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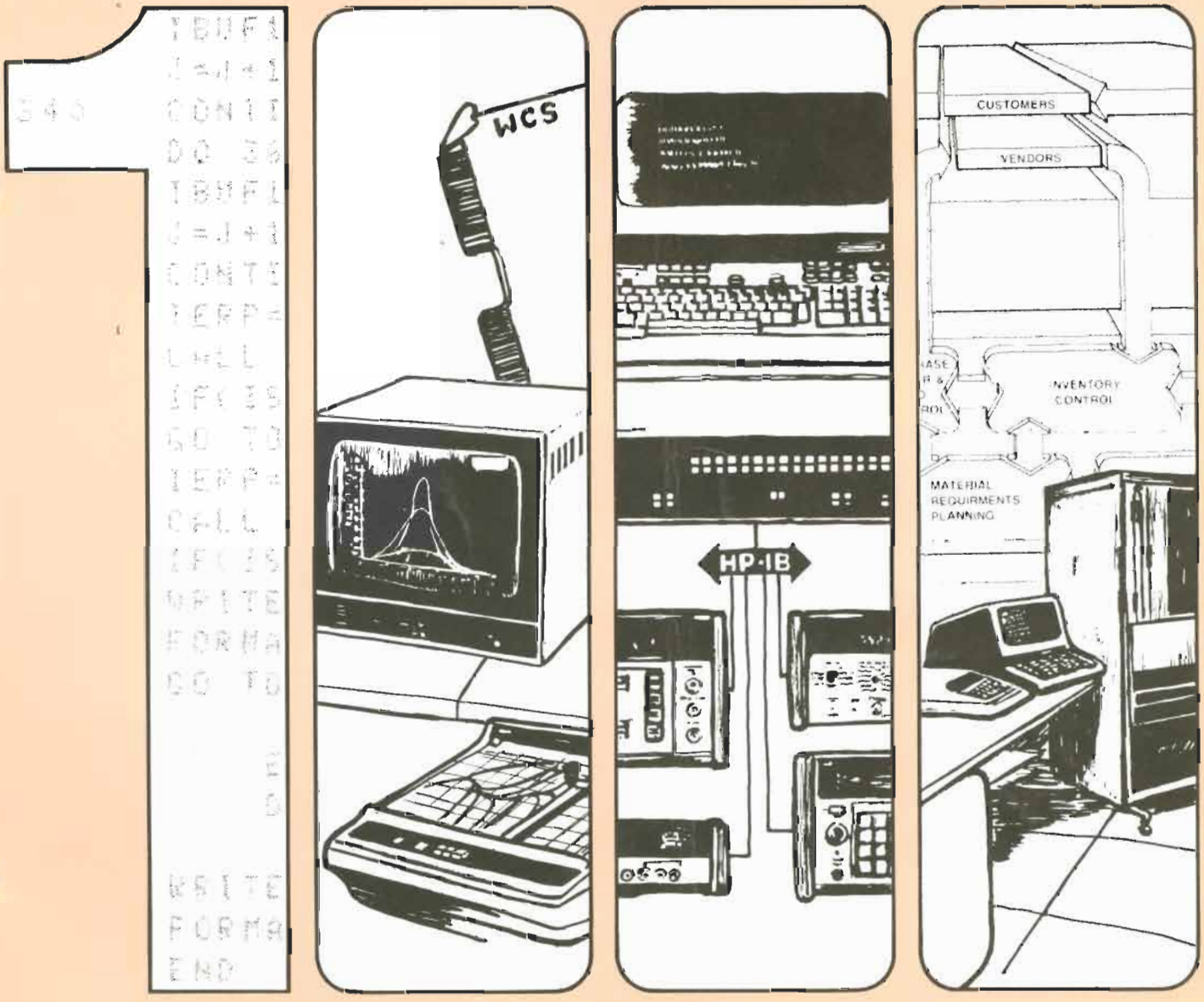

1978

Volume II Issue. 1

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EDITOR'S NOTE

A belated welcome to 1978 and to Issue 1 of Volume 2. That's right! This issue begins Volume 2 of the Communicator 1000. Volume 1 can be considered as all previous issues up to and including Issue 17. Each volume of the Communicator 1000 will reflect one year of issues, 1 through 6. It is hoped that this change will simplify filing of the Communicator 1000 for you.

With this issue, we begin to fulfill our promise from the last issue. The first big article of this year is concerned with the generation of a RTE-M system including Distributed System nodes. This article contains informative data and procedural notes that can be utilized to your best advantage. We also welcome the return of Software Samantha with her vast knowledge of software.

Other features in this issue include: EXEC calls, software hints for your hardware, and more.

The Communicator 1000 staff is anxious to know how we are doing. Does the Communicator 1000 meet your needs? Are there other features you would like to see included? Any and all suggestions, criticisms, and otherwise are gladly received! Why do we need your feedback? We want to make the Communicator 1000 your magazine!! Drop us a line and let us know how you feel. Address all correspondence to:

EDITOR

COMPUTER SYSTEMS/COMMUNICATOR 1000
HP DATA SYSTEMS DIVISION
11000 WOLFE ROAD
CUPERTINO, CALIFORNIA, 95014

We at Hewlett-Packard are doing our best to keep you informed about the HP 1000.

CONTENTS

USER'S QUEUE

The Communicator 1000 received no material for this issue's USER'S QUEUE. Remember, it is your input that makes this section possible. If you have any tips, techniques, or application information that can be useful to our other readers, send it to:

USER'S QUEUE/COMMUNICATOR 1000
HP DATA SYSTEMS DIVISION
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GENERATING RTE-M III FOR DISTRIBUTED SYSTEMS LINKS

David Tribby/DSD

This article explains one method of using an RTE-III system to generate RTE-M III nodes in a DS/1000 network and describes the decisions made in generating an RTE-M III node that has links to both an HP 1000 and HP 3000.

Before reading this article, review the pertinent material in *DS/1000 Network Manager's Manual* (91740-90003), *RTE-M System Generation Manual* (92064-90003), and *RTE-M Programmer's Reference Manual* (92064-90002). You need to have a basic idea of how RTE-M systems are generated and what software is needed for DS/1000 before you can understand this article.

A diagram of our network is shown in figure A. We will establish node 2 as a disc-based system used to generate (using RTMLG) the systems used at the memory-based nodes 7 and 5. All program development will take place at node 2. Node 7 is the only node that can communicate with the HP 3000.

FILE NAMES AND CONVENTIONS

When we use RTMLG to generate (and prepare programs for) node 7 we will use the following file names:

#NODE7	— RTMLG answer file to generate node 7.
'NODE7	— map/echo file produced by RTMLG during generation of node 7.
SNAP7	— snapshot file produced by RTMLG for node 7.
P00007	— absolute file of node 7 system produced by RTMLG.
#ppppp	— RTMLG answer file to load program ppppp (eg: #REMAT for the program REMAT).
ppppp	— map/echo file produced by RTMLG during loading of program ppppp (eg: 'REMAT).
ppppp7	— absolute file of program ppppp ready for downloading into node 7 (eg: REMAT7).
*NODE7	— FMGR answer file to generate node 7 and prepare programs for downloading.

When we generate node 5, we will use the file names #NODE5, 'NODE5, SNAP5, etc.

At node 2 we use the following cartridges during generation:

2	(system disc) absolute files are stored here
32767	contains all Hewlett-Packard software
216	contains answer, map/echo, and snapshot files

THE SYSTEM AT NODE 7

Node 7 is a simple system. The only I/O devices connected are the DS/1000 and DS/3000 hardwire interface boards and the 2645 terminal. As for software, it does not need compilers or the generator because those functions are handled at node 2. Rather than including power fail recovery in the system, we will reboot if the power goes off. (Power fail may be necessary for some applications of Distributed Systems.) The CPU contains 64 pages of memory.

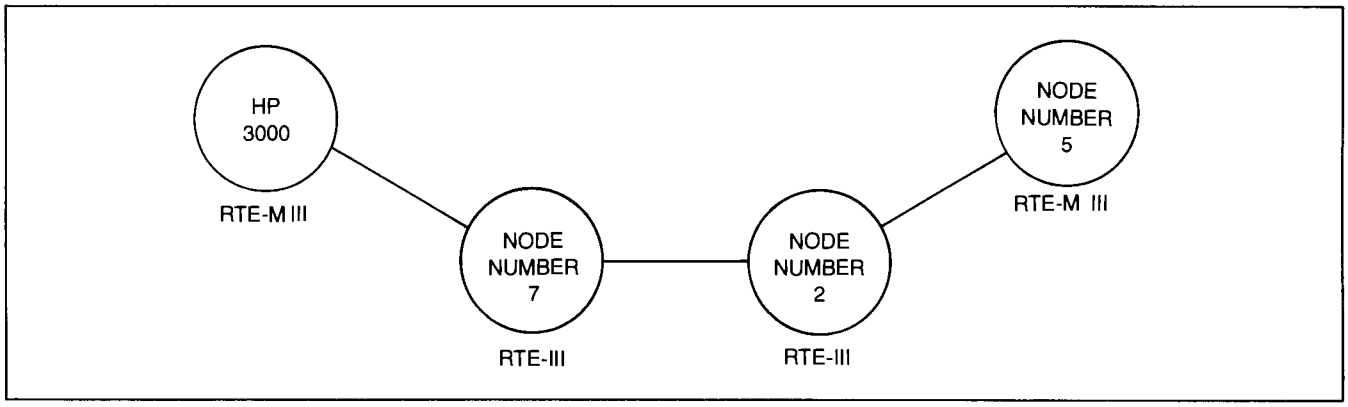


Figure A: Our Network

PLANNING THE I/O

Node 7 has no privileged card (if the DS/1000 link used a modem interface it would be privileged) so the first I/O slot (10) goes for the time base generator (TBG). Both DS links need fast response, so we will put them below the 2645 I/O card. Because the DS/1000 link is non-DMA, we will put it in slot 11. The last interrupt slot needed is 13, so the first word available for base page links is 14. To summarize, we will use the following I/O slots:

10 — TBG
11 — DS/1000 link
12 — DS/3000 link
13 — 2645 terminal

The logical unit numbers are assigned as follows:

1 — system console (2645 keyboard/screen)

2 — system disc (not present in system)

3 — auxiliary disc (not present in system)

4 — standard output device (2645 left CTU)

5 — standard input device (2645 right CTU)

6 — standard list device (2645 printer)

7 — no standard meaning; assign to DS/3000 link

8 — magnetic tape drive (not present in system)

9 — no standard meaning; assign to DS/1000 link

The Equipment Table (EQT) entries can be arbitrarily assigned:

1 — 2645 terminal
2 — DS/3000 link
3 — DS/1000 link

We now have enough information to complete the RTE-M I/O configuration worksheet as shown in figure B.

