set MASK equal to 4. Macro is useful for generating 1-bit flag values with the S.x SCPTEXT symbols.

Code:

```
    MACRO BIT,R,V
R SET 1
    DUP V,1
R SET R+R
BIT ENDM
```

Example:

```
    MASK    BIT    2
```

generates a constant called MASK containing a bit in bit position 2. Same as:

```
    MASK    SET    4
```

LDK Macro

Generates LDN, LDC, or LCN instruction depending on size of its argument, which may be any valid address expression. This macro is recommended for referencing SCPTEXT symbols for CM pointer words.

Code:

```
LDK MACRO A
   LOCAL X
IFD IF DEF,A
X SET A
   [IFLT X,0,5]
X SET -Y
   IFLT [illegible],100B,2
   LCN X
   [IFCP 6]
   IFCP 4
   IFLT [illegible],100B,2
   LDN X
   IFCP [illegible]
IFD ENDIF
   LDC A
   ENDM
```

ADK Macro

Generates ADN, ADC, SSN, or no code depending on size of its argument, which may be an address expression. This macro is recommended for referencing SCPTEXT symbols for control point additives {W.x symbols}.

Code:

```
ADK MACRO A
  LOCAL X
IFD IF DEF,A
X SET A
  IFLT X,0,3
X SET -X
  SBK X
  IFCP 6
  IFLT X,1008,3
  IFNE X,0,1
  ADN X
  IFCP 2
IFD ENDIF
  ADC A
  ENDM
```

SBK Macro

Generates SBN or ADC depending on size of its argument. All symbols in its argument must be defined.

Code:

```
SBK MACRO ARG
  LOCAL CON
CON SET ARG
  IF DEF,ARG,3
  IFLT CON,1008,2
  SBN CON
  IFCP 1
  ADC CON
  ENDM
```

STUDY QUESTIONS

PP MACROS - Section VII

1. A MACRO is

   (a) a subroutine

   (b) a system entry point.

   (c) a function

   (d) a pre-defined sequence of code

2. The PPENTRY Macro, generally used as the first executable code of a PP Program, is used to ______________________________.

3. May a Macro be used in a subroutine?

   (a) Yes

   (b) No

4. May a Macro be used in another Macro?

   (a) Yes

   (b) No

5. Using MACROS generally means less coding.

   (a) True

   (b) False

6. MACROS usually indicates more efficient coding.

   (a) True

   (b) False

7. Macros may not use system symbols.

   (a) True

   (b) False

8. A Macro may generate no machine code.

   (a) True

   (b) False

9. Give an example of a Macro generating a label.

10. Write a Macro named CPNO which will

    (a) Obtain the control point number of the job which called the PP Program

    (b) Store the control point no in any PP memory location.

STUDY QUESTIONS

PP MACROS - Section VII

1. A MACRO is

   {a} a subroutine

   {b} a system entry point

   {c} a function

   {d} a pre-defined sequence of code

2. The PPENTRY Macro, generally used as the first executable code of a PP Program, is used to initialize several direct cell

3. May a Macro be used in a subroutine?

   {a} Yes

   {b} No

4. May a Macro be used in another Macro?

   {a} Yes

   {b} No

5. Using MACROS generally means less coding.

   {a} True

   {b} False

6. MACROS usually indicates more efficient coding.

   {a} True

   {b} False

7. Macros may not use system symbols.

   {a} True

   {b} False

8. A Macro may generate no machine code.

   {a} True

   {b} False

9. Give an example of a Macro generating a label.

   BIT

10. Write a Macro named CPNO which will

   {a} Obtain the control point number of the job which called the PP Program

   {b} Store the control point no in any PP memory location.

SYSTEM TABLES and POINTERS

SYSTEM TABLES AND POINTERS

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section VIII

System Programmers Reference

TRAINING AIDS:

Visuals VALS-53-8-3 thru VALS-53-8-10, VALS-53-8-12 thru VALS-53-8-14

ASSIGNMENTS:

Study Questions Section VIII

OBJECTIVES:

(1) To present the necessary source information for coding system PP Programs.

(2) To present the normal methods of information exchange between user programs and system PP programs.

(3) To define a technique where the information desired by the PP programmer can be located although it may not be specifically described.

SYSTEM TABLES AND POINTERS

Lesson Outline

VIII. SYSTEM TABLES AND POINTERS

A. CMR Summary

- o Pointers
- o Relocatable Tables
- o Fixed Table Areas
- o High Core Tables

B. Control Point Area (200 octal words)

- o Exchange Package
- o Accounting Information
- o Day file message
- o Control Card Buffer
- o Installation Parameter

C. System Exchange Package

- o Next active control point
- o To MTRRS - CPMTR Request
- o CP idle program(s)

D. PP Communication

- o PP Communication area definition
- o PP Communication Area tables
- o Communication word of tables (W.PPMES3)

E. RA Communication Area

- o RA + 0 - Hardware Flags
- o RA + 1 - User/System Interface
- o Parameter(s)
- o Control Card Image

CENTRAL MEMORY RESIDENT

0			Pointers
100			Channel Status Table
154			PP Status Words
200		T.CPA$_n$	Control Point Areas
		T.XPIDLA	System Exchange Packages
		T.PPC$_n$	PP Communication Areas
	*	T.EST	Equipment Status Table
	*	T.FNT	File Name Table
			CIO-CPCIO Special FNTs
			Permanent File FNTs
	*	T.ITABL	INTERCOM Table
	*	T.DAT	Device Activity Table
	*	T.RMSBUF	RMS Buffer
	*	T.STG	Tape Staging Table
	*	T.APF	Attached Permanent File Table
	ǂ	T.RQS	Request Stack
		T.RBR	Record Block Reservation Table (Headers)
		T.RBRBIT	RBR Bit Table
		T.DST	Device Status Table
		T.DPT	Device Pool Table
		T.SEQ	Sequencer Table
		T.RMS	Rotating Mass Storage Diagnostic Table
		T.INS	Installation Area
		T.MST	Mounted Set Table
		T.DDT	Dismounted Device Table
		T.VSNBUF	VSN Buffer
		T.TAPES	Tapes Table
		T.MAIL	Scheduler Mailbox Buffer
		T.IDT	Logical ID Table
		T.DFB	Dayfile Buffers
		T.PJT	Parameter Storage for Delayed PP Jobs
		T.SCHPT	(Optional) Scheduler Statistics
		T.SCHJCA	Scheduler Job Control Area
		T.SCHJDT	Scheduler Job Descriptor Table
		T.BCFAP	CPMTR CEFAP Buffer
		T.EPAGE	Empty Page Stack

T.ECSPRM	ECS Parameters
T.SUBPG	Subpage Buffer
T.ECTL	Description of T.EBUF Area
T.EBUF	Move Buffer for RMS-ECS Transfer
T.PPOVL	PP Resident Overlay Save Buffer
T.BRKPT	Breakpoint Table (ECS System)
T.AREA	Area Table (ECS System)
T.ENTRY	Entry Table (ECS System)
	CM Resident Programs (Disk System)
	Segmented System Areas (ECS System)
T.LIB	Library Directory
	INTERCOM Pointer Area
	INTERCOM Small Buffers and User Tables
	(Job control point user field length)
T.RBT	RBT Chains

* Table Must Begin Before 100008

ǂTable Must Begin Before 200008

CMR POINTER AREA

Pointer	59	47	35	29	23	11	Word
P.ZERO	Zeros						0
P.LIB	C.DIRFWA A	FWA of Library Directory		LWA+1 Library Directory		C.DSFLAG Deadstart Load Flag	1
P.RBR P.RBT P.CMLWA	C.RBRAD	FWA of RBR Area	C.RBTEC RBT Ordinal of Empty Chain		Length/100B of RBT Area	C.CMLWA (LWA+1)/100B of CM	2
P.NPP P.NCP P.DFB	FWA/10B of Dayfile Buffer	(Reserved)			C.NPP No. of PPs	C.NCP No. of CPs	3
P.SEQ P.FNT P.HEC	C.FNT FWA of FNT	C.FNTLWA LWA+1 of FNT	C.SEQ T.SEQ/10B		C.SEQL L.SEQ	C.HEC Hardware Error Count	4
P.CST P.PCOM P.EST	C.EST FWA of EST	LWA+1 of EST	C.CST FWA of CST		C.CSTL LWA+1 of CST	C.PCOM Address of Comm Area PP1	5
P.PFM1	C.PFMOVE	C.APFL No. of APF Entries		C.APF FWA of APF		C.PFMCH Interlock Byte	6
P.MST P.DDT P.DSMO	C.DSMO (Reserved)	C.NDDT L.DDT	C.DDT T.DDT/10B		C.NMST L.MST	C.MST T.MST/10B	7
P.INS	(Reserved for Installations)						10
P.EIRPR	C.LEPAGE L.ECSTK+1		C.ECSPRM T.ECSPRM		ICC Area Address		11
P.ELBST	Maximum Length/ 1000B of ECS Library File	ECS Flaw Table Address			ECS Page Stack Address		12
P.RQS	C.DAT T.DAT	C.DATL L.DAT	C.RQSFS FWA/2 of Request Stack		No. of DST Entries	FWA/10B of DST	13
P.DPT P.TAPES P.RMS	C.TAPES T.TAPES/10B	L.TAPES	C.RMS T.RMS/10B		C.RMSL L.RMS	C.DPT T.DPT/10B	14
P.STG						C.STG T.STG	15
P.INT	C.INT/C.IFL (LWA+1)/100B of INTERCOM	C.ITABL FWA of Multiplexer Table	C.IBUFF B	FWA of INTERCOM Pointer and Buffer Area		C.ILTABL Length of Multiplexer Table	16
	(Reserved)						17

NOTES: CMR POINTER AREA (CONT'D)

Symbol	59	47	41	35	23	17	11	0	Word
T.JDATE	(Leading Zeros)				Y	Y	D	D D	20
P.NRBR	C.NRQS Number of Request Stack Entries	C.NRBR Number of RBR Headers		Reserved	C.LRBR	Size of Total RBR Area			21
T.BJDT	Ordinal Date in Binary (YYDDD)		Reserved			Time in Binary (HHMMSS)			22
P.EVICT P.RMSBUF P.SYRBT					C.RMSBUF T.RMSBUF FWA of RMSBUF		Trace Buffer T.TRB/10B		23
P.CMFL							Machine FL/100B		24
	^ S	Y	S	T	E	M	^	^ ^	25
T.CPJOBN P.PJT P.SPDROP	Job Sequence Number	C.SPDROP DST Ordinal for 1SP Drop		Job Count	C.PJTFWA T.PJT/10B		C.PJTLWA T.PJT/10B+ L.PJT/10B		26
T.EPBL P.ECSFL	C.ECSPL ECS Page Length			C.ECSBL ECS Buffer Length			C.CPECFL Machine ECS FL/1000B		27
T.CLK	H	H	.	M	M	.	S	S	30
T.SLAB1 T.DATE	M	M	/	D	D	/	Y	Y	31
T.SLAB2									32
T.SLAB3				System Label					33
T.SLAB4				SCOPE Version					34
T.SLAB5				3.4					35
T.SLAB6									36
T.MSP					Debugger		Step Flag		37

NOTES: CMR POINTER AREA (CONT'D)

	59	47	35	23	11	0	
T.MSC	Count of PP Job Queue Entries	Number of Idle PPs	Number of Seconds*4096			40	
P.CHRQ				C.CHRQ First 10 Channels	C.CHRQ2 Second 10 Channels	41	
P.PPLIB	Position of CIO	0 0 0 0	Number of Programs		Address of First Entry	42	
P.VRNBUF	C.VRNFWA T.VRNBUF/10B	C.VRNFIN Pointer to First VSN	C.STGFLG Stage ON/OFF	C.VRNINT Buffer Interlock	C.VRNFUL Buffer Full Flag	43	JOB MODE Rescheduling
T.CPSTA	Idle Exchange Package Address	• •	Next Slice Time	2 0	Active XP Address		
		• • • • • •		0 3 0 3	• • • •	44	
				0 0 0 L	• • • •		OFF
T.CPSTB						45	
	0 0 0 0 0 0 0 0	0 0 0 0	0 0 0	0 0 0 0	0 0 P		EXN
T.MXNCTL	STL Code		20	Active XP Address	2 6 1 P	46	MXN
				• • • • • •	2 6 2 P		MAN
T.PPID	* * * * * *				PP Input Register Address	47	
T.PPIP	* * * * * *				PP Input Register Address	50	
T.CMPID	Computer ID for ECS Partitioning					51	
	(Reserved)					52	
T.SPF			C.SNTLWA Length of Spot Name Table	C.SNTFWA FWA of Spot Name Table	C.CPN Station Control Point Number	53	
	(Reserved)					54	
T.RCHN	SPM-1RN Communications Word				First RBT Word Pair to Release	55	
T.CPT1 } T.UAS	Unassigned CM/100B	Unassigned ECS/1000B	ECS Size		Initial CPMTR Address	56	
T.ECSPAR } P.EPAGE		C.EPAGE T.EPAGE	ECS Flaw Table Flag	ECS Parity Flag	ECS Parity Address/1000B	57	

L = { 0 Turned Off; 1 Locked Off } P = { 0 CPUA; 1 CPUB }

CONTROL POINT AREA

Bit positions: 59 47 44 41 35 29 23 17 11 5 0

Word	Contents (bits 59 → 0)	Address
W.CPAn	Exchange Package	0–17
W.CPSLIC, W.CPUST, W.CPLINK	C.CPSTAT Status Byte | C.CPSLIC M.RCLCP Time | * * * * | C.CPUPRI, C.CPLINK Next Active Control Point	20
W.CPTIME	C.CPUQS C.CPUQMS CPU-A Seconds*4096 This Quantum | C.CPUAS Total CPU-A Time as Number of Seconds*4096	21
W.CPTIMB	C.CPUQS C.CPUQMS CPU-B Seconds*4096 This Quantum | C.CPUBS Total CPU-B Time as Number of Seconds*4096	22
W.PPTIME, W.CPPTM	C.CPPQS C.CPPQMS PP Seconds*4096 This Quantum | C.CPPTS Total PP Time as Number of Seconds*4096	23
W.CPSTAT, W.CPFL, W.CPEF	C.CPMEMO Error Memo | C.CPEF Error Flag | C.CPSM Storage Move | C.CPRA RA/100B | C.CPFL FL/100B	24
W.CPJNAM	C.CPJNAM Job Name | | JDT Ordinal	25
W.CPCC	C.CPRPV Reprieve CKSM Value | C.CPRPA Reprieve Address | C.CPNFL Nominal FL/100B | C.CPNCSP Next Control Card Pointer	26
W.CPECS	A | | C.CPECRA ECS RA/1000B | C.CPECFL ECS FL/1000B	27
W.CPDFM	Last Dayfile Message	30–37
W.CPPRI, W.CPJCP, W.CPTIML, W.CPIOL	C.CPTIML Current Time Limit (15 Bits) | C.CPIOL IO Time Limit (15 Bits) | C.CPPRI Job Class | C.CPECSI Initial ECS FL/1000B | C.CPFLI Initial FL/100B	40
W.CPSWP, W.CPINT	C.CPQNT Quantum | C.CPUTA User Table Address | C.CPORG, C.CPEVNT Flags | Job Origin	41
W.CPSCH, W.CPRO	C.CPFLG Swap Flags | C.CPJQP Job Queue Priority | C.CPRFL Reserved FL | C.CPJDA JDT Address (Absolute)	42
W.SSW, W.CPSSW	Saved SPOT Error Flags | | Reserved | C.CPSSW Sense Switches |	43
W.CPMST	| C.CPMST Setname MST Ordinal	44
W.CPCSF	Core Seconds Factor (Floating Point)	45
W.CPACS	(Reserved) Accumulated CM Core Seconds (Integer)	46
W.CPACSE	(Reserved) Accumulated ECS Core Seconds (Integer)	47

A if set, do not update exchange package ECS RA and FL

CONTROL POINT AREA (CONT'D)

Bit positions: 59, 47, 41, 35, 23, 17, 11, 5

Symbol	Contents	Word
W.CPFACT	Account Parameter for Permanent Files	50
W.CPFST W.FSTCC	FST Entry for Next Control Card PRU	51
W.CKP W.CPCKP W.CPID	C.CPDID Destination ID (59–36); C.CPSID Source ID (35–24); C.CPCON Console Checkpoint Flag (23–12); C.CPCKP Number of Checkpoints (11–0)	52
W.CPOAE	C.CPREQ Req Flag; A; B; C; Relative Address of Tape Label Information (35–24); C.CPOAE Equipment Assigned (11–0)	53
W.CPVRNO	Family Pack VSN Assignment 66x VSN Type-in	54
W.CPLDR1	C.CPLW C.CPLT Loader Flags (59–48); Global Library (23–0)	55
W.CPLDR2	Set	56
W.CPLDR3	Indicators	57
W.CPAR	RA+1 Contents (and Control Point Number of Last Auto-recall Request; C.CPAR Reply Word Address (17–0)	60
W.CPIOQ W.CPTAPE W.CPSTG	C.CPTMT MT (59–48); C.CPTNT NT (47–36); C.CPIOQ MST/PFC of Input File (35–12); C.CPMNT MT Max, NT Max (11–0)	61
W.CPDFMC W.CPDPV W.CPDSMO W.CPIRB	C.CPDFMC Dayfile Message Count (59–48); C.CPDSMO Default Set MST Ordinal (47–36); C.CPRBID INTERCOM Batch Routing ID (35–24); C.CPDPV Job Dependency ID (11–0)	62
W.CPFP W.CPOUT W.CPFLAG W.CPERT	C.CPFLAG Flags (59–48); C.CPFST FST Address (35–24); C.CPFP C.CPOUT Flags (11–0)	63
W.CPMSLM	C.CPMSLM MS Limit in PRU's (59–36); C.CPMSMX Maximum PRU Count (35–18); C.CPMSRC Running PRU Count (17–0)	64
W.CHTIM	Channel Time as Number of Seconds*4096 (35–0)	65
W.CPMSI	C.CPSITM Time of Swap-In (59–36)	66
W.CPSR	C.CPSR Stack Requests (47–36)	67
W.CPCAF	Start Control Card Buffer	70
W.CPCAL	End	167
W.CPINS	Reserved for Installations	170–177

A S.YNRDY B S.YNNO C Extended label format

NOTES: CMR POINTER AREA (CONT'D)

	59	47	35	23	11	0
P.SCH	C.LEJDT LE.JDT	C.SRS T.XPSCH/10B	C.JCA T.SCHJCA/10B	C.LJDT L.SCHJDT	C.JDT T.SCHJDT/10B	60
P.STR	C.NFL Needed FL/100B	C.JQP Queue Priority of Job in Counter	C.RFL Reserved FL/100B	C.RCL C.STMF SCH Recall	C.AFL Available FL/100B	61
T.SCHCP	Interlock Word (Scheduler)					62
T.SCHPP	Interlock Word (PP Routines)					63
	(Reserved)					64
P.MAIL P.SWPECS P.SCHPT	C.MAILF T.MAIL/10B	C.MAILL L.MAIL	C.SWPECS L.ECSSWP	C.SCHPT T.SCHPT/10B	C.ISIZLN INTERCOM User Table	65
P.LNK P.IDT	C.ECSLNK	(Reserved)		C.LIDT Length of ID Table	C.IDT T.IDT/10B	66
P.AREA P.ENTRY	FWA of Breakpoint Table T.BRKPT		FWA of Entry Table T.ENTRY		FWA of Area Table T.AREA	67
	(Reserved)					70-76
P.PPOVL				C.PPOVL T.PPOVL/10B	T.ELIBD	77

NOTES: CMR POINTER AREA (CONT'D)

60 P.SCH

Contains information relative to the integrated scheduler. Pointer to job scheduler exchange package is in byte 1; a pointer to the job control area is in byte 2; length and pointer to the job description table is in bytes 3 and 4; length of job description table entries is in byte 0.

61 P.STR

Information relative to job scheduling.

62 P.SCHCP

Interlock word for integrated scheduler.

SYSTEM JOB EXCHANGE PACKAGE AREA

Bit positions: 59, 47, 35, 29, 23, 17, 14, 11, 0

	59	47	35	23
T.XPSCH	Exchange Package for Scheduler and Storage Move			
W.CPSLIC W.CPUST W.CPLINK	C.CPSTAT Status Byte	C.CPSLIC M.RCLCP Time	. . . .	C.CPUPRI C.CPLINK Next Active Control Point
W.CPTIME	CPU-A Scheduler/Storage Move Time			
W.CPTIMB	CPU-B Scheduler/Storage Move Time			
W.PPTIME	PPU Idle Time			
W.XPIR	Scheduler Input Register			
W.XPOR	Scheduler Output Register			
Scheduler Only T.SCHRS	Scheduler Request Stack Table			L.SCHRS=4
T.MTRRS	CPMTR MTR Request Stack			L.MTRRS=4
T.XPIDLA	CPU-A Idle Program Exchange Package P=CP MTR (If IP.ECSB≠0, FL=400000B ECS FL=17777777B B2=1 B5=L.ECSTK B7=0 A6=T.EPAGE)			
W.CPSLIC W.CPUST W.CPLINK	C.CPSTAT Status Byte	C.CPSLIC M.RCLCP Time	. . . .	C.CPUPRI C.CPLINK Next Active Control Point
W.CPTIME	CPU-A Idle Time			
W.CPTIMB				
W.PPTIME				
W.XPIR	I D L E 1			
T.XPIDLB	(If IP.MCPU=2) CPU-B Idle Program Exchange Package P=CP.MTR (If IP.ECSB≠0, FL=400000B ECS FL=17777777B B2=1 B5=L.ECSTK B7=1 A6=T.EPAGE)			
W.CPSLIC W.CPUST W.CPLINK	C.CPSTAT Status Byte	C.CPSLIC M.RCLCP Time	. . . .	C.CPUPRI C.CPLINK Next Active Control Point
W.CPTIME				
W.CPTIMB	CPU-B Idle Time			
W.PPTIME				
W.XPIR	I D L E 2			

PP COMMUNICATION AREA

The PP Communications Area contains up to twenty 8-word areas, one for each PP, through which the PPs communicate with each other.

T.PPCX (where X = 1, 2,..., 20)	First word address of each area.
W.PPIR	Word 0 - relative location of the PP input register within a PP communication area.
W.PPOR	Word 1 - relative location of the PP output register within PP communications area. For PP_2 - PP_n Byte 0 contains a MTR function code.
W.PPMESx (where X = 1,2,...,6)	W.PPMESx are the relative locations of the six words of the PP message buffer within a PP communication area.

Each peripheral processor contains pointers to its Input-Register, and Message Buffer in peripheral processor memory locations 74 and 75, respectively. The communication areas are used to provide a means of communication between MTR and peripheral processor programs. When a peripheral processor is idle, its resident program continuously scans its Input Register. When MTR has a task for that processor, it sets the name of the appropriate routine in the Input Register of the idle processor, which when it recognizes the request, loads the routine and executes it.

MTR regularly scans the Output Register of each active peripheral processor. When a peripheral processor requires MTR assistance (such as, for example, reserving a data channel), it places a code in its Output Register. MTR detects the request during its scan of the output registers and processes it. When the request has been processed, MTR clears the requesting processor's Output Register; this informs the requesting processor that the request has been processed.

The six-word Message Buffer is used to pass parameters and messages between MTR and the peripheral processor resident programs.

PP COMMUNICATION AREA

FOR PP0

Word	Bits 59–18	Bits 17–0	
W.PPIR	CPCIO Output Register		
W.PPOR	MTR Output Register		
W.PPMES1	Stack Request Parameters		
W.PPMES2			
W.PPMES3	7HDAYFILE	0 0 0 0 3 0	Extend for System Dayfile
W.PPMES4	0		
W.PPMES5	7HCERFILE	0 0 0 0 3 0	Extend for CERFILE
W.PPMES6	0		

(Bit positions printed above the diagram: 59, 17, 0)

FOR PP1

Word	Contents	
W.PPIR	DSD Input Register	
W.PPOR	DSD Output Register	
W.PPMES1	Stack Request Parameters	COMMUNICATION AREA
W.PPMES2		
W.PPMES3	Control Point 0 Message Buffer	
W.PPMES4		
W.PPMES5		
W.PPMES6	DSD – 1DL Communication Word	

PP COMMUNICATION AREA (CONT'D)

FOR PP2 THROUGH PPn

Word	Bits 59 … 39 … 35 … 0		Word No.
W.PPIR	Program Name or 0 | C.CPNUM	Control Point No.; Recall; Called from event or delay stack	0
W.PPOR	MTR Function Code		1
W.PPMES1	STACK REQUEST PARAMETERS	COMMUNICATION AREA	2
W.PPMES2			3
W.PPMES3	COMMUNICATION WORD		4
W.PPMES4	EVENT STACK PARAMETERS		5
W.PPMES5			6
W.PPMES6			7

COMMUNICATION WORD

59	47	35	23	17 / 11	0
C.RWPPCF Control Point	C.RWPPWT Cumulative Byte Count	C.RWPPLW PP Buffer Length	C.RWPPCC	C.RWPPST Code and Status	C.RWPPWC Current PRU Byte Count

RA COMMUNICATION AREA

Bit positions: 59, 35, 29, 23, 17, 11, 5, 0

Word	Contents
RA+0	R (bit 23); O, T, P (bits 16–12); SS (bits 11–6)
RA+1	User/System Interface
RA+2 … RA+53	Parameter (One per Word, Left Justified) · · · / (Reserved) / Code
RA+54 … RA+63	1AJ Bootstrap for Absolute Programs
RA+64	Name/Library Name / Number of Parameter Words, Beginning in RA+2
RA+65	M / LWA+1 of Loadable Area in ECS / / L / LWA+1 of Loadable Area in CM
RA+66	X / FWA of Loadable Area in ECS / / D / FWA of Loadable Area in CM
RA+67	C
RA+70	Control Statement Card Image (Replaced by Operator Message If CFO Type-In)
	FORTRAN 2.3 Execution FL
RA+77	FORTRAN 2.3 ASA Flag +0 = Non-ASA; -0 = ASA
RA+100	Loader Word
RA+101	User Program

NOTES: RA COMMUNICATION AREA

R	Job dependency recheck bit
O	CFO flag (1 = accept comment from operator)
T	Storage move flag (1 = move being attempted)
P	Pause flag (1 = control point pausing)
SS	Sense switches
CODE	00 = Continuation
	01 = Comma
	02 = Equals sign
	03 = Slash
	04 = Left parenthesis
	05 = Plus sign
	06 = Minus sign
	07 = Blank
	10 = Semi-colon
	11 =
	12 =
	13 = (reserved)
	14 =
	15 =
	16 = Other
	17 = Termination
L	Library/file flag (1 = name is library name)
X	XJ flag: if XJ = 1, and XJ can be issued
C	LDV completion flag (bit 29)
D	DIS RSS flag (bit 18)
M	CMU Bit; if M=1 and CMU can be issued

NOTES ON RA COMMUNICATIONS AREA

RA Reserved for use of hardware and software flags in the event of error.

R	Job dependency recheck bit
T	Storage move flag (1 = move being attempted)
P	Pause flag (1 = control point pausing)
SS	Sense switches
SL	Sense lights

RA+1 If a user program wants to call a PP program, the call is placed in the RA+1 and then performs and XJ (CEJ - central exchange jump) to initiate CPMTR. CPMTR will execute certain RA+1 calls himself. If, however, the call should be assigned to a PP, the call will be passed to MTR. Should the XJ (CEJ/MEJ hardware) not exist on the machine, the CPMTR will be initiated by MTR, if he finds an RA+1 call in his normal scan.

Periodic Recall is accomplished by placing 'RCL' left-justified into RA+1.

Automatic Recall for an RA+1 request is accomplished by setting bit 40 in RA+1. A CP program may put itself into auto-recall by putting 'RCL' left-justified into RA+1 and setting bit 40 to one. The low order 18 bits will be, in any case, the address of the reply word.

RA+2-RA+63 Contain control card parameters, if they exist. They are stored by 1AJ. As the control card is cracked, the following codes are used for special characters:

CODE
00 = Continuation
01 = Comma
02 = Equals sign
03 = Slash
04 = Left parenthesis
05 = Plus sign
06 = Minus sign
07 = Blank
10 = Semi-colon
11 =
12 =
13 = (reserved)
14 =
15 =
16 = Other
17 = Termination

RA+64-RA+67 1AJ records the total number of parameters in RA+64. This section is used by the first several Loader routines to record Loader information for modification of additional Loader routines.

L	Library/file flag (1 = name is library name)
X	XJ flag: If XJ = 1, an XJ can be issued
C	LDV completion flag (bit 29)
D	DIS RSS flag (bit 18)

STUDY QUESTIONS

SYSTEM TABLES AND POINTERS - SECTION VIII

1. Locations 0 through 77 (octal) of CMR are known as ________________.

2. Some CMR tables are fixed (i.e. start in a specific location). These that are not fixed are accessed indirectly through a ________________________________.

3. P.LIB refers to the System ____________________________________.

4. P.FNT contains pointers to the ________________________________.

5. P.ZERO is not a pointer.

   (a) True

   (b) False

6. The pointer area of CMR contains some tables.

   (a) True

   (b) False

7. Pointers and tables in CMR may not be modified by the PP Programmer.

   (a) True

   (b) False

8. The control point area contains

   (a) The Jobs Exchange Package

   (b) The Jobs Name

   (c) The Job Time Limit

   (d) All of the above

9. The PP communication area is for ______________________________.

10. Users may communicate with a PP program throught ________________ in low "user core".

11. PPs may communicate with one another using a ______________________ area in CMR.

STUDY QUESTIONS

SYSTEM TABLES AND POINTERS - SECTION VIII

1. Locations 0 through 77 {octal} of CMR are known as Pointers.

2. Some CMR tables are fixed {i.e. start in a specific location}. These that are not fixed are accessed indirectly through a Pointer.

3. P.LIB refers to the System Library.

4. P.FNT contains pointers to the File Name Table.

5. P.ZERO is not a pointer.

   {a} True

   {b} False

6. The pointer area of CMR contains some tables.

   {a} True

   {b} False

7. Pointers and tables in CMR may not be modified by the PP Programmer.

   {a} True

   {b} False

8. The control point area contains

   {a} The Jobs Exchange Package

   {b} The Jobs Name

   {c} The Job Time Limit

   {d} All of the above

9. The PP communication area is for PP program communication

10. Users may communicate with a PP program throught RA+1 in low "user core".

11. PPs may communicate with one another using a Table (Message) area in CMR.

PP RESIDENT

PP RESIDENT

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section IX

System Programmers Reference

TRAINING AIDS:

Visuals VALS-53-9-5 thru VALS-53-9-7, VALS-53-9-10, VALS-53-9-20, VALS-53-9-23 thru VALS-53-9-26, VALS-53-9-39 thru VALS-53-9-62

ASSIGNEMNTS:

Study Questions Section IX

OBJECTIVES:

(1) To present the detailed functions of PP resident in order that the PP programmer may take full advantage of its functions.

(2) To present the inter-dependcies of the PP resident routines.

(3) To introduce the PP programmer to actual system code - STL.

PP RESIDENT

Lesson Outline

IX. PP RESIDENT

A. Introduction

- o Pool Processor philosophy
- o Transient Programs
- o Direct Cells
- o Scratch Area
- o Communication PP-System

B. PP Program Concepts

- o Direct Cells
- o PP Resident
- o Transient Area
- o Secondary Overlaps
- o Buffer Areas

C. PP Resident Code General Description

- o Handles communications between PP programs and Monitor
- o Miscellaneous functions for programmer

D. PP Resident Code Functions

o	R.IDLE	PP Idle Loop
o	R.OVLJ	Lead Overlay {int}
o	R.RAFL	Request access to FL
o	R.TAFL	Terminate access to FL
o	R.TFL	Test FL
o	R.MTR	Issue MTR function
o	R.WAIT	Wait for MTR
o	R.RCH	Reserve channel
o	R.STB	Store byte
o	R.OVL	Load Overlay
o	R.READP	Read {Stack Processor}
o	R.WRITEP	Write {stack processor}
o	E.EREQS	Enter Request {stack processor}
o	R.RWP	Read/Write code switcher
o	R.DFM	Dayfile message

E. PP RESIDENT Code Flow Charts

- o Note: R.RWP code for communication PP to PP over channel

F. PP Resident Actual Code - STL

PERIPHERAL PROCESSOR RESIDENT

INTRODUCTION

In the SCOPE operating System, the System Display program (DSD), and the Monitor program (MTR) permanently reside in two of the peripheral processors, 1 and 0 respectively. The remaining processors form a pool of processors to which MTR may assign tasks as required. These pool processors have no fixed assignments; any processor may be assigned to the execution of any system routine, and it is possible that more than one processor may be executing the same routine at the same time. All processors contain a small resident program which handles the communications between pool processor programs and the Monitor, and initiates the execution of these programs as directed by MTR.

When SCOPE is deadstarted a series of deadstart PP programs are loaded into the PP's. The last deadstart program to be loaded is named STL. It is loaded at location 100_8 in each of the pool PP's. The program STL contains PP Resident. STL starts executing at location 1000_8. When it is done it jumps to the PP Resident Idle loop, R.IDLE (see below), and the PP is ready to load and run programs as directed by MTR.

POOL PROCESSOR STRUCTURE

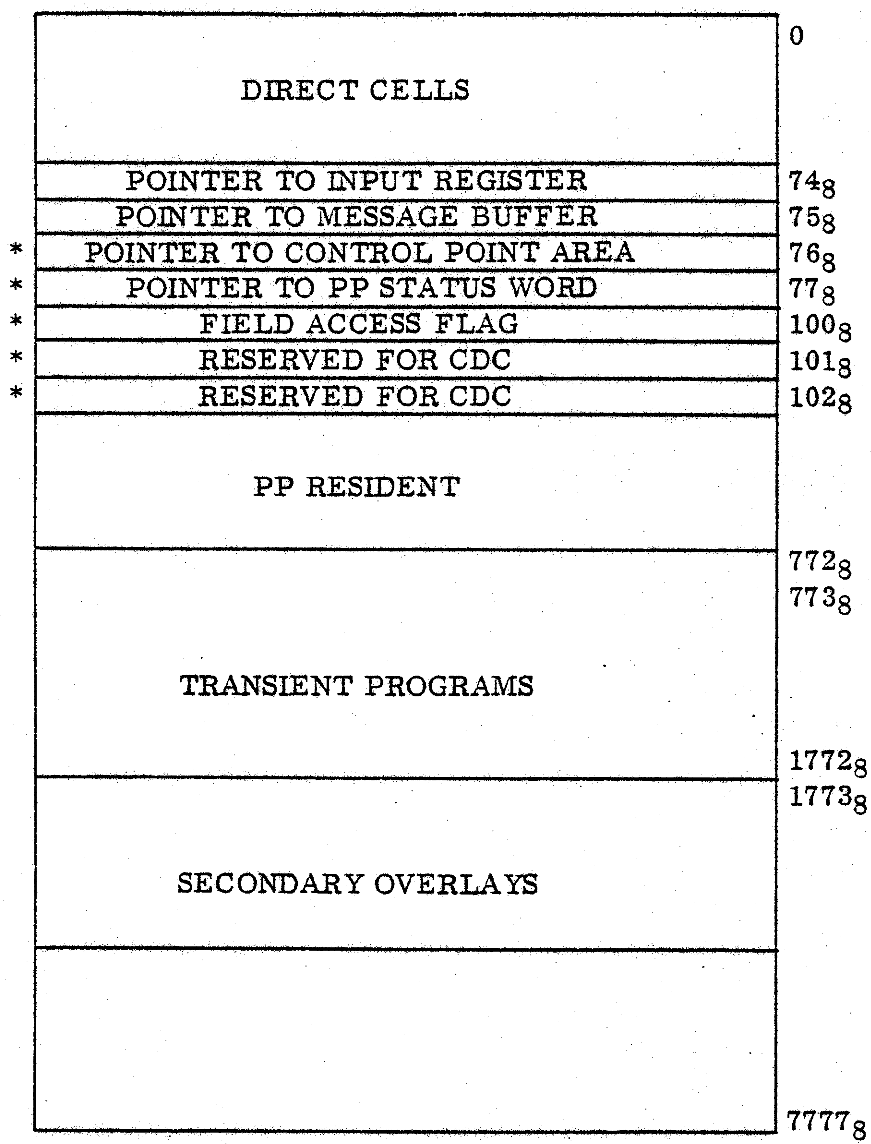
PP resident is contained in locations 0103_8 through 0772_8. When directed to do so by MTR, the resident loads a program into its memory and executes it. Since that program remains in that processor only for the period of time required to perform its function, it is called a transient program. Transient programs occupy locations 0773B through 1772B, although the first instruction is at location 1000B. Transient programs generally load overlays to perform specific tasks. For example, CIO, which is a transient program, calls various overlays depending on the task (read, write, backspace) and the equipment (disk, tape, etc.) specified. Secondary overlays are loaded into memory beginning at location 1773B, the first instruction falling at location 2000_8. Overlays are generally entered via a return jump. Transient programs have names beginning with a letter (CIO, EXU) or the numeral 1 (1AJ, 1IQ); overlays have names beginning with a numeral 2 through 9 (2BP, 4LB, 9DM, etc.)

Both transient and overlay programs, as well as the resident program, make extensive use of the low core locations 01 through 73. Figure 2 details these direct cell assignments.

PP RESIDENT

The peripheral processor resident program has two main functions to perform:

1. All communication between MTR and the transient or overlay programs is handled by the resident.



* Cells 76 through 102B constitute the five bytes of the PPU's central memory status word.

Pool PP Layout

DIRECT CELLS

D.ZX	00	SCRATCH AREA	
	01		
	02		
	03		
	04		
	05		
	06		
	07		
D.TX	10		
	11		
	12		
	13		
	14		
	15		
	16		
	17		
D.TWX	20	D.FNT	Words 2 and 3 of FNT/FST entry for current file
	21	D.FNT+1	
	22	D.FNT+2	
	23	D.FNT+3	
	24	D.FNT+4	
	25	D.FNT+5	
	26	D.FNT+6	
	27	D.FNT+7	
D.THX	30	D.FNT+8	
	31	D.FNT+9	
	32	D.EST	EST entry for device being used by this PPU
	33	D.EST+1	
	34	D.EST+2	
	35	D.EST+3	
	36	D.EST+4	
	37	D.DTS	Device type and allocation type
D.FRX	40	D.BA	FET address relative to lower 18 bits of input register
	41	D.BA+1	
	42	D.BA+2	
	43	D.BA+3	
	44	D.BA+4	
	45	D.LECS	ECS field length requirement
	46	D.PR	Computed priority
	47	D.JTL	Job Time Limit/10B

DIRECT CELLS (Cont)

D.FFX	50	D.PPIRB	Contents of PPU input register
	51	D.PPIRB+1	
	52	D.PPIRB+2	
	53	D.PPIRB+3	
	54	D.PPIRB+4	
	55	D.RA	Reference address/100B of user's area
	56	D.FL	Field length 100/B of user's area
	57	D.FA	Address of file FST address
D.SX	60	D.FIRST	Circular buffer
	61	D.FIRST+1	First parameter from FET
	62	D.IN	Circular buffer
	63	D.IN+1	IN parameter from FET
	64	D.OUT	Circular Buffer
	65	D.OUT+1	OUT parameter from FET
	66	D.LIMIT	Circular buffer
	67	D.LIMIT+1	Limit parameter from FET
D.SVX	70	D.PPONE	The constant 1
	71	D.HN	The constant 100B
	72	D.TH	The constant 1000B
	73	D.TR	The constant 3
	74	D.PPIR	Address of input register
	75	D.PPMES	Address of message buffer
	76	C.CPAD	Address of control point area
	77	D.PPSTAT	Address of PPSTATUS word

2. The resident, when directed by MTR, loads transient programs and initiates the execution of these programs.

Communication between MTR and the resident program is carried out through the use of PP communication areas in central memory, one for each processor. Each communication area consists of a one-word Input Register, a one-word Output Register, and a six-word Message Buffer. Pool processors address these areas by means of pointers in locations D.PPIR, D.PPMES1, and D.PPSTAT.

MTR assigns a task to a pool processor by placing the request in the processor's Input Register. The name of the program package which is to be loaded and executed appears in the high-order 18 bits of the Input Register. This name consists of three display code characters, such as 1AJ, CIO, etc. The number of the control point to which this package is assigned appears in the low-order four bits of byte 1 of the Input Register. Package parameters, such as the address of arguments required by the package, appear in the low-order 36 bits of the Input Register. The PP is given control to execute the code just loaded. The request itself remains in the Input Register until the task is completed. On completion of a task, the transient program requests MTR to release the processor; MTR then clears the processor's Input Register. The Input Register of a pool processor is thus clear only when the processor is idle.

All communication between the Monitor and the transient and overlay programs is handled by the resident program. MTR performs a variety of functions, each of which is identified by a function code of one or two octal digits.

To transmit a monitor request, the resident routine R.MTR places the request in the PPs output register. R.MTR uses locations D.T0 through D.T4 in peripheral processor memory as temporary storage for the request to be written into the output register. Byte 0 of the register contains the function code in the low-order bit positions. Bytes 1 through 4 are used for the arguments. Thus, for a Request Channel Function (M.RCH=12), the channel number is placed in byte 1. For some functions, the arguments are placed in the message buffer and only the function code appears in the output register. A peripheral processor program may utilize the routine by placing the arguments for the function in bytes D.T1 through D.T4, setting the A register function number and executing a return jump to R.MTR. The resident routine will enter the function number in location D.T0 and write the contents of locations D.T0 through D.T4 into the output register. R.MTR will jump to R.WAIT.

If the system is using the XJ/MXN or MAN, R.WAIT will decide whether the monitor request is for CPMTR or MTR. If the request is for CPMTR, the PP input register address is written into word 47 of CMR, T.PPID. CPMTR requests are the first ten functions (12B) unless the ILR is used in which case CPMTR executes the first nine (11B) functions leaving M.RCH(12B) to be handled by MTR.

If the request is for MTR, the input register address is written into word 50 of CMR, T.PPIP. MTR executes all functions greater than 12B. The use of T.PPIP saves MTR from having to search through all of the output registers. MTR need only check one word in CMR to know if a request is pending. PP resident will issue an MXN or MAN to initiate CPMTR if needed. Otherwise the request will be picked up by MTR in its loop. On an EXN system, only T.PPIP is used by PP resident. Regardless of mode of execution, the resident will wait until the output register is cleared by MTR before proceeding. Control will be returned to the requesting program upon MTR's clearing the output register.

When a pool processor program completes execution, it exits to location R.IDLE, which is the address of the resident idle loop. The entry point to this idle loop is R.IDLE (103_8). When referring to a PP Resident routine, the name of its entry point is used as the name of the routine. Thus the name of the idle loop is R.IDLE. In this idle loop, the processor's Input Register is scanned at intervals until a request is found in the Input Register. A delay between successive scans avoids unnecessary memory and read pyramid conflicts. Normally, the PP Input Register of an idle PP contains zero. If the PP Input Register becomes non-zero, it means MTR wants PP Resident to load a PP transient program into the PP. When a request is detected, the resident stores the routine name and the control point. It then sends function R.TAFL, terminates access to the control point field length, to MTR and waits for MTR to clear the Output Register before continuing. When the Output Register is cleared R.IDLE calls the PP Resident subroutine R.OVL. R.OVL will then search the library directory for the requested routine; if found, the package is read from the resident library into the processor's memory beginning at location 773_8 (C.PPFWA through L.PPHDR). If the routine is not found in the directory, 1EJ enters the message "XXX NOT IN PPLIB" in the dayfile, and requests MTR to abort the job which called the routine. The resident then returns to its idle loop. If the program is located, it is loaded by R.OVL which then returns control to R.IDLE which executes the instruction

```
LJM   C.PPFWA
```

This transfers control to the first instruction of the transient program. When a transient program terminates, the instruction it must execute is

```
LJM   R.IDLE
```

At location 100B of PP resident is the field access flag. There is evidently some need for a better description of the use of the field access flag. The basic principles are:

1. The field access flag must always be set whenever any data is read or written within a user field length.
2. The execution of the R.MTR subroutine while the field access flag is set may cause R.PAUSE to be executed. If an absolute address has been computed and saved, it is invalidated by the execution of R.MTR because D.RA may change.
3. When a PP program is looping, waiting for any external event to occur, the loop must either be performed while the field access flag is not set or must include an execution of R.PAUSE.
4. When no field length access is required for a major process (i.e. searching the FNT) it is best to clear the field access flag while processing. This allows a storage move to be initiated without delay.

R.RAFL (synonymous to R.PAUSE) will set the field access flag. If a storage move is in progress, the field access flag is not set until the storage move flag has been cleared. If the field access flag is already set, R.RAFL checks the storage move flag and temporarily clears the field access flag to allow the storage move.

R.TAFL is used to terminate access to the field length. It unconditionally clears the field access flag.

RESIDENT ROUTINES

Several resident routines and words are used by transient and overlay programs. These routines are described below. The order of the routines has been changed but essentially the function of each routine remains the same with the exception of R.OVL, R.RCH, and R.DCH. These three routines have been conditionally modified to accommodate the Distributive Data Path (DDP) and Interlock Register (ILR) in CYBER 70 hardware. Should an installation not use these two hardware features, PPRES is functionally unchanged.

In the diagram of PPRES the labels MAIN, SEG-1, and MAIN2 refer to the segments described at the discussion of the DDP/ILR at the end of this section.

PP RESIDENT ROUTINES

MAIN	R.IDLE	PP RESIDENT IDLE LOOP	103
	R.OVLJ	LOAD PRIMARY OVERLAY INTERNALLY	125
	R.RAFL	REQUEST ACCESS TO CONTROL POINT FIELD LENGTH	133
	R.TAFL	TERMINATE ACCESS TO CONTROL POINT FIELD LENGTH	172
	R.TFL	COMPARE ACCUMULATOR TO FIELD LENGTH	202
	R.MTR	ISSUE MONITOR FUNCTION	217
	R.WAIT	WAIT FOR OUTPUT REGISTER TO CLEAR	230
	R.RCH	RESERVE CHANNEL	271
	R.DCH	DROP CHANNEL	322
	R.STB	MASK BYTE INTO LISTED WORDS	343
SEG-1	R.OVL	LOAD PP OVERLAY	362
	R.READP	TRANSMITS DATA FROM STACK PROCESSOR	542
	R.WRITEP	TRANSMITS DATA TO STACK PROCESSOR	551
	R.RWP	SUPPLIES DISK READ/WRITE LOGIC	566
	R.EREQS	ENTER REQUEST STACK	655
	R.DFM	TRANSMIT DAYFILE MESSAGE	704
MAIN2		CONDITIONAL CODE	737

- R.IDLE

  Calling Sequence: LJM R.IDLE

R.IDLE is the idle loop in which PP resident continually scans its input register for something to do.

- R.OVLJ

  Calling Sequence: Store name of overlay in D.T6, D.T7.

  LJM R.OVLJ

The R.IDLE routine contains an additional entry point named R.OVLJ. A PP program can load a transient program on top of itself without changing the Input Register by storing the name of the transient program left-justified in D.T6 and D.T7, and then executing a long jump to R.OVLJ. The program will be loaded at C.PPFWA through L.PPHDR and control will be transferred to location C.PPFWA.

R.IDLE destroys direct cells 20_8 through 22_8 and some of the temporaries. R.OVLJ and all other PP Resident routines destroy only temporary cells (0 through 17_8).

- R.RAFL

  Calling Sequence: RJM R.RAFL

The subroutine is called to request access to the control point field length. A test is made on the storage move flag for the control point. If set, a call is made to R.TAFL to clear the field access flag in the PP status word, then pauses until the storage move is cleared. When it is cleared, set the field access flag in the PP status word and reset RA in D.RA, FL in D.FL.

- R.TAFL

  Calling Sequence: RJM R.TAFL

R.TAFL is called to terminate access to the control point field length by clearing the field access flag in CM byte R.FAF.

- R.TFL

  Calling Sequence: Load relative address

  RJM R.TFL

R.TFL is used to insure that a relative address is within the field length. The 18-bit address is added to the control point reference address (RA) and compared with the field length. If the address is out of range, R.TFL will exit with a negative A register. If the address is legal, the A register will contain the absolute CM address (RA + relative address) upon exit. The control point RA and FL are kept locally within PP resident at D.RA and D.FL, respectively. Since these locations are set by routine R.RAFL, the transient program and its overlays cannot call R.TFL until R.RAFL has been called. Many PP programs do not call R.TFL but do their own checking of addresses.

- R.MTR

Calling Sequence: Store function parameters in D.T1 to D.T4

```
Load    function code
RJM     R.MTR
```

The PP resident subroutine R.MTR is called by PP transient programs and overlays to transmit requests to MTR. The requesting PP program sets direct cells D.T1 through D.T4 with the values it wants to be put into the four right-most bytes of the PP Output Register. The requesting program then loads the MTR function code into the A Register and executes a return jump to R.MTR. R.MTR stores the function code value from the A Register into cell D.T0 and then writes D.T0 through D.T4 to the Output Register. R.MTR then executes a return jump to the R.WAIT subroutine. R.WAIT checks the left-most byte of the Output Register at a fixed interval. When the byte becomes zero (meaning that MTR has processed the request), R.WAIT returns to R.MTR which returns to the calling routine.

In order to check byte zero of the PP Output Register, R.WAIT reads the Output Register into direct cells D.T0 through D.T4. When control is returned to the PP routine which called R.MTR, these direct cells are intact; (i.e., they contain the value of the Output Register read by R.WAIT). For certain MTR requests, MTR will return parameters to the requesting PP in bytes one through four of the PPs Output Register. The requesting PP routine can pick up these parameters from cells D.T1 through D.T4.

When a PP transient program has completed its function, it must inform MTR, so that MTR can assign a new task to the PP. The program tells MTR it has finished by issuing an M.DPP function. MTR will zero the input register of the PP and record the fact that the PP is available. The last few lines of code of each PP transient program, therefore, are:

```
LDN     M.DPP               DROP THE PP ASSIGNMENT
RJM     R.MTR
LJM     R.IDLE              EXIT TO IDLE LOOP
```

Note that R.IDLE is not a subroutine and it is entered with a long jump and not a return jump.

- R.WAIT

Calling Sequence: RJM R.WAIT

R.WAIT has been modified for the use of two monitors and the MXN. R.WAIT is responsible for determining whether a PP request is for MTR or CPMTR. If the request is for CPMTR, the PP input register address is written into T.PPID. T.MXNCTL is read up and executed. This word contains the exchange package address to which the MXN will be issued.

If the request is for MTR, the input register address is written to T.PPIP. In either case, R.WAIT will cause the PP to idle until byte 0 of the output registers clear.

- R.RCH

Calling Sequence: Load channel number

```
        RJM     R.RCH
```

The channel numbers contained in the A register will be stored in byte D.T1, monitor function M.RCH inserted in D.T0, and D.T0 through D.T4 written to the output register for that PP. Channels will be assigned by MTR on the following priority basis.

If alternate channels are specified MTR will stop looking for alternate channels upon sensing 6 bits of zero. Thus, if one alternate channel is desired, the programmer must clear D.T2 before entering R.RCH so the search will be terminated at that point. The procedure for requesting channel 12 with alternate channel 13 would be:

```
LDN     n
STD     D.T2
LDC     1312B
RJM     R.RCH
```

Monitor will stop looking for alternate channels after four channels have been investigated or 6 bits of zero are detected.

When R.RCH is used, D.T4 is automatically set nonzero; in this case, the function is not considered complete; (i.e., output register is not cleared) until a channel can be assigned. When complete, byte 0 of the output register is cleared.

- R.DCH

Calling Sequence: Load channel number

```
        RJM     R.DCH
```

Since more than one PP can request the same channel at the same time, it is necessary to use an MTR request to reserve a channel.

The only PP which can release a channel, however, is the PP which reserved it and there is no need for an interlock. To release a channel reservation, a PP program loads the number of the channel into the A Register and executes a return jump to the PP Resident subroutine R.DCH. If the channel is assigned to the PP, R.DCH will modify the Channel Status Table entry for the channel to indicate that the channel is free. If a PP calls R.DCH to release a channel it has not reserved, R.DCH will issue an M.KILL.

- R.STB

Calling Sequence: Load L(List)

RJM R.STB

Where list has the form:

L (byte)

L (word 1)

L (word 2)

.

.

.

L (word n)

zero

An entry point to R.STB called R.STBMSK is the address of the mask "anded" with each word in the list before the word is "exclusive ored" with the byte. This mask is initially 7700B and this value should be restored by any routine which substitutes an alternate mask. R.STB is used primarily to substitute channel numbers in driver overlays.

All the PP hardware instructions used for I/O contain a field which specifies the number of the channel over which the I/O is to take place. For example, the instruction

IAM BUFF,5

would be used to read data from hardware channel five into the PP starting at location BUFF.

When a programmer is coding a PP program, he normally does not know what channel will be used for the I/O. The channel number is normally obtained by the PP program from an entry in the EST table. For this reason the above I/O instruction would be written as follows:

IAM BUFF,**

The double asterisks indicate that the value will be filled in by the program itself when it is executed. COMPASS assembles double asterisks as a zero.

Since the channel number goes into the first (or only) byte of an instruction along with the OP code, the first byte of the instruction would contain 7100_8 (the OP code for an IAM is 71_8). The second byte of the instruction would contain the value of BUFF. When the PP program is called, and determines the channel number, it must modify all the I/O instructions in itself so that the first byte of each instruction contains the OP code followed by the correct channel number. Normally there would be a list somewhere in the program giving the addresses of all instructions to be modified in this way.

The PP resident subroutine R.STB can be called to insert a channel number into one or more instructions, whether or not the fields to be altered previously contain zero. Before return-jumping to R.STB, the program loads the address of a list in the A register. The first byte in this list contains the address of some other PP cell that contains the new channel number. The second and following bytes of the list contain the addresses of the instruction words in which the new channel number is to be inserted. The first zero byte in the list terminates it.

Although R.STB is most often called to insert channel numbers into I/O instructions, it can also be called to perform general masking operations.

- R.OVL

  Calling Sequence: Store name of overlay in D.T6, D.T7

	Load A register	Load Address
	RJM	R.OVL

This routine has been changed for SCOPE 3.4. It now performs a binary search upon the PP Program Name Table (PPNT), looking for the name of the overlay. If the name is found, the overlay is loaded from CM, disk, or ECS. If it is not found, an OVL error flag is set and the control point is aborted. Then an exit is made to R.IDLE.

  Calls: R.READP (Disk Resident Overlay)

  R.MTR (PP Call Error)

- R.READP (R.WRITEP)

Calling Sequence:	Load	L (request)
	RJM	R.READP (R.WRITEP)

When a PP program wishes to issue a stack request for a transfer of data to or from its own memory, the PP program formats the stack request, loads the address of the request into the A Register, and calls the PP Resident subroutine R.READP/R.WRITEP. There are two entry points to this subroutine. If the stack request is to read data, the entry point R.READP is used. R.WRITEP is used when writing data.

R.READP (R.WRITEP) computes the PP word count from the first and last word addresses given in the already formatted request and adds the computed word count, the address of the PP message buffer, and the control point number to the request. The request is entered in the stack and data is transmitted via channel directly to (from) PP memory. Upon exit from R.READP (R.WRITEP), the following information will be set:

(D.T3 + C.RWPPWT)	=	number of PP words transmitted
(S.T3 + C.RWPPLW)	=	LWA+1 of data transmitted
(D.T3 + C.RWPPST)	=	upper six bits of status in bits 0 through 5
(D.T4 + C.RWPPST)	=	lower twelve bits of status

The 18-bit status has the same format and meaning for PP I/O as the status in bits 0 through 17 of the first FET word for central memory I/O.

READP/R.WRITEP will call R.EREQS to issue the stack request. It then helps control the transfer of data by communicating with stack processor.

- R.RWP

  Calling Sequence: Load IAM/OAM function
  71B = IAM
  73B = OAM

  RJM R.RWP

This routine performs a number of functions in handling the reads and writes on disk. R.RWP will set the functions for the IAM or OAM; sets the FWA for transmission; stores the PP message area address in the stack request and then issues the stack request. If the field access flag was set, R.RWP will pause for storage relocation and then perform the disk I/O. Transmission is governed by control word W.RWPPCW of the PP message area.

0 = Request is in stack
1 = Sense waiting for channel
2 = Sense waiting for transmission
3 = Sense transmission ready
4 = Sense end of transmission

Calls = R.EREQS
R.PAUSE
R.STB

- R.EREQS

  Calling Sequence: Store L(request) in D.T0

  RJM R.EREQS

In order to place a request in the request stack (for the stack processor) this PP subroutine adds the control point number to the request, places a request in the message area, and issues an M.ICE function for SPM.

- R.DFM

  Calling Sequence: Load L(message)+flag bits

  RJM R.DFM

R.DFM will cause a message to be written from PP memory to the dayfile and/or the console. The flag bits are contained in the high-order 6-bits of the A register upon entry to R.DFM and are used to determine the destinations of the message. Possible values of the flag bits are described below; one or more bits may be on. All are optional.

Bit 0 = Do not send to B display.

Bit 1 = Do not send to control point dayfile.

Bit 2 = Do not send to system dayfile (no A display).

Bit 3 = Flag as an accounting message (a $ will be placed in the 20th character of messages that are sent to system dayfile).

Bit 4 = Send to hardware error file.

Bit 5 = Do not insert job name in system dayfile.

- READECS

  This is an extension to R.OVL which is entered when a load from ECS is needed.

PERIPHERAL PROCESSOR RESIDENT WITH DDP AND ILR

INTRODUCTION

This is a discussion of PP resident for those who will be using the two new features of CYBER 70 hardware, namely the Distributive Data Path (DDP) and the Interlock Register (ILR). Complete descriptions of the hardware are found in the section called CYBER 70 Hardware Features. Likewise, most PP resident functions will remain the same and they are described earlier in this section on PP resident. The concern here is with the segmenting of PP resident and how it accomodates the DDP and ILR.

CYBER SYMBOLS

There are several parameters and symbols which are relevant to the discussion of the DDP and ILR. They are described here with their default values indicated.

IP.DPLIB = 0 — If non-zero, this parameter indicates that the DDP is to be used for PP overlay loading from ECS. Certain code, such as SEG-2 and the PP resident segment loader in MAIN, is conditionally assembled with IP.DPLIB ≠ 0.

IP.ELIB = 0 — Used with IP.DPLIB in the following manner:

IP.ELIB = 0; no overlay loading from ECS

IP.ELIB ≠ 0, IP.DPLIB = 0; perform overlay loading from ECS via CM buffer, ICEBOX

IP.ELIB $\neq 0$,	IP.DPLIB $\neq 0$; perform overlay loading from ECS via DDP, if present. Otherwise use ICEBOX. STL makes this decision at initialization time by searching the EST. Certain code in MAIN is conditionally assembled depending upon IP.ELIB $\neq 0$
IP.ILR = 0	Indicates the presence of ILR. If no ILR exists, everything is assembled with IP.ILR = 0. If ILR is present, all PP code is assembled with IP.ILR $\neq 0$ but CMR is set zero or non-zero, to indicate whether or not the ILR is to be used. Word 77 of CMR (P.ILR/P.PPOVL) has byte 2 set to the value of IP.ILR. At initialization this byte is checked for the presence of the ILR. There is also a check made for a physical channel 15. If none exists, PP resident will clear this byte.
CH.ILR = 15B	The ILR hangs on its own channel 15B. This channel is always active and if no ILR exists, channel 15B is not used. The symbol CH.ILR should be used to refer to this pseudo channel.
C.ILR = 2	The number of the byte in P.ILR (77) which contains the value of IP.ILR. This byte serves as the ILR on/off flag.
C.PPOVL = 3	Number of the byte in P.PPOVL (77) which contains the pointer to the CM buffer used to hold SEG-1 and SEG-2 of PPRES.
P.ILR = 77B	Word 77 of CMR which contains the ILR on/off flag.
P.PPOVL = 77B	Word 77 of CMR containing pointer to PPRES overlay buffer and address of the beginning FNT entry for the ECS library.
S.CHAN = 12D	The ILR has one bit for each channel and pseudo channel in the system, mapped from left to right. These channel numbers begin with channel zero at bit 12 (actual bit 13). Channel numbers are calculated by biasing the number by S.CHAN.

POINTER WORD - P.PPOVL/P.ILR

59	47	35	23	11	0
		C.ILR IP.ILR	C.PPOVL T.PPOVL/10B	T.ELIBD	77

C.ILR/IP.ILR - Contains value of IP.ILR. Read up by PP's to verify ILR exists.

C.PPOVL/T.PPOVL - Table in CM holding PPRES overlays, SEG-1 and SEG-2.

T.ELIBD - Beginning FNT entry for ECS library.

EST Entry for DDP

59	47	35	23	11	0
	CH2 CH1	CH4 CH3	"DP"	EQ. NO.	

ON/OFF BIT

"DP" is the hardware mnemonic for the DDP.

SEGMENTATION OF PP RESIDENT

In order to support the DDP and ILR, considerable code had to be added to PP resident. Not desiring to expand the size of the resident area, it was decided that the most practical solution was to segment PPRES. This segmentation is transparent to the USER and, in fact, will occur only if IP.DPLIP is defined as non-zero.

The structure is as follows:

MAIN

103	R.IDLE
125	R.OVLJ
133	R.RAFL
172	R.TAFL
202	R.TFL
217	R.MTR
230	R.WAIT
271	R.RCH
322	R.DCH
342	R.STB

This segment permanently resides in PPRES beginning at location 103B. It is not overlayed.

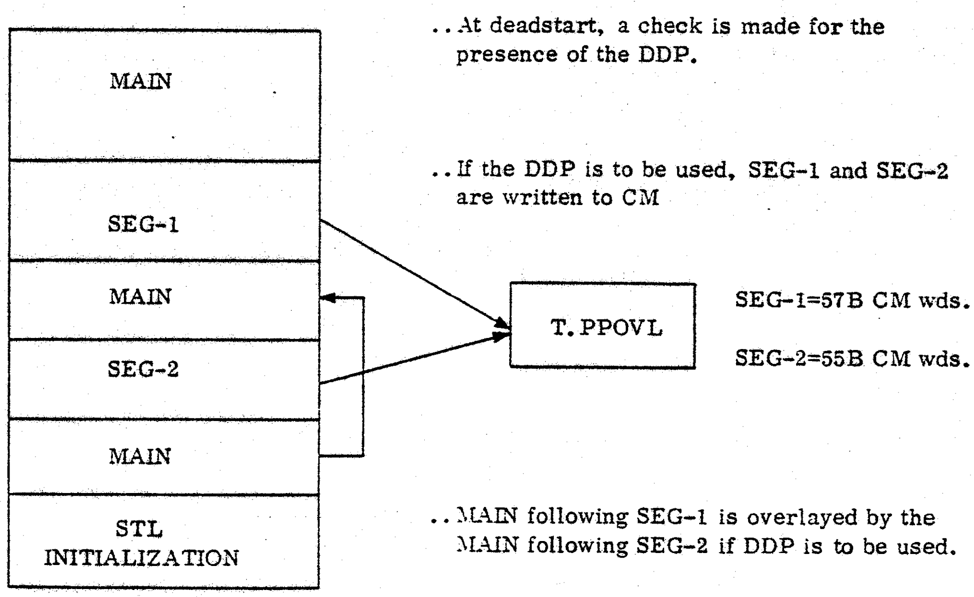
SEG-1		SEG-2	
362	R.OVL	364	DDP overlay loading
542	R.READP		
551	R.WRITEP	724	
566	R.RWP		
655	R.EREQS		
704	R.DFM		

- SEG-2 is assembled only if IP.DPLIB ≠ 0.
- R.OVL's entry point is part of MAIN. The real origin of SEG-1 is 364. This allows SEG-1 to be overlayed by SEG-2 and when SEG-2 has finished executing, return jump to R.OVL. SEG-2 is automatically overlayed by SEG-1 again, when execution is finished.

MAIN2 (conditionally assembled)

(IP.ELIB ≠ 0)		(IP.DPLIB ≠ 0)	
737	load from ECS via CP.ECOVL	737	PP res segment loader
766			

- This second section of MAIN is determined at deadstart time depending upon the setting of the IPARAMS. Once the decision is made, MAIN remains constant throughout the running of the system.



PP Resident - Segmented

PPRES - FUNCTIONING WITH THE DDP

If IP.DPLIB is set non-zero and the PP routines have been assembled with the DDP/ILR code, the procedure is as follows:

PP overlay loading from ECS --

- PPRES now contains MAIN-SEG-1-MAIN2.
- A request for a PP overlay is made.
- R.OVL searches the PPNT for the program name.
- When the program is found, a check for residency is made.
- If ECS resident, a jump is made to the portion of MAIN2, which contains the PPRES segment loader and load SEG-2 over SEG-1.
- SEG-2 check to see if the DDP is operational.
- If DDP available, the overlay is loaded through the DDP and then SEG-1 is reloaded.
- A jump is made to the entry point of R.OVL.
- If the DDP is not available, a jump is made to BACKUP where the residency of this overlay is changed from ECS to disk in the PP Program Name Table (PPNT).
- Then SEG-1 is reloaded, a jump is made to the entry point of R.OVL, and the overlay loading process is begun again, this time from disk.

It should be noted here that the above procedure for backup is used in any case of DDP unavailability; i.e., the DDP is turned off, the hardware is dead, etc. It is also used in case of ECS parity error in which case the status word is read to check for parity or abort status. After the flaw table has been updated and an entry made in the C.E. Error File, the system will go to disk backup.

PPRES - Functioning With the ILR

The ILR is used by PPRES for channel reservations. There are several functions available in the ILR but the most commonly used functions are Test and Set, Test and Clear, and Clear.

- R.RCH

  If the ILR is present, R.RCH in PPRES will simply perform a Test and Set on the ILR bit corresponding to the channel to be reserved. In a channel request, PPRES will only test one time. If the R.RCH is unsuccessful (the channel bit is already set), the request must then wait and be processed by MTR in its loop. If, however, R.RCH was successful, the bit is set meaning the channel is now reserved. Then the Channel Status Table (CST) is updated to reflect the reservation.

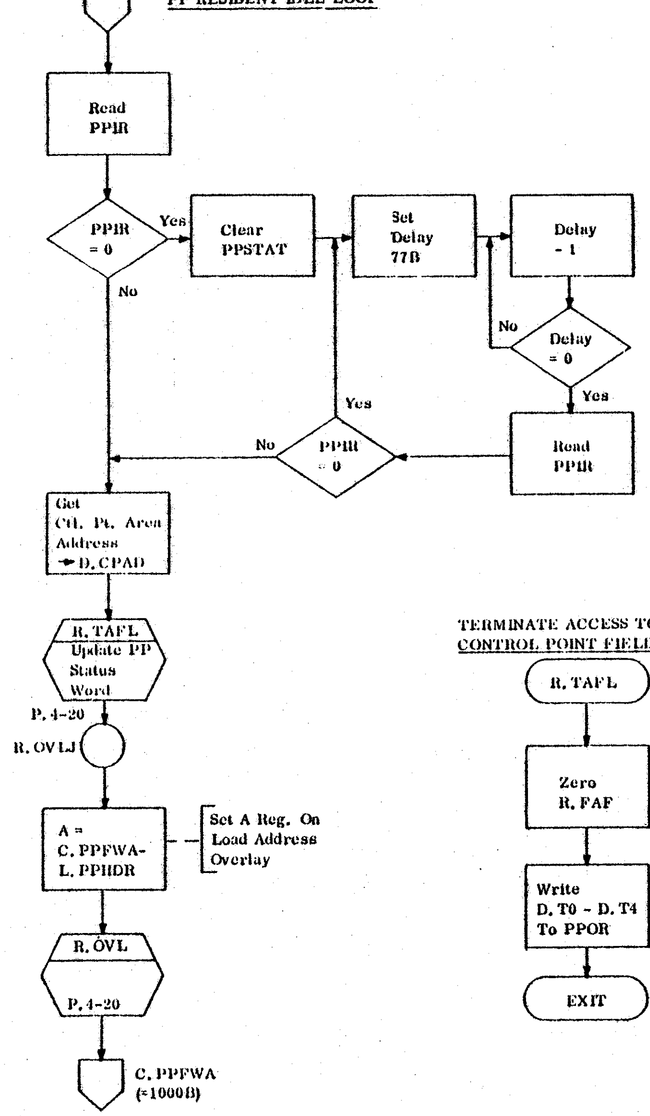
Since, normally, channel reservation is performed by CPMTR, in the case of the ILR the number of CPMTR functions is dropped to eleven, eliminating M.RCH with code 12.

- R.DCH

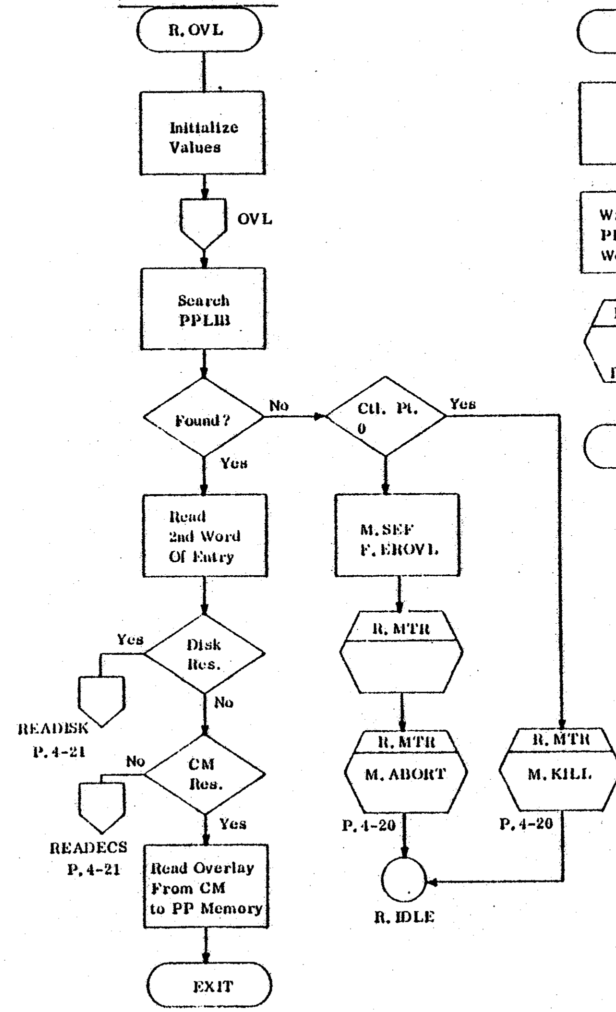
  Dropping the channel is simply a matter of clearing the channel bit in the ILR. It is not necessary to update the CST, since channel reservation does not depend upon this information.

PP RESIDENT IDLE LOOP

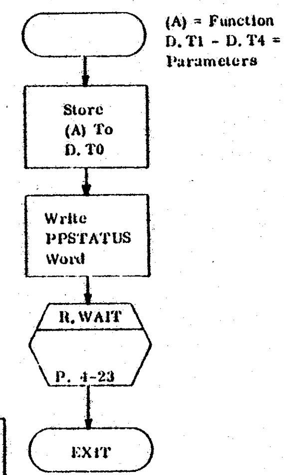
TERMINATE ACCESS TO THE CONTROL POINT FIELD LENGTH

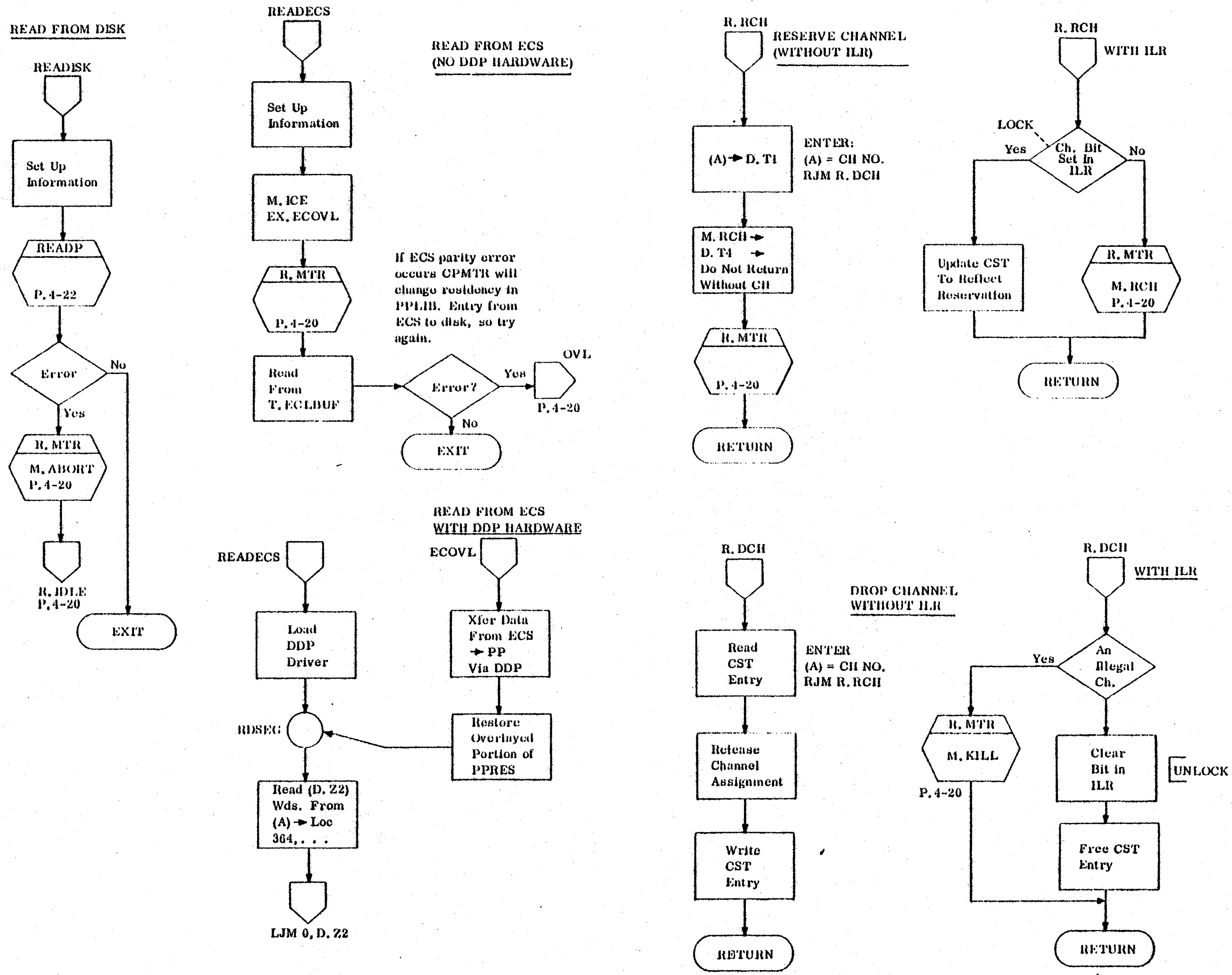


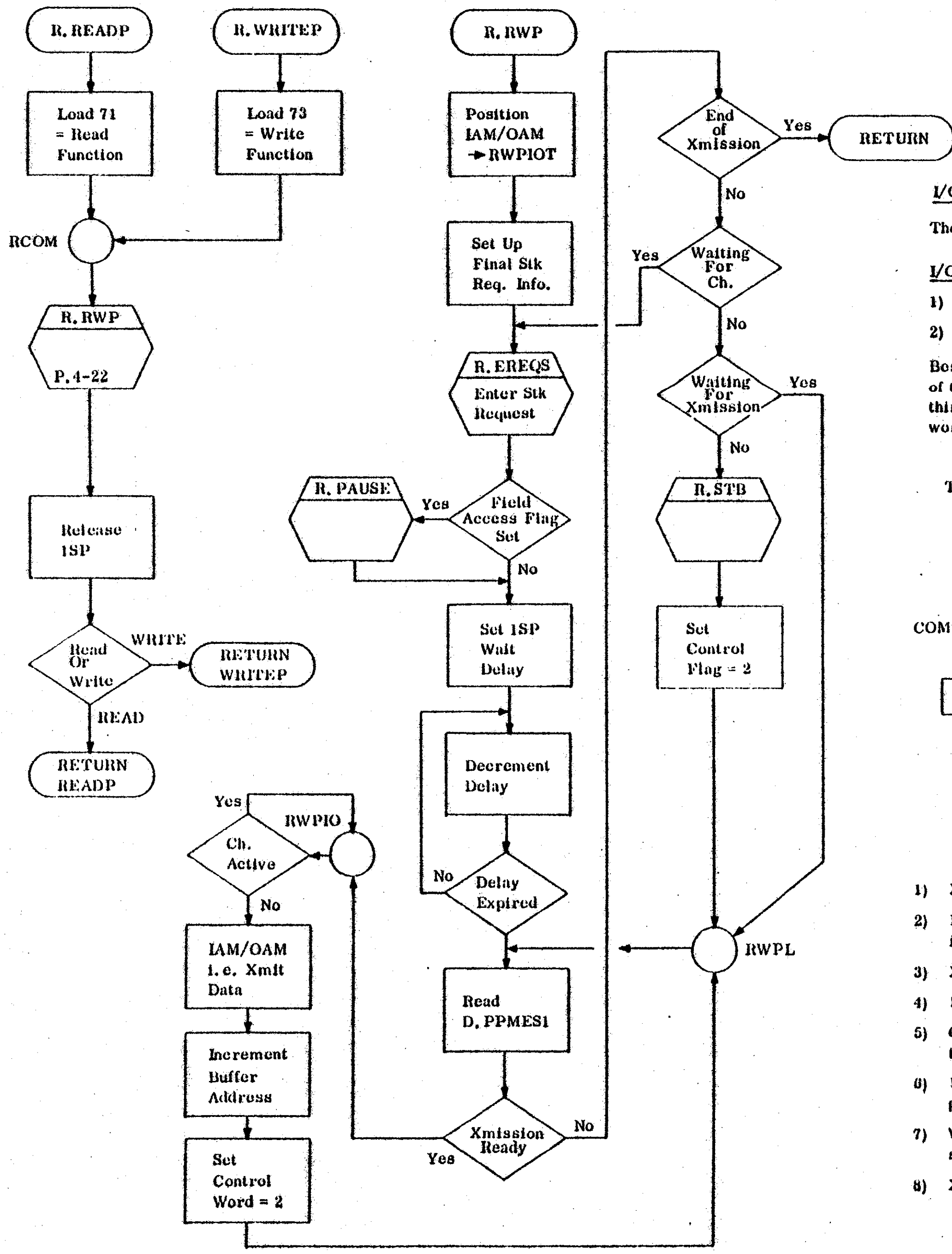
LOAD PP OVERLAY



ISSUE MONITOR FUNCTION




READ FROM DISK
READISK
Set Up Information
READP
P. 4-22
Error
No
Yes
R. MTR
M. ABORT
P. 4-20
R. IDLE
P. 4-20
EXIT
READECS
READ FROM ECS
(NO DDP HARDWARE)
Set Up Information
M. ICE
EX. ECOVL
R. MTR
P. 4-20
If ECS parity error occurs CPMTR will change residency in PPLIB. Entry from ECS to disk, so try again.
Read From T. ECLBUF
Error?
Yes
OVL
P. 4-20
No
EXIT
READ FROM ECS
WITH DDP HARDWARE
READECS
ECOVL
Load DDP Driver
Xfer Data From ECS → PP Via DDP
RDSEG
Restore Overlayed Portion of PPRES
Read (D. Z2) Wds. From (A) → Loc 364, . . .
LJM 0, D. Z2
R. RCH
RESERVE CHANNEL
(WITHOUT ILR)
(A) → D. T1
ENTER:
(A) = CH NO.
RJM R. DCH
M. RCH →
D. T4 →
Do Not Return Without CH
R. MTR
P. 4-20
RETURN
R. RCH
WITH ILR
LOCK
Ch. Bit Set In ILR
Yes
No
Update CST To Reflect Reservation
R. MTR
M. RCH
P. 4-20
RETURN
R. DCH
DROP CHANNEL
WITHOUT ILR
Read CST Entry
ENTER
(A) = CH NO.
RJM R. RCH
Release Channel Assignment
Write CST Entry
RETURN
R. DCH
WITH ILR
An Illegal Ch.
Yes
R. MTR
M. KILL
P. 4-20
Clear Bit in ILR
UNLOCK
Free CST Entry
RETURN



<u>I/O TO AND FROM A PP</u>

There are two routines in PP resident for doing mass storage.

<u>I/O TO AND FROM A PP</u>

1) R. READP

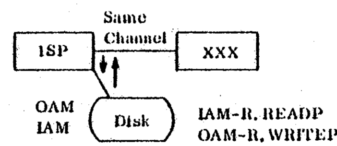
2) R. WRITEP

Besides the two word stack request in the first and second words of the message buffer, there is a third word which goes into the third word of the requesting PP's message buffer. This third word is used for dynamic communication with the stack processor.

The communication word is as follows:

Phase Code	Total Byte Count	Current LWA+1		Channel Number	Byte Count
				Code and Status	

COMMUNICATION BETWEEN ISP AND ANOTHER PPU



Phase Code
0 - Wait for ISP
1 - Channel Monitor Okay
2 - Ready for Data
3 - Data Is Coming
4 - Done
5 - Acknowledge

1) XXX makes request and zeros out word in communication area.

2) ISP when it selects this request, discovers the channel and sends it to the communication word.

3) XXX sets phase to 2.

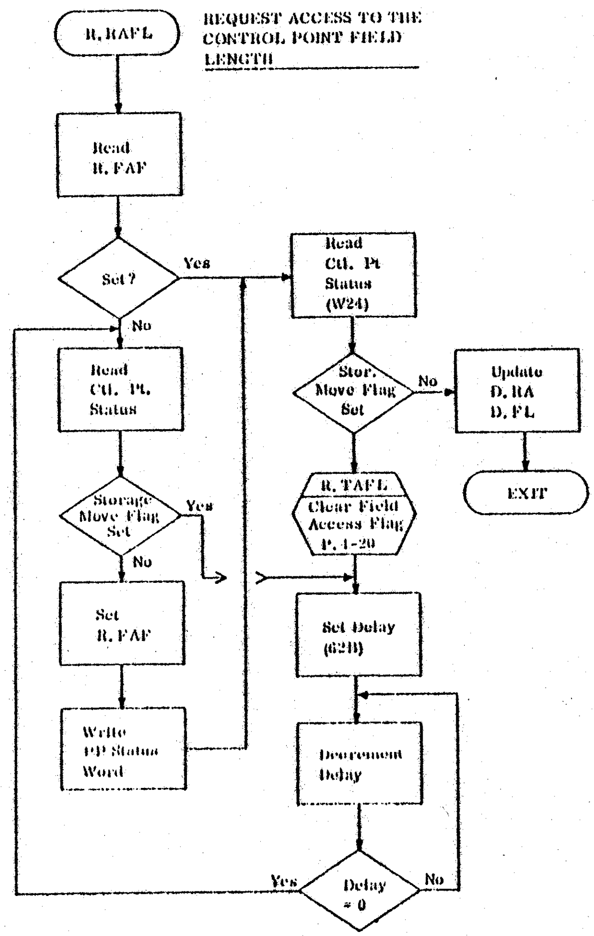
4) ISP will sense and read data from the disk.

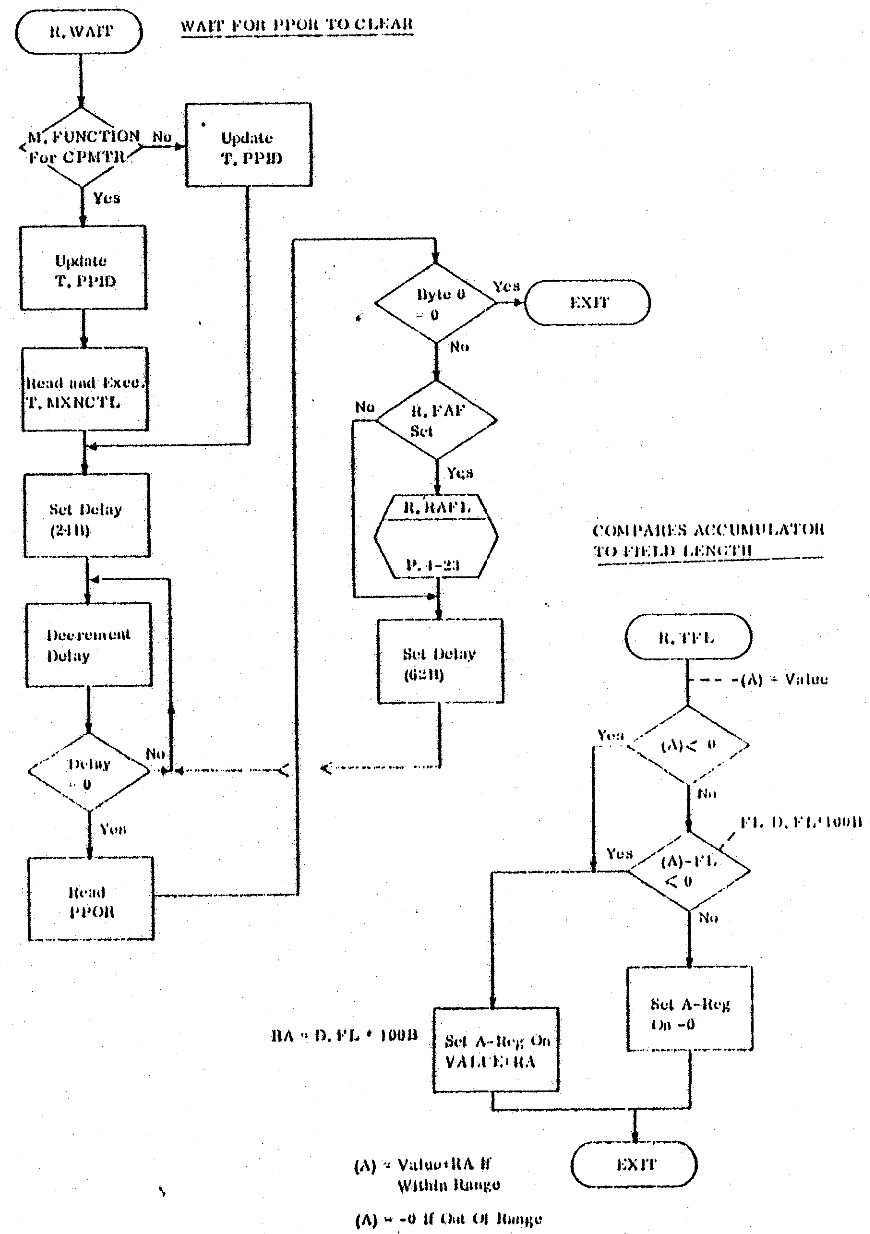
5) Once read ISP will set the phase to 3 and switch the channel to the requesting PP.

6) ISP does an OAM and XXX picks it up with an IAM and sets the phase to 2.

7) When the stack processor wants to terminate the operation it sets the phase to 4.

8) XXX senses and acknowledges with phase code set to 5 to free the SP.


R.RAFL
REQUEST ACCESS TO THE CONTROL POINT FIELD LENGTH
Read R.FAF
Set?
Yes
No
Read Ctl. Pt. Status
Storage Move Flag Set
Yes
No
Set R.FAF
Write PP Status Word
Read Ctl. Pt Status (W24)
Stor. Move Flag Set
No
Update D.RA D.FL
EXIT
R.TAFL
Clear Field Access Flag
P. 4-20
Set Delay (62B)
Decrement Delay
Delay = 0
Yes
No


R.WAIT
WAIT FOR PPOR TO CLEAR
M.FUNCTION For CPMTR
No
Yes
Update T.PPID
Update T.PPID
Read and Exec. T.MXNCTL
Set Delay (24B)
Decrement Delay
Delay = 0
No
Yes
Read PPOR
Byte 0 = 0
Yes
No
EXIT
R.FAF Set
No
Yes
R.RAFL
P. 4-23
Set Delay (62B)
COMPARES ACCUMULATOR TO FIELD LENGTH
R.TFL
(A) = Value
(A) < 0
Yes
No
FL. D.FL*100B
(A)-FL < 0
Yes
No
Set A-Reg On -0
RA = D.FL * 100B
Set A-Reg On VALUE+RA
EXIT
(A) = Value+RA If Within Range
(A) = -0 If Out Of Range

```
STL --- PP RESIDENT / START SYSTEM EXECUTION          COMPASS 3.75077.     09/10/75  09.59.29.      PAGE     1
STORAGE ALLOCATION.

          ADDRESS   LENGTH                BINARY CONTROL CARDS.

              100     2160                IDENT  STL,100B
             2260     (345)               END

                                BLOCKS    TYPE       ADDRESS    LENGTH

                                PROGRAM*  ABSOLUTE         0      2171
                                PPOLAY    ABSOLUTE      2171        67
```

9-27

```
                                                                        STL          2
                     IDENT  STL,1008                                    STL          3
                     PERIPH                                             STL          4
                     SST                                                SC40125   1484
                     LIST   D                 INCLUDE DETAILS           SC40125   1485
                     LIST   F                 LIST IF-SKIPPED LINES     STL          7
          **                                                            STL          8
          *          ****************************************           STL          9
          *          ****************************************           STL         10
          *                                                             STL         11
          *          B E G I N   D E C K   * S T L *                    STL         12
          *                                                             STL         13
          *          ****************************************           STL         14
          *          ****************************************
          *

                                                                        SC40125   1487
          **         THE DEADSTART PACKAGE CONSISTS OF THE FOLLOWING DECKS --  SC40125   1488
          *                                                             SC40125   1489
          *                    CEA                                      SC40125   1490
          *                    CONTROL                                  SC40125   1491
          *                    IRCP                                     SC40125   1492
          *                    STL                                      SC40125   1493
          *                    TDS                                      SC40125   1494
          *                                                             SC40125   1495
          *          CEA, CONTROL, IRCP, AND STL (EXECUTED IN THAT ORDER)   SC40125   1496
          *          CONSTITUTE DEADSTART PROPER, IN THAT THEIR FUNCTIONS   SC40125   1497
          *          ARE PERFORMED PRIOR TO, AND ARE RESPONSIBLE FOR INITIATING,  SC40125   1498
          *          THE EXECUTION OF THE SCOPE OPERATING SYSTEM.  TDS, ALTHOUGH  SC40125   1499
          *          PART OF THE DEADSTART PACKAGE, IS A POST-DEADSTART PROCESSOR,  SC40125   1500
          *          IN THAT ITS FUNCTIONS ARE PERFORMED UNDER THE CONTROL,   SC40125   1501
          *          AND WITH THE AID, OF THE SCOPE OPERATING SYSTEM.     SC40125   1502
          *          (A GENERAL OVERVIEW OF THE DEADSTART PROCESS/PACKAGE   SC40125   1503
          *          IS CONTAINED IN THE DOCUMENTATION FOR *CEA*).

                                                                        STL         16
          **                                                            STL         17
          *          STL                                                STL         18
          *                                                             STL         19
          *          FUNCTION                                           STL         20
          *                                                             STL         21
          *          STL IS LOADED INTO PP1 AS SOON AS IRCP HAS COMPLETED THE   STL         22
          *          DEADSTART LOADING PROCESS TO TRANSMIT              STL         23
          *          THE PP RESIDENT TO THE POOL PPS AND LOAD MTR, DSO INTO   STL         24
          *          PP0, PP1 RESPECTIVELY
```

82-6

```
                        **                                                          STL        26
                        *       ENTRY AND EXIT INFORMATION                          STL        27
                        *                                                           STL        28
                        *       ENTRY                                               STL        29
                        *            STL EXPECTS THE SYSTEM TO BE INTACT ON AN ALLOCATABLE   STL        30
                        *              DEVICE, CMR TO BE INTACT IN CM, AND ALL RECORD BLOCKS  STL        31
                        *              USED BY THE SYSTEM TO BE RECORDED IN THE APPROPRIATE  STL        32
                        *              RBR-S AND RBT-S.  FURTHER, IT IS ASSUMED THAT MTR AND  STL        33
                        *              DSD HAVE BEEN COPIED TO CM AT MTRBUF AND DSDBUF DURING STL        34
                        *              SYSTEM LOADING.  FURTHER, IT IS ASSUMED THAT PP2-PP19  STL        35
                        *              ARE LOOKING FOR THEIR RESPECTIVE NUMBERS IN CM LOCN    STL        36
                        *              ZERO AND THAT PP0 IS LOOKING FOR 77B.  UPON DETECTING  STL        37
                        *              ITS NUMBER IN LOCN ZERO EACH PP BEGINS EXECUTING AN    STL        38
                        *              IAM INSTRUCTION ON CHANNEL ZERO.                       STL        39
                        *                                                           STL        40
                        *       EXIT                                                STL        41
                        *              UPON EXIT, MTR AND DSD ARE IN CONTROL.                 STL        42
                        *              THE POOL PPS ARE LOOPING IN THE IDLE LOOP OF PPRES.    STL        43


                        **                                                          STL        45
                        *       NOTES                                               STL        46
                        *              1.  STL CONSISTS OF TWO PARTS.  THE FIRST PART IS PPRES STL        47
                        *                  WHICH RUNS FROM LOCNS 100B TO 1000B.  THE SECOND   STL        48
                        *                  PART IS THE MAIN ROUTINE WHICH RUNS STARTING       STL        49
                        *                  AT 1000B.                                          STL        50
                        *              2.  UPON COMPLETION OF SYSTEM LOADING, IRCP SIGNALS    STL        51
                        *                  THE PROGRAM IN PP1 (TAPE ROUTINE) TO LOAD STL      STL        52
                        *                  FROM STLBUF IN CM AND TRANSFER CONTROL TO 1000B.   STL        53


                        **      *CALL  IPARAMS  --  SCOPE 3 INSTALLATION PARAMETERS SC40125  1505
                                                                                    SC40125  1506
       0                IPARAMS CTEXT  SCOPE 3 INSTALLATION PARAMETERS.             IPARAMS     2

                        **      *CALL  ECSCOM -- ECS DEFINITIONS                    SC40125  1508
                                                                                    SC40125  1509
       0                ECSCOM  CTEXT  ECS DEFINITIONS.                             ECSCOM      2
                                LIST   -R                                           ECSCOM      4
                                LIST   *                                            ECSCOM     64
```

S T L --- PERIPHERAL PROCESSOR RESIDENT

```
**
*               IN THE SCOPE OPERATING SYSTEM, THE SYSTEM MONITOR PROGRAM
*               (MTR) AND THE DYNAMIC SYSTEM DISPLAY PROGRAM (DSD) PERMANENTLY
*               RESIDE IN TWO OF THE PERIPHERAL PROCESSORS, PP0 AND PP1
*               RESPECTIVELY.  THE REMAINING PERIPHERAL PROCESSORS FORM A POOL
*               OF PROCESSORS TO WHICH MTR MAY ASSIGN TASKS AS REQUIRED.
*               THESE POOL PROCESSORS HAVE NO FIXED ASSIGNMENTS - ANY
*               PROCESSOR MAY BE ASSIGNED TO THE EXECUTION OF ANY SYSTEM
*               ROUTINE, AND IT IS POSSIBLE THAT MORE THAN ONE PROCESSOR MAY
*               BE EXECUTING THE SAME ROUTINE AT THE SAME TIME.  ALL
*               PROCESSORS CONTAIN A SMALL RESIDENT PROGRAM WHICH HANDLES THE
*               COMMUNICATION BETWEEN POOL PROCESSOR PROGRAMS AND MTR AND
*               INITIATES THE EXECUTION OF THESE PROGRAMS AS DIRECTED BY MTR.


**
*               POOL PROCESSOR STRUCTURE
*
*
*                    *************************************************
*                 0B *                                               *
*                    *                                               *
*                    *                 DIRECT CELLS                  *
*                    *                                               *
*                    *                                               *
*                    *************************************************
*               74B  *          POINTER TO INPUT REGISTER            *
*                    *************************************************
*               75B  *          POINTER TO MESSAGE BUFFER            *
*                    *************************************************
*               76B  *            CONTROL POINT ADDRESS              *
*                    *************************************************
*               77B  *          POINTER TO PP STATUS FIELD           *
*                    *************************************************
*              100B  *              FIELD ACCESS FLAG                *
*                    *************************************************
*              101B  *                  RESERVED                     *
*                    *************************************************
*              102B  *                  RESERVED                     *
*                    *************************************************
*              103B  *                                               *
*                    *                                               *
*                    *                                               *
*                    *                 PP RESIDENT                   *
*                    *                                               *
*                    *                                               *
*                    *                                               *
*                    *************************************************
*              773B  *                                               *
*                    *                                               *
*                    .                                               .
*                    .                                               .
*                    .              TRANSIENT PROGRAMS               .
*                    .                                               .
*                    .                                               .
*                    *                                               *
```

S T L --- PERIPHERAL PROCESSOR RESIDENT

```
                                      *
                    *                 ******************************************
                    *                 *                                        *
                    *         1773B   *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *          SECONDARY OVERLAYS            *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 ******************************************
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *        HIGHER-LEVEL OVERLAYS           *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *                 *                                        *
                    *         7777B   ******************************************
                    *
                    *
                    *                 (CELLS 76B-102B CONSTITUTE THE FIVE BYTES
                    *                  OF THE PPU-S CENTRAL MEMORY STATUS WORD)


                    **
                    *     PP RESIDENT IS CONTAINED IN LOCATIONS 103B-772B. WHEN DIRECTED
                    *     TO DO SO BY MTR, THE RESIDENT LOADS A PROGRAM INTO ITS MEMORY
                    *     AND EXECUTES IT - SINCE THAT PROGRAM REMAINS IN THAT
                    *     PROCESSOR ONLY FOR THE PERIOD OF TIME REQUIRED TO PERFORM ITS
                    *     FUNCTION, IT IS CALLED A TRANSIENT PROGRAM.  TRANSIENT
                    *     PROGRAMS USUALLY OCCUPY LOCATIONS 773B-1772B, ALTHOUGH THE
                    *     FIRST INSTRUCTION IS AT LOCATION 1000B.  TRANSIENT PROGRAMS
                    *     GENERALLY LOAD OVERLAYS TO PERFORM SPECIFIC TASKS.  FOR
                    *     EXAMPLE,  CIO, WHICH IS A TRANSIENT PROGRAM, CALLS VARIOUS
                    *     OVERLAYS DEPENDING ON THE TASK (READ,WRITE, BACKSPACE) AND
                    *     THE EQUIPMENT (DISK,TAPE) SPECIFIED.  SECONDARY OVERLAYS ARE
                    *     LOADED INTO MEMORY USUALLY BEGINNING AT LOCATION 1773B, THE
                    *     FIRST INSTRUCTION FALLING AT LOCATION 2000B.  OVERLAYS ARE
                    *     GENERALLY ENTERED VIA A RETURN JUMP.  TRANSIENT PROGRAMS HAVE
                    *     NAMES BEGINNING WITH A LETTER (CIO, EXU) OR THE NUMERAL 1
                    *     (1AJ, 1IQ) - OVERLAYS HAVE NAMES BEGINNING WITH THE NUMERALS
                    *     2 THROUGH 9 (2BP, 4LB, 9DM).
                    *
                    *     BOTH TRANSIENT AND OVERLAY PROGRAMS, AS WELL AS THE RESIDENT
                    *     PROGRAM, MAKE EXTENSIVE USE OF THE LOW CORE LOCATIONS 1B-73B.
                    *     THE FOLLOWING FIGURE DETAILS THESE DIRECT CELL ASSIGNMENTS -
                    *
                    *                 ******************************************
                    *     D.Z*   00B  *                                        *
                    *            01B  *
```

TE-6

HIGH-ORDER 18 BITS OF THE INPUT REGISTER. THIS NAME CONSISTS STL 281

S T L   ---   PERIPHERAL PROCESSOR RESIDENT

```
                    *          02B *                                              *
                    *          03B *                                              *
                    *          04B *                                              *
                    *          05B *                                              *
                    *          06B *                                              *
                    *          07B *             SCRATCH                          *
                    *   D.T*   10B *             AREA                             *
                    *          11B *                                              *
                    *          12B *                                              *
                    *          13B *                                              *
                    *          14B *                                              *
                    *          15B *                                              *
                    *          16B *                                              *
                    *          17B *                                              *
                    *              ************************************************
                    *   D.TW*  20B * D.FNT                                        *
                    *          21B * D.FNT+1                                      *
                    *          22B * D.FNT+2                                      *
                    *          23B * D.FNT+3                                      *
                    *          24B * D.FNT+4      WORDS 2 AND 3 OF FNT/FST        *
                    *          25B * D.FNT+5      ENTRY FOR CURRENT FILE          *
                    *          26B * D.FNT+6                                      *
                    *          27B * D.FNT+7                                      *
                    *   D.TH*  30B * D.FNT+8                                      *
                    *          31B * D.FNT+9                                      *
                    *              ************************************************
                    *          32B * D.EST                                        *
                    *          33B * D.EST+1      EST ENTRY FOR DEVICE            *
                    *          34B * D.EST+2      BEING USED BY THIS PPU          *
                    *          35B * D.EST+3                                      *
                    *          36B * D.EST+4                                      *
                    *              ************************************************
                    *          37B * D.DST (D.JFL)   DEVICE TYPE (JOB CM FL/100B)*
                    *              ************************************************
                    *   D.FR*  40B * D.BA                                         *
                    *          41B * D.BA+1       FET ADDRESS RELATIVE TO LOWER   *
                    *          42B * D.BA+2       18 BITS OF INPUT REGISTER       *
                    *          43B * D.BA+3                                       *
                    *          44B * D.BA+4                                       *
                    *              ************************************************
                    *          45B * D.JECS       ECS FIELD LENGTH/1000B          *
                    *              ************************************************
                    *          46B * D.JPR        COMPUTED PRIORITY               *
                    *              ************************************************
                    *          47B * D.JTL        JOB TIME LIMIT/10B              *
                    *              ************************************************
                    *   D.FF*  50B * D.PPIRB                                      *
                    *          51B * D.PPIRB+1                                    *
                    *          52B * D.PPIRB+2    CONTENTS OF PPU INPUT REGISTER  *
                    *          53B * D.PPIRB+3                                    *
                    *          54B * D.PPIRB+4                                    *
                    *              ************************************************
                    *          55B * D.RA         USER AREA REFERENCE ADDRESS/100B*
                    *              ************************************************
                    *          56B * D.FL         USER AREA FIELD LENGTH/100B     *
                    *              ************************************************
                    *          57B * D.FA         ADDRESS OF FILE FST             *
```

2E-6

STL --- PERIPHERAL PROCESSOR RESIDENT

```
*                   ***********************************************************
*       D.SX*  60B  * D.FIRST       CIRCULAR BUFFER                           *
*              61B  * D.FIRST+1     -FIRST- PARAMETER FROM FET                *
*                   ***********************************************************
*              62B  * D.IN          CIRCULAR BUFFER                           *
*              63B  * D.IN+1        -IN- PARAMETER FROM FET                   *
*                   ***********************************************************
*              64B  * D.OUT         CIRCULAR BUFFER                           *
*              65B  * D.OUT+1       -OUT- PARAMETER FROM FET                  *
*                   ***********************************************************
*              66B  * D.LIMIT       CIRCULAR BUFFER                           *
*              67B  * D.LIMIT+1     -LIMIT- PARAMETER FROM FET                *
*                   ***********************************************************
*       D.SV*  70B  * D.PPONE       CONSTANT 1                                *
*                   ***********************************************************
*              71B  * D.HN          CONSTANT 100B                             *
*                   ***********************************************************
*              72B  * D.TH          CONSTANT 1000B                            *
*                   ***********************************************************
*              73B  * D.TR          CONSTANT 3                                *
*                   ***********************************************************
*              74B  * D.PPIR        PP INPUT REGISTER ADDRESS IN CM           *
*                   ***********************************************************
*              75B  * D.PPMES1      PP MESSAGE BUFFER ADDRESS IN CM           *
*                   ***********************************************************
*              76B  * D.CPAD        CONTROL POINT AREA ADDRESS                *
*                   ***********************************************************
*              77B  * D.PPSTAT      PP STATUS WORD ADDRESS IN CM              *
*                   ***********************************************************


**
*          THE PERIPHERAL PROCESSOR RESIDENT PROGRAM HAS TWO MAIN
*          FUNCTIONS TO PERFORM -
*
*             ALL COMMUNICATION BETWEEN MTR AND THE TRANSIENT OR OVERLAY
*             PROGRAMS IS HANDLED BY THE RESIDENT.
*
*             THE RESIDENT, WHEN DIRECTED BY MTR, LOADS TRANSIENT
*             PROGRAMS AND INITIATES THE EXECUTION OF THESE PROGRAMS.
*
*          COMMUNICATION BETWEEN MTR AND THE RESIDENT PROGRAM IS CARRIED
*          OUT THROUGH THE USE OF PP COMMUNICATION AREAS IN CENTRAL
*          MEMORY, ONE FOR EACH PROCESSOR.  EACH COMMUNICATION AREA
*          CONSISTS OF A ONE-WORD INPUT REGISTER, A ONE-WORD OUTPUT
*          REGISTER, AND A SIX-WORD MESSAGE BUFFER.  THERE IS ALSO ONE
*          STATUS WORD IN CENTRAL MEMORY ASSOCIATED WITH EACH OF THE
*          POOL PPU-S.  POOL PROCESSORS ADDRESS THESE AREAS BY MEANS OF
*          POINTERS IN DIRECT CELL LOCATIONS D.PPIR, D.PPMES1, AND
*          D.PPSTAT.
*
*          MTR ASSIGNS A TASK TO A POOL PROCESSOR BY PLACING THE REQUEST
*          IN THE PROCESSOR-S INPUT REGISTER.  THE NAME OF THE PROGRAM
*          PACKAGE WHICH IS TO BE LOADED AND EXECUTED APPEARS IN THE
*          HIGH-ORDER 18 BITS OF THE INPUT REGISTER.  THIS NAME CONSISTS
```

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S T L --- PERIPHERAL PROCESSOR RESIDENT

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*         OF THREE DISPLAY CODE CHARACTERS, SUCH AS 1AJ OR CIO.  THE
*         NUMBER OF THE CONTROL POINT TO WHICH THIS PACKAGE IS ASSIGNED
*         APPEARS IN THE LOW-ORDER FOUR BITS OF BYTE ONE OF THE INPUT
*         REGISTER.  PACKAGE PARAMETERS, SUCH AS THE ADDRESS OF
*         ARGUMENTS REQUIRED BY THE PACKAGE, APPEAR IN THE LOW-ORDER
*         36 BITS OF THE INPUT REGISTER.  THE PPU IS GIVEN CONTROL TO
*         EXECUTE THE CODE JUST LOADED.  THE REQUEST ITSELF REMAINS IN
*         THE INPUT REGISTER UNTIL THE TASK IS COMPLETED.  ON COMPLETION
*         OF A TASK, THE TRANSIENT PROGRAM REQUESTS MTR TO RELEASE THE
*         PROCESSOR - MTR THEN CLEARS THE PROCESSOR-S INPUT REGISTER.
*         THE INPUT REGISTER OF A POOL PROCESSOR IS THUS CLEAR ONLY WHEN
*         THE PROCESSOR IS IDLE.
*
*         ALL COMMUNICATION BETWEEN MTR AND THE TRANSIENT AND OVERLAY
*         PROGRAMS IS HANDLED BY THE RESIDENT PROGRAM.  MTR PERFORMS A
*         VARIETY OF FUNCTIONS, EACH OF WHICH IS IDENTIFIED BY A
*         FUNCTION CODE OF ONE OR TWO OCTAL DIGITS.
*
*         TO TRANSMIT A REQUEST TO MTR, THE RESIDENT PLACES THE REQUEST
*         IN ITS OUTPUT REGISTER.  BYTE 0 OF THE OUTPUT REGISTER
*         CONTAINS THE FUNCTION CODE IN THE LOW-ORDER BIT POSITIONS.
*         BYTES 1 THROUGH 4 ARE USED FOR ARGUMENTS - THE NUMBER OF
*         ARGUMENT BYTES DEPENDS ON THE PARTICULAR FUNCTION.  THUS,
*         FOR A REQUEST CHANNEL FUNCTION, THE CHANNEL NUMBER IS PLACED
*         IN BYTE 1.  FOR SOME FUNCTIONS, THE FUNCTION ARGUMENTS ARE
*         PLACED IN THE MESSAGE BUFFER AND ONLY THE FUNCTION CODE
*         APPEARS IN THE OUTPUT REGISTER.  MTR REGULARLY SCANS THE
*         OUTPUT REGISTER OF EACH PROCESSOR TO DETERMINE IF A REQUEST
*         IS PRESENT.  WHEN THE REQUEST HAS BEEN DETECTED, ANALYZED,
*         AND PROCESSED, MTR CLEARS THE OUTPUT REGISTER.  THE RESIDENT,
*         AFTER PLACING THE REQUEST IN THE OUTPUT REGISTER, WAITS FOR
*         THE OUTPUT REGISTER TO BE CLEARED BEFORE PROCEEDING.
*
*         THE RESIDENT CONTAINS A ROUTINE CALLED R.MTR WHICH HANDLES
*         THE TRANSMISSION OF FUNCTION REQUESTS TO MTR.  THIS PROCESS
*         REQUEST ROUTINE USES LOCATIONS D.T0-D.T4 IN PERIPHERAL
*         PROCESSOR MEMORY AS TEMPORARY STORAGE FOR THE REQUEST TO BE
*         WRITTEN IN THE OUTPUT REGISTER.  A PERIPHERAL PROCESSOR
*         PROGRAM MAY UTILIZE THE ROUTINE BY PLACING THE ARGUMENTS FOR
*         THE FUNCTION IN BYTES D.T1 THROUGH D.T4, SETTING THE
*         A-REGISTER WITH THE FUNCTION NUMBER, AND EXECUTING A RETURN
*         JUMP TO R.MTR.  THE RESIDENT ROUTINE WILL ENTER THE FUNCTION
*         NUMBER IN LOCATION D.T0 AND WRITE THE CONTENTS OF LOCATIONS
*         D.T0 THROUGH D.T4 IN THE OUTPUT REGISTER.  CONTROL WILL BE
*         RETURNED TO THE REQUESTING PROGRAM UPON MTR-S CLEARING THE
*         OUTPUT REGISTER.
*
*         WHEN A POOL PROCESSOR PROGRAM COMPLETES EXECUTION, IT EXITS
*         TO LOCATION R.IDLE, WHICH IS THE ADDRESS OF THE RESIDENT
*         IDLE LOOP.  THE ENTRY POINT TO THIS IDLE LOOP IS R.IDLE.
*         WHEN REFERRING TO A PP RESIDENT ROUTINE, THE NAME OF ITS
*         ENTRY POINT IS USED AS THE NAME OF THE ROUTINE.  THUS, THE
*         NAME OF THE IDLE LOOP IS R.IDLE.  IN THIS IDLE LOOP, THE
*         PROCESSOR-S INPUT REGISTER IS SCANNED AT INTERVALS UNTIL A
*         REQUEST IS FOUND IN THE INPUT REGISTER.  A DELAY BETWEEN
*         SUCCESSIVE SCANS AVOIDS UNNECESSARY MEMORY AND READ/WRITE
```

S T L   ---   PERIPHERAL PROCESSOR RESIDENT


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         *          CONTAINS ZERO.  IF THE PP INPUT REGISTER BECOMES NON-ZERO,
         *          IT MEANS MTR WANTS PP RESIDENT TO LOAD A PP TRANSIENT PROGRAM  STL        339
         *          INTO THE PPU. 'WHEN THE REQUEST IS DETECTED, THE RESIDENT      STL        340
         *          STORES THE ROUTINE NAME AND THE CONTROL POINT.  IT THEN        STL        341
         *          EXECUTES FUNCTION R.TAFL, TERMINATING ACCESS TO THE CONTROL    STL        342
         *          POINT FIELD LENGTH.  R.IDLE CALLS THE PP RESIDENT SUBROUTINE   STL        343
         *          R.OVL.  R.OVL WILL THEN ISSUE A CP MONITOR REQUEST (M.ICE      STL        344
         *          WITH EX.PLIB) WITH THE ROUTINE NAME TO GET THE ROUTINE         FEAT75A      5
         *          SEARCHED AND WILL WAIT UNTIL THE REQUEST IS COMPLETED.         FEAT75A      6
         *          WHEN IT IS COMPLETED, THIRD WORD OF PP MESSAGE BUFFER GIVES    FEAT75A      7
         *          THE INFORMATION HOW THE ROUTINE CAN BE LOADED.  IF THE         FEAT75A      8
         *          ROUTINE IS NOT FOUND IN THE DIRECTORY, AND THIS IS A CONTROL   FEAT75A      9
         *          POINT ZERO REQUEST, CP MONITOR WILL PLACE A BAD MTR REQUEST    FEAT75A     10
         *          (M.KILL) TO THE PP O.R. TO STOP THE SYSTEM.  IF CONTROL        FEAT75A     11
         *          POINT IS NON-ZERO, CP MONITOR WILL PLACE A REQUEST TO ABORT    FEAT75A     12
         *          THE JOB WITH A PP OVERLAY ERROR FLAG (F.EROVL).  CP MONITOR    FEAT75A     13
         *          WILL THEN INFORM THE PP TO RETURN TO ITS IDLE LOOP.            FEAT75A     14
         *          IF THE PROGRAM IS LOCATED, R.OVL LOADS THE ROUTINE AS IT IS    FEAT75A     15
         *          INSTRUCTED BY CP MONITOR, AND THEN IT RETURNS CONTROL TO       FEAT75A     16
         *          R.IDLE WHICH EXECUTES THE INSTRUCTION                          FEAT75A     17
         *                   LJM   C.PPFWA.                                        FEAT75A     18
         *          THIS TRANSFERS CONTROL TO THE FIRST INSTRUCTION OF THE         STL        357
         *          TRANSIENT PROGRAM.  WHEN A TRANSIENT PROGRAM TERMINATES,       STL        358
         *          IT MUST NOTIFY MTR THAT THE PPU IS AVAILABLE FOR ASSIGNMENT    STL        359
         *          TO ANOTHER TASK.  THIS IS DONE IN THE FOLLOWING MANNER -       STL        360
         *                   LDN    M.DPP     DROP THE PP ASSIGNMENT               STL        361
         *                   RJM  R.MTR                                            STL        362
         *                   LJM  R.IDLE     EXIT TO IDLE LOOP                     STL        363
                                                                                   STL        364

         **
         *          SEVERAL RESIDENT ROUTINES AND WORDS ARE USED BY TRANSIENT      STL        366
         *          AND OVERLAY PROGRAMS.  THESE ROUTINES ARE DESCRIBED BELOW.     STL        367
         *          LOCATION VALUES ARE THE ENTRY POINT ADDRESSES AS DEFINED       STL        368
         *          IN *PPTEXT* AND ARE SUBJECT TO CHANGE.                         SC40125   1510
         *                                                                         SC40125   1511
         *                                                                         STL        370
         *              ************************************************           STL        371
         *     R.IDLE   *                                              *           STL        372
         *              *            PP RESIDENT IDLE LOOP             * 103B      STL        373
         *              *                                              *           STL        374
         *              ************************************************           STL        375
         *     R.OVLJ   *                                              *           STL        376
         *              *       PRIMARY OVERLAY INTERNAL LOAD          * 125B      SC40125   1512
         *              *                                              *           SC40125   1513
         *              ************************************************           STL        379
         *     R.RAFL   *                                              *           STL        380
         *   (R.PAUSE)  *          REQUEST ACCESS TO THE               * 140B      SC40125   1514
         *              *        CONTROL POINT FIELD LENGTH            *           SC40125   1515
         *              *                                              *           SC40125   1516
         *              ************************************************           STL        386
         *     R.TAFL   *                                              *           STL        387
         *              *TERMINATE ACCESS TO CONTROL POINT FIELD LENGTH* 173B      SC40125   1517
         *              *                                              *           SC40125   1518
         *              ************************************************           STL        390
         *     R.TFL    *                                              *           STL        391
                                                                       * 207B      SC40125   1519
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S T L   ---   PERIPHERAL PROCESSOR RESIDENT

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                *                *      COMPARE ACCUMULATOR TO FIELD LENGTH      *            SC40125  1520
                *                *                                               *            STL       395
                *                *************************************************            STL       396
                *     R.MTR      *                                               * 220B       SC40125  1521
                *   (R.PROCES)   *          ISSUE MONITOR FUNCTION               *            SC40125  1522
                *                *                                               *            STL       399
                *                *************************************************            STL       400
                *     R.WAIT     *                                               * 231B       SC40125  1523
                *                *      WAIT FOR OUTPUT REGISTER TO CLEAR        *            SC40125  1524
                *                *                                               *            STL       403
                *                *************************************************            STL       404
                *     R.RCH      *                                               * 303B       SC40125  1525
                *                *             RESERVE CHANNEL                   *            SC40125  1526
                *                *                                               *            STL       407
                *                *************************************************            STL       408
                *     R.DCH      *                                               * 326B       SC40125  1527
                *                *        RELEASE CHANNEL RESERVATION            *            SC40125  1528
                *                *                                               *            STL       411
                *                *************************************************            STL       412
                *     R.STB      *                                               * 355B       SC40125  1529
                *                *        MASK BYTE INTO LISTED WORDS            *            SC40125  1530
                *                *                                               *            STL       415
                *                *************************************************            STL       416
                *     R.OVL      *                                               * 363B       SC40125  1531
                *                *             LOAD PP OVERLAY                   *            SC40125  1532
                *                *                                               *            STL       419
                *                *************************************************            STL       420
                *     R.READP    *                                               * 543B       SC40125  1533
                *     R.WRITEP   *                                               * 552B       SC40125  1534
                *                *        TRANSMIT DATA VIA CHANNEL              *            SC40125  1535
                *                *        FROM (TO) STACK PROCESSOR              *            SC40125  1536
                *                *                                               *            SC40125  1537
                *                *                                               *            STL       423
                *                *************************************************            STL       424
                *     R.RWP      *                                               * 567B       SC40125  1538
                *                *      HANDLE DISK READ/WRITE LOGIC             *            SC40125  1539
                *                *                                               *            STL       427
                *                *************************************************            STL       428
                *     R.EREQS    *                                               * 656B       SC40125  1540
                *                *          ENTER REQUEST STACK                  *            SC40125  1541
                *                *                                               *            SC40125  1542
                *                *************************************************            SC40125  1543
                *     R.DFM      *                                               * 705B       SC40125  1544
                *                *        TRANSMIT DAYFILE MESSAGE               *            SC40125  1545
                *                *                                               *            SC40125  1546
                *                *************************************************            SC40125  1547
```

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                  ****
                  *          PP RESIDENT CONSTANTS                                          STL       430
                  *                                                                         STL       431
       144        RWDELAY    EQU     100                                                    STL       432
       175        ILDELAY    EQU     125                                                    STL       433
                             IFEQ    IP.ECSB,0                                              STL       434
                  ECSLIB     EQU     0                                                      STL       435
                  DDPLIB     EQU     0                                                      STL       436
                             ELSE    3                                                      STL       437
         1        ECSLIB     EQU     IP.ELIB/IP.ELIB                                        STL       438
         0        DDPLIB     EQU     IP.DDP/IP.DDP                                          STL       439
         3        SBPH       EQU     IP.SBPH                                                FEAT75A    19
                  ****                                                                      STL       441
                                                                                            STL       442


                  **         PP RESIDENT LOCAL MACROS                                       SC40125  1550


                  **         TESTZ   OPN,A,B
                  *                                                                         SC40125  1552
                  *          MACRO TO TEST (A-REG)=0 AFTER OPERATION *OPN*                  SC40125  1553
                                                                                            SC40125  1554
                  TESTZ      MACRO   OPN,A,B                                                SC40125  1555
                             IFNE    A,0,2                                                  STL       446
                  (DUMMY)    SET     A                                                      STL       447
                             OPN     B(DUMMY)                                               STL       448
                  TESTZ      ENDM                                                           STL       449
                                                                                            STL       450


                  **
                  *          * * * * * * * * * * * * * * * * * * * *                        STL       460
                  *                                                                         STL       461
                  *          B E G I N   * P P   R E S I D E N T *                          STL       462
                  *                                                                         STL       463
                  *          * * * * * * * * * * * * * * * * * * * *                        STL       464
                                                                                            STL       465
```

```
                                ****                                              STL      467
                                       USE     0        ESTABLISH USE BLOCKS      STL      468
                                       USE     PPOLAY                             STL      469
                                *                                                 STL      470
                                       USE     0                                  STL      471
     100                               ORG        100B                            STL      472
                                *                                                 STL      473
     100        0000            R.FAF  DATA       0                               STL      474
     101        0000                   DATA       0           RESERVED            STL      475
     102        0000                   DATA       0           RESERVED            STL      476
                                ****                                              STL      477
```

```
                                  **                                                             STL        479
                                  *        R.IDLE    PP RESIDENT IDLE LOOP                       STL        480
                                  *        ------------------------------                        STL        481
                                  *                                                              STL        482
                                  *        CALLING SEQUENCE                                      STL        483
                                  *                                                              STL        484
                                  *        LJM       R.IDLE                                      STL        485
                                  *                                                              STL        486
                                  *        THIS ROUTINE IS THE IDLE LOOP IN WHICH PP RESIDENT CHECKS   SC40125   1570
                                  *        ITS INPUT REGISTER FOR A NEW ASSIGNMENT.              SC40125   1571
                                  *        IF THERE IS NONE -                                    SC40125   1572
                                  *           ZERO  PP STATUS WORD (ONLY ONCE PER ENTRY).        SC40125   1573
                                  *           USE PP STATUS WORD ADDRESS TIMES 2 AS A DELAY COUNT   SC40125   1574
                                  *             (330B - 370B MICROSECONDS).                      SC40125   1575
                                  *           RE-INITIATE INPUT REGISTER SCAN.                   SC40125   1576
                                  *        IF AN OVERLAY IS SPECIFIED -                          SC40125   1577
                                  *           SET CONTROL POINT NUMBER INTO D.CPAD.              SC40125   1578
                                  *           CLEAR FIELD ACCESS FLAG IN PP STATUS WORD VIA R.TAFL.   SC40125   1579
                                  *           FALL THROUGH TO R.OVLJ TO LOAD AND TRANSFER CONTROL   SC40125   1580
                                  *             TO OVERLAY.                                      SC40125   1581
                                  *                                                              STL        492
                                  *        CALLS - R.TAFL                                        STL        493
                                  *                                                              SC40125   1582
                                  *        USES   D.T6 - D.TW2                                   SC40125   1583
                                                                                                 STL        495
    103        3074          R.IDLE    LDD       D.PPIR          READ INPUT REGISTER             STL        496
    104        6016                    CRD       D.T6                                            STL        497
    105        3017                    LDD       D.T7                                            STL        498
    106        0512                    NJN       IDL2            NO REQUEST, CLEAR PP STATUS WORD   STL     499
    107        3077                    LDD       D.PPSTAT                                        STL        500
    110        6216                    CWD       D.T6            CLEAR PP STATUS WORD            STL        501
                                                                                                 STL        502
    111        3077          IDL1      LDD       D.PPSTAT                                        SC40125   1584
    112        1701                    SBN       1                                               STL        503
    113        0576                    NJN       *-1             DELAY                           STL        504
                                                                                                 STL        505
    114        3074                    LDD       D.PPIR                                          STL        506
    115        6016                    CRD       D.T6            READ INPUT REGISTER             STL        507
    116        3017                    LDD       D.T7                                            STL        508
    117        0471                    ZJN       IDL1            NO REQUEST, LOOP                STL        509
                                                                                                 STL        510
    120        1217          IDL2      LPN       L.CPNUM                                         SC40125   1585
    121        1007                    SHN       7                                               STL        511
    122        3476                    STD       D.CPAD                                          STL        512
    123        0200 0173               RJM      R.TAFL           UPDATE PP STATUS WORD           STL        513
                                                                                                 STL        514
```

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VALS-53-9-39

```
                              **                                                            STL       516
                              *     R.OVLJ       LOAD NEW PRIMARY OVERLAY INTERNALLY        STL       517
                              *     ---------------------------------------------------     STL       518
                              *                                                             STL       519
                              *     CALLING SEQUENCE                                        STL       520
                              *                                                             STL       521
                              *     STORE    OVERLAY NAME IN D.T6, D.T7                     STL       522
                              *     LJM      R.OVLJ                                         STL       523
                              *                                                             STL       524
                              *     ACTIONS                                                 STL       525
                              *                                                             STL       526
                              *     CAUSES OVERLAY TO BE LOADED AT C.PPFWA-L.PPHDR VIA R.OVL  SC40125  1587
                              *     TRANSFERS CONTROL TO C.PPFWA                            STL       528
                              *                                                             SC40125  1588
                              *     THIS ROUTINE CAN BE USED BY A PP PROGRAM TO LOAD A TRANSIENT  SC40125  1589
                              *     PROGRAM ON TOP OF ITSELF WITHOUT CHANGING THE INPUT REGISTER.  SC40125  1590
                              *                                                             STL       529
                              *     CALLS - R.OVL                                           STL       530
                                                                                            STL       531
                                                                                            STL       532
   125          2000 0773       R.OVLJ  LDC      C.PPFWA-L.PPHDR                            STL       533
   127          0200 0363               RJM      R.OVL            LOAD OVERLAY              STL       534
   131          0100 1000               LJM      C.PPFWA          ENTER OVERLAY             STL       535
```

VALS-53-9-40

9-40

```
                              **                                                              STL        537
                              *        R.RAFL    REQUEST ACCESS TO THE CONTROL POINT FIELD LENGTH   STL        538
                              *        ------------------------------------------------------       STL        539
                              *                                                              STL        540
                              *        CALLING SEQUENCE                                      STL        541
                              *                                                              STL        542
                              *        RJM       R.RAFL                                      STL        543
                              *                                                              STL        544
                              *        ACTIONS                                               STL        545
                              *                                                              STL        546
                              *        TEST STORAGE MOVE FLAG FOR CONTROL POINT              STL        547
                              *        IF STORAGE MOVE FLAG SET, CLEAR FIELD ACCESS FLAG IN PP     SC40125   1592
                              *           STATUS WORD VIA R.TAFL (ONLY IF FAF SET), THEN DELAY     SC40125   1593
                              *           UNTIL STORAGE MOVE FLAG IS CLEARED.  (DELAY IS PP RESIDENT SC40125 1594
                              *           CONSTANT *RWDELAY* MICROSECONDS).                  SC40125   1595
                              *        SET THE FIELD ACCESS FLAG IN THE PP STATUS WORD       STL        550
                              *        REPEAT PROCESS UNTIL FIELD ACCESS FLAG IS SET         SC40125   1596
                              *           AND STORAGE MOVE FLAG IS CLEAR.                    SC40125   1597
                              *                                                              SC40125   1598
                              *        RETURNS                                               SC40125   1599
                              *                                                              SC40125   1600
                              *        FIELD LENGTH (FL) IN D.FL                             SC40125   1601
                              *        REFERENCE ADDRESS (RA) IN D.RA AND A-REGISTER         SC40125   1602
                              *                                                              STL        552
                              *        CALLS - R.TAFL                                        STL        553
                              *                                                              SC40125   1603
                              *        USES    D.T0 - D.T4                                   SC40125   1604

                              **                                                             STL        555
                              *        R.PAUSE EQU R.RAFL                                    STL        556
                                                                                             STL        559
                                                                                             STL        560
                                                                                             STL        561
  133      3014               RAFLX    LDD       D.T0+C.CPFL                                 STL        562
  134      3456                        STD       D.FL              RESET FL                  STL        563
  135      3013                        LDD       D.T0+C.CPRA                                 STL        564
  136      3455                        STD       D.RA              RESET RA                  STL        565
                                                                                             STL        566
  137      0100 0000          R.RAFL   ENM                                                   STL        567
                                                                                             STL        568
                    140       R.PAUSE  EQU       R.RAFL                                      STL        569
                                                                                             STL        570
  141      5000 0100                   LDM       R.FAF                                       STL        571
  143      3376                        LMD       D.CPAD                                      STL        572
  144      0513                        NJN       RAFL3             FAF IS NOT SET. TEST STORAGE MOVE FLG STL 573
                                                                                             STL        574
  145      3076               RAFL1    LDD       D.CPAD                                      STL        575
  146      1624                        ADN       W.CPSTAT                                    STL        576
  147      6010                        CRD       D.T0              READ CONTROL POINT STATUS WORD STL     577
  150      3012                        LDD       D.T0+C.CPSM                                 STL        578
  151      0461                        ZJN       RAFLX                                       STL        579
                                                                                             STL        580
  152      0200 0173                   RJM       R.TAFL            CLEAR FIELD ACCESS FLAG   STL        581
                                                                                             STL        582
  154      1462               RAFL2    LDN       RWDELAY/2                                   STL        583
  155      1701                        SBN       1                                           STL        584
  156      0576                        NJN       *-1               DELAY RWDELAY MICROSECONDS
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VALS-53-9-41

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                                                                              STL   585
 157     3076          RAFL3   LDD     D.CPAD                                 STL   586
 160     1624                  ADN     W.CPSTAT                               STL   587
 161     6010                  CRD     D.T0                                   STL   588
 162     3012                  LDD     D.T0+C.CPSM                            STL   589
 163     0570                  NJN     RAFL2      WAIT FOR STORAGE MOVE FLAG TO CLEAR  STL   590
                                                                              STL   591
 164     3076                  LDD     D.CPAD                                 STL   592
 165     5400 0100             STM     R.FAF      SET FIELD ACCESS FLAG       STL   593
 167     3077                  LDD     D.PPSTAT                               STL   594
 170     6276                  CWD     D.CPAD     UPDATE PP STATUS WORD       STL   595
 171     0353                  UJN     RAFL1                                  STL   596
```

VALS-53-9-42

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```
                                 **
                                 *     R.TAFL    TERMINATE ACCESS TO CONTROL POINT FIELD LENGTH     STL      598
                                 *     ----------------------------------------------------------   STL      599
                                 *     CALLING SEQUENCE                                             STL      600
                                 *                                                                  STL      601
                                 *     RJM       R.TAFL                                             STL      602
                                 *                                                                  STL      603
                                 *     ACTION                                                       STL      604
                                 *                                                                  STL      605
                                 *     CLEAR THE FIELD ACCESS FLAG IN THE PP STATUS WORD            STL      606
                                                                                                    STL      607
                                                                                                    STL      608
      172        0100 0000      R.TAFL   ENM       X                                                STL      609
      174        1400                    LDN       0                                                STL      610
      175        5400 0100               STM       R.FAF            CLEAR FIELD ACCESS FLAG         STL      611
      177        3077                    LDD       D.PPSTAT                                         STL      612
      200        6276                    CWD       D.CPAD                                           STL      613
      201        0370                    UJN       R.TAFLX                                          STL      614
                                                                                                    STL      615
                                                                                                    STL      616
```

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VALS-53-9-43

```
                              **
                              *      R.TFL     COMPARES ACCUMULATOR TO FIELD LENGTH
                              *      ----------------------------------------------
                              *
                              *      CALLING SEQUENCE
                              *
                              *      LOAD       VALUE
                              *      RJM        R.TFL
                              *
                              *      RETURNS
                              *
                              *      ACCUMULATOR=VALUE+RA IF VALUE IS LESS THAN FIELD LENGTH
                              *      ACCUMULATOR=-0  OTHERWISE

  202      1014               TFL0   SHN        12
  203      3156                      ADD        D.FL            ADD FIELD LENGTH
  204      3155                      ADD        D.RA            ADD RA
  205      1006                      SHN        6               REPOSITION VALUE

  206      0100 0000          R.TFL  ENM        X

  210      0705                      MJN        TFL1            JUMP IF NEGATIVE
  211      1014                      SHN        12              POSITION TO HUNDREDS
  212      3256                      SBD        D.FL
  213      1006                      SHN        6
  214      0765                      MJN        TFL0            SENSE IN RANGE

  215      1500               TFL1   LCN        0               ERROR RETURN
  216      0367                      UJN        R.TFLX
```

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VALS-53-9-44

```
                                        **                                                                    
                                        *       R.MTR     ISSUE MONITOR FUNCTION                     STL       647
                                        *       --------------------------------                     STL       648
                                        *                                                            STL       649
                                        *       CALLING SEQUENCE                                     STL       650
                                        *                                                            STL       651
                                        *       (STORE    FUNCTION PARAMETERS IN D.T1-D.T4)          STL       652
                                        *       LOAD      FUNCTION CODE                              STL       653
                                        *       RJM       R.MTR                                      STL       654
                                        *                                                            STL       655
                                        *       ACTIONS                                              STL       656
                                        *                                                            STL       657
                                        *       PLACE FUNCTION CODE IN D.T0                          STL       658
                                        *       WRITE FUNCTION (D.T0 - D.T4) TO PP OUTPUT REGISTER   STL       659
                                        *       WAIT FOR OUTPUT REGISTER TO CLEAR (FUNCTION ACCEPTED) STL      660
                                        *                                                            STL       661
                                        *       RETURNS                                              STL       662
                                        *                                                            STL       663
                                        *       CONTENTS OF OUTPUT REGISTER IN D.T0-D.T4             STL       664
                                        *                                                            STL       665
                                        *       CALLS - R.WAIT                                       STL       666
                                                                                                     STL       667
                                        **
                                        *       R.PROCES EQU R.MTR                                   STL       669
                                                                                                     STL       670
                                                                                                     STL       671
     217          0100 0000          R.MTR     ENM        X                                          STL       672
                                                                                                     STL       673
                            220      R.PROCES  EQU        R.MTR            NAME OF ENTRY POINT       SC40125  1610
     221          3410                                                                               STL       674
     222          3074                         STD        D.T0                                       SC40125  1611
     223          1601                         LDD        D.PPIR                                     STL       675
     224          6210                         ADN        W.PPOR-W.PPIR                              STL       676
                                               CWD        D.T0             WRITE OUTPUT REGISTER     STL       677
     225          0200 0231                                                                          STL       678
                                               RJM        R.WAIT           WAIT FOR FUNCTION ACCEPTED STL      679
     227          0367                                                                               STL       680
                                               UJN        R.MTRX           EXIT                      STL       681
                                                                                                     STL       682
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VALS-53-9-45

```
                            **                                                              STL     684
                            *         R.WAIT   WAIT FOR OUTPUT REGISTER TO CLEAR            STL     685
                            *         -----------------------------------------             STL     686
                            *                                                               STL     687
                            *         CALLING SEQUENCE                                      STL     688
                            *                                                               STL     689
                            *         RJM      R.WAIT                                       STL     690
                            *                                                               STL     691
                            *         ACTION                                                STL     692
                            *                                                               STL     693
                            *         DETERMINE IF THE MONITOR FUNCTION IS TO BE PROCESSED BY PPMTR  STL     694
                            *         OR CPMTR.                                             STL     695
                            *                                                               STL     696
                            *         IF CPMTR, WRITE THE INPUT REGISTER ADDRESS INTO T.PPID.   STL     697
                            *         READ AND EXECUTE T.MXNCTL.  T.MXNCTL IS MAINTAINED BY CPMTR  STL     698
                            *         AND IS USED TO DETERMINE TO WHICH EXCHANGE PACKAGE ADDRESS  STL     699
                            *         AN MXN SHOULD BE ISSUED.                              STL     700
                            *                                                               STL     701
                            *         IF PPMTR, WRITE THE INPUT REGISTER ADDRESS INTO T.PPIP.   STL     702
                            *                                                               STL     703
                            *         AT DEADSTART TIME STL DETERMINES IF THE MXN MAY BE USED.  STL     704
                            *         IF NOT, R.WAIT IS MODIFIED TO TREAT ALL FUNCTIONS AS PPMTR  STL     705
                            *         FUNCTIONS.                                            STL     706
                            *                                                               STL     707
                            *         FOR ALL FUNCTIONS, CPMTR OR PPMTR -                   STL     708
                            *         WAIT FOR OUTPUT REGISTER TO CLEAR AND PAUSE FOR CM    STL     709
                            *         RELOCATION IF THE STORAGE MOVE FLAG IS SET            STL     710
                            *                                                               STL     711
                            *         CALLS - R.PAUSE                                       STL     712
                                                                                            STL     714
                                                                                            STL     715
   230       0100 0000      R.WAIT    ENM      X                                            STL     716
                            *                                                               STL     717
   232       3010                     LDD      D.T0                                         STL     718
   233       1713           WAIT2     SBN      M.MTRCPU+1     SKIP MXN IF FUNCTION GTR THAN M.RCH  STL     719
   234       0704                     MJN      WAIT2A                                       STL     720
                                                                                            STL     721
   235       1450                     LDN      T.PPIP                                       STL     722
   236       6270                     CWD      D.PPIR-4                                     STL     723
   237       0314                     UJN      WAIT6                                        STL     724
                                                                                            STL     725
   240       1447            WAIT2A   LDN      T.PPID                                       STL     726
   241       6270                     CWD      D.PPIR-4                                     STL     727
                            *                                                               STL     728
   242       1401                     LDN      1                                            STL     729
   243       3410                     STD      D.T0                                         STL     730
   244       1446                     LDN      T.MXNCTL                                     STL     731
   245       6110 0245      WAIT4     CRM      WAIT4,D.T0     READ THE MXN CONTROL WORD     STL     732
   247       2000 0000      WAIT5     LDC      **             LOAD EXCHANGE JUMP ADDRESS    STL     733
   251       2610           WAIT5A    MXN      0                                            FEAT65A  11
                            *                                                               STL     735
   252       1424                     LDN      20                                           STL     736
   253       1701            WAIT6    SBN      1                                            STL     737
   254       0676                     PJN      WAIT6                                        STL     738
                                                                                            STL     739
   255       3074                     LDD      D.PPIR                                       STL     740
   256       1601                     ADN      W.PPOR-W.PPIR                                STL     741
```

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VALS-53-9-46

```
 257       6010                    CRD      D.TO         READ PP OUTPUT REGISTER             STL     742
 260       3010                    LDD      D.TO                                             STL     743
 261       0446                    ZJN    R.WAITX        EXIT WHEN ZERO                      STL     744
                                                                                             STL     745
 262       5000 0100               LDM      R.FAF                                            STL     746
 264       0403                    ZJN    WAIT7          JUMP IF FIELD ACCESS FLAG NOT SET   STL     747
                                                                                             STL     748
 265       0200 0140               RJM    R.RAFL         PAUSE FOR RELOCATION                STL     749
                                                                                             STL     750
 267       1462            WAIT7   LDN      RWDELAY/2                                        STL     751
 270       0362                    UJN    WAIT6                                              STL     752
```

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                                   **                                                              STL       754
                                   *    R.RCH     RESERVE CHANNEL                                  STL       755
                                   *    ------------------------                                   STL       756
                                   *                                                               STL       757
                                   *    CALLING SEQUENCE                                           STL       758
                                   *                                                               STL       759
                                   *    LOAD      CHANNEL NUMBER                                   STL       760
                                   *    RJM       R.RCH                                            STL       761
                                   *                                                               STL       762
                                   *    RETURNS WHEN ASSIGNMENT COMPLETE                           STL       763
                                   *                                                               STL       764
                                   *                                                               STL       770
                                   *    SINCE MORE THAN ONE PPU CAN BE REQUESTING THE SAME CHANNEL SC40125  1614
                                   *    AT THE SAME TIME, IT IS NECESSARY TO USE A MONITOR FUNCTION SC40125 1615
                                   *    TO RESERVE A CHANNEL.                                      SC40125  1616
                                   *                                                               STL       771
                                   *    CHANNELS WILL BE ASSIGNED BY MTR ON THE FOLLOWING          STL       772
                                   *    PRIORITY BASIS -                                           STL       773
                                   *                                                               STL       774
                                   *          D.T0    D.T1    D.T2    D.T3    D.T4                 STL       775
                                   *       ****************************************                STL       776
                                   *       *       * 2 / 1 * 4 / 3 *       *       *                STL       777
                                   *       ****************************************                STL       778
                                   *                                                               STL       779
                                   *    IF ALTERNATE CHANNELS ARE SPECIFIED, MTR WILL STOP LOOKING STL       780
                                   *    FOR ALTERNATE CHANNELS AFTER 4 CHANNELS HAVE BEEN INVESTIGATED STL   781
                                   *    OR UPON SENSING 6 BITS OF ZERO.  THUS, IF ONLY ONE ALTERNATE STL     782
                                   *    CHANNEL IS DESIRED, (D.T2) MUST BE SET TO ZERO BEFORE      STL       783
                                   *    ENTERING R.RCH.                                            STL       784
                                   *                                                               SC40125  1617
                                   *    MONITOR INDICATES THAT A CHANNEL IS RESERVED BY STORING    SC40125  1618
                                   *    THE ADDRESS OF THE INPUT REGISTER OF THE PP RESERVING      SC40125  1619
                                   *    THE CHANNEL IN BYTE 4 OF THE CHANNEL STATUS TABLE          SC40125  1620
                                   *    ENTRY FOR THE CHANNEL.                                     SC40125  1621
                                   *                                                               STL       785
                                   *    CALLS - R.MTR                                              STL       786
                                                                                                   STL       787
                                                                                                   STL       788
     271                  11            BSSZ   R.RCH-*-1         SPACE FORMERLY USED BY ILR        FEAT75A    20
                                   *                                                               STL       797
     302       0100 0000      R.RCH     ENM       X                                                STL       798
     304       3411                     STD       D.T1           CHANNEL NUMBER                    STL       799
     305       1412                     LDN       H.RCH                                            STL       806
     306       3414                     STD       D.T4           DO NOT RETURN WITHOUT RESERVATION STL       807
     307       0200 0220                RJM    R.MTR             ISSUE REQUEST CHANNEL             STL       808
     311       0370                     UJN       R.RCHX                                           STL       809
                                                                                                   FEAT75A    21
     312                  10            BSSZ   R.DCH-*-4         SPACE FORMERLY USED BY ILR        FEAT75A    22
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                                **                                                      STL       811
                                *       R.DCH      DROP CHANNEL                         STL       812
                                *       ----------------------                          STL       813
                                *                                                       STL       814
                                *       CALLING SEQUENCE                                STL       815
                                *                                                       STL       816
                                *       LOAD       CHANNEL NUMBER                       STL       817
                                *       RJM        R.DCH                                STL       818
                                *                                                       STL       819
                                *       ACTIONS                                         STL       820
                                *                                                       STL       821
                                *       UNLIKE THE CASE OF REQUESTING A CHANNEL, THE ONLY PP WHICH   SC40125  1627
                                *       CAN RELEASE A CHANNEL IS THE PP WHICH RESERVED IT.           SC40125  1628
                                *       THERE IS NO NEED FOR AN INTERLOCK.                           SC40125  1629
                                *                                                                    SC40125  1630
                                *       (THE FWA OF THE CHANNEL STATUS TABLE IS INSERTED             SC40125  1631
                                *       IN THIS ROUTINE BY *STL* AT DEADSTART TIME).                 SC40125  1632
                                *                                                                    SC40125  1633
                                *       CHANNEL STATUS TABLE IS UPDATED TO INDICATE THAT THE         STL       822
                                *       CHANNEL IS FREE BY STORING THE ADDRESS OF THE APPROPRIATE    SC40125  1634
                                *       CST ENTRY IN BYTE 4 OF THAT CST ENTRY.                       SC40125  1635
                                *       (BEFORE ALLOWING PP TO RELEASE CHANNEL, DETERMINE IF PP      SC40125  1636
                                *       HAS CHANNEL AND ISSUE M.KILL VIA R.MTR IF NOT).              SC40125  1637
                                *                                                                    SC40125  1638
                                *       (THE FWA OF THE CHANNEL STATUS TABLE IS INSERTED             SC40125  1639
                                *       IN THIS ROUTINE BY *STL* AT DEADSTART TIME).                 SC40125  1640
                                *                                                                    SC40125  1641
                                *       USES    D.T0 - D.T4                                          SC40125  1642
                                                                                                     STL       824
   322        1477              DCH3    LDN        M.KILL                                            STL       825
   323        0200 0220                 RJM        R.MTR                                             STL       826
                                *                                                                    STL       827
   325        0100 0000         R.DCH   ENM        X                                                 STL       828
   327        2100 0000                 ADC        **                  T.CST INSERTED AT DEADSTART   STL       829
                          330   DCH1    EQU        *-1                                               STL       830
   331        6010                      CRD        D.T0                                              STL       831
   332        3014                      LDD        D.T4                                              STL       832
   333        3374                      LMD        D.PPIR                                            STL       833
   334        0565                      NJN        DCH3                                              STL       834
   335        3013                      LDD        D.T3                                              STL       835
   336        3414                      STD        D.T4                                              STL       837
   337        6210                      CWD        D.T0                                              STL       838
   340        0364                      UJN        R.DCHX                                            STL       839
                                                                                                     STL       840
   341                    2             BSSZ   2                   SPACE FORMERLY USED BY ILR        FEAT75A    23
                                                                                                     FEAT75A    24
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VALS-53-4-49

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                                 **                                                          STL      842
                                 *         R.STB     MASK BYTE INTO LISTED WORDS             STL      843
                                 *         -------------------------------------             STL      844
                                 *                                                           STL      845
                                 *         CALLING SEQUENCE                                  STL      846
                                 *                                                           STL      847
                                 *         LOAD      L(LIST)                                 STL      848
                                 *         RJM       R.STB                                   STL      849
                                 *                                                           STL      850
                                 *         WHERE LIST HAS THE FORM                           STL      851
                                 *                                                           STL      852
                                 *         L(BYTE),L(WORD1),L(WORD2),...L(WORDN),0           STL      853
                                 *                                                           STL      854
                                 *         AN ENTRY POINT TO R.STB CALLED R.STBMSK IS THE ADDRESS OF    STL      855
                                 *         THE MASK -ANDED- WITH EACH WORD IN THE LIST BEFORE THE WORD  STL      856
                                 *         IS -EXCLUSIVE ORED- WITH THE BYTE.  THIS MASK IS INITIALLY   STL      857
                                 *         7700B AND THIS VALUE SHOULD BE RESTORED BY ANY ROUTINE       STL      858
                                 *         WHICH SUBSTITUTES AN ALTERNATE MASK.                         STL      859
                                 *         USES   D.Z0    D.T0    D.T2                       SC40125 1644
                                                                                             SC40125 1645
                                                                                             STL      860
     343       3412              STB0      STD       D.T2          SAVE WORD LOCATION        STL      861
     344       4012                        LDI       D.T2          FETCH WORD                STL      862
     345       2200 7700                   LPC       7700B         CLEAR BYTE FIELD          STL      863
                          346    R.STBMSK  EQU       *-1           MAY BE USED TO CHANGE BYTE MASK   STL      864
     347       4300                        LMI       0             OR BYTE INTO WORD         STL      865
     350       4412                        STI       D.T2          RESTORE WORD              STL      866
     351       3610              STB1      AOD       D.T0          ADVANCE IN LIST           STL      867
     352       4010                        LDI       D.T0                                    STL      868
     353       0567                        NJN       STB0          SENSE NOT END OF LIST     STL      869
                                                                                             STL      870
     354       0100 0000         R.STB     ENM                     STORE BYTE FOR I/O CHANNEL   STL      871
     356       3410                        STD       D.T0          SAVE LIST LOCATION        STL      872
     357       4010                        LDI       D.T0          FETCH BYTE LOCATION       STL      873
     360       3400                        STD       0                                       STL      874
     361       0367                        UJN       STB1                                    STL      875
                                                                                             STL      876
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VALS-53-9-50

```
                                **                                                                 STL        878
                                *            R.OVL       LOAD PP OVERLAY                           STL        879
                                *            -------------------------                             STL        880
                                *                                                                  STL        881
                                *            CALLING SEQUENCE                                      STL        882
                                *                                                                  STL        883
                                *            STORE       OVERLAY NAME IN D.T6,D.T7                 STL        884
                                *            LOAD        ADDRESS TO START LOADING OVERLAY          STL        885
                                *            RJM         R.OVL                                     STL        886
                                *                                                                  STL        887
                                *            ACTIONS                                               STL        888
                                *                                                                  STL        889
                                *            LOCATIONS BEYOND R.DFM AREA (737 - 772) ARE USED FOR  FEAT75A     25
                                *            THIS FUNCTION.                                        FEAT75A     26
                                *            ISSUE A M.ICE(EX.PLIB) FUNCTION WITH THE ROUTINE NAME AND    FEAT75A     27
                                *            LOAD ADDRESS AND WAIT UNTIL IT IS ACCEPTED.  THEN WAIT UNTIL FEAT75A     28
                                *            BYTE 0 OF MESSAGE BUFFER WORD 3 BECOMES NON-ZERO.     FEAT75A     29
                                *            IF IT IS 1, THE ROUTINE IS DISK RESIDENT AND THIS IS THE     FEAT75A     30
                                *            START OF NORMAL COMMUNICATION WITH THE STACK PROCESSOR.      FEAT75A     31
                                *            THE ROUTINE IS WAITING IN THE 1SP-S BUFFER TO BE LOADED      FEAT75A     32
                                *            THROUGH THE SPECIFIED CHANNEL.                        FEAT75A     33
                                *            IF IT IS 5, THE ROUTINE IS CM RESIDENT AND BYTES 1 AND 2     FEAT75A     34
                                *            GIVE CM ADDRESS AND BYTE 4 GIVES ITS LENGTH IN CM WORDS.     FEAT75A     35
                                *            IF IT IS GREATER THAN 5, THE ROUTINE IS ECS RESIDENT AND     FEAT75A     36
                                *            PPOR BYTE 1 GIVES NUMBER OF PRU-S IN THE BUFFER.  AND        FEAT75A     37
                                *            MSG3 AND MSG4 GIVE STATUS OF SYSTEM BUFFER AS FOLLOWS.       FEAT75A     38
                                *              MSG3 - 18/ECS DESCRIPTOR WORD OF ECS RESIDENT LIBRARY,     FEAT75A     39
                                *                     18/ASSIGNED SYSTEM BUFFER ENTRY ADDRESS,            FEAT75A     40
                                *                     6/0, 18/PPNT+1 ADDRESS.              FEAT75A     41
                                *              MSG4 - 1/0, 1/DDP FLAG (1 IF DDP TYPE), 10/0,              FEAT75A     42
                                *                     6/20B, 18/PRU DESCRIPTOR FWA,        FEAT75A     43
                                *                     24/CM DATA BUFFER ADDRESS IF CM BUFFER TYPE, OR     FEAT75A     44
                                *                         DDP CHANNEL NUMBER IF DDP TYPE.  FEAT75A     45
                                *            AT THE START OF ECS PROCESSING, R.OVL WILL CHECK THE TYPE    FEAT75A     46
                                *            OF ASSIGNED SYSTEM BUFFER, AND IF THE LOADED ECS DRIVER      FEAT75A     47
                                *            IS NOT OF CORRECT TYPE, IT WILL LOAD THE OTHER DRIVER FROM   FEAT75A     48
                                *            CM SAVE AREA.  THEN IT WILL READ IN THE PRU-S SPECIFIED IN   FEAT75A     49
                                *            PRU DESCRIPTOR AREA UNTIL A SHORT PRU, FROM CM DATA AREA OR  FEAT75A     50
                                *            THROUGH DDP.  THEN IT WILL ISSUE M.ICE(EX.PLIB) WITH         FEAT75A     51
                                *            BYTE 1 = 0.  THIS WILL REQUEST CP MONITOR TO RELEASE THE     FEAT75A     52
                                *            ASSIGNED SYSTEM BUFFER.  R.OVL WILL EXIT WHEN PPOR IS ZEROED. FEAT75A    53
                                *            COMMUNICATIONS BETWEEN R.OVL AND CP MONITOR FOR ABNORMAL     FEAT75A     54
                                *            SITUATIONS ARE -                                      FEAT75A     55
                                *              M.ICE(EX.PLIB) WITH BYTE 1                          FEAT75A     56
                                *                  = 1 -- NO SHORT PRU, CONTINUE LOAD BUFFER       FEAT75A     57
                                *                  = 2 -- ACCESS TO ECS THROUGH DDP IN TROUBLE     FEAT75A     58
                                *                  = 3 -- NO DDP DRIVER AVAILABLE FOR R.OVL        FEAT75A     59
                                *                  = 4 -- NO ECS DRIVER AVAILABLE FOR R.OVL        FEAT75A     60
                                *            FOR VALUES 2-4 CP MONITOR WILL SET UP STACK REQUEST   FEAT75A     61
                                *            TO LOAD THE ROUTINE FROM THE DISK.                    FEAT75A     62
                                *                                                                  FEAT75A     63
                                *            USES  D.Z1 - D.T7                                     FEAT75A     64
                                                                                                   STL        901
      362      0100 0000       R.OVL         ENM         X                                         STL        902
                                                                                                   STL        903
                                                                                                   STL        904
      364      0100 0737                     LJM   OVLA                                            FEAT75A     65
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VALS-53-9-51

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                                     *
                                     *       FROM OVLA RETURN TO OVLB                           FEAT75A
                                     *                                                          FEAT75A
  366      1702               OVLB     SBN    2                                                 FEAT75A
  367      0615                        PJN    OVLC                                              FEAT75A
  370      3613                        AOD    D.T3+C.RWPPCF       JUMP IF NOT DISK RESIDENT     FEAT75A
  371      3075                        LDD    D.PPMES1            RELEASE 1SP                   FEAT75A
  372      1602                        ADN    W.RWPPCH                                          FEAT75A
  373      6213                        CWD    D.T3                                              FEAT75A
  374      3017                        LDD    D.T4+C.RWPPST                                     FEAT75A
  375      1066                        SHN    -9                                                FEAT75A
  376      0463                        ZJN    R.OVLX                                            FEAT75A
  377      1422                        LDN    M.ABORT             RETURN TO CALLER IF NO ERROR  FEAT75A
  400      0200 0220                   RJM    R.MTR                                             FEAT75A
  402      0100 0103                   LJM    R.IDLE              EXIT TO IDLE                  FEAT75A
                                                                                                FEAT75A
  404      0507               OVLC     NJN    OVLE                JUMP IF ECS RESIDENT          FEAT75A
  405      3014                        LDD    D.T4                                              FEAT75A
  406      1014                        SHN    12                                                FEAT75A
  407      3115                        ADD    D.T5                                              FEAT75A
  410      6117 0000                   CRM    **,D.T7             READ CM IF CM RESIDENT        FEAT75A
                     411      OVLD     EQU    *-1                                               FEAT75A
  412      0347                        UJN    R.OVLX              RETURN                        FEAT75A
                                                                                                FEAT75A
  413                         OVLE     BSS    0                                                 FEAT75A
                                                                                                FEAT75A
  413      3006                        LDD    D.Z6                SAVED PPOR BYTE 1 HAS PRU COUNT  FEAT75A
  414      0445                        ZJN    R.OVLX              RETURN IF END OF ECS READ     FEAT75A
  415      3075                        LDD    D.PPMES1                                          FEAT75A
  416      1603                        ADN    3                                                 FEAT75A
  417      6001                        CRD    D.Z1                READ PP COMMUNICATION AREA MES4  FEAT75A
  420      3001                        LDD    D.Z1                TO CHECK DDP FLAG             FEAT75A
  421      1007                        SHN    7                                                 FEAT75A
                                                                                                FEAT75A
                     422      R.ECOVL  EQU    *                                                 FEAT75A
                     422      BASE.1   EQU    *                                                 FEAT75A
                     422      S.SEG0   EQU    *                                                 FEAT75A
                                                                                                FEAT75A
                       2      ERRDDP   EQU    2                   ERROR IN DDP ACTIVITY         FEAT75A
                       3      ERRNODP  EQU    3                   NO DDP OVERLAY                FEAT75A
                       4      ERRNOEC  EQU    4                   NO ECS OVERLAY                FEAT75A
                                                                                                FEAT75A
  422      0707               ECOVL    MJN    ECOVLA              JUMP IF THROUGH DDP           FEAT75A
  423      1413                        LDN    LSEG1               SEG LENGTH OF SEG-1 (ECS OVERLAY)  FEAT75A
  424      3410                        STD    D.T0                                              FEAT75A
  425      1404                        LDN    ERRNOEC                                           FEAT75A
  426      0310                        UJN    ISSUERR             ERROR - NO ECS CODE AVAILABLE FEAT75A
                                     *                                                          FEAT75A
                                     *       PRECEDING TWO INSTRUCTIONS WILL BE REPLACED BY     FEAT75A
                                     *       LDC (SEG-1 SAVE AREA IN CM) WHEN OVERLAY SEG-1 IS SAVED.  FEAT75A
                                     *                                                          FEAT75A
                     426      CMS01    EQU    *-1                                               FEAT75A
  427      6110 0422          ECOVLB   CRM    ECOVL,D.T0          LOAD ECS/DDP DRIVER           FEAT75A
                                                                                                FEAT75A
  431      1400               ECOVLA   LDN    LSEG2                                             FEAT75A
  432      3410                        STD    D.T0                                              FEAT75A
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      433         1403                              LDN    ERRNODP                                          FEAT75A
      434         0302                              UJN  ISSUERR            ERROR - NO DDP CODE AVAILABLE   FEAT75A
                                                                                                            FEAT75A
                                           *                                                                FEAT75A
                                           *        PRECEDING TWO INSTRUCTIONS WILL BE REPLACED BY          FEAT75A
                                           *        LDC (SEG-2 SAVE AREA INCM) WHEN OVERLAY SEG-2 IS SAVED. FEAT75A
                                           *                                                                FEAT75A
                                  434      CMSD2    EQU    *-1                                              FEAT75A
      435         0371                              UJN  ECOVLB                                             FEAT75A
      436         0100 0750        ISSUERR          LJM  ISSUE                                              FEAT75A
                                   22      XLSEG0   SET    *-BASE.1+4           END OF SEGMENT 0            FEAT75A
                                    3      LSEG0    EQU    XLSEG0/5                                         FEAT75A
                                                                                                            FEAT75A
                                           .ECS     IFNE   ECSLIB,0                                         FEAT75A
                                                    USE    PPOLAY                                           FEAT75A
                                                                                                            FEAT75A
                                 2171      S.SEG1   EQU    *0                                               FEAT75A
    L 422                                           LOC    BASE.1                                           FEAT75A
                                                                                                            FEAT75A
    L 422         0607             ECOVL            PJN  ECOVLA             JUMP IF NOT THROUGH DDP         FEAT75A
    L 423         1400                              LDN    LSEG2            SET LENGTH OF SEG-2 (DDP OVERLAY) FEAT75A
    L 424         3410                              STD    D.T0                                             FEAT75A
                                           *                                                                FEAT75A
                                           *        NEXT INSTRUCTION BECOMES LDC (SEG-2 SAVED AREA IN CM)   FEAT75A
                                           *        WHEN OVERLAY SEG-2 IS SAVED.                            FEAT75A
                                           *                                                                FEAT75A
    L 425         0100 0507                         LJM  NODDP                                              FEAT75A
                                 2175      CMS1     EQU    *-1+S.SEG1-BASE.1                                FEAT75A
    L 427         6110 0422                         CRM    ECOVL,D.T0                                       FEAT75A
                                                                                                            FEAT75A
    L 431         3007             ECOVLA           LDD    D.Z7                                             FEAT75A
    L 432         5400 0475                         STM    SDBLDD           SET PP ADDRESS OF START OF LOADING FEAT75A
    L 434         3002                              LDD    D.Z2             SET PRU DESCRIPTOR FWA(UPPER 6 BITS) FEAT75A
    L 435         5400 0455                         STM    SDBLOOP          WITH LDC CODE                   FEAT75A
    L 437         3003                              LDD    D.Z3                                             FEAT75A
    L 440         5400 0456                         STM    SDBLOOP+1        SET PRU DESCRIPTOR FWA(LOWER 12 BITS) FEAT75A
    L 442         3004                              LDD    D.Z4                                             FEAT75A
    L 443         1277                              LPN    77B                                              FEAT75A
    L 444         2100 2000                         ADC    .LDC.                                            FEAT75A
    L 446         5400 0472                         STM    SDBDATA          DATA AREA FWA                   FEAT75A
    L 450         3005                              LDD    D.Z5                                             FEAT75A
    L 451         5400 0473                         STM    SDBDATA+1                                        FEAT75A
    L 453         1400                              LDN    0                                                FEAT75A
    L 454         3410                              STD    D.T0             INITIALIZE NO. OF CM WORDS      FEAT75A
    L 455         2000 0000        SDBLOOP          LDC    **                                               FEAT75A
    L 457         6001                              CRD    D.Z1             READ PRU DESCRIPTOR             FEAT75A
    L 460         5600 0456                         AOM    SDBLOOP+1        BUMP DESCRIPTOR ADDRESS         FEAT75A
    L 462         3003                              LDD    D.Z3                                             FEAT75A
    L 463         3510                              RAD    D.T0             UPDATE WORD COUNT               FEAT75A
    L 464         3003                              LDD    D.Z3                                             FEAT75A
    L 465         1071                              SHN    -6                                               FEAT75A
    L 466         3403                              STD    D.Z3             PRU LENGTH / 100 IS 0 IF SHORT PRU FEAT75A
    L 467         0403                              ZJN  SDBDATA                                            FEAT75A
    L 470         3706                              SOD    D.Z6             DECREMENT PRU COUNT             FEAT75A
    L 471         0563                              NJN  SDBLOOP            PROCESS NEXT PRU DESCRIPTOR     FEAT75A
    L 472         2000 0000        SDBDATA          LDC    **               END OF BUFFER OR SHORT PRU      FEAT75A
    L 474         6110 0000                         CRM    **,D.T0                                          FEAT75A
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L 476      3003          475   SDBLOD    EQU    *-1
L 477      0406                          LDD    D.Z3                                                   FEAT75A   180
L 500      3010                          ZJN    SDBA                                                   FEAT75A   181
L 501      1002                          LDD    D.T0       TERMINATE ECS ACCESS IF SHORT PRU           FEAT75A   182
L 502      3110                          SHN    2          GET NEXT PRU LOAD ADDRESS                   FEAT75A   183
L 503      3507                          ADD    D.T0                                                   FEAT75A   184
L 504      1401                          RAD    D.Z7                                                   FEAT75A   185
L 505      0100 0750                     LDN    1          UPDATE PP ADDRESS IF END OF BUFFER          FEAT75A   186
                               SDBA      LJM    ISSUE      REQUEST CONTINUE                            FEAT75A   187
                                                                                                       FEAT75A   188
L 507      1403                NODDP     LDN    ERRNODP                                                FEAT75A   189
L 510      0374                          UJN    SDBA       ERROR - NO DDP OVERLAY AVAILABLE            FEAT75A   190
                                                                                                       FEAT75A   191
                          73   XLSEG1    SET    *-BASE.1+4                                             FEAT75A   192
                          13   LSEG1     EQU    XLSEG1/5   END OF SEGMENT 1                            FEAT75A   193
                         511   ESEG1     EQU    LSEG1*5+BASE.1                                         FEAT75A   194
                                         IFGT   ESEG1,R.READP,1                                        FEAT75A   195
                                         ERR    SEG-1 TOO LARGE                                        FEAT75A   196
                               .ECS      ELSE                                                          FEAT75A   197
                               LSEG1     EQU    0                                                      FEAT75A   198
                               .ECS      ENDIF                                                         FEAT75A   199
                                                                                                       FEAT75A   200
                               .DDP      IFNE   DDPLIB,0                                               FEAT75A   201
                               S.SEG2    EQU    *0                                                     FEAT75A   202
                                         LOC    BASE.1                                                 FEAT75A   203
                               ECOVL     MJN    ECOVLA                                                 FEAT75A   204
                                         LDN    LSEG1                                                  FEAT75A   205
                                         STD    D.T0                                                   FEAT75A   206
                                         LDC    **                                                     FEAT75A   207
                               CMS2      EQU    *-1+S.SEG2-BASE.1  ADDRESS OF SEG-1 (SDB OVERLAY)      FEAT75A   208
                                         CRM    ECOVL,D.T0                                             FEAT75A   209
                               ECOVLA    LDD    D.Z7                                                   FEAT75A   210
                                         STM    DDPLOD                                                 FEAT75A   211
                                         LDC    DDPSTBL    SET PP ADDRESS OF START OF LOADING          FEAT75A   212
                                         RJM    R.STB                                                  FEAT75A   213
                                         LDD    D.Z2                                                   FEAT75A   214
                                         STM    DDPLOOP    SET PRU DESCRIPTOR FWA(UPPER 6 BITS)        FEAT75A   215
                                         LDD    D.Z3       WITH LDC CODE                               FEAT75A   216
                                         STM    DDPLOOP+1                                              FEAT75A   217
                               DDPLOOP   LDC    **         SET PRU DESCRIPTOR FWA(LOWER 12 BITS)       FEAT75A   218
                                         CRD    D.Z1                                                   FEAT75A   219
                                         AOM    DDPLOOP+1  READ PRU DESCRIPTOR                         FEAT75A   220
                                         LDC    **         BUMP PRU DESCRIPTOR ADDRESS                 FEAT75A   221
                               READ3     EQU    *-1+S.SEG2-BASE.1  ADD LOWER HALF OF PARTITION RE      FEAT75A   222
                                         RAD    D.Z5                                                   FEAT75A   223
                                         SHN    -12                                                    FEAT75A   224
                                         ADC    **                                                     FEAT75A   225
                               READ4     EQU    *-1+S.SEG2-BASE.1  ADD UPPER HALF OF PARTITION RE      FEAT75A   226
                                         RAD    D.Z4                                                   FEAT75A   227
                               DDPCHA    FNC    5001B,**                                               FEAT75A   228
                               DDPCHB    ACN    **                                                     FEAT75A   229
                                         LDN    2                                                      FEAT75A   230
                               DDPCHC    OAM    D.Z4,**                                                FEAT75A   231
                                         LDD    D.Z3                                                   FEAT75A   232
                                         SHN    2                                                      FEAT75A   233
                                         ADD    D.Z3                                                   FEAT75A   234
                                         ZJN    DDPCHE                                                 FEAT75A   235
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                        DDPCHD    IAM    **,**                                FEAT75A   237
                        DDPLOD    EQU    *-1                                  FEAT75A   238
                        DDPCHE    AJM   DDPCHF,**                             FEAT75A   239
                                                                              FEAT75A   240
                                  LDN    ERRDDP        ERROR IN DDP ACTIVITY  FEAT75A   241
                                  UJN   DDPH                                  FEAT75A   242
                                                                              FEAT75A   243
                        DDPF      SOD    D.Z6          DECREMENT PRU COUNT    FEAT75A   244
                                  NJN   DDPLOOP                               FEAT75A   245
                                  LDN    1             REQUEST CONTINUE       FEAT75A   246
                                  UJN   DDPH                                  FEAT75A   247
                                                                              FEAT75A   248
                        DDPCHF    EJM   DDPCHE,**                             FEAT75A   249
                        DDPCHG    DCN    **                                   FEAT75A   250
                                  LDC    5000                                 FEAT75A   251
                                  RAM    DDPLOD                               FEAT75A   252
                                  STD    D.Z7          UPDATE LOAD ADDRESS    FEAT75A   253
                                  LDD    D.Z3                                 FEAT75A   254
                                  SHN    -6                                   FEAT75A   255
                                  NJN   DDPF           JUMP - FULL PRU        FEAT75A   256
                        DDPH      LJM   ISSUE                                 FEAT75A   257
                                                                              FEAT75A   258
                        DDPSTBL   VFD    12/D.Z5                              FEAT75A   259
                                  VFD    12/DDPCHA                            FEAT75A   260
                                  VFD    12/DDPCHB                            FEAT75A   261
                                  VFD    12/DDPCHC                            FEAT75A   262
                                  VFD    12/DDPCHD                            FEAT75A   263
                                  VFD    12/DDPCHE                            FEAT75A   264
                                  VFD    12/DDPCHF                            FEAT75A   265
                                  VFD    12/DDPCHG                            FEAT75A   266
                                  DATA   0                                    FEAT75A   267
                        XLSEG2    SET    *-BASE.1+4                           FEAT75A   268
                        LSEG2     EQU    XLSEG2/5                             FEAT75A   269
                        ESEG2     EQU    LSEG2*5+BASE.1                       FEAT75A   270
                                  IFGT   ESEG2,R.READP,1                      FEAT75A   271
                                  ERR    SEG-2 TOO LARGE                      FEAT75A   272
                        .DDP      ELSE                                        FEAT75A   273
                 0      LSEG2     EQU    0                                    FEAT75A   274
                        .DDP      ENDIF                                       FEAT75A   275
                                                                              FEAT75A   276
                                  IFNE   ECSLIB,0,1                           FEAT75A   277
                                  USE    *                                    FEAT75A   278