RELOCATING THE SYSTEM AREA

For node 7 we need to include the following modules in the system area:

%MSY3 — Main system module for RTE-M III
%MTI — Timer module
%MTS — Timer operator/program functions
%MOP — LU, EQ, PR operator requests
%MCL3 — Class I/O
%MRN — Resource Numbers
%4DV05 — 2645 Driver
%DVG67 — DS/3000 driver
%DVA65 — DS/1000 driver

RTE-M TABLES

The generator requests information used to build several tables. The information for I/O tables is in the worksheet (figure B). Here are other questions asked by RTMLG:

OF I/O CLASSES?
We need enough classes for all the monitors and all master and slave users. Thirty should be enough.

OF RESOURCE NUMBERS?
We need three for DS/1000 plus any that application programs might use. Ten should do the job.

BUFFER LIMITS?
We will use the suggested limits of 100,400. If we find that this ties up too much SAM, we can lower the limits on-line with the BL command.

MAX NUMBER OF PARTITIONS?
At this time we do not know for sure, but ten should be enough. After we calculate our exact need, we will change this number.

ID SEG?
We will get this value after we determine the number of programs we need in the system.

RESIDENT LIBRARY, SUBSYSTEM GLOBAL, AND COMMON

In our RTE-M system we want to make the most out of the memory available. One way to save space is to put re-entrant routines in the resident library rather than having them appended to individual programs. There are several re-entrant routines appended to more than one DS module:

Module Name	Located in Library
.ENTR	%RILB2
MALRN	%MSYLB
MRNRQ	%MSYLB
MPRTN	%MSYLB

RTE-M I/O CONFIGURATION WORKSHEET

I/O SLOT NO. (octal)	DEVICE NAME	DRIVER NAME	LU NO. (dec.)	EQT SUBCH. NO. (dec.)	INTERRUPT TABLE ENTRY	BUF. REQ. (B)	DMA (D)	TIME OUT (dec. no. of 10 ms)	EQT EXT. (dec. no. words)
10	TBG			,					
11	DS/1000 LINK	DVA 65	9	3 , 1	PRG , QUEUE			T=3	X=7
12	DS/3000 LINK	DVG 67	7	2 ,	EQT , 2		D		
13	2645 SCREEN	DVR 05	1	1 ,	EQT , 1				X=13
	2645 L. CTU		4	1 , 1	,				
	2645 R. CTU		5	1 , 2	,				
	2645 PRINTER		6	1 , 4	,				
				,	,				
				,	,				
				,	,				
				,	,				
				,	,				
				,	,				
				,	,				
				,	,				
				,	,				

Figure B

We need to include all the Subsystem Global Area (SSGA) modules for both the DS links. According to the Network Manager's Manual we need to relocate the following:

Module Name	Located in Library
RES	%DSLB1
#REQU	%DSLB1
DRTEQ	%DSLB1
PGMAD	%DSLB1
HSLC	%D3KLB
D$EQT	%D3KLB

No DS modules require common, but some application programs might. We will set aside fifty words. (If we find out we need a few more words in the memory resident area, we can reduce this number.)

"MEMORY RESIDENT" AREA

In RTE-III, programs loaded after the common area are said to be memory resident because they are never swapped out of memory. This differentiates them from the partition resident programs which may be swapped to and from the disc. In RTE-M, both reside in memory and cannot be swapped.

RTE-M programs cannot be generated into partitions; partition resident programs must be downloaded after the system has been booted up. So any programs that need to be present at bootup must be generated into the memory resident area.

We must decide which DS/1000 modules to include in our node and which of these must be generated into the system.

The Network Manager's Manual tells us the following programs are required for DS communications:

DS/1000	DS/3000	Either
QUEUE	QUEZ	LSTEN
GRPM	QUEX	UPLIN
RTRY	RPCNV	
QCLM	RQCNV	

To download programs with FLOAD or remote operator commands after the system has been initialized, we need APLDR and EXECW generated into the memory resident area. WHZAT should also be included so we can determine if something went wrong. We need the start-up program PASS to get things going. (Because it can only be run once, PASS should be relocated as the last program. Then it can be removed from the system and another program can be downloaded into its area.)

Because node 7 has no disc, there is no need for the RFAM, DLIST, and PROGL monitors. The EXECM, PTOPM, OPERM, and CNSLM monitors should be included, but they do not have to be in the memory-resident area. The RMOTE, REDIT, and REMAT programs can also be loaded into partitions after initialization.

If we total up the number of programs and add one for an application program, we find that 22 ID segments are needed.

Referring to the program sizes in the Network Manager's Manual, we see that the following partition sizes are needed:

for OPERM, 2 pages
for CNSLM, 2 pages
for REDIT, 3 pages
for REMAT, 6 pages
for RMOTE, 6 pages.

Any memory left after these can be put into a partition for the application program.

When programs are relocated, it is usually necessary to search several libraries. We can speed up our generation by searching the libraries in the correct order so we do not have to redo any search. Sometimes this is impossible, but the order that works best is:

%RMTIO	(if the FORTRAN formatter is used for remote I/O)
%FF4.N	(if the FORTRAN formatter is used for I/O)
%FMPC	(if the RTE-M uses a cartridge file system)
%FMPF	(if the RTE-M uses a flexible disc file system)
%DSML2	(if the RTE-M has no file system)
%D3KLB	(if the program accesses an HP 3000 node)
%DSLB2	(if the program accesses an HP 1000 node)
%DSLB1	(if the program does any DS communications)
%MSYLB	
%RLIB1	
%RLIB2	

(Note that you would use only one of %FMPF, %FMPC, and %DSML2.)

We want to run LSTEN from the start-up program so we use the library searches described in the Network Manager's Manual.

Check over the map/echo file after RTMLG has been run to determine if any of the searches produced no result. Removing unnecessary searches will speed up the generation. Another way to speed it up is to include the cartridge reference number in file *namr* so all the mounted cartridges will not have to be searched. (If you move your files to a different cartridge, it is easy to use the EDITR X command to modify #NODE7.)

THE START-UP PROGRAM

To make our network initialization automatic, we want to include the PASS start-up program described in the Network Manager's Manual. The flowchart in figure C shows what it does: schecule LSTEN for initialization, download partition resident programs, schedule LSTEN to bring up the new monitors, and run WHZAT to let everyone know downloading is done.

The listing below has a few more "bells and whistles" than the one in the manual, but it is basically the same program. The portions of the program we must change for node 7 (at the end of the listing) are the downloaded program names, the LSTEN answers, and three integers.

```
ASMB,L,R
      NAM PASS,19 START-UP PROGRAM FOR NODE
      EXT EXEC,FLOAD,CNUMD
      SUP
*
*
PASS  JSB SCHLS     SCHEDULE LSTEN FOR INITIALIZATION
*
*  DOWNLOAD PROGRAMS INTO PARTITIONS
LODIT LDA NAME      MOVE NAME
      LDB @PROG      OF PROGRAM
      MVW D3           TO MESSAGE.
*
      JSB EXEC      PRINT MESSAGE:
      DEF *+5
      DEF D2          ICODE FOR WRITE
      DEF D1          LU FOR SYSTEM CONSOLE
      DEF DWNLD       DOWNLOAD MESSAGE
      DEF D18         LENGTH = 18
```