  440            102              BSSZ      R.READP-1-*                       STL      1049
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S T L --- PERIPHERAL PROCESSOR RESIDENT (MAIN) COMPASS 3.75077. 09/10/75 09.59.29. PAGE 16


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                                **
                                *      R.READP (R.WRITEP)        TRANSMIT DATA VIA CHANNEL FROM (TO)   STL       1051
                                *                                STACK PROCESSOR                       STL       1052
                                *      -----------------------------------------------------------     STL       1053
                                *                                                                      STL       1054
                                *      CALLING SEQUENCE                                                STL       1055
                                *                                                                      STL       1056
                                *      LOAD      L(REQUEST)                                            STL       1057
                                *      RJM       R.READP (R.WRITEP)                                    STL       1058
                                *                                                                      STL       1059
                                *      ACTIONS                                                         STL       1060
                                *                                                                      STL       1061
                                *      SAVE STACK REQUEST LOCATION IN D.T0.                            STL       1062
                                *      LOAD A-REGISTER WITH *IAM*/*OAM* FUNCTION.                      SC40125   1678
                                *      ENTER REQUEST IN STACK AND READ/WRITE DISK VIA R.RWP.           SC40125   1679
                                *      RELEASE STACK PROCESSOR ON COMPLETION OF DATA TRANSFER          SC40125   1680
                                *         BY SETTING BYTE C.RWPPCF=5 IN CONTROL WORD                   SC40125   1681
                                *         W.RWPPCW IN PP MESSAGE AREA.                                 SC40125   1682
                                *                                                                      SC40125   1683
                                *      RETURNS                                                         STL       1066
                                *                                                                      STL       1067
                                *      (D.T3+C.RWPPLW)=LWA+1 OF DATA TRANSMITTED                       STL       1068
                                *      (D.T3+C.RWPPST,D.T4+C.RWPPST)=TERMINAL STATUS OF FILE           STL       1069
                                *      (D.T3+C.RWPPWT)=NUMBER OF PP WORDS TRANSMITTED                  STL       1070
                                *                                                                      STL       1071
                                *      CALLS - R.RWP                                                   STL       1072
                                *                                                                      STL       1073
                                *      USES   D.T0    D.T3 - D.T7                                      SC40125   1684
                                                                                                       SC40125   1685
      542         0100 0000       R.READP   ENM      X                                                 STL       1074
      544         3410                      STD      D.T0              SAVE REQUEST LOCATION           STL       1075
      545         1471                      LDN      718               READ                            STL       1076
      546         0307                      UJN      RCOM                                              STL       1077
                                                                                                       STL       1078
      547         1012            RCOMA     SHN      10                                                STL       1079
      550         0671                      PJN      R.READPX          EXIT IF IAM                     SC40125   1686
                                                                                                       STL       1080
                                                                                                       STL       1081
      551         0100 0000       R.WRITEP  ENM
      553         3410                      STD      D.T0                                              STL       1083
      554         1473                      LDN      738               WRITE                           STL       1084
                                                                                                       STL       1085
      555         0200 0567       RCOM      RJM      R.RWP             HANDLES READ/WRITE LOGIC        SC40125   1687
      557         3613                      AOD      D.T3+C.RWPPCF        RELEASE 1SP                  STL       1086
      560         3075                      LDD      D.PPMES1                                          STL       1087
      561         1602                      ADN      W.RWPPCW                                          STL       1088
      562         6213                      CWD      D.T3                                              STL       1089
      563         5000 0637                 LDM      RWPIOT            IAM OR OAM                      STL       1090
      565         0361                      UJN      RCOMA                                             STL       1091
                                                                                                       STL       1092
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                                    **                                                                    STL      1094
                                    *          R.RWP              HANDLES DISK READ/WRITE LOGIC          STL      1095
                                    *          -----------------------------------------------           STL      1096
                                    *                                                                     STL      1097
                                    *          CALLING SEQUENCE                                           STL      1098
                                    *                                                                     STL      1099
                                    *          LOAD    IAM/OAM FUNCTION                                   STL      1100
                                    *                   71B = IAM                                         STL      1101
                                    *                   73B = OAM                                         STL      1102
                                    *          RJM     R.RWP                                              STL      1103
                                    *                                                                     STL      1104
                                    *          ACTIONS                                                    STL      1105
                                    *                                                                     STL      1106
                                    *          SET FUNCTION FOR IAM OR OAM                                STL      1107
                                    *          SET FWA FOR TRANSMISSION                                   STL      1108
                                    *          STORE PP MESSAGE AREA ADDRESS IN STACK REQUEST             STL      1109
                                    *          ISSUE READP/WRITEP STACK REQUEST VIA R.RWP                 SC40125  1689
                                    *          PAUSE FOR STORAGE RELOCATION IF FIELD ACCESS FLAG WAS SET  STL      1111
                                    *          PERFORM DISK INPUT/OUTPUT                                  STL      1112
                                    *             (TRANSMISSION IS GOVERNED BY BYTE C.RWPPCF              SC40125  1690
                                    *             OF CONTROL WORD W.RWPPCW IN PP MESSAGE AREA)            SC40125  1691
                                    *                   0 = REQUEST IS IN STACK                           STL      1115
                                    *                   1 = SENSE WAITING FOR CHANNEL                     STL      1116
                                    *                        (PP RESIDENT CHANNEL INPUT/OUTPUT INSTRUCTIONS  SC40125  1692
                                    *                         MUST BE PLUGGED VIA R.STB ONCE STACK PROCESSOR SC40125  1693
                                    *                         HAS SIGNALLED THE CHANNEL TO BE USED FOR    SC40125  1694
                                    *                         THIS DATA TRANSFER OPERATION)               SC40125  1695
                                    *                   2 = SENSE WAITING FOR TRANSMISSION                STL      1117
                                    *                   3 = SENSE TRANSMISSION READY                      STL      1118
                                    *                   4 = SENSE END OF TRANSMISSION                     STL      1119
                                    *                                                                     STL      1120
                                    *          CALLS - R.EREQS                                            STL      1121
                                    *                  R.PAUSE                                            STL      1122
                                    *                  R.STB                                              STL      1123
                                                                                                          SC40125  1696
                                                                                                          SC40125  1697
   566       0100 0000          R.RWP     ENM       X                                                     STL      1125
   570       1006                         SHN       6                  POSITION IAM/OAM FUNCTION          STL      1126
   571       5400 0637                    STM       RWPIOT             SET IAM OR OAM                     STL      1127
   573       5010 0007                    LDM       5*W.STPFW+C.STPFW,D.T0                                STL      1128
   575       5400 0640                    STM       RWPIOA             SET FWA FOR TRANSMISSION           STL      1129
   577       3075                         LDD       D.PPMES1                                              STL      1130
   600       5410 0006                    STM       5*W.STPMS+C.STPMS,D.T0        ADD MESSAGE AREA ADDRES STL      1131
   602       0200 0656                    RJM       R.EREQS            ENTER REQUEST IN STACK             STL      1132
                        603     R.RWPP    EQU       *-1                CHANGED BY LDR                     STL      1133
                                                                                                          STL      1134
   604       5000 0100          RWPP      LDM       R.FAF              IF FIELD ACCESS FLAG IS SET        STL      1135
   606       0403                         ZJN       RWPD                                                  STL      1136
   607       0200 0140                    RJM       R.PAUSE            PAUSE FOR STORAGE RELOCATION       STL      1137
   611       1462               RWPD      LDN       RWDELAY/2          DELAY RWDELAY MICROSECONDS         STL      1138
   612       1701                         SBN       1                                                     STL      1139
   613       0576                         NJN       *-1                                                   STL      1140
                                                                                                          SC40125  1698
   614       3075               RWPL      LDD       D.PPMES1                                              STL      1141
   615       1602                         ADN       W.RWPPCW                                              STL      1142
   616       6013                         CRD       D.T3               READ CONTROL WORD                  STL      1143
   617       3013                         LDD       D.T3+C.RWPPCF                                         STL      1144
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 620      1703
 621      0413                         SBN      3
 622      0643                         ZJN      RWPIO               SENSE TRANSMISSION READY              STL    1145
 623      1602                         PJN      R.RWPX              SENSE END OF TRANSMISSION             STL    1146
 624      0757                         ADN      2                                                         STL    1147
 625      0566                         MJN      RWPP                SENSE STILL WAITING FOR CHANNEL       STL    1148
 626      2000 0651                    NJN      RWPL                SENSE WAITING FOR TRANSMISSION        STL    1149
 630      0200 0355                    LDC      RWPSTBL                                                   STL    1150
 632      3613                         RJM      R.STB               STORE CHANNEL NUMBER                  STL    1151
 633      0312                         AOD      D.T3+C.RWPPCF       RESET CONTROL FLAG = 2                STL    1152
                                       UJN      RWPWF                                                     STL    1153
 634      3017                                                                                            STL    1154
 635      6500 0635          RWPIO     LDD      D.T3+C.RWPPWC                                             STL    1155
 637      2400               RWPIOW    IJM      *,**                WAIT FOR CHANNEL ACTIVE               STL    1156
 640      2400               RWPIOT    PSN                          TRANSMIT                              STL    1157
 641      3017               RWPIOA    PSN                          STARTING AT THIS ADDRESS              STL    1158
 642      5500 0640                    LDD      D.T3+C.RWPPWC                                             STL    1159
 644      3713                         RAM      RWPIOA              BUMP TRANSFER ADDRESS                 STL    1160
 645      3075                         SOD      D.T3+C.RWPPCF       RESET CONTROL FLAG = 2                STL    1161
 646      1602               RWPWF     LDD      D.PPMES1                                                  STL    1162
 647      6213                         ADN      W.RWPPCW                                                  STL    1163
 650      0343                         CWD      D.T3                RESTORE CONTROL WORD                  STL    1164
                                       UJN      RWPL                                                      STL    1165
                                                                                                          STL    1166

                             ****
                             *         TABLE OF INSTRUCTIONS FOR CHANNEL INSERTION FOR 1SP COMMUN.        STL    1168
                             *                                                                            STL    1169
 651      0016               RWPSTBL   VFD      12/D.T3+C.RWPPCC                                          STL    1170
 652      0635                         VFD      12/RWPIOW                                                 STL    1171
 653      0637                         VFD      12/RWPIOT                                                 STL    1172
 654      0000                         DATA     0                                                         STL    1173
                             ****                                                                         STL    1174
                                                                                                          STL    1175
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                                **                                                                     STL       1177
                                *          R.EREQS   ENTER REQUEST STACK                               STL       1178
                                *          -----------------------------                               STL       1179
                                *                                                                      STL       1180
                                *          CALLING SEQUENCE                                            STL       1181
                                *                                                                      STL       1182
                                *          STORE     L(REQUEST) IN D.T0                                STL       1183
                                *          RJM       R.EREQS                                           STL       1184
                                *                                                                      STL       1185
                                *          ACTIONS                                                     STL       1186
                                *                                                                      STL       1187
                                *          INSERT ADDRESS OF FORMATTED REQUEST IN *CWM* INSTRUCTION.   SC40125   1701
                                *          ADD CONTROL POINT NUMBER TO REQUEST                         STL       1188
                                *          PLACE REQUEST IN MESSAGE AREA                               STL       1189
                                *          INITIALIZE (ZERO) CONTROL/COMMUNICATIONS WORD W.RWPPCW.     SC40125   1702
                                *          REQUEST STACK PROCESSOR CENTRAL EXECUTIVE SPM               SC40125   1703
                                *             VIA M.ICE/EX.SPM.                                        SC40125   1704
                                *                                                                      STL       1191
                                *          CALLS - R.MTR                                               STL       1192
                                *                                                                      SC40125   1705
                                *          USES    D.T0 - D.T5                                         SC40125   1706
                                                                                                       STL       1193
                                                                                                       STL       1194
   655        0100 0000         R.EREQS    ENM       X                                                 STL       1195
   657        3010                         LDD       D.T0                                              STL       1196
   660        5400 0674                    STM       ENTRSTKW+1     SAVE LOCATION OF REQUEST           STL       1197
   662        3076                         LDD       D.CPAD                                            STL       1198
   663        1001                         SHN       1                                                 STL       1199
   664        5410 0004                    STM       5*W.STCPU+C.STCPU,D.T0                            STL       1200
   666        1402                         LDN       2                                                 STL       1201
   667        3410                         STD       D.T0                                              STL       1202
   670        1400                         LDN       P.ZERO                                            STL       1203
   671        6011                         CRD       D.T1                                              STL       1204
   672        3075                         LDD       D.PPMES1                                          STL       1205
   673        6310 0000         ENTRSTKW   CWM       **,D.T0        PLACE REQUEST IN MESSAGE AREA      STL       1206
                                           TESTZ     ADN,(W.RWPPCW-2)  POINT TO COMMUNICATIONS WORD    STL       1207
   675        6211                         CWD       D.T1           CLEAR IT (FOR READP/WRITEP)        STL       1208
                                                                                                       STL       1209
   676        1403                         LDN       EX.SPM         SPM EXECUTIVE CODE                 SC40090      1
   677        3414                         STD       D.T4           STORE CENTRAL EXECUTIVE CODE       STL       1211
   700        1406                         LDN       M.ICE                                             STL       1212
   701        0200 0220                    RJM       R.MTR          ISSUE STACK REQUEST                STL       1213
   703        0351                         UJK       R.EREQSX       EXIT                               STL       1214
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                          **                                                                  STL      1216
                          *         R.DFM     TRANSMIT DAYFILE MESSAGE                        STL      1217
                          *         --------------------------------                          STL      1218
                          *                                                                   STL      1219
                          *         CALLING SEQUENCE                                          STL      1220
                          *                                                                   STL      1221
                          *         LOAD      (FLAG)LOCATION OF MESSAGE                       STL      1222
                          *         RJM       R.DFM                                           STL      1223
                          *                                                                   STL      1224
                          *         ACTIONS                                                   STL      1225
                          *                                                                   STL      1226
                          *         TRANSMIT MESSAGE TO PP MESSAGE AREA                       STL      1227
                          *         CALL MONITOR FUNCTION M.DFM,(FLAG)                        STL      1228
                          *                                                                   STL      1229
                          *         THE DAYFILE FLAG BITS (UPPER 6 BITS OF THE A-REGISTER)    STL      1230
                          *         DETERMINE (WHEN SET) THE FOLLOWING MESSAGE HANDLING -     STL      1231
                          *            BIT 0 - DO NOT SEND TO B DISPLAY                       STL      1232
                          *            BIT 1 - DO NOT SEND TO CONTROL POINT DAYFILE           STL      1233
                          *            BIT 2 - DO NOT SEND TO SYSTEM DAYFILE (NO A DISPLAY)   STL      1234
                          *            BIT 3 - FLAG AS AN ACCOUNTING MESSAGE (A $ WILL BE     STL      1235
                          *                    PLACED IN THE 20TH CHARACTER OF MESSAGES THAT  STL      1236
                          *                    ARE SENT TO THE SYSTEM DAYFILE)                STL      1237
                          *            BIT 4 - SEND TO HARDWARE ERROR FILE                    STL      1238
                          *            BIT 5 - DO NOT INSERT JOB NAME IN SYSTEM DAYFILE       STL      1239
                          *                                                                   STL      1240
                          *         CALLS - R.MTR                                             STL      1241
                          *                                                                   SC40125  1708
                          *         USES   D.Z0    D.T0 - D.T7                                SC40125  1709
                                                                                              STL      1242
                                                                                              STL      1243
  704      0100 0000      R.DFM     ENM       X                                               STL      1244
  706      3410                     STD       D.T0          LOCATION OF MESSAGE               STL      1245
  707      1063                     SHN       -12                                             STL      1246
  710      3411                     STD       D.T1          STORE FLAG                        STL      1247
  711      3075                     LDD       D.PPMES1                                        STL      1248
  712      3412                     STD       D.T2          SET STORAGE (-1) ADDRESS          STL      1249
  713      1413           DFM2      LDN       D.T3                                            STL      1250
  714      3400                     STD       0             SET ASSEMBLY ADDRESS              STL      1251
  715      4010           DFM1      LDI       D.T0          MOVE BYTE                         STL      1252
  716      4400                     STI       0             TO ASSEMBLY AREA                  STL      1253
  717      0402                     ZJN       *+2           SENSE END OF MESSAGE              STL      1254
  720      3610                     AOD       D.T0          ADVANCE IN MESSAGE                STL      1255
  721      3600                     AOD       0             AND ASSEMBLY AREA                 STL      1256
  722      1120                     LMN       D.T3+5                                          STL      1257
  723      0571                     NJN       DFM1          SENSE ASSEMBLY NOT FULL           STL      1258
  724      3012                     LDD       D.T2                                            STL      1259
  725      6213                     CWD       D.T3          WRITE ASSEMBLY TO MESSAGE AREA    STL      1260
  726      3612                     AOD       D.T2          ADVANCE STORAGE ADDRESS           STL      1261
  727      1207                     LPN       7                                               STL      1262
  730      0403                     ZJN       DFM3          JUMP IF END OF MESSAGE AREA       STL      1263
  731      3017                     LDD       D.T3+4                                          STL      1264
  732      0560                     NJN       DFM2          LOOP IF NOT END OF MESSAGE AREA.  STL      1265
                                                                                              STL      1266
  733      1413           DFM3      LDN       M.DFM                                           STL      1267
  734      0200 0220                RJM       R.MTR         SEND DAYFILE MESSAGE              STL      1268
  736      0345                     UJN       R.DFMX                                          STL      1269
                          *                                                                   STL      1270
```

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VALS-53-9-60

```
 737        3407            OVLA      STD   D.Z7           PLACE LOAD ADDRESS                  FEAT75A   280
 740        3413                      STD   D.T3                                               FEAT75A   281
 741        5400 0640                 STM   RWPIOA         SAVE FOR DISK READ                  FEAT75A   282
 743        5400 0411                 STM   OVLD           SAVE FOR CM READ                    FEAT75A   283
 745        3017                      LDD   D.T7           PLACE PROGRAM NAME                  FEAT75A   284
 746        3412                      STD   D.T2                                               FEAT75A   285
 747        3016                      LDD   D.T6                                               FEAT75A   286
 750        3411            ISSUE     STD   D.T1                                               FEAT75A   287
 751        1402                      LDN   EX.PLIB        REQUEST PP LIBRARY ACCESS           FEAT75A   288
 752        3414                      STD   D.T4                                               FEAT75A   289
 753        1406                      LDN   M.ICE          ISSUE M.ICE REQUEST                 FEAT75A   290
 754        0200 0220                 RJM   R.MTR                                              FEAT75A   291
 756        3011                      LDD   D.T1                                               FEAT75A   292
 757        3406                      STD   D.Z6           SAVE PPOR BYTE 1                    FEAT75A   293
 760        2000 7100                 LDC   7100B          PREPARE FOR DISK READ               FEAT75A   294
 762        5400 0637                 STM   RWPIOT                                             FEAT75A   295
 764        2000 0366                 LDC   OVLB           SET EXIT ADDRESS FROM R.RWP         FEAT75A   296
 766        5400 0567                 STM   R.RWP                                              FEAT75A   297
 770        0100 0614                 LJM   RWPL           JUMP INTO R.RWP ROUTINE             FEAT75A   298
                            *                                                                  FEAT75A   299
                            *         EXIT TO OVLB                                             FEAT75A   300
                            *                                                                  FEAT75A   301


                            **                                                                 STL      1639
                            *         * * * * * * * * * * * * * * * * * * * *                  STL      1640
                            *                                                                  STL      1641
                            *         E N D   * P P   R E S I D E N T *                        STL      1642
                            *                                                                  STL      1643
                            *         * * * * * * * * * * * * * * * * * * * *                  STL      1644


                            ****                                                               STL      1646
                                      IFGT      *,C.PPFWA-L.PPHDR,1                            STL      1647
                                      ERR       PP RESIDENT IS TOO LARGE                       STL      1648
                            ****                                                               STL      1652


                       13      L=PPOVL  EQU     LSEG1+LSEG2    L.PPOVL .GE. L=PPOVL            STL      1654


 772                    6             BSSZ  C.PPFWA-*                                          STL      1656
```

```
                   **         *CALL   DSLCOM  --  DEADSTART PARAMETERS COMMON DECK     SC40125  1818
                                                                                       SC40125  1819
                   **DOCK     LIST    OFF                                              SC40125  1820
                              LIST    -L                                               STL      1663
                              LIST    *                                                STL      1665
                   **DOCK     LIST    ON                                               STL      1666
```

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                                                                              STL      1668
                                **                                            STL      1669
                                *          STL                                STL      1670
                                *          ---                                STL      1671
                                *                                             STL      1672
                                *          MAIN ROUTINE                       STL      1673
                                *                                             STL      1674
                                *          STORE POINTERS TO W.PPIR, W.PPMES1, AND T.PPS1      STL      1675
                                *          INTO PP RESIDENT.  MODIFY *R.WAIT* IF -EXN- MODE AND NOT   STL      1676
                                *          -MXN- MODE.  STORE FWA+1 OF T.ECLBUF IN *READECS* IF ECS  STL      1677
                                *          CODE IS ASSEMBLED.  CLEAN UP CMR.  SEND PP RESIDENT       STL      1678
                                *          TO THE POOL PPU-S IN THE FOLLOWING MANNER -               STL      1679
                                *             1) THE CORRECT ADDRESSES OF THE PP-S INPUT REGISTER,   STL      1680
                                *                MESSAGE BUFFER, AND STATUS WORD ARE STORED IN DIRECT STL      1681
                                *                CELLS D.PPIR, D.PPMES1, AND D.PPSTAT, RESPECTIVELY   STL      1682
                                *             2) THE PP NUMBER IS STORED IN CM LOCATION ZERO         STL      1683
                                *             3) STL WAITS UNTIL THE PP ACKNOWLEDGES THE SIGNAL BY   STL      1684
                                *                RESETTING CM LOCATION ZERO TO ZERO                  STL      1685
                                *             4) STL OUTPUTS ONE BYTE EQUAL TO R.IDLE-1 OVER CHANNEL STL      1686
                                *                ZERO.  SINCE THE PP WILL READ THIS INTO ITS LOCATION STL     1687
                                *                ZERO, THIS WILL CAUSE THE PP TO BEGIN EXECUTION AT THE STL   1688
                                *                LOCATION OF R.IDLE WHEN CHANNEL ZERO IS DISCONNECTED. STL    1689
                                *             5) STL OUTPUTS 777B BYTES STARTING FROM LOCATION ONE.  STL      1690
                                *                THIS INCLUDES DIRECT CELLS 1-77B AND ALL OF PP RESIDENT STL  1691
                                *                WHICH RESIDES AT 100B THRU 777B.  THE RECEIVING PP WILL STL  1692
                                *                READ THIS INTO THE SAME LOCATIONS IN ITS MEMORY     STL      1693
                                *             6) STL DISCONNECTS CHANNEL ZERO, CAUSING THE RECEIVING STL      1694
                                *                PP TO BEGIN EXECUTION                               STL      1695
                                *          SEND A SMALL PROGRAM TO PP0 TO CAUSE IT TO READ MTR FROM  STL      1696
                                *          THE CM BUFFER (MTRBUF).  MOVE THE SMALL PROGRAM TO LOW PP1 STL     1697
                                *          MEMORY AND EXECUTE IT TO READ DSD INTO PP1 FROM THE CM    STL      1698
                                *          BUFFER (DSDBUF).                                          STL      1699
                                *          ALL PPU-S ARE NOW COMPLETELY SET UP AND SCOPE IS FREE TO  STL      1700
                                *          CARRY ON.                                                 SC40125  1821
                                *                                                                    SC40125  1822
                                *          CALLS  PPOVL                                              SC40125  1823
                                *                 SEG                                                SC40125  1824
                                *                 CLEANUP                                            SC40125  1825
                                *                 DESEL                                              STL      1701
                                                                                                     STL      1702
                                                                                                     STL      1703
      1000          1403          STL    LDN    P.NPP           FETCH NUMBER OF PP-S                 STL      1704
      1001          6001                 CRD    D.Z1            FROM CMR                             STL      1705
      1002          3004                 LDD    C.NPP+D.Z1                                           STL      1706
      1003          2100 1700            ADC    1700B           -SBN Z-                              STL      1707
      1005          5400 1134            STM    STL3            MODIFY INSTRUCTION                   STL      1708
      1007          1405                 LDN    P.PCOM                                               STL      1709
      1010          6010                 CRD    D.T0                                                 STL      1710
      1011          3014                 LDD    D.T0+C.PCOM     ADDRESS OF PP1 COMM. AREA            STL      1711
      1012          1610                 ADN    W.PPIR+10B      PP2 INPUT REGISTER ADDRESS           STL      1712
      1013          3474                 STD    D.PPIR                                               STL      1713
      1014          1602                 ADN    W.PPMES1-W.PPIR                                      STL      1714
      1015          3475                 STD    D.PPMES1                                             STL      1715
      1016          2000 0155            LDK    T.PPS1+1                                             STL      1716
      1020          3477                 STD    D.PPSTAT        STORE POINTERS IN PP RESIDENT        STL      1717
      1021          1405                 LDN    P.CST                                                STL      1718
      1022          6010                 CRD    D.T0                                                 STL      1719
                                         LDD    D.T0+C.CST
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--- PERIPHERAL PROCESSOR RESIDENT (MAIN) COMPASS 3.75077. 09/10/75 09.59.29. PAGE 16


```
 1024      5400 0330            STM    DCH1
 1026      0200 1223            RJM    PPOVL                                       STL      1720
 1030      0200 1226            RJM    SEG             DDP,ILR INITIALIZATION      STL      1722
                                                                                   STL      1723
                         *                             GO COPY PPRES SEGMENTS TO CM BUFFER  STL  1724
                         *                                                         STL      1726
 1032      1446                        TEST IF EXN OR MXN MODE,  MODIFY IF EXN     STL      1727
 1033      6013                 LDK    T.MXNCTL                                    STL      1728
 1034      5000 0245            CRD    D.T3                                        STL      1729
 1036      3413                 LDM    WAIT4                                       STL      1730
 1037      5000 0246            STD    D.T3                                        STL      1731
 1041      3414                 LDM    WAIT4+1                                     STL      1732
 1042      3017                 STD    D.T4                                        STL      1733
 1043      0425                 LDD    D.T7                                        STL      1734
                                ZJN    NOMXN           NO MXN                      STL      1735
 1044      1445                                                                    STL      1736
 1045      6006                 LDN    T.CPSTB                                     FEAT65A    12
 1046      3011                 CRD    D.Z6                                        FEAT65A    13
 1047      1066                 LDD    D.Z6+3                                      FEAT65A    14
 1050      0407                 SHN    -9                                          FEAT65A    15
                                ZJN    STL002          CPU-B IS OFF                FEAT65A    16
 1051      1444                                                                    FEAT65A    17
 1052      6006                 LDN    T.CPSTA                                     FEAT65A    18
 1053      3011                 CRD    D.Z6                                        FEAT65A    19
 1054      1066                 LDD    D.Z6+3                                      FEAT65A    20
 1055      0510                 SHN    -9                                          FEAT65A    21
                                NJN    STL004          BOTH CPUS ARE ON            FEAT65A    22
 1056      3617                                                                    FEAT65A    23
                                AOD    D.T7            CPU-A IS OFF, USE CPU-B     FEAT65A    24
 1057      3017                                                                    FEAT65A    25
 1060      1220          STL002 LDD    D.T7                                        FEAT65A    26
 1061      0404                 LPN    20B                                         FEAT65A    27
                                ZJN    STL004          NOT MAN                     FEAT65A    28
                         *                                                         FEAT65A    29
                         *      IT IS AN MAN SYSTEM RUNNING ON JUST ONE CPU.       FEAT65A    30
 1062      2000                 MODIFY THE CRM AT WAIT4.  IT IS NOT NEEDED.        FEAT65A    31
 1063      0304                 CON    .LOC.                                       FEAT65A    32
 1064      3413                 UJN    WAIT5A-WAIT4                                FEAT65A    33
                                STD    D.T3                                        FEAT65A    34
                    1065 STL004 EQU    *                                           FEAT65A    35
 1065      1446                 LDK    T.MXNCTL        MODIFY T.MXNCTL             FEAT65A    36
 1066      6213                 CWD    D.T3                                        FEAT65A    37
 1067      0304                 UJN    STL00                                       STL      1737
                                                                                   STL      1738
                    1070 NOMXN  EQU    *                                           STL      1739
 1070      1400                 LDN    0                                           STL      1740
 1071      5400 0233            STM    WAIT2                                       STL      1741
                    1073 STL00  EQU    *                                           STL      1742
                         *                                                         STL      1743
 1073      0200 1261            RJM    CLEANUP         CLEANUP CMR                 STL      1744
 1075      1400                 LDN    0                                           STL      1745
 1076      3410                 STD    D.T0                                        STL      1746
 1077      3411                 STD    D.T1                                        STL      1755
 1100      3412                 STD    D.T2                                        STL      1756
 1101      3413                 STD    D.T3                                        STL      1757
 1102      1402                                                                    FEAT75A
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1103    3414                 STD  D.T4                                     STL
1104    1400                 LDN  0                                        STL
1105    6210                 CWD  D.T0         STORE FLAG                  STL
1106    1400         STL2    LDN  0                                        STL
1107    6010                 CRD  D.T0                                     STL
1110    3014                 LDD  D.T4                                     STL
1111    0574                 NJN  STL2         LOOP UNTIL PP IS READY TO INPUT  STL
1112    6500 1112            IJM  *,0                                      STL
1114    2000 0102            LDC  R.IDLE-1       OUTPUT STARTING ADDRESS - 1  STL
1116    7200                 OAN  0                                        STL
1117    2000 0777            LDC  777B         OUTPUT REST OF PP-RESIDENT  STL
1121    7300 0001            OAM  1,0                                      STL
1123    7500                 DCN  0                                        STL
1124    1410                 LDN  10B                                      STL
1125    3574                 RAD  D.PPIR                                   STL
1126    1410                 LDN  10B                                      STL
1127    3575                 RAD  D.PPMES1                                 STL
1130    3677                 AOD  D.PPSTAT                                 STL
1131    5601 1102            AOM  STL1         BUMP PP NUMBER              STL
1133    1277                 LPN  77B                                      STL
1134    1700         STL3    SBN  **             IS IT LAST PP             STL
1135    0544                 NJN  STL1         NO, LOOP                    STL
                     *                                                     STL
1136    0200 1717            RJM  DESEL          DESELCT 6681 AND DISCONNECT CHANNELS  STL
                                                                           STL
                                                                           STL
1140    1400                 LDN  0                                        STL
1141    6010                 CRD  D.T0           SEND A SMALL PROGRAM TO PP0 THAT  STL
1142    1477         STL4    LDN  77B            WILL CAUSE IT TO READ MTR FROM CM  STL
1143    3414                 STD  D.T4                                     STL
1144    1400                 LDN  0                                        STL
1145    6210                 CWD  D.T0                                     STL
                                                                           STL
                     *       STORE ADDRESS OF MTR SAVE BUFFER INTO MTR CODE SO THAT  STL
                     *       MTR CAN FIND THE REMAINDER OF HIS INITIALIZATION CODE.  STL
                                                                           STL
1146    2012 1201            LDC  MTRBUF+L.PPHDR/5  FIRST EXECUTABLE WORD  STL
1150    6010                 CRD  D.T0                                     STL
1151    1701                 SBN  L.PPHDR/5      BIAS BACK TO START OF BUFFER  STL
1152    3414                 STD  D.T4                                     STL
1153    1063                 SHN  -12                                      STL
1154    3413                 STD  D.T3                                     STL
1155    2012 1201            LDC  MTRBUF+L.PPHDR/5                         STL
1157    6210                 CWD  D.T0                                     STL
1160    1400         STL5    LDN  0                                        STL
1161    6010                 CRD  D.T0                                     STL
1162    3014                 LDD  D.T4                                     STL
1163    0574                 NJN  STL5         LOOP UNTIL PP IS READY TO INPUT  STL
1164    1407                 LDN  7                                        STL
1165    7300 1213            OAM  MTRDSDL,0    OUTPUT PROGRAM              STL
1167    7500                 DCN  0                                        STL
1170    2012 3200            LDC  DSDBUF                                   STL
1172    5400 1216            STM  MTRDSDL1+1                               STL
1174    1063                 SHN  -12                                      STL
1175    2100 2000            ADC  20000                                    STL
1177    5400 1215            STM  MTRDSDL1                                 STL
1201    1407                 LDN  MTRDSDL2-MTRDSDL                         STL
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 1202      3410
 1203      3710              STL6     STD    D.T0                                        STL
 1204      5010 1213                  SOD    D.T0                                        STL
 1206      4410                       LDM    MTRDSDL,D.T0                                STL
 1207      3010                       STI    D.T0                                        STL
 1210      0572                       LDD    D.T0                                        STL
 1211      0100 0002                  NJN    STL6                                        STL
                                      LJM    MTRDSDL1-MTRDSDL                            STL
                                                                                         STL

                             ****
                             *        THE FOLLOWING IS THE SMALL PROGRAM WHICH IS SENT TO PP0    STL
                             *        TO READ MTR FROM CM, AND WHICH IS USED HERE IN PP1         STL
                             *        TO READ DSO FROM CM.                                       STL
 1213      0000                                                                          STL
 1214      0000              MTRDSDL  VFD    24/0                                        STL
 1215      2012 1200                                                                     STL
 1217      6106 0001         MTRDSDL1 LDC    MTRBUF
 1221      1462                       CRM    1,D.Z6                                      STL
                                      VFD    12/4095/5-1                                 STL
                    1222     MTRDSDL2 EQU    *                                           STL
                             ****                                                        STL
                                                                                         STL
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                          **      PPOVL                                    SC40125  1828
                          *       -----                                    SC40125  1829
                          *                                                SC40125  1830
                          *       DDP 7 ILR  INITIALIZATION.               SC40125  1831
                                                                           SC40125  1832
                                                                           SC40125  1833
                    100   .LJM.   EQU     0100B                            STL      1841
                   2000   .LDC.   EQU     2000B                            STL      1842
                          *                                                STL      1843
 1222      0100 0000      PPOVL   ENM     X                                STL      1844

                          .DDP    IFNE    DDPLIB,0                         STL      1845
                                                                           FEAT01     49
                          **      STORE PARTITION RE INTO *ECOVL*          FEAT01     50
                                                                           FEAT01     51
                                  LDK     T.CPSTA                          FEAT01     52
                                  CRD     D.Z1          READ CPU A STATUS  FEAT01     53
                                  LDD     D.Z2                             FEAT01     54
                                  SCN     77B                              FEAT01     55
                                  SHN     6                                FEAT01     56
                                  ADD     D.Z1                             FEAT01     57
                                  SHN     6                                FEAT01     58
                                  ADN     4                                FEAT01     59
                                  CRD     D.Z1          READ RE WORD FROM EXCHANGE PKG.  FEAT01  60
                                  LDD     D.Z2                             FEAT01     61
                                  STM     READ3         STORE LOWER HALF OF RE   FEAT01  62
                                  LDD     D.Z1                             FEAT01     63
                                  STM     READ4         STORE UPPER HALF OF RE   FEAT01  64
                          PPOVL3  EQU     *                                STL      1880
                          .DDP    ENDIF                                    STL      1881

 1224      0375                   UJK     PPOVLX                           FEAT75A   304
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                              **        SEG                                                      SC40125   1870
                              *         ---                                                      SC40125   1871
                              *                                                                  SC40125   1872
                              *         WRITE PPRES SEGMENTS TO T.PPOVL                          STL       1937
                              *                                                                  STL       1938
                                                                                                 STL       1939
   1225        0100 0000                                                                         
   1227        1477           SEG       ENM       X                                              SC40125   1873
   1230        6001                     LDN       P.PPOVL          BUFFER POINTER POINTER        SC40125   1874
   1231        3004                     CRD       D.Z1                                           STL       1942
   1232        1003                     LDD       D.Z1+C.PPOVL                                   STL       1943
   1233        0471                     SHN       3                                              STL       1944
                                        ZJN  SEGX              ECS OVERLAYS SAVE AREA NOT PROVIDED   FEAT75A    305
   1234        1603                                                                              FEAT75A    306
                                        ADN    LSEG0                                             FEAT75A    307
                                        IFNE   DDPLIB,0,1                                        FEAT75A    308
                                        STM      CMS2                                            FEAT75A    309
   1235        5400 0426                IFNE   ECSLIB,0,1      PLACE STARTING ADDRESS OF SAVED SEG-1 FEAT75A    310
   1237        1063                     STM    CMS01                                             FEAT75A    311
   1240        2100 2000                SHN      -12           IN SEG-2 CODE AND SEG-0 CODE      FEAT75A    312
                                        ADC      .LOC.                                           FEAT75A    313
                                        IFNE   DDPLIB,0,1                                        FEAT75A    314
                                        STM      CMS2-1                                          FEAT75A    315
   1242        5400 0425                IFNE   ECSLIB,0,1                                        FEAT75A    316
                                        STM    CMS01-1                                           FEAT75A    317
   1244        1403                                                                              FEAT75A    318
   1245        3411                     LDN    LSEG0                                             FEAT75A    319
                                        STD      D.T1          SAVE LENGTH IN CM WORDS OF SEG-0  FEAT75A    320
   1246        1413           .ECS      IFNE   ECSLIB,0                                          FEAT75A    321
   1247        3412                     LDN    LSEG1+LSEG2                                       FEAT75A    322
                                        STD      D.T2          SAVE LENGTH OF SEG-1 AND SEG-2    FEAT75A    323
                                                                                                 FEAT75A    324
                              .DDP      IFNE   DDPLIB,0                                          FEAT75A    325
                                        LDD      D.Z1+C.PPOVL                                    FEAT75A    326
                                        SHN      3                                               FEAT75A    327
                                        ADN    LSEG0+LSEG1                                       FEAT75A    328
                                        STM    CMS1            PLACE STARTING ADDRESS OF SAVED SEG-2 FEAT75A    329
                                        STM    CMS02           IN SEG-1 CODE AND SEG-0 CODE      FEAT75A    330
                                        SHN      -12                                             FEAT75A    331
                                        ADC      .LOC.                                           FEAT75A    332
                                        STM      CMS1-1                                          FEAT75A    333
                                        STM    CMS02-1                                           FEAT75A    334
                              .DDP      ENDIF                                                    FEAT75A    335
                              .ECS      ENDIF                                                    FEAT75A    336
   1250        3004                                                                              FEAT75A    337
   1251        1003                     LDD      D.Z1+C.PPOVL                                    FEAT75A    338
   1252        6311 0422                SHN      3                                               FEAT75A    339
                                        CWM    S.SEG0,D.T1     SAVE SEG-0                        FEAT75A    340
   1254        6312 2171                IFNE   ECSLIB,0,1                                        FEAT75A    341
   1256        0100 1225                CWM    S.SEG1,D.T2     AND SEG-1 + SEG-2                 FEAT75A    342
                                        LJM  SEGX                                                FEAT75A    343
                                                                                                 FEAT75A    344
                                                                                                 FEAT75A    345
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                                      **                                                          STL      1981
                                      *          CLEANUP                                          STL      1982
                                      *          -------                                          STL      1983
                                      *                                                           STL      1984
                                      *          SET UP DEADSTART FLAG BYTE FROM -CEDARGS- PARAMETERS   STL      1985
                                      *          SET DEADSTART TYPE IN DAYFILE MESSAGE            STL      1986
                                      *          SET UP BROADCAST BOX MESSAGE AND SYSTEM HEADER (RECOVERY ONLY) STL 1987
                                      *          CLEAR OUT JUNK LEFT IN CM BY DEADSTART ROUTINES  STL      1988
                                      *          SET UP -DAYFILE- AND -CERFILE- FNT-S FOR *TDS* PROCESSING STL 1989
                                                                                                  STL      1990
                                                                                                  STL      1991
                                                                                                  STL      1992
     1260        0100 0000    CLEANUP    ENM    X                                                 STL      1993
                                      *          SET UP DEADSTART FLAG BYTE FROM CEDARGS PARAMETERS STL    1994
                                                                                                  STL      1995
                                                                                                  STL      1996
     1262        1401                    LDN    P.LIB                                             STL      1997
     1263        6001                    CRD    D.Z1                                              STL      1998
     1264        2010 6772               LDK    CEDARGS             GET PARAMETER WORD            STL      1999
     1266        6010                    CRD    D.T0                                              STL      2000
     1267        3014                    LDD    D.T4                ACTION                        STL      2001
     1270        1012                    SHN    S.ACTION                                          STL      2002
     1271        3405                    STD    D.Z1+C.DSFLAG                                     STL      2003
     1272        3013                    LDD    D.T3                SYSTEM LEVEL                  STL      2004
     1273        1010                    SHN    S.SYSLVL                                          STL      2005
     1274        3505                    RAD    D.Z1+C.DSFLAG                                     STL      2006
     1275        3012                    LDD    D.T2                PF LEVEL                      STL      2007
     1276        1277                    LPN    77B                                               STL      2008
     1277        1005                    SHN    S.PFLVL                                           STL      2009
     1300        3505                    RAD    D.Z1+C.DSFLAG                                     STL      2010
     1301        3012                    LDD    D.T2                RMS LABEL LEVEL               STL      2011
     1302        1071                    SHN    -6                                                STL      2012
     1303        1007                    SHN    S.LBLLVL                                          STL      2013
     1304        3505                    RAD    D.Z1+C.DSFLAG                                     SC40713    63
                              .ECS       IFNE   IP.ECSB,0                                         STL      2015
     1305        3011                    LDD    D.T1                ECS LEVEL                     SC40713    64
     1306        1277                    LPN    77B                 SAVE 6 BIT ECS FLAG           FEAT53053   1
     1307        0402                    ZJN    ELNK                JP IF ECS OFF                 FEAT53053   2
     1310        1401                    LDN    1                   ELSE ON                       FEAT53053   3
     1311        1004         ELNK       SHN    S.ECSLVL                                          STL      2017
     1312        3505                    RAD    D.Z1+C.DSFLAG                                     SC40713    65
                              .ECS       ENDIF                                                    SC40713    66
     1313        3011                    LDD    D.T1                                              SC40713    67
     1314        1071                    SHN    -6                  SHIFT OFF ECS FLAG            SC40713    68
     1315        1003                    SHN    S.CMU               SET UP CMU FLAG               SC40713    69
     1316        3505                    RAD    D.Z1+C.DSFLAG                                     STL      2018
     1317        1401                    LDN    P.LIB                                             STL      2019
     1320        6201                    CWD    D.Z1                                              STL      2020
                                                                                                  STL      2021
                                      *          SET DEADSTART TYPE IN DAYFILE MESSAGE            STL      2022
                                      *          IF RECOVERY -                                    STL      2023
                                      *               SET UP BROADCAST BOX MESSAGE                STL      2024
                                      *               INSERT RECOVERY INDICATOR IN LAST WORD OF SYSTEM HEADER STL 2025
                                                                                                  STL      2026
     1321        5014 1626               LDM    MTXLST1,D.T4        1. L/R                        STL      2027
     1323        5500 1607               RAM    DSTYPE                                            STL      2028
     1325        5013 1630               LDM    MTXLST2,D.T3        2. A/B/C/D                    STL      2029
     1327        1006                    SHN    6
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 1330     5400 1610                STM   DSTYPE+1
 1332     3012                     LDD   D.T2                                                   STL      2030
 1333     1071                     SHN   -6                                                     STL      2031
 1334     3401                     STD   D.Z1                                                   STL      2032
 1335     5001 1634                LDM   MTXLST3,D.Z1        3. I/C                             STL      2033
 1337     5500 1610                RAM   DSTYPE+1                                               STL      2034
 1341     3012                     LDD   D.T2                                                   STL      2035
 1342     1277                     LPN   77B                                                    STL      2036
 1343     3412                     STD   D.T2                                                   STL      2037
 1344     5012 1636                LDM   MTXLST4Q,D.T2                                          STL      2038
 1346     1006                     SHN   6                                                      FEAT61A   101
 1347     5400 1611                STM   DSTYPE+2                                               STL      2040
 1351     3010                     LDD   D.T0                                                   STL      2041
 1352     1277                     LPN   77B                                                    STL      2042
 1353     3401                     STD   D.Z1                                                   STL      2043
 1354     5001 1641                LDM   MTXLST4,D.Z1        5. Y/N                             STL      2044
 1356     5500 1611                RAM   DSTYPE+2                                               STL      2045
 1360     2000 0055                LDC   1R                  6. Y/N                             STL      2046
 1362     1006                     SHN   6                                                      STL      2047
 1363     5400 1612                STM   DSTYPE+3                                               STL      2048
 1365     3010                     LDD   D.T0                                                   STL      2049
 1366     1071                     SHN   -6                                                     SC40070    51
 1367     3410                     STD   D.T0                                                   SC40070    52
 1370     5010 1641                LDM   MTXLST4,D.T0        7. Y/N                             SC40070    53
 1372     5500 1612                RAM   DSTYPE+3                                               SC40070    54
                          ECS      IFNE  IP.ECSB,0                                              SC40070    55
 1374     3011                     LDD   D.T1                                                   STL      2050
 1375     1277                     LPN   77B                                                    SC40070    56
 1376     3411                     STD   D.T1                                                   SC40070    57
 1377     5011 1643                LDM   MTXLST5,D.T1        8. Y/N                             SC40070    58
                                   ELSE                                                         SC40070    59
                                   LDN   1R                                                     SC40070    60
                          ECS      ENDIF                                                        STL      2064
 1401     1006                     SHN   6                                                      STL      2065
 1402     5500 1613                RAM   DSTYPE+4                                               STL      2066
 1404     5014 1547                LDM   DFLPTR,D.T4         LOAD ADDRESS OF DEADSTART TYPE     STL      2067
 1406     5400 1413                STM   TYPE                                                   STL      2068
 1410     1404                     LDN   4                                                      STL      2069
 1411     3401                     STD   D.Z1                INDEX                              STL      2070
 1412     5001 0000       SETTYPE  LDM   **,D.Z1             GET DEADSTART TYPE                 STL      2071
                1413      TYPE     EQU   *-1                                                    STL      2072
 1414     5401 1602                STM   DSLVL,D.Z1          STORE IN MESSAGE                   STL      2073
 1416     3701                     SOD   D.Z1                TEST IF DONE                       STL      2074
 1417     0672                     PJN   SETTYPE             MORE CHARACTERS TO MOVE            STL      2075
 1420     1402                     LDN   2                                                      STL      2076
 1421     3420                     STD   D.TWO                                                  STL      2077
 1422     1403                     LDK   P.DFB               GET DAYFILE BUFFER POINTER         STL      2078
 1423     6001                     CRD   D.Z1                                                   STL      2079
 1424     3001                     LDD   D.Z1                T.DFB/10B                          STL      2080
 1425     1003                     SHN   3                                                      STL      2081
 1426     6001                     CRD   D.Z1                                                   STL      2082
 1427     3103                     ADD   D.Z3                DFBO                               STL      2083
 1430     3101                     ADD   D.Z1                DFBO+IN                            STL      2084
 1431     1704                     SBN   4                   POSITION IN MESSAGE                STL      2085
 1432     6320 1602                CWM   DSLVL,D.TWO         WRITE DEADSTART TYPE TO DAYFILE BUF STL     2086
 1434     3014                     LDD   D.T4                TEST DEADSTART TYPE FOR RECOVERY   STL      2087
 1435     0503                     NJN   RECOVERY            YES                                STL      2088
                                                                                                STL      2089
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                                      LJM  NOT1PR                                               STL     2090
 1436        0100 1506                                                                          STL     2091
                              *                                                                 STL     2092
 1440        1401      RECOVERY LDN   1                                                         STL     2093
 1441        3420               STD   D.TWO                                                     STL     2094
 1442        1431               LDK   T.DATE                GET DATE (RECOVERED BY IRCP)        STL     2095
 1443        6120 1570          CRM   DSRDATE,D.TWO                                             STL     2096
 1445        1430               LDK   T.CLK                 GET CLOCK TIME (RECOVERED BY IRCP)  STL     2097
 1446        6120 1575          CRM   DSRTIME,D.TWO                                             STL     2098
 1450        5000 1610          LDM   DSTYPE+1                                                  STL     2099
 1452        1071               SHN   -6                                                        STL     2100
 1453        5500 1622          RAM   DSRSYSHD+1            INSERT SYSTEM LEVEL                 STL     2101
 1455        5000 1575          LDM   DSRTIME                                                   STL     2102
 1457        1277               LPN   77B                                                       STL     2103
 1460        5500 1623          RAM   DSRSYSHD+2            INSERT HOUR                         STL     2104
 1462        5000 1576          LDM   DSRTIME+1                                                 STL     2105
 1464        5400 1624          STM   DSRSYSHD+3                                                STL     2106
 1466        5000 1577          LDM   DSRTIME+2             INSERT HOUR                         STL     2107
 1470        5400 1625          STM   DSRSYSHD+4                                                STL     2108
 1472        1435               LDK   T.SLABS               WRITE RECOVERY TYPE IN SYSTEM HEADER STL    2109
 1473        6320 1621          CWM   DSRSYSHD,D.TWO                                            STL     2110
 1475        1406               LDN   LE.MAIL                                                   STL     2111
 1476        3420               STD   D.TWO                                                     STL     2112
 1477        1465               LDK   P.MAIL                                                    STL     2113
 1500        6001               CRD   D.Z1                                                      STL     2114
 1501        3001               LDD   D.Z1+C.MAILF          T.MAIL/10B                          STL     2115
 1502        1003               SHN   3                                                         STL     2116
 1503        3102               ADD   D.Z1+C.MAILL          L.MAIL                              STL     2117
 1504        6320 1563          CWM   BCBMSG,D.TWO          PUT RECOVERY TYPE IN BROADCAST BOX  STL     2118
                              *                                                                 STL     2119
 1506                  NOT1PR   BSS   0                                                         STL     2120
                              *                                                                 STL     2121
                              *                                                                 STL     2122
 1506        1410               LDN   10B                                                       STL     2123
 1507        3410               STD   D.TO                                                      STL     2124
                              *                                                                 STL     2125
                              *         THE COMMUNICATION AREAS OF                              STL     2126
                              *                  PP1 - TAPE DRIVER                              STL     2127
                              *                  PP2 - RMS CONTROL                              FEAT48C 2529
                              *         PP3 - TAPE DRIVER (66X ONLY)                            FEAT48C 2530
                              *         PP4 - RMS DRIVER MINI-DIRECTORY                         FEAT48C 2531
                              *         PP5 - RMS DRIVER MINI-DIRECTORY                         STL     2130
                              *         ARE CLEARED BY WRITING 10B CM WORDS FROM PPCBUF INTO EACH STL   2131
                              *                                                                 STL     2132
 1510        3074               LDD   D.PPIR                                                    STL     2133
 1511        1710               SBN   W.PPIR+10B                                                FEAT48C 2532
                          5     DUP   5,1                                                       STL     2135
                                CWM   PPCBUF,D.TO           CLEAR AN AREA                       STL     2136
                              **                                                                STL     2137
                              *         SET BYTE 4 OF PSEUDO-FET FOR *DAYFILE* AND *CERFILE*    STL     2138
                              *         TO 1 SO THAT MTR WILL WAIT UNTIL TOS HAS COMPLETED      STL     2139
                              *         THE PERMANENT FILE OPERATION (CATALOG OR SHRINK) FOR    STL     2140
                              *         THESE FILES.  TOS WILL SET BYTE 4 TO 2 TO INDICATE      STL     2141
                              *         FUNCTION COMPLETION.                                    STL     2142
                                                                                                STL     2143
                                IFNE  P.DFB,P.NCP,1                                             STL     2144
                                ERR   CODE CHANGE REQUIRED                                      STL     2145
 1524        1403               LDK   P.DFB
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 1525     6001                  CRD   D.Z1                              STL   2146
 1526     3001                  LDD   D.Z1        T.OFB/10B             STL   2147
 1527     1003                  SHN   3                                 STL   2148
 1530     6006                  CRD   D.Z6        DAYFILE FET           STL   2149
 1531     3105                  ADD   D.Z1+C.NCP                        STL   2150
 1532     1601                  ADN   1                                 STL   2151
 1533     6013                  CRD   D.T3        CERFILE FET           STL   2152
 1534     1401                  LDN   1           FLAG FOR MTR TO WAIT  STL   2153
 1535     3412                  STD   D.Z6+4                            STL   2154
 1536     3417                  STD   D.T3+4                            STL   2155
 1537     3001                  LDD   D.Z1                              STL   2156
 1540     1003                  SHN   3                                 STL   2157
 1541     6206                  CWD   D.Z6        UPDATE DAYFILE FET    STL   2158
 1542     3105                  ADD   D.Z1+C.NCP                        STL   2159
 1543     1601                  ADN   1                                 STL   2160
 1544     6213                  CWD   D.T3                              STL   2161
                        *                                               STL   2162
 1545     0100 1260             UJK   CLEANUPX    RETURN                STL   2163

 1547     1551          DFLPTR  VFD   12/DFLMSG1                        STL   2165
 1550     1556                  VFD   12/DFLMSG2                        STL   2166
                        *                                               STL   2167
 1551     5555          DFLMSG1 DATA  10H   NORMAL                      STL   2168
 1552     5516
 1553     1722
 1554     1501
 1555     1455
 1556     5522          DFLMSG2 DATA  10H RECOVERY                      STL   2169
 1557     0503
 1560     1726
 1561     0522
 1562     3155

 1563     0000          BCBMSG  VFD   12/0                              STL   2171
 1564     0001                  VFD   12/1    DAYFILE FLAGS - NO MSG TO B DISPLAY  STL   2172
 1565     0000                  VFD   36/0                              STL   2173
 1566     0000
 1567     0000
                        *                                               STL   2174
 1570               5   DSRDATE BSS   5                                 STL   2175
                        *                                               STL   2176
 1575               5   DSRTIME BSS   5                                 STL   2177
                        *                                               STL   2178
 1602               5   DSLVL   BSS   5                                 STL   2179
                        *                                               STL   2180
 1607     5100          DSTYPE  DATA  1L(                               STL   2181
 1610               3           BSSZ  3                                 STL   2182
 1613     0052                  DATA  1R)                               STL   2183
                   31   BCBMSGL SET   *-BCBMSG                          STL   2184
 1614               5           BSSZ  5*LE.MAIL-BCBMSGL                 STL   2185
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                                                                   COMPASS 3.75077.    09/10/75  09.59.29.    PAGE   47
 S T L   ---   START SYSTEM EXECUTION                                                             STL       2189
                                                                                                  STL       2190

  1623          5500                          DATA   1L                                           STL       2192
  1624                          2             BSS    2                                            STL       2193
                                                                                                  STL       2194
                                      MTXLST1  DATA   1RL                                         STL       2195
  1626          0014                           DATA   1RR                                         STL       2196
  1627          0022                  *                                                           STL       2197
                                      MTXLST2  DATA   1RA                                         STL       2198
  1630          0001                           DATA   1RB                                         STL       2199
  1631          0002                           DATA   1RC                                         STL       2200
  1632          0003                           DATA   1RD                                         STL       2201
  1633          0004                  *                                                           FEAT61A    102
                                      MTXLST3  DATA   1RI                                         FEAT61A    103
  1634          0011                           DATA   1RC                                         FEAT61A    104
  1635          0003                  *                                                           FEAT61A    105
                                      MTXLST4Q DATA   1RI                                         STL       2202
  1636          0011                           DATA   1RC                                         STL       2203
  1637          0003                           DATA   1RQ                                         STL       2204
  1640          0021                  *                                                           STL       2205
                                      MTXLST4  DATA   1RY                                         STL       2206
  1641          0031                           DATA   1RN                                         STL       2207
  1642          0016                  *                                                           FEAT75B     14
                                      ECS      IFNE   IP.ECSB,0                                   FEAT75B     15
                                      MTXLST5  DATA   1RN                                         STL       2209
  1643          0016                           DATA   1RI
  1644          0011                           DATA   1RU
  1645          0025                  ECS      ENDIF
                                                                                                  STL       2211

  1646                          50    PPCBUF   BSSZ   10B*5
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                              **
                              *       DESEL          DESELECTS 6681/6684                          STL      2216
                              *       -----------------------------------------------------------  STL      2217
                              *                                                                   STL      2218
                              *       DESEL READS UP AN EST ENTRY. IF THE ENTRY IS EMPTY OR THE   STL      2219
                              *       DEVICE TURNED OFF, IT IS SKIPPED AND THE NEXT EST ENTRY IS  STL      2220
                              *       READ UP. THE HARDWARE MNEMONIC IS CHECKED TO SEE IF IT IS A STL      2221
                              *       3000 DEVICE WHICH USES A 6681 OR 6684. IF IT DOES NOT, THE  STL      2222
                              *       ENTRY IS SKIPPED AND THE NEXT ONE READ UP. IF IT DOES, THE RMS STL   2223
                              *       BIT IS CHECKED. IF IT IS  AN RMS DEVICE, THE CHANNELS ARE   STL      2224
                              *       TAKEN FROM THE DST. IF IT IS NOT AN RMS DEVICE, THE CHANNELS STL     2225
                              *       ARE TAKEN FROM THE EST. IN EITHER CASE THE CHANNELS ARE STORED STL   2226
                              *       IN CHANSTR, THE CHANNEL STORAGE AREA. A CHECK IS MADE SO THAT STL    2227
                              *       DUPLICATE CHANNELS ARE NOT STORED. WHEN THE ENTIRE EST HAS  STL      2228
                              *       BEEN PROCESSED A JUMP OCCURS TO DESEL2. THE CHANNELS STORED STL      2229
                              *       IN CHANSTR ARE FUNCTIONED SEQUENTIALLY TO DESELECT THE 6681 OR STL   2230
                              *       6684 AND DSCONNECTED.                                       STL      2231
                                                                                                  STL      2232
 1716        0100 0000          DESEL    ENM   X                                                  SC40125  1878
                          13    P.DST    EQU   P.RQS                                              SC40125  1879
                           2    ESTFWA   EQU   D.Z2          POINTER TO DST ADDRESS/8             STL      2233
                           3    LWAEST   EQU   D.Z3          POINTER TO CURRENT EST ENTRY         STL      2234
                          15    CHINDX   EQU   D.T5          LWA+1 OF EST                         STL      2235
                          16    TABINDX  EQU   D.T6          INDEX INTO CHANNELS TO BE FUNCTIONED STL      2236
                          17    TEMP     EQU   D.T7          INDEX INTO MNEMONIC TABLE            STL      2237
                          20    BYTINDX  EQU   D.TW0         TEMPORARY STORAGE                    STL      2238
                          22    DSTFWA   EQU   D.TH2         INDEX INTO CHANNEL BYTES             STL      2239
                          23    ABSINDX  EQU   D.TW3         ADDRESS OF DST                       STL      2240
                              *                                                                   STL      2241
 1720        1413                                                                                 STL      2242
 1721        6010                        LDK   P.DST                                              STL      2243
 1722        3014                        CRD   D.T0          POINTER TO DST IN BYTE 4             STL      2244
 1723        3422                        LDD   D.T4                                               STL      2245
 1724        1405                        STD   DSTFWA        POINTER TO DST/8                     STL      2246
 1725        6002                        LDK   P.EST         SAVE POINTER TO DST                  SC40439     1
 1726        1400                        CRD   D.Z2          POINTER TO EST IS IN CM WORD 5       STL      2249
 1727        3400                        LDN   0             ESTFWA AND LWAEST INITIALIZED        STL      2250
 1730        3415                        STD   D.Z0                                               STL      2251
 1731        3416                        STD   CHINDX        INITIALIZE INDEXES                   STL      2252
 1732        3417                        STD   TABINDX                                            STL      2253
 1733        3420                        STD   TEMP                                               STL      2254
 1734        3423                        STD   BYTINDX                                            STL      2255
 1735        3002                        STD   ABSINDX                                            STL      2256
 1736        6010               DESEL0   LDD   ESTFWA                                             STL      2257
 1737        3013                        CRD   D.T0                                               STL      2258
 1740        0414               DESEL1   LDD   D.T0+C.ESTMNE CELLS 10-14 CONTAIN EST ENTRY        STL      2259
 1741        1006                        ZJN   INCREST       HARDWARE MNEMONIC FROM EST           STL      2260
 1742        0712                        SHN   6             ZERO ENTRY, JUMP                     STL      2261
 1743        1071                        MJN   INCREST       TEST ON/OFF BIT                      STL      2262
 1744        3417                        SHN   -6            DEVICE OFF, SKIP ENTRY               STL      2263
 1745        5016 2151                   STD   TEMP                                               STL      2264
 1747        0405               DESEL1A  LDM   MNETAB,TABINDX STORE FOR FURTHER ACTION            STL      2266
 1750        3317                        ZJN   INCREST       MNEMONIC TABLE ENTRY                 STL      2267
 1751        0416                        LMD   TEMP          IF END OF TABLE, JUMP                STL      2268
 1752        3616                        ZJN   DESEL1B       TEST FOR MATCHING MNEMONIC           STL      2269
 1753        0371                        AOD   TABINDX       IF THEY MATCH, JUMP                  STL      2270
                                         UJN   DESEL1A       INCREMENT INDEX INTO MNEMONIC TABLE  STL      2271
                                                             CONTINUE THRU TA...
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                                   *                                                                STL      2273
 1754        3602                INCREST   AOD    ESTFWA             INCREMENT EST POINTER          STL      2274
 1755        3003                          LDD    LWAEST                                            STL      2275
 1756        3202                          SBD    ESTFWA                                            STL      2276
 1757        0406                          ZJN  DESEL22              IF END OF EST, JUMP            STL      2277
 1760        1400                          LDN    0                                                 STL      2278
 1761        3416                          STD    TABINDX            REINITIALIZE                   STL      2279
 1762        3420                          STD    BYTINDX                                           STL      2280
 1763        3415                          STD    CHINDX                                            STL      2281
 1764        0350                          UJN  DESEL0               GO GET NEXT EST ENTRY          STL      2282
                                   *                                                                STL      2283
 1765        0100 2066           DESEL22   LJM  DESEL2                                              STL      2284
                                   *                                                                STL      2285
 1767        3010                DESEL1B   LDD    D.T0               MNEMONIC THAT GOT US HERE      STL      2286
 1770        2200 4000                     LPC    4000B              RMS BIT                        STL      2287
 1772        0411                          ZJN    DESEL1C            CHANNELS IN EST, JUMP          STL      2288
 1773        3714                          SOD    D.T0+C.ESTDST      DST ORDINAL FROM EST           SC40439     2
 1774        3022                          LDD    DSTFWA                                            SC40439     3
 1775        1002                          SHN    2                                                 SC40439     4
 1776        3114                          ADD    D.T0+C.ESTDST                                     SC40439     5
 1777        1001                          SHN    1                                                 SC40439     6
 2000        6010                          CRD    D.T0               CELLS 10-14 CONTAIN DST ENTRY  STL      2293
 2001        1402                          LDN    2                                                 STL      2294
 2002        3420                          STD    BYTINDX                                           STL      2295
 2003        3620                DESEL1C   AOD    BYTINDX            INDEX TO CHANNEL BYTE          STL      2296
 2004        1400                DESE1CC   LDN    0                                                 STL      2297
 2005        3415                          STD    CHINDX                                            STL      2298
 2006        5020 0010                     LDM    D.T0,BYTINDX       BYTE IN WHICH CHANNELS ARE LOCATED STL   2299
 2010        2200 0037                     LPC    37B                GET RID OF 6684 BIT            STL      2300
 2012        3417                          STD    TEMP               SAVE IT FOR FURTHER ACTION     STL      2301
 2013        3023                DESEL1D   LDD    ABSINDX                                           STL      2302
 2014        3215                          SBD    CHINDX                                            STL      2303
 2015        0411                          ZJN  STORIT                                              STL      2304
 2016        5015 2120                     LDM    CHANSTR,CHINDX                                    STL      2305
 2020        3317                          LMD    TEMP               OR, IF DUPLICATE ENTRY,        STL      2306
 2021        0411                          ZJN  NXTCHAN              YES, JUMP                      STL      2307
 2022        3615                          AOD    CHINDX             NEITHER EMPTY OR DUPLICATE,    STL      2308
 2023        0367                          UJN  DESEL1D              GO CONTINUE SEARCH             STL      2309
                                   *                                                                STL      2310
 2024        0100 1754           INCR222   LJM  INCREST                                             STL      2311
                                   *                                                                STL      2312
 2026        3017                STORIT    LDD    TEMP                                              STL      2313
 2027        5415 2120                     STM    CHANSTR,CHINDX     STORE CHANNEL                  STL      2314
 2031        3623                          AOD    ABSINDX                                           STL      2315
 2032        1400                NXTCHAN   LDN    0                                                 STL      2316
 2033        3415                          STD    CHINDX             CLEAR INDEX                    STL      2317
 2034        5020 0010                     LDM    D.T0,BYTINDX       CHANNEL BYTE                   STL      2318
 2036        1071                          SHN    -6                 SHIFT TO GET ALTERNATE CHANNEL STL      2319
 2037        0464                STEP      ZJN  INCR222                                             STL      2320
 2040        3417                          STD    TEMP               SAVE CHANNEL                   STL      2321
 2041        3023                DESEL1E   LDD    ABSINDX                                           STL      2322
 2042        3215                          SBD    CHINDX                                            STL      2323
 2043        0407                          ZJN  STOR2                                               STL      2324
 2044        5015 2120                     LDM    CHANSTR,CHINDX                                    STL      2325
 2046        3317                          LMD    TEMP               IF IT IS A DUPLICATE,          STL      2326
 2047        0407                          ZJN  INCRBYT              GO CHECK NEXT BYTE FOR MORE CHANNELS STL 2327
 2050        3615                          AOD    CHINDX                                            STL      2328
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2051        0367                  UJN  DESEL1E           OTHERWISE CONTINUE SEARCH          STL  2329
                          *                                                                 STL  2330
2052        3017          STOR2   LDD   TEMP                                                STL  2331
2053        5415 2120             STM   CHANSTR,CHINDX    STORE CHANNEL                     STL  2332
2055        3623                  AOD   ABSINDX                                             STL  2333
2056        3620          INCRBYT AOD   BYTINDX                                             STL  2334
2057        1703                  SBN   3B                                                  STL  2335
2060        0643                  PJN  INCR222           NO MORE CHANNELS ON THIS DEVICE, JUMP STL  2336
2061        5020 0010             LDM   D.TO,BYTINDX                                        STL  2337
2063        0453                  ZJN  STEP                                                 STL  2338
2064        0100 2004             LJM  DESE1CC           GO PROCESS MORE CHANNELS           STL  2339
                          *                                                                 STL  2340
2066        3023          DESEL2  LDD   ABSINDX                                             STL  2341
2067        3215                  SBD   CHINDX                                              STL  2342
2070        0426                  ZJN  DESEND            FINISHED                           STL  2343
2071        5015 2120             LDM   CHANSTR,CHINDX                                      STL  2344
2073        2100 6500             ADC   6500B                                               STL  2345
2075        5400 2111             STM   DESIJM           MODIFY IJM INSTRUCTION             STL  2346
2077        2100 1000             ADC   1000B                                               STL  2347
2101        5400 2113             STM   DESDCN           MODIFY DCN INSTRUCTION             STL  2348
2103        2100 0200             ADC   200B                                                STL  2349
2105        5400 2107             STM   DESFNC            MODIFY FNC INSTRUCTION            STL  2350
2107        7700 2100     DESFNC  FNC   2100B,**         FUNCTION CHANNEL                   STL  2351
2111        6500 2114     DESIJM  IJM   DESEL5A,**       IF INACTIVE, JUMP                  STL  2352
2113        7500          DESDCN  DCN   **               DIS CONNECT CHANNEL                STL  2353
2114        3615          DESEL5A AOD   CHINDX           INCREMENT CHNSTR POINTER           STL  2354
2115        0350                  UJN   DESEL2                                              STL  2355
                          *                                                                 STL  2356
2116        0100 1716     DESEND  LJM  DESELX            FINISHED                           STL  2357
                          *                                                                 STL  2358
2120                 31   CHANSTR BSSZ  25D              CHANNEL STORAGE AREA               STL  2359
2151        0114          MNETAB  VFD   12/2HAL          821 DATA FILE                      STL  2360
2152        0115                  VFD   12/2HAM          841 MULTIPLE DISK DRIVE            STL  2361
2153        0120                  VFD   12/2HAP          3234/854 DISK PACK DRIVE           STL  2362
2154        0106                  VFD   12/2HAF          814 DISK FILE                      STL  2363
2155        0104                  VFD   12/2HAD          3637/865 DRUM                      STL  2364
2156        1524                  VFD   12/2HMT          7 TRACK TAPE                       STL  2365
2157        1624                  VFD   12/2HNT          9 TRACK TAPE                       STL  2366
2160        1420                  VFD   12/2HLP          501,512,505 LINE PRINTER           STL  2367
2161        1434                  VFD   12/2HL1          501,505 LINE PRINTER               STL  2368
2162        1435                  VFD   12/2HL2          512 LINE PRINTER                   STL  2369
2163        0322                  VFD   12/2HCR          405 CARD READER                    STL  2370
2164        0320                  VFD   12/2HCP          415 CARD PUNCH                     STL  2371
2165        1421                  VFD   12/2HLQ          512 LINE PRINTER                   STL  2372
2166        2422                  VFD   12/2HTR          PAPER TAPE READER                  STL  2373
2167        2420                  VFD   12/2HTP          PAPER TAPE PUNCH                   STL  2374
2170        0000                  VFD   12/0                                                STL  2375
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                      *
                      *        ****************  ********************          STL     2377
                      *        **************************************          STL     2378
                      *                                                        STL     2379
                      *        E N D   D E C K   * S T L *                     STL     2380
                      *                                                        STL     2381
                      *        **************************************          STL     2382
                      *        **************************************          STL     2383
       2260                                                                    STL     2384
                               END                                             STL     2385
                                                                               STL     2386
             50300B CM  STORAGE USED           2739 STATEMENTS     1729 SYMBOLS
                        MODEL 74 ASSEMBLY      6.206 SECONDS       1030 REFERENCES
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S T L  ---  START SYSTEM EXECUTION
SYMBOLIC REFERENCE TABLE.                        COMPASS 3.75077.    09/10/75  09.59.29.    PAGE   52

ABSINDX        23
ASYSLVL         0        48/29 D   48/43 S   49/31     49/44 S   49/51     50/05 S   50/13
BASE       107000        36/05 D
BASE.1        422        36/05 D   36/05     36/05 D   36/05
BCBMSG       1563        26/36 D   27/11     27/18     27/28     28/14     28/16
BCBMSGL        31        45/28     46/38 L   46/53
BREAKPT         0        46/53 D   46/54
BSYSLVL         1        36/05 D
BUF        110517        36/05 D
[illegible]              36/05 D   36/05
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S T L   ---   START SYSTEM EXECUTION                              COMPASS 3.75077.     09/10/75  09.59.29.      PAGE    52
SYMBOLIC REFERENCE TABLE.

ABSINDX      23                        48/29 D   48/43 S   49/31     49/44 S   49/51     50/05 S   50/13
ASYSLVL       0                        36/05 D
BASE     107000                        36/05 D   36/05     36/05 D   36/05
BASE.1      422                        26/36 D   27/11     27/18     27/28     28/14     28/16
BCBMSG     1563                        45/28     46/38 L   46/53
BC3MSGL      31                        46/53 D   46/54
BREAKPT       0                        36/05 D
BSYSLVL       1                        36/05 D
BUF      110517                        36/05 D   36/05
BYTINDX      20                        48/27 D   49/08 S   49/25 S   49/47     50/09
                                       48/42 S   49/24 S   49/28   : 50/06 S
CEDARGS  106772                        36/05 D   43/18
CHANSTR    2120                        49/34     49/43 S   49/54     50/04 S   50/16     50/31 L
CHINDX       15                        48/24 D   49/09 S   49/32     49/37 S   49/46 S   49/54     50/04     50/16
                                       48/39 S   49/27 S   49/34     49/43     49/52     49/57 S   50/14     50/26 S
CHPR         11                        36/05 D
CLEANUP    1261                        38/51     43/13 D
CLEANUPX   1260                        43/12 L   46/18
CMBUFFER 124700                        36/05 D   36/05
CMLWAB   110522                        36/05 D
CMRSIZE   17000                        36/05 D
CMS01       426                        26/53 D   42/20 S   42/26 S
CMS02       434                        27/08 D
CMSI       2175                        27/28 D
CMUXPKG   65040                        36/05 D
CM19        310                        36/05 D
CNTPR         5                        36/05 D
CPUOFF        1                        36/05 D
CSYSLVL       2                        36/05 D
C.CPFL        4      PPTEXT            15/34
C.CPRA        3      PPTEXT            15/36
C.CPSM        2      PPTEXT            15/50     16/05
C.CST         2      PPTEXT            37/57
C.DSFLAG      4      PPTEXT            43/22 S   43/25 S   43/29 S   43/33 S   43/40 S   43/45 S
C.ESTDST      4      PPTEXT            49/17 S   49/20
C.ESTMNE      3      PPTEXT            48/46
C.MAILF       0      PPTEXT            45/25
C.MAILL       1      PPTEXT            45/27
C.NCP         4      PPTEXT            46/05     46/14
C.NPP         3      PPTEXT            37/43
C.PCOM        4      PPTEXT            37/48
C.PPFWA    1000      PPTEXT            14/21     14/23     35/37 F   35/46
C.PPOVL       3      PPTEXT            42/12     42/47
C.RWPPCC      3      PPTEXT            32/30
C.RWPPCF      0      PPTEXT            26/06 S   30/46 S   31/57     32/09 S   32/18 S
C.RWPPST      3      PPTEXT            26/10
C.RWPPWC      4      PPTEXT            32/12     32/16
C.STCPU       4      PPTEXT            33/29 S
C.STPFW       2      PPTEXT            31/40
C.STPMS       1      PPTEXT            31/43 S
DCH1        330                        23/36 D   38/01 S
DCH3        322                        23/31 L   23/40
DDPLIB        0                        11/11 D   28/23 F   41/14 F   42/17 F   42/23 F   42/34 F
DESDCN     2113                        50/20 S   50/25 L
DESEL      1717                        39/24     48/21 D
DESELX     1716                        48/20 L   50/29
DESEL0     1735                        48/44 L   49/10
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SYMBOLIC REFERENCE TABLE.

DESEL1	1737		48/46 L							
DESEL1A	1745		48/52 L	48/57						
DESEL1B	1767		48/55	49/14 L						
DESEL1C	2003		49/16	49/25 L						
DESEL1D	2013		49/31 L	49/38						
DESEL1E	2041		49/51 L	50/01						
DESEL2	2066		49/12	50/13 L	50/27					
DESEL22	1765		49/05	49/12 L						
DESEL5A	2114		50/24	50/26 L						
DESEND	2116		50/15	50/29 L						
DESE1CC	2004		49/26 L	50/11						
DESFNC	2107		50/22 S	50/23 L						
DESIJM	2111		50/18 S	50/24 L						
DFLMSG1	1551		46/22	46/25 L						
DFLMSG2	1556		46/23	46/30 L						
DFLPTR	1547		44/36	46/22 L						
DFLTOT	1421		36/05 D							
DFM1	715		34/39 L	34/45						
DFM2	713		34/37 L	34/52						
DFM3	733		34/50	34/54 L						
DIRBIAS	30		36/05 D							
DMPFLAG	110516		36/05 D	36/05						
DRIVBUF	107000		36/05 D	36/05						
DSDBUF	123200		36/05 D	36/05	39/52					
DSLVL	1602		44/42 S	44/55	46/48 L					
DSPBUF	400		36/05 D							
DSPLCHAN	10		36/05 D							
DSPLCTLR	7		36/05 D							
DSRDATE	1570		45/06 S	46/44 L						
DSRSYSHD	1621		45/11 S	45/14 S	45/16 S	45/18 S	45/20	46/56 L		
DSRTIME	1575		45/08 S	45/12	45/15	45/17	46/46 L			
DSTFWA	22		48/28 D	48/34 S	49/18					
DSTYPE	1607		43/55 S	44/06 S	44/17 S	44/25 S	45/09			
			44/01 S	44/12 S	44/20 S	44/35 S	46/50 L			
DSYSLVL	3		36/05 D							
D.CPAD	76	PPTEXT	13/45 S	15/44	15/47	16/02	16/08	16/11	17/18	33/27
D.FL	56	PPTEXT	15/35 S	18/17	18/25					
D.PPIR	74	PPTEXT	13/27	19/33	20/43	23/39	39/15 S			
			13/38	20/39	20/56	37/50 S	45/44			
D.PPMES1	75	PPTEXT	26/07	30/47	31/54	33/34	37/52 S			
			26/29	31/42	32/19	34/35	39/17 S			
D.PPSTAT	77	PPTEXT	13/31	13/34	16/10	17/17	37/54 S	39/18 S		
D.RA	55	PPTEXT	15/37 S	18/18						
D.TW0	20	PPTEXT	44/46 S	45/04 S	45/08	45/22 S	48/27			
			44/55	45/06	45/20	45/28				
D.TW2	22	PPTEXT	48/28							
D.TW3	23	PPTEXT	48/29							
D.T0	10	PPTEXT	15/34	20/48	26/54	30/42 S	37/47 S	39/44	44/23 S	48/46
			15/36	21/01 S	26/57 S	31/40	37/48	39/46 S	44/24	49/14
			15/49 S	21/02	27/22 S	31/43	37/56 S	40/01 S	45/34 S	49/17 S
			15/50	23/37 S	27/29	33/25	37/57	40/02 S	45/48	49/20
			16/04 S	23/43	27/44 S	33/29	38/53 S	40/03	45/48	49/22 S
			16/05	24/29 S	27/49 S	33/31 S	39/03	40/04 I	45/48	49/28
			19/32 S	24/30	27/57	33/35	39/05 S	40/05	45/48	49/47
			19/35	24/34 S	28/04	34/32 S	39/28 S	43/19 S	45/48	50/09
			20/34	24/35	28/06	34/39	39/32	44/13	48/32 S	
			20/46 S	26/45 S	30/32 S	34/42 S	39/38 S	44/21	48/45 S	

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D.T1            11    PPTEXT    22/42 S  33/37    35/08 S  38/54 S  42/49    43/42    44/29 S
                                33/33 S  34/34 S  35/13    42/29 S  43/35    44/27    44/30
D.T2            12    PPTEXT    24/23 S  24/28 I  34/46    35/06 S  42/32 S  43/26    44/02    44/09 S
                                24/24    34/36 S  34/48 S  38/55 S  42/51    43/30    44/07    44/10
D.T3            13    PPTEXT    23/41    30/49    32/12    32/30    34/51    38/39 S  43/23    46/16
                                26/06 S  31/56 S  32/16    34/37    35/02 S  38/43    43/56
                                26/09    31/57    32/18 S  34/44    38/09 S  38/56 S  46/07 S
                                30/46 S  32/09 S  32/21    34/47    38/11 S  39/42 S  46/10 S
D.T4            14    PPTEXT    22/44 S  26/10    35/10 S  39/06    39/47    44/36
                                23/38    26/18    38/13 S  39/30 S  43/20    44/56
                                23/42 S  33/40 S  39/01 S  39/40 S  43/54    48/33
D.T5            15    PPTEXT    26/20    48/24
D.T6            16    PPTEXT    13/28 S  13/32    13/39 S  35/07    48/25
D.T7            17    PPTEXT    13/29    13/40    26/21    35/05    38/14    38/29 S  38/31    48/26
D.Z0             0    PPTEXT    48/38 S
D.Z1             1    PPTEXT    26/31 S  42/11 S  43/25 S  43/47    44/39 S  44/49    45/27    46/14
                                26/32    42/12    43/29 S  44/04 S  44/40    44/51 S  46/01 S
                                27/46 S  42/47    43/33 S  44/05    44/42    44/53    46/02
                                37/42 S  43/17 S  43/40 S  44/15 S  44/43 S  45/24 S  46/05
                                37/43    43/22 S  43/45 S  44/16    44/48 S  45/25    46/11
D.Z2             2    PPTEXT    27/33    48/22    48/36 S
D.Z3             3    PPTEXT    27/35    27/48    27/50    27/52 S  28/02    44/52    48/23
D.Z4             4    PPTEXT    27/37
D.Z5             5    PPTEXT    27/41
D.Z6             6    PPTEXT    26/27    35/14 S  38/19    38/25    46/04 S  46/13
                                27/54 S  38/18 S  38/24 S  40/19    46/09 S
D.Z7             7    PPTEXT    27/31    28/07 S  35/01 S
ECBUFFER    135000              36/05 D
ECOVL          422              26/43 L  26/54 S  27/20 L  27/29 S
ECOVLA         431              26/43    26/56 L  27/20    27/31 L
ECOVLB         427              26/54 L  27/09
ECSLIB           1              11/10 D  27/14 F  29/41 F  42/19 F  42/25 F  42/30 F  42/50 F
ELNK          1311              43/37    43/39 L
ENTRSTKW       673              33/26 S  33/35 L
ERRODP           2              26/39 D
ERRNODP          3              26/40 D  27/01    28/11
ERRNOEC          4              26/41 D  26/46
ESEG1          511              28/16 D  28/17 F
ESTFWA           2              48/22 D  48/44    49/02 S  49/04
EX.PLIB          2    PPTEXT    35/09
EX.SPM           3    PPTEXT    33/39
FLCM        400000              36/05 D
FLECS         1000              36/05 D
FVALUE           2              36/05 D
F.AUTOLD       414              36/05 D
F.BREAD         40              36/05 D
HOLDFWA     110515              36/05 D  36/05
IDL1           111              13/34 L  13/41
IDL2           120              13/30    13/43 L
ILDELAY        175              11/05 D
INCRBYT       2056              49/56    50/06 L
INCREST       1754              48/47    48/49    48/53    49/02 L  49/40
INCR222       2024              49/40 L  49/49    50/08
IP.DDP           0              11/11
IP.ECSB          1              11/06 F  43/34 F  44/26 F  47/24 F
IP.ELIB        144              11/10
IP.SBPH          3              11/12
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IRADR	65000		36/05 D	36/05			
IRFLAG	65030		36/05 D				
ISSUE	750		27/10	28/09	35/08 L		
ISSUERR	436		26/47	27/02	27/10 L		
LBLADR	53701		36/05 D	36/05			
LBLADR2	54002		36/05 D				
LBLSIZE	100		36/05 D	36/05			
LBUF	4		36/05 D	36/05			
LE.MAIL	6	PPTEXT	45/21	46/54			
LINES	30		36/05 D				
LNTTABLE	127600		36/05 D				
LSEG0	3		27/12 D	42/16	42/28		
LSEG1	13		26/44	28/15 D	28/16	35/42	42/31
LSEG2	0		26/56	27/21	29/38 D	35/42	42/31
LVALUE	0		36/05 D				
LWAEST	3		48/23 D	49/03			
L=PPOVL	13		35/42 D				
L.CPNUM	17	PPTEXT	13/43				
L.PPHDR	5	PPTEXT	14/21	35/37 F	39/37	39/39	39/43
MAXRBCNT	100		36/05 D	36/05			
MAXPBLTH	10100		36/05 D	36/05			
MERRCNT	12		36/05 D				
MNETAB	2151		48/52	50/32 L			
MSYSDEV	5		36/05 D	36/05			
MTRBUF	121200		36/05 D	36/05	39/37	39/43	40/18
MTRDSDL	1213		39/50	39/57	40/03	40/07	40/16 L
MTRDSDL1	1215		39/53 S	39/56 S	40/07	40/18 L	
MTRDSDL2	1222		39/57	40/21 D			
MTXLST1	1626		43/54	47/06 L			
MTXLST2	1630		43/56	47/09 L			
MTXLST3	1634		44/05	47/14 L			
MTXLST4	1641		44/16	44/24	47/21 L		
MTXLST4Q	1636		44/10	47/17 L			
MTXLST5	1643		44/30	47/25 L			
M.ABORT	22	PPTEXT	26/13				
M.DFM	13	PPTEXT	34/54				
M.ICE	6	PPTEXT	33/41	35/11			
M.KILL	77	PPTEXT	23/31				
M.MTRCPU	12	PPTEXT	20/35				
M.RCH	12	PPTEXT	22/43				
NOCOP	507		27/27	28/11 L			
NOMXN	1070		38/15	38/46 D			
NOT1PR	1506		45/01	45/30 L			
NXTCHAN	2032		49/36	49/45 L			
OPCXCTLW	117000		36/05 D	36/05			
OVLA	737		25/57	35/01 L			
OVLB	366		26/04 L	35/17			
OVLC	404		26/05	26/17 L			
OVLD	411		26/22 D	35/04 S			
OVLE	413		26/17	26/25 L			
PNTPRU	64676		36/05 D				
PPCBUF	1646		45/48	45/48	45/48	45/48	45/48	47/32 L
PPOVL	1223		38/03	41/11 D			
PPOVLX	1222		41/10 L	41/36			
PP0SVADR	107000		36/05 D	36/05			
PP1BIAS	0		36/05 D	36/05			
PP2BIAS	10		36/05 D	36/05			

PP3BIAS	20		36/05 D	36/05			
PRULEN1	101		36/05 D	36/05			
PRULIM	2		36/05 D				
P.CST	5	PPTEXT	37/55				
P.DFB	3	PPTEXT	44/47	45/55 F	45/57		
P.DST	13		48/21 D	48/31			
P.EST	5	PPTEXT	48/35				
P.LIB	1	PPTEXT	43/16	43/46			
P.MAIL	65	PPTEXT	45/23				
P.NCP	3	PPTEXT	45/55 F				
P.NPP	3	PPTEXT	37/41				
P.PCOM	5	PPTEXT	37/46				
P.PPOVL	77	PPTEXT	42/10				
P.RQS	13	PPTEXT	48/21				
P.ZERO	0	PPTEXT	33/32				
RAFLX	133		15/34 L	15/51			
RAFL1	145		15/47 L	16/12			
RAFL2	154		15/55 L	16/06			
RAFL3	157		15/45	16/02 L			
RBBUF	52701		36/05 D				
RBLIM	1		36/05 D				
RCOM	555		30/34	30/45 L			
RCOMA	547		30/36 L	30/51			
RECOVERY	1440		44/57	45/03 L			
RMSBUF0	54700		36/05 D	36/05			
RMSBUF1	117500		36/05 D	36/05			
RMSERRA	31		36/05 D				
RMSERRB	32		36/05 D				
RMSERRC	33		36/05 D				
RMSERRD	34		36/05 D				
RMSERRE	35		36/05 D				
RMSERRG	37		36/05 D				
RMSERRJ	40		36/05 D				
RMSERRK	41		36/05 D				
RMSERRL	42		36/05 D				
RMSERRM	43		36/05 D				
RMSERRN	44		36/05 D				
RMSERRO	45		36/05 D				
RMSERRP	46		36/05 D				
RMSERRQ	30		36/05 D				
RMSPRU	100		36/05 D	36/05			
ROCKCNT	10		36/05 D				
RVALUE	1		36/05 D				
RWDELAY	144		11/04 D	15/55	21/10	31/50	
RWPD	611		31/48	31/50 L			
RWPIO	634		32/02	32/12 L			
RWPIOA	640		31/41 S	32/15 L	32/17 S	35/03 S	
RWPIOT	637		30/50	31/39 S	32/14 L	32/32	35/16 S
RWPIOW	635		32/13 L	32/31			
RWPL	614		31/54 L	32/06	32/22	35/19	
RWPP	604		31/47 L	32/05			
RWPSTBL	651		32/07	32/30 L			
RWPWF	645		32/10	32/19 L			
R.DCH	326	PPTEXT	22/48	23/35 D			
R.DCHX	325		23/34 L	23/44			
R.DFM	705	PPTEXT	34/32 D				
R.DFMX	704		34/31 L	34/56			

SYMBOLIC REFERENCE TABLE.

R.ECOVL	422		26/35 D						
R.EREQS	656	PPTEXT	31/44	33/25 D					
R.EREQSX	655		33/24 L	33/43					
R.FAF	100	PPTEXT	12/08 L	15/43	16/09 S	17/16 S	21/05	31/47	
R.IDLE	103	PPTEXT	13/27 L	26/15	39/09				
R.MTR	220	PPTEXT	19/29 D	19/30	22/45	23/32	26/14	33/42	34/55 35/12
R.MTRX	217		19/28 L	19/39					
R.OVL	363	PPTEXT	14/22	25/56 D					
R.OVLJ	125	PPTEXT	14/21 L						
R.OVLX	362		25/55 L	26/12	26/23	26/28			
R.PAUSE	140	PPTEXT	15/41 D	31/49					
R.PROCES	220	PPTEXT	19/30 D						
R.RAFL	140	PPTEXT	15/40 D	15/41	21/08				
R.RCH	303	PPTEXT	22/39	22/42 D					
R.RCHX	302		22/41 L	22/46					
R.READP	543	PPTEXT	28/17 F	29/46	30/32 D				
R.READPX	542		30/31 L	30/37					
R.RWP	567	PPTEXT	30/45	31/38 D	35/18 S				
R.RWPP	603	PPTEXT	31/45 D						
R.RWPX	566		31/37 L	32/03					
R.STB	355	PPTEXT	24/34 D	32/08					
R.STBMSK	346	PPTEXT	24/26 D						
R.TAFL	173	PPTEXT	13/46	15/53	17/15 D				
R.TAFLX	172		17/14 L	17/19					
R.TFL	207	PPTEXT	18/22 D						
R.TFLX	206		18/21 L	18/30					
R.WAIT	231	PPTEXT	19/37	20/33 D					
R.WAITX	230		20/32 L	21/03					
R.WRITEP	552	PPTEXT	30/42 D						
SBPH	3		11/12 D						
SDBA	505		28/03	28/09 L	28/12				
SDBDATA	472		27/40 S	27/42 S	27/53	27/56 L			
SDBLOD	475		27/32 S	28/01 D					
SDBLOOP	455		27/34 S	27/36 S	27/45 L	27/47 S	27/55		
SEG	1226		38/05	42/10 D					
SEGX	1225		42/09 L	42/14	42/52				
SETTYPE	1412		44/40 L	44/44					
STARTCP	110465		36/05 D	36/05					
STB0	343		24/23 L	24/31					
STB1	351		24/29 L	24/37					
STEP	2037		49/49 L	50/10					
STL	1000		37/41 L						
STLBUF	117500		36/05 D	36/05					
STL00	1073		38/44	38/49 D					
STL002	1057		38/21	38/31 L					
STL004	1065		38/27	38/33	38/41 D				
STL1	1102		38/57 L	39/19 S	39/22				
STL2	1106		39/04 L	39/07					
STL3	1134		37/45 S	39/21 L					
STL4	1142		39/29 L						
STL5	1160		39/45 L	39/48					
STL6	1203		40/02 L	40/06					
STORIT	2026		49/33	49/42 L					
STOR2	2052		49/53	50/03 L					
S.ACTION	12	PPTEXT	43/21						
S.CMU	3	PPTEXT	43/44						
S.ECSLVL	4	PPTEXT	43/39						

SYMBOLIC REFERENCE TABLE.

```
S.LBLLVL       7    PPTEXT     43/32
S.PFLVL        5    PPTEXT     43/28
S.SEG0       422               26/37 D  42/49
S.SEG1      2171               27/17 D  27/28     42/51
S.SYSLVL      10    PPTEXT     43/24
TABINDX       16               48/25 D  48/40 S   48/52     48/56 S   49/07 S
TABLESAV 117500                36/05 D  36/05
TAPEPPP  105000                36/05 D
TAPEPRU     1000               36/05 D  36/05
TBUF0      52700               36/05 D  36/05
TBUF1      53700               36/05 D  36/05
TEMP          17               48/26 D  48/51 S   49/30 S   49/42     49/55
                               48/41 S  48/54     49/35     49/50 S   50/03
TFL0         202               18/16 L  18/27
TFL1         215               18/23    18/29 L
TYPE        1413               44/37 S  44/41 D
T.CLK         30    PPTEXT     45/07
T.CPA1       200    PPTEXT     36/05
T.CPSTA       44    PPTEXT     38/23
T.CPSTB       45    PPTEXT     38/17
T.DATE        31    PPTEXT     45/05
T.MXNCTL      46    PPTEXT     20/47    38/08     38/42
T.PPID        47    PPTEXT     20/42
T.PPIP        50    PPTEXT     20/38
T.PPS1       154    PPTEXT     37/53
T.SLAB5       35    PPTEXT     45/19
WAIT2        233               20/35 L  38/48 S
WAIT2A       240               20/36    20/42 L
WAIT4        245               20/48 L  20/48 S   38/10     38/12     38/38
WAIT5        247               20/49 L
WAIT5A       251               20/50 L  38/38
WAIT6        253               20/40    20/53 L   20/54     21/11
WAIT7        267               21/06    21/10 L
W.CPCAF       70    PPTEXT     36/05
W.CPSTAT      24    PPTEXT     15/48    16/03
W.PPIR         0    PPTEXT     19/34    20/57     37/49     37/51     45/45
W.PPMES1       2    PPTEXT     37/51
W.PPOR         1    PPTEXT     19/34    20/57
W.RWPPCW       2    PPTEXT     26/08    30/48     31/55     32/20
W.STCPU        0    PPTEXT     33/29 S
W.STPFW        1    PPTEXT     31/40
W.STPMS        1    PPTEXT     31/43 S
XCHJPKG  110475                36/05 D  36/05
XLSEG0        22               27/11 D  27/12
XLSEG1        73               28/14 D  28/15
XOPTION        0               36/05 D
XVALUE         3               36/05 D
.LOC.       2000               27/39    38/37     41708 D   42/22
.LJM.        100               41/07 D
```

STUDY QUESTIONS

PPRES

1. Explain in general the functions of PPRES.
2. Which direct cells are forefixed at deadstart time?
3. What does it mean if a PP is idle, and what is it then really doing?
4. How does a PP make monitor requests, and how does a PP know its request is handled?
5. Which PPRES-routine decides whether a monitor request is for CPMTR or for PPMTR, how does he decide it, and explain what he will do then in either case.
6. How does a PP routine know whether an issued MXN or MAN instruction took effect?
7. A PP needs access to a control point field length. Explain what he has to do.
8. Why is it necessary to terminate access to the control point field length as soon and as often as possible?
9. How does a PP program end?
10. What happens if a PP places M.KILL in its PPOR, and how can we make this PP again available for the system?

STUDY QUESTIONS

PPRES

1. Explain in general the functions of PPRES. a group of utility functions
2. Which direct cells are forefixed at deadstart time? D. PPMESS
3. What does it mean if a PP is idle, and what is it then really doing? looking at its input register
4. How does a PP make monitor requests, and how does a PP know its request is handled? placing them in its output register
5. Which PPRES-routine decides whether a monitor request is for CPMTR or for PPMTR, how does he decide it, and explain what he will do then in either case.
6. How does a PP routine know whether an issued MXN or MAN instruction took effect?
7. A PP needs access to a control point field length. Explain what he has to do. Request access — R.RAFL
8. Why is it necessary to terminate access to the control point field length as soon and as often as possible? because of storage moves
9. How does a PP program end? M.DPP
10. What happens if a PP places M.KILL in its PPOR, and how can we make this PP again available for the system? stops system — typing in acknowledgement through DSD.

MONITOR FUNCTIONS

MONITOR FUNCTIONS

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section X

System Programmers Reference

TRAINING AIDS:

Visuals VALS-53-10-3 thru VALS-53-10-5, VALS-53-10-17

ASSIGNMENTS:

Study Questions Section X

OBJECTIVES:

(1) To define the SCOPE 3.4 System Monitor(s)

(2) To define methods for users to make requests of MTR or CPMTR

(3) To discuss specific MTR and CPMTR functions

(4) To discuss MTR and CPMTR request processing techniques (details)

MONITOR FUNCTIONS

Lesson Outline

X. MONITOR FUNCTIONS

A. Definition

- o CPMTR - Central Processor Monitor
- o MTR - Peripheral Processor Monitor

B. General Purposes of CRMTR

- o Process pool PP requests
- o Process RA+1 requests
- o Schedule CPU{s}

C. General Purpose of MTR

- o Control all system activities
- o Handles system-user communication

D. MTR - CPMTR Communication

- o Uses CMR Tables
- o Both do something - not look for something to do

E. Detailed Monitor Functions

- o CPMTR
- o MTR

F. Monitor Request Processing

- o PP to MTR
- o PP to CPMTR
- o User to MTR
- o User to CPMTR

MONITOR

SCOPE 3.4 is controlled by a monitor which is divided into two parts.

CPMTR - Central Processor Monitor

MTR - Peripheral Processor Monitor

The names of the two monitors are related to the residence of the code and do not indicate what they control.

CPMTR monitor, as the name implies, executes in the CP. It is responsible for three main functions:

1. Process certain pool PP output register requests.

2. Process user RA+1 requests.

3. Schedules CPU(s)

MTR, residing in PP0, is in general control of the SCOPE system. It runs continuously during system execution with this main functions:

1. Control and coordinate <u>all</u> system activities.

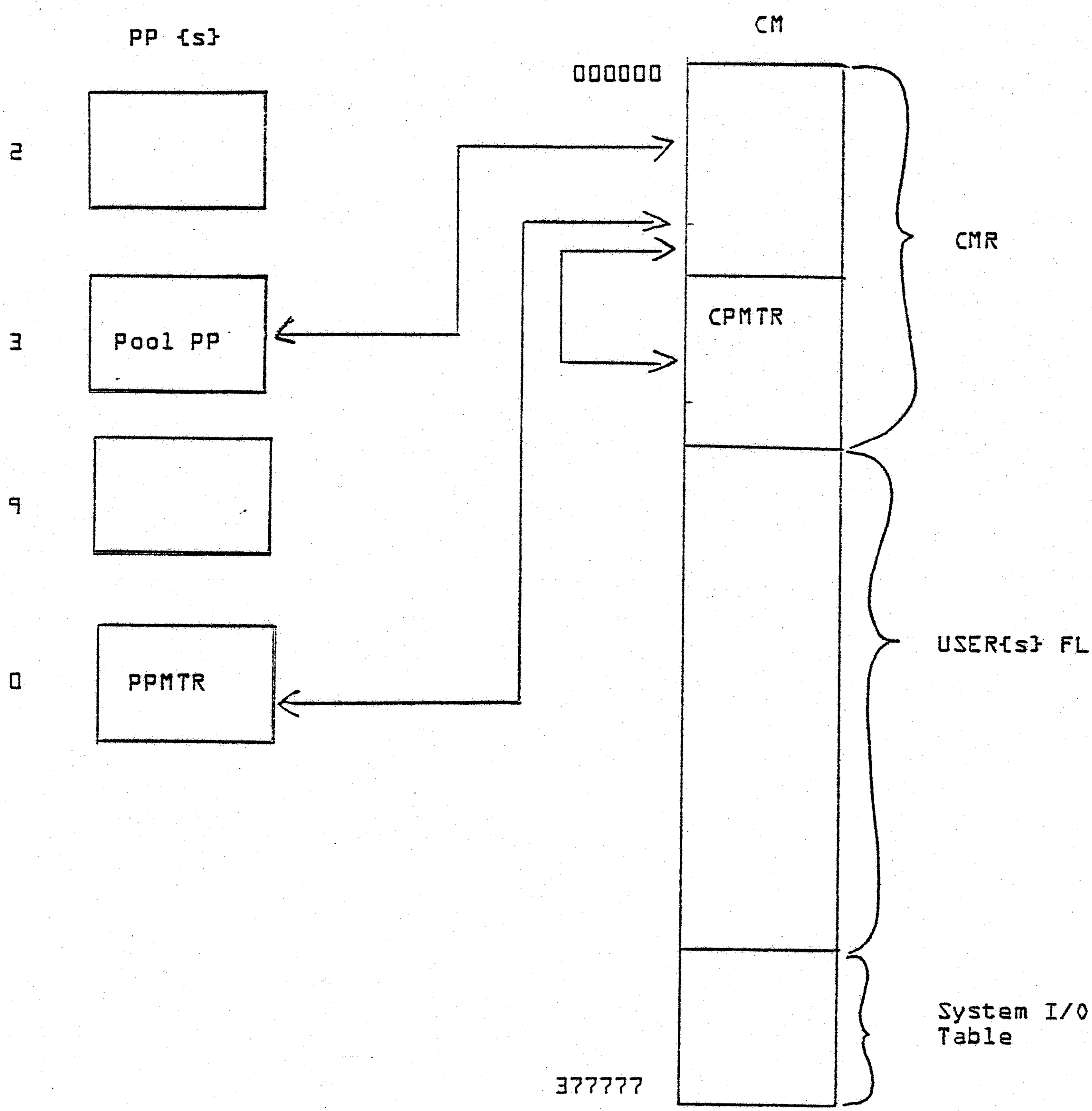
2. Maintain system clocks.

3. Assign system resources.

4. Handles system-user communications.

Users may make requests of either of these monitors in several ways. These will be discussed later in this section. A list of specific monitor functions follows:

TWO MONITORS



MONITOR FUNCTIONS

01	M.SEIST		Set CPU status bits
02	M.CLRST		Clear CPU status bits
03	M.RCP		Request central processor
04	M.DCP		Drop central processor
05	M.RCLCP		Recall central processor
06	M.ICE		Initiate central executive
	00	EX.CMSM	CM storage move
	01	EX.ECSM	ECS storage move
	02	EX.ECOVL	ECS overlay load
	03	EX.SPM	Call stack processor manager
	05	EX.SCH	Call scheduler
	06	EX.SCHI	Call scheduler
	07	EX.REQEB	Request ECS buffer
	10	EX.RELEB	Release ECS buffer
	11	EX.REQSB	Request system buffer
	12	EX.RELSB	Release system buffer
	13	EX.MVIN	Move data to ECS from system buffer
	14	EX.MVOUT	Move data from ECS to system buffer
	15	EX.FLHB	Flush buffer
	16	EX.CSWAP	Clean ECS after ECS RPE in swap file
	17	EX.AUTEB	Terminate automatic allocation
	20	EX.ECD	Display ECS
	21	EX.ECR	Release display
	22	EX.ECW	Modify ECS
	23	EX.CEM	Clear CEM-working flag
	24	EX.DDPER	Process DDP overlay loading error
	25	EX.ECLDV	Make successive partial reads of ECS record
07	M.CPUST		Change CPU status {IP.MCPU = 1}
10	M.SLICE		MTR interrupts CPMTR at end of time slice for job
12	M.RCH		Reverse channel
13	M.DFM		Dayfile message
15	M.STEP		Enter step mode
16	M.RBTSTO		Request RBT storage
17	M.RSTOR		Request storage
20	M.TSR		Terminate storage request {IP.RTMTR = 0}
21	M.DPP		Drop PP
22	M.ABORT		Abort control point and drop PP
25	M.SEQ		Assign job sequence number
26	M.SEF		Set error flag
27	M.ISP		Initiate stack processor
30	M.SPRCL		Stack processor recall
31	M.CCPA		Change control point assignment
32	M.RPJ		Request peripheral job
33	M.EES		Enter event stack
34	M.CPJ		Capture peripheral job
35	M.SCH		Initiate integrated scheduler
36	M.PASS		MTR ignores it-to be cleared by another routine
37	M.RACT		Request control point activity
41	M.NTIME		Enter new time limit
42	M.NOTE		Null function-cleared immediately by PPMTR
43	M.PRCH		Request channel surveillance
44	M.BUFPTR		Buffer pointer address
45	M.PATCH		Enter a patch into MTR
46	M.TRACE		Turn on MTR trace
47	M.SLPER		XJ other CPU
77	M.KILL		Issues bad monitor request

Detailed CPMTR Functions

M.CLRST - Clear Status
{0002,BBBB,xxxx,xxxx,00NN}

Where:

BBBB = pattern of bits to be cleared.

NN = control point number (only if MTR output register)

Called to clear CPU status bits in control point areas. Will cause linkage or delinkage from chain of control points actively waiting for CPU.

M.CPUST - Change CPU Status
{0007,xxxX,xxxx,xxxx,xxxx}

Option 1 — X = 0. If either CPU is off, it is returned to the on status. This does not affect a CPU that was locked off at deadstart load time.

Option 2 — X = 1 or 2. CPU X is turned off. If any control point was dedicated to this CPU, it will not execute during the period the CPU is off; job returns to CPU when CPU is turned on again.

SCOPE 3.4

M.DCP - Drop Central Processor
{0004,****,****,****,00NN}

NN = Control point number {MTR only}.

Execution of the central processor job at the control point is stopped. The control point status bit C, D, W, X, and Y are cleared. The control point is removed from the active control point ring.

The control point status bits prior to M.DCP are returned to byte 1 of the output register of the requesting PPU.

M.ICE - Initiate Central Execution
{0006,PPPP,PPPP,PPPP,IIII}

The parameter IIII identifies a central memory program which will be started by CPMTR upon recognition of this request. Some of these programs run in user mode and some in monitor mode. Only one user mode program may be initiated at any time. A user mode program though, may be interrupted by the execution of a monitor mode function.

All programs initiated by an M.ICE operate with RA=0 and a large enough field length to allow access to the entire central memory and ECS.

The parameters passed in the center three bytes are interpreted differently by each of the central executive programs.

*	0	CM storage move
*	1	ECS storage move
	2	Load ECS resident overlay
	3	Stack Processor manager
	4	Unused
*	5	Scheduler
*	6	Scheduler {Storage Request Entry}
	7	Request ECS buffer
	10	Release ECS buffer
	11	Request system buffer
	12	Release system buffer
	13	RMS-ECS move
	14	ECS-RMS move
	15	Flush ECS buffer
	16	Clean ECS after ECS RPE in swap file
	17	Terminate automatic allocation
	20	Display ECS
	21	Release display
	22	Modify ECS
	23	Clear CEM working flag
	24	ECS transfer through DDP failure; try RMS
	25	Enable successful partial reads of ECS records

* Executes in User Mode

SCOPE 3.4

M.RCH - Request Channel
(0012,BBAA,DDCC,xxxx,RRRR)

AA = first choice channel number
BB = second choice channel number
CC = third choice channel number
DD = fourth choice channel number

RRRR = 0000   Request immediate reply
RRRR ≠ 0000   No reply until a requested channel has been reserved.

When channel zero is requested, it must be field AA. When BB, CC, or DD is zero it is assumed that this is not a channel request and that there are no alternate choices beyond it.

If none of the requested channels are available and an immediate reply is requested, MTR will set bytes 0 and 4 of the PPU output register to zero.

When a channel is granted, the number of that channel will be reutrned in the PPU output register byte 1 (location of AA). Byte 4 will be set to a non-zero value.

On exit, if a channel has been reserved, the output register will look like: 0000 XXXX xxxx xxxx YYYY

Where:

XXXX = channel number
YYYY = PP input register address

If the CEJ/MEJ feature is not in use, this function is performed by MTR.

M.RCLCP - Recall Central Processor
(0005,FFFF,xxxx,xxxx,00NN)

Where:

FFFF = Control point address of CPU if pre-emption is to take place, or address plus 1 to flag I/O in process.

NN = Control point number (MTR only).

This request has two forms:

1. If bit zero of FFFF is not set this function is used to remove a control point from recall status. The X and Y status bits are cleared. If the resulting status permits, the control point is linked into the ring of jobs waiting for the CPU. If FFFF contains the control point address, the CPU is assigned to the job immediately.

2. If bit zero of FFFF is set, this is a function issued by MTR when the value of a buffer pointer has changed while the job is in the active CPU ring but is not currently running. The effect is to schedule the job immediately.

M.RCP - Request Central Processor
{0003,XXXX,XXXX,XXXX,00NN}

Where:

NN = control point number (MTR only)

This request is synonymous with an M.SETST to set the W status, except that the pre-emption flag is set.

M.SETST - Set Status
{0001,BBBB,XXXX,XXXX,00NN}

Where:

BBBB = pattern of bits to be set

NN = control point number (only if MTR output register)

Called to set CPU status in control point area. Will cause linking or delinking when appropriate.

M.SLICE - Terminate Slice Period
{0010,XXXX,XXXX,XXXX,XXXX}

Only MTR can issue this function. It is issued to interrupt an executing user mode program so that CPMTR can reschedule.

MTR

SCOPE 3.4

Detailed MTR Functions

PP Monitor Functions

*	13	M.DFM	Issue dayfile message
*	15	M.STEP	Enter STEP mode
*	16	M.RBTSTO	Request RBT storage
*	17	M.RSTOR	Request storage
**	20	M.TSR	Terminate storage request
*	21	M.DPP	Drop PP
*	22	M.ABORT	Abort control point and drop PP
*	25	M.SEQ	Assign job sequence number
*	26	M.SEF	Set error flag
*	27	M.ISP	Initiate Stack Processor
*	30	M.SPRCL	Stack Processor Recall
*	31	M.CCPA	Change control point assignment
*	32	M.RPJ	Request peripheral job
**	33	M.EES	Enter event stack
**	34	M.CPJ	Capture peripheral job
**	35	M.SCH	Initiate Integrated Scheduler
**	36	M.PASS	To be cleared by another routine
*	37	M.RACT	Request control point activity
*	41	M.NTIME	Enter new time limit
**	42	M.NOTE	Null function, cleared immediately Used as break point.
**	43	M.PPCH	Request channel surveilance by PP
**	44	M.BUFPTR	Buffer pointer address
**	45	M.PATCH	Enter a patch into MTR
**	46	M.TRACE	Turn on MTR TRACE
**	47	M.SLPER	XJ to other CPU
**	77	M.KILL	Bad MONITOR request made

* New function code for SCOPE 3.4

** New function for SCOPE 3.4

Function 23 (M.REQP) and 24 (M.DEQP) have been deleted because they were used so infrequently that their space (approximately 100 bytes in MTR) could not be justified. Any routines using these functions should be modified accordingly. This implies requesting CH.EST and searching the EST or the equipment needed. When the equipment is found, a check must be made for a control point number in the entry. If a control point number is present, the equipment is reserved; therefore drop the channel and try again later. If there is no control point number, the equipment is free and may be reserved by writing the requesting program's control point into the EST entry.

A complete description of the contents of the output register and function parameters for each of the above requests follows. Those bits or bytes irrelevant to the function are denoted by asterics (*). Functions are in alphabetical order.

M.ABORT - Abort Control Point and Drop PP
{0022,****,****,****,****}

The job associated with the requesting PP is terminated. The requesting processor is responsible for an explanation message in the dayfile. The operation of this function is identical with function M.DPP except that the error flag in the control point area is set to F.ERPP {3} to note the abort function.

M.BUFPTR - Address of Buffer Pointer Word
{0044,****,****,00AA,AAAA}

AAAAAA = Buffer Pointer Address

The address is absolute; the I/O driver has set the field access flag. The function is not cleared by MTR but by the I/O driver itself. When the low order 12 bits of the buffer pointer changes, MTR restarts the associated control point.

M.CCPA - Change Control Point Assignment
{0031,****,****,****,**NN}

The requesting PPU is released from its current control point assignment in the same manner as if it had issued an M.DPP function, but its input register is not cleared. The PPU is then assigned to control point NN with the new control point number inserted in its input register. The calling program must change the control point address at D.CPAD and rewrite the PP status word.

M.CPJ - Capture Peripheral Jobs
{0034,00XX,XXXX,****,****}

XXXXXX = Address relative to RA of the buffer where captured job data is to be placed.

Issued to find a job either in the event stack or in the PP delay stack for a control point. First the event stack is searched, then the delay stack. If a job is found, its data is written to a buffer specified in the call. When the end of the delay stack is reached, an exit is made.

M.DFM - Process Dayfile Message
{0013,FFFF,MMMM,****,****}

Where:

FFFF = Dayfile flag bits

MMMM = LWA+1 of message {MMMM PPOR}

= Dayfile dump index {MMMM PPOR}

The dayfile flag bits, when set, determine the following message handling {bits 0-5 set by the calling PP; bits 6-8 by MTR}:

Bit 0	Do not send to B display
1	Do not send to the control point dayfile
2	Do not send to system dayfile (no A display)
3	Flag as an accounting message
4	Send to hardware error file
5	Do not insert the job name in system dayfile

The possible value of the dayfile dump index is:

0	For a system dayfile dump
1 thru N.CP	For a control point dayfile dump
N.CP+1	For a hardware error file dump

M.DDP - Drop PP
(0021,****,****,****,****)

MTR clears the PP control point assignment (the PP status word and PP input register are cleared.)

M.EES - Enter Event Stack
(0040,00AA,AAAA,****,SYTT)

Where:

AAAAAA = Word address of Event Status

Y = Byte address in word

TT = Bit address in byte

S = F+B

F.ESOFF	0000	F=0	Assign when bit = 0
F.ESON	4000	F=4	Assign when bit = 1
F.ESABS	0000	B=0	AAAAAA is an absolute address
F.ESREL	1000	B=1	Relative to RA
F.ESCPA	2000	B=2	Control point address

The event stack is similar to the delay stack and is used by the Scheduler. This function writes to the peripheral job table, the PP input register and three parameter words. It then sets up the control point number and linkages in the event stack. The new entry is linked to the oldest prior entry. Now it clears the output register and exists. A separate queue is maintained for each control point.

MTR

SCOPE 3.4

M.ISP - Initiate Stack Processor
{0027,000X,****,****,CCCC}

Where:

X = 0 Initiate 1SS only if PP active flag = 0

≠ 0 Initiate 1SS whether PP active flag is set or not

CCCC = DST ordinal

A check is made to see if a PP is already assigned to this DST ordinal. If no, check for available PP and if one is available, proceed to either set the PP active flag or not and then store the DST ordinal and "1SS" in the input register. If a PP was assigned to the DST ordinal initially, check if 1SS should be initiated anyway. If no, clear the output register and exit. If yes, proceed as above if a PP is available or reserved. Exit if PP job queue is full. After the input register has been set up in the available PP the message buffers are cleared and the 1SP count updated. Check for a previously assigned 1SP. If no, get pointer to PP reserved when no 1SP is assigned. Push down the available PP chain. Whether another 1SP was assigned or not, if no PP is available, make an entry into the peripheral job table, identify it as a stack processor and push down the stack placing 1SP on top. Then, update the PPQ count and exit clearing the output register. If after 1SP assignment check there was a PP available assign 1SP to control point zero, set the 1SP flag for PP status and job queue and exit, clearing the output register.

M.NOTE - Null Function
{0042,****,****,****,****}

This function is for use in debugging PP programs. It may be used as a breakpoint. M.NOTE is cleared by MTR.

M.NTIME - Enter New Time Limit
{0041,TTTT,T***,****,**NN}

A central processor job time limit of TTTTT seconds is entered at the control point. Any previous time limit is superceded. If the requesting PPU is assigned to control point zero, the parameter NN will give the number of the control point to be considered; in any other case this parameter is irrelevant.

M.PASS - MTR PASS
{0036,****,****,****,****}

Indicates a no operation by MTR and it will be cleared by another routine.

MTR

SCOPE 3.4

M.PATCH - Enter Patch into MTR
{0045,AAAA,BBBB,CCCC,DDDD}

Where:

AAAA = address for BBBB

CCCC = address for DDDD

Simply inserts patch at address indicated. May be used by an operator during debugging of MTR.

M.PPCH - Request Channel Surveilance by PP MTR
{0043,BBAA,DDCC,****,RRRR}

AA = First choice channel number
BB = Second choice channel number
CC = Third choice channel number
DD = Fourth choice channel number
RRRR = 0 reply immediately ≠ 0 reply after reservation

This function is part of the RCH routine. M.RCH is a CP monitor function. If CP monitor requests a channel and the request is rejected, the M.RCH function is changed to M.PPCH, in order that MTR can keep a surveilance of the channels until the requested channel is free. MTR will update the channel reject history and when the requested channel is available, MTR will change the M.PPCH to M.RCH and initiate CP monitor.

M.RACT - Request Control Point Activity
{0037,**NN,IIII,****,****}

This request allows a PPU to know the various activity counts of control point NN at a given time {NN cannot be zero}. If the parameter IIII is non-zero, the pseudo-activity count will be incremented or decremented by the constant IIII {after sign extension}. The reply of monitor is made via the PPU output register:

Byte 1 control point status {C.CPSTAT}

2 control point activity {general activity} count

3 PP delay count

4 pseudo-activity count

M.RBTSTO - Request RBT Storage
{0016,SSSS,****,****,****}

MTR sets SSSS*1008 as the new RBT starting address.

SCOPE
3.4

M.SCH - Initiate Integrated Scheduler
{0033,000X,****,****,****}

Where:

X = 2   places {0000,0R1=0R4} in stack ELSE initiate Scheduler immediately.

If X≠2, call the Scheduler, clear the output register and exit. Otherwise, check if Request Stack is full and if yes, call the Scheduler to empty it before making stack entry. If stack is not full, make entry. In either case, advance the request stack pointer.

M.SEF - Set Error Flag
{0026,**NN,EEEE,****,****}

Monitor will drop the central program at control point NN and set the error flag to the value EEEE.

M.SEQ - Assign Job Sequence Number
{0025,****,****,****,****}

Monitor returns in byte 1 of the PPU output register a job sequence number {in display code}.

M.SLPER - Initiate CPMTR in Other CPU
{0047,****,****,****,****}

M.SLPER is issued to initiate CPMTR in the other CPU. CPMTR itself will check and issue the function if the other CPU should be executing.

M.SPRCL - Stack Processor Recall
{0030,00SS,AAAA,000F,CCCC}

This function is called with F non-zero when a stack request has been completed to update the exit count of that control point {CPSR}, and to update the I/O channel time information {if IOTIME mods are assembled on} using SS*AAAA which is the disk factor {SS=millisecond/PRV*4}*PRV count {AAAA}. If F is zero, then only the I/O channel time information is updated. CCCC is the control point area address.

M.STEP - Monitor Step Control
{0015,****,****,****,**NN}

This control is initiated by a keyboard request. MTR sets an internal step control flag and at each subsequent request MTR pauses for console keyboard input. A space from the keyboard causes MTR to process the request. A period from the keyboard causes MTR to process the request and clear the step control flag to resume high speed operation. If NN = 0, all PPU requests are stepped. If

MTR

√ SCOPE 3.4

NN is non-zero, control point NN is the only one to be placed in step mode; only the requests issued by the PPU's assigned to control point N will be stepped.

M.TRACE - Trace Output Registers
(0046,AAAA,FFFF,NNNN,****)

Where:

AAAA = Absolute address of buffer/100B (typically within job's field length)

FFFF = Field length of buffer/100B

NNNN = Number of next word pair in buffer.

This is a function reserved for CDC development. A buffer is defined for MTR to dump its trace of the monitor functions issued by other PPs. A trace record consists of a two word entry contain function and PP status information.

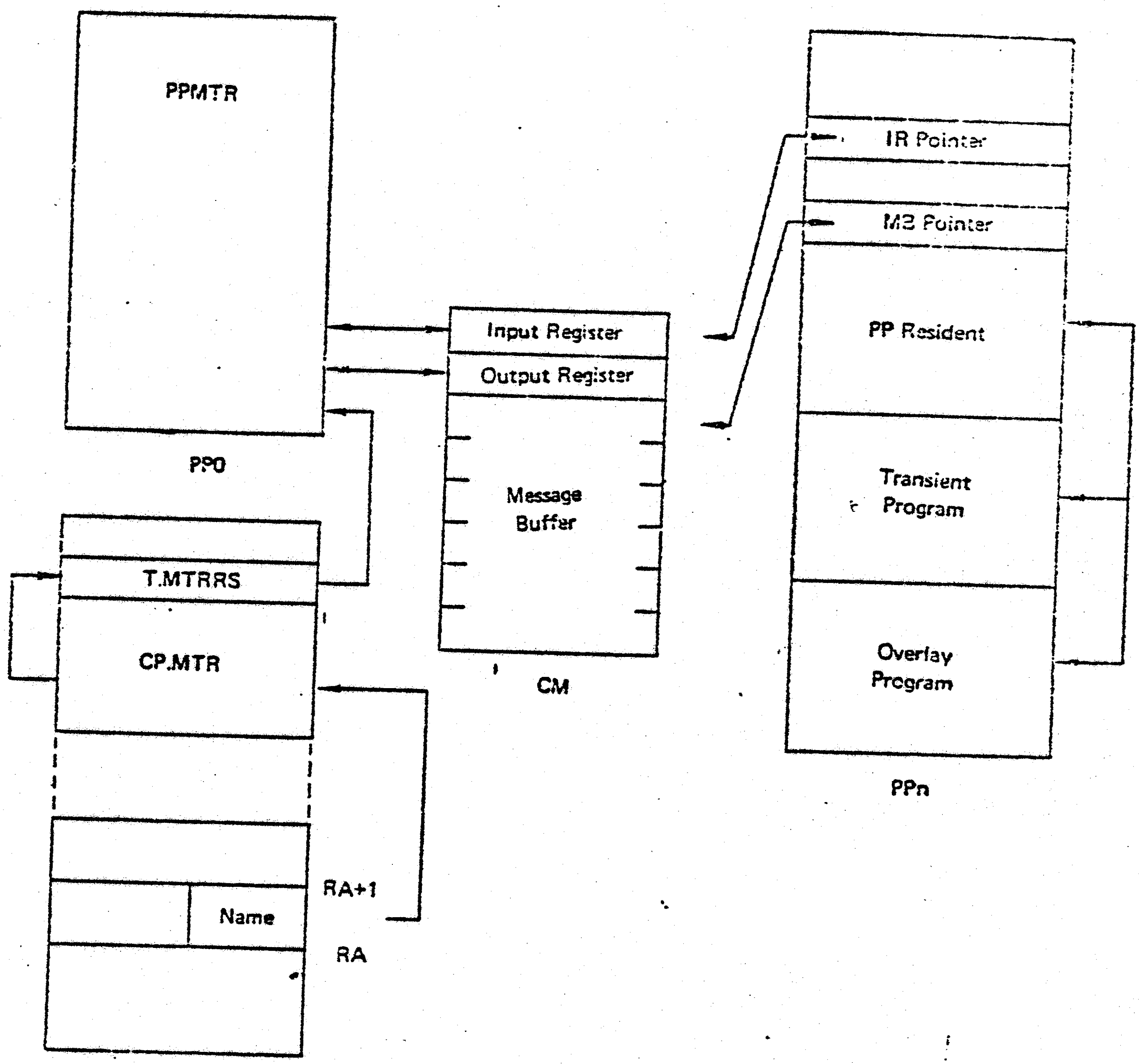
M.TSR - Terminate Storage Request
(0020,****,****,****,****)

DSD issues this function when the operator types DIRABT. This function clears the SMABT flag to zero.

This causes the rejection of an M.RSTOR function that is hung up because a control point will not allow itself to be moved.

SCOPE 3.4

Monitor Request Processing



STUDY QUESTIONS

Monitor Functions - Section X

1. The SCOPE Operating System is controlled by a monitor named ______________________ whose residence is in ____________________.

2. Monitor functions are assigned order codes. These order codes have nothing to do with which monitor will perform the function.

   (a) true

   (b) false

3. Some monitor functions codes have multiple sub-functions.

   (a) true

   (b) false

4. What does the monitor function code M.ICE do?

5. Some monitor functions cause no action at all.

   (a) true

   (b) false

6. The monitor function M.KILL causes ______________________________.

7. Some monitor functions will reply to the requesting PP immediately, others may be delayed.

   (a) true

   (b) false

8. Some monitor functions may only be issued by MTR.

   (a) true

   (b) false

9. A new time limit for a job may be effected by issuing the ________________________ monitor function.

10. A PP programmer may issue a request of MTR by _________________________.

11. A CP programmer may issue a request of MTR by ________________________.

STUDY QUESTIONS

Monitor Functions - Section X

1. The SCOPE Operating System is controlled by a monitor named MTR whose residence is in PPO.

2. Monitor functions are assigned order codes. These order codes have nothing to do with which monitor will perform the function.

   {a} true
   {b} false

3. Some monitor functions codes have multiple sub-functions.

   {a} true
   {b} false

4. What does the monitor function code M.ICE do? Initiate Central Executive Routine(s)

5. Some monitor functions cause no action at all.

   {a} true
   {b} false

6. The monitor function M.KILL causes the system to "crash".

7. Some monitor functions will reply to the requesting PP immediately, others may be delayed.

   {a} true
   {b} false

8. Some monitor functions may only be issued by MTR.

   {a} true
   {b} false

9. A new time limit for a job may be effected by issuing the M.NTIME monitor function.

10. A PP programmer may issue a request of MTR by using R.MTR.

11. A CP programmer may issue a request of MTR by using RA+1.

EXTERNAL INPUT/OUTPUT

EXTERNAL INPUT/OUTPUT

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section XI

TRAINING AIDS:

Visuals VALS-53-11-4 thru VALS-53-11-7, VALS-53-11-9 thru VALS-53-11-17, VALS-53-11-23, VALS-53-11-26

ASSIGNMENTS:

Study Questions Section XI

OBJECTIVES:

(1) To present the external I/O hardware used by the CYBER computers.

(2) To introduce the methods used by system I/O drivers in performing I/O.

(3) To present enough details on external I/O to allow coding of a simple PP program which will input some data from a peripheral device.

EXTERNAL INPUT/OUTPUT

Lesson Outline

XI. EXTERNAL INPUT/OUTPUT

A. Channel Hardware Concepts
- o Connecting device
- o Two way 12 lane path
- o Two traffic control flags
- o CYBER DATA CHANNEL - Graphic

B. Two Types I/O Devices
- o Designed especially for CYBER
- o Designed oridignally for 3000

C. Channel Communication
- o SELECT
- o CONNECT
- o FUNCTION
- o Function Code Format Example

D. How Data Input Works

E. How Data Output Works

F. How Status Request Works

G. Channel Characteristics
- o Any PP may read/write any channel
- o May be "hung"
- o May be used for PP-PP communication
- o 12-bit bi-directional

H. Channel Input/Output PP Instructions

I. Modes of Function Codes
- o Mode I
- o Mode II

J. Programming the PP for I/O
- o Mode I function codes
- o Flow Chart
- o Instruction Codes

K. Channel I/O Preparation/Termination

- o Using R.RCH request
- o Using R.MTR request
- o Using immediate reply requests
- o Using alternate requests
- o How to drop a channel

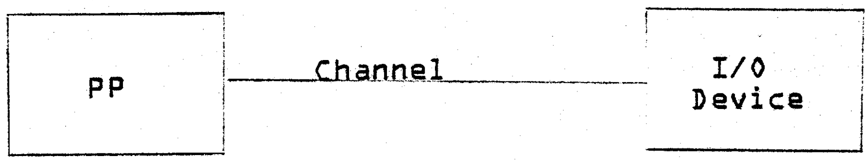
L. SCOPE Input/Output Software Subsystems

- o CP.CIO
- o CP.SPM
- o OV.CIO
- o 1SS - 1SP {Disk}
- o I/O drives {tape}

M. PP to PP Communication over channel

EXTERNAL INPUT/OUTPUT

All input/ourput operations of the CYBER product lines is handled by peripheral processors. These peripheral processors {PPs} are connected to input/output devices by channels as shown in the following diagram.

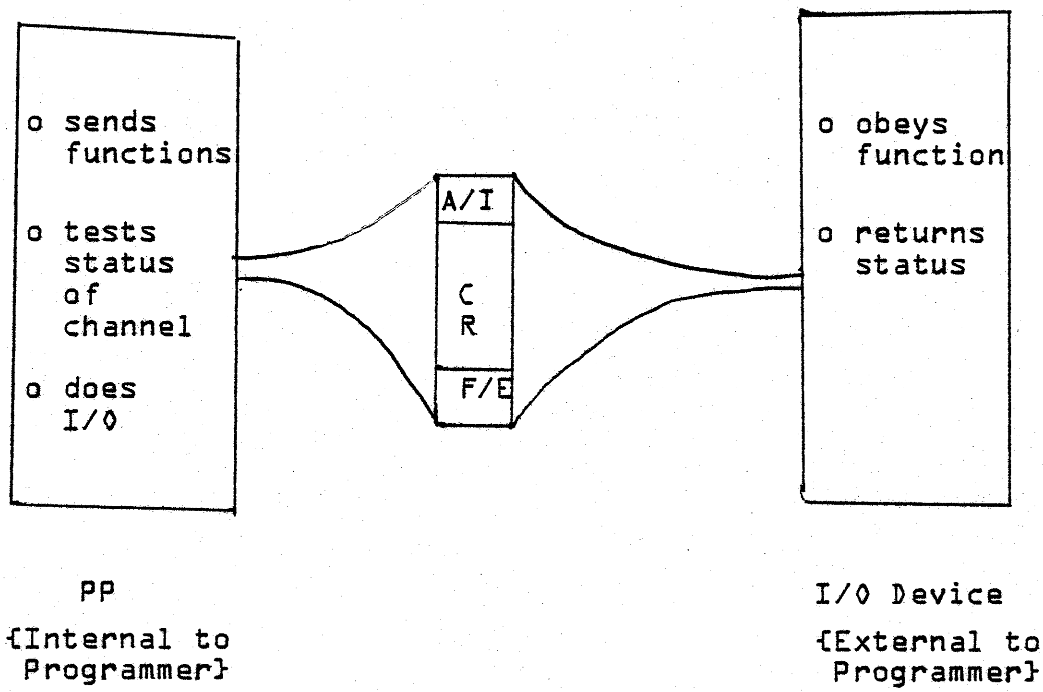


Input/output operations are performed using special communication codes between PP and I/O devices.

The Channel Hardware

The channel hardware may be thought of as a two way path between an Input/Output device and a PP. This path has twelve lanes {bits} for data or control function traffic. In addition there are two traffic control devices {flags}. This concept may be represented as follows;

CYBER DATA CHANNEL



A/I - Active/Inactive Flag
set by PP only
cleared by PP or I/O Device

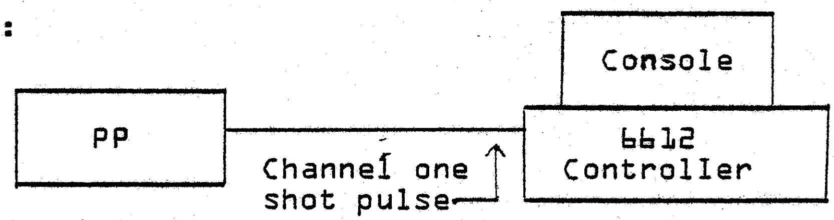
CR - 12-bit bidirectional channel register
holds function codes or data

F/E - Full/Empty Flag
set by PP or I/O Device
cleared by PP or I/O Device

TWO TYPES OF I/O DEVICES

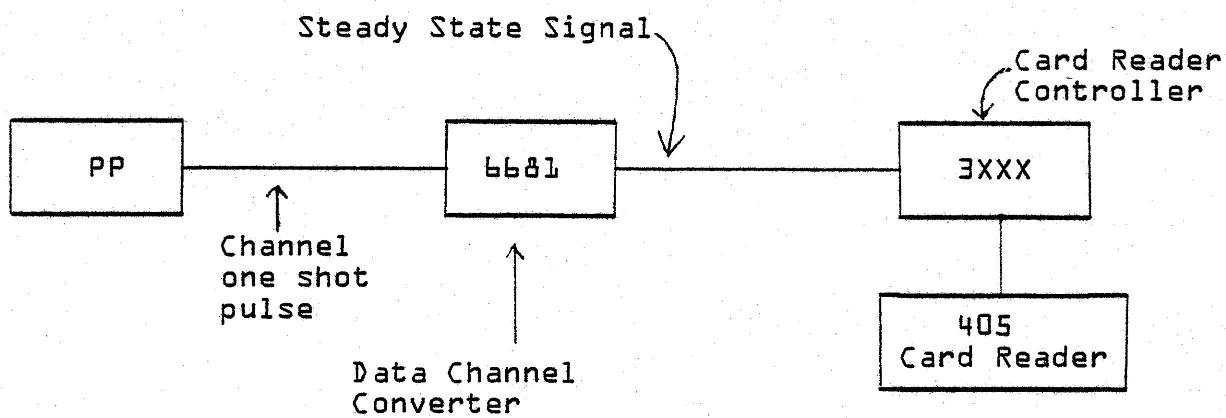
1. Designed especially for the CYBER/6000 mainframes. These use a one-shot pulse technique.

Example:



2. Designed originally for lower 3000 series computers, but used on CYBER/6000 mainframes. These require a converter (syncronizer) to convert the one shot pulse into a static (steady state) signal.

Example:



Channel Communications

Communication with an Input/Output device over a channel uses one or more of three basic actions. These actions are:

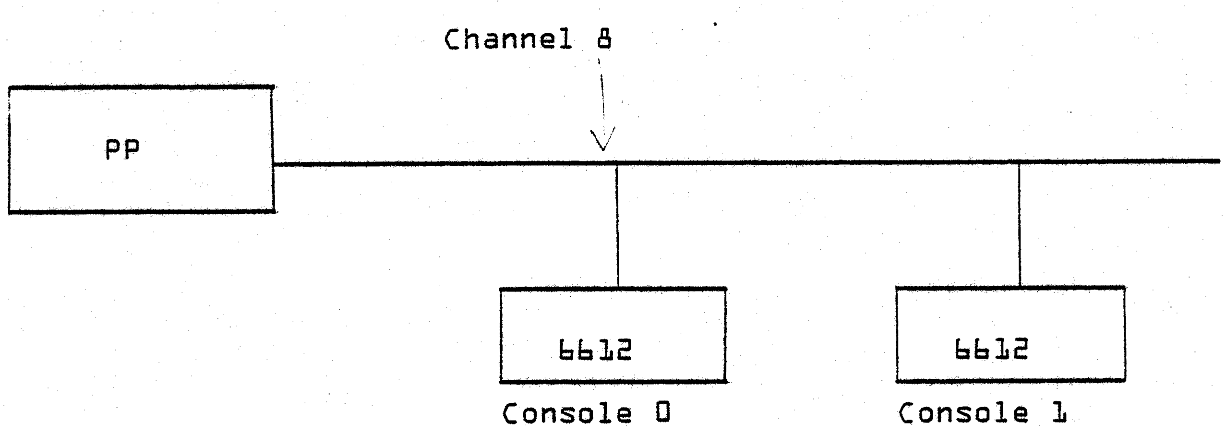
1. SELECT - This will select one of multiple data channel converters (6681's) on the same channel.

2. CONNECT - This will connect one of multiple I/O controllers on the same channel converter (6681).

3. FUNCTION - This will direct the connected I/O device to take some specific action.

All three of these actions are defined by codes which are referred to by the generic term function code. The codes are, however, very specific for the action desired. The function codes vary in format and in the number of functions required to perform an I/O operation. Each I/O device controller has a unique function code format. The function code format is XXXX or four octal digits.

Example: Select, connect and function console 0 of two consoles on the same channel of a CYBER for keyboard input.



The select, connect and function may be accomplished in one function code.

The format of the function code is:

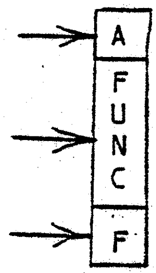
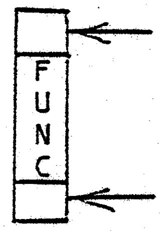
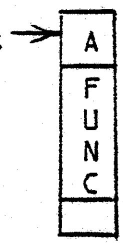
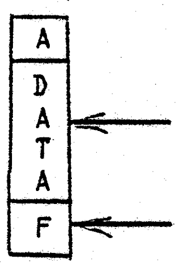
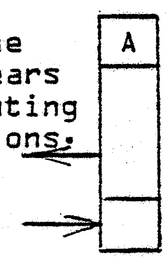
Select Equip.	Console Tube	Mode	Char Size

Specifically the function code to do the input in the example is

7020 (octal)

Actual communication with an Input/Output device requires a series of function code PP Instructions intermixed with other channel instruction in the PP. There are instructions for testing the condition of a data channel, activating or deactivating and inputing or outputing on a data channel.

How Data Input Works

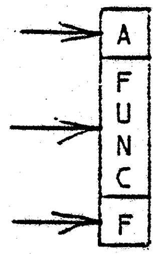
	PP	Channel	I/O Device
1.	Selects an I/O device - be executing a function instruction EAN or FCN with the function code. Note: The function code FUNC must specify the I/O device + input mode.		
2.			Responds to select code by clearing the Active and Full Flags (this says I am selected)
3.	Requests that data be sent (input) by setting the Active Flag using the ACN instruction.		
4.			Responds by getting input from device storage and placing it in the channel register and turning on the Full flag.
5.	Removed the data from the channel register and clears the full flag - by executing the IAN or IAM instructions.		

Note: Steps 3, 4 and 5 are repeated until one of the following conditions exist.

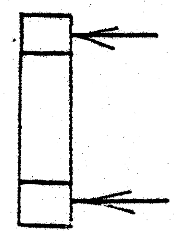
HOW DATA OUTPUT WORKS

PP	Channel	I/O Device

1. Selects an I/O device by executing a FAN or FCN

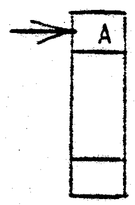


Note: The function code must specify the I/O device + output mode

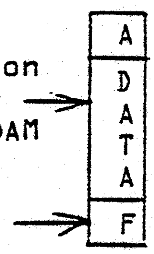


2. Responds to select by clearing the active and full flags

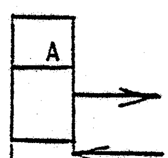
3 Alerts the I/O device by setting the active flag with a ACN



4. Sends the data to I/O Device by putting data on channel and setting the full flag with IAM or OAM

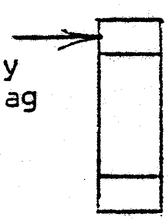


5. Accepts the data and clears the empty flag

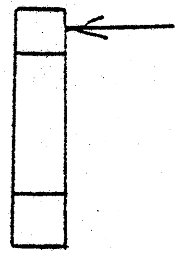


Note: Steps 3, 4, and 5 are repeated until all the data has been transmitted.

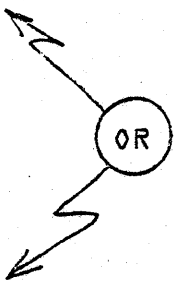
6. Deactivities channel by clearing the active flag with DCN instruction



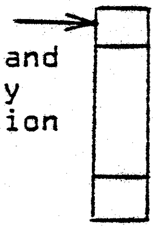
6\.



Encounters an EOR and clears the Active Flag.



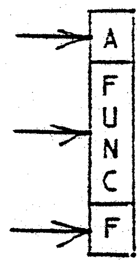
7\. Inputs the desired data and clears the Active Flag by executing a DCN instruction



HOW STATUS REQUEST WORKS

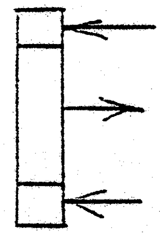
PP	Channel	I/O Device

1. Sends a select request to I/O device by executing a FAN or FCN



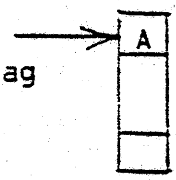
Note: The function code must specify the I/O device + status mode.

2.

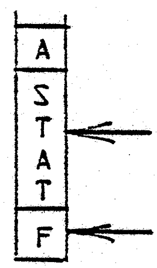


Responds to select by clearing the active and full flags

3. Request a status by setting the active flag with an ACN

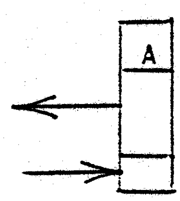


4.

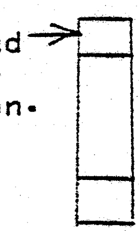


Responds to status request by putting status on the channel and setting the full flag.

5. Inputs status from channel and clears the full flag by executing an IAN



6. Deactivities channel and clears active - by executing a DCN instruction.



CHANNEL CHARACTERISTICS

- o Any PP may read/write any channel
- o Composed of a 12-bit bi-directional register + two flags.
- o The communication language is composed of function codes and status replies.
- o May be "hung" by using wrong code sequences.
- o Has no hardware interlock to prevent undisciplined usage.
- o May be used for communication between two PP's.

INPUT / OUTPUT INSTRUCTIONS

AJM
TJM
} check CHANNEL ACTIVE flag

FJM
EJM
} check CHANNEL FULL flag

ACN * activate channel

DCN * deactivate channel

FNC * send function code

FAN * send function from A

IAN * input a word to A

IAM ** input a block to PP memory

OAN * output a word from A

OAM ** output a block from PP memory

* THESE INSTRUCTIONS CAN HANG THE PP
**THESE INSTRUCTIONS CAN BE A NOP

Modes of Function Codes

Some Input/Output devices require function codes of more than nine bits. This coupled with the length of the equipment identifier (6 bits) require a total function code of greater than twelve bits. This forces the programmer to use two function commands, where one command would have ordinarly been used. To allow function codes of 12 bits to be passed to the Input/Output devices, a special format of funtion codes was developed. To distinguish between the normal function code format and the extended function code format, a mode designation was used. The mode disignations along with their formats are:

Mode I

This function code format is used when the Input/Output device requires only 9 bits of function data. The format is:

Equip. No.	Function	
11	8	0

Mode II

This function code format is used when the Input/Output device requires the full 12 bits allowed in the function data. The format is:

Function	
11	0

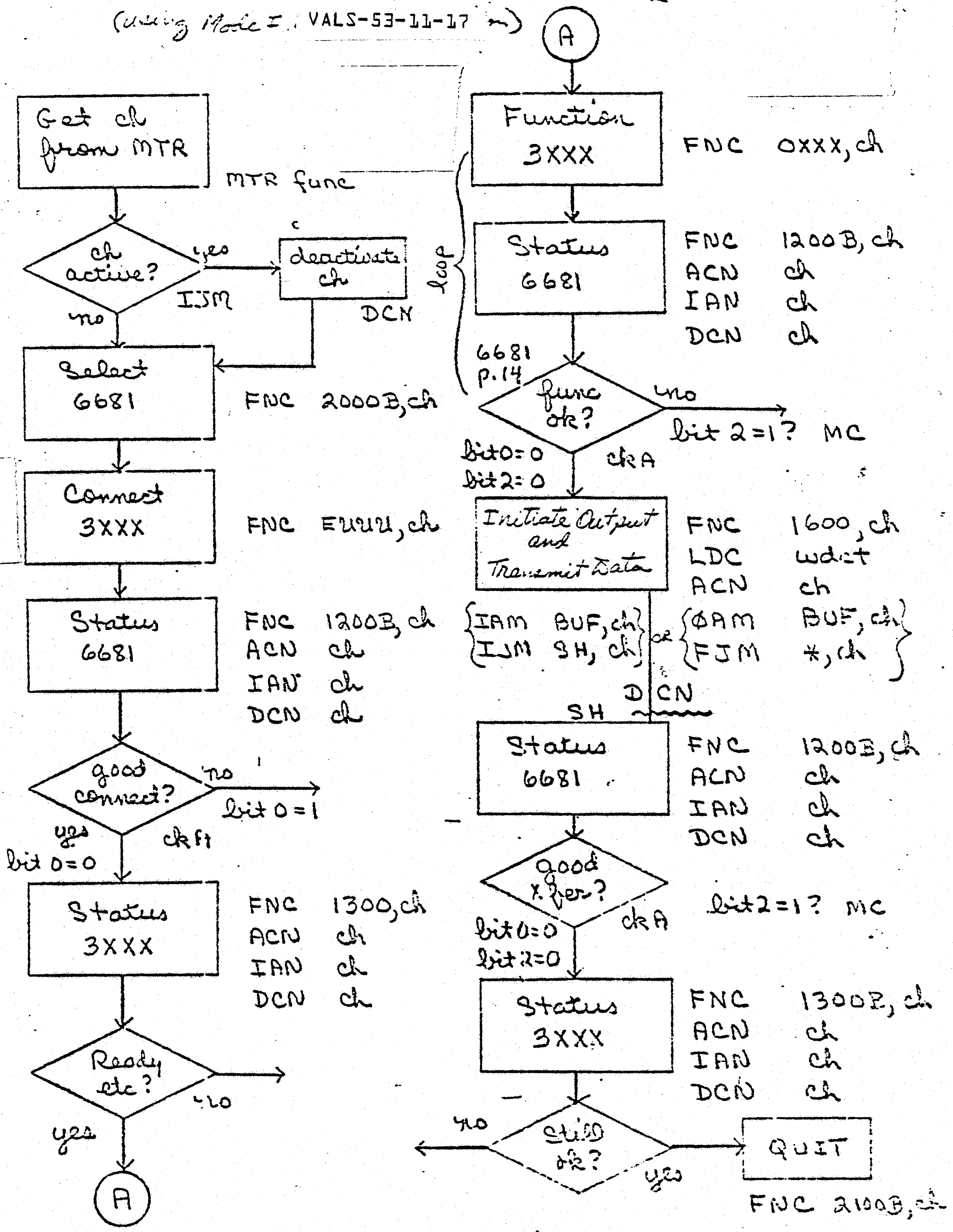
These two modes of function codes are distinguished by the high order (leftmost) octal digit. The Mode I function code may contain an equipment number from 4 thru 7. Other octal digits in the equipment no. position are used in the mode II function. Some differences in the mode I and mode II function codes are illustrated below.

Differences Between Mode I and II

Mode II	Conn			Mode I	Conn
Initiate Conn		FNC	1000,Ch.	FNC	4,000,Ch
Output Conn Code		LDC	EUUU ie 1001		
		ACN	ch.		
		OAN	ch.		
		FJM	*,ch		
		DCN	ch		

Mode II	Func			Mode I	Func
Initiate Func		FNC	1100,ch	Func	0XXX,ch
Output Func Code		LDC	XXXX,ch ie 5000		
		ACN	ch		
		OAN	ch		
		FJM	*,ch		
		DCN	ch		

PROGRAMMING THE PERIPHERAL
(using Mode I, VALS-53-11-17 ...)



1. Code Example (MTR has assigned channel 5)

```
        ~
        IJM     *+3, 5   ch
        DCN     5
        LDC     2000B
        FAN     5
        FNC     6003B, 5
        FNC     1200B, 5
        ACN     5
        IAN     5
        DCN     5
        LPN     7
        ZJN     ØK
        STD     2
        LPN     1
        NJN     EREJ
        LDD     2
        LPN     2
        NJN     IREJ
        LDD     2
        LPN     4
        NJN     PREJ
        ~

ØK
        ~
```

a. what does the code do? Write the comment lines

b. comment on the logic.

2. How to Request a Channel

```
LDN   0
STD   D.T2
LDC   0506B
RJM   R.RCH
```

a. What is the first choice channel? ____________

b. Where will the assigned channel number be found? ____________

3. Another Way to Request a Channel:

```
LDC   0506B
STD   D.T1
STD   D.T4
LDN   0
STD   D.T2
LDN   M.RCH
RJM   R.MTR
```

a. Is there any difference in the reply which will be received by these two sets of code?

4. How to Request a Channel and Ask for Immediate Reply:

```
LDC    0506B
STD    D.T1
LDN    0
STD    D.T2
STD    D.T4
LDN    M.RCH
RJM    R.MTR
```

D.T4 being 0 will indicate to MTR to reply immediately if the desired channel is not available. R.RCH would wait until the channel could be assigned.

---

5. How to Drop a Channel:

a.

```
RJM    R.DCH
```

Where must the channel number be? ______

b.

```
LDN    M.DCH
RJM    R.MTR
```

Where must the channel number be? ______

When requesting alternate channels,
6. the driver code must be changed to reflect which channel MTR assigned

```
X       EQU     5
CH      EQU     D.Z1      addr to contain ch. no.
         {
        LDN     0         clear 5 bytes
        CRD     D.T0
        LDN
        LDC     0605B     Request 5 or 6
        RJM     R.RCH
        LDD     D.T1      get ch received
        STD     CH
        LDC     LIST
        RJM     R.STB     go change ch no.
         {
X1      FNC     2000B,X  }
         {               }
X2      FNC     6003B,X  }  driver code
         {               }  (assembled for
X3      FNC     1200B,X  }  channel 5 )
         {

LIST    VFD     12/CH     addr containing ch no.
                          (direct cell)
        VFD     12/X1    }
        VFD     12/X2    }  all driver addresses
        VFD     12/X3    }  containing ch no.
         {
        DATA    0
```

The channel no. must be changed in every instruction using it.
The ch. no. will always be in the ch portion of the instr ie FNC 2000B,X

77	ch
2000	

7. A Better Way to Handle Alternate Channels

```
X       SET   6          first choice ch
CH      EQU   D.Z1       loc. to hold current ch
        LDN   X          initialize CH
        STD   CH
LØØP    LDN   0
        STD   D.T2
        LDC   0506B      request ch 5 or 6
        RJM   R.RCH
        LDD   D.T1       get ch received
X0      SBD   CH         see if same as last time
        ZJN   X1
        LDD   D.T1       reset CH if different
        STD   CH
        LDC   LIST
        RJM   R.STB      go change
X1      FNC   2000B,X  }
          }            }
X2      FNC   6003B,X  } driver code
          }            }

LIST    VFD   12/CH
        VFD   12/X1    }
        VFD   12/X2    } addresses where
          }            } ch needs changing
        DATA  0
```

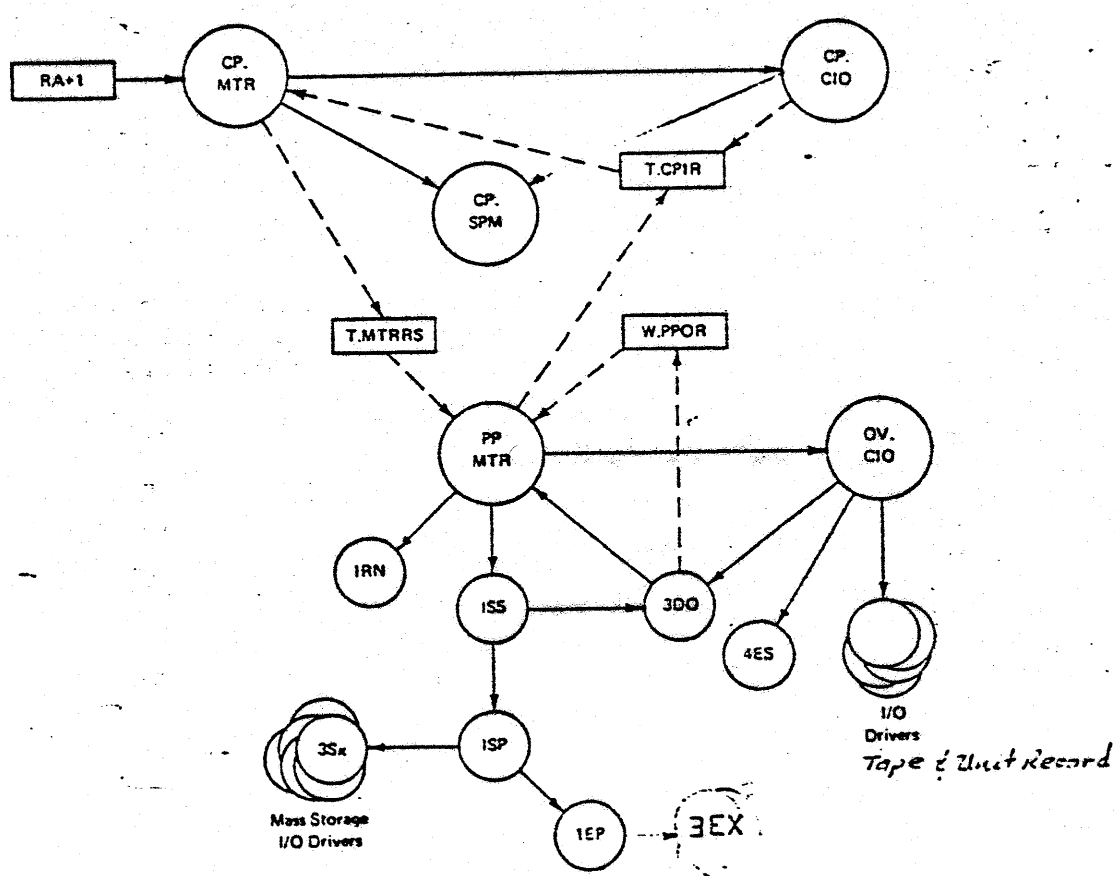
SCOPE 3.4

INPUT/OUTPUT
SOFTWARE
SUBSYSTEMS

INTRODUCTION

Input and output request processing depends upon the source of each request. Active user CP programs issue RA+1 requests for I/O which are cycled through CPMTR. PP programs request I/O by placing a monitor request into their PP output register. System programs, which run at control point N.CP+1 cannot make monitor requests through RA+1. Since they run as CP service functions for PP programs, they make such requests through the output register of the PP servicing the program.

CPMTR assigns the I/O request to CP.CIO for I/O buffered requests or has MTR assign a PPU for CIO (circular input/output), who processes requests for magnetic tape, teletype, and unit record I/O. When actual disk I/O is required CIO/CP.CIO cause a copy of 1SP/1EP to be loaded to actually access the disk.



Another I/O processor, JANUS, exists in SCOPE, but its function is limited to processing unit record I/O for the system input and output queues. The queues contain job input and output files and are related to the job processing activities of SCOPE.

CIO

The circular input/output processor consists of the central memory program CP.CIO, the PP program OV.CIO and several PP I/O drivers. A system programmer can write his own input/output software, or he can have his program generate a call to CIO. Before calling CIO, the program must set up circular buffer parameters and the CIO operation code in the file environment table (FET) for the file. The relative address of the FET is placed in the CIO call.

A PP routine places a CIO call in its PP output register; PPMTR passes it through the CP input register for the CP.MTR. A CP program places a CIO call in the CP request register (RA+1). When PPMTR accepts the CIO call, it assigns a PP and clears byte 0 of the PP output register.

When CP.MTR detects a CIO call, it passes it to CP.CIO if the request is for a buffered file or to CIO, for validation and selection of the proper routine to supervise execution of the function. The CIO is then reissued via the request stack and CP.MTR to be processed by the required PPCIO driver; byte zero of the RA+1 register is cleared. When the I/O operation is completed CP.CIO adds one to the code/status field of FET word one. As all CIO codes placed in the FET code/status field are even numbers, an odd number in that field signals completion of the operation (or that the file is not busy).

SCOPE CIO CODES (3.4)

All codes indicated by * are illegal; all reserved codes are illegal. All codes are octal for coded mode operations; add 2 for binary mode. Example: 010 is coded READ, 012 is binary READ.

000	RPHR	054	*	130	CLOSE,NR
004	WPHR	060	UNLOAD	134	*
010	READ	064	*	140	OPEN
014	WRITE	070	RETURN	144	OPEN,WRITE
020	READSKP	074	*	150	CLOSE
024	WRITER	100	OPEN,NR	154	*
030	*	104	OPEN,WRITE NR	160	OPEN
034	WRITEF	110	POSMF	164	*
040	BKSP	114	EVICT	170	CLOSE,UNLOAD
044	BKSPRU	120	OPEN,NR	174	CLOSE,RETURN
050	REWIND	124	*		

200 Series for Special Read or Write {reverse, skip, non-stop, rewrite, etc.}

200	READC	230	*	254	*
204	WRITEC	234	REWRITEF	260	READN
210	READLS	240	SKIPF	264	WRITEN
214	REWRITE	244	*	270	*
220	*	250	READNS	274	*
224	REWRITER				

300 Series for Tape OPEN and CLOSE

300	OPEN,NR	324	*	354	*
304	*	330	CLOSER	360	*
310	*	334	*	364	*
314	*	340	OPEN	370	CLOSER,UNLOAD
320	*	350	CLOSER	374	*

400 Series {Reserved for CDC}

500 Series {Reserved for Installations}

600 Series

600	*	630	*	654	*
604	*	634	*	660	*
610	*	640	SKIPB	664	*
614	*	644	*	670	*
620	*	650	*	674	*
624	*				

7000 Series {Reserved for CDC}

CIRCULAR BUFFER

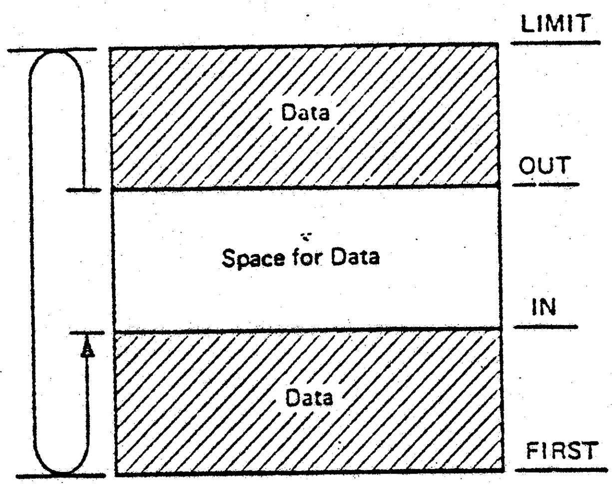
A circular buffer is a temporary storage area in central memory through which data passes during I/O operations. It is termed circular because I/O processing routines treat the last word and the first word of the buffer area as contiguous.

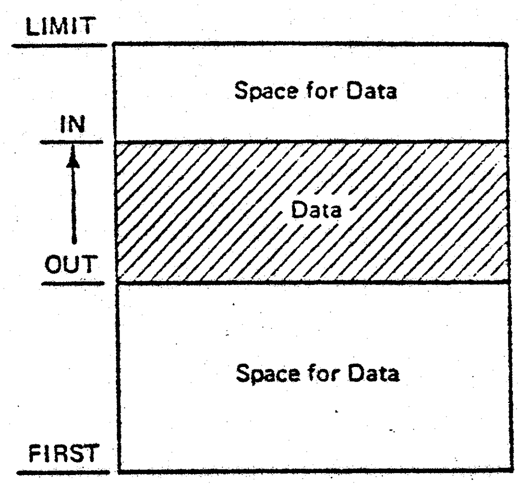
FIRST is the first word address of the circular buffer. Routines that process I/O never change the value of FIRST.

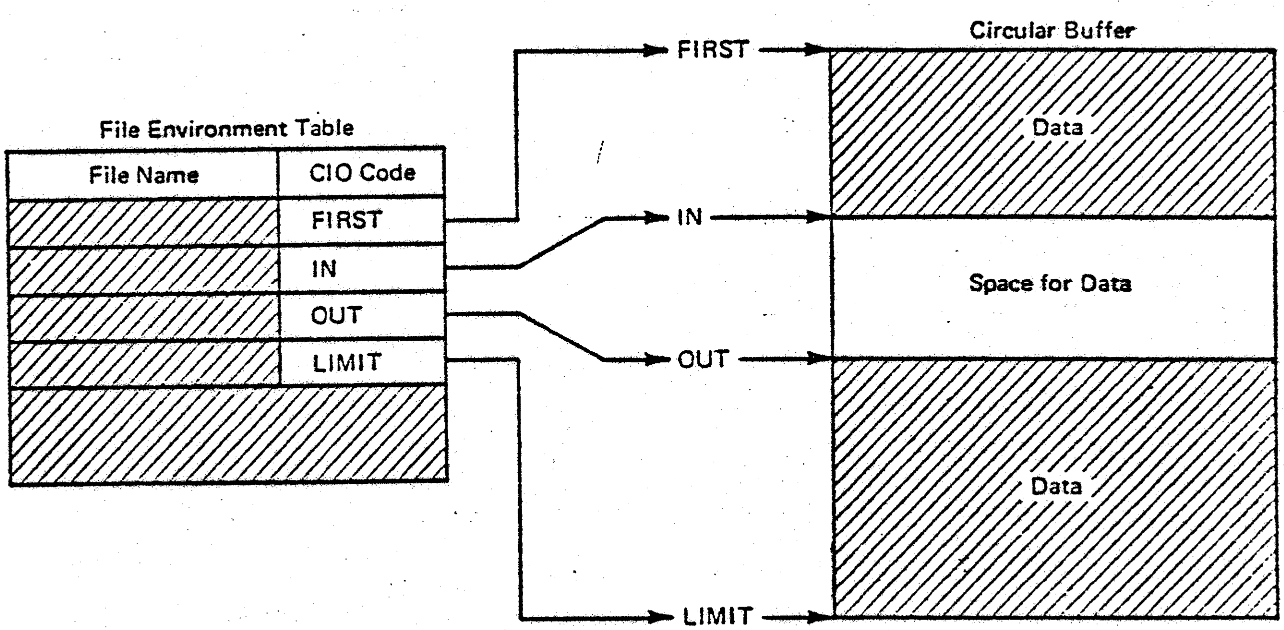
LIMIT is the last word address +1 of the buffer area. No data is stored in this word. When LIMIT is reached, the next address accessed is FIRST. Routines that process I/O never change the value of LIMIT.

OUT is the next location from which data is removed from the circular buffer. CIO or the calling program changes OUT depending on whether the operation is read or write.

IN is the next location into which data is written. CIO or the calling program changes IN depending on whether the operation is read or write. When IN=OUT-1, the buffer is full. A partly filled buffer extends from OUT to IN-1.







The circular buffer must be at least one word larger than the length of one PRU. For a write operation at least one PRU of data should be in the buffer. For a read operation the buffer must have room to receive one PRU of data. Less than one PRU may be transmitted only if an end-of-record is read or written.

CIO OPERATION

When MTR initiates CIO, either version, to perform file I/O, CIO locates the FNT for the file. If the FNT pointer in the FET is non-zero, CIO checks the FNT entry indicated by the pointer to determine if the file name in the FNT entry is the same as the file name in the FET; it will also check that the file is assigned to the job control point. If the names do not match or if the FNT pointer is zero, CIO will search the entire FNT for a file assigned to that job control point with a matching name. If the file is not found, CP.CIO will create a FNT entry for the file. Such files are always local and assigned to allocatable devices. Once the FNT entry is found or created, CIO stores the address of the FNT entry in the FET. The FNT pointer in the FET facilitates the FNT search.

If file status is busy, CIO posts the request for rescheduling and exits. Otherwise, CIO checks the code field in the FET against the last code/status field in the FNT to ensure the requested operation can legally follow the preceding operation. If not, CIO replaces the RA+1 call with a request for the PP program CEM which handles error messages, then reissues the RA+1 call to be processed again by CP.MTR. If the operation is legal, CIO transfers the code/status field in the FET to the last code/status field in the FNT. The proper CIO routine is selected to supervise function execution.

When the file is opened, CIO determines if the file is on an allocatable or non-allocatable device or is ECS resident by checking the device code in the second word of the FNT. If the file is on an allocatable device, CIO puts the request in the I/O request stack in CMR. The stack processor CP.SPM schedules I/O on allocatable devices; it will perform the I/O and set the completion bit. PP.CIO and its overlays process I/O requests for non-allocatable.

When PP.CIO is required, PPMTR assigns an available PP and causes CIO to be loaded and initialized. Depending upon the operation, CIO will call one or more of the following overlays.

Function Routines:

1CL	File Close
1OP	File Open
1MF	Multifile Positioning
1RP	Reel Close
3DO	Mass Storage Device File Open
4ES	Enter Stack Request {mass storage I/O}
6WM	Write Error Message

Tape Drivers:

1RS	Read 7-track stranger {S} tapes
1RT	Read 7-track SCOPE standard labeled tapes
1MT	Read/write L {Long Stranger} tapes {7-track}
1NR	Read 9-track stranger {S} tapes
1NW	Write 9-track stranger {S} tapes
1WS	Write 7-track stranger {S} tapes
1WI	Write 7-track SCOPE standard labeled tapes
1TF	Move tape forward {except long record {L} tapes}
2TB	Move tape backward {except long record {L} tapes}
1R9	Read 9-track SCOPE standard labeled tapes
1W9	Write 9-track SCOPE standard labeled tapes

Unit Record Drivers:

2PC	On line card punch
2RC	On line card reader
2LP	On line printer

Tape Error Recovery Drivers:

1P1	Write error recovery - tape positioning
1P2	Write error recovery - erase/rewrite
1P3	Write error recovery - verification driver
1P4	Write error recovery - final driver
1RV	Initialize/terminate read error recovery
1R2	Read parity error recovery
1R3	Read error recovery - position/reread
1NO	Noise error recovery - read error processing
1N2	Noise error recovery - read recovery driver
1N3	Noise error recovery - skip noise record
1CS	Write CM data - 7/9 track stranger tape read recovery
1CT	Write CM data - 7/9 track SCOPE standard tape read recovery
1CR	Write CM data - 7-track other tape read recovery

If the file device code is for a non-allocatable device, PPCIO loads an I/O driver into its PP to perform the actual I/O. The overlay selected is determined by the operation requested. For example, if a user issues a request to read data from a file on a SCOPE standard format 7-track tape, CIO will call the overlay 1RT into its PP. 1RT will reserve one of the hardware channels connected to the equipment. It then issues the function codes to connect the controller and tape drive. 1RT issues functions to transmit one PRU of data from the tape driver over the data channel.

1RT accumulates the PRU of data in a PP buffer. When the entire PRU is transmitted or an end-of-record {short PRU} is encountered, 1RT picks up the pointers to the circular buffer in central memroy from the FET. 1RT continues to transfer PRUs of data from the tape through the PP buffer to the circular buffer until the buffer is full or an end-of-record is encountered. 1RT updates the PRU count in the file FNT, releases the channel, sets completion bits in the FNT and FET, and drops out.

The following charts depict the logical sequence of events during various CIO tape operations.