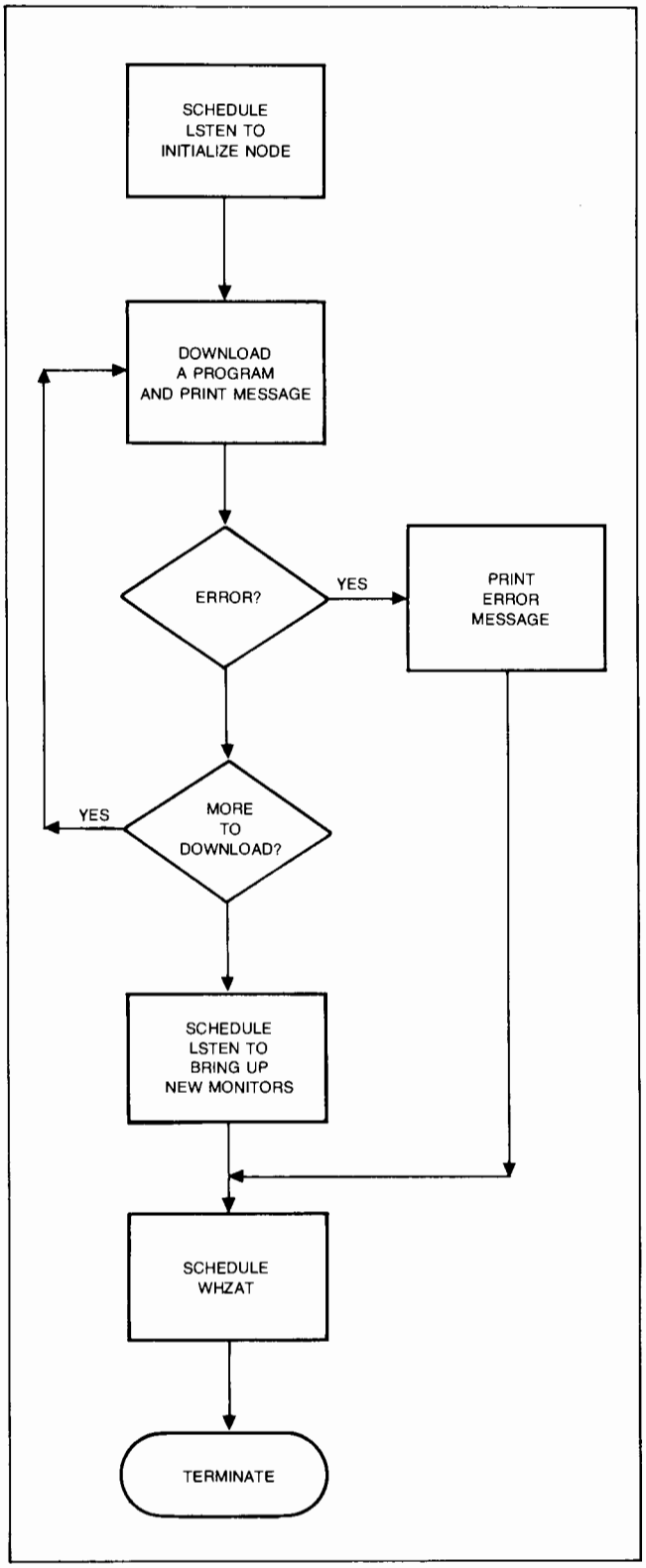


FIGURE C. PASS Program Flowchart

```
*
      ISZ PARTN      BUMP (ASCII) PARTITION #.
*
      JSB FLOAD
      DEF *+6
NAME  DEF NMTBL      ABSOLUTE FILE NAME
      DEF CART       CARTRIDGE NUMBER
      DEF FLNOD      NODE WHICH CONTAINS FILE
      DEF NEG1       DESTINATION NODE = LOCAL
      DEF ERROR      ERROR (RETURNED)
*
      LDA ERROR      IF ERROR
      SZA             IN DOWNLOAD,
      JMP LOERR         PRINT LOAD ERROR.
      LDA NAME       POINT TO
      ADA D3          NEXT
      STA NAME          NAME.
      CPA NMEND      ALL DONE?
      JMP LSTN2         YES--SCHEDULE LSTEN FOR 2ND TIME
      JMP LODIT         NO--CONTINUE
*
* SCHEDULE LSTEN TO BRING UP NEW MONITORS
LSTN2 LDA @BUF2      SET UP NEW
      STA BUFAD       BUFFER ADDRESS
      LDA LEN2          AND NEW
      STA LEN            LENGTH.
      JSB SCHLS      SCHEDULE LSTEN.
*
*  SCHEDULE WHZAT TO PRINT ON LU 1
SCWHZ JSB EXEC
      DEF *+4
      DEF D9          ICODE FOR SCHEDULE WITH WAIT
      DEF WHZAT       PROGRAM NAME
      DEF D1          LU FOR SYSTEM CONSOLE
*
*  ALL DONE
      JSB EXEC
      DEF *+2
      DEF D6          ICODE FOR TERMINATION
*
*
*  SUBROUTINE TO PUT ANSWERS INTO I/O CLASS,
SCHLS NOP             ENTRY POINT


*
      CLA             SET CLASS
      STA CLASS        TO ZERO.
*
      JSB EXEC
      DEF *+8
      DEF D20          ICODE FOR CLASS WRITE/READ
      DEF D0           CONTROL WORD
BUFAD DEF BUF          DATA BUFFER (CHANGED 2ND TIME)
      DEF LEN          BUFFER SIZE (CHANGED 2ND TIME)
      DEF D0           PLACE
      DEF D0            HOLDERS
      DEF CLASS        CLASS NUMBER RETURNED HERE
*
      JSB EXEC       SCHEDULE LSTEN
      DEF *+6
      DEF D9           ICODE FOR SCHEDULE WITH WAIT
      DEF LSTEN        PROGRAM NAME
      DEF NEG1         TELL LSTEN TO USE I/O CLASS
      DEF CLASS        CLASS NUMBER
      DEF RCDLN        RECORD LENGTH
*
      JMP SCHLS,I    RETURN.
*
*  PRINT ERROR MESSAGE FROM DOWNLOAD
LOERR LDA =AR        DEFAULT SIGN IS BLANK.
      LDB ERROR
      SSB,RSS
      JMP STSGN
```


```
      CMB,INB        IF ERROR IS NEGATIVE,
      STB ERROR        COMPLEMENT IT AND
      LDA =AR-         SET SIGN IN MESSAGE TO MINUS.
STSGN STA MSG+5      STORE SIGN OF ERROR.
*
      JSB CNUMD      CONVERT ERROR
      DEF *+3         TO ASCII (DECIMAL)
      DEF ERROR        AND STORE IN
      DEF MSG+6         MESSAGE.
*
      JSB EXEC       PRINT ERROR MESSAGE:
      DEF *+5
      DEF D2          ICODE FOR WRITE
      DEF D1          LU = SYS CONSOLE
      DEF MSG         MESSAGE ADDRESS
      DEF D9          LENGTH = 9
*
      JMP SCWHZ      TERMINATE.
*
*  DOWNLOAD MESSAGE:
DWNLD ASC 6,DOWNLOADING
PROG  ASC 11,AAAAAA INTO PARTITION
PARTN ASC 1,01
@PROG DEF PROG
*  DOWNLOAD ERROR MESSAGE:
MSG   ASC 9,FLOAD ERROR NNNNNN
*
*
NEG1  DEC -1
D0    DEC 0
D1    DEC 1
D2    DEC 2
D3    DEC 3
D6    DEC 6
D9    DEC 9
D18   DEC 18
D20   DEC 20
*
CLASS NOP            CLASS NUMBER GOES HERE
ERROR NOP            FLOAD ERROR CODE
*
LSTEN ASC 3,LSTEN    NAME OF PROGRAMS
WHZAT ASC 3,WHZAT
*
* PROGRAMS TO BE DOWNLOADED
NMTBL EQU *          NAME TABLE
*  +-----------------------------------------+
*  ! NAMES OF PROGRAMS TO BE DOWNLOADED GO HERE !
*  +-----------------------------------------+
NMEND DEF *          END OF NAME TABLE
*
*
** BUFFER FOR LSTEN INITIALIZATION
BUF   EQU *
*  +-------------------------------------------------+
*  ! ANSWERS FOR RUNNING LSTEN THE FIRST TIME GO HERE !
*  +-------------------------------------------------+
LEN   ABS *-BUF      MUST BE < OCTAL 200
*
** BUFFER FOR SCHEDULING MONITOR AFTER DOWN-LOAD
@BUF2 DEF BUF2
BUF2  EQU *
*  +-------------------------------------------------+
*  ! ANSWERS FOR RUNNING LSTEN SECOND TIME GO HERE !
*  +-------------------------------------------------+
LEN2  ABS *-BUF2     LENGTH OF 2ND LSTEN BUFFER
*
*  +-----------------------------------------+
*  ! THE FOLLOWING CHANGE FOR DIFFERENT SYSTEMS !
*  +-----------------------------------------+
CART  BSS 1          CARTRIDGE NUMBER
FLNOD BSS 1          NODE WHICH CONTAINS FILES
RCDLN BSS 1          LENGTH OF LSTEN ANSWERS
      END PASS
```

We have already discussed the programs to be downloaded:

```
NMTBL EQU *          NAME TABLE
      ASC 3,OPERM7   LOADED INTO PARTITION 1
      ASC 3,PTOPM7   LOADED INTO PARTITION 2
      ASC 3,CNSLM7   LOADED INTO PARTITION 3
      ASC 3,EXECM7   LOADED INTO PARTITION 4
      ASC 3,REDIT7   LOADED INTO PARTITION 5
      ASC 3,REMAT7   LOADED INTO PARTITION 6
      ASC 3,RMOTE7   LOADED INTO PARTITION 7
NMEND DEF *          END OF NAME TABLE
```

When we initialize the node, we want to establish communication with the HP 3000 on LU 7 and with the HP 1000 node on LU 9. The only monitor generated into the system is EXECW. Our LSTEN answers are

```
BUF   EQU *
      ASC 4,YES      1000 CONNECTED?
      ASC 4,YES      3000 CONNECTED?
      ASC 4,10       NO. OF TRANSACTIONS
      ASC 4,5        NO. OF CONCURRENT HP3000 USERS
      ASC 4,7        LU OF HP3000
      ASC 4,9        ENABLE LU
      ASC 4,/E       LAST LU
      ASC 4,0        NDT FILE NAME (NONE)
      ASC 4,7        LOCAL NODE NUMBER
      ASC 4,3        NUMBER OF NODES
      ASC 4,2,9      FIRST NODE
      ASC 4,7        SECOND NODE (LOCAL)
      ASC 4,6,9,90   THIRD NODE
      ASC 4,EXECW    MONITOR
      ASC 4,/E       LAST MONITOR
      ASC 4,DS       SECURITY CODE
      ASC 4,/E       OPERATION?
LEN   ABS *-BUF      MUST BE < OCTAL 200
```

To bring up the new monitors after they have been downloaded, we pass LSTEN the second buffer:

```
BUF2  EQU *
      ASC 4,/S       OPERATION?
      ASC 4,CNSLM    MONITOR?
      ASC 4,PTOPM    MONITOR?
      ASC 4,EXECM    MONITOR?
      ASC 4,OPERM    MONITOR?
      ASC 4,/E       MONITOR?
      ASC 4,/E       OPERATION?
LEN2  ABS *-BUF2     LENGTH OF 2ND LSTEN BUFFER
```

For node 7 the three integers have these values:

```
CART  EQU D2         CARTRIDGE NUMBER
FLNOD EQU D2         NODE WHICH CONTAINS FILES
RCDLN DEC 4          LENGTH OF LSTEN ANSWERS
```

SYSTEM AVAILABLE MEMORY

System available memory (SAM) is a vital resource for DS software. Tables, lists, and all communications messages use SAM. We will specify four pages, but if it turns out more pages are needed for partitions, this value could be reduced to two.

THE COMPLETED ANSWER FILE

After assembling the modified PASS, we are ready to run RTMLG with the following answer file:

```
GEN
MAP MODULES ON 'NODE7::216
ECHO ON 'NODE7::216
OUTPUT ON P00007::2
END
* TYPE OF SYSTEM
3
* TBG CHANNEL
10
* PRIV INTERRUPT CARD
0
YES    * PRIV DRIVERS ACCESS COMMON
* MEMORY SIZE
64
* FIRST WORD OF BASE PAGE
14
** EXTENDED INSTRUCTION SET **
.MPY,RP,100200
.DIV,RP,100400
.DLD,RP,104200
.DST,RP,104400
.MBT,RP,105765
.MVW,RP,105777
** FLOATING POINT INSTRUCTIONS **
.FAD,RP,105000
.FSB,RP,105020
.FMP,RP,105040
.FDV,RP,105060
IFIX,RP,105100
FLOAT,RP,105120
END
LINKS IN CURRENT
** SYSTEM MODULES **
REL %MSY3::32767
REL %MTI::32767
REL %MTS::32767
REL %MOP::32767
REL %MCL3::32767
REL %MRN::32767
SEARCH %MDMLB::32767
* DRIVERS:
REL %4DV05::32767
REL %DVG67::32767
REL %DVA65::32767
END
* NO OF I/O CLASSES
30



* NO OF RESOURCE NUMBERS
10
* BUFFER LIMITS
100,400
** EQUIPMENT TABLE (EQT) ENTRIES **
* EQT 1 = 2645 TERMINAL
13,DVR05,X=13
* EQT 2 = DS/3000 LINK
12,DVG67,D
* EQT 3 = DS/1000 LINK
11,DVA65,T=3,X=7
END
** DEVICE REFERENCE TABLE (DRT) ENTRIES **
* LU 1 = 2645 KEYBOARD/SCREEN
1
0
0
* LU 4 = 2645 LEFT CARTRIDGE TAPE UNIT
1,1
* LU 5 = 2645 RIGHT CARTRIDGE TAPE UNIT
1,2
* LU 6 = 2645 PRINTER
1,4
* LU 7 = DS/3000 LINK
2
0
* LU 9 = DS/1000 LINK
3,1
END
** INTERRUPT TABLE ENTRIES **
* SELECT CODE 11 = DS/1000 LINK
11,PRG,QUEUE
* SELECT CODE 12 = DS/3000 LINK
12,EQT,2
* SELECT CODE 13 = 2645 TERMINAL
13,EQT,1
END
* MAXIMUM NUMBER OF PARTITIONS
10
* NUMBER OF ID SEGMENTS
22



* START UP PROGRAM
PASS
** RESIDENT LIBRARY MODULES **
REL %RLIB2::32767 (.ENTR)
REL %MSYLB::32767 (MALRN)
REL %MSYLB::32767 (MRNRQ)
REL %MSYLB::32767 (MPRTN)
END
** SUBSYSTEM GLOBAL AREA (SSGA) MODULES **
REL %DSLB1::32767 (RES)
REL %DSLB1::32767 (#REQU)
REL %DSLB1::32767 (DRTEQ)
REL %DSLB1::32767 (PGMAD)
REL %D3KLB::32767 (HSLC)
REL %D3KLB::32767 (D$EQT)
END
* NUMBERS OF WORDS IN COMMON
50
* ALIGN AT NEXT PAGE?
NO
** "MEMORY RESIDENT" PROGRAMS (NOT IN PARTITIONS) **
REL %WHZT3::32767
SEARCH %MSYLB::32767
END
0
REL %UPLIN::32767
SEARCH %MSYLB::32767
END
0
REL %QUEUE::32767
END
0
REL %GRPM::32767
END
0
REL %RTRY::32767
END
0
REL %QCLM::32767
END
0
REL %3APLD::32767
SEARCH %FMPC::32767
SEARCH %DSLB2::32767
SEARCH %DSLB1::32767
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
0
REL %EXECW::32767
SEARCH %DSLB1::32767
END
0
REL %QUEZ::32767
END
0
REL %RPCNV::32767
SEARCH %DSLB1::32767
END
0
REL %RQCNV::32767
END
0
REL %QUEX::32767
SEARCH %MSYLB::32767
END
0
REL %LSTEN::32767
REL %FMPF::32767 (READF)
REL %FMPF::32767 (RW$UB)
REL %FMPF::32767 (RWND$)
REL %FMPF::32767 (P.PAS)
```

```
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
0
REL %PASS7::216
SEARCH %DSLB2::32767
SEARCH %DSLB1::32767
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
0
END
0
NO
* NO. OF ADDITIONAL SAM PAGES
4
** PARTITION # AND SIZE:
1,2
2,2
3,2
4,3
5,3
6,6
7,6
END
SNAP ON SNAP7::216
END
```

It only takes a few minutes to generate an RTE-M system, so we can re-do it several times and optimize the system.

LEARNING FROM THE FIRST TRY

The first thing to determine from the map/echo file after the generation completes: were there any errors in the answer file? For some errors, RTMLG prompts for the correct reply from the system console. When this happens, the easiest thing to do is reply with the EXIT command, look at 'NODE7 to determine the error, and fix #NODE7.

Once we get a successful run, we have a system that should work. We could go ahead and prepare the partition resident programs, but it is usually a better idea to optimize the system before we use it.

One way to gain more memory for partitions is to put small partition resident programs into the memory resident area. For example, OPERM uses a little more than half a page but its partition requires two pages.

To get an idea of how many programs will fit, look in 'NODE7 for the value reported by RTMLG after all memory resident programs have been relocated:

```
* REL USER PROGS
-
END
*
*
* LWA MEM RES PROG = 75216  CHANGE?
```

The last word of memory is 77777 (octal) so there is more than a page available. We cannot know if they will fit until we try, but we will put OPERM, PTOPM, and CNSLM into the memory resident area. If RTMLG tells us there is not enough memory, we will have to remove one of the monitors and retry. But if they do fit, we can pick up five pages for partitions.

When we move these to the memory resident area, we can remove their partitions and remove the downloading commands from PASS.

After PASS is re-assembled and #NODE7 is edited, we are ready to try again.

RESULTS OF THE SECOND TRY

Luck was with us! Suprisingly, we fit six pages of partition resident programs and used only one more memory resident page. RTMLG reports that all three monitors fit, with only 48 words left to spare:

```
* REL USER PROGS
-
END
*
*
* LWA MEM RES PROG = 77717  CHANGE?
0
*
* ALIGN AT NEXT PAGE?
NO
* SAM =  00048  WORDS
```

RTMLG also tell us we have ten pages remaining for a fifth partition:

```
4,6
* PAGES REMAINING =  00010
* ?
END
```

Depending upon the application programs to be loaded, these pages could be divided among several partitions or used for SAM. In any case, we now know the number of partitions and can change that answer in #NODE7.

PARTITION RESIDENT PROGRAMS

Before we re-edit #NODE7, let us prepare answer files to load the four partition resident programs. The answers are much the same as the answers used to load memory resident programs. Here is #REMAT, the answer file for REMAT:

```
LOAD
TR,SNAP::216
ECHO ON 'REMAT::216
MAP MODULES ON 'REMAT::216
LINKS IN CURRENT
OUTPUT ON REMAT::2
REL %REMAT::32767
SEARCH %DSLB2::32767
SEARCH %DSLB1::32767
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
END
END
```

To run these answer files with RTMLG, we need to specify SSGA access and partition residence by setting the fifth parameter to 5. For REMAT, the command is

```
:RU,RTMLG,#R,EM,AT,,5
```

All of our loading answer files can be used for either node 5 or node 7; we simply rename the snapshot and absolute output files. Here is *NODE7, a FMGR answer file to generate node 7 then load the partition resident programs:

```
:RU,RTMLG,#N,OD,E7
:RN,SNAP7::216,SNAP
:RU,RTMLG,#E,XE,CM,,5
:PU,EXECM7::2                    Purge old absolute file.
:ST,EXECM::2,EXECM7::2::-1       Copy new one, remove extents.
:PU,EXECM::2                     No longer need general name.
:RU,RTMLG,#R,ED,IT,,5
:PU,REDIT7::2
:ST,REDIT::2,REDIT7::2::-1
:PU,REDIT::2
:RU,RTMLG,#R,EM,AT,,5
:PU,REMAT7::2
:ST,REMAT::2,REMAT7::2::-1
:PU,REMAT::2
:RU,RTMLG,#R,MO,TE,,5
:PU,RMOTE7::2
:ST,RMOTE::2,RMOTE7::2::-1
:PU,RMOTE::2
:RN,SNAP::216,SNAP7
```

ANOTHER SURPRISE!