READ	Standard Binary	Standard Coded	S Binary	S Coded	L Binary	L Coded
1. Exit if not enough room in buffer for one maximum size physical record.	x	x				
2. Exit if not enough room in buffer for MLRS words.			x	x	x	x
3. Read one physical record into PP.	x	x	x	x		
4. Read one physical record into CM.					x	x
5. If physical record exceeds maximum allowable, return error status DEVICE CAPACITY EXCEEDED and perform error procedures.	x	x				
6. If physical record exceeds maximum logical record size, return error status DEVICE CAPACITY EXCEEDED and perform error procedures. If a long record is encountered, excess information is discarded without notification to user.			x	x	x	x
7. If end-of-file mark was read, perform end-of-file mark procedures.	x	x	x	x	x	x
8. If noise records encountered, go to 3.	x	x	x	x	x	x
9. If parity error, perform parity procedures.	x	x	x	x	x	x
10. If end-of-tape reflective spot was encountered and tape is unlabeled, perform end-of-reel procedures.			x	x	x	x
11. If short PRU was read, strip level number.	x	x				
12. If zero length PRU was read, go to 21.	x	x				
13. When 6681 is present, convert data in PP from BCD to display code.		x		x		
14. When 6681 is present, convert data in CM from External BCD to display code.						x

READ (continued)

	Standard Binary	Standard Coded	S Binary	S Coded	L Binary	L Coded
15. Convert 1632 line terminator to 0003.		x				
16. Transmit data to CM.	x	x	x	x		
17. Update IN.	x	x	x	x	x	x
18. Fetch OUT from CM.	x	x				
19. Place in word 7 of FET the number of unused bits in the last data word.			x	x	x	x
20. If full PRU, go to 1.	x	x				
21. If last record was level 17 of tape mark, set end-of-file status.	x	x	x	x	x	x
22. Set end of record in status field of FET and exit.	x	x	x	x	x	x

WRITE	Standard Binary	Standard Coded	S Binary	S Coded	L Binary	L Coded
1. Exit if not full PRU.	x	x				
2. If data from OUT to IN exceeds maximum logical record size from FET, return DEVICE CAPACITY EXCEEDED and perform error procedures.			x	x	x	x
3. Fetch number of unused bits in last data word from FET and adjust record length. If record length constitutes a noise record, return DEVICE CAPACITY EXCEEDED and perform error procedures.			x	x	x	x
4. Read one PRU of data starting at OUT from CM to PP.	x	x				
5. Read data contained between OUT and IN from CM to PP. Adjust by unused bit count.			x	x		
6. When 6681 present, convert display code to BCD in PP memory.		x		x		
7. When 6681 present, convert from display code to BCD in GM.						x
8. Convert zero byte line terminator to 1632.		x				
9. Write record to tape.	x	x	x	x		
10. Write from CM to tape, data contained between OUT and IN, adjusted by unused bit count.					x	x
11. When 6681 present, convert data in CM buffer back to display code.						x
12. If parity error, perform parity procedure.	x	x	x	x	x	x
13. If end-of-tape reflective spot, perform end-of-reel procedures.	x	x	x	x	x	x
14. Update OUT.	x	x	x	x	x	x
15. Exit.			x	x	x	x
16. Fetch IN from CM	x	x				
17. Go to 1.	x	x				

WRITER	Standard Binary	Standard Coded	S Binary	S Coded	L Binary	L Coded
1. If IN = OUT, exit.			x	x	x	x
2. If PRU not full, insert level number in PP buffer.	x	x				
3. If data from OUT to IN exceeds maximum logical record size from FET, return DEVICE CAPACITY EXCEEDED and perform error procedures.			x	x	x	x
4. Fetch number of unused bits in last data word from FET and adjust record length. If record length constitutes a noise record, return DEVICE CAPACITY EXCEEDED and perform error procedures.			x	x	x	x
5. Read one PRU starting at OUT or between OUT and IN, whichever is smaller, from CM to PP.	x	x				
6. Read data between OUT and IN from CM to PP. Adjust by unused bit count.			x	x		
7. When 6681 is present, convert display code to BCD in PP memory.		x		x		
8. When 6681 is present, convert display code to BCD in CM.						x
9. Convert zero byte line terminator to 1632.			x			
10. If IN = OUT, write zero length record. Go to 12.	x	x				
11. Write record to tape.	x	x	x	x		
12. Write data between OUT and IN from CM to tape, adjust by unused bit count.						
13. When 6681 is present, convert data in CM buffer to display code.						x
14. If parity error, perform parity procedures.	x	x	x	x	x	x
15. If end-of-tape reflective spot, perform end-of-reel procedures.	x	x	x	x	x	x
16. Update OUT.	x	x	x	x	x	x

WRITER (continued)

	Standard Binary	Standard Coded	Binary	Coded	L Binary	L Coded
17. Exit.						
18. If full PRU is not written, exit.	x	x				
19. Go to 1.	x	x				

WRITEF

	Standard Binary	Standard Coded	S Binary	S Coded	L Binary	L Coded
1. If no data from OUT to IN, go to 23.	x	x				
2. If no data from OUT to IN, go to 19.			x	x	x	x
3. If not full PRU, insert 0 level number.	x	x				
4. If data from OUT to IN exceeds maximum logical record size, return DEVICE CAPACITY EXCEEDED and perform error procedures.			x	x	x	x
5. Fetch number of unushed bits in last data word from FET and adjust record length. If record length constitutes a noise record, return DEVICE CAPACITY EXCEEDED and perform error procedures.			x	x	x	x
6. Fetch one PRU of data starting at OUT or data between OUT and IN, whichever is smaller, from CM to PP.	x	x				
7. Read data contained between OUT and IN from CM to PP. Adjust by unused bit count.			x	x		
8. When 6681 is present, convert display code to BCD in PP memory.		x		x		
9. When 6681 is present, convert display code to BCD in CM.						x
10. Convert zero byte line terminator to 1632.		x				
11. Write record to tape.	x	x	x	x		
12. Write data between OUT and IN from CM to tape, adjust by unused bit count.					x	x
13. When 6681 is present, convert data in CM buffer to display code.						x
14. If parity error, perform parity procedures.	x	x	x	x	x	x
15. If end-of-tape reflective spot, perform end-of-reel procedures.	x	x	x	x	x	x
16. Update OUT.	x	x	x	x	x	x

WRITEF (continued)	Standard Binary	Standard Coded	S Binary	S Coded	L Binary	L Coded
17. Write end-of-file mark and exit.			x	x	x	x
18. If full PRU is not written, write zero length level 17 record and exit.	x	x				
19. Go to 3.	x	x				
20. If last operation was WRITE, write zero length PRU.	x	x				
21. Go to 17.	x	x				

STUDY QUESTIONS

External Input/Output - Section XI

1. In the SCOPE Operating System all Input/Output operations are performed by ______________________________.

2. A channel may pass information in more than one direction.
   (a) true
   (b) false

3. More than one PP may read data from a single channel concurrently.
   (a) true
   (b) false

4. All PP's are connected to all channels.
   (a) true
   (b) false

5. What function does the Active/Inactive flag serve?

6. The Active Flag may be set by ______________________________.

7. A 6681 is a ______________________________?

8. Input/Output devices are directed by ______________codes.

9. Most channel instructions will hang the PP if not executed in proper sequence.
   (a) true
   (b) false

10. Some channel instructions may act as a NOP. Which One(s)?

    ____

11. Channel function codes are __________ or __________ bit in length.

12. There is a hardware interlock to prevent more than one PP from using a channel that is already busy.
    (a) true
    (b) false

STUDY QUESTIONS

External Input/Output - Section XI

1. In the SCOPE Operating System all Input/Output operations are performed by PPs.

2. A channel may pass information in more than one direction.

   {a} true
   {b} false

3. More than one PP may read data from a single channel concurrently.

   {a} true
   {b} false

4. All PP's are connected to all channels.

   {a} true
   {b} false

5. What function does the Active/Inactive flag serve?
To direct "traffic" on the channel

6. The Active Flag may be set by the PP.

7. A 6681 is a data channel converter?

8. Input/Output devices are directed by function codes.

9. Most channel instructions will hang the PP if not executed in proper sequence.

   {a} true
   {b} false

10. Some channel instructions may act as a NOP. Which One{s}?
IAM OAM

11. Channel function codes are 9 or 12 bits in length.

12. There is a hardware interlock to prevent more than one PP from using a channel that is already busy.

   {a} true
   {b} false

13. Monitor manages channel activity. How does this effect the PP programmer?

14. In SCOPE the disk Input/Output is handled by ______________________.
(Subprogram(s)).

15. Tape Input/Output activity is managed by ______________________.

13. Monitor manages channel activity. How does this effect the PP programmer? He should request channels through MTR.

14. In SCOPE the disk Input/Output is handled by ISP (Subprogram(s)).

15. Tape Input/Output activity is managed by CIO.

DEADSTART

DEADSTART
Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section XII

Systems Programmers Reference

TRAINING AIDS:

Visuals VALS-53-12-5, VALS-53-12-10, VALS-53-12-11

ASSIGNMENTS:

Study Questions Section XII

OBJECTIVES:

(1) To present the sequence of events from the time the deadstart button is pushed.

(2) To give an overview of the software routines in the deadstart package.

(3) To present enough details of the deadstart matrix switch program to allow the system programmer to change tape channel selection for deadstarting.

DEADSTART

Lesson Outline

XII. DEADSTART

A. Pushing the Deadstart Button - Master clear

- o Master Clears all I/O channels
- o Deselects all I/O equipment
- o All channels active and empty
- o Selects all 6681's in system

B. Pushing the Deadstart Button - Hardware Boot

- o Causes all PP to "wait" - IAM
- o Causes program in matrix switches to be read into PP0
- o Disconnects Channel 0
- o Disconnects Channel 12
- o Connects to Channel 12 (deadstart tape)
- o Reads first record of tape
- o EOR on tape drive disconnects channel

C. Pushing the Deadstart button - Software Boot

- o Software (CEA) read into PP0
- o CEA execution

D. Matrix Switch Program

- o 60X/65X tapes on channel 0
- o 60X/65X tapes on channel 1-11
- o 60X/65X tapes on channel 12-13
- o 60X/65X tapes on channel 0, no 6681
- o Warmstart - 66X tape - no 6681
- o Warmstart - 66X tape , channel 12-13
- o Warmstart - 66X tape, channel 12-13 no 6681
- o Coldstart from card reader on channel 12-13
- o Coldstart from card reader on channel 1-11

E. Deadstart Tape Records

- o CEA
- o D
- o CMR
- o EST
- o IRP
- o P
- o STL
- o IRCP

F. Deadstart Software Flow Charts

Deadstart

The deadstart procedure is initiated by momentarily pushing the deadstart button either on the console or on the deadstart panel. Pushing this button causes the following:

I. Master Clear

1. Master clears all I/O channels
2. Deselects all I/O equipment in system except deadstart panel.
3. Sets all channels active and empty.
4. Selects all 6681's in system.

II. Deadstart Hardware Boot

5. Causes all PP's to "wait" executing an IAM instruction on the channel corresponding to the PP's number.
6. Causes program in deadstart panel (matrix switches) to be read into PP0 location 01 thru 14 octal.
7. Disconnects channel 0, causing execution to begin at location 01 in PP0.
8. Disconnects channel 12 (6681 still selected).
9. Connects to MT with deadstart tape.
10. Reads in first record of deadstart tape.
11. EOR signal causes PP to disconnect channel 12

III. Deadstart Software Boot

12. Software program (CEA) just loaded by the above steps begins execution at location 0015 in PP0.

The deadstart procedure continues with a complete series of software programs as outlined in the flowcharts below. The deadstart package consists of the following decks:

CEA
CONTROL
IRCP
STL
TDS

For all panel settings, a 1 indicates the up or set position; a 0 indicates the down position.

Deadstart Panel to Read from 60x/65x Tape on Channel 0

ADDRESS	BINARY				OCTAL
0001	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0
0002	1 1 1	1 1 1	0 0 0	0 0 0	7 7 0 0
0003	e e e	r r r	0 0 u	u u u	e r u u
0004	1 1 1	1 1 1	0 0 0	0 0 0	7 7 0 0
0005	0 0 0	0 0 0	0 0 1	0 0 0	0 0 1 0
0006	1 1 1	1 1 1	0 0 0	0 0 0	7 7 0 0
0007	0 0 1	1 0 0	0 0 0	s 0 0	1 4 0 s
0010	1 1 1	1 0 0	0 0 0	0 0 0	7 4 0 0
0011	1 1 1	0 0 1	0 0 0	0 0 0	7 1 0 0
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3

The remainder of the panel is irrelevant.

eee	Tape controller number (4 or greater)
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 is not to be saved)
rrr	CMR number (000 for first CMR)

Deadstart Panel to Read from 60x/65x Tape on Channel 1-11

ADDRESS	BINARY				OCTAL
0001	1 1 1	0 1 1	0 0 c	c c c	7 3 c c
0002	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0003	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0004	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0005	e e e	r r r	0 0 u	u u u	e r u u
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	0 0 1	1 0 0	0 0 0	s 0 0	1 4 0 s
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0013	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0
0014	1 1 1	0 0 1	0 0 1	0 1 0	7 1 1 2

cccc	Tape channel number (1-11)
eee	Tape controller number (4 or greater)
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 is not to be saved)
rrr	CMR number (000 for first CMR)

Deadstart Panel to Read from 60x/65x Tape Channels 12 or 13

ADDRESS	BINARY				OCTAL
0001	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0002	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0003	e e e	r r r	0 0 u	u u u	e r u u
0004	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0005	0 0 0	0 0 0	0 0 1	0 0 0	0 0 1 0
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	0 0 1	1 0 0	0 0 0	s 0 0	1 4 0 s
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3

The remainder of the panel is irrelevant.

cccc	Tape channel number (12 or 13)
eee	Tape controller number (4 or greater)
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 is not to be saved)
rrr	CMR number (000 for first CMR)

Deadstart Panel (Warmstart) to Read from 66x Tape on Channel 0 Without a 6681 Data Channel Converter

ADDRESS	BINARY				OCTAL
0001	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0
0002	0 0 1	1 1 1	0 0 0	0 0 1	1 7 0 1
0003	0 0 0	1 0 1	1 1 1	1 1 0	0 5 7 6
0004	0 1 0	1 0 0	0 0 0	0 0 0	2 4 0 0
0005	0 1 0	1 0 0	r r r	s 0 0	2 4 r s
0006	1 1 1	1 1 1	0 0 0	0 0 0	7 7 0 0
0007	e e e	0 d 0	1 1 u	u u u	e d 6 u
0010	1 1 1	1 0 0	0 0 0	0 0 0	7 4 0 0
0011	1 1 1	0 0 1	0 0 0	0 0 0	7 1 0 0
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3

The remainder of the panel is irrelevant

eee	Tape controller number
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 is not to be saved)
rrr	CMR number (000 for first CMR)
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only

Deadstart Panel (Warmstart) to Read from 66x Tape on Channels 1-11 Without a 6681 Data Channel Converter

ADDRESS	BINARY				OCTAL
0001	1 1 1	0 1 1	0 0 c	c c c	7 3 c c
0002	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0003	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0004	0 1 0	1 0 0	0 0 0	0 0 0	2 4 0 0
0005	0 1 0	1 0 0	r r r	s 0 0	2 4 r s
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	e e e	0 d 0	1 1 u	u u u	e d 6 u
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0013	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0
0014	1 1 1	0 0 1	0 0 1	0 1 0	7 1 1 2

cccc	Tape channel number (1-11)
eee	Tape controller number
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 not to be saved)
rrr	CMR number (000 if first CMR)
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only

Deadstart Panel (Warmstart) to Read from 66x Tape on Channels 1-11 with a 6681 Data Channel Converter

ADDRESS	BINARY				OCTAL
0001	1 1 1	0 1 1	0 0 c	c c c	7 3 c c
0002	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0003	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0004	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0005	0 1 0	0 0 1	r r r	s 0 0	2 1 r s
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	e e e	0 d 0	1 1 u	u u u	e d 6 u
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0013	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0
0014	1 1 1	0 0 1	0 0 1	0 1 0	7 1 1 2

cccc	Tape channel number (1-11)
eee	Tape controller number
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 not to be saved)
rrr	CMR number (000 if first CMR)
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only

Deadstart Panel (Warmstart) to Read from 66x Tape on Channel 12 or 13 Without a 6681 Data Channel Converter

ADDRESS	BINARY				OCTAL
0001	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0002	0 0 1	1 1 1	0 0 0	0 0 1	1 7 0 1
0003	0 0 0	1 0 1	1 1 1	1 1 0	0 5 7 6
0004	0 1 0	1 0 0	0 0 0	0 0 0	2 4 0 0
0005	0 1 0	1 0 0	r r r	s 0 0	2 4 r s
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	e e e	0 d 0	1 1 u	u u u	e d 6 u
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3

The remainder of the panel is irrelevant.

cccc	Tape channel number (12 or 13)
eee	Tape controller number
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 is not to be saved)
rrr	CMR number (000 if first CMR)
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only

Deadstart Panel (Warmstart) to Read from 66x Tape on Channel 12 or 13 with a 6681 Data Channel Converter

ADDRESS	BINARY				OCTAL
0001	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0002	0 0 1	1 1 1	0 0 0	0 0 1	1 7 0 1
0003	0 0 0	1 0 1	1 1 1	1 1 0	0 5 7 6
0004	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0005	0 1 0	0 0 1	r r r	s 0 0	2 1 r s
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	e e e	0 d 0	1 1 u	u u u	e d 6 u
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3

The remainder of the panel is irrelevant.

cccc	Tape channel number (12 or 13)
eee	Tape controller number
uuuu	Tape unit number
s	PP0 save switch (1 if PP0 is not to be saved)
rrr	CMR number (000 if first CMR)
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only (ignored for 9-track tape)

Deadstart Panel (Coldstart) to Read from Card Reader on Channel 12 or 13

ADDRESS	BINARY				OCTAL
0001	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0002	0 1 0	1 0 0	0 0 0	0 0 0	2 4 0 0
0003	0 1 0	1 0 0	0 0 0	0 0 0	2 4 0 0
0004	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0005	e e e	r r r	0 0 t	t t t	e r t t
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	0 0 1	1 0 0	0 d 0	s 0 0	1 4 d s
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	1 1 1	1 1 0	1 1 0	1 0 0	7 6 6 4
0013	0 0 0	0 0 0	0 0 n	n n n	0 0 n n

The remainder of the panel is irrelevant.

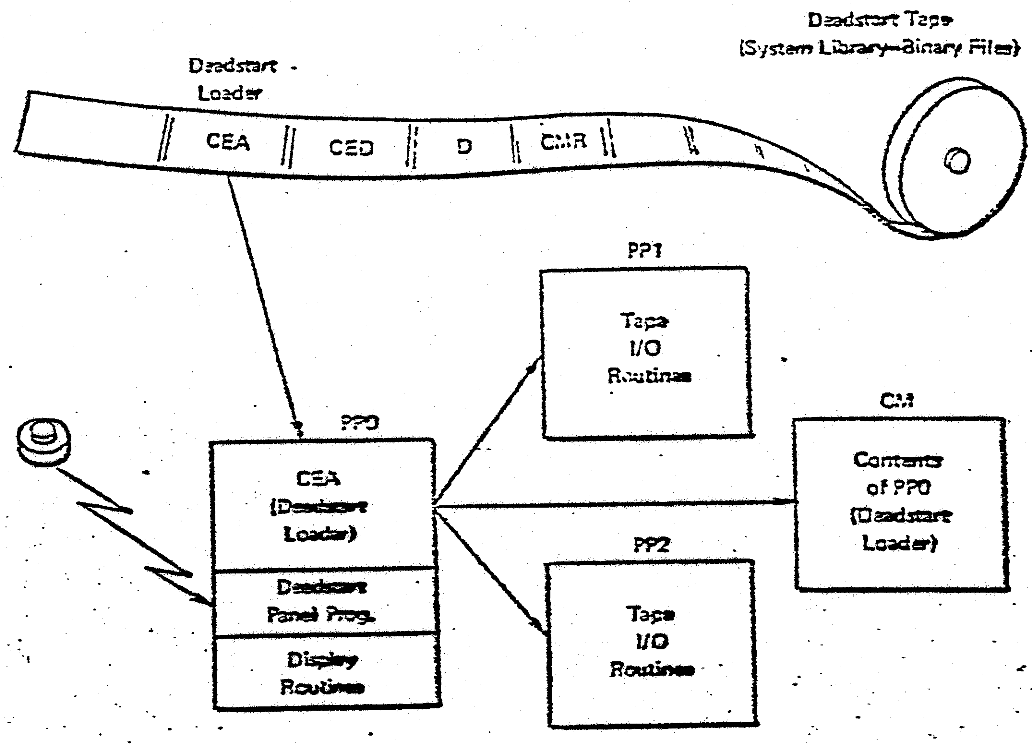
cccc	Card reader channel number (12 or 13)
eee	Card reader controller number (4 or greater)
s	PP0 save switch (1 if PP0 not to be saved)
rrr	CMR number (000 if first CMR)
tttt	Tape channel number (66x) for deadstart tape
nnnn	Tape unit number (66x)
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only (ignored for 9-track tape)

Deadstart Panel (Coldstart) to Read from Card Reader on Channel 1-11

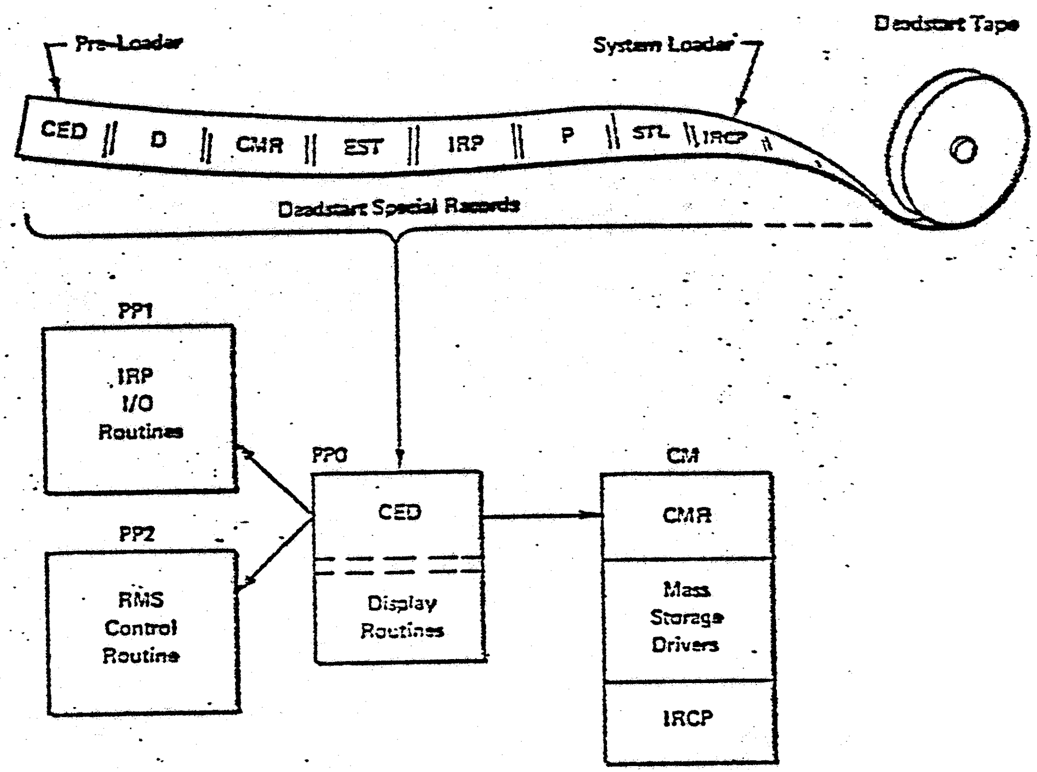
ADDRESS	BINARY				OCTAL
0001	1 1 1	0 1 1	0 0 c	c c c	7 3 c c
0002	0 0 0	0 0 0	0 0 1	0 1 1	0 0 1 3
0003	1 1 1	1 0 1	0 0 c	c c c	7 5 c c
0004	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0005	e e e	r r r	0 0 t	t t t	e r t t
0006	1 1 1	1 1 1	0 0 c	c c c	7 7 c c
0007	0 0 1	1 0 0	0 d 0	s 0 0	1 4 d s
0010	1 1 1	1 0 0	0 0 c	c c c	7 4 c c
0011	1 1 1	0 0 1	0 0 c	c c c	7 1 c c
0012	1 1 1	1 1 0	1 1 0	1 0 0	7 6 6 4
0013	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0 0
0014	1 1 1	0 0 1	0 0 1	0 1 0	7 1 1 2*

cccc	Card reader channel number (1-11)
eee	Card reader controller number (4 or greater)
s	PP0 save switch (1 if PP0 not to be saved)
rrr	CMR number (000 if first CMR)
tttt	Tape channel number (66x) for deadstart tape
d	Tape density (0=556 bpi, 1=800 bpi) for 7-track only

DEADSTART — PHASE 1



DEADSTART — SYSTEM ACTIVATION



SCOPE SYSTEM TAPE

The released SCOPE 3.4 system (deadstart) tape consists of 21 + n records, each followed by an EOR, where n is the number of programs and overlays in the tape:

Name	Description
CEA	PP0 save program
CE Diagnostics	See next page
CED	Deadstart PP control program — resides in PP0
TDR	Read driver for 60x, 65x tape drives — in PP1
MDR	Read driver for 66x tape drives — in PP1 and PP3
D	Deadstart dump control program, handles options — in PP0
DMT	Dump magnetic tape driver for 60x, 65x tape drives — in PP0
DTS	Dump magnetic tape driver for 66x tape drives — in PP0
CMR	Central memory resident (up to 8 copies)
COM	Deadstart option matrix generator — in PP2
EST	Deadstart equipment reconfiguration program
ESB	Deadstart reconfiguration program, segment 2
IRP	Deadstart RMS driver control program — in PP2
5CP	Deadstart 6603-I driver
5CQ	Deadstart 6638 driver
5CS	Deadstart 854 driver
5CT	Deadstart 6603-II driver
5CV	Deadstart 821 driver
5CW	Deadstart 841 driver
5CY	Deadstart 844 disk subsystem driver
P	Pre-address 6603-II program
0SY	844 Buffer controlware
0MT	MTS controlware
STL	Deadstart system initiation program (PP resident)
IRCP	Deadstart main central processor program
MTR	System monitor program

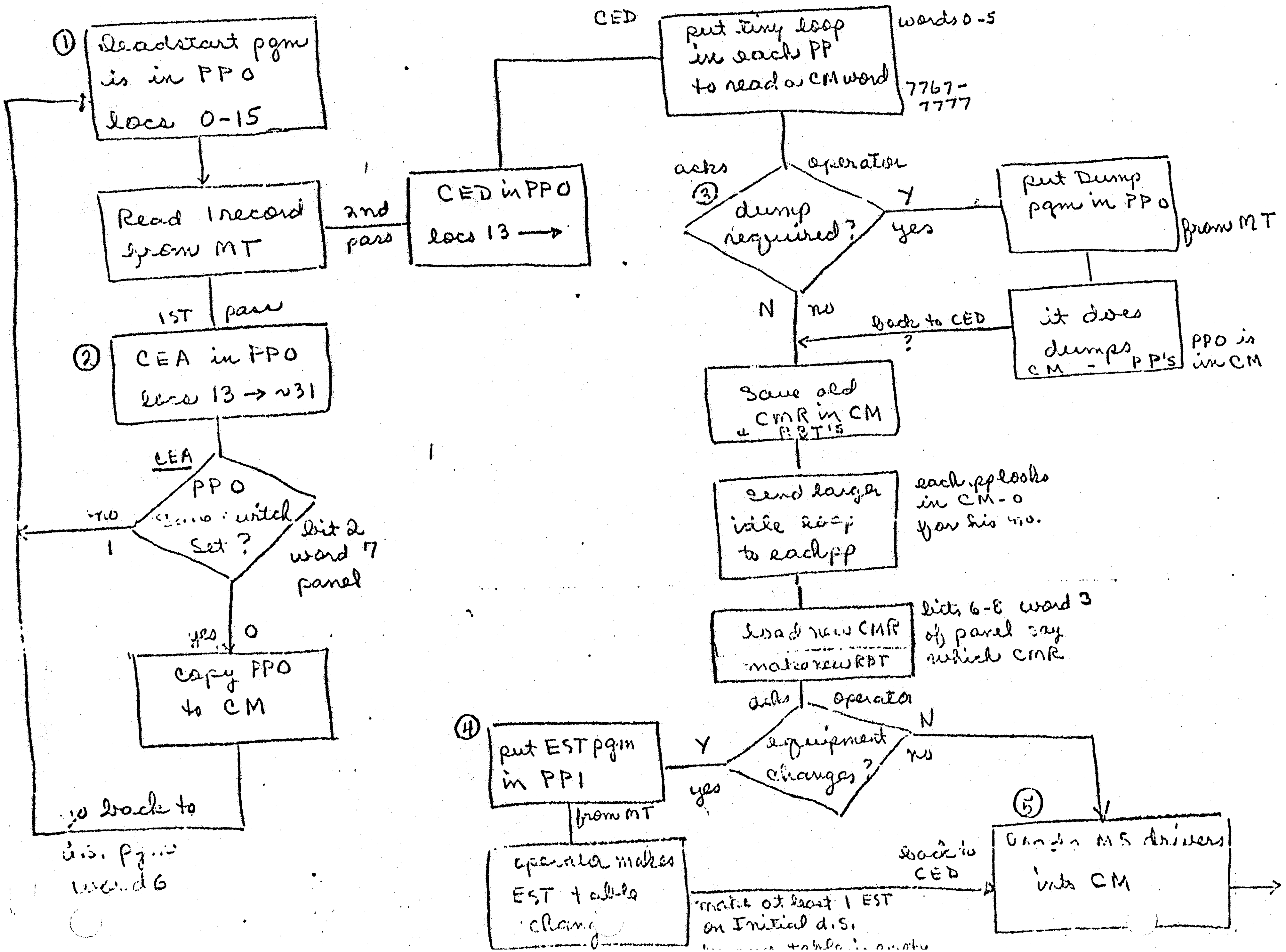
DSD		Display control program
Directory	{	Library name table
		PP name table
		PP programs — the first must be stack processor's segment
System Libraries	{	Entry point table
		External reference list
		External reference table
		Program number table
		Program name table
		CP/PP routines

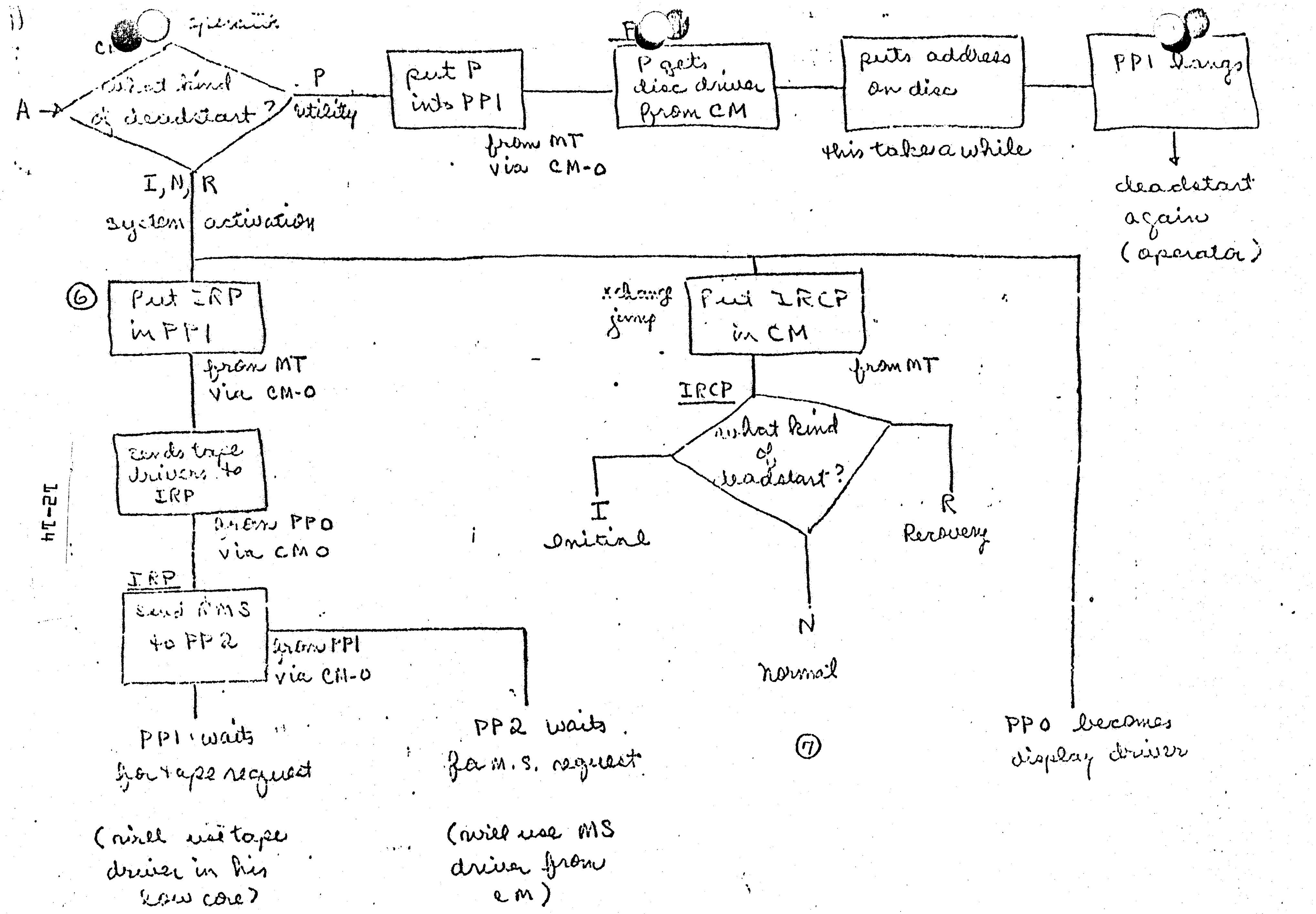
Any installation may expand the above records in two ways:

1. By installing CE Diagnostics. The deadstart diagnostic sequencer, CES, will be placed after CEA, followed by diagnostic routines selected for the site (CU1, ALS, FST, etc.), followed by routine CED.

2. By placing up to seven additional CMR records on the system tape for different equipmer configuration.

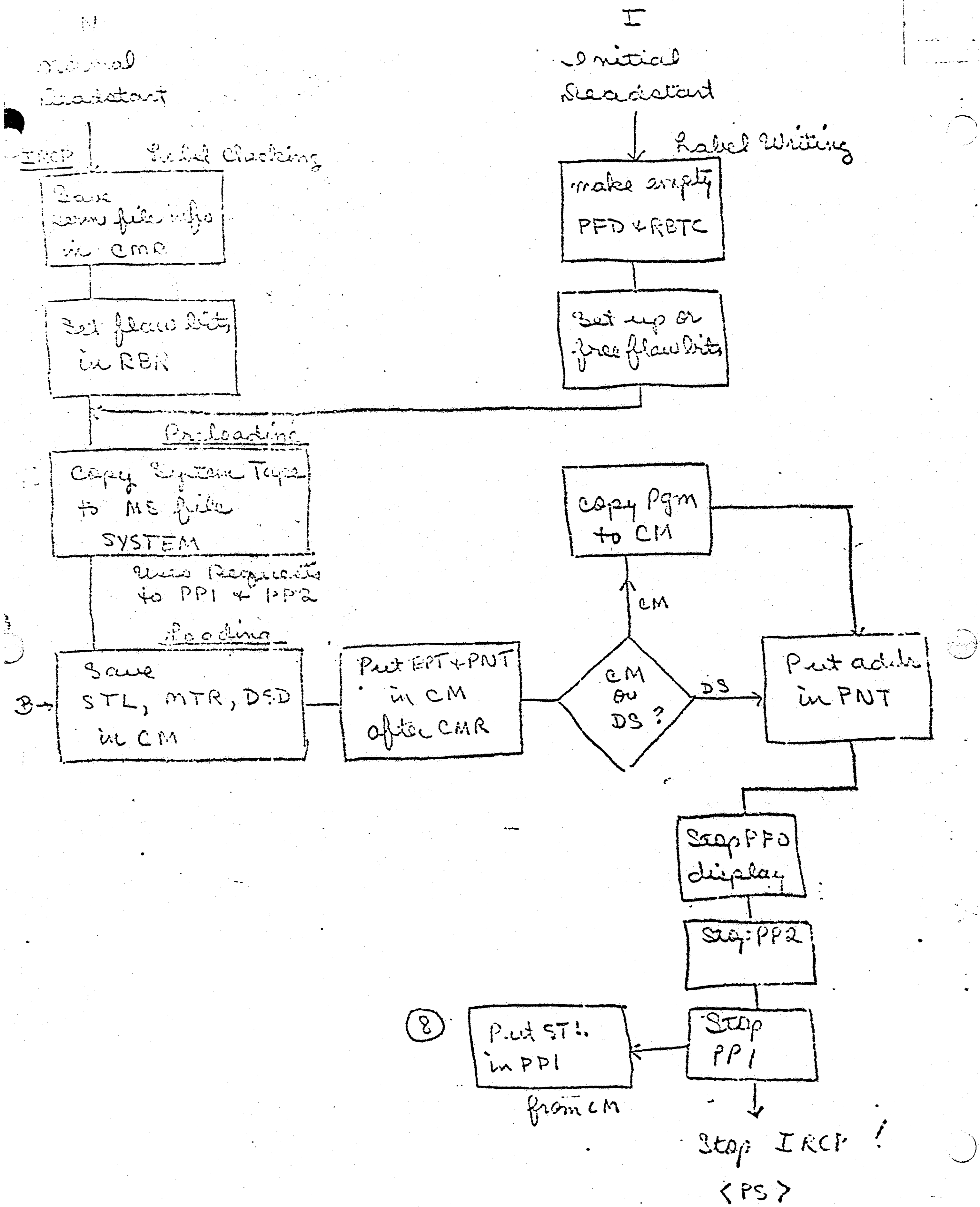
Start Sequence (Software)





what kind of deadstart?
A
P utility
put P into PP1
from MT via CM-0
P gets disc driver from CM
puts address on disc
this takes a while
PP1 hangs
deadstart again (operator)
I, N, R
system activation
⑥
Put IRP in PP1
from MT via CM-0
xchange jump
Put IRCP in CM
from MT
IRCP
what kind of deadstart?
I
Initial
R
Recovery
N
normal
⑦
sends tape drivers to IRP
from PP0 via CM0
IRP
send RMS to PP2
from PP1 via CM-0
PP1 waits for tape request
(will use tape driver in his own core)
PP2 waits for M.S. request
(will use MS driver from CM)
PP0 becomes display driver

12-14


N
Normal Deadstart
IRCP
Label Checking
Save perm file info in CMR
Set flaw bits in RBR
I
Initial Deadstart
Label Writing
make empty PFD + RBTC
Set up or free flaw bits
Preloading
Copy System Tape to MS file SYSTEM
Issue Requests to PP1 + PP2
Loading
Save STL, MTR, DSD in CM
Put EPT + PNT in CM after CMR
CM or DS ?
CM
copy Pgm to CM
DS
Put addr in PNT
Stop PFD display
Stop PP2
Stop PP1
8
Put STL in PP1 from CM
Stop IRCP !
<PS>

STL

Sends PP Res to PP2 - PP8

from PP1 via CM-0

- fixes D.PPIR, D.PPØR, D.PPMESI
- puts PP no. in CM-0
- PP sees his no.
- sends R.IDLE -1 addr to PP loc 0
- sends 777 pp words (PP res 1-777)
- disconnect ch 0 (pp goes to R.IDLE)

Sends MTR to PP0

from CM

- sends small pgm via CM-0
- .. which reads CM ..

Sends DSD to PP9

from CM

Sets up his own PP res

goes to his R.IDLE

RECOVERY

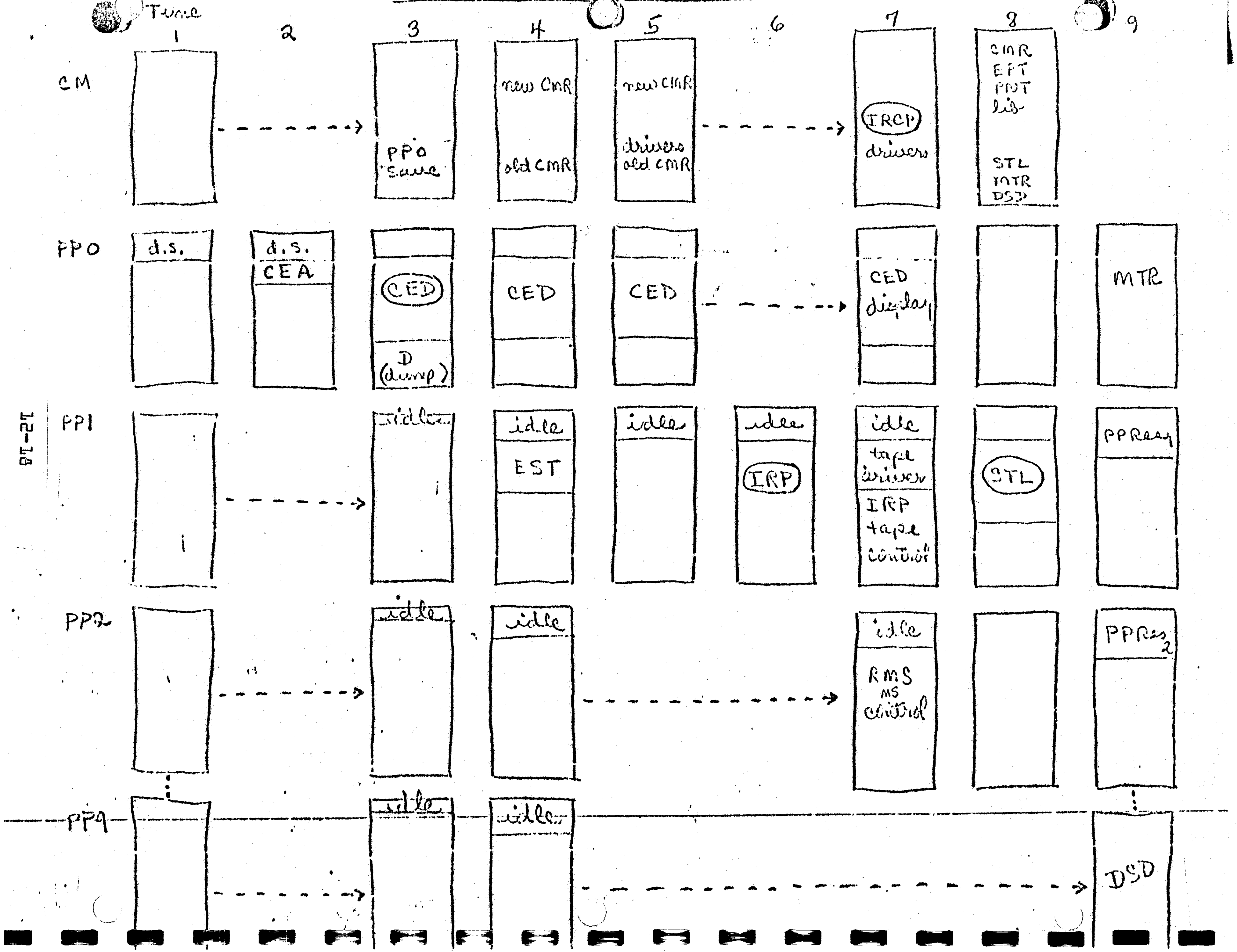
deadstart

Some tables must be intact

FNT
RBT's
System Dayfile Buffer

Restore Them from where Saved

go to LOADING



Time
1
2
3
4
5
6
7
8
9
CM
PPO
PP1
PP2
PP9
PPO save
new CMR
old CMR
new CMR
drivers
old CMR
IRCP
drivers
CMR
EPT
PNT
STL
MTR
DSD
d.s.
d.s.
CEA
CED
D
(dump)
CED
CED
CED
display
MTR
idle
idle
EST
idle
idle
IRP
idle
tape
driver
IRP
tape
control
STL
idle
idle
idle
RMS
MS
control
idle
idle
DSD

STUDY QUESTIONS
Deadstart - Section XII

1. Pushing the deadstart button causes PPs to ______________________________.

2. The first program executed in the deadstart sequence always comes from ______________________________.

3. The matrix switches on the deadstart pannel are for ____________________ ____.

4. The deadstart software begins execution at location ____________________ ____.

5. The deadstart software normally is read from ____________________________.

6. The name of the first software sequence to be executed is ____________ ______________________________.

7. The CMR tables are initialized from code found _________________________.

8. Deadstart routines may not be modified.

   (a) true
   (b) false

9. Where may a listing of the deadstart software be made?

10. How many PP(s) are required for deadstarting?

11. Are there more than one kind of deadstart?
    (a) yes
    (b) no

12. Is any peripheral equipment, other than a tape drive, required for deadstart?
    (a) yes - Explain ____
    (b) no - Explain ____

13. Deadstarting normally requires operator intervention. Why?
    ____

14. Does deadstart have an effect on the permanent files of a SCOPE System? Explain ____.

15. How is a deadstart tape prepared? ____________________________________

STUDY QUESTIONS

Deadstart - Section XII

1. Pushing the deadstart button causes PPs to be reset.

2. The first program executed in the deadstart sequence always comes from matrix switches (PPO).

3. The matrix switches on the deadstart pannel are for selecting an initial deadstart code in the PPO.

4. The deadstart software begins execution at location 15 octal.

5. The deadstart software normally is read from tape.

6. The name of the first software sequence to be executed is CEA.

7. The CMR tables are initialized from code found on deadstart tape.

8. Deadstart routines may not be modified.

   (a) true
   (b) false

9. Where may a listing of the deadstart software be made?
   from the SCOPE PL(s)

10. How many PP(s) are required for deadstarting? 2

11. Are there more than one kind of deadstart?

   (a) yes
   (b) no

12. Is any peripheral equipment, other than a tape drive, required for deadstart?

   (a) yes - Explain a disk file for system
   (b) no - Explain

13. Deadstarting normally requires operator intervention. Why?
   to select hardware options

14. Does deadstart have an effect on the permanent files of a SCOPE System? Explain yes - an Initial will wipe them.

15. How is a deadstart tape prepared? using EDITLIB

RELOCATABLE OVERLAYS

RELOCATABLE OVERLAY

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section XIII

TRAINING AIDS:

Visuals VALS-53-13-3, VALS-53-13-5, VALS-53-13-6

ASSIGNMENTS:

Study Questions Section XIII

OBJECTIVES:

(1) To present the techniques and requirements for using relocatable PP code.

(2) To present enough details of PP program re-location for the student to be able to follow some system routines which use the re-location techniques.

RELOCATABLE OVERLAYS

Lesson Outline

XIII. RELOCATABLE OVERLAYS

A. Concepts of Relocation

- o Identified by SEGMENT
- o Assembled with any ORG
- o May be loaded anywhere in PP
- o Must be adjusted for different loading points

B. Relocation Tables

- o List of address to relocate
- o Generated by MACROS
- o Example

C. Flow Chart of Relocating Process

- o Must be performed by PP programmer
- o May use PP Res routines also

D. Relocation using ORG as part of Relocation bias.

name like IDENT

```
                                IDENT     PGM, C.PPFWA
000:7777              TSYM      DATA      -0              code of transient program
                      ABC       SEGMENT   77B
                                ORG       2000B           ORG anywhere
                                LOC       0
0000=0014                       VFD       12/RTAB         distance to relocation table
0001=0100 0000        XENTRY    LJM       0               entry and exit
                      ENTRY     EQU       *-1
0003=5000 [0011]                LDM       LOC             instructions (do nothing)
0005=5000 1000                  LDM       TSYM
0007:0100 [0013]  12            LJM       *+3
0011                  LOC       BSS       1
0012=0100 [0001]                LJM       XENTRY          exit
                      RTAB      BSS       0
                                VFD       12/0004B        relocation table
                                VFD       12/0010B
                                VFD       12/0013B
                                DATA      0

                      ABD       SEGMENT   77B

                                END
```

these must be relocated

next segment

```
                                      IDENT  PGM.C.PPFWA
                                      PERIPH
                                      SST
 1000                                 ORG    C.PPFWA
                              * MACROS TO REDEFINE INSTRUCTIONS INVOLVING ADDRESSSES
                              LJM.    MACRO  M,D
                                      LOCAL  A
                                      VFD    6/01B,6/D          01 IS FUNCTION CODE FOR LJM
                              A       VFD    12/M
                                      RMT
                                      VFD    12/A
                                      RMT
                                      ENDM
                              LDM.    MACRO  M,D
                                      LOCAL  A
                                      VFD    6/50B,6/D          50B IS FUNCTION CODE FOR LDM
                              A       VFD    12/M
                                      RMT
                                      VFD    12/A
                                      RMT
                                      ENDM
                              * CODE FOR CALLING PROGRAM
 1000          7777           TSYM    DATA   -0
 1001                         CODE    BSS    100
 1145          0000           TSYM1   DATA   0

                              ABC     SEGMENT 77B
 2000                                 ORG    2000B              CAN BE ANYWHERE
                     2000     ORG     SET    2000B              MUST AGREE WITH ORG STATEMENT
 L      0                             LOC    0

 L      0      0014                   VFD    12/RTAB            DISTANCE TO RTAB

                                      LIST   G
 L      1      0100 0000      XENTRY  LJM    0
                    2         ENTRY   EQU    *-1                ENTRY AND EXIT POINTS

 L      3      5000                   LDM.   LOC                MUST BE RELOCATED
 L      4      0011    +*000001       VFD    12/LOC
 L      5      5000 1000              LDM    TSYM               LOAD A SYMBOL FROM TRANSIENT
 L      7      0100                   LJM.   *+3                MUST BE RELOCATED
 L     10      0013    +*000002       VFD    12/*+3
 L     11                     LOC     BSS    1
 L     12      0100                   LJM.   XENTRY             MUST BE RELOCATED
 L     13      0001    +*000003       VFD    12/XENTRY

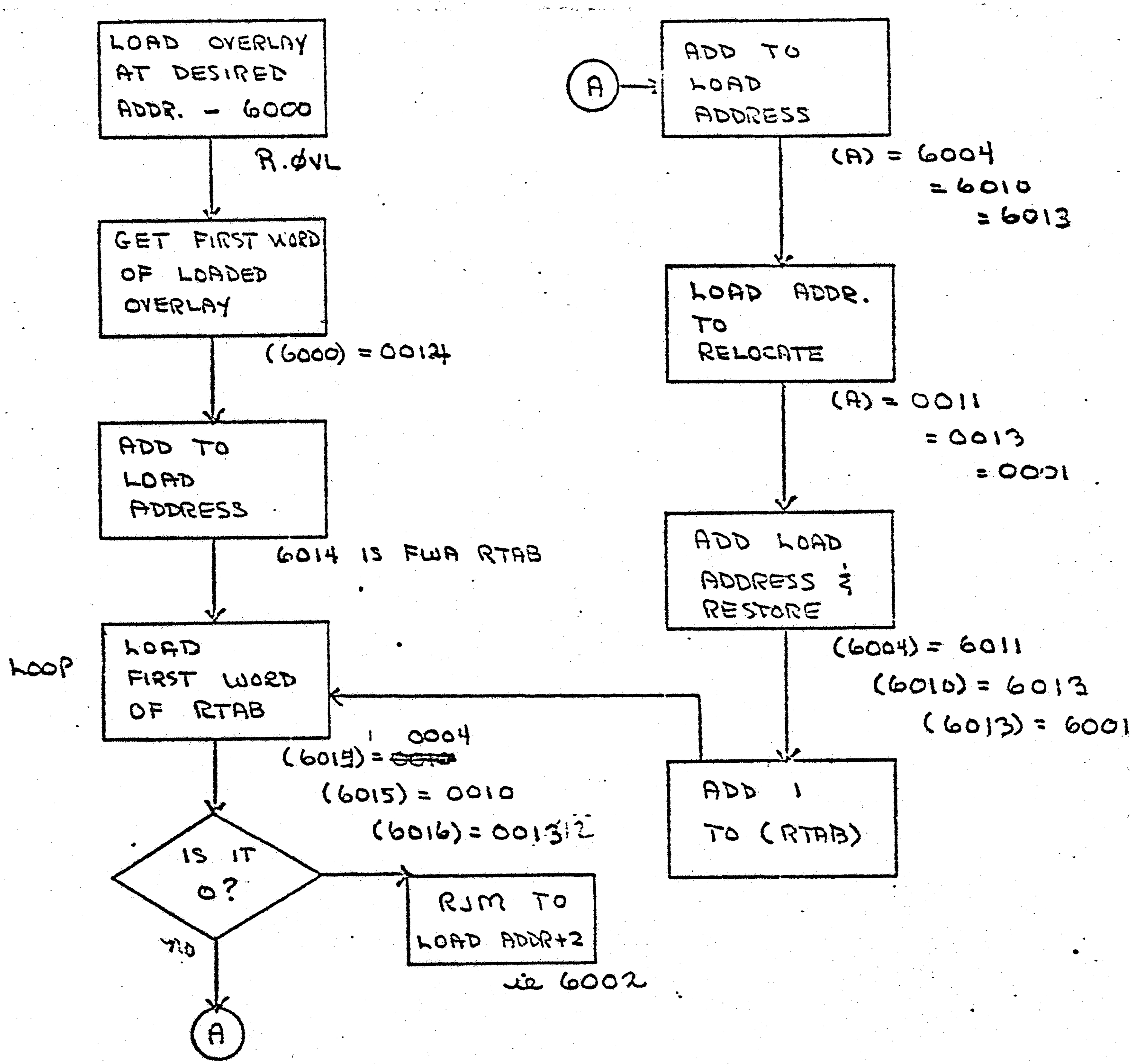
 L     14                     RTAB    BSS    0                  BEGINNING OF RELOCATION TABLE
                                      HERE
 L     14      0004                   VFD    12/+*000001
 L     15      0010                   VFD    12/+*000002
 L     16      0013                   VFD    12/+*000003
 L     17      0000                   DATA   0                  END OF RELOCATION TABLE
                                      END
```

EXAMPLE: LOAD THE OVERLAY AT 6000B

CONTENTS OF CORE:

(1000) =	7777	
(1001) =	⋮	
(1145) =	0000	
	⋮	
(6000) =	0014	- DISTANCE TO TABLE
(6001) =	0100	ENTRY/EXIT
(6002) =	0000	
(6003) =	5000	
(6004) =	0011	
(6005) =	5000	
(6006) =	1000	
(6007) =	0100	ADDRESSES TO RELOCATE
(6010) =	0013 12	
(6011) =	G	
(6012) =	0100	
(6013) =	0001	
(6014) =	0004	RELOCATION TABLE
(6015) =	0010	
(6016) =	0013 12	
(6017) =	0000	

THE CALLING PROGRAM MUST RELOCATE THE OVERLAY



THE LOOP RELOCATES EACH ADDRESS CONSECUTIVELY UNTIL IT REACHES A ZERO WORD — END OF RTAB

```
                                          IDENT  PGM.C.PPEWA
                                          PERIPH
                                          SST
  1000                                    ORG    C.PPEWA
  1000      7777                          DATA   -0

                                 * MACROS TO REDEFINE INSTRUCTIONS INVOLVING ADDRESSSES
                                 LJM.     MACRO  M,D
                                          LOCAL  A
                                          VFD    6/01B,6/D          01 IS FUNCTION CODE FOR LJM
                                 A        VFD    12/M-ORG
                                          RMT
                                          VFD    12/A-ORG
                                          RMT
                                          ENDM
                                 LDM.     MACRO  M,D
                                          LOCAL  A
                                          VFD    6/50B,6/D          50B IS FUNCTION CODE FOR LDM
                                 A        VFD    12/M-ORG
                                          RMT
                                          VFD    12/A-ORG
                                          RMT
                                          ENDM

                                 * CODE FOR CALLING PROGRAM

                                 ABC      SEGMENT 77B
  2000                                    ORG    2000B              CAN BE ANYWHERE
                         2000    ORG      SET    2000B              MUST AGREE WITH ORG STATEMENT

  2000      0012                          VFD    12/RTAB-ORG        DISTANCE TO RELOCATION TABLE

  2001      0100 0000            XENTRY   LJM    0
                         2002    ENTRY    EQU    *-1                ENTRY AND EXIT POINTS

  2003      5000                          LDM.   LOC                MUST BE RELOCATED
  2005      0100                          LJM.   *+3                MUST BE RELOCATED
  2007                           LOC      BSS    1
  2010      0100                          LJM.   XENTRY             MUST BE RELOCATED

  2012                           RTAB     BSS    0                  BEGINNING OF RELOCATION TABLE
                                          LIST   G
                                          HERE
  2012      0004                          VFD    12/*+000001-ORG
  2013      0006                          VFD    12/*+000002-ORG
  2014      0011                          VFD    12/*+000003-ORG
  2015      0000                          DATA   0                  END OF RELOCATION TABLE

  2016                                    END

               46400  STORAGE USED            75 STATEMENTS      735 SYMBOLS
                    5600 ASSEMBLY          0.327 SECONDS          17 REFERENCES
```

STUDY QUESTIONS

Relocatable Overlays - Section XIII

1. Relocatable Overlays are absolute PP programs.

   {a} true

   {b} false

2. How are relocatable overlays named?

3. Where are relocatable overlays stored?

4. How are relocatable overlays loaded?

5. The PP resident routines R.OVL may be used to load a relocatable Overlay.

   {a} true

   {b} false

6. Relocatable overlays are generally used because ______________________ ____.

7. A relocation table is ____.

8. Using relocatable code generally requires more programming than performing the same function with transient programs or primary overlays.

   {a} true - explain ______________________________________

   {b} false - explain _____________________________________

9. MACROS may be used in relocatable code to ___________________________.

10. Why does the programmer have to play "loader"?

STUDY QUESTIONS

Relocatable Overlays - Section XIII

1. Relocatable Overlays are absolute PP programs.

   {a} true

   {b} false

2. How are relocatable overlays named? just like any PP program three char.

3. Where are relocatable overlays stored? CM, Disk, ECS

4. How are relocatable overlays loaded? using R.OVL usually

5. The PP resident routines R.OVL may be used to load a relocatable Overlay.

   {a} true

   {b} false

6. Relocatable overlays are generally used because they are used by more than one routine

7. A relocat~~able~~ion table is a table of addresses which must be re-located.

8. Using relocatable code generally requires more programming than performing the same function with transient programs or primary overlays.

   {a} true - explain relocation code needed

   {b} false - explain ______

9. MACROS may be used in relocatable code to assist in relocation

10. Why does the programmer have to play "loader"?

    there is no variable-absolute loader.

SAMPLE PP PROGRAMS

SAMPLE PP PROGRAMS

Lesson Guide

REFERENCES:

PP COMPASS Student Guide Section XIV

TRAINING AIDS:

Visuals VALS-53-14-3, VALS-53-14-6, VALS-53-14-9
VALS-53-14-15, VALS-53-14-18

ASSIGNMENTS:

Review all sample programs in the Section Text

OBJECTIVES:

(1) To illustrate by example the usual methods of program structure.

(2) To illustrate by example the methods of PP programmer message transmission to dayfile.

(3) To illustrate by example error messages issued by system.

(4) To introduce the PP programmer to a PP dump.

(5) To introduce the PP program - 1RN

SAMPLE PP PROGRAMS

Lesson Outline

XIV. SAMPLE PP PROGRAMS

A. Sum to numbers from CM
- o Structure
- o Symbols
- o Comments
- o Calling CP program
- o Linkage
- o Dayfile

B. Error Detection/Processing
- o Test
- o Detect
- o Issue Message
- o Exit
- o Auto Recall Error
- o PP Call Error
- o Hung in Auto Recall
- o Hang PP
- o Hang PP {dump}

C. Assembly Error{s}

D. Actual SCOPE PP Code - 1RN
- o Structure
- o Documentation
- o System Symbols
- o MACROS
- o Detail Code
- o Assembly Errors
- o XREF List

PP PROGRAM

```
                                     IDENT    SUM,C.PPFWA
                               * THIS IS A PP PGM TO SUM 2 NUMBERS FROM CP MEMORY
                               * IT IS A TEST TO SHOW THE LINKAGE AND HOW TO PUT IT IN THE SYSTEM
                               * THE PP PGM IS ENTERED FROM OVL BY A LJM
                               * IT IS A TRANSIENT PROGRAM AND WILL RUN AT 1000
                                     PERIPH                       * TELL ASSEMBLER ITS PP
                                     SST                          * GET ACCESS TO SYSTEM SYMBOLS
1000                                 ORG      C.PPFWA      * WILL RUN AT 1000
1000        3074                     PPENTRY  D.PPIRB,D.TO
1004        3074                     LDD      D.PPIR       * GET CM ADDR OF INPUT REGISTER
1005        6050                     CRD      D.PPIRB      * GET PARAM WORD FROM CM
1006        1402                     LDN      2            * FOR 2 MORE CM WORDS
1007        3402                     STD      2
1010        3054                     LDD      D.PPIRB+4    * GET CM ADDR OF BUF-1
1011        1601                     ADN      1            * REL ADDR OF BUF IN A
1012        0200 0505                RJM      R.TFL        * ABSOLUTIZE IT
1014        0603                     PJN      *+3.         * MJN WONT REACH ABT
1015        0100 1056                LJM      ABT
1017        6132 1065                CRM      BUF,2        * READ TWO DATA WORDS
1021        5000 1076                LDM      BUF+9        * GET DATA FROM BUF+1
1023        5500 1071                RAM      BUF+4        * ADD DATA FROM BUF
1025        0200 0446                RJM      R.RAFL       * GO SEE IF MOVE PENDING
1027        1401                     LDN      1            * TO WRITE ONE WORD
1030        3401                     STD      1
1031        3054                     LDD      D.PPIRB+4    * GET ADDR TO SEND ANS BACK
1032        1603                     ADN      3            * REL ADDR OF ANS
1033        0200 0505                RJM      R.TFL        * GO ABSOLUTIZE IT
1035        0721                     MJN      ABT
1036        6301 1065                CWM      BUF,1        * WRITE ANSWER BACK
1040        1400                     LDN      0            * ZERO OUTPUT BUFFER
1041        6010                     CRD      D.TO
1042        1401                     LDN      1
1043        3414                     STD      D.TO+4       * SET COMPLETE BIT
1044        3054                     LDD      D.PPIRB+4
1045        0200 0505                RJM      R.TFL        * ABSOLUTIZE PSEUDO FET ADDR
1047        0707                     MJN      ABT
1050        6210                     CWD      D.TO         * PUT FET WORD BACK
1051        1412                     LDN      M.DPP        * GET DROP ME CODE
1052        0200 0516          EXIT  RJM      R.MTR        $ GO DROP PP
1054        0100 0103                LJM      R.IDLE       * GO TO IDLE LOOP
1056        2000 1077          ABT   LDC      ABTMSG       * ABORT MESSAGE ADDR + FLAG 0
1060        0200 0671                RJM      R.DFM        * ISSUE DAYFILE MESSAGE
1062        1413                     LDN      M.ABORT      * ABORT  OUT OF RANGE
1063        0100 1052                LJM      EXIT
1065                           BUF   BSS      10           * BUFFER FOR CM WORDS
1077        5502               ABTMSG DIS     ,* BAD ADDR*
1105                                 END
                     54202     STORAGE USED            51 STATEMENTS       712 SYMBOLS
                               6600 ASSEMBLY         0.750 SECONDS          35 REFERENCES
```

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VALS-53-14-3

```
VER 1.1          SUM,C.PPFWA                                                          01/14/71
                        SYMBOLIC REFERENCE TABLE

     ABT        0001054                              001013,   001033,   001045
     BUF        0001057                              001015,   001017,   001021,   001034
     C.PPFWA    0001000       SCPTEXT                001071,   000000
     D.PPIR     0000575       SCPTEXT                001002
     D.PPIRB    0001051       SCPTEXT                001003,   001006,   001027,   001042
     D.TT       0000010       SCPTEXT                001037,   001041,   001046
     EXIT       0001050                              001055
     M.ABORT    0000013       SCPTEXT                001054
     M.OFP      0000012       SCPTEXT                001047
     R.TFLE     0000150       SCPTEXT                001052
     R.MTP      0003450       SCPTEXT                001050
     R.PAUSE    0000407       SCPTEXT                001000,   001023
     R.TFL      0000634       SCPTEXT                001010,   001031,   001043
```

(this page is from an earlier run)

Note the symbols used in the PP program were defined in SCPTEXT which was called from the Compass card.

Core map of CP program

```
CORE MAP  02.46.39.  NORMAL                      CONTROL
          ---TIME---LOAD MODE --L1--L2-----TYPE----------------USER---++---CALL----
          FWA LOADER  054333  FWA TABLES  054274
          -PROGRAM----ADDRESS-                              --LABELED---COMMON--
          PROG3        000115                                 BLOCK          000100
          CPC          000117
```

PROB3 CP PROGRAM COMPASS - VER 2. 02/17/72 18.05.46.

```
                                      IDENT     PROB3
                                      ENTRY     TESTIT
 0  5110000001              TESTIT    SA1       1              * CK RA+1 FOR EMPTY
             0311000000 +             NZ        X1,TESTIT
 1  5110000004 C                      SA1       PARAM          * PUT PARAM IN RA+1
             10611                    BX6       X1
 2  5160000001                        SA6       1
 3  5110000001              LOOP      SA1       1              * WAIT TILL PICKED UP
             0311000003 +             NZ        X1,LOOP
 4  0100000000 X                      ENDRUN
                                      USE       /BLOCK/
 0                          FAKEFET   BSSZ      1              * PSEUDO FET TO HOLD COMPLETE BIT
 1  00000000000000000173    BUF       DATA      123,456
 3                          ANS       BSSZ      1
 4  23251520000000000000 C  PARAM     VFD       18/3LSUM,3/2,3/0,36/FAKEFET
 6                                    END       TESTIT
                     43406  STORAGE USED               18 STATEMENTS        7 SYMBOLS
                            6600 ASSEMBLY           0.240 SECONDS          12 REFERENCES
```

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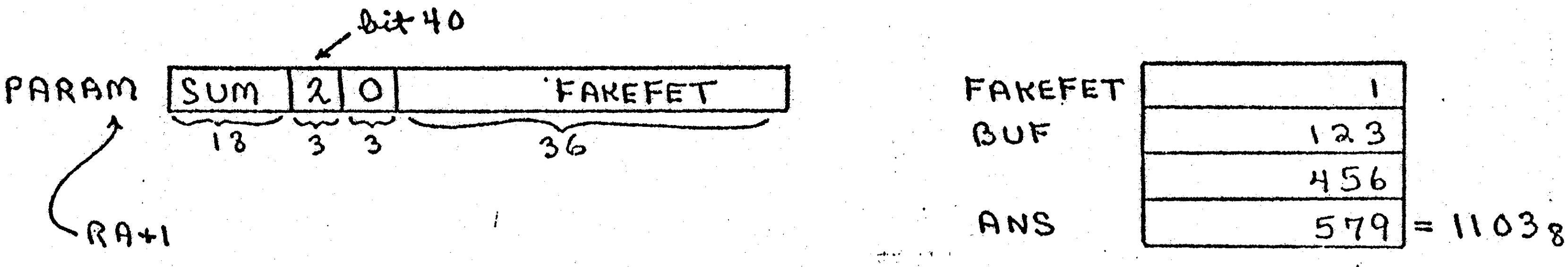
OUTPUT

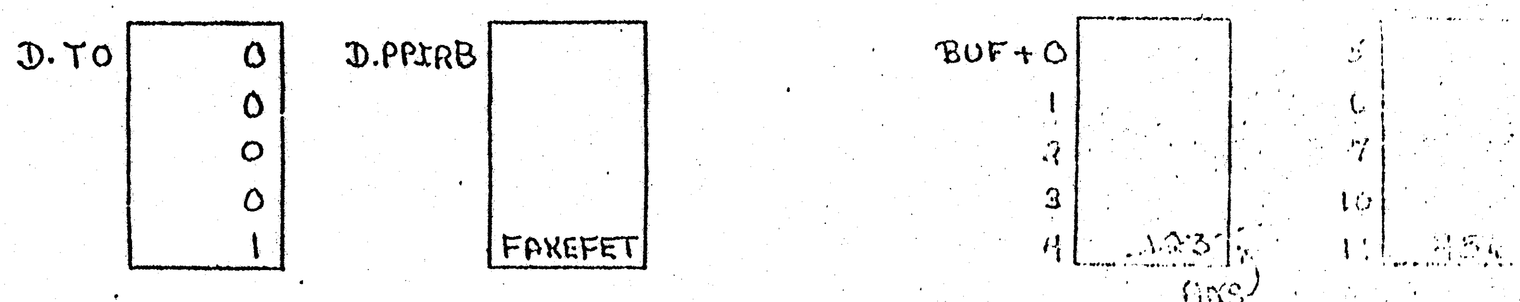
```
RELATIVE        DMP(100,105)

00100    00000 00000 00000 00001 |00000 00000 00000 00173 |00000 00000 00000 00710 |00000 00000 00000 01103
00104    23251 52000 00000 00100 |51100 00001 03110 00105 |
```

Parameters in CP Program



Parameters in PP Program



DAYFILE

```
  02/17/72   N W L  SCOPE 3.3   LEVEL 250  06/29/71
18.04.55.JOB0008
18.04.55.JOB,CM70000,T30.
18.05.02.ENTL,77777.
18.05.04.GO.
18.05.04.COMPASS(B=PPTEST,S=SCPTEXT)
18.05.05. MINIMUM FIELD LENGTH NEEDED = 054300
18.05.05. ASSEMBLY COMPLETE.
18.05.05.REWIND(PPTEST)
18.05.05.EDITLIB.
18.05.07.          READY(SYSTEM)
18.05.08.          ADD(*,PPTEST)
18.05.08.          COMPLETE.
18.05.42.GO.
18.05.45.COMPASS.
18.05.46. MINIMUM FIELD LENGTH NEEDED = 043500
18.05.46. ASSEMBLY COMPLETE.
18.05.46.LGO.
18.05.47.CPA    051.564 CPB    000.005
18.05.47.PP     007.634 IO     000.764 NEW FL 00500
18.05.47.DMP(100,105)
18.05.47.RFL,70000.
18.05.48.CPA    051.570 CPB    000.005
18.05.48.PP     008.033 IO     000.764 NEW FL 70000
18.05.48.EDITLIB(RESTORE)
18.05.52.GO.
18.05.55.MASS STORAGE  000310 PRU
18.05.55.CPA    051.948 SEC.
18.05.55.CPB    000.005 SEC.
18.05.55.PP     010.311 SEC.
18.05.55.IO     000.955 SEC.
```

Copy of Card deck of PPTEST

```
CDC02HJ.
SHEHYN,CM60000,T7777,P1.
COMPASS(B=PPTEST,S=SCPTEXT)
REWIND(PPTEST)
EDITLIB.                                PUT IT IN SYSTEM AND MAKE NEW CMR
COMPASS.                                ASSEMBLE CP PGM TO TRY IT OUT
LGO.
DMP(100,105)
DMP.
DMP(100,400)
EDITLIB(RESTORE)
EXIT.
DMP(100,105)
DMP(100,400)
7  EDITLIB(RESTORE)
8            IDENT      SUM,C.PPFWA
9  * THIS IS A PP PGM TO SUM 2 NUMBERS FROM CP MEMORY
   * IT IS A TEST TO SHOW THE LINKAGE AND HOW TO PUT IT IN THE SYSTEM
   * THE PP PGM IS ENTERED FROM OVL BY A LJM
   * IT IS A TRANSIENT PROGRAM AND WILL RUN AT 1000
             PERIPH                          * TELL ASSEMBLER ITS PP
             SST                             * GET ACCESS TO SYSTEM SYMBOLS
             BASE       0               * MOST PP PGMS ARE OCTAL
             ORG        C.PPFWA         * WILL RUN AT 1000
             RJM        R.PAUSE
             LDD        D.PPIR          * GET CM ADDR OF INPUT REGISTER
             CRD        D.PPIRB         * GET PARAM WORD FROM CM
             LDN        2               * FOR 2 MORE CM WORDS
              {
             MJN        ABT
             CWD        D.T0            * PUT FET WORD BACK
             LDN        M.DPP           * GET DROP ME CODE
   EXIT      RJM        R.MTR           $ GO DROP PP
             LJM        R.IDLE          * GO TO IDLE LOOP
   ABT       LDN        M.ABORT         * ABORT IF ADDR OUT OF RANGE
             LJM        EXIT
   BUF       BSS        12
7            END
8  READY(SYSTEM)
9  ADD(*,PPTEST)
   COMPLETE.
7            IDENT      PROB3
8            ENTRY      TESTIT
9  TESTIT    SA1        1               * CK RA+1 FOR EMPTY
             NZ         X1,TESTIT
             SA1        PARAM           * PUT PARAM IN RA+1
             BX6        X1
             SA6        1
   LOOP      SA1        1               * WAIT TILL PICKED UP
             NZ         X1,LOOP
             ENDRUN
             USE        /BLOCK/
   FAKEFET   BSSZ       1               * PSEUDO FET TO HOLD COMPLETE BIT
   BUF       DATA       123,456
   ANS       BSSZ       1
6  PARAM     VFD        18/3LSUM,3/2,3/0,36/FAKEFET
7            END        TESTIT
8
9
```

```
                                          IDENT     SUM,C.PPFWA
                                   * THIS IS A PP PGM TO SUM 2 NUMBERS FROM CP MEMORY
                                   * IT IS A TEST TO SHOW THE LINKAGE AND HOW TO PUT IT IN THE SYSTEM
                                   * THE PP PGM IS ENTERED FROM OVL BY A LJM
                                   * IT IS A TRANSIENT PROGRAM AND WILL RUN AT 1000
                                          PERIPH                      * TELL ASSEMBLER ITS PP
                                          SST                         * GET ACCESS TO SYSTEM SYMBOLS
1000                                      ORG       C.PPFWA      * WILL RUN AT 1000
1000        3074                          PPENTRY   D.PPIRB,D.TO
1004        3074                          LDD       D.PPIR       * GET CM ADDR OF INPUT REGISTER
1005        6050                          CRD       D.PPIRB      * GET PARAM WORD FROM CM
1006        1402                          LDN       2            * FOR 2 MORE CM WORDS
1007        3402                          STD       2
1010        3054                          LDD       D.PPIRB+4    * GET CM ADDR OF BUF-1
1011        1601                          ADN       1            * REL ADDR OF BUF IN A

1012        2110 0000                     ADC       100000B      * GENERATE BAD ADDRESS

1014        0200 0505                     RJM       R.TFL        * ABSOLUTIZE IT
1016        0603                          PJN       *+3          * MJN WONT REACH ABT
1017        0100 1060                     LJM       ABT
1021        6102 1067                     CRM       BUF,2        * READ TWO DATA WORDS
1023        5000 1100                     LDM       BUF+9        * GET DATA FROM BUF+1
1025        5500 1073                     RAM       BUF+4        * ADD DATA FROM BUF
1027        0200 0446                     RJM       R.RAFL       * GO SEE IF MOVE PENDING
1031        1401                          LDN       1            * TO WRITE ONE WORD
1032        3401                          STD       1
1033        3054                          LDD       D.PPIRB+4    * GET ADDR TO SEND ANS BACK
1034        1603                          ADN       3            * REL ADDR OF ANS
1035        0200 0505                     RJM       R.TFL        * GO ABSOLUTIZE IT
1037        0721                          MJN       ABT
1040        6301 1067                     CWM       BUF,1        * WRITE ANSWER BACK
1042        1400                          LDN       0            * ZERO OUTPUT BUFFER
1043        6010                          CRD       D.TO
1044        1401                          LDN       1
1045        3414                          STD       D.TO+4       * SET COMPLETE BIT
1046        3054                          LDD       D.PPIRB+4
1047        0200 0505                     RJM       R.TFL        * ABSOLUTIZE PSEUDO FET ADDR
1051        0707                          MJN       ABT
1052        6210                          CWD       D.TO         * PUT FET WORD BACK
1053        1412                          LDN       M.DPP        * GET DROP ME CODE
1054        0200 0516           EXIT      RJM       R.MTR        $ GO DROP PP
1056        0100 0103                     LJM       R.IDLE       * GO TO IDLE LOOP
1060        2000 1101           ABT       LDC       ABTMSG       * ABORT MESSAGE ADDR + FLAG 0
1062        0200 0671                     RJM       R.DFM        * ISSUE DAYFILE MESSAGE
1064        1413                          LDN       M.ABORT      * ABORT  OUT OF RANGE
1065        0100 1054                     LJM       EXIT
1067                            BUF       BSS       10         * BUFFER FOR CM WORDS
1101        5502                ABTMSG    DIS       ," BAD ADDR"
1107                                      END
                      54202     STORAGE USED              54 STATEMENTS      712 SYMBOLS
                                6400 ASSEMBLY           0.735 SECONDS         38 REFERENCES
```

14-9

TEST ERROR PROCESSING

VALS-53-14-9

```
  02/17/72   N W L  SCOPE 3.3   LEVEL 250  06/29/71
18.12.41.SHEHY1H
18.12.41.SHEHYN,CM70000.
18.12.47.GO.
18.12.47.COMPASS(B=PPTEST,S=SCPTEXT)
18.12.49. MINIMUM FIELD LENGTH NEEDED = 054300
18.12.49. ASSEMBLY COMPLETE.
18.12.49.REWIND(PPTEST)
18.12.49.EDITLIB.
18.12.58.          READY(SYSTEM)
18.12.59.          ADD(*,PPTEST)
18.12.59.          COMPLETE.
18.13.18.GO.
18.13.20.COMPASS.
18.13.21. MINIMUM FIELD LENGTH NEEDED = 043500  .
18.13.21. ASSEMBLY COMPLETE.
18.13.21.LGO.
18.13.22.CPA   050.592 CPB   001.258
18.13.22.PP    009.818 IO    000.766 NEW FL 00500
18.13.22. BAD ADDR
18.13.22.EXIT.
18.13.22.DMP(100,105)
18.13.23.DMP(100,400)
18.13.23.RFL,70000.
18.13.23.CPA   050.595 CPB   001.258
18.13.23.PP    011.092 IO    000.766 NEW FL 70000
18.13.23.EDITLIB(RESTORE)
18.13.28.GO.
18.13.31.MASS STORAGE  000310 PRU
18.13.31.CPA   050.958 SEC.
18.13.31.CPB   001.258 SEC.
18.13.31.PP    013.465 SEC.
18.13.31.IO    000.957 SEC.
```

dayfile message issued from within PP program

14-10

```
                                            IDENT    PROB3
                                            ENTRY    TESTIT
0   5110000001                    TESTIT    SA1      1              * CK RA+1 FOR EMPTY
             0311000000 +                   NZ       X1,TESTIT
1   5110000004 C                            SA1      PARAM          * PUT PARAM IN RA+1
             10611                          BX6      X1
2   5160000001                              SA6      1
3   5110000001                    LOOP      SA1      1              * WAIT TILL PICKED UP
             0311000003 +                   NZ       X1,LOOP
4   0100000000 X                            ENDRUN
                                            USE      /BLOCK/

0   00000000000000000001          FAKEFET   DATA     1              * FAKEFET SHOULD CONTAIN ZERO
                                                                    * OR MTR WILL REJECT CALL
                                                                    * WITH AUTO RECALL ERR MSG

1   00000000000000000173          BUF       DATA     123,456
3                                 ANS       BSSZ     1
4   23251520000000000000 C        PARAM     VFD      18/3LSUM,3/2,3/0,36/FAKEFET
6                                           END      TESTIT
                        43406     STORAGE USED              22 STATEMENTS        7 SYMBOLS
                                  6600 ASSEMBLY          0.252 SECONDS          12 REFERENCES
```

AUTO RECALL ERROR

```
 02/17/72 + N W L  SCOPE 3.3   LEVEL 250  06/29/71
18.32.53.SHEHY1T
18.32.53.SHEHYN,CM70000.
18.32.54.GO.
18.32.54.COMPASS(B=PPTEST,S=SCPTEXT)
18.32.55. MINIMUM FIELD LENGTH NEEDED = 054300
18.32.55. ASSEMBLY COMPLETE.
18.32.56.REWIND(PPTEST)
18.32.56.EDITLIB.
18.32.57.          READY(SYSTEM)
18.32.58.          ADD(*,PPTEST)
18.32.58.          COMPLETE.
18.33.16.GO.
18.33.19.COMPASS.
18.33.20. MINIMUM FIELD LENGTH NEEDED = 043500
18.33.20. ASSEMBLY COMPLETE.
18.33.20.LGO.
18.33.21.CPA   051.243 CPB   000.000
18.33.21.PP    006.274 IO    000.765 NEW FL 00500
18.33.21.AUTO-RECALL ERROR
18.33.21.EXIT.
18.33.21.DMP(100,105)
18.33.22.DMP(100,400)
18.33.22.RFL,70000.
18.33.22.CPA   051.246 CPB   000.000
18.33.22.PP    007.496 IO    000.765 NEW FL 70000
18.33.22.EDITLIB(RESTORE)
18.33.25.GO.
18.33.27.MASS STORAGE  000310 PRU
18.33.27.CPA   051.624 SEC.
18.33.27.PP    009.769 SEC.
18.33.27.IO    000.956 SEC.
```

dayfile message issued by MTR.

```
                                       IDENT    PROB3
                                       ENTRY    TESTIT
 0  5110000001               TESTIT    SA1      1                 * CK RA+1 FOR EMPTY
          0311000000 +                 NZ       X1,TESTIT
 1  5110000004 C                       SA1      PARAM             * PUT PARAM IN RA+1
          10611                        BX6      X1
 2  5160000001                         SA6      1
 3  5110000001               LOOP      SA1      1                 * WAIT TILL PICKED UP
          0311000003 +                 NZ       X1,LOOP
 4  0100000000 X                       ENDRUN
                                       USE      /BLOCK/
 0                           FAKEFET   BSSZ     1                 * PSEUDO FET TO HOLD COMPLETE BIT
 1  00000000000000000173     BUF       DATA     123,456
 3                           ANS       BSSZ     1
                                                                    out of range
 4  23251520000000100000 C   PARAM     VFD      18/3LSUM,3/2,3/0,36/FAKEFET+100000B
                                                          * BAD ADDR IN PARAM WILL CAUSE
                                                          * MTR TO REJECT CALL
                                                          * WITH PP CALL ERROR MSG

 6                                     END      TESTIT
                  43406      STORAGE USED            23 STATEMENTS        7 SYMBOLS
                             6600 ASSEMBLY        0.267 SECONDS          12 REFERENCES
```

PP CALL ERROR

```
  02/17/72 + N H L  SCOPE 3.3   LEVEL 250  06/29/71
18.35.14.SHEHY1H
18.35.14.SHEHYN,CM70000.
18.35.18.GO.
18.35.18.COMPASS(B=PPTEST,S=SCPTEXT)
18.35.19. MINIMUM FIELD LENGTH NEEDED = 054300
18.35.19. ASSEMBLY COMPLETE.
18.35.19.REWIND(PPTEST)
18.35.19.EDITLIB.
18.35.51.              READY(SYSTEM)
18.35.52.              ADD(*,PPTEST)
18.35.52.              COMPLETE.
18.37.33.GO.
18.37.36.COMPASS.
18.37.37. MINIMUM FIELD LENGTH NEEDED = 043500
18.37.37. ASSEMBLY COMPLETE.
18.37.37.LGO.
18.37.38.CPA    052.704 CPB   000.148
18.37.38.PP     023.407 IO    000.765 NEW FL 00500
18.37.38.PP CALL ERROR <-------------------------- dayfile message
18.37.38.EXIT.                                     issued by MTR
18.37.38.DMP(100,105)
18.37.39.DMP(100,400)
18.37.39.RFL,70000.
18.37.40.CPA    052.707 CPB   000.148
18.37.40.PP     024.630 IO    000.765 NEW FL 70000
18.37.40.EDITLIB(RESTORE)
18.37.57.GO.
18.37.59.MASS STORAGE  000372 PRU
18.37.59.CPA    053.307 SEC.
18.37.59.CPB    000.148 SEC.
18.37.59.PP     030.776 SEC.
18.37.59.IO     000.956 SEC.
```