After using this answer file, RTMLG reports a surprising result for RMOTE:

```
NO UNDEFS
* RELOCATION FINISHED
*  4 PAGES REQUIRED
```

Because we do not use FMGR routines (we use %DSML2), RMOTE requires two pages less in our system than in an RTE-III. We can decrease RMOTE's partition to four pages and increase the last one to twelve pages. Because it is desirable to have partitions in increasing order by size, we will put RMOTE in partition 3 and REMAT in partition 4.

We could also use the memory to allocate more SAM. If we find that our system does not have enough SAM to pass the buffer sizes we need, we can re-generate and allocate more.

Here is our final answer file:

```
GEN
MAP MODULES ON 'NODE7::216
ECHO ON 'NODE7::216
OUTPUT ON P00007::2
END
* TYPE OF SYSTEM
3
* TBG CHANNEL
10
* PRIV INTERRUPT CARD
0
YES    * PRIV DRIVERS ACCESS COMMON
* MEMORY SIZE
64
* FIRST WORD OF BASE PAGE
14
** EXTENDED INSTRUCTION SET **
.MPY,RP,100200
.DIV,RP,100400
.DLD,RP,104200
.DST,RP,104400
.MBT,RP,105765
.MVW,RP,105777
** FLOATING POINT INSTRUCTIONS **
.FAD,RP,105000
.FSB,RP,105020
.FMP,RP,105040
.FDV,RP,105060
IFIX,RP,105100
FLOAT,RP,105120
END


LINKS IN CURRENT
** SYSTEM MODULES **
REL %MSY3::32767
REL %MTI::32767
REL %MTS::32767
REL %MOP::32767
REL %MCL3::32767
REL %MRN::32767
SEARCH %MDMLB::32767
* DRIVERS:
REL %4DV05::32767
REL %DVG67::32767
REL %DVA65::32767
END
* NO OF I/O CLASSES
30
* NO OF RESOURCE NUMBERS
10
* BUFFER LIMITS
100,400
** EQUIPMENT TABLE (EQT) ENTRIES **
* EQT 1 = 2645 TERMINAL
13,DVR05,X=13
* EQT 2 = DS/3000 LINK
12,DVG67,D
* EQT 3 = DS/1000 LINK
11,DVA65,T=3,X=7
END
** DEVICE REFERENCE TABLE (DRT) ENTRIES **
* LU 1 = 2645 KEYBOARD/SCREEN
1
0
0
* LU 4 = 2645 LEFT CARTRIDGE TAPE UNIT
1,1
* LU 5 = 2645 RIGHT CARTRIDGE TAPE UNIT
1,2
* LU 6 = 2645 PRINTER
1,4
* LU 7 = DS/3000 LINK
2
0
* LU 9 = DS/1000 LINK
3,1
END
** INTERRUPT TABLE ENTRIES **
* SELECT CODE 11 = DS/1000 LINK
11,PRG,QUEUE
* SELECT CODE 12 = DS/3000 LINK
12,EQT,2
* SELECT CODE 13 = 2645 TERMINAL
13,EQT,1
END
* MAXIMUM NUMBER OF PARTITIONS
5
* NUMBER OF ID SEGMENTS
22
* START UP PROGRAM
PASS
** RESIDENT LIBRARY MODULES **
REL %RLIB2::32767 (.ENTR)
REL %MSYLB::32767 (MALRN)
REL %MSYLB::32767 (MRNRQ)
REL %MSYLB::32767 (MPRTN)
END
** SUBSYSTEM GLOBAL AREA (SSGA) MODULES **
REL %DSLB1::32767 (RES)
```

```
REL %DSLB1::32767 (#REQU)
REL %DSLB1::32767 (DRTEQ)
REL %DSLB1::32767 (PGMAD)
REL %D3KLB::32767 (HSLC)
REL %D3KLB::32767 (D$EQT)
END
* NUMBERS OF WORDS IN COMMON
S0
* ALIGN AT NEXT PAGE?
NO
** "MEMORY RESIDENT" PROGRAMS (NOT IN PARTITIONS) **
REL %WHZT3::32767
SEARCH %MSYLB::32767
END
0
REL %UPLIN::32767
SEARCH %MSYLB::32767
END
0
REL %QUEUE::32767
END
0
REL %GRPM::32767
END
0
REL %RTRY::32767
END
0
REL %QCLM::32767
END
0
REL %3APLD::32767
SEARCH %FMPC::32767
SEARCH %DSLB2::32767
SEARCH %DSLB1::32767
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
0
REL %EXECW::32767
SEARCH %DSLB1::32767
END
0
REL %OPERM::32767
SEARCH %DSLB1::32767
SEARCH %MSYLB::32767
END
0
REL %PTOPM::32767
SEARCH %DSLB1::32767
END
0
REL %CNSLM::32767
SEARCH %D3KLB::32767
SEARCH %DSLB1::32767
END
0
REL %QUEZ::32767
END
0
REL %RPCNV::32767
SEARCH %DSLB1::32767
END
0
REL %RQCNV::32767
END
0
REL %QUEX::32767
SEARCH %MSYLB::32767
END
0
REL %LSTEN::32767
REL %FMPF::32767 (READF)
REL %FMPF::32767 (RW$UB)
REL %FMPF::32767 (RWND$)
REL %FMPF::32767 (P.PAS)
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
0
REL %PASS7::216
SEARCH %DSLB2::32767
SEARCH %DSLB1::32767
SEARCH %MSYLB::32767
SEARCH %RLIB2::32767
END
0
END
0
NO
* NO. OF ADDITIONAL SAM PAGES
4
** PARTITION # AND SIZE:
1,3
2,3
3,4
4,6
5,12
END
SNAP ON SNAP7::216
END
```

The final version of PASS has these buffers:

```
* PROGRAMS TO BE DOWNLOADED
NMTBL EQU *          NAME TABLE
      ASC 3,EXECM7   LOADED INTO PARTITION 1
      ASC 3,REDIT7   LOADED INTO PARTITION 2
      ASC 3,RMOTE7   LOADED INTO PARTITION 3
      ASC 3,REMAT7   LOADED INTO PARTITION 4
NMEND DEF *          END OF NAME TABLE
*
*
** BUFFER FOR LSTEN INITIALIZATION
BUF   EQU *
      ASC 4,YES      1000 CONNECTED?
      ASC 4,YES      3000 CONNECTED?
      ASC 4,10       NO. OF TRANSACTIONS
      ASC 4,5        NO. OF CONCURRENT HP3000 USERS
      ASC 4,7        LU OF HP3000
      ASC 4,7        ENABLE LU
      ASC 4,/E       LAST LU
      ASC 4,0        NDT FILE NAME (NONE)
      ASC 4,7        LOCAL NODE NUMBER
      ASC 4,3        NUMBER OF NODES
      ASC 4,1,9      FIRST NODE
      ASC 4,7        SECOND NODE (LOCAL)
      ASC 4,6,9,90   THIRD NODE
      ASC 4,EXECW    MONITOR
      ASC 4,CNSLM    MONITOR
      ASC 4,PTOPM    MONITOR
      ASC 4,OPERM    MONITOR
      ASC 4,/E       LAST MONITOR
      ASC 4,DS       SECURITY CODE
      ASC 4,/E       OPERATION?
LEN   ABS *-BUF      MUST BE < OCTAL 200
*
** BUFFER FOR SCHEDULING MONITOR AFTER DOWN-LOAD
@BUF2 DEF BUF2
BUF2  EQU *
      ASC 4,/S       OPERATION?
      ASC 4,EXECM    MONITOR?
      ASC 4,/E       MONITOR?
      ASC 4,/E       OPERATION?
LEN2  ABS *-BUF2     LENGTH OF 2ND LSTEN BUFFER
*
CART  EQU D2         CARTRIDGE NUMBER
FLNOD EQU D2         NODE WHICH CONTAINS FILES
RCDLN DEC 4          LENGTH OF LSTEN ANSWERS
      END PASS
```

DOWNLOADING THE SYSTEM

After we have run RTMLG for the third time, our optimized system is ready for downloading. At node 7 we set the S-register as follows: Bits 14 and 15: CBL ROM slot number (usually 3), Bits 6 thru 10: DS/1000 link select code (octal 11), Bits 0 thru 6: Absolute file number. For our system, the S-register is 141107 (octal).

Press PRESET, IBL, and RUN. If the communications board and cables have been connected properly and the central

node has been initialized, we will see the S-register flash as the system is downloaded. The message "SET TIME" will appear on the screen when the process is completed. If this does not happen, several things may be wrong:

The time base generator or an I/O board is not in the correct slot.

The jumpers on the DS/1000 communications boards at nodes 7 and 2 are not in the same position.

The CBL communications ROM has not been installed in position 3 at node 7.

The DS/1000 communications microcode has not been installed.