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```
                                  IDENT     SUM,C.PPFWA
                             * THIS IS A PP PGM TO SUM 2 NUMBERS FROM CP MEMORY
                             * IT IS A TEST TO SHOW THE LINKAGE AND HOW TO PUT IT IN THE SYSTEM
                             * THE PP PGM IS ENTERED FROM OVL BY A LJM
                             * IT IS A TRANSIENT PROGRAM AND WILL RUN AT 1000
                                  PERIPH                        * TELL ASSEMBLER ITS PP
                                  SST                           * GET ACCESS TO SYSTEM SYMBOLS
1000                              ORG       C.PPFWA        * WILL RUN AT 1000
1000      3074                    PPENTRY   D.PPIRB,D.TO
1004      3074                    LDD       D.PPIR         * GET CM ADDR OF INPUT REGISTER
1005      6050                    CRD       D.PPIRB        * GET PARAM WORD FROM CM
1006      1402                    LDN       2              * FOR 2 MORE CM WORDS
1007      3402                    STD       2
1010      3054                    LDD       D.PPIRB+4      * GET CM ADDR OF BUF-1
1011      1601                    ADN       1              * REL ADDR OF BUF IN A
1012      0200 0505               RJM       R.TFL          * ABSOLUTIZE IT
1014      0603                    PJN       *+3            * MJN WONT REACH ABT
1015      0100 1056               LJM       ABT
1017      6122 1065               CRM       BUF,2          * READ TWO DATA WORDS
1021      5000 1076               LDM       BUF+9          * GET DATA FROM BUF+1
1023      5500 1071               RAM       BUF+4          * ADD DATA FROM BUF
1025      0200 0446               RJM       R.RAFL         * GO SEE IF MOVE PENDING
1027      1401                    LDN       1              * TO WRITE ONE WORD
1030      3401                    STD       1
1031      3054                    LDD       D.PPIRB+4      * GET ADDR TO SEND ANS BACK
1032      1603                    ADN       3              * REL ADDR OF ANS
1033      0200 0505               RJM       R.TFL          * GO ABSOLUTIZE IT
1035      0721                    MJN       ABT
1036      6301 1065               CWM       BUF,1          * WRITE ANSWER BACK
1040      1400                    LDN       0              * ZERO OUTPUT BUFFER
1041      6010                    CRD       D.TO
1042      1401                    LDN       1
1043      3413                    STD       D.TO+3         * SET COMPLETE BIT IN WRONG PLACE
                                                           * TO HANG IN AUTO RECALL
1044      3054                    LDD       D.PPIRB+4
1045      0200 0505               RJM       R.TFL          * ABSOLUTIZE PSEUDO FET ADDR
1047      0707                    MJN       ABT
1050      6210                    CWD       D.TO           * PUT FET WORD BACK
1051      1412                    LDN       M.DPP          * GET DROP ME CODE
1052      0200 0516     EXIT      RJM       R.MTR          $ GO DROP PP
1054      0100 0103               LJM       R.IDLE         * GO TO IDLE LOOP
1056      2000 1077     ABT       LDC       ABTMSG         * ABORT MESSAGE ADDR + FLAG 0
1060      0200 0671               RJM       R.DFM          * ISSUE DAYFILE MESSAGE
1062      1413                    LDN       M.ABORT        * ABORT  OUT OF RANGE
1063      0100 1052               LJM       EXIT
1065                    BUF       BSS       10           * BUFFER FOR CM WORDS
1077      5502          ABTMSG    DIS       ,* BAD ADDR*
1105                              END
                 54202  STORAGE USED            54 STATEMENTS      712 SYMBOLS
                        6600 ASSEMBLY         0.762 SECONDS         35 REFERENCES
```

14-15

VALS-53-14-15

HUNG IN AUTO RECALL

```
 02/17/72   N W L  SCOPE 3.3   LEVEL 250  06/29/71
18.16.11.SHEHY1I
18.16.11.SHEHYN,CM70000.
18.16.14.GO.
18.16.14.COMPASS(B=PPTEST,S=SCPTEXT)
18.16.15. MINIMUM FIELD LENGTH NEEDED = 054300
18.16.15. ASSEMBLY COMPLETE.
18.16.15.REWIND(PPTEST)
18.16.15.EDITLIB.
18.16.17.            READY(SYSTEM)
18.16.17.            ADD(*,PPTEST)
18.16.18.            COMPLETE.
18.16.38.GO.
18.16.40.COMPASS.
18.16.41. MINIMUM FIELD LENGTH NEEDED = 043500
18.16.41. ASSEMBLY COMPLETE.
18.16.41.LGO.
18.16.42.CPA    051.387 CPB    000.000
18.16.42.PP     006.936 IO     000.766 NEW FL 00500
18.16.43.JOB HUNG IN AUTO-RECALL
18.16.43. ADDRESS =000100
18.16.43.EXIT.
18.16.43.DMP(100,105)
18.16.43.DMP(100,400)
18.16.44.RFL,70000.
18.16.45.CPA    051.390 CPB    000.000
18.16.45.PP     000.813 IO     000.766 NEW FL 70000
18.16.45.EDITLIB(RESTORE)
18.18.19.GO.
18.18.22.MASS STORAGE  000372 PRU
18.18.22.CPA    054.987 SEC.
18.18.22.CPB    000.350 SEC.
18.18.22.PP     054.617 SEC.
18.18.22.IO     000.957 SEC.
```

dayfile message issued by MTR

14-76

```
                                    IDENT     SUM,C.PPFWA
                               * THIS IS A PP PGM TO SUM 2 NUMBERS FROM CP MEMORY
                               * IT IS A TEST TO SHOW THE LINKAGE AND HOW TO PUT IT IN THE SYSTEM
                               * THE PP PGM IS ENTERED FROM OVL BY A LJM
                               * IT IS A TRANSIENT PROGRAM AND WILL RUN AT 1000
                                    PERIPH                          * TELL ASSEMBLER ITS PP
                                    SST                             * GET ACCESS TO SYSTEM SYMBOLS
1000                                ORG       C.PPFWA         * WILL RUN AT 1000
1000        3074                    PPENTRY   D.PPIRB,D.T0
1004        3074                    LDD       D.PPIR          * GET CM ADDR OF INPUT REGISTER
1005        6050                    CRD       D.PPIRB         * GET PARAM WORD FROM CM
1006        1402                    LDN       2               * FOR 2 MORE CM WORDS
1007        3402                    STD       2
1010        3054                    LDD       D.PPIRB+4       * GET CM ADDR OF BUF-1
1011        1601                    ADN       1               * REL ADDR OF BUF IN A

1012        2110 0000               ADC       1000000B        * GENERATE BAD ADDRESS

1014        0200 0505               RJM       R.TFL           * ABSOLUTIZE IT
1016        0603                    PJN       *+3             * MJN WONT REACH ABT
1017        0100 1060               LJM       ABT
1021        6102 1072               CRM       BUF,2           * READ TWO DATA WORDS
1023        5000 1103               LDM       BUF+9           * GET DATA FROM BUF+1
1025        5500 1076               RAM       BUF+4           * ADD DATA FROM BUF
1027        0200 0446               RJM       R.RAFL          * GO SEE IF MOVE PENDING
1031        1401                    LDN       1               * TO WRITE ONE WORD
1032        3401                    STD       1
1033        3054                    LDD       D.PPIRB+4       * GET ADDR TO SEND ANS BACK
1034        1503                    ADN       3               * REL ADDR OF ANS
1035        0200 0505               RJM       R.TFL           * GO ABSOLUTIZE IT
1037        0721                    MJN       ABT
1040        6301 1072               CWM       BUF,1           * WRITE ANSWER BACK
1042        1400                    LDN       0               * ZERO OUTPUT BUFFER
1043        6010                    CRD       D.T0
1044        1401                    LDN       1
1045        3414                    STD       D.T0+4          * SET COMPLETE BIT
1046        3054                    LDD       D.PPIRB+4
1047        0200 0505               RJM       R.TFL           * ABSOLUTIZE PSEUDO FET ADDR
1051        0707                    MJN       ABT
1052        6210                    CWD       D.T0            * PUT FET WORD BACK
1053        1412                    LDN       M.DPP           * GET DROP ME CODE
1054        0200 0516     EXIT      RJM       R.MTR           $ GO DROP PP
1056        0100 0103               LJM       R.IDLE          * GO TO IDLE LOOP

1060        1406          ABT       LDN       6               * SET FLAG BITS FOR DFM
1061        1014                    SHN       12
1062        2100 1104               ADC       ABTMSG          * ADD MSG ADDRESS
1064        0200 0671               RJM       R.DFM           * ISSUE DAYFILE MESSAGE
1066        0300                    UJN       0               * HANG PP

1067        1413                    LDN       M.ABORT         * ABORT  OUT OF RANGE
1070        0100 1054               LJM       EXIT
1072                      BUF       BSS       10         * BUFFER FOR CM WORDS

1104        5355          ABTMSG    DIS       ,*$ DIRTY BAD MSG*
```

HANG PP

14-17

VALS-53-14-18

HONK PP — PARTIAL DUMP

0000	7763	4005	7207	3605	0374	0005	0410	0003	P07
0020	----	----	0100	0002	0022	0006	3243	0040	P07
0040	----	0005	----	----	0001	0105	----	----	P07
0060	----	3362	----	0477	----	0362	0006	2221	P07
0100	1600	----	----	2074	6016	3017	0512	0200	P07
0120	1217	1007	3476	0200	0471	2000	0773	0200	P07
0140	5400	0256	1401	6410	3310	1014	3111	0472	P07
0160	6115	0011	3414	1463	3413	3006	1073	1217	P07
0200	3006	1007	1203	0523	3007	1277	1014	3110	P07
0220	0516	1413	0200	0516	0100	0103	3010	5400	P07
0240	0247	0200	0274	3317	1066	0444	0352	0377	P07
0260	7777	----	----	----	----	----	----	----	P07
0300	1012	0671	0100	2205	3410	1473	0200	0320	P07
0320	0310	1005	5400	0370	5010	0007	5400	0371	P07
0340	0210	0446	1462	1701	0576	3175	1602	6013	P07
0360	0402	0200	0663	3613	0312	3017	6925	0366	P07
0400	6013	0343	0016	0356	0370	----	0100	0335	P07
0420	3410	1403	6011	3075	6310	0247	6211	1403	P07
0440	[illegible]	[illegible]	[illegible]	2113	3455	1100	0442	3176	P07
0460	[illegible]	[illegible]	2075	5400	0100	3077	6276	0357	P07
0500	[illegible]	3155	3155	1006	0100	1016	0705	1014	P07
0520	3074	1601	6210	0200	3527	3307	3100	3525	P07
0540	[illegible]	3445	1462	1701	0575	0362	----	----	P07
0560	0100	2352	3411	1402	3414	0210	0516	3013	P07
0600	2100	0101	6010	3414	6210	3376	0467	3011	P07
0620	3012	5200	0102	5400	3102	0610	2100	1750	P07
0640	0603	2101	----	5400	0101	3077	6276	0100	P07
0660	4110	0557	0100	0353	3410	4010	3400	0367	P07
0700	3400	4320	4400	0402	3510	3600	1120	0571	P07
0720	0200	0516	3345	0100	0111	3377	6216	1400	P07
0740	----	----	----	----	----	----	----	----	P07
0760	----	----	----	----	----	----	----	----	P07
1000	3174	6950	0211	0446	3371	6050	1402	3402	P07
1020	1163	6132	1072	5300	1103	5500	1076	0200	P07
1040	6301	1072	1400	6010	1401	3414	3654	0200	P07
1060	1406	1014	2100	1104	0200	0671	----	1413	P07
1100	----	----	----	----	5355	0411	2224	3155	P07
1120	3644	3053	1277	1014	3154	0200	0505	0707	P07
1140	0200	0671	1413	0366	2000	1671	0100	1140	P07
1160	0511	2022	----	1071	3234	0756	3034	3411	P07
1200	3412	1411	3230	0516	4230	0446	3455	3014	P07
1220	3334	0503	0100	1344	3732	0403	0100	1156	P07
1240	5400	1656	2000	2355	5400	1657	1454	6010	P07
1260	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1663	P07
1300	2005	2222	0317	1174	0502	1422	1006	3307	P07
1320	1544	3051	1340	1540	3451	3075	6250	1400	P07
1340	0200	0515	0100	0103	3051	1240	0503	0100	P07
1360	3544	0362	0100	1217	0200	0446	3455	3014	P07
1400	3435	0370	1456	0020	2034	2220	0603	0100	P07
1420	1020	3427	6020	3024	1702	0736	5425	1024	P07
1440	0023	3027	1620	6020	3022	0416	3027	2100	P07
1460	6023	3320	0435	1430	5425	1624	3430	3030	P07
1500	0603	0100	1154	1401	3427	1400	3425	3426	P07
1520	5027	1624	3226	0613	0305	5027	1624	3226	P07
1540	0547	3025	3415	6200	1565	3031	3226	0710	P07
1560	4030	3432	0100	1156	0100	----	1007	2100	P07
1600	2100	1700	3421	2000	3422	3420	1400	3422	P07
1620	1437	0240	0516	0100	1564	----	----	----	P07
1640	----	----	----	----	2701	1124	1116	0755	P07
1660	----	1505	1555	0122	0755	0522	2217	2200	P07
1700	2205	2125	0523	2455	0530	0305	0564	2355	P07
1720	0522	2217	2246	2324	0124	2523	5501	1422	P07
1740	1116	0322	0501	2311	1607	5506	1455	0124	P07
1760	5501	1414	1727	0504	5551	1505	1552	----	P07
2000	2000	0100	3471	1400	3405	1423	0200	2071	P07
2020	0671	1417	3435	1425	0200	2071	1420	3435	P07
2040	3330	1374	5500	2265	3034	1071	3434	1207	P07
2060	5500	2234	2011	2243	0200	0671	0100	1120	P07
2100	0100	2210	3412	1014	3113	2175	4357	0710	P07
2120	1014	3113	2277	0327	3707	3413	1163	3412	P07
2140	3071	5505	2227	0357	3013	1712	0705	3413	P07
2160	2177	7633	0766	3414	3071	5505	2231	0367	P07
2200	1336	5505	2232	5405	2226	1371	1131	0513	P07
2220	5535	2225	2100	2670	0322	0155	5555	3333	P07
2240	4135	3400	----	2020	5555	5555	3334	4157	P0
2260	4155	1505	2755	0614	5533	3340	3333	----	P0
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	P07

0010	----	----	----	----	----	0700	----	----	PC.
0030	7600	0024	0001	0002	----	0305	1363	----	P07
0050	2325	1527	----	----	0100	1400	0105	5757	P07
0070	0001	0100	0005	----	5110	5112	1600	0152	P07
0110	0724	1470	1761	0376	3074	6715	3117	0571	P07
0130	0135	0100	1000	----	2100	0171	5400	0731	P07
0150	6010	1402	3405	1005	3312	3012	[illegible]	[illegible]	P07
0170	0524	3001	3516	0561	3017	1577	3202	0555	P07
0210	6105	0773	0100	0134	3075	0215	1002	5500	P07
0230	0247	3611	5400	0050	3012	5400	0201	5000	P07
0250	0013	0043	0011	3403	----	4112	0773	1500	P07
0270	----	----	----	0100	0243	3410	1471	0507	P07
0310	3613	3075	1002	6213	5000	0370	0261	0100	P07
0330	3075	5410	0000	0203	0407	5000	3100	0403	P07
0350	3013	1703	0013	0543	1602	0757	0565	2000	P07
0370	7125	1120	2017	5307	0371	3713	[illegible]	1052	P07
0410	3010	5400	0425	2076	1061	5410	0504	1462	P07
0430	2414	1406	0230	0016	0061	3000	0100	3276	P07
0450	1520	0019	3012	0412	0205	0571	4552	1714	P07
0470	0100	0125	1400	5400	0100	3077	2276	0370	P07
0510	3256	1006	0755	1500	0307	0100	0722	2410	P07
0530	3074	1601	6010	3011	0471	5000	0100	0403	P07
0550	----	----	----	----	----	----	----	----	P07
0570	5400	0102	3012	5400	0101	0762	0100	2430	P07
0610	1714	0705	1704	0702	1716	1600	1500	6010	P07
0630	5406	0112	1501	3111	0302	3000	5200	0101	P07
0650	0576	3412	4012	2200	7700	4300	4412	3010	P07
0670	0100	1065	3410	1063	3411	3075	3413	1413	P07
0710	3012	6213	3612	1207	0403	3017	0563	1401	P07
0730	5400	0101	5400	0102	0366	----	----	----	P07
0750	----	----	----	----	----	----	----	----	P07
0770	----	----	----	2225	1500	0773	----	0021	P07
1010	3654	1601	2111	----	0200	0202	0503	1300	P07
1030	0446	1401	3401	3054	1603	0200	0505	0721	P07
1050	0505	0707	6210	1412	0200	0516	0100	0103	P07
1070	0100	1054	----	----	----	----	----	----	P07
1110	0201	0455	1523	0700	----	----	----	----	P07
1130	6240	1412	0200	0515	0100	0103	2300	1601	P07
1150	2000	1714	0100	1140	1401	3432	3337	3413	P07
1170	0311	2000	----	3234	0603	0100	1144	3034	P07
1210	3456	3011	0403	0100	1357	0235	----	3035	P07
1230	3037	0415	2003	3355	5400	1655	2000	0563	P07
1250	3010	0404	1007	3276	0406	3011	0406	1007	P07
1270	3606	1013	3306	1370	5500	1653	3537	6504	P07
1310	1370	5500	1652	2403	2457	3076	1055	0307	P07
1330	6010	2000	1750	3412	1437	0200	0516	1412	P07
1350	1770	1400	6010	3076	1535	6210	0373	1402	P07
1370	3435	0370	0100	----	3076	1622	6010	3014	P07
1410	1154	3431	1400	3426	1401	3425	3125	1667	P07
1430	3430	3027	1602	6020	3020	0426	2177	2777	P07
1450	0151	6026	3020	1306	0707	3027	2100	0145	P07
1470	3526	3625	1120	6403	0100	1416	3026	3231	P07
1510	5027	1624	0424	3231	0711	3026	3231	0712	P07
1530	0706	5027	1024	3426	3027	3425	3027	1120	P07
1550	0437	3431	1400	5427	1624	0100	1533	2000	P07
1570	0152	3401	6020	3024	0567	3001	1070	1217	P07
1610	3423	2000	0703	3424	3075	6220	1400	6020	P07
1630	----	----	----	----	----	----	----	----	P07
1650	0617	2255	3333	3333	3333	5503	1555	5555	P07
1670	----	1505	1555	0122	0755	0522	2217	2246	P07
1710	1411	1511	2400	----	1505	1555	0122	0755	P07
1730	0531	0431	5503	1715	2014	0524	0500	----	P07
1750	5511	1624	0522	0317	1555	0320	5516	1724	P07
1770	3076	2100	0165	6001	3001	0403	0100	1120	P07
2010	1407	3405	1424	0200	2071	2011	2224	0260	P07
2030	2100	0164	0200	2071	3034	1277	3403	1053	P07
2050	5500	2264	3034	1270	6503	2000	0220	1003	P07
2070	0100	2034	3176	6010	3012	3113	3114	0553	P07
2110	3413	1063	3412	3071	5505	2226	0363	3012	P07
2130	5505	2226	0264	3113	2177	7033	0706	3413	P07
2150	5605	2227	0371	1612	1006	5505	2230	3014	P07
2170	3014	1712	0705	3414	5605	2231	0371	1612	P07
2210	2000	2210	5505	2226	1277	1133	0334	1422	P07
2230	3557	4335	4455	0320	0255	5555	3336	3557	P07
2250	3534	3455	1117	5555	5555	3333	3357	[illegible]	P07
2270	----	----	----	----	3602	3014	4402	[illegible]	P07
2310	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	P07

SSVER 1.1 1

Example showing assembly error because MJN could not reach ABT

```
                                IDENT   SUM,C.PPFWA
                                PERIPH                  # TELL ASSEMBLER ITS PP
                                SST                     # GET ACCESS TO SYSTEM SYMBOL
                                BASE    0               # MOST PP PGMS ARE OCTAL
1000                            ORG     C.PPFWA         # WILL RUN AT 1000
1000      0200 0430             RJM     R.PAUSE
1002      3075                  LDD     D.PPIR          # GET CM ADDR OF INPUT REGISTER
1003      0050                  CRD     D.PPIRB         # GET PARAM WORD FROM CM
1004      3054                  LDD     D.PPIRB+4       # GET CM ADDR OF BUF-1
1005      1601                  ADN     1               # REL ADDR OF BUF IN A
1006      0200 0634             RJM     R.TFL           # ABSOLUTIZE IT
A  1010   0742                  MJN     ABT
1011      1402                  LDN     2               # FOR 2 MORE CM WORDS
1012      3402                  STD     2
1013      6102 1055             CRM     BUF,2           # READ TWO DATA WORDS
1015      5000 1066             LDM     BUF+11          # GET DATA FROM BUF+1
1017      5500 1061             RAM     BUF+4           # ADD DATA FROM BUF
1021      0200 0430             RJM     R.PAUSE         # GO SEE IF STORAGE MOVE WAITING
1023      1401                  LDN     1               # TO WRITE ONE WORD
1024      3401                  STD     1
1025      3054                  LDD     D.PPIRB+4       # GET ADDR TO SEND ANS BACK
1026      1603                  ADN     3               # REL ADDR OF ANS
1027      0200 0634             RJM     R.TFL           # GO ABSOLUTIZE IT
1031      0721                  MJN     ABT
1032      6301 1055             CWM     BUF,1           # WRITE ANSWER BACK
1034      1400                  LDN     0               # ZERO OUTPUT BUFFER
1035      0310                  CRD     D.10
1036      1401                  LDN     1
1037      3414                  STD     D.10+4          # SET COMPLETE BIT
1040      3054                  LDD     D.PPIRB+4
1041      0200 0634             RJM     R.TFL           # ABSOLUTIZE PSEUDO FET ADDR
1043      0707                  MJN     ABT
1044      6210                  CWD     D.10            # PUT FET WORD BACK
1045      1412                  LDN     M.DPP           # GET DROP ME CODE
1046      0200 0450   EXIT      RJM     R.MTR           $ GO DROP PP
1050      0100 0100             LJM     R.IDLE          # GO TO IDLE LOOP
1052      1413        ABT       LDN     M.ABORT         # ABORT IF ADDR OUT OF RANGE
1053      0100 1046             LJM     EXIT
1055                  BUF       BSS     12
1057                            END

A TYPE ERROR          ADDRESS FIELD BAD
      OCCURRED ON PAGES    1
```

14-19

ASSEMBLY ERROR

For Example: In another run, some of the instructions were moved, closer to the others which used them. This run hung 6 pp's and killed the whole system, necessitating initial deadstart. WHY? 11/15/71

```
                                   IDENT   SQT,C.PPERA
                                   PERIPH                   * TELL ASSEMBLER ITS PP
                                   SST                      * GET ACCESS TO SYSTEM SYMBOLS
                                   BASE    0              * MOST PP PGMS ARE OCTAL
1000                               ORG     C.PPERA        * WILL RUN AT 1000
1000    0200 0430                  RJM     R.PAUSE
1002    0275                       LDD     D.PPIR         * GET CM ADDR OF INPUT REGISTER
1003    6050                       CRD     D.PPIRB        * GET PARAM WORD FROM CM
1004    1402                      {LDN     2              * FOR 2 MORE CM WORDS
1005    3402                      {STD     2
1006    3054                       LDD     D.PPIRB+4      * GET CM ADDR OF BUF-1
1007    1601                       ADN     1              * REL ADDR OF BUF IN A
1010    0200 0634                  RJM     R.TFL          * ABSOLUTIZE IT
1012    0603                       PJN     *+3            * MJN WON'T REACH
1013    0100 1054                  LJM     ABT
1015    6102 1057                  CRM     BUF,2          * READ TWO DATA WORDS
1017    5000 1070                  LDM     BUF+11         * GET DATA FROM BUF+1
1021    5500 1063                  RAM     BUF+4          * ADD DATA FROM BUF
1023    0200 0430                  RJM     R.PAUSE        * GO SEE IF STORAGE MOVE WAITING
1025    1401                      {LDN     1              * TO write 1 word
1026    3401                      {STD     1
1027    3054                       LDD     D.PPIRB+4      * GET ADDR TO SEND ANS BACK
1030    1603                       ADN     3              * REL ADDR OF ANS
1031    0200 0634                  RJM     R.TFL          * GO ABSOLUTIZE IT
1033    0721                       MJN     ABT
1034    6301 1057                  CWM     BUF,1          * WRITE ANSWER BACK
1036    1400                       LDN     0              * ZERO OUTPUT BUFFER
1037    6010                       CRD     D.TO
1040    1401                       LDN     1
1041    3414                       STD     D.TO+4         * SET COMPLETE BIT
1042    3054                       LDD     D.PPIRB+4
1043    0200 0634                  RJM     R.TFL          * ABSOLUTIZE PSEUDO FET ADDR
1045    0707                       MJN     ABT
1046    6210                       CWD     D.TO                PUT IT BACK
1047    1412                       LDN     M.DPP          * GET DROP ME CODE
1050    0200 0430        EXIT      RJM     R.MTR          $ GO DROP PP
1052    0100 1100                  LJM     R.IDLE         * GO TO IDLE LOOP
1054    1413             ABT       LDN     M.ABORT        * ABORT IF ADDR OUT OF RANGE
1055    0100 1050                  LJM     EXIT
1057                     BUF       BSS     ?
                                   END
```

D2-41

RECOT

STORAGE ALLOCATION.

ADDRESS	LENGTH	BINARY CONTROL CARDS.	
1000	2336	IDENT	1RN,C.PPFWA
3336	(373)	END	

BLOCKS	TYPE	ADDRESS	LENGTH
PROGRAM*	ABSOLUTE	0	3321
TA.CH	ABSOLUTE	3321	14
TA.CHE	ABSOLUTE	3335	1

```
                              IDENT     1RN,C.PPFWA
                              PERIPH
                   *    TITLE CARD FOLLOWS
                   *
                              SST
                              ORG       C.PPFWA
 1000                         LIST   F
                   **
                   *          1RN - AGE QUEUES, MANAGE RBT STORAGE, STATUS TAPE DRIVES
                   *
                   *          FUNCTION
                   *          --------
                   *
                   *          1RN IS A PP ROUTINE WHICH BOUNCES AT CONTROL POINT ZERO ONCE
                   *          EVERY SECOND.  A CALL TO 1RN IS ASSEMBLED INTO MTRS PP
                   *          DELAY STACK SO THAT MTR WILL CALL 1RN AFTER MTR HAS BEEN
                   *          INITIALIZED AFTER A DEADSTART.  WHEN 1RN HAS COMPLETED ITS
                   *          TASK IT GOES INTO MTRS PP DELAY STACK WITH A DELAY WHICH
                   *          WILL CAUSE IT TO BE EXECUTED ONCE A SECOND.  THE MAJOR
                   *          FUNCTIONS OF 1RN ARE AS FOLLOWS..
                   *
                   *          ROUTINE AQS
                   *          -----------
                   *
                   *          ROUTINE AQS AGES THE INPUT AND OUTPUT QUEUES AND UPDATES
                   *          THE COUNTS IN THE FIRST WORD OF THE JOB CONTROL AREA.  THESE
                   *          COUNTS INCLUDE..
                   *
                   *            1. THE NUMBER OF JOBS IN THE INPUT QUEUE REQUIRING
                   *               NON-ALLOCATABLE DEVICES.
                   *
                   *            2. THE NUMBER OF JOBS IN THE INPUT QUEUE NOT REQUIRING
                   *               NON-ALLOCATABLE DEVICES (BIT 11 IN EACH OF THESE
                   *               COUNTS IS SET IF ONE OR MORE FIXED PRIORITY JOBS ARE
                   *               FOUND).
                   *
                   *            3. NUMBER OF EMPTY FNT SLOTS.
                   *
                   *          THE INPUT QUEUE IS AGED (THE PRIORITY IS INCREMENTED BY ONE)
                   *          EVERY 2**IP.IQD SECONDS.  THE OUTPUT QUEUE IS AGED EVERY
                   *          2**IP.OQD SECONDS.  JOBS WAITING TO BE STAGED BY TAPE
                   *          STAGEING (WITH DISPOSITION CODE OF 5 OR 6) ARE ALSO AGED
                   *          EVERY 2**IP.IQD SECONDS.  THE PRIORITY OF A JOB IS NOT
                   *          INCREMENTED UNLESS THE LOWER 6 BITS OF THE PRIORITY IS LESS
                   *          THAN THE VALUE MAXAGE (SYMBOL INTERNAL TO 1RN, RELEASED
                   *          EQUAL TO 77B).
                   *          IF 1RN FINDS AN INCREASE IN THE NUMBER OF JOBS READY TO BE
                   *          SCHEDULED (COUNTS IN FIRST WORD OF JCA) THEN 1RN SETS
                   *          BYTE C.JCCLK OF THE FIRST WORD OF THE JCA EQUAL TO ZERO TO
                   *          TELL SCHEDULER TO CALL 1IB.
                   *
                   *
                   *          ROUTINE RCN
                   *          -----------
                   *
                   *          REQUESTS ADDITIONAL RBT STORAGE OR RELEASES UNUSED RBT
```

```
*         STORAGE.                                                     1RN      60
*                                                                      1RN      61
*         ROUTINE TPSTAT                                               1RN      62
*         ---------------                                              1RN      63
*                                                                      1RN      64
*         STAUSES TAPE DRIVES.                                         1RN      65
*                                                                      1RN      66
*                                                                      1RN      67
```

```
        20     RBTWP      EQU       D.TW0
        25     RBTPTR     EQU       D.TW5
        31     LWA        EQU       RBTPTR+4
        27     FRSTRBT    EQU       RBTPTR+2
        30     RBTCL      EQU       RBTPTR+3

        32     RBTCNT     EQU       D.TH2
        33     EMPCT      EQU       D.TH3
        34     CURRENT    EQU       D.TH4
        35     PREVIOUS   EQU       D.TH5
        36     CONTIG     EQU       D.TH6
        37     START      EQU       D.TH7
        40     LOWSCRAP   EQU       D.FR0
        41     RBTLINK    EQU       D.FR1
        42     ZERO       EQU       RBTLINK+1
        21     PASSIGN    EQU       D.TW1
        40     TWO        EQU       D.BA

        55     CW.RCHN    EQU       T.RCHN

               RBT        MACRO     CELL
                          LDD       LWA
                          SHN       5
                          SBD       CELL
                          SHN       1
                          ENDM
```

14-24

```
                    *                                                         1RN      99
                    *                                                         1RN     100
                    *        AQS - AGE QUEUES                                 1RN     101
                    *                                                         1RN     102
                    *        AUTHOR - RL MCALLESTER                           1RN     103
                    *                                                         1RN     104
                    *        WRITTEN - AUGUST 1970 FOR SCOPE 3.4              1RN     105
                    *                                                         1RN     106
                    *                                                         1RN     107
                    *                                                         1RN     108



                    *        DIRECT CELLS                                     1RN     110
                    *                                                         1RN     111
                    *                                                         1RN     112
           20       D.FNT     EQU    D.FNT        5 CELLS WHICH HOLD FNT OF A FILE      1RN     113
           25       FST1      EQU    D.TW5        5 CELLS WHICH HOLD 1ST WORD OF FST    1RN     114
           32       FST2      EQU    D.TH2        5 CELLS WHICH HOLD 2ND WORD OF FST    1RN     115
           37       STGFLG    EQU    D.TH7        STAGE ON/OFF FLAG                     1RN     116
                    *                                                         1RN     117
                    *                                                         1RN     118
                    *               FNT COUNTS                                1RN     119
                    *                                                         1RN     120
                    *                                                         1RN     121
           42       PRCOUNT   EQU    D.FR2        PRIORITY JOBS                         1RN     122
           44       IQCOUNT   EQU    D.FR4        INPUT QUEUE JOBS                      1RN     123
           46       EMCOUNT   EQU    D.FR6        EMPTY FNTS                            1RN     124
           47       CHFLG     EQU    D.FR7        SET NON-ZERO IF CH.FNT IS RESERVED    1RN     125
                    *                              DURING FNT SEARCH
            2       FLNKAD    EQU    D.Z2         SUPPLYMENT FNT ADDRESS                FEAT61A 743
```

14-25

```
                IPARAMS  CTEXT  SCOPE 3 INSTALLATION PARAMETERS.
 1000

                                                                                1RN      138
                *         PRIORITY DEFINITIONS                                  1RN      139
                *                                                               1RN      140
                *                                                               1RN      141
                *     THE LENGTH OF THE AGE ADDEND IN THE INPUT QUEUE IS        1RN      142
                *     DETERMINDED BY 12-THE NUMBER OF BITS IN IP.LVF            FEAT10Q   10
                                                                                FEAT10Q   11
          1     PMPY      SET   1                                               FEAT10Q   12
         -1     PSHIFT    SET   -1                                              FEAT10Q   13
         24               DUP   20,4                                            FEAT10Q   14
                PSHIFT    SET   PSHIFT+1                                        FEAT10Q   15
                PMPY      SET   PMPY*2                                          FEAT10Q   16
                          IFGE  IP.LVF*PMPY,10000B,1                            FEAT10Q   17
                          STOPDUP                                               FEAT10Q   18
        100     PMPY      SET   PMPY/2                  MAX SUBLEVEL            1RN      150
         77     MAXAGE    SET   PMPY-1                                          1RN      151
                *                                                               1RN      152
                *                                                               1RN      153
                *     THE INPUT QUEUE AND THE OUTPUT QUEUE ARE TO BE AGED EACH 2**IP.IQD 1RN 154
                *     AND 2**IP.OQD SECONDS RESPECTVELY.                        1RN      155
                *                                                               1RN      156
                IQP       BIT   IP.IQD                  INPUT QUEUE AGING PERIOD   1RN   157
                OQP       BIT   IP.OQD                  OUTPUT QUEUE AGING PERIOD  1RN   158
                *
                LOCKMASK  BIT   S.FLOCK


                                                                                1RN      160
                *         DISPOSITION CODES                                     1RN      161
                *                                                               1RN      162
                                                                                1RN      163
          4     INPFILE   EQU   4                       UNSTAGED TAPE JOB       1RN      164
          5     TAPEQ     EQU   5                       TAPE JOB BEING DISPLAYED
          6     TAPEQ6    EQU   6
```

14-26

```
                               *
                               *       INITIALIZE DIRECT CELLS
                               *                                                      1RN
 1000         1401             AQS      LDN     1                                     1RN
 1001         3470                      STD     D.PPONE                               1RN
 1002         1400                      LDN     P.ZERO                                1RN
 1003         6042                      CRD     PRCOUNT     INITIALIZE COUNTS         1RN
 1004         3074                      LDD     D.PPIR      READ INPUT REGISTER       1RN
 1005         6050                      CRD     D.PPIRB                               1RN
                               *                                                      1RN
                                                                                      1RN
                               TAF      IFNE    IP.TF,0                               1RN
                                        RJM     VECN                                  1RN
                               TAF      ENDIF               CHECK EMPTY CHAIN         1RN
                               *                                                      1RN
 1006         1443                      LDN     P.VRNBUF                              1RN
 1007         6010                      CRD     D.T0        GET TAPE SCHEDULING FLAG  1RN
 1010         3012                      LDD     D.T0+C.STGFLG                         1RN
 1011         3437                      STD     STGFLG                                1RN
                                                                                      1RN
                                                                                      1RN

                               *       SCAN THE FNT, COUNTING AND AGING INPUT AND/OR OUTPUT QUEUE
                               *                                                      1RN
                               *       COUNT EMPTY FNT ENTRIES                        1RN
                               *       COUNT PRIORITY INPUT JOBS.                     1RN
                               *       COUNT INPUT QUEUE JOBS                         1RN
                               *                                                      1RN
                               *       IF EITHER INPUT OR OUTPUT QUEUE IS TO BE AGED, RESERVE CH.SCH
                               *                                                      1RN
 1012         1400                      LDN     0                                     1RN
 1013         3447                      STD     CHFLG       INITIALIZE CHFLG          1RN
                               *                                                      1RN
 1014         3054                      LDD     D.PPIRB+4                             1RN
 1015         1277                      LPK     IQP-1                                 1RN
 1016         0405                      ZJN     SRCH4       JUMP IF INPUT QUEUE TO BE AGED  1RN
 1017         3054                      LDD     D.PPIRB+4                             1RN
 1020         2200 0377                 LPK     OQP-1                                 1RN
 1022         0505                      NJN     SRCH10      JUMP IF NEITHER QUEUE TO BE AGED  1RN
                               *                                                      1RN
 1023         3647             SRCH4    AOD     CHFLG       SET CHFLG NON-ZERO        1RN
 1024         1415                      LDN     CH.FNT                                1RN
 1025         0200 0303                 RJM     R.RCH       RESERVE CH.FNT            1RN
                               *                                                      1RN
                               *       INITIALIZE SEARCH                              1RN
                               *                                                      1RN
 1027         1404             SRCH10   LDN     P.FNT                                 1RN
 1030         6010                      CRD     D.T0        FNT POINTER               1RN
 1031         0307                      UJN     SRCH20                                1RN
                               *                                                      1RN
                               *       ADVANCE THE SEARCH                             1RN
                               *                                                      1RN
 1032         1403             SRCH15   LDN     LE.FNT                                1RN
                                                                                      1RN
```

14-27

```
SRCH23A    1107
SRCH24
```



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                                                                                                  1RN      219
 1033    3510                         RAD   D.T0                                                  1RN      220
 1034    3311                         LMD   D.T1                                                  1RN      221
 1035    0503                         NJN   SRCH20               JUMP WHEN ALL DONE WITH SEARCH   1RN      222
 1036    0100 1220                    LJM   SRCH90                                                1RN      223
                             *                                                                    1RN      224
                             *        GET FNT ENTRY                                               1RN      225
                             *                                                                    1RN      226
 1040    3010                SRCH20   LDD   D.T0                                                  1RN      227
 1041    6020                         CRD   D.FNT                                                 1RN      228
 1042    3020                         LDD   D.FNT                                                 1RN      229
 1043    0503                         NJN   SRCH22                                                1RN      230
 1044    3646                         AOD   EMCOUNT              COUNT EMPTY FNT ENTRIES          1RN      231
 1045    0364                SRCH21   UJN   SRCH15                                                1RN      232
                             *                                                                    1RN      233
 1046    1071                SRCH22   SHN   -6                                                    1RN      234
 1047    0462                         ZJN   SRCH15               JUMP IF FNT SUPPLEMENT           1RN      235
                             *                                                                    1RN      236
 1050    3023                         LDD   D.FNT+C.FCPNUM                                        1RN      237
                   3         C.FLOCK  EQU   C.FLOCK                                               1RN      238
 1051    1257                         LPN   L.CPNUM+LOCKMASK     CHECK FOR CP 0 AND UNLOCKED      1RN      239
 1052    0557                         NJN   SRCH15               JUMP IF NOT                      1RN      240
                             *                                                                    SC42522    1
                             *        SEARCH FOR INPUT SUPPLEMENT                                 SC42522    2
                             *                                                                    SC42522    3
                             *                                                                    SC42522    4
 1053    1400                SRCH22A  LDN   0                                                     SC42522    5
 1054    3402                         STD   FLNKAD                                                SC42522    6
 1055    3023                         LDD   D.FNT+C.FLINK                                         SC42522    7
 1056    1015                         SHN   17-S.FLINK                                            SC42522    8
 1057    0611                         PJN   SRCH22B              IF NO MORE SUPPLEMENT            SC42522    9
                             *                                                                    SC42522   10
 1060    3024                         LDD   D.FNT+C.FLNKAD                                        SC42522   11
 1061    3402                         STD   FLNKAD                                                SC42522   12
 1062    6020                         CRD   D.FNT                                                 SC42522   13
 1063    3022                         LDD   D.FNT+C.FIDENT                                        SC42522   14
 1064    2300 0100                    LMC   0100B                CHECK FOR CORRECT SUPPLEMENT     SC42522   15
 1066    0402                         ZJN   SRCH22B              IF FOUND                         SC42522   16
 1067    0363                         UJN   SRCH22A              GO ON SEARCHING                  SC42522   17
                             *                                                                    SC42522   18
                1070         SRCH22B  EQU   *                                                     1RN      241
 1070    3010                         LDD   D.T0                 READ 2ND WORD OF FST             1RN      242
 1071    1602                         ADN   2                                                     1RN      243
 1072    6032                         CRD   FST2                                                  1RN      244
                             *                                                                    1RN      245
 1073    3036                         LDD   FST2+C.FPRI                                           1RN      246
 1074    0450                         ZJN   SRCH21               JUMP IF ZERO PRIORITY            1RN      247
                             *                                                                    1RN      248
                             *        CHECK DISPOSITION CODE                                      1RN      249
                             *                                                                    1RN      250
 1075    3034                SRCH23   LDD   FST2+C.FDC                                            1RN      251
 1076    1277                         LPN   77B                                                   1RN      252
 1077    1704                         SBN   INPFILE                                               1RN      253
 1100    0431                         ZJN   SRCH30               JUMP IF INPUT QUEUE              1RN      254
                             *                                                                    1RN      255
 1101    1702                         ADK   INPFILE-TAPEQ6       CHECK FOR TAPE JOB BEING DISPLAYED 1RN    256
 1102    0405                         ZJN   SRCH23A              JUMP IF JOB IN TAPEQ6            1RN      257
 1103    1601                         ADK   TAPEQ6-TAPEQ         UNSTAGED TAPE JOB
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 1104     0505                          NJN   SRCH40
 1105     3037                          LDD    STGFLG            NOT IN TAPE QUEUE                    1RN     258
 1106     0523                          NJN   SRCH30             IF STAGING OFF SCHEDULE TAPE JOB     1RN     259
 1107     0100 1205      SRCH23A        LJM   SRCH34             JUMP IF STAGING OFF                  1RN     260
                          *                                      JUMP TO AGE PRIORITY                 1RN     261
 1111     3034           SRCH40         LDD    FST2+C.FOC                                             1RN     262
 1112     1270                          LPN    70B                                                    1RN     263
 1113     0414                          ZJN   SRCH26         JUMP IF NOT OUTPUT                       1RN     264
                          *                                                                           1RN     265
                          *       TEST FOR AGING OF THE OUTPUT QUEUE                                  1RN     266
                          *                                                                           1RN     267
 1114     3054                          LDD    D.PPIRB+4                                              1RN     268
 1115     2200 0377                     LPK    OQP-1                                                  1RN     269
 1117     0510                          NJN   SRCH26                                                  1RN     270
                          *                                                                           1RN     271
 1120     3636           SRCH24         AOD    FST2+C.FPRI       INCREMENT PRIORITY                   1RN     272
 1121     2200 7777                     LPC    7777B                                                  1RN     273
 1123     0404                          ZJN   SRCH26             JUMP IF AGED PAST 7777B              1RN     274
                          *                                                                           1RN     275
 1124     3010                          LDD    D.T0                                                   1RN     276
 1125     1602                          ADN    2                                                      1RN     277
 1126     6232                          CWD    FST2              WRITE OUT AGED FST2                  1RN     278
 1127     0100 1032      SRCH26         LJM   SRCH15                                                  1RN     279
                          *                                                                           1RN     280
                          *       PROCESS INPUT QUEUE                                                 1RN     281
                          *                                                                           1RN     282
 1131     3034           SRCH30         LDD    FST2+C.FINFLG     CHECK FOR REAL-TIME JOB (NOT         1RN     283
 1132     1006                          SHN    17-S.FINRT          CONSIDERED PART OF INPUT QUEUE)    1RN     284
 1133     0773                          MJN   SRCH26             JUMP IF REAL TIME JOB                FEAT61A 768
                          *                                                                           1RN     286
                          *    7000 SUPPORT.                                                          1RN     287
                          *       DO NOT COUNT AS PART OF THE INPUT QUEUE JOBS WITH CP70.             1RN     288
                          *       ALSO DONT COUNT JOBS WITH CP76 IF THE 7000 LINK IS UP.              1RN     289
                          *                                                                           1RN     290
                         CC7            IFNE   IP.CC7,0                                               1RN     291
 1134     3032                          LDD    FST2+C.FCPU       CHECK CP PARAMETER FROM JOBCARD      1RN     292
 1135     1071                          SHN    -6                                                     1RN     293
 1136     1760                          SBN    60B                                                    1RN     294
 1137     0503                          NJN    *+3                                                    1RN     295
 1140     0100 1205                     LJM   SRCH34             JUMP IF CP70                         SC42522  19
 1142     0705                          MJN   SRCH32             JUMP IF 7000 NOT TO BE USED          SC42522  20
 1143     1453                          LDK    T.SPF             * JOB MAY BE RUN ON                  1RN     297
 1144     6020                          CRD    D.FNT             * EITHER MACHINE                     1RN     298
 1145     3020                          LDD    D.FNT             * CHECK LINK TO 7000                 1RN     299
 1146     0537                          NJN   SRCH34             JUMP IF LINK IS UP                   1RN     300
                1147     SRCH32         EQU    *                                                      1RN     301
                         CC7            ENDIF                                                         1RN     302
                          *                                                                           1RN     303
                          *      JOB IS IN INPUT QUEUE, DETERMINE JOB CLASS                           1RN     304
                          *                                                                           1RN     305
 1147     1401                          LDN    1                 INTIALIZE D.Z1 (D.Z1=0 IF JOB        1RN     306
 1150     3401                          STD    D.Z1               CLASS=1, D.Z1=1 IF JOB CLASS=2)     1RN     307
 1151     3010                          LDD    D.T0                                                   1RN     308
 1152     1601                          ADN    1                                                      1RN     309
 1153     6025                          CRD    FST1              READ FST1                            1RN     310
 1154     3025                          LDD    FST1+C.FTAPE                                           1RN     311
 1155     0510                          NJN   SRCH33             JUMP IF JOB HAS TAPES (CLASS 2)      1RN     312
                                                                                                      1RN     313
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14-29

1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES   COMPASS 3.75077.


```
1156    3002                LDD   FLNKAD         CHECK SUPPLYMENT FNT               FEAT61A   769
1157    0405                ZJN   SRCH32A                                           FEAT61A   770
1160    1602                ADN   2              FETCH SUPPLYMENT FST2              FEAT61A   771
1161    6020                CRD   D.FNT                                             FEAT61A   772
1162    3022                LDD   D.FNT+C.FECFL                                     FEAT61A   773
1163    0502                NJN   SRCH33         JUMP IF JOB HAS ECS FL (CLASS 2)   1RN       315
                   *                                                                FEAT61A   774
              1164 SRCH32A  EQU   *                                                 FEAT61A   775
                   *                                                                FEAT61A   776
1164    3701                SOD   D.Z1           JOB IS CLASS 1, SET D.Z1=0         1RN       316
                   *                                                                1RN       317
                   *      INCREMENT INPUT QUEUE COUNTS FOR APPROPRIATE CLASS        1RN       318
                   *                                                                1RN       319
1165    3002       SRCH33   LDD   FLNKAD         CHECK DEPENDENCY COUNT             SC42522    21
1166    0406                ZJN   SRCH33A        IF NO INPUT FNT SUPPLEMENT         SC42522    22
1167    1602                ADN   2                                                 SC42522    23
1170    6020                CRD   D.FNT                                             SC42522    24
1171    3020                LDD   D.FNT+C.FDPCT                                     SC42522    25
1172    1377                SCN   77B                                               SC42522    26
1173    0512                NJN   SRCH34         IF THERE IS DEPENDENCY COUNT       SC42522    27
                   *                                                                SC42522    28
1174    5601 0044  SRCH33A  AOM   IQCOUNT,D.Z1   INCREMENT NB OF INPUT QUEUE JOBS   SC42522    29
1176    3036                LDD   FST2+C.FPRI                                       1RN       321
1177    1071                SHN   -PSHIFT                                           FEAT10Q    19
1200    2177 7707           ADC   -IP.LVF                                           1RN       323
1202    0703                MJN   SRCH34         JUMP IF NOT FIXED PRIORITY         1RN       324
1203    5601 0042           AOM   PRCOUNT,D.Z1   INCREMENT APPROPRIATE COUNT        1RN       325
                   *                                                                1RN       326
                   *      AGE PRIORITY OF INPUT QUEUE ENTRY IF ITS TIME             1RN       327
                   *                                                                1RN       328
1205    3054       SRCH34   LDD   D.PPIRB+4                                         1RN       329
1206    1277                LPK   IQP-1                                             1RN       330
1207    0507                NJN   SRCH36         JUMP IF NOT TIME TO AGE            1RN       331
1210    3036                LDD   FST2+C.FPRI                                       1RN       332
1211    1277                LPK   MAXAGE         UPDATE AGE ONLY TO MAX SUBLEVEL    FEAT10Q    20
1212    1177                LMK   MAXAGE                                            FEAT10Q    21
1213    0403                ZJN   SRCH36         JUMP IF MAXAGE EXCEEDED (DONT AGE) 1RN       335
1214    0100 1120           UJK   SRCH24         JUMP TO AGE PRIORITY               1RN       336
                   *                                                                1RN       337
1216    0100 1032  SRCH36   LJM   SRCH15         JUMP TO ADVANCE FNT SEARCH         1RN       338


                   *                                                                1RN       340
                   *      THE FNT SEARCH IS COMPLETE                                1RN       341
                   *                                                                1RN       342
                   *      RESERVE CH.FNT IF NOT ALREADY RESERVED AND READ JCA WORD 0  1RN     343
                   *                                                                1RN       344
1220    3047       SRCH90   LDD   CHFLG          JUMP IF CHANNEL ALREADY RESERVED   1RN       345
1221    0504                NJN   SRCH92                                            1RN       346
                   *                         RESERVE CHANNEL                        1RN       347
1222    1415                LDN   CH.FNT                                            1RN       348
1223    0200 0303           RJM   R.RCH                                             1RN       349
                   *                                                                1RN       350
1225    1460       SRCH92   LDK   P.SCH          GET ADDR OF JCA                    1RN       351
1226    6001                CRD   D.Z1                                              1RN       352
1227    3003                LDD   D.Z1+C.JCA                                        1RN       353
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1230    3415                    STD     D.T5            D.T5 = ADDR OF JCA/8
1231    1003                    SHN     3
1232    6001                    CRD     D.Z1
1233    1601                    ADN     1
1234    6010                    CRD     D.T0    ,
                      *
                      *    IF COUNT OF INPUT QUEUE JOBS  ( WITH OR WITHOUT TAPES ) HAS
                      *    INCREASED SET BYTE C.JCCLK OF JCA WD 0 TO 0 TO TELL SCHEDULER
                      *    TO CALL 1I8
                      *
1235    3042                    LDD     PRCOUNT
1236    0404                    ZJN     SRCH93          IF NO PRIORITY BATCH JOBS
1237    2000 4000               LDC     4000B
1241    3544                    RAD     IQCOUNT         SET PRIORITY FLAG

1242    3043          SRCH93    LDD     PRCOUNT+1
1243    0404                    ZJN     SRCH94          IF NO PRIORITY TAPE JOB
1244    2000 4000               LDC     4000B
1246    3545                    RAD     IQCOUNT+1

1247    3014          SRCH94    LDD     D.T0+C.JCNJI
1250    3244                    SBD     IQCOUNT
1251    0704                    MJN     SRCH95          IF COUNT OF BATCH JOBS INCREASED

1252    3013                    LDD     D.T0+C.JCNTJ
1253    3245                    SBD     IQCOUNT+1
1254    0603                    PJN     SRCH96          IF NO INCREASE IN NUMBER OF TAPE JOB
                      *
1255    1400          SRCH95    LDN     0               SET C.JCCLK = 0
1256    3403                    STD     D.Z1+C.JCCLK
                      *
                      *    SAVE FNT COUNTS IN JCA WORD 1
                      *
1257    3044          SRCH96    LDD     IQCOUNT
1260    3414                    STD     D.T0+C.JCNJI    STORE NEW COUNT OF BATCH JOBS
1261    3045                    LDD     IQCOUNT+1
1262    3413                    STD     D.T0+C.JCNTJ
1263    3046                    LDD     EMCOUNT
1264    3412                    STD     D.T0+C.JCEMC    EMPTY FNT COUNT
                      *
1265    3015                    LDD     D.T5            LOAD ADDR OF JCA/8
1266    1003                    SHN     3
1267    6201                    CWD     D.Z1
1270    1601                    ADN     1
1271    6210                    CWD     D.T0
                      *
1272    1415                    LDN     CH.FNT          DROP FNT CHANNEL
1273    0200 0326               RJM     R.DCH
```

```
1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES
RCN - RELEASE CHAIN AND/OR REQUEST OR RELEASE RBT STORG
                        0     RCN       EQU     0
                              **
                              *         THIS SECTION OF 1RN MERGES RELEASED RBT WORD PAIRS INTO THE
                              *         EMPTY CHAIN.  DIRECT CELL USAGE IS AS FOLLOWS.
                              *         RBTCNT    RUNNING COUNT OF EMPTY WORD PAIRS IN EMPTY CHAIN
                              *         EMPCT     COUNT OF EMPTY WORD PAIRS TO BE ADDED TO CHAIN
                              *         RBTWP     ORDINAL OF FIRST WORD PAIR TO BE MERGED.  THIS WORD
                              *                   PAIR IS ORIGINALLY THE START OF THE CHAIN TO BE
                              *                   MERGED AS DELIVERED FROM SPM.
                              *         FRSTRBT   THE EMPTY CHAIN POINTER -- BYTE 2 OF P.RBT
                              *         CURRENT   ORDINAL OF CURRENT WORD PAIR IN EMPTY CHAIN
                              *         PREVIOUS  THE ORDINAL OF THE LAST WORD PAIR IN THE CHAIN WHICH
                              *                   WE WORKED WITH
                              *         CONTIG    THE ORDINAL+1 OF THE HIGH END OF THE LAST BLOCK OF
                              *                   CONTIGUOUS WORD PAIRS.
                              *         START     THE ORDINAL OF THE LOW END OF THE LAST BLOCK OF
                              *                   CONTIGUOUS WORD PAIRS. (HIGH AND LOW REFER TO THE
                              *                   MAGNITUDE OF WORD PAIR ORDINALS)
                              *         LOWSCRAP  THE ORDINAL OF THE LOWEST WORDPAIR TO BE MERGED
                              *
                              *         IN ADDITION 1RN MAINTAINS A TABLE OF WORD PAIRS TO BE MERGED
                              *         STARTING AT LOCATION *SCRAP*.
                              *
                              *         FIRST WE READ IN P.RBT. THIS PLACES THE RBT LENGTH/100B IN
                              *         RBTCL AND MACHINE FL/100B IN LWA.  INITIALIZE RBTCNT AT ZERO.
                              *         THO 5 CELLS STARTING AT ZERO WILL BE USED TO ZERO EMPTY WORD
                              *         PAIRS. SET EMPCT TO AN ARTIFICIAL 1 IN CASE THERE ARE NO WORD
                              *         PAIRS TO BE MERGED.  READ CW.RCHN.  SPM WILL HAVE PLACED THE
                              *         BEGINNING ORDINAL OF THE CHAIN TO BE MERGED INTO BYTE 4 OF
                              *         THIS WORD.  IF THIS BYTE IS ZERO WE JUMP TO RCN4C WHICH WILL
                              *         SKIP THE MERGE PROCESS AND CHECK FOR A NEED FOR RBT STORAGE
                              *         ADJUSTMENT.
                                    INIT    LDN       P.RBT
  1275      1402                            CRD       RBTPTR          INITIALIZE LWA
  1276      6025                    IPTF    IFEQ   IP.TF,1
                                            RJM    PRBT               TEST FOR GOOD P.RBT CONTENTS
                                    IPTF    ENDIF
                                            LDN       0
  1277      1400                            STD       RBTCNT
  1300      3432                            STD       ZERO
  1301      3442                            STD       ZERO+1
  1302      3443                            STD       ZERO+2
  1303      3444                            STD       ZERO+3
  1304      3445                            STD       ZERO+4
  1305      3446                            LDN       1
  1306      1401                            STD       EMPCT
  1307      3433
                                            LDK       CW.RCHN
  1310      1455                            CRD       D.T0
  1311      6010                            LDD       D.T4
  1312      3014                            STD       RBTWP
  1313      3420                            ZJN       RCN4C           FORCE A TEST OF RBT LENGTH
  1314      0431
                              **
                              *         IF THERE IS A CHAIN TO BE MERGED STORE THE ORDINAL OF THE
                              *         START OF IT IN RBTWP.  NOW START EMPCT AT 0.  STORE THE
                              *         ORDINAL OF THE CURRENT WORD PAIR AS GIVEN IN RBTWP IN THE
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                             *      SCRAP TABLE USING EMPCT AS AN INDEX.  IF WE HAVE RUN OUT OF     1RN
                             *      WORD PAIRS AS INDICATED BY RBTWP BEING 0, ZERO THE 4TH BYTE      1RN
                             *      OF CW.RCHN TO TELL SPM WE ARE DONE AND JUMP TO WORK ON THE       1RN
                             *      SCRAP WE HAVE IN THE PP.  IF THERE IS A WORD PAIR READ ITS       1RN
                             *      FIRST WORD INTO RBTWP, THUS PUTTING THE POINTER TO THE NEXT      1RN
                             *      PAIR IN SPMS CHAIN IN RBTWP.  ZERO OUT THE SECOND WORD OF THE    1RN
                             *      PAIR.  INCREMENT THE COUNT OF ENTRIES IN SCRAP BY ADDING ONE     1RN
                             *      TO EMPCT.  CHECK TO SEE IF THE SCRAP TABLE FILLS THE AVAILABLE   1RN
                             *      SPACE IN THE PP AND IF NOT LOOP FOR THE NEXT WORD PAIR FROM      1RN
                             *      SPMS CHAIN.  IF SCRAP HAS FILLED ALL SPACE IN THE PP REWRITE     1RN
                             *      CW.RCHN WHICH WILL POINT TO THE NEXT PAIR WHICH SHOULD BE        1RN
                             *      MERGED.  1RN WILL START WITH IT THE NEXT TIME AROUND.            1RN
                                                                                                     1RN
                             *      PULL AS MANY WORDPAIRS AS WE CAN OUT OF THE SPM-RELEASE CHAIN    1RN
                             *      (CW.RCHN POINTS TO IT) ,STORING THEIR ORDINALS AT SCRAP THUR     1RN
                             *      7775B.  AS WE RECORD A WORDPAIR WE AERO IT OUT, SO THAT LATER    1RN
                             *      WHEN WE MERGE THEM IN, OUT OF ORDER, WE PROTECT AGAINST DS REC   1RN
                             *      RECOVERY CATCHING US WITH ONE OF THESE SCRAPS POINTING INTO      1RN
                             *      THE EXISTING EMPTY CHAIN.                                        1RN
        1315      1400       RCN1A  LDN     0                                                    1RN
        1316      3433              STD     EMPCT                                                1RN
        1317      3020       RCN2   LDD     RBTWP                                                1RN
        1320      5433 3334         STM     SCRAP,EMPCT                                          1RN
        1322      0503              NJN     RCN3                                                 1RN
        1323      3414              STD     D.T4                                                 1RN
        1324      0317              UJN     RCN4                                                 1RN
                                                                                                 1RN
        1325      3031       RCN3   RBT     RBTWP                                                1RN
        1331      6020              CRD     RBTWP                                                1RN
        1332      6242              CWD  ZERO              ZAP THE SCRAP,                        1RN
        1333      1601              ADN     1                                                    1RN
        1334      6242              CWD     ZERO           CLEAR SECOND WORD                     1RN
                                                                                                 1RN
        1335      3633              AOD     EMPCT                                                1RN
        1336      2177 3335         ADC     -7776B+SCRAP                                         1RN
        1340      0756              MJN     RCN2           LOOP IF STILL ROOM IN PP              1RN
        1341      3020              LDD     RBTWP                                                1RN
        1342      3414              STD     D.T4                                                 1RN
                                                                                                 1RN
        1343      1455       RCN4   LDK     CH.RCHN                                              1RN
        1344      6210              CWD     D.T0                                                 1RN
                             **                                                                  1RN
                             *      WE NOW HAVE A TABLE IN THE PP OF SCRAP WORD PAIRS BEGINNING AT  1RN
                             *      *SCRAP*.  EMPCT HOLDS A COUNT OF THESE ENTRIES.  EMPCT IS 1 IF  1RN
                             *      THERE ARE NO VALID ENTRIES BUT THE FIRST ENTRY HAS BEEN ZEROED  1RN
                             *      AT LOAD TIME (SCRAP DATA 0).  RESERVE THE RBT CHANNEL.  READ    1RN
                             *      P.RBT AGAIN TO SET THE EMPTY CHAIN START IN FRSTRBT.  SET       1RN
                             *      CURRENT EQUAL TO FRSTRBT TO INDICATE THAT WE ARE CURRENTLY      1RN
                             *      WORKING ON THIS WORD PAIR.  SET PREVIOUS, CONTIG, AND START     1RN
                             *      TO ZERO.                                                        1RN
                                                                                                 1RN
        1345      1417       RCN4C  LDN     CH.RBT                                               1RN
        1346      0200 0303         RJM     R.RCH                                                1RN
                                                                                                 1RN
        1350      1402              LDN     P.RBT                                                1RN
        1351      6025              CRD     RBTPTR                                               1RN
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1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES                        1RN
RCN - RELEASE CHAIN AND/OR REQUEST OR RELEASE RBT STORG,                     1RN
                          IPTF    IFEQ   IP.TF,1        TEST FOR GOOD P.RBT CONTENTS   1RN
                                  RJM    PRBT                                1RN
                          IPTF    ENDIF                                      1RN
                                                                             1RN
1352      3027                    LDD    FRSTRBT                             1RN
1353      3434                    STD    CURRENT                             1RN
                                                                             1RN
1354      1400                    LDN    0                                   1RN
1355      3435                    STD    PREVIOUS                            1RN
1356      3436                    STD    CONTIG                              1RN
1357      3437                    STD    START                               1RN
                          **                                                 1RN
                          *       RCN4B IS THE START OF THE MAIN MERGE LOOP.  FIRST SET LOWSCRAP   1RN
                          *       TO 7777B, WHICH IS HIGHER THAN ANY ALLOWABLE WORD PAIR ORDINAL   1RN
                          *       AND SET D.Z1 AND D.Z2 TO ZERO.  D.Z2 IS USED TO INCREMENT        1RN
                          *       THROUGH THE SCRAP LIST AND D.Z1 IS USED TO HOLD THE INDEX INTO   1RN
                          *       SCRAP OF THE LOWEST ENTRY WE FIND EACH TIME THROUGH.             1RN
                                                                             1RN
1360      1500            RCN4B   LCN    0              SET IMPOSSIBLE       1RN
1361      3440                    STD    LOWSCRAP                            1RN
1362      1400                    LDN    0                                   1RN
1363      3402                    STD    D.Z2                                1RN
1364      3401                    STD    D.Z1                                1RN
                          **                                                 1RN
                          *       NOW LOOP THROUGH SCRAP USING P.Z2 AS AN INDEX UNTIL D.Z2 IS      1RN
                          *       EQUAL TO EMPCT.  KEEP THE INDEX TO THE LOWEST ENTRY WE FIND      1RN
                          *       IN D.Z1. AND THE LOWEST ORDINAL IN LOWSCRAP.  WHEN WE ARE DONE   1RN
                          *       ZERO OUT THE ENTRY IN SCRAP WHICH WE HAVE MOVED TO LOWSCRAP.     1RN
                                                                             1RN
1365      5002 3334       RCN4A   LDM    SCRAP,D.Z2                          1RN
1367      0406                    ZJN    RCN5                                1RN
1370      3240                    SBD    LOWSCRAP                            1RN
1371      0604                    PJN    RCN5           JUMP IF NOW LOW ENOUGH   1RN
1372      3540                    RAD    LOWSCRAP       BETTER - STORE IT    1RN
1373      3002                    LDD    D.Z2           AND IT-S LOCATION    1RN
1374      3401                    STD    D.Z1                                1RN
1375      3602            RCN5    AOD    D.Z2                                1RN
1376      3333                    LMD    EMPCT                               1RN
1377      0565                    NJN    RCN4A                               1RN
1400      5401 3334               STM    SCRAP,D.Z1     CLEAR LOWEST SCRAP   1RN
                          **                                                 1RN
                          *       AT THIS POINT WE HAVE MOVED THE ORDINAL OF THE LOWEST WORD       1RN
                          *       PAIR TO LOWSCRAP AND WE MUST NOW ADD THIS WORD PAIR TO THE       1RN
                          *       EMPTY CHAIN.  ADD 1 TO RBTCNT.  WHEN WE ARE DONE RBTCNT WILL     1RN
                          *       CONTAIN THE TOTAL NUMBER OF WORD PAIRS IN THE EMPTY CHAIN. IF    1RN
                          *       PREVIOUS IS EQUAL TO CONTIG THE TWO WORD PAIRS BEFORE THE        1RN
                          *       CURRENT ONE ARE CONTIGUOUS SO WE SKIP SETTING START AND CONTIG   1RN
                          *       BUT IF THE PREVIOUS TWO ARE NOT CONTIGUOUS RESET CONTIG AND      1RN
                          *       START BECAUSE THE PREVIOUS WORD PAIR IS NOW THE LOW END OF       1RN
                          *       THE HIGHEST CONTIGUOUS AREA. (LOW AND HIGH STILL REFER TO WORD   1RN
                          *       PAIR ORDINALS). IN ANY CASE INCREMENT CONTIG (AFTER RESETTING    1RN
                          *       IF NECESSARY) SO THAT IS HOLDS THE VALUE WHICH THE CURRENT       1RN
                          *       WORD PAIR MUST HAVE IF IT IS TO BE CONTIGUOUS. IF CURRENT IS     1RN
                          *       ZERO WE HAVE ARRIVED AT THE END OF THE EMPTY CHAIN, BUT MAY      1RN
                          *       STILL HAVE WORD PAIRS FROM SPM TO ADD TO IT, HOWEVER IF          1RN
                          *       LOWSCRAP IS 7777 THERE ARE NO MORE ENTRIES IN THE SCRAP TABLE    1RN
                          *       SO WE MUST BE THROUGH.  IF LOWSCRAP IS NOT 7777 AND WE ARE AT    1RN
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34-E4

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                              *   THE END OF THE CHAIN, THE WORD PAIR POINTED TO BY LOWSCRAP      1RN
                              *   MUST BE ADDED TO THE ENDO OF THE CHAIN, SO WE MAKE LOW SCRAP     1RN
                              *   POINT TO 0 (THE END OF THE CHAIN) AND PREVIOUS (THE LAST WORD    1RN
                              *   PAIR IN THE EXISTING CHAIN) POINT TO LOWSCRAP.  IF PREVIOUS IS   1RN
                              *   ZERO THERE IS NO EXISTING CHAIN SO WE MAKE P.RBT POINT TO        1RN
                              *   LOWSCRAP.  IF CURRENT IS NON-ZERO WE ARE NOT AT THE END OF THE   1RN
                              *   EXISTING CHAIN SO WE SEE IF LOWSCRAP IS SMALLER THAN OUR         1RN
                              *   CURRENT POSITION ON THE EXISTING CHAIN. IF IT IS SMALLER IT      1RN
                              *   MUST BE MERGED BETWEEN CURRENT AND PREVIOUS, TAKING INTO         1RN
                              *   ACCOUNT THAT PREVIOUS MAY NOT EXIST IN WHICH P.RBT MUST NOW      1RN
                              *   BE SET TO POINT TO LOWSCRAP.  IF LOWSCRAP IS LARGER THAN         1RN
                              *   CURRENT WE MUST MOVE TO THE NEXT WORD PAIR DOWN THE EXISTING     1RN
                              *   CHAIN SO WE READ CURRENT TO GET THE ORDINAL OF THE NEXT WORD     1RN
                              *   PAIR, SET PREVIOUS TO CURRENT, AND SET CURRENT TO WHAT THE       1RN
                              *   OLD CURRENT POINTED TO, AND LOOP BACK TO OUR TEST FOR            1RN
                              *   CONTIGUOUS WORD PAIRS.                                           1RN
                                                                                                   1RN
1402   3632        RCN5A   AOD      RBTCNT                                                         1RN
1403   3035                LDD      PREVIOUS     TEST CONTIGUOUS                                   1RN
1404   3336                LMD      CONTIG                                                         1RN
1405   0404                ZJN      RCN6                                                           1RN
1406   3035                LDD      PREVIOUS     SET NEW BEGINNING                                 1RN
1407   3436                STD      CONTIG                                                         1RN
1410   3437                STD      START                                                          1RN
                                                                                                   1RN
1411   3636        RCN6    AOD      CONTIG                                                         1RN
1412   3034        RCN7    LDD      CURRENT                                                        1RN
1413   0507                NJN      RCN7A                                                          1RN
1414   3040                LDD      LOWSCRAP                                                       1RN
1415   2300 7777           LMC      7777B                                                          1RN
1417   0522                NJN      RCN8                                                           1RN
1420   0100 1470           LJM      RCN10A       RELEASE TERMINATION                               1RN
1422   3240        RCN7A   SBD      LOWSCRAP                                                       1RN
1423   0613                PJN  RCN7Q            SCRAP .LE. EMP CHN CURRENT                        1RN
1424   3031                RBT      CURRENT                                                        1RN
1430   6010                CRD      D.T0                                                           1RN
1431   3034                LDD      CURRENT                                                        1RN
1432   3435                STD      PREVIOUS                                                       1RN
1433   3010                LDD      D.T0                                                           1RN
1434   3434                STD      CURRENT                                                        1RN
1435   0344                UJN      RCN5A                                                          1RN
                                                                                                   1RN
                              *   SCRAP ORDINAL IS .LT. NEXT EMPYTY-CHAIN WOROPAIR, SOMAKE THE     1RN
                              *   PREVIOUS WORDPAIR POINT TO THE SCRAP, WHICCH IS NOW ZERO, THEN   1RN
                              *   MAKE THE SCRAP POIKNT TO THE NEXT EMP-CHN WP.  DOING THINGS      1RN
                              *   THIS WAY ASSURES( FOR RECOVERY) THAT AT NO TIME DO TWO WORDPAI   1RN
                              *   PAIRS POINT TO THE SAME ONE.                                     1RN
                              *                                                                    1RN
1436   0503        RCN7Q   NJN  RCN8                                                               1RN
1437   0100 2174           LJM  VEC30            BOMB,CHAIN MERGING ON ITSELF                      1RN
                              *                                                                    1RN
1441   3035        RCN8    LDD      PREVIOUS                                                       1RN
1442   0504                NJN      RCN9                                                           1RN
                                                                                                   1RN
1443   3040                LDD      LOWSCRAP                                                       1RN
1444   3427                STD      FRSTRBT                                                        1RN
1445   0310                UJN      RCN10                                                          1RN
                                                                                                   1RN
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14-35

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1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES
RCN - RELEASE CHAIN AND/OR REQUEST OR RELEASE RBT STORG                                  1RN    690
                                                                                         1RN    691
                                                                                         1RN    692
                              RCN9     LDD     LOWSCRAP                                  1RN    693
 1446       3040                       STD     RBTLINK                                   1RN    694
 1447       3441                       RBT     PREVIOUS                                  1RN    695
 1450       3031                       CWD     RBTLINK                                   1RN    696
 1454       6241                                                                         1RN    697
                              RCN10    LDD     CURRENT                                   1RN    698
 1455       3034                       STD     RBTLINK                                   1RN    699
 1456       3441                       RBT     LOWSCRAP                                  1RN    700
 1457       3031                       CWD     RBTLINK                                   1RN    701
 1463       6241                                                                         1RN    702
                                       LDD     LOWSCRAP                                  1RN    703
 1464       3040                       STD     PREVIOUS                                  1RN    704
 1465       3435                       LJM     RCN4B                                     1RN    705
 1466       0100 1360                                                                    1RN    706
                              *        RBT STORAGE MANAGEMENT                            1RN    707
                              *                                                          1RN    708
                              *        WHEN WE ARRIVE AT RCN10A WE HAVE MERGED ALL OF SCRAP INTO THE   1RN    709
                              *        EMPTY CHAIN.  RBTCNT HOLDS THE NUMBER OF MEMBERS IN THE EMPTY   1RN    710
                              *        CHAIN.  CONTIG HOLDS THE ORDINAL OF THE WORD PAIR AT THE LOW    1RN    711
                              *        END OF THE HIGHEST CONTIGUOUS AREA OF FREE WORD PAIRS.  FIRST   1RN    712
                              *        CALCULATE THE CURRENT END OF THE WORD PAIR AREA AND SAVE THIS   1RN    713
                              *        VALUE (/100B) IN CURRENT.  IF RBTCNT SHOWS THAT LESS THAN 20B   1RN    714
                              *        FREE WORD PAIRS ARE IN THE EMPTY CHAIN JUMP TO RCN12 TO TRY TO  1RN    715
                              *        INCREASE RBT STORAGE.  DO NOT CHANGE STORAGE IF THERE FROM 21B  1RN    716
                              *        TO 77B FREE WORD PAIRS.  IF THERE ARE MORE THAN 77B TRY TO      1RN    717
                              *        REDUCE THE RBT.                                                1RN    718
                                                                                         1RN    719
                              RCN10A   LDD     LWA                                       1RN    720
 1470       3031                       SBD     RBTCL       CURRENT LOW RBT ADDRESS       1RN    721
 1471       3230                       STD     CURRENT                                   1RN    722
 1472       3434                                                                         1RN    723
                                       LDD     RBTCNT                                    1RN    724
 1473       3032                       SBN     20B                                       1RN    725
 1474       1720                       PJN     *+3         NEED MORE - LESS THAN 20 FREE PAIRS   1RN    726
 1475       0603                       LJM     RCN12                                     1RN    727
 1476       0100 2047                  LDD     RBTCNT      CONVERT TO CM WORD LENGTH/100B    1RN    728
 1500       3032                       SHN     -5                                        SC40854    57
 1501       1072                       SBN     1                                         SC40854    58
 1502       1701                       STD     D.Z1        FUDGE FACTOR SO  PJN .NE. ZJN SC40854    59
 1503       3401                       SBN    1            NO CHANGE NEEDED IF 21 - 37 WORD PAIR   1RN    731
 1504       1701                       PJN   *+3           OR IF 40 - 77 WORD PAIR       1RN    732
 1505       0603                       LJM   RCN11                                       1RN    733
 1506       0100 1555                                                                    1RN    734
                              **                                                         1RN    735
                              *        REDUCE RBT                                        1RN    736
                              *                                                          1RN    737
                              *        IF THE HIGHEST WORD PAIR IN THE RBT AREA (POINTED TO BY RBTCL)  1RN    738
                              *        IS NOT THE HIGHEST WORD PAIR IN THE EMPTY CHAIN (POINTED TO BY  1RN    739
                              *        CONTIG) RBT STORAGE CANNOT BE REDUCED.  CALCULATE THE LOWEST    1RN    740
                              *        WORD PAIR (HIGHEST ABSOLUTE ADDRESS) WHICH CAN BE RELEASED.     1RN    741
                              *        THIS WORD PAIR ORDINAL IS POINTED TO BY START. ALL WORD PAIRS   1RN    742
                              *        ABOVE START ARE CONTIGUOUS MEMBERS OF THE MEPTY CHAIN.  SAVE    1RN    743
                              *        THIS ADDRESS/100B IN D.T1. CURRENT + D.Z1 EQUALS THE ADDRESS    1RN    744
                              *        /100B WHICH WE WOULD LIKE TO REDUCE TO GOING SIMPLY BY THE      1RN    745
                              *        NUMBER OF EMPTY WORD PAIRS.  COMPARE THIS FIGURE WITH D.T1 AND
                              *        SET D.T1 TO THE SMALLER OF THE TWO FIGURES.  D.T1 NOW CONTAINS
                              *        THE ADDRESS/100B OF THE ADDRESS TO WHICH IT IS SAVE TO RELEASE
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14-3E

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                              *     RBT STORAGE AND STILL LEAVE FROM 20B TO 77B WORD PAIRS AT       1RN       746
                              *     LEAST AVAILABLE.  HOWEVER, TO MARK THE END OF THE RBT AREA,     SC40854    60
                              *     WE MUST INSURE THAT THE LAST TWO WORD PAIRS OF THE NEW          SC40854    61
                              *     END ARE PART OF THE EMPTY CHAIN.  IF NOT, THEN STORAGE          SC40854    62
                              *     CANNOT BE REDUCED THIS FAR, OTHERWISE THE -END OF RBT-          SC40854    63
                              *     MARK PAIRS WOULD DESTROY A VALID ENTRY.                         SC40854    64
                              *     NOW COMPARE D.T1 VALUE WITH THE CURRENT VALUE                   SC40854    65
                              *     AND IF IT IS LESS THAN WE NOW HAVE WE CAN REDUCE TO THAT        1RN       748
                              *     VALUE.  STORE THE NEW RBT LENGTH IN RBTCL, ZERO THE NEW END     1RN       749
                              *     OF THE EMPTY CHAIN, AND ISSUE A MONITOR CALL TO REDUCE RBT      1RN       750
                              *     STORAGE. RELEASE THE RBT CHANNEL AND WE ARE THROUGH WITH RBTS.  1RN       751
1510     3030                       LDD       RBTCL         TEST IF EMPTY CHAIN EXTENDS TO END      1RN       752
1511     1005                       SHN       5             OF RBT STORAGE AREA                     1RN       753
1512     3236                       SBD       CONTIG                                                1RN       755
1513     0403                       ZJN   *+3                                                       SC40854    66
1514     0100 1555                  LJM   RCN11             IF NOT, CANNOT REDUCE                   SC40854    67
                              *                                                                     1RN       757
1516     3031                       RBT       START                                                 1RN       758
1522     1702                       SBN    2                CALCULATE HIGHEST ADDRESS/100B          SC40854    68
1523     1071                       SHN       -6                                                    1RN       759
1524     3411                       STD       D.T1          RELEASE CAN BE DONE TO                  1RN       760
                                                                                                    1RN       761
1525     3034                       LDD       CURRENT                                               1RN       762
1526     3101                       ADD       D.Z1          (A) CONTAINS ADDRESS RELEASE SHOULD     1RN       763
                                                             BE DONE TO                             1RN       764
1527     3211                       SBD       D.T1          COMPARE WITH OUR LIMIT                  1RN       765
1530     0602                       PJN       *+2                                                   1RN       766
1531     3511                       RAD       D.T1          PICK THE SMALLEST                       1RN       767
                                                                                                    1RN       768
1532     3031                       LDD       LWA                                                   1RN       769
1533     3211                       SBD       D.T1          (A) = NEW RBT LENGTH                    1RN       770
1534     3230                       SBD       RBTCL         - CURRENT LENGTH                        1RN       771
1535     0620                       PJN       RCN11         NO REDUCE TODAY                         1RN       772
                                                                                                    1RN       773
1536     3530                       RAD       RBTCL         STORE NEW LENGTH                        1RN       774
1537     1430                       LDN   T.CLK             TIME OF DAY                             SC40854    87
1540     6012                       CRD   D.T2                                                      SC40854    88
1541     3011                       LDD       D.T1                                                  1RN       775
1542     1006                       SHN       6                                                     1RN       776
1543     1602                       ADN   2                                                         SC40854    89
1544     6242                       CWD       ZERO          ZERO NEW END OF CHAIN POINTER           1RN       777
1545     1702                       SBN   2                                                         SC40854    90
1546     6370 2167                  CWM   RBTMARK,D.PPONE   MARK END OF RBT, WITH TIME              SC40854    91
1550     6212                       CWD   D.T2              IN SECOND WORD                          SC40854    92
1551     3732                       SOD   RBTCNT            BACKUP NO. OF ZERO CHAIN                SC40854    93
                              *                             ENTRIES TO NOT COUNT THE MARK PAIR      SC40854    94
1552     1416                       LDN       M.RBTSTO                                              1RN       778
1553     0200 0220                  RJM       R.MTR                                                 1RN       779
                                                                                                    1RN       780
1555     1402             RCN11     LDN       P.RBT                                                 1RN       781
1556     6225                       CWD       RBTPTR                                                1RN       782
                          IPTF      IFEQ   IP.TF,1                                                  1RN       783
                                    RJM  PRBT                                                       1RN       784
                          IPTF      ENDIF                                                           1RN       785
1557     1417                       LDN       CH.RBT                                                1RN       786
1560     0200 0326                  RJM       R.DCH                                                 1RN       787
                                                                                                    1RN       788
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14-37