The wrong cable is connected to an I/O board.

The LU to node 7 has not been initialized by LSTEN at node 2.

If everything has been set up correctly, PASS should take over, schedule LSTEN to initialize the node, and start downloading programs. It is possible that a bad answer in the PASS buffer will cause LSTEN to prompt on the system console. If the correct answer is obvious, enter it. Otherwise type /A to abort. PASS will print a downloading error message, schedule WHZAT, then terminate. You can then run LSTEN from the console.

If you detect any errors in the LSTEN answers, be sure to re-edit the PASS program and re-generate the system.

AUTOMATIC BOOTUP

If the CPU at node 7 is a 21MX-E series with the Remote Program Load (RPL) feature (model 2113B), you can set the RPL switches to automatically download a system when the power comes on. As described in the 21MX-E series installation and service manual, the bits in the S-register correspond to RPL switches as follows:

RPL Switch	8	7	6	5	4	3	2	1
S-R Register	15	14	10	9	8	7	6	0

Because bits 1 through 5 of the S-register are not mapped into the RPL switches, the absolute file for node 7 must be renamed to P00000 or P00001. If we choose P00001, the RPL switches will be

RPL Switch	8	7	6	5	4	3	2	1
Value	1	1	0	1	0	0	1	1

where 1 is closed and 0 is open.

MODIFYING THE SYSTEM

Suppose the system at node 7 had included several I/O devices with large drivers, a flexible disc file system, a power fail routine, or some application programs that were necessary at bootup. Obviously, the first try at generation would not have fit; what could be left out?

The DS/3000 communications modules QUEZ, QUEX, RPCNV, and RQCNV are expected at bootup, but they are not required. LSTEN will try to schedule them during initialization, but they are not needed for the link to node 2 and can be downloaded later. LSTEN will report an error, but the programs will be scheduled as soon as they are loaded. QUEX is the largest of the four, followed by RQCNV and RPCNV. QUEZ is so small that it should not be put into a partition.

When changes are made to the system, you will probably have to change the number of ID segments and partitions. When new devices are added, the DRT, EQT, and interrupt table change. All of these changes affect the amount of memory available for memory resident programs. (If more interrupts are added, do not forget to change the first word available for base page links.)

WHAT NEXT?

You have a system that works, but you will probably have to re-generate after it has been used for awhile. You may find that some monitors are not used and can be left out. Some application programs may be developed that should be put into the memory resident area. If large buffers are passed across the link, or several programs run at the same time, you may need to increase the SAM allocation. Keep track of how your system is used, where its weaknesses are, and how it can be improved...and regenerate your system with these in mind.

SPECIAL TREATMENT BY SYSTEM OF PROGRAMS IN MEMORY SUSPEND LIST

Jim Bridges/DSD

System Available Memory (SAM) is a dynamic resource. While the total is fixed at the time of generation, an individual program will need only a portion of SAM for any single request. At the time of the request, there may not exist a block of memory sufficient for the need; however, since memory may be released by another program, the current program is suspended in state 4 (mem suspend) until this happens.

When memory is returned to SAM (at system entry point $RTN), returned memory is concatenated with any adjacent free blocks of memory. Then the head (only!!!) of the memory suspend list is examined to see if its request for memory can now be met; if so, it is scheduled. No other program in the memory suspend list is examined. The head of the list is the highest priority and the system makes the decision that if the highest priority program cannot run, then lower priority programs should not run.

The decision to handle the memory suspend list in this way is not arbitrary. It is reasoned that lower priority programs which use memory may fragment SAM such there may never be a block large enough to satisfy the highest priority program. If the lower priority programs were not held off, then we might have a situation of a high priority program never running while several lower priority programs could run without problems. The system cannot know for certain, of course, whether this will happen but since the situation is resolved by priority, the user can always alter it by changing priorities.

The situation is not the same for programs waiting upon release of other resources. For example, if a resource number is released, the system schedules all programs waiting on a resource number (i.e., they were suspended because they requested a resource number and one was not available at the time).

The treatment of the state 4 list can result in some peculiar symptoms. For example, suppose we have two programs communicating through SAM using mailbox I/O (class I/O). One program (say, FILL) sends 50 word records to a second program (say, REC), which merely picks up the buffers with a class get.

```
FTN4,L
      PROGRAM FILL(3,97),FILL UP SAM WITH CLASS I/O WR/RD
      DIMENSION IBUF(50),LU(5),IA(2)
      EQUIVALENCE (REG,IA)
      CALL RMPAR (LU)
      ICL = 0
      CALL EXEC (20,0,IBUF,50,IP1,IP2,ICL)
      CALL EXEC (21,ICL+20000B,IBUF,50,IP1,IP2,IP3)
      DO 12 I= 1,100
      REG = EXEC (20,0,IBUF,50,IP1,IP2,ICL)
      WRITE (LU,100) I,ICL,IA
100   FORMAT (" FILL: INDEX,CLASS,REGS = "I4,307)
12    CONTINUE
      END
```

```
FTN4,L
      PROGRAM REC(3,99),GET BUFFERS FROM FILL THRU
CLASS I/O
      DIMENSION IBUF(50),LU(5),IA(2)
      EQUIVALENCE (REG,IA),(LU(2),ICL)
      CALL RMPAR (LU)
      DO 10 I=1, 100
      REG = EXEC (21,ICL+20000B,IBUF,50,IP1,IP2,IP3)
10    WRITE (LU,100) I,ICL,IA
100   FORMAT (" REC: INDEX,CLASS,REGS = "I4,307)
      END
```

These examples should serve only as bad (very bad) examples of programming practice; they are only to illustrate a point. Notice that FILL has a higher priority than REC, which could allow it to use up SAM before REC had a chance to empty it with Class Get requests. In this case, REC will get a chance to run while FILL is writing to the terminal (thus suspended in state 3). The scenario (which you can easily verify) is:

1. Run FILL first and allow it to become suspended in state 4. If you have a great deal of SAM, you may have to increase the size of the loop (but stick with a buffer size of 50).

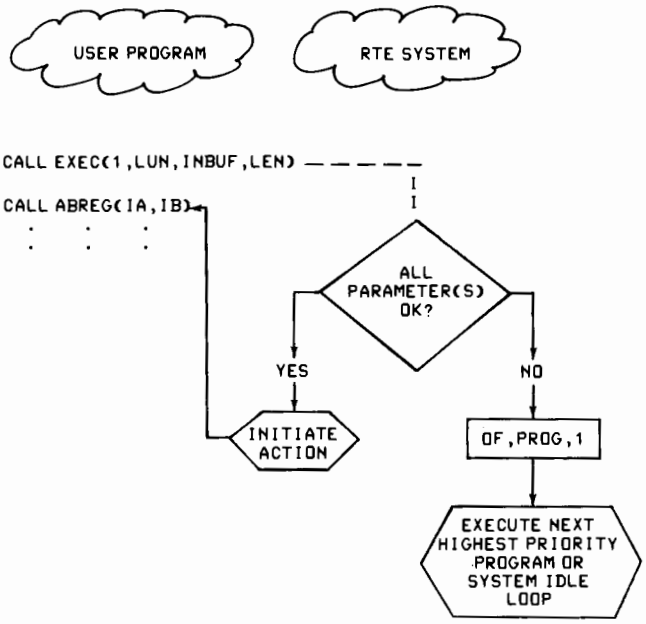
2. When FILL is suspended in state 4, run REC, passing it the terminal logical unit and the Class Number (obtained from the print-out of FILL).

It is assumed that you are the only user of the system during this experiment — else it may not work as intended. But if you are the only user then you will shortly observe that REC and FILL both become memory suspended (in state 4). This happens for REC because it is using the Formatter, which calls REIO. REIO requires SAM. Usually, at the point at which the dual suspension occurs, other programs may still be run. For example, simply run WHZAT to a buffered terminal. If the free memory list is traced (beginning at $ALC + 211B in RTE III) it is possible to observe that there is (perhaps) a great deal of free memory available. However, there is no single block of SAM large enough for the requests made from FILL (50 words plus 8 words overhead for a total of 58 per request).

It might appear strange that REC ever got locked into state 4 since the messages it is writing are using a smaller buffer than FILL. But one must remember that the situation is dynamic. At the time the system made the request for SAM on behalf of REC, some SAM was being used to output requests pending on the terminal EQT. Some time later, enough SAM was released (as shown by an examination of the free list) to satisfy the original request. But (!!) the original

request is not repeated because REC is lower priority than FILL and there is not enough SAM (in a block) to satisfy FILL!

Now, an interesting effect can be observed by doing an SS,FILL on REC and then entering GO,REC on the terminal. REC gets taken out of the memory suspend list by the OP suspend and put into state 6. The GO request puts it back in the schedule list. The original request by REIO is repeated and, since there is now enough memory, the program continues for a while. However, it probably again gets deadlocked with FILL in state 4. Reversing the priorities of FILL and REC will clear up the situation, however.



HOW TO HANDLE NO-ABORT EXEC REQUESTS IN FORTRAN

Larry W. Smith/Neely Sales Region

The purpose of this article is to show the proper FORTRAN coding for trapping rejected user EXEC calls. This capability is extremely powerful, but can result in a little confusion on the coding level. Furthermore, incorrect coding can result in unpredictable results, making debugging that more difficult. This article will also give you a general relationship between the RTE system and the user EXEC call.

When an EXEC call is made to the RTE system, one of two things can happen as a result:

1. The call is accepted, the action initiated, and the call completes normally.

2. The call is rejected by either the system or the device driver (if it was an I/O or control request).

If a call without the abort bit set in the request parameter is accepted by the system as in case #1, and the action is successfully initiated, a return to the next statement in the user's program is made. The user can now continue processing. On the other hand, in the event of a bad call as in case # 2, where one or more of the call parameters are illegal and/or out-of-range, the system aborts the user program (OF,PROG,1) but does not release any disc tracks it might own. The program must then wait to be scheduled again. The net result is that the user has no control over the cause of program abortion. This is the most common usage of an EXEC call in most applications.

To summarize the above, the following diagram might be helpful:

USING THE ABORT BIT

If the user program wishes to trap a rejected EXEC call to continue execution, bit 15 of the first parameter (known as the 'request code') must be set. This allows an unconditional return to the user's program in one of two different places regardless of the validity of the call. If the call is rejected, the system posts the cause in the A and B registers and returns to the very next statement. This statement must be an unconditional branch statement as follows:

```
      CALL EXEC(1+100000B,LUN,INBUF,LEN)--> ABORT BIT SET IN
                                            FIRST PARAMETER
                                            TELLING SYSTEM
                                            TO RETURN TO
                                            NEXT STATEMENT
                                            IF CALL IS
                                            REJECTED.

      GO TO 77                         ---> SYSTEM RETURNS
                                            HERE IF AND ONLY
                                            IF THE CALL WAS
                                            REJECTED.

55    CALL ABREG(IA,IB)                ---> NORMAL RETURN.
                                            IF CALL WAS AN
                                            I/O
                                            REQUEST, THEN
                                            IA=EQT WORD#5
                                            AND
                                            IB=TRANSMISSION
                                            length)always
                                            +).
                                            NOT ALL EXEC RE-
                                            QUESTS RETURN
                                            SIGNIFICANT IN-
                                            FORMATION.

77    CALL ABREG(IA,IB)                ---> IA = ASCII SOURCE
                                            OF REJECTION:

                                            IO I/O REQUEST
                                            SC SCHEDULE OR
```

```
SEGMENT LOAD RN -
RESOURCE NUMBER
OR DISC ALLOCA-
TION LU - LU LOCK

IB = ASCII TYPE
OF REJECTION:
THIS NUMBER DE-
PENDS UPON THE
SOURCE OF RE-
JECTION (SEE
PAGES 94-101 OF
THE RTE-II/III
POCKET GUIDE).
```

You must be very careful not to put any other statements such as CONTINUE or branch to a label occurring on the very next statement. The subroutine ABREG is in the system library and returns the A and B registers in integer variables IA and IB respectively. This call should always be made immediately following the EXEC call to prevent any accidental modification of the A and/or B registers.

Two additional and extremely important items should also be noted in the above example:

1. The user must make a call to EXEC, and must not use EXEC as a function subroutine as REG=EXEC(...) as shown below in HOW NOT TO USE THE ABORT BIT.

2. The dummy label 55 must be coded or else the FORTRAN compiler generates a fatal error.

HOW NOT TO USE THE ABORT BIT

As some of you know, there is a way to retrieve the A and B registers by a different method not requiring the use of ABREG. This can be accomplished completely on the source level with help of the EQUIVALENCE statement as follows:

```
DIMENSION IQ(2)
EQUIVALENCE(REG,IQ(1),IA),(IQ(2),IB)
```

This has the effect of equating the two-word integer array IQ to the floating-point variable REG, thus allowing an EXEC call to be used as a real function subroutine:

```
REG=EXEC(1,8,INBUF,-128)
```

Although this is a neat trick having the only benefit of saving a little memory, it cannot be used in conjunction with setting the abort bit. Let's see why.

To fully understand the effects of mixing REG=EXEC(...) and the abort bit, we must look at the object code produced by the FORTRAN compiler. If we take the first example and add in the abort bit to the request parameter, the source and object code would look like this:


```
REG=EXEC(1+100000B,LUN,INBUF,LEN)

   GO TO TO 77
55 CALL ABREG(IA,IB)
```

```
        LDA =D1          COMPUTE
        ADS =B100000     1+100000B
        STA I.001         AND SAVE.
        JSB EXEC
        DEF *+5
        DEF I.001
        DEF LUN
        DEF INBUF
        DEF LEN
        JSB .DST         SAVE A & B
        DEF REG           AT REG.
        JMP @77
@55     JSB ABREG
        DEF *+3
        DEF IA
        DEF IB
         .  .
         .  .
         .  .
```

I think you can begin to see that if the call completes normally, the computer will execute an address at the DEF REG, and the result would most likely cause a memory protect (MP) or dynamic mapping (DM) interrupt violation and abort the program. On the other hand, if the call was rejected, the program would branch to label 77 with the A and B registers containing the cause of rejection as mentioned above. All in all, what appears to be very normal on the FORTRAN level becomes out of sync' with the assembly code level.

CONCLUSION

Whenever you attempt to diverge from the standard usage of a high-level language such as FORTRAN, consult with your systems personnel or a systems engineer from Hewlett-Packard for a complete description of the usage and possible side effects of what you wish to do.

HALT-PROOF 21MX COMPUTER

Steve Rutel/Editor

A letter was brought to my attention that concerned itself with a peculiarity noticed when programming a 21MX-M Series computer. The letter was originally attentioned to Software Samantha. However, due to the subject matter involved (Software Samantha is concerned strictly with software), it was felt that the letter was more appropriately dealt with in this section. It was found that the problem experienced was related to the hardware design of the 21MX-M Series computer:

> "Recently a peculiarity has been observed that pertains to the operation of the front panel controls of the HP 21MX-M series of computer.
>
> An apparent oversight in the microprogramming of the 21MX allows the front panel buttons to become locked out, after the execution of certain sequences of computer instructions. The front panel controls then become totally inoperative, and the computer cannot be halted, except by turning off the main CPU power switch."

After reading the letter, I went to the Data Systems Hardware Support group to inquire as to why this problem had occurred. As is typical with the Hardware Support group, they responded with quick and accurate answers to my questions. They directed me to the Engineering Supplement Package (H-P Part No. 02108-90017), page 3-1;

> NOTE
>
> *The interrupt system should always be enabled before enabling Memory Protection. If the interrupt system is off and Memory Protect is on, and a violation occurs, the CPU will permanently freeze and can recover only by going to reset.*

The letter also contained an explanation that was verified as being accurate. I therefore offer it to you here:

> "If the 21MX computer is equipped with the memory protect option, and if the instruction STC 5 is executed when the interrupt system is off, the computer will then be placed into the halt-proof mode. Since the memory protect is then enabled, all I/O instructions will be prevented from executing. However, since the interrupt system is disabled, memory protect violations cannot be trapped to location 5. Instead, all I/O instructions, including halt, are treated as NOP instructions, and are ignored. Since the front panel is microprogrammed, the HALT button is also ignored by this process."

As a final note, it is recommended that the programmer of a 21MX-M Series computer pay close attention to his or her software development. If the computer utilizes Memory Protect, certain assembly instruction sequences can cause inconvenience when executed. The Reseting of the computer could occur more often than desired.

HOW FFP AFFECTS PROGRAM SIZE & SPEED

Al Liu/DSD

The table below can be used to compute the saving in memory requirement and increase in speed achieved by using FFP. Execution times were obtained by coding FORTRAN DO-LOOPS and taking averages. No effort was made to check for different times which may occur at boundary conditions. Therefore the tables are of greatest value in showing the relative differences between the FFP microcode and the M and E series computers.

Subroutine Name	Micro-code	Size (octal words)	Execution Time subroutine calls (microsec)		F.F.P.**
			M	E	
.GOTO	105221	23	41	22	10.6
..MAP	105222	74	131	79	17.7 to 27.2
.ENTR,.ENTP	105223 105224	70	122	73	13.9 + 3.7
DBLE	105201	32	57	34	13.02
SNGL	105202	111	159	95	18.2
.XMPY	105203	322	457	274	56.7 to 64.8
.XDIV	105204	260	383	230	80.7 to 93.1
.DFER,.XFER	105205 105220	64	113	68	12.8
.XADD,.XSUB	105213 105214	257	660	396	38 to 50.7
PWR2	105225	30	42	25	8.4
.XPAK	105206	164	253	152	18.9 to 29.5
.FLUN	105226	16	30	18	3.1
.XCOM	105215	50	74	40	11.7 to 12.1
.PACK	105230	111	159	95	19.2 to 27.2
..DCM	105216	27	50	30	22.1 to 33.4
DDINT	105217	35	63	38	23.9 to 58.6
Total		2216	2794	1669	480.3 x = # of parameters

**From 13306A Fast FORTRAN Processor Specifications, HP 1000 Computer Systems Technical Data, 3/77 (.SETP not included because it is for DOS III only.)

If a user program references all the above subroutines, then by installing the FFP option on a 21MX/M or 21MX/E CPU, it can be reduced in size by 2216 octal words (or 1166 decimal words). Besides the size reduction, the processing time will also be reduced according to the comparison table above. Approximately, speed improvement will be around 6 and 3.5 times for 21MX/M and 21MX/E CPU respectively.

SOFTWARE SAMANTHA
c/o Communicator 1000 Group
HP Data Systems Division,
11000 Wolfe Road,
Cupertino, Ca., 95014,
U.S.A.