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                                                                                      1RN        789
 1562       1413            DROP     LDN      P.RQS                                   1RN        790
 1563       6010                     CRD      D.T0                                    1RN        791
 1564       3711                     SOD      D.T1       ADJUST FOR DUMMY DAT ENTRY   1RN        792
 1565       3610                     AOD      D.T0                                    1RN        793
 1566       3010                     LDD      D.T0       READ THE DAT TABLE           1RN        794
 1567       6111 3334                CRM      DAT,D.T1                                1RN        795
                                                                                      1RN        796
 1571       3011                     LDD      D.T1       CALCULATE INDEX OF LAST DAT  1RN        797
 1572       1701                     SBN      1                                       1RN        798
 1573       3401                     STD      D.Z1                                    1RN        799
 1574       1002                     SHN      2                                       1RN        800
 1575       3501                     RAD      D.Z1                                    1RN        801
                                                                                      1RN        802
 1576       5001 3335       DAT0     LDM      DAT+1,D.Z1                              1RN        803
 1600       1277                     LPN   77B                                        FEAT54A27    1
 1601       3402                     STD      D.Z2       SAVE EQP TYPE                1RN        804
 1602       0503                     NJN      DAT01                                   FEAT08A     93
 1603       0100 1662                LJM      DAT32      SKIP DUMMY DAT ENTRY (DUAL ACCESS)  FEAT08A  94
                                                                                      FEAT08A     95
                                                                                      FEAT08A     96
 1605       1400            DAT01    LDN      0                                       1RN        807
 1606       3403                     STD      D.Z3                                    1RN        808
 1607       5003 2157       DAT1     LDM      RELACT,D.Z3   SEARCH FOR MATCH IN REL. ACT. TABLE  1RN  809
 1611       0504                     NJN      *+4                                     1RN        810
 1612       1477                     LDN      77B                                     1RN        811
 1613       0200 0220                RJM      R.MTR                                   1RN        812
 1615       1071                     SHN      -6                                      1RN        813
 1616       3202                     SBD      D.Z2                                    1RN        814
 1617       0403                     ZJN      DAT2       JUMP IF FOUND                1RN        815
 1620       3603                     AOD      D.Z3                                    1RN        816
 1621       0365                     UJN      DAT1                                    1RN        817
                                                                                      1RN        818
 1622       5003 2157       DAT2     LDM      RELACT,D.Z3   GET RELATIVE ACTIVITY     1RN        819
 1624       5101 3337                ADM   DAT+3,D.Z1    INCREMENT BY 1 IF SYSTEM DEVICE  1RN    820
 1626       1277                     LPN      77B                                     1RN        821
 1627       3403                     STD      D.Z3                                    1RN        822
                                                                                      1RN        823
 1630       5001 3337                LDM   DAT+3,D.Z1    1 IF SYSTEM DEVICE, 0 OTHERWISE  1RN    824
 1632       3404                     STD      D.Z4                                    1RN        825
 1633       5001 3340       DAT3     LDM      DAT+4,D.Z1                              1RN        826
 1635       3504                     RAD      D.Z4                                    1RN        827
 1636       3703                     SOD      D.Z3                                    1RN        828
 1637       0573                     NJN      DAT3                                    1RN        829
                                                                                      FEAT08A     97
 1640       5001 3334                LDM      DAT,D.Z1   ADD TWO DUAL ACCESS FLAG     FEAT08A     98
 1642       5101 3341                ADM      DAT+5,D.Z1 TO SEE IF BOTH SET           FEAT08A     99
 1644       1063                     SHN      -12                                     FEAT08A    100
 1645       0404                     ZJN      DAT33      JUMP IF NOT DUAL ACCESS      FEAT08A    101
 1646       3004                     LDD      D.Z4       DIVIDE BY 2 IF DUAL ACCESS   FEAT08A    102
 1647       1076                     SHN      -1                                      FEAT08A    103
 1650       3404                     STD      D.Z4                                    FEAT08A    104
                                                                                      FEAT08A    105
 1651       5001 3336       DAT33    LDM      DAT+2,D.Z1 AVERAGE WITH OLD ACTIVITY    1RN        831
 1653       3104                     ADD      D.Z4                                    1RN        832
 1654       1076                     SHN      -1                                      1RN        833
 1655       5401 3336                STM      DAT+2,D.Z1                              1RN        834
 1657       1400                     LDN      0
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1660    5401 3340            STM    DAT+4,D.Z1      ZERO OLD STACK REQUEST COUNT       1RN      835
1662    1505          DAT32  LCN    5                                                  1RN      836
1663    3501                 RAD    D.Z1                                               FEAT08A  106
1664    0703                 MJN    *+3                                                1RN      838
1665    0100 1576            LJM    DAT0                                               1RN      839
                                                                                       1RN      840
1667    3010                 LDD    D.T0                                               1RN      841
1670    6311 3334            CWM    DAT,D.T1        PUT BACK DAT TABLE                 1RN      842
                      *                                                                1RN      843
                      *      SET 1RN IN DELAY STACK FOR ASSIGNMENT BY MTR              1RN      844
                      *             FIVE MILLISECONDS AFTER THE NEXT SECOND            1RN      845
                      *                                                                1RN      846
1672    1440          DAT4   LDK    T.MSC                                              1RN      847
1673    6010                 CRD    D.T0            READ SYSTEM MILLISECOND CLOCK      1RN      848
1674    3013                 LDD    D.T3            MTR SECONDS CLOCK                  1RN      849
1675    3253                 SBD    D.PPIRB+3       LAST TIME WE LOOKED AT TAPES       1RN      850
1676    0603                 PJN    TI1                                                1RN      851
1677    2101 0000            ADC    10000B          (CLOCK WRAP AROUND)                1RN      852
                      TSINT  CEQU   15              TAPE STAT INTERVAL (IN SEC)        1RN      853
1701    1717          TI1    ADK    -TSINT                                             1RN      854
1702    0707                 MJN    TI2             JUMP IF NOT TIME TO STAT TAPES     1RN      855
1703    3013                 LDD    D.T3            * RESET TAPE STAT                  1RN      856
1704    3453                 STD    D.PPIRB+3       * TIMING BYTE                      1RN      857
1705    2000 2350            LDC    TPSTAT          - CHANGE LJM DROPP INTO            1RN      858
1707    5400 2046            STM    TI3+1           - LJM TPSTAT                       1RN      859
                 1711 TI2    EQU    *                                                  1RN      860
1711    2001 0010            LDC    10010B          COMPUTE DELAY TIME                 1RN      861
1713    3214                 SBD    D.T4                                               1RN      862
1714    3412                 STD    D.T2                                               1RN      863
1715    1063                 SHN    -12                                                1RN      864
1716    3411                 STD    D.T1                                               1RN      865
1717    3654                 AOD    D.PPIRB+4                                          1RN      866
1720    3075                 LDD    D.PPMES1        WRITE INPUT REG TO MES BUF WORD 1  1RN      867
1721    6250                 CWD    D.PPIRB                                            1RN      868
1722    1432                 LDN    M.RPJ           REQUEST PERIPHERAL JOB             1RN      869
1723    0200 0220            RJM    R.MTR                                              1RN      870
                                                                                       1RN      871
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                          55   DDT       EQU   D.FF5          FWA/8 OF DDT                      FEAT45S    2
                          57   MDDT      EQU   D.FF7          MEMBER DDT ORDINAL                FEAT45S    3

                                         LDN   P.CST                                            FEAT45S    5
 1725        1405                        CRD   D.T0                                             FEAT45S    6
 1726        6010                        LDD   D.T0+C.CST                                       FEAT45S    7
 1727        3012                        ADN   CH.DDT                                           FEAT45S    8
 1730        1616                        CRD   D.T0                                             FEAT45S    9
 1731        6010                        LDD   D.T3                                             FEAT45S   10
 1732        3013                        SBD   D.T4                                             FEAT45S   11
 1733        3214                        ZJN   STATDDT4                                         FEAT45S   12
 1734        0403            STATDDT2    LJM   TI2A           AVOID POSSIBLE PP SATURATION      FEAT45S   13
 1735        0100 2045                                                                          FEAT45S   14
                                                              CONTINUE - NO DDT ACTIVITY        FEAT45S   15
                             STATDDT4    BSS   0                                                FEAT45S   16
 1737                                    LDN   P.EST                                            FEAT45S   17
 1737        1405                        CRD   D.EST                                            FEAT45S   18
 1740        6032                        LDD   D.EST                                            FEAT45S   19
 1741        3032                        STD   ESTFWA                                           FEAT45S   20
 1742        3453                        LDD   D.EST+1                                          FEAT45S   21
 1743        3033                        STD   ESTLWA                                           FEAT45S   22
 1744        3452                        LDN   P.DDT                                            FEAT45S   23
 1745        1407                        CRD   D.EST                                            FEAT45S   24
 1746        6032                        LDD   D.EST+C.DDT                                      FEAT45S   25
 1747        3034                        STD   DDT                                              FEAT45S   26
 1750        3455                        LDN   1                                                FEAT45S   27
 1751        1401                        STD   MDDT                                             FEAT45S   28
 1752        3457                        STD   ESTORD                                           FEAT45S   29
 1753        3450                        UJN   STATDD10                                         FEAT45S   30
 1754        0306                                                                               FEAT45S   31
                             STATDDT6    AOD   MDDT                                             FEAT45S   32
 1755        3657            STATDDT8    AOD   ESTORD                                           FEAT45S   33
 1756        3650                        ADD   ESTFWA                                           FEAT45S   34
 1757        3153                        SBD   ESTLWA         CHECK FOR END OF EST              FEAT45S   35
 1760        3252                        ZJN   STATDDT2                                         FEAT45S   36
 1761        0453            STATDD10    LDD   ESTORD                                           FEAT45S   37
 1762        3050                        ADD   ESTFWA                                           FEAT45S   38
 1763        3153                        CRD   D.T0                                             FEAT45S   39
 1764        6010                        LDD   D.T0+C.ESTAT                                     FEAT45S   40
 1765        3010                        SHN   17-S.ESTRMS                                      FEAT45S   41
 1766        1006                        PJN   STATDDT8       IF NOT RMS DEVICE                 FEAT45S   42
 1767        0666                        LDD   D.T0+C.ESTMNE                                    FEAT45S   43
 1770        3013                        SHN   10                                               FEAT45S   44
 1771        1012                        LPN   10B            GENERATE STATUS                   FEAT45S   45
 1772        1210         13   S.ESTON   EQU   S.ESTON                                          FEAT45S   46
                                         STD   STAT           PUT IN ON/OFF BIT                 FEAT45S   47
 1773        3422                        LDD   D.T0+C.ESTAT                                     FEAT45S   48
 1774        3010                        SHN   -3                                               FEAT45S   49
 1775        1074                        LPN   6                                                FEAT45S   50
 1776        1206          4   S.ESTBSY  EQU   S.ESTBSY                                         FEAT45S   51
                           5   S.ESTFR   EQU   S.ESTFR                                          FEAT45S   52
                                         RAD   STAT           PUT IN FREE,BUSY BITS             FEAT45S   53
 1777        3522                        LDD   D.T0+C.ESTAT                                     FEAT45S   54
 2000        3010                        SHN   8                                                FEAT45S   55
 2001        1010                        LPN   1                                                FEAT45S   56
 2002        1201         12   S.ESTRID  EQU   S.ESTRID
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2003    3522                            RAD   STAT          PUT IN REQUEST IDLE BIT    FEAT45S  57
2004    3055                            LDD   DDT                                      FEAT45S  58
2005    1003                            SHN   3                                        FEAT45S  59
                  2                     DUP   LE.DDT,1                                 FEAT45S  60
                                        ADD   MDDT                                     FEAT45S  61
2010    1702                            SBN   LE.DDT                                   FEAT45S  62
2011    6010                            CRD   D.T0                                     FEAT45S  63
2012    3013                            LDD   D.T0+C.DDST+W.DDVSN*5                    FEAT45S  64
2013    1071                            SHN   -6                                       FEAT45S  65
2014    3322                            LMD   STAT                                     FEAT45S  66
2015    1237                            LPN   37B                                      FEAT45S  67
2016    0503                            NJN   CALL1PK                                  FEAT45S  68
2017    0100 1755                       LJM   STATDDT6                                 FEAT45S  69
                                                                                       FEAT45S  70
2021                         CALL1PK    BSS   0                                        FEAT45S  71
                                                                                       FEAT45S  72
                  342013     OV.1PK     EQU   OV.1PK                                   FEAT45S  73
2021    2013 3420                       LDC   3RKIP                                    FEAT45S  74
2023    3410                            STD   D.T0                                     FEAT45S  75
2024    1071                            SHN   -6                                       FEAT45S  76
2025    1377                            SCN   77B                                      FEAT45S  77
2026    3411                            STD   D.T1                                     FEAT45S  78
2027    2000 0500                       LDC   FC.1PK5*100B                             FEAT45S  79
2031    3412                            STD   D.T2                                     FEAT45S  80
2032    1400                            LDN   0                                        FEAT45S  81
2033    3413                            STD   D.T3                                     FEAT45S  82
2034    3414                            STD   D.T4                                     FEAT45S  83
2035    3075                            LDD   D.PPMES1                                 FEAT45S  84
2036    6210                            CWD   D.T0                                     FEAT45S  85
2037    1400                            LDN   0                                        FEAT45S  86
2040    3411                            STD   D.T1                                     FEAT45S  87
2041    3412                            STD   D.T2                                     FEAT45S  88
2042    1432                            LDN   M.RPJ                                    FEAT45S  89
2043    0200 0220                       RJM   R.MTR                                    FEAT45S  90
                                                                                       FEAT45S  91
2045                         TI2A       BSS   0                                        FEAT45S  92
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14-41

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                                                                                          1RN      874
                          TAF       IFNE   IP.TF,0                                        1RN      875
                                    RJM   VECN          CHECK EMPTY CHAIN                 1RN      876
                          TAF       ENDIF                                                 1RN      877
                                                                                          1RN      878
 2045        0100 3032    TI3       LJM   DROPP         AT TP STAT TIME CHANGED TO LJM TPSTAT 1RN  879
                                                                                          1RN      880
                          IPTF      IFEQ   IP.TF,1                                        1RN      881
                          PRBT      ENM    X                                              1RN      882
                                    LDD    RBTPTR       CHECK POINTER IN WORD 2 OF CM     1RN      883
                                    SCN    7B           GUARANTEED TO BE .LT. 1000008     1RN      884
                                    ZJN   TF1           JUMP, BITS 59-54 OK               1RN      885
                          TOHANG    RJM   HANG                                            1RN      886
                          TF1       LDD    RBTPTR+1                                       1RN      887
                                    ADD    RBTPTR                                         1RN      888
                                    NJN   TF2           JUMP, RBR FWA OK                  1RN      889
                                    RJM   HANG                                            1RN      890
                          TF2       LDD    RBTPTR                                         1RN      891
                                    STM    SAVECELL                                       1RN      892
                                    LDN    1                                              1RN      893
                                    STD    RBTPTR                                         FEAT67E    1
                                    LDN    P.RQS                                          1RN      895
                                    CRM    BUFFER,RBTPTR    GET POINTER WITH FWA OF DST   1RN      896
                                    LDM    BUFFER+4         FWA OF DST/8                  1RN      897
                                    SHN    3                FWA OF DST                    1RN      898
                                    SBD    RBTPTR+1         COMPARE TO FWA OF RBR AREA    1RN      899
                                    PJN   TF3                                             1RN      900
                                    RJM   HANG                                            1RN      901
                          TF3       SHN    6                                              1RN      902
                                    SBM    SAVECELL                                       1RN      903
                                    SHN    12                                             1RN      904
                                    PJN   TF4               JUMP, FWA OF RBR-S OK         1RN      905
                                    RJM   HANG                                            1RN      906
                          TF4       LDM    SAVECELL                                       1RN      907
                                    STD    RBTPTR           RESTORE DIRECT CELL           1RN      908
                                    LDD    RBTPTR+3                                       1RN      909
                                    NJN   TF5               JUMP, RBT LENGTH IS NON-ZERO (OK) 1RN  910
                                    RJM   HANG                                            1RN      911
                          TF5       ADC    -200B                                          1RN      912
                                    MJN   TF6               JUMP, SHOULD NOT HAVE MORE THAN 10K 1RN 913
                                                              RBT WORD PAIRS              1RN      914
                                    RJM   HANG                                            1RN      915
                          TF6       LDD    RBTPTR+3                                       1RN      916
                                    SHN    5                (A)=MAXIMUM POSSIBLE RBT ORDINAL 1RN   917
                                    SBD    RBTPTR+2                                       1RN      918
                                    PJN   TF7               JUMP, EMPTY CHAIN ORDINAL OK  1RN      919
                                    RJM   HANG                                            1RN      920
                                                                                          1RN      921
                          TF7       LDD    RBTPTR+4                                       1RN      922
                                    STM    SAVECELL                                       1RN      923
                                    LDN    1                                              1RN      924
                                    STD    RBTPTR+4                                       1RN      925
                                    LDN    P.CMFL                                         1RN      926
                                    CRM    BUFFER,RBTPTR+4                                1RN      927
                                    LDM    BUFFER+4         MACHINE FL/100B               1RN      928
                                    SBM    SAVECELL                                       1RN      929
                                    ZJN   TF8               JUMP, CM LWA+1 BAD            1RN      930
                                    RJM   HANG
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                          TF8       LDM    SAVECELL         RESTORE DIRECT CELL               1RN      931
                                    STD    RBTPTR+4                                           1RN      932
                                    UJK    PRBTX            EXIT                              1RN      933
                          HANG      ENM    X                                                  1RN      934
                                    LDC    0315B            CM                                1RN      935
                                    STD    D.T1                                               1RN      936
                                    LDC    3555B            2                                 1RN      937
                                    STD    D.T2                                               1RN      938
                                    LDC    0201B            BAD                               1RN      939
                                    STD    D.T3                                               1RN      940
                                    LDC    0455B             D                                1RN      941
                                    STD    D.T4                                               1RN      942
                                    LDN    77B                                                1RN      943
                                    RJM  R.MTR              CM2 BAD                           1RN      944
                                    UJN  *                  HANG FOREVER                      1RN      945
                                                                                              1RN      946
                          SAVECELL  BSS     1                                                 1RN      947
                          BUFFER    BSS     5                                                 1RN      948
                                                                                              1RN      949
                          IPTF      ENDIF                                                     1RN      950
                          **                                                                  1RN      951
                          *         RBT INCREASE                                              1RN      952
                          *         RELEASE THE RBT CHANNEL SO THAT IT IS NOT FROZEN WHILE WE TRY 1RN  953
                          *         TO INCRESE RBT STORAGE AFTER WE WRITE THE UPDATED P.RBT TO    1RN  954
                          *         CM.  INCREMENT CURRENT TO CONTAIN THE NEW RBT SIZE (IN THE    1RN  955
                          *         FORM OF THE DESIRED RBT START ADDRESS/100B).  RBT STORAGE IS  1RN  956
                          *         ALWAYS REQUESTED FROM MONITOR IN 100B WORD INCREMENTS.  ISSUE 1RN  957
                          *         THE STORAGE REQUEST.  IF IT IS GRANTED (D.T1 = CURRENT)       1RN  958
                          *         CONTINUE, OTHERWISE QUIT AND TRY AGAIN LATER.  NOW ZERO OUT   1RN  959
                          *         THE LAST WORD OF THE NEW STORAGE (THE NEW EMPTY CHAIN END) AND 1RN 960
                          *         LINK TOGETHER THE NEW 40B WORD PAIRS.  RESERVE THE RBT CHANNEL 1RN 961
                          *         AGAIN AND READ P.RBT BACK INTO THE PP.  SET RBTCL TO THE NEW  1RN  962
                          *         EMPTY CHAIN SIZE.  IF THERE ARE NO WORD PAIRS IN THE EMPTY    1RN  963
                          *         CHAIN SET THE POINTER IN P.RBT TO POINT TO OUR NEW CHAIN.  IF 1RN  964
                          *         THERE IS AN EXISTING CHAIN PREVIOUS MUST STILL POINT TO THE   1RN  965
                          *         LAST WORD PAIR ( ANYONE WHO GOT WORD PAIRS WHILE WE DIONT HAVE 1RN 966
                          *         THE CHANNEL GO THEM FROM THE OTHER END) SO WE SIMPLY LINK OUR 1RN  967
                          *         NEW WORD PAIRS TO THE EXISTING CHAIN.  REWRITE P.RBT AND      1RN  968
                          *         RELEASE THE RBT CHANNEL.                                      1RN  969
  2047         1402       RCN12     LDN        P.RBT                                          1RN      970
  2050         6225                 CWD        RBTPTR                                         1RN      971
                                                                                              1RN      972
  2051         1417                 LDN        CH.RBT                                         1RN      973
  2052         0200 0326            RJM        R.DCH                                          1RN      974
                                                                                              1RN      975
  2054         3630                 ADD      RBTCL                                            1RN      976
  2055         1070                 SHN      -7             TEST SIZE OF RBT AREA .LT. 20K    SC41866    1
  2056         0403                 ZJN    *+3                                                SC41866    2
  2057         0100 1562  RCN13     LJM    DROP             RETURN WITH NO INCREASE           SC41866    3
                                                                                              SC41866    4
  2061         3734       +         SOD      CURRENT        ELSE, SET NEW LOWER LIMIT         SC41866    5
  2062         3411                 STD        D.T1                                           SC41866    6
  2063         1416                 LDN        M.RBTSTO                                       1RN      978
  2064         0200 0220            RJM        R.MTR                                          1RN      979
  2066         3034                 LDD        CURRENT                                        1RN      980
  2067         3311                 LMD        D.T1                                           1RN      981
                                                                                              1RN      982
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1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES     COMPASS 3.75077.     09/10/75 09.59.3
SYMBOLIC REFERENCE TABLE
  ..H23A   1107                 8/56
SRCH24     1120
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                                                                                     SC41866     7
 2070     0566                     NJN   RCN13          EXIT IF MTR RETURNED OLD LIMIT  SC41866  8
 2071     3441                     STD   RBTLINK        ELSE, ADD 32 MORE WORD PAIRS    SC41866  9
 2072     1430                     LDN   T.CLK          FETCH CLOCK                     SC41866 10
 2073     6012                     CRD   D.T2                                           SC41866 11
 2074     3011                     LDD   D.T1           MARK NEW LIMIT OF RBT AREA      SC41866 12
 2075     1006                     SHN   6                                              SC41866 13
 2076     6370 2167                CWM   RBTMARK,D.PPONE                                SC41866 14
 2100     6212                     CWD   D.T2                                           SC41866 15
 2101     3031                     LDD   LWA            COMPUTE HIGHEST ORDINAL IN RBT  SC41866 16
 2102     3211                     SBD   D.T1                                           SC41866 17
 2103     1005                     SHN   5                                              SC41866 18
 2104     1701                     SBN   1                                              SC41866 19
 2105     3411                     STD   D.T1                                           SC41866 20
                                                                                     1RN       991
 2106     3031           RCN14     RBT      D.T1                                     1RN       992
 2112     6241                     CWD      RBTLINK                                  1RN       993
 2113     1601                     ADN      1                                        1RN       994
 2114     6242                     CWD      ZERO                                     1RN       995
 2115     3011                     LDD      D.T1                                     1RN       996
 2116     3441                     STD      RBTLINK                                  1RN       997
 2117     3711                     SOD      D.T1                                     1RN       998
 2120     1237                     LPN      37B                                      1RN       999
 2121     0564                     NJN      RCN14         REPEAT 40B TIMES           1RN      1000
                                                                                     SC40854   101
 2122     3035                     LDD      PREVIOUS      SAVE PREVIOUS              SC40854   102
 2123     3447                     STD      D.FR7                                    SC40854   103
 2124     3031                     RBT      D.T1          ZAP PREV MARKER AND LINK   SC40854   104
 2130     6241                     CWD      RBTLINK         IT INTO THE CHAIN        SC40854   105
 2131     1601                     ADN      1                                        SC40854   106
 2132     6242                     CWD      ZERO                                     SC40854   107
 2133     3011                     LDD      D.T1                                     SC40854   108
 2134     3441                     STD      RBTLINK                                  1RN      1001
 2135     1417                     LDN         CH.RBT                                1RN      1002
 2136     0200 0303                RJM         R.RCH                                 1RN      1003
 2140     1402                     LDN         P.RBT                                 1RN      1004
 2141     6025                     CRD         RBTPTR                                1RN      1005
 2142     3630                     AOD         RBTCL                                 1RN      1006
 2143     3027                     LDD         FRSTRBT                               1RN      1007
 2144     0504                     NJN         RCN15                                 1RN      1008
 2145     3041                     LDD         RBTLINK                               1RN      1009
 2146     3427                     STD         FRSTRBT                               1RN      1010
 2147     0306                     UJN         RCN16                                 1RN      1011
                                                 LINK PREV END TO ZAPPED MARKER      SC40854   109
 2150     3031           RCN15     RBT      D.FR7                                    1RN      1013
 2154     6241                     CWD         RBTLINK                               1RN      1014
 2155     0100 1555                LJM         RCN11                                 1RN      1015
                         RCN16     MACRO       EQ,SPEED                              1RN      1016
                         DEV       VFD         6/EQ_B,6/SPEED                        1RN      1017
                                   ENDM                                              1RN      1018
                                                                                     1RN      1019
 2157     0106           RELACT    DEV         01,6                                  1RN      1020
 2160     0203                     DEV         02,3                                  1RN      1021
 2161     0404                     DEV         04,4                                  1RN      1022
 2162     0510                     DEV         05,8                                  1RN      1023
 2163     0610                     DEV         06,8                                  1RN      1024
 2164     0712                     DEV         07,10                                 FEAT04   1574
 2165     1304                     DEV      13,4          844
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2[redacted]0000                            DATA    0                TABLE TERMINATOR
     2167     5505                                                                   1RN      1028
     2170     1604            RBTMARK      VFD     48/8L END RBT,12/7777B
     2171     5522                                                                   SC40854   111
     2172     0224
     2173     7777

                              **           VECN    - VERIFY EMPTY CHAIN             1RN      1029
                              *                    - - - -                          1RN      1030
                              *            CHECKS THAT EMPTY CHAIN IS IN RANGE AND MONOTONIC INCREASING.  1RN  1031
                              *                                                     1RN      1032
                              IPTF         IFNE    IP.TF,0                          1RN      1033
                              VECNX        LJM     *+*                              1RN      1034
                              VECN         EQU     *-1                              1RN      1035
                                           LDN     P.RBT                            1RN      1036
                                           CRD     D.T3  - T7                       1RN      1037
                                           LDD     D.T5         EMP. CHAZIN START   1RN      1038
                                           STD     D.T1                             1RN      1039
                                           LDN     0                                1RN      1040
                                           STD     D.T0         INITIALIZE PREVIOUS 1RN      1041
                              *                                                     1RN      1042
                              VEC10        LDD     D.T1         RANGE CHECK         1RN      1043
                                           ZJN     VECNX        (EXIT, END OF CAAIN) 1RN     1044
                                           SBN     1                                1RN      1045
                                           SHN     -5                               1RN      1046
                                           SBD     D.T6                             1RN      1047
                                           PJN     VEC30                            1RN      1048
                                           LDD     D.T0                             1RN      1049
                                           SBD     D.T1                             1RN      1050
                                           PJN     VEC30        BOMB . WAS .LE. PREVIOUS  1RN 1051
                                           LDD     D.T1                             1RN      1052
                                           STD     D.T0         NEW *PREVIOUS* VALUE 1RN     1053
                                           LDD     D.T7                             1RN      1054
                                           SHN     5                                1RN      1055
                                           SBD     D.T1                             1RN      1056
                                           SHN     1                                1RN      1057
                                           CRD     D.T1                             1RN      1058
                                           UJN     VEC10                            1RN      1059
                              *                                                     1RN      1060
                              IPTF         ENDIF                                    1RN      1061
     2174                     *                    KILL MTR . . .                   1RN      1062
     2174     1400            VEC30        BSS     0                                1RN      1063
     2175     3414                         LDN     0                                1RN      1064
     2176     1415                         STD     D.T4         (STEP               1RN      1065
     2177     0200 0220                    LDN     M.STEP        CTL PT ZERO)       1RN      1066
     2201     1402                         RJM     R.MTR                            1RN      1067
     2202     3406                         LDN     LVECM/5                          1RN      1068
     2203     1405                         STD     D.Z6                             1RN      1069
     2204     6001                         LDN     P.PCOM                           1RN      1070
     2205     3005                         CRD     D.Z1                             1RN      1071
     2206     1604                         LDD     D.Z1+C.PCOM                      1RN      1072
     2207     6306 2212                    ADN     4                                1RN      1073
     2211     0362                         CWM     VECM,D.Z6                        1RN      1074
                                           UJN     VEC30                            1RN      1075
     2212     5534            VECM         DIS     ,* 1RN BAD EMP CHAIN*            1RN      1076
                                                                                    1RN      1077
                                                                                    1RN      1078

               15     ERRN13     EQU ...
```

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```
                          4         BSSZ   4                                  1RN      1079
2224                     16  LVECM  EQU    *-VECM                             1RN      1080
```

T4-4b

```
                                   LIST   -L,-R,-N
                                   LIST   -R                                              1RN       1082
                                   LIST   *                                               CIOCOM       3
      3                            LIST   M                                               CIOCOM     353
      3                 LOAD       MACRO  M,D                                             FXSC44019    1
                        STORE      MACRO  M,D                                             TPCOMD      73
                                   LIST   L,R                                             TPCOMD      87
                    1   SCR1       EQU    D.Z1                                            1RN       1086
                    7   DCHAN      EQU    7                                               1RN       1087
                    6   INDEX      EQU    6                                               1RN       1088
                   13   STAT81     EQU    11                                              1RN       1089
                   50   ESTORD     EQU    50B                                             1RN       1090
                   51   ESTADR     EQU    51B                                             1RN       1091
                   52   ESTLWA     EQU    52B                                             1RN       1092
                   53   ESTFWA     EQU    53B                                             1RN       1093
                   54   TTFWA      EQU    54B                                             1RN       1094
                   55   TTLEN      EQU    55B                                             1RN       1095
                   56   TTPOS      EQU    56B                                             1RN       1096
                   57   ESTINUSE   EQU    57B                                             1RN       1097
                   60   RDYCNT     EQU    60B                                             1RN       1098
                   20   TA.CVS     EQU    20B                                             1RN       1099
                   21   TA.EQS     EQU    21B                                             1RN       1100
                   22   TSTAT      EQU    22B                                             1RN       1101
                   22   STAT       EQU    22B                                             1RN       1102
                   23   JREW       EQU    23B                                             1RN       1103
                   36   DRVR       EQU    36B                                             1RN       1104
                        TTNOW      MACRO                  CEFAP CODE FOR 1RN              1RN       1105
                                   LDD    TTFWA                                           1RN       1106
                                   SHN    3                                               1RN       1107
                                   ADD    TTPOS                                           1RN       1108
                                   ENDM                                                   1RN       1109
                                   ECHO   8,P1=(Z,N,P,M),P2=(N,Z,M,P)                     1RN       1110
                        P1_JK      MACRO  WHERE                                           1RN       1111
                                   IF     DEF,WHERE,3                                     1RN       1112
                                   IFLT   *-WHERE,40B,2                                   1RN       1113
                                   P1_JN  WHERE                                           1RN       1114
                                   SKIP   2                                               1RN       1115
                                   P2_JN  *+3                                             1RN       1116
                                   LJM    WHERE                                           1RN       1117
                                   ENDM                                                   1RN       1118
                        BIT.TRD    BIT    S.TTFRD                                         1RN       1119
         2230                      ERRCOM                                                 1RN       1120
                   21   ERRNO      EQU    D.FNT+1           ERROR NUMBER FOR 6WM          1RN       1121
                   22   ERRNO2     EQU    D.FNT+2                                         ERRCOM   .1
                    1   ERRN1      EQU    1D       FET OUTSIDE FL                          ERRCOM   .1
                    2   ERRN2      EQU    2D       CIO CODE NOT DEFINED ON DEVICE       (F)ERRCOM   .1
                    3   ERRN3      EQU    3D       ILLEGAL FILE NAME                   (EP)ERRCOM   .1
                    4   ERRN4      EQU    4D       READ OR SKIP F AFTER WRITE           (F)ERRCOM   .1
                    5   ERRN5      EQU    5D       SYSTEM ERROR TAPES-TABLE            (EP)ERRCOM   .1
                    6   ERRN6      EQU    6D       WAITING FOR FNT SPACE                (F)ERRCOM   .1
                    7   ERRN7      EQU    7D       PHYSICAL/LOGICAL POSITIONS DISAGREE (SPECIAL)ERRCOM .1
                   10   ERRN8      EQU    8D       BUFFER ARGUMENT ERROR               (NF)ERRCOM   .1
                   11   ERRN9      EQU    9D       ERROR CONDITION NOT CLEARED LAST REQUEST(F)ERRCOM .1
                   12   ERRN10     EQU    10D      AUTO-TAPE ASSIGNMENT UNSUCCESSFUL    (F)ERRCOM   .1
                   13   ERRN11     EQU    11D      READ PERMISSION NOT GRANTED          (F)ERRCOM   .1
                   14   ERRN12     EQU    12D      ILLEGAL FUNCTION CODE               (EP)ERRCOM   .1
                   15   ERRN13     EQU    13D      DATA BLOCK TO LONG                   (F)ERRCOM   .1
                                                                                        (F)ERRCOM   .1
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TAPE STATUS CODE                                                                              (F)ERRCOM   .1
            16   ERRN14   EQU   140     ILL-FORMED MULTIFILE SET                              (F)ERRCOM   .1
            17   ERRN15   EQU   150     MUST POSITION MEMBER FILE                   (SPECIAL NF)ERRCOM   .1
            20   ERRN16   EQU   160     BLANK TAPE READ                                       (F)ERRCOM   .1
            21   ERRN17   EQU   170     HARDWARE-6681 FAILED CHANNEL ACTIVE                   (F)ERRCOM   .1
            22   ERRN18   EQU   180     FET TOO SHORT                                         (F)ERRCOM   .1
            23   ERRN19   EQU   190     TRIED TO WRITE NOISE RECORD                           (F)ERRCOM   .1
            24   ERRN20   EQU   200     UBC TOO LARGE                                         (F)ERRCOM   .1
            25   ERRN21   EQU   210     MLRS TOO LARGE                                        (F)ERRCOM   .1
            26   ERRN22   EQU   220     DATA EXCEEDS MLRS                                     (F)ERRCOM   .1
            27   ERRN23   EQU   230     ***NOT USED***                                       (EP)ERRCOM   .1
            30   ERRN24   EQU   240     RELEASE ILLEGAL ON PERMANENT FILE                    (EP)ERRCOM   .1
            31   ERRN25   EQU   250     WRITE NOT AT EOI ON PERMANENT FILE                    (F)ERRCOM   .1
            32   ERRN26   EQU   260     HARDWARE UNIT HUNG BUSY                              (EP)ERRCOM   .1
            33   ERRN27   EQU   270     INDEX BUFFER TOO SMALL                                (F)ERRCOM   .1
            34   ERRN28   EQU   280     INDEX ADDRESS NOT IN FL                              (EP)ERRCOM   .1
            35   ERRN29   EQU   290     WRITE NOT AT EOI REQUIRES MODIFY PERM                (EP)ERRCOM   .1
            36   ERRN30   EQU   300     WRITE REQUIRES EXTEND PERMISSION                     (EP)ERRCOM   .1
            37   ERRN31   EQU   310     EVICT ILLEGAL ON PERMANENT FILE                      (EP)ERRCOM   .1
            40   ERRN32   EQU   320     DEVICE FULL/FILE MAY NOT OVERFLOW                     (F)ERRCOM   .1
            41   ERRN33   EQU   330     FILE MAY NOT RESIDE ON DEVICE ASSIGNED                (F)ERRCOM   .1
            42   ERRN34   EQU   340     SPECIFIED DEVICE NON-EXISTENT                         (F)ERRCOM   .1
            43   ERRN35   EQU   350     HARDWARE-MMTS MEMORY PARITY ERROR                     (F)ERRCOM   .1
            44   ERRN36   EQU   360     HARDWARE-NO END OF OP                                    ERRCOM   .1
            45   ERRN37   EQU   370     POS ERR LO PT                                        (EP)ERRCOM   .1
            46   ERRN38   EQU   380     PARITY ERROR                          (EP)               ERRCOM   .1
            47   ERRN39   EQU   390     ECS INDEX ERROR                                       (F)ERRCOM   .1
            50   ERRN40   EQU   400     SIS OR SDA PERMISSIONS VIOLATED                       (F)ERRCOM   .1
            51   ERRN41   EQU   410     FUNCTION ILLEGAL ON MULTI-FILE SET                    (F)ERRCOM   .1
            52   ERRN42   EQU   420     ILLEGAL MULTIFILE NAME                                (F)ERRCOM   .1
            53   ERRN43   EQU   430     HARDWARE-6681 FAILED NO DATA ON IAN                   (F)ERRCOM   .1
            54   ERRN44   EQU   440     HARDWARE-DENSITY CHANGE DURING IO                    (NF)ERRCOM   .1
            55   ERRN45   EQU   450     ERRASE  LIMIT EXCEEDED                                (F)ERRCOM   .1
            56   ERRN46   EQU   460     MULTIPLE LOADPOINTS ON TAPE                           (F)ERRCOM   .1
            57   ERRN47   EQU   470     ERROR IN XL BUFFER FORMAT                             (F)ERRCOM   .1
            60   ERRN48   EQU   480     MULTIFILE NAME NOT FOUND ON MF DEVICE                 (F)ERRCOM   .1
            61   ERRN49   EQU   490              WRITE ATTEMPT ON PROTECTED VOLUME               ERRCOM   .1
                                                                                                 ERRCOM   .1
                                                                                                 1RN      1122
                                ENDM                                                             MCEEF    .1
                                MCEEF                                                            MCEEF    .1
 2230                    CEEFX  LJM     *                                                        MCEEF    .1
 2230     0100 2230  2231 CEEF  EQU     *-1                                                      MCEEF    .1
                                ADC     0100B                                                    MCEEF    .1
 2232     2100 0100             STM     CEF1                                                     MCEEF    .1
 2234     5400 2260             LDD     TA.EQS                                                   MCEEF    .1
 2236     3021                  STM     CEF5                                                     MCEEF    .1
 2237     5400 2264             LDD     TA.CVS                                                   MCEEF    .1
 2241     3020                  STM     CEF4                                                     MCEEF    .1
 2242     5400 2263             LDN     2                                                        MCEEF    .1
 2244     1402                  STD     SCR1                                                     MCEEF    .1
 2245     3401                  LDD     D.PPMES1                                                 MCEEF    .1
 2246     3075                  CWM     CEF1,SCR1                                                MCEEF    .1
 2247     6301 2260             STD     D.T2                                                     MCEEF    .1
 2251     3412                  LDN     20B                                                      MCEEF    .1
 2252     1420                  STD     D.T1                                                     MCEEF    .1
 2253     3411                  LDN     M.OFM                                                    MCEEF    .1
 2254     1413                  RJM     R.MTR
 2255     0200 0220             UJN     CEEFX
 2257     0350
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2260       0100          CE             01000
2261       3600          LABEL0   IF    DEF,DRVR      SYSTEM I/O DRIVER / ERROR CODE          MCEEF   .1
                         CEF2     VFD   12/DRVR*100B                                          MCEEF   .1
                         LABEL0   ENDIF               PROGRAM CODE / EST ORDINAL              MCEEF   .1
                         LABEL0   IF    -DEF,DRVR                                             MCEEF   .1
                         CEF2     DATA  0                                                     MCEEF   .1
2262       0013          LABEL0   ENDIF               PROGRAM CODE / EST ORDINAL              MCEEF   .1
2263       0000          CEF3     VFD   12/IPJPTCN                                            MCEEF   .1
2264       0000          CEF4     DATA  0             PP NUMBER/CHANNEL NUMBER                MCEEF   .1
2265       0000          CEF5     DATA  0             LAST CHANNEL (6681-4) STATUS            MCEEF   .1
                         CEF6     DATA  0             LAST EQUIPMENT STATUS                   MCEEF   .1
                                                      LAST STATUS II FROM MMTC, NOTE - THISMCEEF   .1
                                                      CELL WILL REMAIN ZERO IF STATUS II      MCEEF   .1
2266                              ENDM                IS NEVER TAKEN BY THE DRIVER.           MCEEF   .1
2266       0100 0000              MFCONV                                                      MCEEF   .1
2270                     FCONV    ENM   X                                                     MCEEF   .1
                                  STORE FNCODE                                                1RN      1123
                                  IFC   NE,=__==,1                                            MFCONV  .1
                                  ERR   ,                                                     MFCONV  .1
                                  IF    DEF,FNCODE,3  -OPERAND                                STORE   .2
                                  IFLT  FNCODE,100B,2                                         STORE   .2
                                  STD   FNCODE                                                STORE   .2
2270       5400 2273              IFNE  ,,1                                                   STORE   .2
                                  STM   FNCODE                                                STORE   .2
2272                              ENDM                                                        STORE   .2
                         FCONV1   CHOP  FNC,2000B                                             STORE   .2
                 2272    COP.TP   SET   *                                                     STORE   .2
                         CH.IF    IF    -DEF,CHOPIN                                           STORE   .2
                 2272    CHOPIN   EQU   *                                                     MFCONV  .1
3321                              USE   TA.CH                                                 CHOP    .2
3321                     RESA     BSS   0                                                     CHOP    .2
3321       0011                   VRM   D.T1                                                  CHOP    .2
                                  VFD   12D/D.T1      INITIALIZE CHANNEL ADDRESS TABLE        CHOP    .2
3322                              ENDM                                                        CHOP    .2
3322       2262                   VRM   CEF3                                                  CHOP    .2
                                  VFD   12D/CEF3                                              VRM     .3
                                  ENDM                                                        VRM     .3
3335                              USE   TA.CHE                                                CHOP    .2
3335       0000                   VRM   0                                                     VRM     .3
                                  VFD   12D/0                                                 VRM     .3
                                  ENDM                                                        CHOP    .2
                                  USE   *                                                     CHOP    .2
                                  USE   *                                                     VRM     .3
                         CH.IF    ENDIF                                                       VRM     .3
2272       7713 2000              IFC   NE,=2000B==,1                                         CHOP    .2
                                  FNC   2000B,IP.PTCN                                         CHOP    .2
                                  IFC   EQ,=2000B==,1                                         CHOP    .2
                                  FNC   IP.PTCN                                               CHOP    .2
                                  IFNE  1,IP.NTCN,5   DO NOT ASSEMBLE IF ONLY ONE CHANNEL     CHOP    .2
3323                              USE   TA.CH                                                 CHOP    .2
3323       2272                   VRM   COP.TP                                                CHOP    .2
                                  VFD   12D/COP.TP                                            CHOP    .2
                                  ENDM                                                        CHOP    .2
                                  USE   *                                                     CHOP    .2
                                  ENDM                                                        VRM     .3
                 2273    FNCODE   EQU   *-1                                                   VRM     .3
2274       1500                   LCN   0                                                     CHOP    .2
                                                                                              CHOP    .2
                                                                                              MFCONV  .1
                                                                                              MFCONV  .1
```

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TAPE STATUS CODE                                                                                    MFCONV   .1
                                  FWAIT1   CHOP    IJM,FCONVX         EXIT IF CHANNEL INACTIVE      CHOP     .2
 2275                     2275    COP.TP   SET     *                                                CHOP     .2
                                  CH.IF    IF      -DEF,CHOPIN                                      CHOP     .2
                                  CHOPIN   EQU     *                                                CHOP     .2
                                           USE     TA.CH                                            CHOP     .2
                                  RESA     BSS     0                  INITIALIZE CHANNEL ADDRESS TABLE  CHOP .2
                                           VRM     D.T1                                             CHOP     .2
                                           VRM     CEF3                                             CHOP     .2
                                           USE     TA.CHE                                           CHOP     .2
                                           VRM     0                                                CHOP     .2
                                           USE     *                                                CHOP     .2
                                           USE     *                                                CHOP     .2
                                  CH.IF    ENDIF                                                    CHOP     .2
                                           IFC     NE,=FCONVX==,1                                   CHOP     .2
                                           IJM     FCONVX,IP.PTCN                                   CHOP     .2
 2275         6513 2266                    IFC     EQ,=FCONVX==,1                                   CHOP     .2
                                           IJM     IP.PTCN                                          CHOP     .2
                                           IFNE    1,IP.NTCN,5        DO NOT ASSEMBLE IF ONLY ONE CHANNEL  CHOP .2
                                           USE     TA.CH                                            CHOP     .2
                                           VRM     COP.TP                                           VRM      .3
 3324                                      VFD     12D/COP.TP                                       VRM      .3
 3324         2275                         ENDM                                                     CHOP     .2
                                           USE     *                                                CHOP     .2
                                           ENDM                                                     MFCONV   .1
                                           SBN     1                                                MFCONV   .1
 2277         1701                         NJN     FWAIT1             LOOP TILL TIME EXPIRED        MFCONV   .1
 2300         0574                         CHOP    DCNPSN                                           CHOP     .2
 2301                                      SET     *                                                CHOP     .2
                          2301    COP.TP   IF      -DEF,CHOPIN                                      CHOP     .2
                                  CH.IF    EQU     *                                                CHOP     .2
                                  CHOPIN   USE     TA.CH                                            CHOP     .2
                                  RESA     BSS     0                  INITIALIZE CHANNEL ADDRESS TABLE  CHOP .2
                                           VRM     D.T1                                             CHOP     .2
                                           VRM     CEF3                                             CHOP     .2
                                           USE     TA.CHE                                           CHOP     .2
                                           VRM     0                                                CHOP     .2
                                           USE     *                                                CHOP     .2
                                           USE     *                                                CHOP     .2
                                  CH.IF    ENDIF                                                    CHOP     .2
                                           IFC     NE,===,1                                         CHOP     .2
                                           DCNPSN  ,IP.PTCN                                         CHOP     .2
                                           IFC     EQ,===,1                                         CHOP     .2
                                           DCNPSN  IP.PTCN            DO NOT ASSEMBLE IF ONLY ONE CHANNEL  CHOP .2
 2301         7553                         IFNE    1,IP.NTCN,5                                      CHOP     .2
                                           USE     TA.CH                                            CHOP     .2
                                           VRM     COP.TP                                           VRM      .3
 3325                                      VFD     12D/COP.TP                                       VRM      .3
 3325         2301                         ENDM                                                     CHOP     .2
                                           USE     *                                                CHOP     .2
                                           ENDM                                                     MFCONV   .1
                                  FCONV4   LDN     1                                                MFCONV   .1
 2302         1401                         RJM     CEEF                                             MFCONV   .1
 2303         0200 2231                    LDN     ERRN17                                           MFCONV   .1
 2305         1421                         LJM     CALL6WM                                          MFCONV   .1
 2306         0100 3311                                                                             MFCONV   .1
                                           ENDM                                                     1RN      1124
                                           MSTS
 2310
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 2310       0100 2310          STSX      LJM   *
                         2311  STS       EQU   *-1                                                    MSTS    .1
 2312       2000 1200                    LDC   TA.CVST                                                MSTS    .1
 2314       0200 2267                    RJM  FCONV                                                   MSTS    .1
 2316       0200 2333                    RJM  STSVER          FUNCTION FOR CONVERTER STATUS           MSTS    .1
 2320       1207                         LPN   7              INPUT + VERIFY RECEIPT OF 1 BYTE.       MSTS    .1
 2321                                    STORE  TA.CVS                                                MSTS    .1
                                         IFC   NE,=__==,1                                             MSTS    .1
                                         ERR   ,              -OPERAND                                STORE   .2
                                         IF    DEF,TA.CVS,3                                           STORE   .2
                                         IFLT  TA.CVS,100B,2                                          STORE   .2
 2321       3420                         STD   TA.CVS                                                 STORE   .2
                                         IFNE  ,,1                                                    STORE   .2
                                         STM   TA.CVS                                                 STORE   .2
                                         ENDM                                                         STORE   .2
 2322       2000 1300                    LDC   TA.EQST                                                STORE   .2
 2324       0200 2267                    RJM  FCONV                                                   MSTS    .1
 2326       0200 2333                    RJM  STSVER          FUNCTION FOR EQUIPMENT STATUS           MSTS    .1
 2330                                    STORE  TA.EQS        INPUT + VERIFY RECEIPT OF 1 BYTE.       MSTS    .1
                                         IFC   NE,=__==,1                                             MSTS    .1
                                         ERR   ,              -OPERAND                                STORE   .2
                                         IF    DEF,TA.EQS,3                                           STORE   .2
                                         IFLT  TA.EQS,100B,2                                          STORE   .2
 2330       3421                         STD   TA.EQS                                                 STORE   .2
                                         IFNE  ,,1                                                    STORE   .2
                                         STM   TA.EQS                                                 STORE   .2
                                         ENDM                                                         STORE   .2
 2331       0356                         UJN  STSX                                                    STORE   .2
                                                                                                      MSTS    .1
 2332       0100 2332          STSVERX   LJM   *
                         2333  STSVER    EQU   *-1                                                    MSTS    .1
 2334                                    CHOP  ACNPSN                                                 MSTS    .1
                         2334  COP.TP    SET   *                                                      MSTS    .1
                               CH.IF     IF    -DEF,CHOPIN                                            CHOP    .2
                               CHOPIN    EQU   *                                                      CHOP    .2
                                         USE   TA.CH                                                  CHOP    .2
                               RESA      BSS   0                                                      CHOP    .2
                                         VRM   D.T1           INITIALIZE CHANNEL ADDRESS TABLE        CHOP    .2
                                         VRM   CEF3                                                   CHOP    .2
                                         USE   TA.CHE                                                 CHOP    .2
                                         VRM   0                                                      CHOP    .2
                                         USE   *                                                      CHOP    .2
                                         USE   *                                                      CHOP    .2
                               CH.IF     ENDIF                                                        CHOP    .2
                                         IFC   NE,===,1                                               CHOP    .2
                                         ACNPSN    ,IP.PTCN                                           CHOP    .2
                                         IFC   EQ,===,1                                               CHOP    .2
 2334       7453                         ACNPSN    IP.PTCN                                            CHOP    .2
                                         IFNE  1,IP.NTCN,5    DO NOT ASSEMBLE IF ONLY ONE CHANNEL     CHOP    .2
                                         USE   TA.CH                                                  CHOP    .2
 3326                                    VRM   COP.TP                                                 CHOP    .2
 3326       2334                         VFD   12D/COP.TP                                             CHOP    .2
                                         ENDM                                                         VRM     .3
                                         USE   *                                                      VRM     .3
                                         ENDM                                                         CHOP    .2
 2335                                    CHOP  IANPSN                                                 CHOP    .2
                         2335  COP.TP    SET   *                                                      MSTS    .1
                                                                                                      CHOP    .2
```

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SRCH24      1120                   8/56       9/04
     26     1127                      6 L      /38
SRCH30      1131                   9/08       9/14
SRCH32      11
```



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IRN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES
TAPE STATUS CODE                                                                         CHOP  .2
                                                                                         CHOP  .2
                                   CH.IF     IF     -DEF,CHOPIN                          CHOP  .2
                                   CHOPIN    EQU    *                                    CHOP  .2
                                             USE    TA.CH                                CHOP  .2
                                   RESA      BSS    0          INITIALIZE CHANNEL ADDRESS TABLE  CHOP  .2
                                             VRM    D.T1                                 CHOP  .2
                                             VRM    CEF3                                 CHOP  .2
                                             USE    TA.CHE                               CHOP  .2
                                             VRM    0                                    CHOP  .2
                                             USE    *                                    CHOP  .2
                                             USE    *                                    CHOP  .2
                                   CH.IF     ENDIF                                       CHOP  .2
                                             IFC    NE,===,1                             CHOP  .2
                                             IANPSN    ,IP.PTCN                          CHOP  .2
                                             IFC    EQ,===,1                             CHOP  .2
                                             IANPSN    IP.PTCN                           CHOP  .2
  2335      7053                             IFNE   1,IP.NTCN,5  DO NOT ASSEMBLE IF ONLY ONE CHANNEL  CHOP  .2
                                             USE    TA.CH                                VRM   .3
                                             VRM    COP.TP                               VRM   .3
  3327                                       VFD    12D/COP.TP                           CHOP  .2
  3327      2335                             ENDM                                        CHOP  .2
                                             USE    *                                    MSTS  .1
                                             ENDM                                        CHOP  .2
                                             CHOP   IJM,STSFAIL    JUMP ON HARDWARE ERROR.  CHOP  .2
  2336                          2336  COP.TP SET    *                                    CHOP  .2
                                      CH.IF  IF     -DEF,CHOPIN                          CHOP  .2
                                      CHOPIN EQU    *                                    CHOP  .2
                                             USE    TA.CH                                CHOP  .2
                                      RESA   BSS    0          INITIALIZE CHANNEL ADDRESS TABLE  CHOP  .2
                                             VRM    D.T1                                 CHOP  .2
                                             VRM    CEF3                                 CHOP  .2
                                             USE    TA.CHE                               CHOP  .2
                                             VRM    0                                    CHOP  .2
                                             USE    *                                    CHOP  .2
                                             USE    *                                    CHOP  .2
                                      CH.IF  ENDIF                                       CHOP  .2
                                             IFC    NE,=STSFAIL==,1                      CHOP  .2
                                             IJM    STSFAIL,IP.PTCN                      CHOP  .2
  2336      6513 2342                        IFC    EQ,=STSFAIL==,1                      CHOP  .2
                                             IJM    IP.PTCN                              CHOP  .2
                                             IFNE   1,IP.NTCN,5  DO NOT ASSEMBLE IF ONLY ONE CHANNEL  CHOP  .2
                                             USE    TA.CH                                VRM   .3
                                             VRM    COP.TP                               VRM   .3
  3330                                       VFD    12D/COP.TP                           CHOP  .2
  3330      2336                             ENDM                                        CHOP  .2
                                             USE    *                                    MSTS  .1
                                             ENDM                                        CHOP  .2
                                             CHOP   DCNPSN                               CHOP  .2
  2340                          2340  COP.TP SET    *                                    CHOP  .2
                                      CH.IF  IF     -DEF,CHOPIN                          CHOP  .2
                                      CHOPIN EQU    *                                    CHOP  .2
                                             USE    TA.CH                                CHOP  .2
                                      RESA   BSS    0          INITIALIZE CHANNEL ADDRESS TABLE  CHOP  .2
                                             VRM    D.T1                                 CHOP  .2
                                             VRM    CEF3                                 CHOP  .2
                                             USE    TA.CHE                               CHOP  .2
                                             VRM    0
                                             USE    *
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                                USE     *                                         CHOP     .2
                       CH.IF    ENDIF                                             CHOP     .2
                                IFC     NE,===,1                                  CHOP     .2
                                DCNPSN     ,IP.PTCN                               CHOP     .2
                                IFC     EQ,===,1                                  CHOP     .2
  2340        7553              DCNPSN     IP.PTCN                                CHOP     .2
                                IFNE    1,IP.NTCN,5     DO NOT ASSEMBLE IF ONLY ONE CHANNEL  CHOP     .2
                                USE     TA.CH                                     CHOP     .2
  3331                          VRM     COP.TP                                    CHOP     .2
  3331        2340              VFD     120/COP.TP                                VRM      .3
                                ENDM                                              VRM      .3
                                USE     *                                         CHOP     .2
                                ENDM                                              CHOP     .2
  2341        0370              UJN  STSVERX                                      MSTS     .1

  2342        1402     STSFAIL  LDN     2                                         MSTS     .1
  2343        0200 2231         RJM  CEEF                                         MSTS     .1
  2345        1453              LDN     ERRN43          HARDWARE-6681 FAILED NO DATA ON IAN  MSTS     .1
  2346        0100 3311         LJM  CALL6WM                                      MSTS     .1
                                ENDM                                              MSTS     .1
```

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                          2350  TPSTAT    EQU    *                                                    1RN     1126
2350      1420                            LDN    T.JDATE                                              1RN     1127
2351      6000                            CRD    D.Z0         IF WE GET HERE BEFORE                   1RN     1128
2352      3004                            LDD    D.Z0+4       THE OPERATOR HAS                        1RN     1129
2353      2300 5555                       LMC    2R           ENTERED THE DATE                        1RN     1130
2355      0503                            NJN    TPS2         DONT STATUS TAPES                       1RN     1131
2356      0100 3032             TPS1      LJM    DROPP                                                1RN     1132
                                *                                                                     1RN     1133
                                                              * * * * * * * * * * * * * * * * * * *   1RN     1134
2360      1415                  TPS2      LDN    P.STG        * IF IT IS DESIRED TO PLAY WITH     *   1RN     1135
2361      6000                            CRD    D.Z0         * TAPES BY ISSUEING FUNCTION CODES  *   1RN     1136
2362      3004                            LDD    D.Z0+C.STG   * VIA DSD IT WILL BE NESSESSARY TO  *   1RN     1137
2363      1604                            ADN    4            * DISABLE TAPE STATUSING BY SETTING *   1RN     1138
2364      6000                            CRD    D.Z0         * BYTE 0 OF WORD 4 OF T.STG NON ZERO*   1RN     1139
2365      3000                            LDD    D.Z0+0       * * * * * * * * * * * * * * * * * * *   1RN     1140
2366      0567                            NJN    TPS1                                                 1RN     1141
                                *                                                                     1RN     1142
2367      1405                            LDN    P.EST                                                1RN     1143
2370      6032                            CRD    D.EST                                                1RN     1144
2371                                      MOVE   D.EST+0,ESTFWA                                       MOVE    .1
2371                                      LOAD   D.EST+0                                              LOAD    .2
                                          IFC    NE,=__==,1                                           LOAD    .2
                                          ERR    ,                                                    LOAD    .2
                                          IF     DEF,D.EST+0,3                                        LOAD    .2
                                          IFLT   D.EST+0,100B,2                                       LOAD    .2
2371      3032                            LDD    D.EST+0                                              LOAD    .2
                                          IFNE   ,,1                                                  LOAD    .2
                                          LDM    D.EST+0                                              LOAD    .2
                                          ENDM                                                        MOVE    .1
                                          STORE  ESTFWA                                               STORE   .2
2372                                      IFC    NE,=__==,1                                           STORE   .2
                                          ERR    ,            -OPERAND                                STORE   .2
                                          IF     DEF,ESTFWA,3                                         STORE   .2
                                          IFLT   ESTFWA,100B,2                                        STORE   .2
2372      3453                            STD    ESTFWA                                               STORE   .2
                                          IFNE   ,,1                                                  STORE   .2
                                          STM    ESTFWA                                               STORE   .2
                                          ENDM                                                        MOVE    .1
                                          ENDM                                                        1RN     1145
2373                                      MOVE   D.EST+1,ESTLWA                                       MOVE    .1
2373                                      LOAD   D.EST+1                                              LOAD    .2
                                          IFC    NE,=__==,1                                           LOAD    .2
                                          ERR    ,                                                    LOAD    .2
                                          IF     DEF,D.EST+1,3                                        LOAD    .2
                                          IFLT   D.EST+1,100B,2                                       LOAD    .2
2373      3033                            LDD    D.EST+1                                              LOAD    .2
                                          IFNE   ,,1                                                  LOAD    .2
                                          LDM    D.EST+1                                              LOAD    .2
                                          ENDM                                                        MOVE    .1
                                          STORE  ESTLWA                                               STORE   .2
2374                                      IFC    NE,=__==,1                                           STORE   .2
                                          ERR    ,            -OPERAND                                STORE   .2
                                          IF     DEF,ESTLWA,3                                         STORE   .2
                                          IFLT   ESTLWA,100B,2                                        STORE   .2
2374      3452                            STD    ESTLWA                                               STORE   .2
                                          IFNE   ,,1                                                  STORE   .2
                                          STM    ESTLWA                                               STORE   .2
                                          ENDM
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      2375       1414                     ENDM
      2376       6032                     LDN    P.TAPES                                 MOVE    .1
      2377                                CRD    D.EST                                    1RN      1146
      2377                                MOVE D.EST+0,TTFWA                               1RN      1147
                                          LOAD   D.EST+0                                  1RN      1148
                                          IFC    NE,=__==,1                              MOVE    .1
                                          ERR    ,                                       LOAD    .2
                                          IF     DEF,D.EST+0,3                           LOAD    .2
      2377       3032                     IFLT   D.EST+0,100B,2                          LOAD    .2
                                          LDD    D.EST+0                                 LOAD    .2
                                          IFNE   ,,1                                     LOAD    .2
                                          LDM    D.EST+0                                 LOAD    .2
      2400                                ENDM                                           LOAD    .2
                                          STORE  TTFWA                                   LOAD    .2
                                          IFC    NE,=__==,1                              MOVE    .1
                                          ERR    ,                    -OPERAND           STORE   .2
                                          IF     DEF,TTFWA,3                             STORE   .2
      2400       3454                     IFLT   TTFWA,100B,2                            STORE   .2
                                          STD    TTFWA                                   STORE   .2
                                          IFNE   ,,1                                     STORE   .2
                                          STM    TTFWA                                   STORE   .2
                                          ENDM                                           STORE   .2
      2401                                ENDM                                           STORE   .2
      2401                                MOVE   D.EST+1,TTLEN                           MOVE    .1
                                          LOAD   D.EST+1                                  1RN      1149
                                          IFC    NE,=__==,1                              MOVE    .1
                                          ERR    ,                                       LOAD    .2
                                          IF     DEF,D.EST+1,3                           LOAD    .2
      2401       3033                     IFLT   D.EST+1,100B,2                          LOAD    .2
                                          LDD    D.EST+1                                 LOAD    .2
                                          IFNE   ,,1                                     LOAD    .2
                                          LDM    D.EST+1                                 LOAD    .2
      2402                                ENDM                                           LOAD    .2
                                          STORE  TTLEN                                   LOAD    .2
                                          IFC    NE,=__==,1                              MOVE    .1
                                          ERR    ,                    -OPERAND           STORE   .2
                                          IF     DEF,TTLEN,3                             STORE   .2
      2402       3455                     IFLT   TTLEN,100B,2                            STORE   .2
                                          STD    TTLEN                                   STORE   .2
                                          IFNE   ,,1                                     STORE   .2
                                          STM    TTLEN                                   STORE   .2
                                          ENDM                                           STORE   .2
      2403                                ENDM                                           STORE   .2
      2403       1507                     SETC   1-LE.TAPES,TTPOS                        MOVE    .1
      2404                                LDK    1-LE.TAPES                               1RN      1150
                                          STORE  TTPOS                                   SETC    .1
                                          IFC    NE,=__==,1                              SETC    .1
                                          ERR    ,                    -OPERAND           STORE   .2
                                          IF     DEF,TTPOS,3                             STORE   .2
      2404       3456                     IFLT   TTPOS,100B,2                            STORE   .2
                                          STD    TTPOS                                   STORE   .2
                                          IFNE   ,,1                                     STORE   .2
                                          STM    TTPOS                                   STORE   .2
                                          ENDM                                           STORE   .2
                                          ENDM                                           STORE   .2
      2405                  2405   AEQ    EQU    *                                       STORE   .2
                                          MOVE   ESTFWA,ESTADR                           SETC    .1
                                                                                          1RN      1151
                                                                                          1RN      1152
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1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES        COMPASS 3.75077.     09/10/75  09.59.38.     PAGE    36
TAPE STATUS CODE                                                                                    MOVE     .1
                                    LOAD   ESTFWA                                                   LOAD     .2
2405                                IFC    NE,=__==,1                                               LOAD     .2
                                    ERR    ,                                                        LOAD     .2
                                    IF     DEF,ESTFWA,3                                             LOAD     .2
                                    IFLT   ESTFWA,100B,2                                            LOAD     .2
                                    LDD    ESTFWA                                                   LOAD     .2
2405       3053                     IFNE   ,,1                                                      LOAD     .2
                                    LDM    ESTFWA                                                   LOAD     .2
                                    ENDM                                                            MOVE     .1
                                    STORE  ESTADR                                                   STORE    .2
2406                                IFC    NE,=__==,1               -OPERAND                        STORE    .2
                                    ERR    ,                                                        STORE    .2
                                    IF     DEF,ESTADR,3                                             STORE    .2
                                    IFLT   ESTADR,100B,2                                            STORE    .2
                                    STD    ESTADR                                                   STORE    .2
2406       3451                     IFNE   ,,1                                                      STORE    .2
                                    STM    ESTADR                                                   STORE    .2
                                    ENDM                                                            MOVE     .1
                                    ENDM                                                             1RN        1153
                                    SETC   0,ESTORD                                                 SETC     .1
2407                                LDK    0                                                        SETC     .1
2407       1400                     STORE  ESTORD                                                   STORE    .2
2410                                IFC    NE,=__==,1               -OPERAND                        STORE    .2
                                    ERR    ,                                                        STORE    .2
                                    IF     DEF,ESTORD,3                                             STORE    .2
                                    IFLT   ESTORD,100B,2                                            STORE    .2
                                    STD    ESTORD                                                   STORE    .2
2410       3450                     IFNE   ,,1                                                      STORE    .2
                                    STM    ESTORD                                                   STORE    .2
                                    ENDM                                                            SETC     .1
                                    ENDM                                                             1RN        1154
                                    STORE  ESTINUSE                                                 STORE    .1
2411                                IFC    NE,=__==,1               -OPERAND                        STORE    .1
                                    ERR    ,                                                        STORE    .1
                                    IF     DEF,ESTINUSE,3                                           STORE    .1
                                    IFLT   ESTINUSE,100B,2                                          STORE    .1
                                    STD    ESTINUSE                                                 STORE    .1
2411       3457                     IFNE   ,,1                                                      STORE    .1
                                    STM    ESTINUSE                                                 STORE    .1
                                    ENDM                                                             1RN        1155
                                    STORE  RDYCNT                                                   STORE    .1
2412                                IFC    NE,=__==,1               -OPERAND                        STORE    .1
                                    ERR    ,                                                        STORE    .1
                                    IF     DEF,RDYCNT,3                                             STORE    .1
                                    IFLT   RDYCNT,100B,2                                            STORE    .1
                                    STD    RDYCNT                                                   STORE    .1
2412       3460                     IFNE   ,,1                                                      STORE    .1
                                    STM    RDYCNT                                                   STORE    .1
                                    ENDM                                                            SC41206       1
                                    LDN    CH.EST                   RESERVE CH.EST                  SC41206       2
2413       1440                     RJM    R.RCH                                                     1RN        1156
2414       0200 0303       AEQ1     READI  ESTADR,0.EST             PICK UP EST ENTRY               READI    .1
2416                                LOAD   ESTADR                                                   LOAD     .2
2416                                IFC    NE,=__==,1                                               LOAD     .2
                                    ERR    ,                                                        LOAD     .2
                                    IF     DEF,ESTADR,3                                             LOAD     .2
                                    IFLT   ESTADR,100B,2
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 2416   3051                      LDD    ESTADR                                            LOAD      .2
                                  IFNE   ,,1                                               LOAD      .2
                                  LDM    ESTADR                                            LOAD      .2
                                  ENDM                                                     LOAD      .2
 2417   6032                      CRD    D.EST                                             READI     .1
                                  ENDM                                                     READI     .1
 2420   1400                      LDN    0                                                 1RN       1157
 2421   5450 3334                 STM    LIST,ESTORD          ZERO ENTRY IN LIST           1RN       1158
 2423   3032                      LDD    D.EST+0                                           1RN       1159
 2424   0530                      NJN    AEQ4                 JUMP IF ASSIGNED             1RN       1160
 2425   3035                      LDD    D.EST+3                                           1RN       1161
 2426   2177 6253                 SBK    2RMT                                              1RN       1162
 2430   0404                      ZJN    AEQ15                                             FEAT48AK     1
 2431   2177 7677                 SBK    2RNT-2RMT                                         1RN       1164
 2433   0521                      NJN    AEQ4                                              1RN       1165
 2434   3036            AEQ15     LDD    D.EST+4                                           FEAT48AK     2
 2435   1012                      SHN    17-S.ESTMTS                                       FEAT48AK     3
 2436   0604                      PJN    AEQ2                 NOT MTS                      FEAT48AK     4
 2437   5600 3267                 AOM    MTSCNT               SET MTS FLAG                 FEAT48AK     5
 2441   0313                      UJN    AEQ4                                              FEAT48AK     6
                        *                                                                  FEAT48AK     7
 2442   3057            AEQ2      LDD    ESTINUSE                                          SC41206      3
 2443   0502                      NJN    AEQ3                 CH.EST USED FLAG ALREADY SET SC41206      4
 2444   3657                      AOD    ESTINUSE             IF NOT , SET IT NOW          SC41206      5
                        *                                                                  SC41206      6
 2445   2000 2000       AEQ3      LDC    2000B                * SET STATUS                 1RN       1171
 2447   3532                      RAD    D.EST                * IN PROGRESS BIT            1RN       1172
 2450                             WRITEI ESTADR,D.EST                                      1RN       1173
 2450                             LOAD   ESTADR                                            WRITEI    .1
                                  IFC    NE,=__==,1                                        LOAD      .2
                                  ERR    ,                                                 LOAD      .2
                                  IF     DEF,ESTADR,3                                      LOAD      .2
                                  IFLT   ESTADR,100B,2                                     LOAD      .2
 2450   3051                      LDD    ESTADR                                            LOAD      .2
                                  IFNE   ,,1                                               LOAD      .2
                                  LDM    ESTADR                                            LOAD      .2
                                  ENDM                                                     LOAD      .2
 2451   6232                      CWD    D.EST                                             WRITEI    .1
                                  ENDM                                                     WRITEI    .1
 2452   5450 3334                 STM    LIST,ESTORD          SAVE ADDRESS IN LIST         1RN       1174
 2454   3650            AEQ4      AOD    ESTORD                                            1RN       1175
 2455   3651                      AOD    ESTADR                                            1RN       1176
 2456   3252                      SBD    ESTLWA                                            1RN       1177
 2457                             NJK    AEQ1                 NOT DONE WITH EST            FEAT48AK     8
                                  IF     DEF,AEQ1,3                                        NJK       .1
                                  IFLT   *-AEQ1,40B,2                                      NJK       .1
                                  N_JN   AEQ1                                              NJK       .1
                                  SKIP   2                                                 NJK       .1
 2457   0403                      Z_JN   *+3                                               NJK       .1
 2460   0100 2416                 LJM    AEQ1                                              NJK       .1
 2462                             ENDM                                                     NJK       .1
                                  DCH    EST                  RELEASE CH.EST               SC41206      7
                                  IF     DEF,CH._EST,2                                     DCH       .1
 2462   1440                      LDN    CH._EST                                           DCH       .1
                                  IFCP   1                                                 DCH       .1
                                  LOAD   EST                                               DCH       .1
 2463   0200 0326                 RJM    R.DCH                                             DCH       .1
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1RN - CONTAI... RCN - ...EASE ...N, ... AGE ...UES ... S 3...7. .../10/... 09.5... ...E
SYMBOLIC REFERENCE TABLE.

SRCH23A    1107                              8/56     9/04
SRCH24     1120
SRCH26     1127
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                                                    COMPASS 3.75077.    09/10/75  09.59.38.     PAGE    38
1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES                                      DCH      .1
TAPE STATUS CODE                                                                           1RN      1179
                                    ENDM                                                   1RN      1180
                                    LDD    ESTINUSE       NEVER USED CH.EST -- WE ARE DONE ZJK      .1
 2465        3057                   ZJK    DROPP                                           ZJK      .1
 2466                               IF     DEF,DROPP,3                                     ZJK      .1
                                    IFLT   *-DROPP,40B,2                                   ZJK      .1
                                    Z_JN   DROPP                                           ZJK      .1
                                    SKIP   2                                               ZJK      .1
                                    N_JN   *+3                                             ZJK      .1
                                    LJM    DROPP
 2466        0503                   ENDM
 2467        0100 3032
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                                       IFEQ    IP.NTCN,1,2        * IF ONLY ONE TAPE CHANNEL        1RN       1183
                                       CHOP    LDN                * SAVE SOME TIME BY               1RN       1184
                                       RJM  R.RCH                 * REQUESTING IT NOW               1RN       1185
     2471                              SETC    0,ESTORD                                             1RN       1186
     2471     1400                     LDK     0                                                   SETC   .1
     2472                              STORE   ESTORD                                              SETC   .1
                                       IFC     NE,=__==,1'                                         STORE  .2
                                       ERR     ,                  -OPERAND                         STORE  .2
                                       IF      DEF,ESTORD,3                                        STORE  .2
                                       IFLT    ESTORD,100B,2                                       STORE  .2
     2472     3450                     STD     ESTORD                                              STORE  .2
                                       IFNE    ,,1                                                 STORE  .2
                                       STM     ESTORD                                              STORE  .2
                                       ENDM                                                        STORE  .2
                                       ENDM                                                        SETC   .1
     2473     3077                     LDD     D.PPSTAT                                             1RN       1187
     2474     2177 7622                ADC     -1-T.PPS1          (A) = PP NUMBER                   1RN       1188
     2476     1006                     SHN     6                                                    1RN       1189
     2477     5500 2262                RAM     CEF3               SETUP FOR CEFAP                   1RN       1190
     2501     5050 3334         ST1    LDM     LIST,ESTORD                                          1RN       1191
     2503     0512                     NJN  ST3                                                     1RN       1192
     2504     3650              ST2    AOD     ESTORD                                               1RN       1193
     2505     3153                     ADD     ESTFWA                                               1RN       1194
     2506     3252                     SBD     ESTLWA                                               1RN       1195
     2507     0571                     NJN  ST1                                                     1RN       1196
     2510                              CHOP    LDN                                                  1RN       1197
                          2510  COP.TP SET     *                                                   CHOP   .1
                                CH.IF  IF      -DEF,CHOPIN                                         CHOP   .1
                                CHOPIN EQU     *                                                   CHOP   .1
                                       USE     TA.CH                                               CHOP   .1
                                RESA   BSS     0                                                   CHOP   .1
                                       VRM     D.T1               INITIALIZE CHANNEL ADDRESS TABLE CHOP   .1
                                       VRM     CEF3                                                CHOP   .1
                                       USE     TA.CHE                                              CHOP   .1
                                       VRM     0                                                   CHOP   .1
                                       USE     *                                                   CHOP   .1
                                       USE     *                                                   CHOP   .1
                                CH.IF  ENDIF                                                       CHOP   .1
                                       IFC     NE,===,1                                            CHOP   .1
                                       LDN      ,IP.PTCN                                           CHOP   .1
                                       IFC     EQ,===,1                                            CHOP   .1
     2510     1413                     LDN      IP.PTCN                                            CHOP   .1
                                       IFNE    1,IP.NTCN,5     :  DO NOT ASSEMBLE IF ONLY ONE CHANNEL  CHOP   .1
                                       USE     TA.CH                                               CHOP   .1
     3332                              VRM     COP.TP                                              CHOP   .1
     3332     2510                     VFD     12D/COP.TP                                          VRM    .2
                                       ENDM                                                        VRM    .2
                                       USE     *                                                   CHOP   .1
                                       ENDM                                                        CHOP   .1
     2511     0200 0326                RJM  R.DCH                                                   1RN       1198
     2513     0100 3001                LJM  DEQ                                                     1RN       1199
                                *                                                                   1RN       1200
     2515     6032              ST3    CRD     D.EST                                                1RN       1201
     2516     3050                     LDD     ESTORD                                               1RN       1202
     2517     2100 3600                ADC     DRVR*100B                                            1RN       1203
     2521     5400 2261                STM     CEF2               DRIVER CODE AND EST ORD FOR CEFAP 1RN       1204
     2523     1003                     SHN     3                  0DCAB0                            1RN       1205
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                                                                                  SC43251     3
2524     3350                     LMD   ESTORD            0DCAXB                  1RN      1207
2525     1370                     SCN   70B               0DCA0B                  1RN      1208
2526     2174 5332                ADC   2R00-DRVR*1000B   000A0B + 2R00           1RN      1209
2530     5400 3212                STM   MSGXPE+1          UU INTO MESSAGE         1RN      1210
2532     3035                     LDD   D.EST+3                                   1RN      1211
2533     2200 3777                LPC   3777B                                     1RN      1212
2535     5400 3211                STM   MSGXPE            OT INTO MESSAGE         1RN      1213
                          *                                                       1RN      1214
                          *                    SAVE SOMETIME IF ONLY 1 TAPE CHANNEL 1RN    1215
                          ONE.TC  IFNE  IP.NTCN,1                                 1RN      1216
                          *                                                       1RN      1217
2537     5000 2566                LDM   STCNO        GET TAPE CHAN IN USE (OR 77B IF NONE) 1RN 1218
2541     1277                     LPN   77B                                       1RN      1219
2542     3407                     STD   DCHAN        MOVE TO DIRECT CELL TO SAVE SPACE 1RN 1220
2543     3033                     LDD   D.EST+1                                   1RN      1221
2544     1237                     LPN   37B                                       1RN      1222
2545     3207                     SBD   DCHAN                                     1RN      1223
2546     0417                     ZJN   STOKZ                                     1RN      1224
2547     3033                     LDD   D.EST+1                                   1RN      1225
2550     1071                     SHN   -6                                        1RN      1226
2551     0415                     ZJN   STCNO             NO SECOND CHAN          1RN      1227
2552     3207                     SBD   DCHAN                                     1RN      1228
2553     0433                     ZJN   STCOK                                     1RN      1229
2554     3034                     LDD   D.EST+2                                   1RN      1230
2555     1237                     LPN   37B                                       1RN      1231
2556     0410                     ZJN   STCNO             NO THIRD CHAN           1RN      1232
2557     3207                     SBD   DCHAN                                     1RN      1233
2560     0426                     ZJN   STCOK                                     1RN      1234
2561     3034                     LDD   D.EST+2                                   1RN      1235
2562     1071                     SHN   -6                                        1RN      1236
2563     0403                     ZJN   STCNO             NO FORTH CHAN           1RN      1237
2564     3207                     SBD   DCHAN                                     1RN      1238
2565     0421             STOKZ   ZJN   STCOK                                     1RN      1239
2566                      STCNO   CHOP  LDN                                       CHOP     .1
                   2566   COP.TP  SET   *                                         CHOP     .1
                          CH.IF   IF    -DEF,CHOPIN                               CHOP     .1
                          CHOPIN  EQU   *                                         CHOP     .1
                                  USE   TA.CH                                     CHOP     .1
                          RESA    BSS   0                                         CHOP     .1
                                  VRM   D.T1              INITIALIZE CHANNEL ADDRESS TABLE CHOP .1
                                  VRM   CEF3                                      CHOP     .1
                                  USE   TA.CHE                                    CHOP     .1
                                  VRM   0                                         CHOP     .1
                                  USE   *                                         CHOP     .1
                                  USE   *                                         CHOP     .1
                          CH.IF   ENDIF                                           CHOP     .1
                                  IFC   NE,===,1                                  CHOP     .1
                                  LDN   ,IP.PTCN                                  CHOP     .1
                                  IFC   EQ,===,1                                  CHOP     .1
2566     1413                     LDN   IP.PTCN                                   CHOP     .1
                                  IFNE  1,IP.NTCN,5       DO NOT ASSEMBLE IF ONLY ONE CHANNEL CHOP .1
                                  USE   TA.CH                                     CHOP     .1
3333                              VRM   COP.TP                                    VRM      .2
3333     2566                     VFD   12D/COP.TP                                VRM      .2
                                  ENDM                                            CHOP     .1
                                  USE   *                                         CHOP     .1
                                  ENDM
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7        2567                  -1              BSS    -1                                            1RN      1240
         2566       1477                       LDN    77B                                           1RN      1241
         2567       1777                       SBN    77B                                           1RN      1242
         2570       0404                       ZJN   STCGET                JUMP IF FIRST TIME         1RN      1243
         2571       1677                       ADN    77B                                           1RN      1244
         2572       0200 0326                  RJM   R.DCH                 DROP UNUSEABLE TAPE CHAN   1RN      1245
         2574       3034             STCGET    LDD    D.EST+2                                       1RN      1246
         2575       3412                       STD    D.T2                                          1RN      1247
         2576       3033                       LDD    D.EST+1                                       1RN      1248
         2577       1340                       SCN    40B                                           1RN      1249
         2600       0200 0303                  RJM   R.RCH                                          1RN      1250
         2602       2000 3321                  LDC    RESA                                          1RN      1251
         2604       0200 0355                  RJM   R.STB                                          1RN      1252
                              2606   STCOK     EQU    *                                             1RN      1253
                                     *                                                              1RN      1254
                                     ONE.TC    ENDIF                                                1RN      1255
                                     *                                                              1RN      1256
                                     *                                                              1RN      1257
         2606       2000 2000                  LDC    TA.CVSL              SELECT 6681/4              1RN      1258
         2610       0200 2267                  RJM   FCONV                                          1RN      1259
         2612       3036                       LDD    D.EST+4              SELECT EQUIPTMENT          1RN      1260
         2613       0200 2267                  RJM   FCONV                                          1RN      1261
         2615       0200 2311                  RJM   STS                                            1RN      1262
         2617                                  LOAD   TA.CVS                                        1RN      1263
                                               IFC    NE,=__==,1                                  LOAD     .1
                                               ERR    ,                                           LOAD     .1
                                               IF     DEF,TA.CVS,3                                LOAD     .1
                                               IFLT   TA.CVS,100B,2                               LOAD     .1
         2617       3020                       LDD    TA.CVS                                      LOAD     .1
                                               IFNE   ,,1                                         LOAD     .1
                                               LDM    TA.CVS                                      LOAD     .1
                                               ENDM                                               LOAD     .1
         2620       0414                       ZJN   STZ                                            1RN      1264
         2621       3423             STER668X  STD    JREW                 NON ZERO = DID NOT JUST REWIND   1RN      1265
         2622       1204                       LPN    4                                             1RN      1266
         2623       0432                       ZJN   NOTREADY                                       1RN      1267
                                     *                                                              1RN      1268
                                     *         TRANSMISSION PARITY ERROR                            1RN      1269
                                     *                                                              1RN      1270
         2624       1413                       LDN    13B                  XMSN P.E. FOR CEFAP        1RN      1271
         2625       0200 2231                  RJM   CEEF                                           1RN      1272
         2627       2000 3211                  LDC    MSGXPE               *DTXX XMSN PARITY ERROR*   1RN      1273
         2631       0200 0705                  RJM   R.DFM                                          1RN      1274
         2633       0322                       UJN   NOTREADY                                       1RN      1275

         2634                        STZ       LOAD   TA.EQS                                        1RN      1277
                                               IFC    NE,=__==,1                                  LOAD     .1
                                               ERR    ,                                           LOAD     .1
                                               IF     DEF,TA.EQS,3                                LOAD     .1
                                               IFLT   TA.EQS,100B,2                               LOAD     .1
         2634       3021                       LDD    TA.EQS                                      LOAD     .1
                                               IFNE   ,,1                                         LOAD     .1
                                               LDM    TA.EQS                                      LOAD     .1
                                               ENDM                                               LOAD     .1
         2635       3422                       STD    TSTAT                                         1RN      1278
         2636       1223                       LPN    23B                                           1RN      1279
         2637       1701                       SBN    1                    (A)=0 IF READY, NOT BUSY AND NOT AT   1RN      1280
```

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TAPE STATUS CODE
                                                                   LOAD POINT.  SAVE CONDITION...          1RN     1281
2640     3423                  STD    JREW                         ...AND TEST.                            1RN     1282
2641     0516                  MJN  ST4                            - CLEAR CONVERSION MODE (IF NOT ON      1RN     1283
2642     1444                  LDN    TA.CLCV                      - MMTC THIS WILL REJ -- DONT CARE)      1RN     1284
2643     0200 2267             RJM  FCONV                          ISSUE REWIND                            1RN     1285
2645     1410                  LDN    10B                                                                  1RN     1286
2646     0200 2267             RJM  FCONV                                                                  1RN     1287
2650     0200 2311             RJM  STS                                                                    1RN     1288
2652                           LOAD   TA.CVS                                                               LOAD    .1
                               IFC    NE,=__==,1                                                           LOAD    .1
                               ERR    ,                                                                    LOAD    .1
                               IF     DEF,TA.CVS,3                                                         LOAD    .1
                               IFLT   TA.CVS,100B,2                                                        LOAD    .1
                               LDD    TA.CVS                                                               LOAD    .1
2652     3020                  IFNE   ,,1                                                                  LOAD    .1
                               LDM    TA.CVS                                                               LOAD    .1
                               ENDM                                                                        1RN     1289
                               NJN  STER668X                       JUMP IF PROBLEMS                        1RN     1290
2653     0545                  UJN  ST4                                                                    1RN     1291
2654     0303                                                                                              1RN     1292
                        *                                                                                  1RN     1293
               2655     NOTREADY  EQU    *                                                                 1RN     1294
                               LDN    0                                                                    1RN     1295
2655     1400                  STD    TSTAT                        FAKE NOT READY STAT                     1RN     1296
2656     3422                                                                                              1RN     1297
               2657     ST4    EQU    *                            DROP TAPE DRIVE                         1RN     1298
                               LDK    TA.REL                                                               1RN     1299
2657     1400                  RJM  FCONV                                                                  1RN     1300
2660     0200 2267             LDC    2100B                        DROP 668174                             1RN     1301
2662     2000 2100             RJM    FCONV                                                                1RN     1302
2664     0200 2267             LDD    TSTAT                                                                1RN     1303
2666     3022                  LPN    2                                                                    1RN     1304
2667     1202                  NJN  ST4.5                                                                  1RN     1305
2670     0503                  LDD    JREW                                                                 1RN     1306
2671     3023                  NJN  ST6                                                                    1RN     1307
2672     0523           ST4.5  LDD    D.EST+3                      DT                                      1RN     1308
2673     3035                  STM    JREWM                                                                1RN     1309
2674     5400 3162             LDD    ESTORD                                                               1RN     1310
2676     3050                  STD    0                                                                    1RN     1311
2677     3400                  SHN    3                                                                    1RN     1312
2700     1003                  LMD    0                                                                    1RN     1313
2701     3300                  SCN    70B                                                                  1RN     1314
2702     1370                  ADC    2R00                                                                 1RN     1315
2703     2100 3333             STM    JREWM+1                                                              1RN     1316
2705     5400 3163             LDC    JREWM                                                                1RN     1317
2707     2000 3162             RJM  R.DFM                          JUST REWOUND TAPE, DONT CHANGE FLAGS    1RN     1318
2711     0200 0705             LJM  ST2                                                                    1RN     1319
2713     0100 2504      ST5                                                                                1RN     1320
                        *                                                                                  1RN     1321
                        ST6    LDN    LE.TAPES                                                             1RN     1322
2715     1410                  RAD    TTPOS                                                                1RN     1323
2716     3556                  SBD    TTLEN                                                                TTNOW   .1
2717     3255                  NJN  *+3                                                                    TTNOW   .1
2720     0503                  LJM  WOOPS                                                                  TTNOW   .1
2721     0100 3236             TTNOW                                                                       TTNOW   .1
2723                           LDD    TTFWA                                                                1RN     1324
2723     3054                  SHN    3                                                                    1RN     1325
2724     1003                  ADD    TTPOS
2725     3156                  ENDM
                               CRD    D.Z1
2726     6001                  LDD    D.Z1+0
2727     3001
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     2730      3250                  SBD   ESTORD                                           1RN     1326
     2731      0563                  NJN   ST6                EST NOT FOUND, TRY NEXT ENTRY 1RN     1327
     2732      3004                  LDD   4                                                1RN     1328
     2733      5400 3200             STM   NEWSTAT                                          1RN     1329
     2735      3005                  LDD   5                                                1RN     1330
     2736      5400 3201             STM   NEWSTAT+1                                        1RN     1331
     2740                            TTNOW                                                  1RN     1332
     2740      3054                  LDD   TTFWA                                           TTNOW  .1
     2741      1003                  SHN   3                                               TTNOW  .1
     2742      3156                  ADD   TTPOS                                           TTNOW  .1
                                     ENDM                                                  TTNOW  .1
     2743      1605                  ADK   W.TFLGS                                          1RN     1333
     2744      6001                  CRD   D.Z1                                             1RN     1334
     2745      3002                  LDD   D.Z1+1                                           1RN     1335
     2746      1067                  SHN   -S.TTFRD                                         1RN     1336
     2747      3322                  LMD   STAT                                             1RN     1337
     2750      1201                  LPN   1                                                1RN     1338
     2751      0407                  ZJN   ST8                JUMP IF NO CHANGE IN STATUS   1RN     1339
     2752      3022                  LDD   STAT                                             1RN     1340
     2753      1201                  LPN   1                                                1RN     1341
     2754      0506                  NJN   ST8.5              JUMP IF UNIT JUST CAME READY  1RN     1342
     2755      1400                  LDN   0                  DROPPED READY -- WE KNOW NOTHING 1RN  1343
     2756      0200 3117             RJM   PUTFLAG                                          1RN     1344
     2760      0100 2713    ST8      UJK   ST5                                              1RN     1345
                            *                                                               1RN     1346
                     2762   ST8.5    EQU   *                                                1RN     1347
     2762      3022                  LDD   STAT                                             1RN     1348
                                                          * PASS UNIT STAT TO 1TS.          1RN     1349
     2763      3401                  STD   D.Z1           * IT WILL BE USED BY 1TS TO TELL 4LX 1RN  1350
                                                          * THE DENSITY TO LEAVE THE TAPE AT. 1RN   1351
     2764      1204                  LPN   4                  CLEAR ALL BUT RING IN BIS     1RN     1352
     2765      1076                  SHN   -2+S.TTFRI                                       1RN     1353
     2766      0200 3117             RJM   PUTFLAG                                          1RN     1355
     2770      1400                  LDN   0                                                1RN     1356
     2771      5450 3334             STM   LIST,ESTORD                                      1RN     1357
     2773      3050                  LDD   ESTORD                                           1RN     1358
     2774      5460 3271             STM   RDYLIST,RDYCNT                                   1RN     1359
     2776      3660                  AOD   RDYCNT                                           1RN     1360
     2777      1720                  SBN   16                 (1TS CAN NOT ACCEPT MORE THAN 1RN     1361
     3000      0557                  NJN   ST8                 16 UNITS IN ONE CALL)        1RN     1362
                            *                                                               1RN     1363
     3001                   DEQ      RCH   EST                                              1RN     1364
                                     IF    DEF,CH._EST,2                                   RCH    .1
     3001      1440                  LDN   CH._EST                                         RCH    .1
                                     IFCP  1                                               RCH    .1
                                     LOAD  EST                                             RCH    .1
     3002      0200 0303             RJM   R.RCH                                           RCH    .1
                                     ENDM                                                  RCH    .1
     3004                            MOVE  ESTFWA,ESTADR                                    1RN     1365
     3004                            LOAD  ESTFWA                                          MOVE   .1
                                     IFC   NE,=__==,1                                      LOAD   .2
                                     ERR   ,                                               LOAD   .2
                                     IF    DEF,ESTFWA,3                                    LOAD   .2
                                     IFLT  ESTFWA,100B,2                                   LOAD   .2
     3004      3053                  LDD   ESTFWA                                          LOAD   .2
                                     IFNE  ,,1                                             LOAD   .2
                                     LDM   ESTFWA                                          LOAD   .2
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 TAPE STATUS CODE                                                                                   LOAD    .2
                                               ENDM                                                 MOVE    .1
                                               STORE  ESTADR,                                       STORE   .2
 3005                                          IFC    NE,=__==,1                                    STORE   .2
                                               ERR    ,                      -OPERAND               STORE   .2
                                               IF     DEF,ESTADR,3                                  STORE   .2
                                               IFLT   ESTADR,100B,2                                 STORE   .2
                                               STD    ESTADR                                        STORE   .2
 3005          3451                            IFNE   ,,1                                           STORE   .2
                                               STM    ESTADR                                        STORE   .2
                                               ENDM                                                 MOVE    .1
                                               ENDM                                                  1RN      1366
                                               SETC   0,ESTORD                                      SETC    .1
 3006                                          LDK    0                                             SETC    .1
 3006          1400                            STORE  ESTORD                                        STORE   .2
 3007                                          IFC    NE,=__==,1                                    STORE   .2
                                               ERR    ,                      -OPERAND               STORE   .2
                                               IF     DEF,ESTORD,3                                  STORE   .2
                                               IFLT   ESTORD,100B,2                                 STORE   .2
                                               STD    ESTORD                                        STORE   .2
 3007          3450                            IFNE   ,,1                                           STORE   .2
                                               STM    ESTORD                                        STORE   .2
                                               ENDM                                                 SETC    .1
                                               ENDM                                                  1RN      1367
 3010          5050 3334         DEQ1          LDM    LIST,ESTORD            JUMP AROUND IF NOT ASSIGNED    1RN      1368
 3012          0407                            ZJN    DEQ2                                           1RN      1369
 3013          6032                            CRD    D.EST                  CLEAR STATUS BIT FROM EST ENTRY    1RN      1370
 3014          2077 5777                       LDC    -2000B                                         1RN      1371
 3016          3532                            RAD    D.EST                                          1RN      1372
 3017          3051                            LDD    ESTADR                                         1RN      1373
 3020          6232                            CWD    D.EST                  WRITE EST ENTRY BACK INTO TABLE    1RN      1374
 3021          3650              DEQ2          AOD    ESTORD                                         1RN      1375
 3022          3651                            AOD    ESTADR                                         1RN      1376
 3023          3252                            SBD    ESTLWA                                         1RN      1377
 3024          0563                            NJN    DEQ1                                           1RN      1378
 3025                                          DCH    EST                                           DCH     .1
                                               IF     DEF,CH._EST,2                                 DCH     .1
 3025          1440                            LDN    CH._EST                                       DCH     .1
                                               IFCP   1                                             DCH     .1
                                               LOAD   EST                                           DCH     .1
 3026          0200 0326                       RJM    R.DCH                                         DCH     .1
                                               ENDM                                                  1RN      1379
 3030          3060                            LDD    RDYCNT                                         1RN      1380
 3031          0531                            NJN    C1TS
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                          **      AUTO-ASSIGN TAPE QUEUE MANAGEMENT                                 1RN
                          *                                                                         1RN
                          *       THIS PROCEDURE MAKES USE OF THE MILLISECOND CLOCK (T.MSC).        1RN
                          *       T.MSC IS WRITTEN INTO THE 3 WORDS, W.STGTLE, W.STGTLR AND         1RN
                          *       W.STGTLT. THESE WORDS WILL BE REFERED TO AS E, R AND T.           1RN
                          *                                                                         1RN
                          *       E       EASY                                                      1RN
                          *               WRITTEN INTO WHEN IT MIGHT BE EASIER TO MAKE AN           1RN
                          *               AUTOMATIC TAPE ASSIGNMENT.  CODE IN 1EJ AND 1CL           1RN
                          *               WRITES INTO THIS WORD WHEN TAPES ARE RELEASED.  ALSO      1RN
                          *               BY DSD FOR VSN AND SCR COMMANDS (SYSTEM HAS NEW INFO).    1RN
                          *                                                                         1RN
                          *       R       REJECT                                                    1RN
                          *               WRITTEN INTO WHEN AN AUTO ASSIGN FAILS DUE MOSTLY TO      1RN
                          *               TAPES NOT BEING MOUNTED BUT ALSO WHEN OVERCOMMITTMENT     1RN
                          *               CHECKING DISALLOWS A TAPE ASSIGNMENT.  CODE IN 2TACOM     1RN
                          *               (REQ, 1TS) SUPPORTS THIS WORD.                            1RN
                          *                                                                         1RN
                          *       T       TRY                                                       1RN
                          *               WRITTEN INTO WHEN 1RN CALLS 1TS WHICH TRIES TO MAKE       1RN
                          *               AN AUTO ASSIGNMENT.                                       1RN
                          *                                                                         1RN
                          *       CODE IN 1RN TO CALL 1TS LOOKS SOMETHING LIKE -                    1RN
                          *               IF ((E .GE. R) .AND. (E .GE. T)) CALL 1TS                 1RN
                          *       OR IN WORDS -                                                     1RN
                          *               IF WE KNOW MORE (OR HAVE MORE RESOURES) THAN THE LAST     1RN
                          *               TIME WE LOOKED AND THERE WAS SOMEONE WAITING IT IS A      1RN
                          *               GOOD TIME TO LOOK AGAIN.                                  1RN
                          *                                                                         1RN
                   3032   DROPP     EQU     *                                                       1RN
                          *                                                                         1RN
 3032                     XX        IPTSG   S.AUTO                                                  1RN
                                    NOREF   TSGSET#                                                 1RN
                   6607   TSGSET#   SET     IP.TSG    (FOR XREF ONLY)                               IPTSG .1
                      0   TSGSET#   SET     0                                                       IPTSG .1
                          TSGMIC#   MICRO   1,,$S.AUTO$                                             IPTSG .1
                          TSGSIG#   MICRO   1,1,$"TSGMIC#"$                                         IPTSG .1
                                    IFC     EQ,$-$"TSGSIG#"$,2                                      IPTSG .1
                          TSGMIC#   MICRO   2,,$"TSGMIC#"$                                          IPTSG .1
                          TSGSET#   SET     -0                                                      IPTSG .1
                      0   TSGMIC#   DECMIC  "TSGMIC#"                                               IPTSG .1
                          TSGSIG#   MICRO   ,,$$                                                    IPTSG .1
                                    IFC     NE,$$$,1                                                IPTSG .1
                          TSGSIG#   MICRO   1,,$,+1$                                                IPTSG .1
                          XX      IFGT    IP.TSG&TSGSET#,IP.TSG&TSGSET#&1S"TSGMIC#""TSGSIG#"        IPTSG .1
                                    ENDM                                                            IPTSG .1
                     20   TLWORK    EQU     20B                                                     1RN
 3032        1403                   LDN     3                                                       1RN
 3033        3410                   STD     D.T0                                                    1RN
 3034        1415                   LDN     P.STG                                                   1RN
 3035        6000                   CRD     D.Z0                                                    1RN
 3036        3004                   LDD     D.Z0+C.STG                                              1RN
 3037        1605                   ADN     W.STGTLE                                                1RN
 3040        6110 0020              CRM     TLWORK,D.T0                                             1RN
 3042        1402         CC1       LDN     2                                                       1RN
 3043        3406                   STD     INDEX                                                   1RN
 3044        5006 0020    CC2       LDM     TLWORK,INDEX                                            1RN
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3046    5206 0025     CC3     SBM    TLWORK+5,INDEX     LATER CHANGED TO TLWORK+10        1RN      1425
3050    0732                  MJN    CC5                CANT AUTO-ASSIGN NOW              1RN      1426
3051    0504                  NJN    CC4                                                  1RN      1427
3052    3606                  AOD    INDEX               * CURRENT BYTES                  1RN      1428
3053    1705                  SBN    5                   * ARE EQUAL SO                   1RN      1429
3054    0567                  NJN    CC2                 * TRY NEXT BYTE                  1RN      1430
3055    1405          CC4     LDN    5                   - (W.STGTLR) .LE. (W.STGTLE)     1RN      1431
3056    5500 3047             RAM    CC3+1               - ADVANCE TO CHECK W.STGTLT      1RN      1432
3060    1737                  SBN    TLWORK+15           . IF WE HAVE NOT ALL READY LOOKED 1RN     1433
3061    0560                  NJN    CC1                 . AT W.STGTLT GO BACK TO CHECK IT 1RN     1434
                      XX      ENDIF                                                       1RN      1435
                      *                                                                   1RN      1436
3062    1403          C1TS    LDN    3                                                    1RN      1437
3063    3401                  STD    D.Z1                                                 1RN      1438
3064    3074                  LDD    D.PPIR                                               1RN      1439
3065    6370 3265             CWM    IR1TS,D.PPONE                                        1RN      1440
3067    1604                  ADK    W.PPMES4-1                                           1RN      1441
3070    6301 3272             CWM    RDYLIST+1,D.Z1                                       1RN      1442
                      *                                                                   1RN      1443
3072                  XX      IPTSG  S.AUTO                                               1RN      1444
                              NOREF  TSGSET#                                              IPTSG    .1
                  6607 TSGSET# SET   IP.TSG   (FOR XREF ONLY)                             IPTSG    .1
                     0 TSGSET# SET   0                                                    IPTSG    .1
                      TSGMIC# MICRO  1,,$S.AUTO$                                          IPTSG    .1
                      TSGSIG# MICRO  1,1,$"TSGMIC#"$                                      IPTSG    .1
                              IFC    EQ,$-$"TSGSIG#"$,2                                   IPTSG    .1
                      TSGMIC# MICRO  2,,$"TSGMIC#"$                                       IPTSG    .1
                      TSGSET# SET    -0                                                   IPTSG    .1
                     0 TSGMIC# DECMIC "TSGMIC#"                                           IPTSG    .1
                      TSGSIG# MICRO  ,,$$                                                 IPTSG    .1
                              IFC    NE,$$$,1                                             IPTSG    .1
                      TSGSIG# MICRO  1,,$,+1$                                             IPTSG    .1
                      XX     IFGT   IP.TSG&TSGSET#,IP.TSG&TSGSET#&1S"TSGMIC#""TSGSIG#"    IPTSG    .1
                              ENDM                                                        IPTSG    .1
3072    1415                  LDN    P.STG                                                1RN      1445
3073    6000                  CRD    D.Z0                                                 1RN      1446
3074    1440                  LDN    T.MSC                                                1RN      1447
3075    6010                  CRD    D.T0                                                 1RN      1448
3076    3004                  LDD    D.Z0+C.STG                                           1RN      1449
3077    1607                  ADN    W.STGTLT                                             1RN      1450
3100    6210                  CWD    D.T0                WRITE NEW TIME LAST TRY          1RN      1451
                      XX      ENDIF                                                       1RN      1452
                      *                                                                   1RN      1453
3101    0307                  UJN    CC6                                                  1RN      1454
                      *                                                                   1RN      1455
3102    5000 3267     CC5     LDM    MTSCNT                                               FEAT48AK  9
3104    0506                  NJN    CC7                 FOUND MTS AND NO NON MTS CAME READY FEAT48AK 10
3105    1421                  LDN    N.DPP                                                FEAT48AK 11
3106    0200 0220             RJM    R.MTR                                                1RN      1457
3110    0100 0103     CC6     LJM    R.IDLE                                               1RN      1458
                      *                                                                   FEAT48AK 12
3112    3074          CC7     LDD    D.PPIR                                               FEAT48AK 13
3113    6370 3260             CWM    MTSTAT,D.PPONE                                       FEAT48AK 14
3115    0372                  UJN    CC6                                                  FEAT48AK 15
                      *                                                                   1RN      1459
                      *       SUBROUTINE TO SET TAPES TABLE UNIT ORIENTED FLAG BITS       1RN      1460
                      *                                                                   1RN      1461
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                                  *           UPON ENTRY (A) = R    BITS             1RN     1462
                                  *                                                  1RN     1463
 3116      0100 0000              PUTFLAG     ENM    X                               1RN     1464
 3120      3402                               STD    D.Z1+1                          1RN     1465
 3121                                         TTNOW                                  1RN     1466
 3121      3054                               LDD    TTFWA                           TTNOW   .1
 3122      1003                               SHN    3                               TTNOW   .1
 3123      3156                               ADD    TTPOS                           TTNOW   .1
                                              ENDM                                   TTNOW   .1
 3124      1605                               ADK    W.TFLGS                         1RN     1467
 3125      6201                               CWD    D.Z1                            1RN     1468
 3126      2000 3333                          LDC    2R00                            1RN     1469
 3130      5400 3206                          STM    NEWSTAT+6                       1RN     1470
 3132      5400 3207                          STM    NEWSTAT+7                       1RN     1471
 3134      3022                               LDD    STAT                            1RN     1472
 3135      1277                               LPN    77B                             1RN     1473
 3136      3400                               STD    0                               1RN     1474
 3137      1003                               SHN    3                               1RN     1475
 3140      3300                               LMD    0                               1RN     1476
 3141      1370                               SCN    70B                             1RN     1477
 3142      5500 3207                          RAM    NEWSTAT+7                       1RN     1478
 3144      3022                               LDD    STAT                            1RN     1479
 3145      1071                               SHN    -6                              1RN     1480
 3146      3400                               STD    00                              1RN     1481
 3147      1003                               SHN    3                               1RN     1482
 3150      3300                               LMD    0                               1RN     1483
 3151      1370                               SCN    70B                             1RN     1484
 3152      5500 3206                          RAM    NEWSTAT+6                       1RN     1485
 3154      2000 3200                          LDC    NEWSTAT                         1RN     1486
 3156      0200 0705                          RJM  R.DFM                             1RN     1487
 3160      0100 3116              PFX         UJK  PUTFLAGX                          1RN     1488
 3162      0424                   JREWM       DIS    ,*DTXX JUST REWOUND OR BUSY*    1RN     1489
 3200      0424                   NEWSTAT     DIS  ,*DTXX STAT = YYYY*               1RN     1490
 3211      0424                   MSGXPE      DIS    ,*DTUU XMSN PARITY ERROR*       1RN     1491
 3225      4141                   MSGMAL      DIS    ,*668X MALFUNCTION*             1RN     1492
                                  *                                                  1RN     1493
 3236      2000 3245              WOOPS       LDC    HANGMSG                         1RN     1494
 3240      0200 0705                          RJM  R.DFM                             1RN     1495
 3242      1477                               LDN    M.KILL                          1RN     1496
 3243      0200 0220                          RJM  R.MTR                             1RN     1497
                                  *                                                  1RN     1498
 3245      2331                   HANGMSG     DIS    ,*SYSTEM ERROR T.TAPES*         1RN     1499
 3260      3411                   MTSTAT      VFD    24/3L1IT                        FEAT48AK  16
 3261      2400
 3262      0000 0002                          CON    0,2,0                           FEAT48AK  17
 3264      0000
 3265      3424                   IR1TS       VFD    18/0V.1TS,6/0                   1RN     1500
 3266      2300
 3267      0000                   MTSCNT      CON    0                  IR+2         FEAT48AK  18
 3270      0001                               CON    1                  IR+3         FEAT48AK  19
 3271                       20    RDYLIST     BSSZ   16                              1RN     1502
                                  *                                                  1RN     1503
 3311      2000 3225              CALL6WM     LDC    MSGMAL        * ENTRY HERE ONLY IF THE 668X DOES     1RN     1504
 3313      0200 0705                          RJM  R.DFM           * NOT TAKE THE FUNCTION CODE OFF       1RN     1505
 3315      1400                               LDN    0             * THE CHANNEL.  FAKE NOT READY STAT    1RN     1506
 3316      3422                               STD    STAT          * TO MAKE THE MOST (OR LEAST FAILURE)  1RN     1507
 3317      0100 2715                          LJM  ST6             * FROM MALFUNCTIONING HARDWARE         1RN     1508
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                                        *                                                                        1RN      1509
                                                  USE      TA.CH          (PUT R.STB LIST BEFORE SCRATCH AREA)  1RN      1510
                                3334    LIST      EQU      *                                                     1RN      1511
                                3334    DAT       EQU      *                                                     1RN      1512
        3334          0000              SCRAP     DATA     0                                                     1RN      1513
        3336                                      END                                                            1RN      1514

                         53300B CM  STORAGE USED            3423 STATEMENTS     1792 SYMBOLS
                                    MODEL 74 ASSEMBLY       9.422 SECONDS       1298 REFERENCES
```

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ERROR DIRECTORY.

```
        3 TYPE ERROR              DUPLICATE MACRO DEFINITION.  NEW ONE OVERRIDES.
               OCCURRED ON PAGES        27

        7 TYPE ERROR              ADDRESS VALUE EXCEEDS FIELD SIZE, RESULT TRUNCATED
               OCCURRED ON PAGES        41
```

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SYMBOLIC REFERENCE TABLE.

AEQ	2405		35/56 D						
AEQ1	2416		36/52 L	37/45 F	37/46 F	37/50			
AEQ15	2434		37/13	37/16 L					
AEQ2	2442		37/18	37/22 L					
AEQ3	2445		37/23	37/26 L					
AEQ4	2454		37/10	37/15	37/20	37/41 L			
AQS	1000		7/04 L						
BIT.TRO	400		27/41 D						
CALL1PK	2021		21/12	21/15 L					
CALL6WM	3311		30/54	33/19	47/53 L				
CC1	3042		45/55 L	46/10					
CC2	3044		45/57 L	46/06					
CC3	3046		46/01 L	46/08 S					
CC4	3055		46/03	46/07 L					
CC5	3102		46/02	46/46 L					
CC6	3110		46/44	46/50 L	46/54				
CC7	3112		46/47	46/52 L					
CEEF	2231		28/41 D	30/52	33/17	41/41			
CEEFX	2230		28/40 L	28/57					
CEF1	2260		28/43 S	28/51	29/01 L				
CEF2	2261		29/03 L	39/56 S					
CEF3	2262		29/08 L	29/36	39/19 S				
CEF4	2263		28/47 S	29/09 L					
CEF5	2264		28/45 S	29/10 L					
CEF6	2265		29/11 L						
CHFLG	47		5/30 D	7/36 S	7/45 S	10/49			
CHOPIN	2272		29/28 F	30/03 F	31/34 F	32/25 F	39/28 F		
			29/29 D	30/29 F	32/01 F	32/49 F	40/36 F		
CH.DDT	16	PPTEXT	20/09						
CH.EST	40	PPTEXT	36/50	37/53 F	37/54	43/43 F	43/44	44/36 F	44/37
CH.FNT	15	PPTEXT	7/46	10/52	11/47				
CH.RBT	17	PPTEXT	13/53	17/56	23/44	24/33			
CONTIG	36		4/12 D	14/10 S	15/20	15/23 S	15/26 S	17/14	
COP.TP	2566		29/27 D	30/21	31/33 D	32/19	32/48 D	39/46	
			29/52	30/28 D	31/52	32/24 D	33/10	40/35 D	
			30/02 D	30/47	31/57 D	32/43	39/27 D	40/54	
CURRENT	34		4/10 D	15/27	15/37	16/07	17/23	23/56	
			14/06 S	15/36	15/40 S	16/30 S	23/52 S		
CW.RCHN	55		4/20 D	12/49	13/41				
C1TS	3062		44/43	46/13 L					
C.CST	2	PPTEXT	20/08						
C.DDST	3	PPTEXT	21/08						
C.DDT	2	PPTEXT	20/25						
C.ESTAT	0	PPTEXT	20/40	20/48	20/54				
C.ESTMNE	3	PPTEXT	20/43						
C.FCPNUM	3	PPTEXT	8/18						
C.FCPU	0	PPTEXT	9/36						
C.FDC	2	PPTEXT	8/50	9/06					
C.FDPCT	0	PPTEXT	10/18						
C.FECFL	2	PPTEXT	10/05						
C.FIDENT	2	PPTEXT	8/35						
C.FINFLG	2	PPTEXT	9/27						
C.FLINK	3	PPTEXT	8/28						
C.FLNKAD	4	PPTEXT	8/32						
C.FLOCK	3	PPTEXT	8/19	8/19 D					
C.FPRI	4	PPTEXT	8/45	9/16 S	10/23	10/34			
C.FTAPE	0	PPTEXT	9/56						

SYMBOLIC REFERENCE TABLE.

D.TH1	21	PPTEXT	4/17							
D.TW5	25	PPTEXT	4/03	5/20						
D.T0	10	PPTEXT	7/18 S	8/41	11/25	12/50 S	18/05 S	20/08	20/48	21/29
			7/19	9/20	11/35 S	13/42	18/06	20/10 S	20/54	45/49 S
			7/52 S	9/53	11/37 S	15/36 S	19/08	20/39 S	21/07 S	45/54
			8/01 S	11/05 S	11/39 S	15/39	19/15 S	20/40	21/08	46/38 S
			8/08	11/21	11/45	18/03 S	20/07 S	20/43	21/19 S	46/41
D.T1	11	PPTEXT	8/02	17/31	18/09	21/31 S	24/10	24/21 S	29/33	
			17/21 S	17/38	19/09	23/53 S	24/13 S	24/28		
			17/26	18/04 S	19/32 S	23/57	24/16	24/31		
			17/28 S	18/07	21/22 S	24/05	24/19	28/54 S		
D.T2	12	PPTEXT	17/37 S	19/30 S	21/32 S	24/08	41/08 S			
			17/44	21/24 S	24/04 S	28/52 S				
D.T3	13	PPTEXT	19/16	19/23	20/11	21/26 S				
D.T4	14	PPTEXT	12/51	13/26 S	13/39 S	19/29	20/12	21/27 S	25/45 S	
D.T5	15	PPTEXT	11/01 S	11/41						
D.Z0	0	PPTEXT	34/03 S	34/10 S	34/13 S	45/51 S	46/36 S			
			34/04	34/11	34/14	45/52	46/39			
D.Z1	1	PPTEXT	9/52 S	10/57	14/36 S	18/13 S	18/45	19/04 S	42/57	46/18
			10/10 S	11/03 S	14/40	18/19	18/46	25/51 S	43/13 S	47/04 S
			10/22	11/30 S	16/39 S	18/34	18/53	25/52	43/14	47/11
			10/27	11/43	17/24	18/38	18/56	27/08	43/29 S	
			10/56 S	14/23 S	18/11 S	18/40	19/01	42/56 S	46/14 S	
D.Z2	2	PPTEXT	5/32	14/22 S	14/30	14/35	14/37 S	18/17 S	18/28	
D.Z3	3	PPTEXT	18/22 S	18/23	18/30 S	18/33	18/36 S	18/42 S		
D.Z4	4	PPTEXT	18/39 S	18/41 S	18/49	18/51 S	18/54			
D.Z6	6	PPTEXT	25/49 S	25/54						
EMCOUNT	46		5/29 D	8/12 S	11/38					
EMPCT	33		4/09 D	12/47 S	13/22 S	13/24	13/35 S	14/38		
ERRN0	21		27/43 D							
ERRN02	22		27/44 D							
ERRN1	1		27/45 D							
ERRN10	12		27/54 D							
ERRN11	13		27/55 D							
ERRN12	14		27/56 D							
ERRN13	15		27/57 D							
ERRN14	16		28/01 D							
ERRN15	17		28/02 D							
ERRN16	20		28/03 D							
ERRN17	21		28/04 D	30/53						
ERRN18	22		28/05 D							
ERRN19	23		28/06 D							
ERRN2	2		27/46 D							
ERRN20	24		28/07 D							
ERRN21	25		28/08 D							
ERRN22	26		28/09 D							
ERRN23	27		28/10 D							
ERRN24	30		28/11 D							
ERRN25	31		28/12 D							
ERRN26	32		28/13 D							
ERRN27	33		28/14 D							
ERRN28	34		28/15 D							
ERRN29	35		28/16 D							
ERRN3	3		27/47 D							
ERRN30	36		28/17 D							
ERRN31	37		28/18 D							
ERRN32	40		28/19 D							

SYMBOLIC REFERENCE TABLE.

ERRN33	41		28/20 D
ERRN34	42		28/21 D
ERRN35	43		28/22 D
ERRN36	44		28/23 D
ERRN37	45		28/24 D
ERRN38	46		28/25 D
ERRN39	47		28/26 D
ERRN4	4		27/48 D
ERRN40	50		28/27 D
ERRN41	51		28/28 D
ERRN42	52		28/29 D
ERRN43	53		28/30 D 33/18
ERRN44	54		28/31 D
ERRN45	55		28/32 D
ERRN46	56		28/33 D
ERRN47	57		28/34 D
ERRN48	60		28/35 D
ERRN49	61		28/36 D
ERRN5	5		27/49 D
ERRN6	6		27/50 D
ERRN7	7		27/51 D
ERRN8	10		27/52 D
ERRN9	11		27/53 D
ESTADR	51		27/13 D 36/14 F 36/56 F 37/01 37/33 F 37/42 S 44/06 F 44/29
			36/13 F 36/15 S 36/57 F 37/32 F 37/34 44/05 F 44/07 S 44/32 S
ESTFWA	53		20/20 S 20/38 34/32 F 34/34 S 36/05 F 39/23 43/54 F
			20/34 27/15 D 34/33 F 36/04 F 36/06 43/53 F 43/55
ESTINUSE	57		27/19 D 36/35 F 36/36 F 36/37 S 37/22 37/24 S 38/02
ESTLWA	52		20/22 S 27/14 D 34/53 F 37/43 44/33
			20/35 34/52 F 34/54 S 39/24
ESTORD	50		20/29 S 36/25 F 37/40 39/11 S 40/01 43/36 44/24
			20/33 S 36/26 F 37/41 S 39/20 42/35 44/17 F 44/31 S
			20/37 36/27 S 39/09 F 39/22 S 43/01 44/18 F
			27/12 D 37/08 39/10 F 39/54 43/35 44/19 S
FCONV	2267		29/17 D 31/17 41/22 42/06 42/27
			31/04 41/20 42/04 42/25
FCONVX	2266		29/16 L 30/15
FCONV1	2272		29/26 L
FCONV4	2302		30/51 L
FC.1PK5	5	PPTEXT	21/23
FLNKAD	2		5/32 D 8/27 S 8/33 S 10/01 10/14
FNCODE	2273		29/20 F 29/24 S 29/56 D
FRSTRBT	27		4/05 D 14/05 15/56 S 24/38 24/41 S
FST1	25		5/20 D 9/55 S 9/56
FST2	32		5/21 D 8/45 9/06 9/22 9/36 10/34
			8/43 S 8/50 9/16 S 9/27 10/23
FWAIT1	2275		30/01 L 30/26
HANGMSG	3245		47/37 47/42 L
INDEX	6		27/10 D 45/56 S 45/57 46/01 46/04 S
INIT	1275		12/34 L
INPFILE	4		6/37 D 8/52 8/55
IP.CC7	1		9/35 F
IP.IQD	6		6/26
IP.LVF	70		10/25
IP.NTCN	4		29/49 F 30/44 F 32/16 F 33/07 F 39/43 F 40/51 F
			30/18 F 31/49 F 32/40 F 39/01 F 40/10 F
IP.OQD	10		6/27

IP.PTCN	13		29/08	30/15	31/48	32/37	39/42			
			29/46	30/43	32/15	33/06	40/50			
IP.TF	0		7/12 F	12/36 F	14/01 F	17/52 F	22/01 F	22/07 F	25/13 F	
IP.TSG	6607		45/34	45/45 F	46/22	46/33 F				
IQCOUNT	44		5/28 D	10/22 S	11/14 S	11/19 S	11/22	11/26	11/34	11/36
IQP	100		6/26 D	7/39	10/32					
IR1TS	3265		46/16	47/47 L						
JREW	23		27/25 D	41/34 S	42/01 S	42/31				
JREWM	3162		42/34 S	42/41 S	42/42	47/32 L				
LE.DDT	2	PPTEXT	21/04	21/06						
LE.FNT	3	PPTEXT	7/57							
LE.TAPES	10	PPTEXT	35/45	42/46						
LIST	3334		37/08 S	37/40 S	39/20	43/35 S	44/24	48/03 D		
LOCKMASK	40		6/29 D	8/20						
LOWSCRAP	40		4/14 D	14/32	15/29	15/55	16/10			
			14/20 S	14/34 S	15/33	16/02	16/12			
LVECM	16		25/48	26/02 D						
LWA	31		4/04 D	15/35	16/09	17/18	24/09	24/27		
			13/29	16/04	16/28	17/30	24/15	24/44		
L.CPNUM	17	PPTEXT	8/20							
MAXAGE	77		6/20 D	10/35	10/36					
MDDT	57		20/02 D	20/28 S	20/32 S	21/06	21/06			
MSGMAL	3225		47/35 L	47/53						
MSGXPE	3211		40/04 S	40/07 S	41/42	47/34 L				
MTSCNT	3267		37/19 S	46/46	47/49 L					
MTSTAT	3260		46/53	47/43 L						
M.DFM	13	PPTEXT	28/5[illegible]							
M.DPP	21	PPTEXT	46/48							
M.KILL	77	PPTEXT	47/39							
M.RBTSTO	16	PPTEXT	17/47	23/54						
M.RPJ	32	PPTEXT	19/36	21/33						
M.STEP	15	PPTEXT	25/46							
NEWSTAT	3200		43/04 S	43/06 S	47/13 S	47/14 S	47/21 S	47/28 S	47/29	47/33 L
NOTREADY	2655		41/36	41/44	42/20 D					
OQP	400		6/27 D	7/42	9/13					
OV.1PK	342013	PPTEXT	21/17	21/17 D						
OV.1TS	342423	PPTEXT	47/47							
PASSIGN	21		4/17 D							
PFX	3160		47/31 L							
PMPY	100		6/12 D	6/19	6/19 D	6/19	6/19 D	6/19		
			6/19	6/19 D	6/19	6/19 D	6/19	6/19 D		
			6/19 D	6/19	6/19 D	6/19	6/19 D	6/20		
PRCOUNT	42		5/27 D	7/07 S	10/27 S	11/11	11/16			
PREVIOUS	35		4/11 D	15/19	15/38 S	16/05	24/25			
			14/09 S	15/22	15/52	16/13 S				
PSHIFT	6		6/13 D	6/19 D	6/19 D	6/19 D	6/19 D	6/19 D	6/19 D	6/19 D
			6/19	6/19	6/19	6/19	6/19	6/19	6/19	10/24
PUTFLAG	3117		43/23	43/33	47/04 D					
PUTFLAGX	3116		47/03 L	47/31						
P.CST	5	PPTEXT	20/06							
P.DDT	7	PPTEXT	20/23							
P.EST	5	PPTEXT	20/17	34/17						
P.FNT	4	PPTEXT	7/51							
P.PCOM	5	PPTEXT	25/50							
P.RBT	2	PPTEXT	12/34	13/56	17/50	23/41	24/35			
P.RQS	13	PPTEXT	18/02							
P.SCH	60	PPTEXT	10/55							

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PUTFLAGX   3116
[redacted] CST [redacted] PP[redacted] [redacted]0/06 [redacted]
   JDT        7      PPTEXT      20/23
P.EST         5      PPTEXT      20/17     34/17
P.FNT         4      PPTEXT       7/51
P.PCOM        5      PPTEXT      25/50
P.RBT         2      PPTEXT      12/34     13/56     17/50     23/41     24/35
P.RQS        13      PPTEXT      18/02
P.SCH        60      PPTEXT      10/55
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1RN - CONTAINS, RCN - RELEASE CHAIN, AQS - AGE QUEUES        COMPASS 3.75077.     09/10/75  09.59.38.       PAGE    55
SYMBOLIC REFERENCE TABLE.

P.STG        15      PPTEXT      34/09     45/50     46/35
P.TAPES      14      PPTEXT      35/02
P.VRNBUF     43      PPTEXT       7/17
P.ZERO        0      PPTEXT       7/06
RBTCL        30                   4/06 D   16/29     17/12     17/32     17/35 S   23/47 S   24/37 S
RBTCNT       32                   4/08 D   12/40 S   15/18 S   16/32     16/36     17/45 S
RBTLINK      41                   4/15 D   16/03 S   16/08 S   24/02 S   24/20 S   24/32 S   24/45
                                  4/16     16/05     16/10     24/16     24/28     24/40
RBTMARK    2167                  17/43     24/07     25/03 L
RBTPTR       25                   4/03 D    4/05     12/35 S   17/51     24/36 S
                                  4/04      4/06     13/57 S   23/42
RBTWP        20                   4/02 D   12/52 S   13/23     13/30     13/30 S   13/38
RCN           0                  12/01 D
RCN1A      1315                  13/21 L
RCN10      1455                  15/57     16/07 L
RCN10A     1470                  15/32     16/28 L
RCN11      1555                  16/42     17/16     17/33     17/50 L   24/46
RCN12      2047                  16/35     23/41 L
RCN13      2057                  23/50 L   24/01
RCN14      2106                  24/15 L   24/23
RCN15      2150                  24/39     24/44 L
RCN16      2155                  24/42     24/46 L
RCN2       1317                  13/23 L   13/37
RCN3       1325                  13/25     13/29 L
RCN4       1343                  13/27     13/41 L
RCN4A      1365                  14/30 L   14/39
RCN4B      1360                  14/19 L   16/14
RCN4C      1345                  12/53     13/53 L
RCN5       1375                  14/31     14/33     14/37 L
RCN5A      1402                  15/18 L   15/41
RCN6       1411                  15/21     15/26 L
RCN7       1412                  15/27 L
RCN7A      1422                  15/28     15/33 L
RCN7Q      1436                  15/34     15/49 L
RCN8       1441                  15/31     15/49     15/52 L
RCN9       1446                  15/53     16/02 L
RDYCNT       60                  27/20 D   36/44 F   36/45 F   36/46 S   43/37     43/38 S   44/42
RDYLIST    3271                  43/37 S   46/18     47/51 L
RELACT     2157                  18/23     18/33     24/51 L
RESA       3321                  29/31 L   41/12
R.DCH       326      PPTEXT      11/48     17/57     23/45     37/57     39/50     41/06     44/40
R.DFM       705      PPTEXT      41/43     42/43     47/30     47/38     47/54
R.IDLE      103      PPTEXT      46/50
R.MTR       220      PPTEXT      17/48     19/37     23/55     28/56     47/40
                                 18/26     21/34     25/47     46/49
R.RCH       303      PPTEXT       7/47     10/53     13/54     24/34     36/51     41/11     43/47
R.STB       355      PPTEXT      41/13
SCRAP      3334                  13/24 S   13/36     14/30     14/40 S   48/05 L
SCR1          1                  27/08 D   28/49 S   28/51
SRCH10     1027                   7/43      7/51 L
SRCH15     1032                   7/57 L    8/13      8/16      8/21      9/23     10/40
SRCH20     1040                   7/53      8/03      8/08 L
SRCH21     1045                   8/13 L    8/46
SRCH22     1046                   8/11      8/15 L
SRCH22A    1053                   8/26 L    8/38
SRCH22B    1070                   8/30      8/37      8/40 D
                                  8/50 L
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SYMBOLIC REFERENCE TABLE.

SRCH23A	1107		8/56	9/04 L				
SRCH24	1120		9/16 L	10/38				
SRCH26	1127		9/08	9/14	9/18	9/23 L	9/29	
SRCH30	1131		8/53	9/03	9/27 L			
SRCH32	1147		9/41	9/46 D				
SRCH32A	1164		10/02	10/08 D				
SRCH33	1165		9/57	10/06	10/14 L			
SRCH33A	1174		10/15	10/22 L				
SRCH34	1205		9/04	9/40	9/45	10/20	10/26	10/31 L
SRCH36	1216		10/33	10/37	10/40 L			
SRCH4	1023		7/40	7/45 L				
SRCH40	1111		9/01	9/06 L				
SRCH90	1220		8/04	10/49 L				
SRCH92	1225		10/50	10/55 L				
SRCH93	1242		11/12	11/16 L				
SRCH94	1247		11/17	11/21 L				
SRCH95	1255		11/23	11/29 L				
SRCH96	1257		11/27	11/34 L				
START	37		4/13 D	14/11 S	15/24 S	17/19		
STAT	22		20/47 S	21/01 S	27/24 D	43/19	47/15	47/56 S
			20/53 S	21/10	43/16	43/27	47/22	
STATDDT2	1735		20/14 L	20/36				
STATDDT4	1737		20/13	20/16 L				
STATDDT6	1755		20/32 L	21/13				
STATDDT8	1756		20/33 L	20/42				
STATDD10	1762		20/30	20/37 L				
STAT81	13		27/11 D					
STCGET	2574		41/04	41/07 L				
STCNO	2566		40/12	40/21	40/26	40/31	40/34 L	
STCOK	2606		40/23	40/28	40/33	41/14 D		
STER668X	2621		41/34 L	42/17				
STGFLG	37		5/22 D	7/20 S	9/02			
STOKZ	2565		40/18	40/33 L				
STS	2311		31/02 D	41/23	42/07			
STSFAIL	2342		32/37	33/16 L				
STSVER	2333		31/05	31/18	31/31 D			
STSVERX	2332		31/30 L	33/14				
STSX	2310		31/01 L	31/28				
STZ	2634		41/33	41/46 L				
ST1	2501		39/20 L	39/25				
ST2	2504		39/22 L	42/44				
ST3	2515		39/21	39/53 L				
ST4	2657		42/02	42/18	42/23 D			
ST4.5	2673		42/30	42/33 L				
ST5	2713		42/44 L	43/24				
ST6	2715		42/32	42/46 L	43/02	47/57		
ST8	2760		43/18	43/24 L	43/40			
ST8.5	2762		43/21	43/26 D				
S.AUTO	0		45/41	46/29				
S.ESTBSY	4	PPTEXT	20/51	20/51 D				
S.ESTFR	5	PPTEXT	20/52	20/52 D				
S.ESTMTS	7	PPTEXT	37/17					
S.ESTON	13	PPTEXT	20/46	20/46 D				
S.ESTRID	12	PPTEXT	20/57	20/57 D				
S.ESTRMS	13	PPTEXT	20/41					
S.FINRT	13	PPTEXT	9/28					
S.FLINK	4	PPTEXT	8/29					

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STUDY QUESTIONS

Sample PP Programs - Section XIV

1. How does the calling CP Program usually know when a PP program has completed its task? ______________________________

2. How does the PP programmer generally determine if a PP program has done its task? ______________________________

3. How does a PP program usually get parameters passed to it from the CP user? ______________________________

4. How does a CP program wait for a PP program to complete a task?

   ____

5. When is a PP program hung in Auto Recall?

   ____

6. What is a PP call error? ______________________________

7. How do you hang a PP? ______________________________

8. How do you un-hang a PP? ______________________________

9. List the main functions of - 1RN

STUDY QUESTIONS

Sample PP Programs - Section XIV

1. How does the calling CP Program usually know when a PP program has completed its task? by setting the complete bit

2. How does the PP programmer generally determine if a PP program has done its task? messages or dumps

3. How does a PP program usually get parameters passed to it from the CP user? parameters in Fake FET

4. How does a CP program wait for a PP program to complete a task? using RECALL

5. When is a PP program hung in Auto Recall? when the complete bit is not set

6. What is a PP call error? no PP Program by the name requested.

7. How do you hang a PP? execute a wrong code sequence

8. How do you un-hang a PP? deadstart

9. List the main functions of - 1RN

RBT management
Ages Queues
Status system tape drives

[redacted] AL [redacted] S [redacted] pl [redacted] FP [redacted]

0000	0035	7512	7712	5107	7712	0010	7712	1400	P00	0010	7412	7112	0013	----	0100	0013	----	0006	P00
0020	3007	1071	1714	3413	0403	3005	0302	3007	P00	0030	1204	0505	2010	7000	6350	----	3013	0446	P00
0040	3006	3444	1701	0576	7700	0040	0100	0010	P00	0050	1464	5523	3552	2754	----	----	----	2631	P00
0060	----	0010	0030	0001	0003	0001	0001	0001	P00	0070	0004	----	----	----	----	----	----	----	P00
0100	----	----	----	----	3056	6037	3037	0403	P00	0110	0100	1000	1444	6010	3013	1066	0416	3014	P00
0120	1070	3410	5010	6777	1006	0407	1601	6015	P00	0130	3015	0403	0200	5146	1400	6010	3010	3111	P00
0140	3112	3113	3114	0570	1430	6010	3014	0413	P00	0150	1450	6277	3014	1601	3452	6037	3253	3454	P00
0160	0200	1331	0322	3663	5063	0170	3401	0101	P00	0170	----	0545	1063	1150	1135	0545	0747	1150	P00
0200	1177	1265	1440	6222	7014	2300	6453	1065	P00	0210	0452	2000	1720	5500	0206	1404	3525	3026	P00
0220	1217	0560	1444	6010	3026	3212	0705	2177	P00	0230	3777	0621	0304	2100	4000	0615	3055	6010	P00
0240	3010	0507	3005	3414	1410	3410	3055	6210	P00	0250	0200	5146	3026	1073	1203	3401	5001	0263	P00
0260	3401	0101	----	0360	0267	0341	0267	2000	P00	0270	0100	2100	0011	6010	3013	3314	0427	3012	P00
0300	1204	0524	3014	3253	3414	5014	7020	6416	P00	0310	1665	6010	3402	2000	1400	3514	1063	0404	P00
0320	3613	1063	3512	3002	6210	5700	0272	0705	P00	0330	1717	0506	1413	0302	1433	5400	0272	0100	P00
0340	0202	2000	2623	6010	3023	1006	3514	1063	P00	0350	0404	3513	1063	3512	2000	2523	6210	0357	P00
0360	1411	5500	0206	3026	0402	0371	3625	1063	P00	0370	3524	3045	0312	3402	4002	0403	4702	0303	P00
0400	5402	0001	5002	0002	0566	1430	6010	2000	P00	0410	0100	3514	1071	1745	0503	0100	0456	1430	P00
0420	6210	1422	6010	3614	1604	1277	0510	1404	P00	0430	3514	1071	1774	0503	3414	3613	1422	6210	P00
0440	0100	0202	6210	3044	0473	2000	3407	5400	P00	0450	7720	2000	1500	5400	7721	0200	5456	5000	P00
0460	0442	5400	0437	0354	0100	0417	2000	3357	P00	0470	3414	3613	1277	1741	0567	2000	5733	3413	P00
0500	3612	1277	1745	0560	1466	3512	1071	1741	P00	0510	0553	2000	3333	3412	2000	0100	3511	1071	P00
0520	1137	0513	3010	1277	1135	0505	2000	0303	P00	0530	5400	0437	0100	0464	3011	1071	1745	0572	P00
0540	2000	3357	3411	3610	0365	3761	0504	3050	P00	0550	1701	3461	3406	1007	3407	1625	6010	3012	P00
0560	0503	0100	0104	0200	6111	3007	1620	6015	P00	0570	3015	1140	2200	3040	0525	3007	1640	6001	P00
0600	1625	6010	3003	1377	1006	3102	1014	1370	P00	0610	0411	3212	1014	3213	0605	1421	0200	5316	P00
0620	0340	1401	3403	3015	3404	1020	0721	1017	P00	0630	0622	3026	3216	0705	2177	3777	0705	0307	P00
0640	2100	4000	0604	1400	0200	5163	0351	3007	P00	0650	0200	5163	3056	6010	3010	0570	5051	6600	P00
0660	5161	6620	0563	3007	1667	6010	3011	3114	P00	0670	0555	3003	0513	3007	1620	6015	3015	1020	P00
0700	0604	1416	0200	5316	0341	3004	2200	3062	P00	0710	0573	3062	1703	0770	2012	3401	5400	7720	P00
0720	1063	1006	3161	5400	7721	1400	5400	7722	P00	0730	5400	7723	5400	7724	0200	6326	0200	5466	P00
0740	0343	4604	0200	5757	3045	0502	0371	4045	P00	0750	0575	3026	5245	0001	0771	3045	3404	5004	P00
0760	0002	3445	5004	0003	3406	0410	1007	1620	P00	0770	6010	3010	2200	1000	0544	0200	6043	0344	P00
1000	1071	0503	0100	1042	3044	0503	0100	0112	P00	1010	3040	1217	3406	3056	6134	7720	0200	6326	P00
1020	0200	5466	3056	6277	3062	1710	0705	5006	P00	1030	6600	1710	0720	1420	5400	5117	1401	0200	P00
1040	5103	0311	1401	3454	3056	3452	0200	1331	P00	1050	3037	0510	3656	2300	2636	0504	2000	2632	P00
1060	3456	0100	0112	1400	3406	3407	0200	6111	P00	1070	3060	0434	3055	6010	3010	1106	0435	2000	P00
1100	2624	6010	3011	3114	0527	3060	1701	0505	P00	1110	0200	4347	0713	0310	3032	3401	1461	6027	P00
1120	3001	0502	3432	1400	3460	3032	0504	0200	P00	1130	5406	0302	3732	0100	0104	3055	1701	3452	P00
1140	6037	3037	0405	1401	3454	0200	1331	0363	P00	1150	2000	6001	3454	3153	3452	6037	3037	0510	P00
1160	5454	7023	5054	7022	0565	1401	0306	0200	P00	1170	1331	5054	7022	0471	5400	1151	0350	2000	P00
1200	0004	3443	2140	3547	1001	6010	1701	6015	P00	1210	3014	0522	3441	3017	3312	0406	3051	3144	P00
1220	0403	0200	2620	5600	1200	1705	0704	1401	P00	1230	5400	1200	0343	3044	0421	3046	0454	2000	P00
1240	7620	3226	0703	2176	7777	1630	0654	4046	P00	1250	1102	0404	3064	1702	0746	3043	5400	4013	P00
1260	1426	6334	4012	0100	1223	1500	5300	2776	P00	1270	3413	1500	5300	3004	3414	1441	6210	1500	P00
1300	5400	2776	5400	3004	1400	3463	0100	0104	P00	1310	1400	3437	3052	6237	0305	3052	6277	1400	P00
1320	3437	1400	0334	1553	5000	1323	5454	7023	P00	1330	0100	0162	5054	7023	0404	3410	0110	----	P00
1340	3037	1750	0703	0100	6414	----	5037	1437	P00	1350	3401	0101	----	3052	2177	5075	0757	2000	P00
1360	----	0404	5354	7017	0561	1401	3401	5001	P00	1370	7020	0405	3354	0410	3354	0370	5454	7020	P00
1400	3054	5401	7020	1437	6010	3014	0406	1006	P00	1410	0625	1400	5400	1345	1401	3414	1437	6210	P00
1420	5000	7021	3454	5054	7020	5400	7021	3054	P00	1430	3153	3452	6037	0100	1346	0100	1321	1321	P00
1440	1507	1507	1507	1507	1507	1507	1507	1507	P00	1450	1507	1507	1753	6414	4017	3160	3323	1315	P00
1460	1536	1524	2444	2444	3761	3735	2577	6414	P00	1470	1613	2475	2475	1653	3677	1321	3111	6414	P00
1500	2711	1315	2745	1542	2740	1315	6414	3752	P00	1510	3253	0403	1447	6246	3652	6037	3037	0403	P00
1520	0200	5146	0100	1317	5054	7017	0410	3407	P00	1530	1403	0200	5316	0603	0100	1321	0200	5501	P00
1540	0100	1315	3042	1014	3143	6010	3014	5454	P00	1550	7021	0200	1323	3037	1144	0403	0100	1340	P00
1560	3042	1014	3143	6010	3014	5354	7021	0461	P00	1570	3014	5454	7021	3054	1074	2100	0153	6015	P00
1600	3017	0447	3407	1070	3406	1007	1601	0200	P00	1610	5163	0100	1551	3043	1217	3443	1007	5354	P00
1620	7017	0426	0200	5724	3153	6134	7720	5000	P00	1630	7721	1317	3143	5400	7721	2000	0314	5400	P00
1640	5653	0200	5635	2000	1604	5400	5653	0100	P00	1650	1315	0200	1323	5054	7017	3407	1624	6015	P00
										1670	[illegible]	1063	3440	1433	3410	2000	6656	3106	P00

1720	0100	1315	1432	3410	2000	1750	5400	0012	P00
1740	3404	5004	0003	3306	0504	0200	6243	0365	P00
1760	3040	1202	0412	5054	7017	1641	6010	3014	P00
2000	3540	3040	1203	1103	0405	5054	7017	1070	P00
2020	3601	1400	3443	2100	3234	3143	3143	5400	P00
2040	3014	1201	0503	0100	1312	3021	1101	0444	P00
2060	7720	3021	0520	3040	1201	0515	5054	7017	P00
2100	0100	2307	3042	1706	0710	5000	7755	0405	P00
2120	0657	3021	0436	5054	7017	1625	6010	3013	P00
2140	3412	3312	3310	1006	3411	1063	2100	5500	P00
2160	3040	1244	1144	0511	2000	5555	3403	3404	P00
2200	3117	3115	6301	0003	6342	7720	3001	3142	P00
2220	0413	1402	3540	3015	1604	3216	0603	0100	P00
2240	1400	3437	3015	1605	3216	0663	3002	6010	P00
2260	7720	1405	1006	5400	7721	1400	5400	7722	P00
2300	7724	0200	5466	3013	3420	0100	2413	3021	P00
2320	2426	3615	3216	0404	3015	1277	0564	2001	P00
2340	0502	3015	3117	2101	0101	3407	1063	2100	P00
2360	0100	1312	3403	3055	1601	6334	2432	6203	P00
2400	6010	1412	3414	3002	6210	2000	2437	0200	P00
2420	1072	0403	0100	1312	0100	1315	4555	----	P00
2440	----	----	----	0003	3044	3146	0431	3042	P00
2460	6037	1601	6134	7720	1701	6335	7744	1703	P00
2500	1321	3052	1601	6134	7720	1602	6135	7725	P00
2520	3052	3253	1712	0603	0200	6326	3037	1133	P00
2540	3041	5404	0001	3043	5404	0003	5000	7721	P00
2560	6656	3106	3405	5005	0002	0574	5404	0002	P00
2600	3547	3143	1001	6010	3014	0404	3040	0502	P00
2620	2616	3014	0507	3714	2040	3547	3143	1001	P00
2640	1071	1377	5400	7721	3041	5400	7722	1400	P00
2660	5635	1402	5405	7025	0100	2617	0200	6311	P00
2700	5404	0002	0503	3004	3447	3004	3446	3622	P00
2720	3406	6010	3011	2200	0777	3411	3041	2200	P00
2740	3041	4440	3043	4442	0371	1500	5400	3000	P00
2760	0415	0200	3023	3041	1277	0410	0200	3023	P00
3000	7777	5400	2776	2000	7777	2200	7777	5400	P00
3020	0100	2745	0100	2756	2100	0100	6010	2177	P00
3040	3011	1714	0714	1704	0755	1713	0653	5000	P00
3060	5311	3073	5400	3000	0370	1412	3437	3052	P00
3100	0100	0040	0020	0010	0004	0002	0001	0200	P00
3120	1624	6015	3016	0403	1400	0306	3041	1064	P00
3140	1667	6010	3011	3114	5140	6600	3441	3007	P00
3160	3060	5100	3325	0572	1404	3442	5400	3325	P00
3200	6737	3040	5400	3171	0100	3571	5450	6737	P00
3220	1401	5400	3575	0360	3401	3233	0402	0661	P00
3240	5050	6677	3101	3440	1400	3443	3050	1701	P00
3260	3040	3141	0505	0200	5466	0100	1315	2000	P00
3300	1063	3140	4404	0200	5757	5000	7721	1217	P00
3320	0344	0200	1323	3060	2100	----	0572	3642	P00
3340	3043	0403	1420	3506	5066	6700	5243	0040	P00
3360	1400	3432	0200	4035	0100	3552	3404	2377	P00
3400	0332	3007	0506	1501	3411	1405	3442	0311	P00
3420	0100	3525	3033	3201	0703	0100	3534	2100	P00
3440	3201	0403	0200	6413	3031	3201	0604	3133	P00
3460	3255	0422	1444	5400	5117	1412	0200	5103	P00
3500	0471	0100	3333	3007	0410	1642	6010	1400	P00
3520	3202	3533	3002	3431	0304	3011	3230	0712	P00
3540	5032	1401	5400	3575	5006	6700	5443	0040	P00
3560	5054	7017	3407	1070	3406	1400	0100	3332	P00
3600	3401	1400	5400	3575	3433	5400	5025	5001	P00

1730	1063	5400	0011	1443	3402	5002	0002	0400	P00
1750	3004	3402	0362	1401	3401	3040	1220	0422	P00
1770	1240	0506	1522	0305	3601	3050	0324	1520	P00
2010	0512	3040	1017	0603	0100	1315	1017	0702	P00
2030	2433	3402	1601	6010	2001	0100	3143	6015	P00
2050	3041	1701	3252	3442	0724	3052	1601	6142	P00
2070	1630	6342	7720	3640	1020	3605	0100	1753	P00
2110	3642	1400	6134	7756	3015	3101	3142	3216	P00
2130	1377	1006	3312	1006	3413	3313	3311	1006	P00
2150	3410	3040	1210	0402	1502	2100	5755	3414	P00
2170	3405	3406	3407	0303	1430	6003	2001	0100	P00
2210	3515	2001	0100	3143	6215	3043	0423	3250	P00
2230	1753	0100	2307	1404	6010	3614	1404	6210	P00
2250	3013	3220	0433	3044	0431	2000	2006	5400	P00
2270	5400	7723	3043	0402	1402	3155	1603	5403	P00
2310	0417	3015	0310	3015	3117	2101	0100	6334	P00
2330	0100	3117	3405	1063	3404	3021	1201	1006	P00
2350	0400	3406	3055	6134	7720	5000	7720	0403	P00
2370	3021	0406	3002	6003	3707	3002	6203	3602	P00
2410	5127	1400	3415	2001	0100	3143	6215	3041	P00
2430	----	----	----	3234	----	0005	----	0006	P00
2450	3440	3052	1604	6135	7744	0200	5501	3052	P00
2470	6135	7725	1407	3537	0314	3044	0503	0100	P00
2510	5000	7721	0404	1217	3250	0703	0200	6413	P00
2530	0403	0100	3260	0200	6311	3040	1277	4404	P00
2550	1217	3406	0405	5606	6600	5606	6640	2003	P00
2570	3004	5405	0002	0100	1315	0100	1312	2040	P00
2610	0362	3051	3144	0461	0200	2620	0371	0100	P00
2630	6210	3043	5400	7724	2040	3423	5400	7720	P00
2650	5400	7723	0200	6326	3664	3051	0410	0200	P00
2670	0200	2674	0371	0100	2672	1402	4404	3046	P00
2710	0362	5054	7017	0504	3043	1217	1007	1640	P00
2730	7000	3511	3040	3410	3006	6210	0100	1315	P00
2750	5400	3006	3040	1277	0200	3023	3040	1071	P00
2770	3041	1071	0403	0200	3023	2000	7777	2200	P00
3010	3004	3043	0504	3437	0100	1312	0200	1323	P00
3030	7627	0703	0200	6413	3013	0474	3314	0426	P00
3050	3006	5311	3053	5400	3006	0344	5000	3000	P00
3070	6237	0100	1507	4000	2000	1000	0400	0203	P00
3110	1323	3056	6010	3010	0572	3040	1007	3407	P00
3130	3141	5540	6620	3443	5040	6640	3442	3007	P00
3150	1620	6015	3015	3440	0100	1310	0200	1323	P00
3170	2000	1771	3240	0631	2377	7777	3401	5550	P00
3210	0370	5000	3171	3440	1500	3411	0200	5032	P00
3230	5050	6737	3201	0652	3404	3040	5400	3254	P00
3250	3406	0200	4125	2000	----	3440	0100	3164	P00
3270	7720	3406	0200	6311	3041	3126	5404	0001	P00
3310	5404	0003	3406	0405	5606	6600	5606	6640	P00
3330	1076	1201	3443	5054	7017	3407	1070	3406	P00
3350	0414	5400	3325	0713	3401	3042	1204	0403	P00
3370	7777	3401	3043	0406	5000	5025	3201	0626	P00
3410	1642	6010	3042	1217	1104	0422	1114	0403	P00
3430	0005	0603	0100	3541	5400	3430	0366	3012	P00
3450	0761	1400	3402	2000	0144	6015	3021	1601	P00
3470	3052	6237	0200	1323	3055	6015	3015	1112	P00
3510	3412	3007	1642	6210	3020	3421	6215	3031	P00
3530	3033	3201	0705	3433	0200	4125	0314	0200	P00
3550	3052	6237	3043	0415	3042	1203	1703	0511	P00
3570	3742	1400	5400	3325	2000	----	3443	3050	P00
3610	6737	3533	2400	5001	6757	5500	5025	3701	P00
3630	5500	3430	0604	1400	5400	3430	1400	3433	P00

3640	5400	5024	3227	0705	3027	0403	1400	3432	P00
3660	5020	3352	0511	1436	3437	3052	6237	0200	P00
3700	1102	0521	3057	6010	3010	0507	3057	6237	P00
3720	0100	1321	0350	0100	3712	3657	2300	2632	P00
3740	3407	3041	1377	0406	2300	7700	0403	0200	P00
3760	1321	5000	4012	3440	5600	4014	5600	4012	P00
4000	0705	2000	0101	5400	4012	1426	6334	4012	P00
4020	0306	5400	1345	3043	1217	1007	5400	1360	P00
4040	0200	4623	3052	6237	0200	4646	0407	0200	P00
4060	0200	4735	3021	0435	1406	3437	5054	7017	P00
4100	0200	1323	0361	0200	5006	0504	0200	1323	P00
4120	0200	4635	0100	4034	0100	3536	3006	3415	P00
4140	4351	6237	3043	0403	2000	1017	5400	4535	P00
4160	1217	1601	3250	0405	5017	6700	3521	0360	P00
4200	3521	3715	2077	----	5315	6740	3504	0761	P00
4220	3470	3021	3471	3017	3366	0421	3717	3021	P00
4240	0100	4171	3071	3221	0646	0355	3067	3366	P00
4260	1400	3470	0302	1505	5167	6740	3471	3067	P00
4300	6740	0350	1400	3471	3065	3366	0505	3066	P00
4320	3570	0704	1505	3571	0303	1400	3470	3665	P00
4340	0552	1400	5400	4351	0100	4124	0100	1112	P00
4360	3013	0424	3443	5066	6700	3441	3001	6237	P00
4400	5316	0744	3072	3366	0422	3072	1217	1007	P00
4420	5316	0711	0304	3007	1624	6015	0200	4635	P00
4440	3472	1217	1007	3407	0407	1624	6015	5072	P00
4460	1323	3072	1217	1007	3407	0366	3007	1624	P00
4500	0320	0200	4666	3066	3372	0403	0100	4436	P00
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3060	0100	3144	0100	2507	0100	2740	5072	7160	P07	3070	1014	0705	3007	1070	1203	0466	3032	1014	P07
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3120	5315	1460	3532	3035	1014	3136	1605	6002	P07	3130	1400	3401	5073	7322	2177	4000	3205	0676	P07
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3160	5472	7260	0200	5315	2000	0101	5572	7150	P07	3170	1207	1704	0630	1604	3447	0200	4310	0736	P07
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3260	0200	4310	6203	0351	3045	1204	0566	0345	P07.	3270	3032	1015	0742	5072	7160	1014	0711	3035	P07
3300	1014	3136	6010	3014	1070	1203	0560	3043	P07	3310	1217	1703	0707	1401	0200	5607	0445	1403	P07
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3400	2000	7320	3173	5400	3412	3035	1014	3136	P07	3410	1612	6170	----	3042	1217	1703	0611	1400	P07
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3440	3002	1013	0604	2000	4000	3534	3033	1071	P07	3450	1123	0554	5072	7160	1320	5472	7150	1210	P07
3460	3401	3033	1277	1702	0505	3001	0507	0100	P07	3470	3551	1736	0503	3001	0511	3001	0405	2000	P07
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3520	1410	3514	3032	1204	0402	1404	3514	1214	P07	3530	0403	1402	3514	3047	0200	4310	6210	3033	P07
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3600	2000	0555	1201	0416	5772	7120	0513	5072	P07	3610	7220	2300	1032	0402	1503	2100	0472	0200	P07
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										3650	3034	1217	0400	1702	0453	0733	3030	3131	P07
3640	1307	5173	7321	1720	0030	3436	1063	3435	P07	3670	0233	3431	1063	3430	3035	1014	3136	0230	P07
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3740	3403	1063	3402	5066	7733	3430	3445	3410	P07	3770	0510	0200	5470	0403	0100	3630	0100	3700	P07
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4000	3002	1014	3103	6210	1601	6243	0200	5305	P07	4030	1014	3131	6032	3036	1220	0565	3030	1014	P07
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4100	4000	3505	3006	1014	3107	1611	6201	3010	P07	4130	1101	0505	2000	0342	0200	5436	0100	3630	P07
4120	6030	3631	5473	7321	3030	5473	7320	3131	P07	4150	0703	1706	0767	1425	0200	4736	0551	2005	P07
4140	0200	2412	0100	2652	0200	2412	3066	1706	P07	4170	1014	3131	0423	5466	7720	6030	3656	0313	P07
4160	2712	6030	3066	1706	0614	3030	5466	7734	P07	4210	1063	3430	2005	2712	6230	3200	5305	0100	P07
4200	3766	5066	7734	1014	5166	7720	6230	3431	P07	4230	5072	7160	1065	1201	2100	4241	3530	4030	P07
4220	4140	1014	0100	2153	1006	0773	1072	3430	P07	4250	4320	4260	4260	4026	4026	3000	3030	4242	P07
4240	0361	4301	4301	4301	4301	4040	4320	4040	P07	4270	2302	0704	1021	0606	1001	1001	0670	0100	P07
4260	4302	4040	4320	4233	4076	4100	4320	0100	P07	4310	3177	3456	0470	1001	3556	3035	1014	3136	P07
4300	2467	0100	3622	3035	1014	3136	1604	0100	P07	4330	1577	3156	0354	0100	1360	2000	7323	3173	P07
4320	1610	6040	3042	1006	0704	1006	3143	0502	P07	4350	0523	3401	5673	7321	1063	5173	7320	1237	P07
4340	5400	4366	3415	5073	7320	1071	3401	1105	P07	4370	0427	1702	0423	0624	5073	7320	1014	5173	P07
4360	5473	7320	1014	5173	7321	6170	7363	1217	P07	4410	0400	1601	5473	7321	0350	0100	4457	2000	P07
4400	7321	1720	6040	3040	5473	7320	1014	3141	P07	4430	0377	3416	3017	1067	0426	1101	0516	3016	P07
4420	0100	5573	7320	3001	3515	4015	3417	2200	P07	4450	0200	4223	0100	4333	1116	0412	1117	2140	P07
4440	2300	7400	4415	2077	7677	5573	7320	1411	P07	4470	4060	3516	0357	3016	2200	0177	3415	5016	P07
4460	----	0370	5072	7160	2200	2000	0505	2000	P07	4510	2000	7323	3173	5400	4527	3032	5473	7320	P07
4500	0140	3416	0347	0100	1133	0200	4310	6030	P07	4530	0352	3035	1014	3136	1620	3433	1053	0356	P07
4520	1237	1014	3133	0406	5473	7321	6170	7363	P07	4550	5017	0040	0326	1500	0325	1071	2200	0377	P07
4540	3016	2200	0177	3417	1740	0706	1071	0504	P07	4570	1703	0461	5072	7160	2200	2000	0541	3016	P07
4560	3416	1016	3316	3417	1020	3317	1203	0463	P07	4610	0100	3600	1021	0772	0100	3622	0100	3566	P07
4600	3417	0100	1575	0607	1021	0711	1021	0745	P07	4630	5030	3401	5072	7160	1240	0431	3034	1071	P07
4620	3033	1071	0100	3112	3033	1071	0473	0200	P07	4650	1013	0646	3032	2200	7617	3432	3034	1071	P07
4640	3301	1217	0556	5072	7160	1207	0404	3032	P07	4670	0645	3033	1071	1130	0441	3601	0371	3035	P07
4660	3301	1220	0466	1500	0100	4622	3034	1016	P07	4710	1237	1014	5173	7321	1701	1317	6010	3436	P07
4700	1014	3136	0400	1611	0100	2163	5073	7320	P07	4730	1014	3113	3436	0346	1400	0100	5504	0410	P07
4720	1063	3435	3014	1217	1701	0451	3012	3435	P07	4750	3415	3047	0200	4310	1701	0307	1401	3415	P07
4740	3414	0715	1405	3415	2005	2665	0315	1401	P07	4770	2725	6212	3715	0740	1701	0474	2105	2725	P07
4760	3035	1014	3136	3114	3413	1063	3412	2005	P07	5010	5305	0100	4735	0100	2257	0200	4705	1701	P07
5000	6020	3013	3321	0566	3012	3320	0563	0200	P07	5030	4631	5072	7160	1014	0707	3034	1217	1110	P07
5020	6010	3011	1071	3410	5010	0300	0364	0100	P07	5050	3136	1610	6040	3041	0306	0200	4310	6040	P07
5040	0422	1401	0320	1006	1207	0510	3035	1014	P07	5070	2000	0220	5310	0300	0100	5027	0100	2452	P07
5060	3044	1071	1217	3410	3034	2200	4000	0403	P07	5110	1003	3471	0363	0100	2437	6507	5120	7507	P07
5100	3472	3457	1003	3473	5067	7770	5167	7754	P07	5130	5067	7772	7607	5067	7760	5400	5143	7407	P07
5120	5067	7766	7607	7407	7007	1261	3402	7507	P07	5150	7770	5467	7764	5067	7774	7607	5067	7762	P07
5140	5067	7754	7307	7060	6607	5144	7507	5067	P07	5170	3002	0425	5600	2523	5067	7752	6030	3002	P07
5160	5400	5166	7407	5067	7754	7107	7020	7507	P07	5210	1015	0602	3630	5067	7752	6230	0100	5113	P07
5200	1014	6602	3632	3002	1021	6602	3631	3002	P07	5230	3017	4415	2000	0100	5573	7320	0100	1002	P07
5220	0100	5343	3035	1014	3136	1611	6230	0370	P07	5250	3173	2100	7323	3415	1705	5400	5275	3001	P07
5240	5072	7160	1016	0772	5073	7320	1071	3401	P07	5270	1237	1014	5173	7321	6370	7356	5473	7321	P07
5260	1105	0546	5073	7321	1217	0450	5073	7320	P07	5310	3413	2005	2725	6212	0367	3164	5000	5315	P07
5300	1063	5473	7320	0342	0100	5551	1400	3412	P07	5330	2000	0370	5472	7260	5000	5321	2177	5107	P07
5320	0316	3110	5473	7322	3034	1377	3101	3434	P07	5350	1300	5400	5354	3032	1302	3147	3432	0200	P07
5340	3430	0200	5221	0100	2465	0100	3575	2100	P07	5370	2040	----	0200	4736	0565	3035	1014	3136	P07
5360	5221	0363	0100	----	2300	7777	5400	5403	P07	5410	1001	3413	3035	1014	3136	6210	0200	5305	P07
5400	6010	3014	2200	----	3147	3414	3055	0403	P07	5430	3136	1601	5473	7321	0365	0100	1030	3410	P07
5420	1400	0340	0100	1500	3035	5473	7320	1014	P07	5450	3402	5072	7160	1310	3102	3472	7150	5000	P07
5440	1601	5472	7260	4010	5472	7220	0366	3110	P07	5470	1475	3447	5072	7160	1207	3455	0507	2040	P07
5460	5447	5400	5321	1410	3401	0100	5324	0100	P07	5510	3147	6010	3045	1071	1105	0506	3646	1063	P07
5500	0004	3147	0200	4736	0562	3055	0200	4310	P07	5530	3045	3410	3046	3411	3045	3412	3045	3413	P07
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2200	0737	3113	0505	P07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0100	1153	5672	7260	P07

556[redacted]	17[redacted]	340[redacted]	4000	5472	7220	6300	0100	----	P07	5570	5072	7220	3410	3710	4010	[illegible]	[illegible]	[illegible]	[illegible]
5600	100[redacted]	0771	1014	[redacted]72	[redacted]0	[redacted]	0[redacted]	27[redacted]	P[redacted]	[redacted]	3[redacted]	02[redacted]	47[redacted]	1704	[redacted]040	[redacted]010	5022	7460	P07
5620	1207	0406	0200	4310	6010	1701	6040	3001	P07	5[illegible]	0507	5073	7321	3413	5073	[redacted]20	[redacted]12	30[redacted]	P[redacted]
5640	3313	0506	3040	3312	2200	0737	0414	3013	P07	5650	1217	0512	3012	1237	1014	3113	1720	6012	P07
5660	3613	0355	0333	3012	1071	1105	0506	3613	P07	5670	1063	3512	1237	0342	2000	7323	3173	5400	P07
5700	5714	3012	2277	3777	5473	7320	1237	1014	P07	5710	3113	5473	7321	6170	7363	0100	5606	0100	P07
5720	1440	5073	7320	3445	1237	1014	5173	7321	P07	5730	3446	1701	1317	6033	3402	1063	3401	3037	P07
5740	1217	1101	0554	3046	1217	0100	0627	2000	P07	5750	0221	6507	5751	7107	0100	0100	2425	7775	P07
5760	5115	5117	5122	5123	5124	5127	5132	5137	P07	5770	5142	5144	5146	5155	5162	5165	5157	5751	P07
6000	5753	----	----	----	----	----	----	----	P07	6010	----	----	----	----	----	----	----	----	P07
6020	----	----	----	----	----	----	----	----		6030	----	----	----	----	----	----	----	----	P07
*																			
7020	1000	2000	1000	2400	2000	----	----	----	P07	7030	----	----	----	----	----	----	----	----	P07
7040	----	----	----	----	----	----	----	----	P07	7050	----	----	----	----	----	----	----	----	P07
7060	----	4026	----	4026	----	----	----	----	P07	7070	----	----	----	----	----	----	----	----	P07
7100	----	----	----	----	----	----	----	----	P07	7110	----	----	----	----	----	----	----	----	P07
7120	0747	0802	0751	0013	0760	----	----	----	P07	7130	----	----	----	----	----	----	----	----	P07
7140	----	----	----	----	----	----	----	----	P07	7150	----	----	----	----	----	----	----	----	P07
7160	4000	4100	4300	4300	4100	----	----	----	P07	7170	----	----	----	----	----	----	----	----	P07
7200	----	----	----	----	----	----	----	----	P07	7210	----	----	----	----	----	----	----	----	P07
7220	1032	2300	1032	2300	1032	----	----	----	P07	7230	----	----	----	----	----	----	----	----	P07
7240	----	----	----	----	----	----	----	----	P07	7250	----	----	----	----	----	----	----	----	P07
7260	0451	0374	0451	0374	0451	----	----	----	P07	7270	----	----	----	----	----	----	----	----	P07
7300	----	----	----	----	----	----	----	----	P07	7310	----	----	----	----	----	----	----	----	P07
7320	0005	3761	4000	0316	0040	2045	1403	2062	P07	7330	0005	3541	4000	0316	0040	2045	1403	2062	P07
7340	0005	3621	4000	0316	0040	2045	1403	2062	P07	7350	0005	3701	4000	0316	0040	2045	1403	2062	P07
7360	0005	4041	4000	0331	0256	0256	2053	0304	P07	7370	----	----	----	----	----	----	----	----	P07
7400	----	----	----	----	----	----	----	----	P07	7410	----	----	----	----	----	----	----	----	P07
*																			
7460	----	----	----	----	----	----	----	----	P07	7470	----	----	----	----	----	----	----	3010	P07
7500	5400	7536	3011	5400	7537	3012	5400	7540	P07	7510	2000	7536	3410	0200	7551	3613	3075	1602	P07
7520	6213	3017	1066	0503	0100	0105	1400	6010	P07	7530	1477	3410	3074	1601	6210	0300	0013	0037	P07
7540	0037	0011	----	----	2762	0100	1400	7777	P07	7550	0100	7515	5010	0007	5400	7626	3075	5410	P07
7560	0006	0200	7645	3075	1602	6013	3013	1703	P07	7570	0432	0656	1602	0767	0566	2000	7640	3406	P07
7600	4006	3407	4007	1277	5400	7615	3606	4006	P07	7610	0410	3407	4007	1377	2100	----	4407	0365	P07
7620	3613	0312	3017	6500	7623	7100	6002	3017	P07	7630	5500	7626	3713	3075	1602	6213	0100	7563	P07
7640	0016	7623	7625	----	0100	7563	3010	5400	P07	7650	7663	3076	1001	5410	0004	1402	3410	1400	P07
7660	6011	3075	6310	7536	6211	1403	3414	1406	P07	7670	0200	0220	0351	----	5534	3757	3333	0005	P07
7700	0001	0001	----	0541	4730	0005	2665	0023	P07	7710	0002	----	0403	0002	3657	4040	5733	4057	P07
7720	3400	3420	3440	3460	3500	3520	3560	3640	P07	7730	3720	4000	4100	4120	0005	0005	0005	0005	P07
7740	0005	0005	0005	0005	0005	0005	0005	0005	P07	7750	0200	----	4732	----	0005	----	0001	----	P07
7760	7060	----	7020	----	----	----	0002	----	P07	7770	----	----	0001	----	0003	----	0007	0023	P07

EXAMS

PROBLEM 1

Write a PP program named MYN which will:

1. Write in the job's dayfile the following message:

   PP PROGRAM CODED BY ______________________________.

   Fill in the blank with your name.

   Note: Write a calling CP program to check it out.

PROBLEM 2

Write a PP program named MYN to:

1. Find the name of the job which caused it to be executed.

2. Find the control point number of the calling job.

3. Print the Job Name and control point number in the job's dayfile.

Note: Write a calling CP program to check it out.

PROBLEM 3 {OPTIONAL}

Write a PP program named MYN which will:

1. Get to numbers from a central memory buffer. BUF
2. Sum these two numbers.
3. Place the sum of the numbers in a central memory location. ANS

Problem Data:

```
BUF          DATA          123, 456
ANS          BSSZ          1
```

Note: Use proper communication to retrieve the data and terminate the calling CP program when the sum is placed in ANS.

Write a calling CP program to check out program.

PROBLEM 4 {OPTIONAL}

Add a new control card to the system called CTO {Comment to Operator}. Modify 1AJ to process the new control card.

PROBLEM 5 {OPTIONAL}

Write two PP programs to communicate with each other. Have the second of the programs write a message in the dayfile telling what PP {No.} called it.

SOLUTION PROBLEM 1

```
         IDENT              MYN, C.PPFWA
         LIST               M, G
         PERIPH
         SST
         ORG                C.PPFWA
         PPENTRY            D.IRB, D.TO
         LDC                MES1
         RJM                R.DFM
         LDN                M.DPP
         RJM                R.MTR
         LJM                R.IDLE
MES1     DIS                ,*PP PROGRAM CODED BY ____________*
         END
```

SOLUTION, PROBLEM 2

```
IDENT     MYN, C.PPFWA
LIST      M, G
PERIPH
SST
ORG       C.PPFWA,D.TO

LDN       1
STD       D.T1                Set CM Word Count
LDD       D.CPAD              Get Cont. Pt. addr.
ADN       W.CPJNAM            Add ordinal of Job Name
CRM       MSG, D.T1           Read Job Name into message
LDM       MSG+4               Clear
SCN       77B                    8th
STM       MSG+4                    character
LDD       D.CPAD              Get. Cont. Point addr.
SHN       -7                  Convert to Control Pt. No.
RAM       CPNO                Add to Control Pt. in Msg.

LDC       MSG                 Get Msg. Addr
RJM       R.DFM               Print MSG
LDN       M.DPP               Load Drop PP Code
RJM       R.MTR               Ask MTR to do it
LJM       R.IDLE              Go to Idle

MSG       BSS                 5   Space for Job Name
          DIS                 ,* WAS EXECUTED AT CONTROL
                                 POINT 00*
CPNO      EQU                 *-2
          END
```

ALS COURSE 52

FINAL EXAM

PP COMPASS

1. PP COMPASS generates;

{a} BCD Code
{b} Binary object code
{c} Relocatable code
{d} Compiler code
{e} None of the above

2. PP COMPASS is a __________________ language.

{a} Machine
{b} Compiler
{c} High Level
{d} Assembler

3. PP programs are entered into the SCOPE system by;

{a} LRM
{b} UPDATE
{c} COMPASS
{d} EDITLIB

4. A PP must do all Input/Output operations for SCOPE.

{a} true
{b} false

5. A data channel is;

{a} a device to transmit data to I/O equipment
{b} a device to transmit data from one PP to another PP
{c} a required device for any I/O to a peripheral
{d} a 12-bit bi-directional data path.
{e} all of the above

6. Given the octal data;

PP location	contents
100	1111

What is the result of the following PP code sequence?

```
LDM     100B
ADD     100B
```

{a} A= 002222 Octal
{b} A= 111111 Octal
{c} A= 000000 Octal
{d} A= 771111 Octal
{e} None of the above

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7. The RJM instruction is used to

{a} begin execution of a PP program
{b} return to the SCOPE System
{c} interrupt a PP program
{d} provide linkage to a subroutine

8. The system symbol D.RA refers to

{a} a CMR location
{b} a direct cell in the PP resident
{c} a distant reference address
{d} a dummy location in the PP

9. A PP program name is ______________ characters in length.

{a} 10
{b} 1
{c} 4
{d} 2
{e} none of the above

10. A MACRO is

{a} a closed subroutine
{b} a system entry point
{c} an open subroutine
{d} a pre-defined sequence of code

11. SCOPE uses CMR for;

{a} Pointers
{b} Tables
{c} Libraries
{d} all of the above
{e} none of the above

12. The SCOPE system PP routines are pointed to by;

{a} P.PJT
{b} T.PPIP
{c} T.PPID
{d} P.LIB

13. PPRES is code which

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14. What is the name of the PP resident routine to issue a dayfile message?______________________________

15. SCOPE is controlled by a monitor which

{a} resides on disk
{b} resides in PP1
{c} resides in ECS
{d} resides in PP0

16. The SCOPE Operating System may be halted temporairly with the ______________________ monitor function.

{a} M.STOP
{b} M.KILL
{c} M.PASS
{d} M.STEP

17. In a 10PP system, PP0 may communicate with

{a} 9 other PPs
{b} 1 other PP
{c} 4 other PPs
{d} 2 other PPs

18. All channels may be used for communication between PPs.

{a} true
}b} false

19. SCOPE is normally deadstarted initially

{a} from a card deck
{b} from a paper tape
{c} from a disk file
{d} from a magnetic tape

20. Relocatable Overlays in PP coding are

{a} relocatable binary code
{b} Absolute binary code
{c} Relocatable absolute binary
{d} BCD code

21. Most SCOPE system routines are:

{a} PP routines
{b} CP routines

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