Dear Samantha:

When playing with the RTE-II operating system I discovered two entry points, .ZPRV and .ZRNT, which are not described in my manuals /RTE-II Operating Manual, Relocatable Subroutines/. The Loader has showed to me that both these entry points reside at the same location 2001B of the computer's memory. I have found that their calling sequences look like this:

```
SUB  NOP              BEG  BSS n
     JSB  .ZPRV       SUB  NOP
     DEF  RET               JSB .ZRNT
   ........                 DEF RET
RET  JMP  SUB,I           ........
     DEF  SUB         RET  JMP SUB,I
                           DEF BEG
                           NOP
```

and that .ZPRV is used in some privileged subroutines and .ZRNT in the re-entrant ones. I think that these subroutines are alternatives for $LIBR and $LIBX.

Now, let me ask a question. What is a purpose of these subroutines, how are they called, which are reasons for and advantages of using .ZPRV and .ZRNT, instead of $LIBR and $LIBX?

With regards
Jaromir Vostry,
CKD Polovodice /NVZ-V10,
Budejovicka 5,
14003 Praha 10,
Czechoslovakia
Praha, September 27, 1977

CKD Polovodice /NVZ-V10,
Budejovicka 5,
14003 Praha 10,
Czechoslovakia
Praha

Dear Jaromir:

Thank you for your letter. As a result, the use of the symbols .ZRNT and .ZPRV are being documented in the Relocatable Subroutines manual 24998-90001.

.ZRNT and .ZPRV are symbols with a special significance to the system generator program. They are used only with type 6 subroutines. Used in a rigidly defined format, they cause the generator to modify the object code according to whether the subroutine is placed in the memory resident library or in the disc resident library. (The same subroutine may be placed in both libraries.)

The primary purpose of the memory resident library is to contain all those subroutines which are called by one or more memory resident programs. All such subroutines must be either sharable (re-entrant) or non-interruptible (privileged). A secondary use is for tables that may be used by any program, whether disc or memory resident. Such tables would be coded as type 14, which forces them into the memory resident library regardless of usage.

A subroutine will not be placed in the disc resident library unless it is either type 6 or type 14. A type 6 subroutine is loaded into the memory resident library only if required by a memory resident program. After the memory resident library is complete, all type 6 programs will also go into the disc resident library. Programs on-line will pull the subroutine from the disc resident library. Thus, the type 6 subroutine is a method to avoid loading more than one copy of the subroutine when the same code is used by two or more memory resident programs. By this definition, a subroutine in the memory resident must be coded such that it operates with the interrupts off (do this only if execution takes 1 millisecond or less) or is re-entrant.

The format of a re-entrant subroutine is such that, if it is interrupted and enterred by another program, then the locations in the subroutine which are modified (or may be modified) are moved to system available memory (SAM).

The problem with this scheme (which .ZRNT and .ZPRV are designed to correct) is that both privileged and re-entrant routines break the memory protect fence with calls to $LIBR and $LIBX and this produces an overhead which may be objectionable to disc resident programs. (Remember that each disc resident program gets it's own copy of the subroutine so that sharing does not take place.) So it would be desirable to avoid the re-entrant or privileged form for the copy of the type 6 in the disc resident library. This is exactly what the symbols .ZRNT and .ZPRV provide.

At the completion of system generation, the generator defines the symbols .ZRNT and .ZPRV as equivalent to the following RP commands:

```
.ZPRV,RP,2001
.ZRNT,RP,2001
```

The value, 2001 (octal) is the equivalent of an RSS instruction. Thus the program LOADR will replace a JSB .ZRNT or a JSB JSB .ZPRV with an RSS. This is the same action taken by the generator when a type 6 subroutine is placed in the disc resident library.

The following examples illustrate how an assembled subroutine is modified by the generator:

```
                                                    WHEN ``SUB'' NOT
                                  WHEN ``SUB'' IN   IN CORE RESIDENT
                                   CORE RESIDENT      LIBRARY
                                     LIBRARY        (AS MODIFIED
                                    (AS MODIFIED    BY GENERATOR
AS ASSEMBLED                        BY GENERATOR)    OR LOADER)

        P R I V I L E G E D  W I T H  " . E N T R "

PRAM1 NOP                 PRAM1 NOP           PRAM1  NOP
PRAM2 NOP                 PRAM2 NOP           PRAM2  NOP
SUB   NOP                 SUB   NOP           SUB    NOP
      JSB .ZPRV                 JSB $LIBR             RSS
      DEF LIBX                  NOP                   DEF LIBX
      JSB ,ENTP                 JSB .ENTP             JSB .ENTP
      DEF PRAM1                 DEF PRAM1             DEF PRAM1
      ...                       ...                   ...
      ...                       ...                   ...
LIBX  JMP SUB,I           LIBX  JSB $LIBX     LIBX    JMP SUB,I
      DEF SUB                   DEF SUB               DEF SUB

          N O R M A L  R E - E N T R A N T  R O U T I N E

SUB   NOP                 SUB   NOP           SUB    NOP
      JSB .ZRNT                 JSB $LIBR             RSS
      DEF LIBX                  DEF TDB               DEF LIBX
      ...                       ...                   ...
      ...                       ...                   ...
      ISZ SUB                   ISZ SUB               ISZ SUB
      ISZ TDB+2                 ISZ TDB+2             ISZ TDB+2
      NOP                       NOP                   NOP
      ...                       ...                   ...
LIBX  JMP SUB,I           LIBX  JSB $LIBX     LIBX    JMP SUB,I
      DEF TDB                   DEF TDB               DEF TDB
      DEC 0                     DEC 0                 DEC 0

        R E - E N T R A N T  W I T H  " . E N T R "

PRAM1 NOP                 PRAM1 NOP           PRAM1  NOP
PRAM2 NOP                 PRAM2 NOP           PRAM2  NOP
SUB   NOP                 SUB   NOP           SUB    NOP
      JSB .ZRNT                 JSB $LIBR             RSS
      DEF LIBX                  DEF TDB               DEF LIBX
      JSB .ENTP                 JSB .ENTP             JSB .ENTP
      DEF PRAM1                 DEF PRAM1             DEF PRAM1
      STA TDB+2                 STA TDB+2             STA TDB+2
      ...                       ...                   ...
      ...                       ...                   ...
LIBX  JMP TDB+2,I         LIBX  JSB $LIBX     LIBX    JMP TDB+2,I
      DEF TDB                   DEF TDB               DEF TDB
      DEC 0                     DEC 0                 DEC 0
```

This method allows a library subroutine which is not in the resident library to avoid the unnecessary system overhead involved in re-entrant processing, and the disabling of the interrupt system required in priviledged processing.

Please send any questions, comments, or suggestions involving your HP 1000 (9600) system to:

SOFTWARE SAMANTHA
C/O
Data Systems COMMUNICATOR Editor
Hewlett-Packard
11000 Wolfe Road
Cupertino
CA 94014

HP MEDIA PRODUCTS

Bob Hoke/Disc Memory Division

There have been several requests for an explanation of HP Disc Memory Division's position on the use of non-HP media products (packs and cartridges) on HP driver products. The following are the reasons why we *strongly* specify that our users use *only* the HP supplied media product.

First, the distinction must be made between media and other supplies-type products such as mag-tape and line printer paper. In the case of media, HP's disc driver reliability and performance is intimately dependent upon the quality and performance of the pack or cartridge.

Specifications, such as data integrity, interchangeability, and error-rate performance must be specified in conjunction with a media that meets stringent HP tolerances. yet as important as these specs are, they are not as important as some critical mechanical balance and surface flatness criteria. The mechanical tolerances, although extremely difficult to specify, are factors that can cause major catastrophic damage to HP disc products.

Our experience shows that media from the outside (even from our own vendors) do not reliably meet the above criteria. HP has invested around $200K worth of unique electronic measurement and testing equipment for testing and verifying each and every pack or cartridge product. The high rate of rejection, considering these products were built to HP specs, is the reason why we feel we must continue to carefully control the quality of the media products installed in HP drives. The main reason for rejection turns out not to be the error rate performance but failure to meet the mechanical tolerances.

The user must understand that HP is not supplying the same product as available from an outside vendor. The HP product is selected, uniquely and individually tested, and certified to meet HP's rigid requirements for total driver performance. This added value does make our product cost somewhat more but the added costs are necessary to achieve a high level of customer satisfaction.

WHERE AN OUTSIDE PACK IS USED AND DAMAGE OCCURS AS A RESULT, HP WILL NOT PAY FOR THE REPAIR OF THAT DAMAGE UNDER WARRANTY OR UNDER THE SERVICE CONTRACT.

The media area is under careful study at HP Disc Memory Division and everything possible is being done to bring our customers the best possible value in both drive and media products.

13260A SWITCHES

Marlu Allan/DSD

When your HP 2645 Terminal is delivered to your site, do you have trouble getting it to talk to your HP 21MX Computer? If the answer is yes, do not fret; we have the cure for the ailment.

It turns out, the HP 13260A Extended Asynchronous Communication Interface, ordered separately or as option 30 for the 2645A Terminal, does not come configured for HP 21MX communications. Reconfiguring the switches on the 13260A Interface card is necessary. The information needed to do this is contained in the DVR05 reference manual, part number, 92001-90015.

DOCUMENTATION

The following tables list currently available customer manuals for Data Systems Division products. This list supersedes the list in the last issue of the COMMUNICATOR 1000.

The most recent changes to the tables are indicated for easy reference. Prices are subject to change without notice.

Copies of manuals can be obtained from your local Sales and Service office. The address and telephone number of the office nearest to you are listed in the back of all customer manuals.

Customers in the U.S. may also order directly by mail. Simply list the name and part number of the manual(s) you need on the Corporate Parts Center form supplied at the back of the COMMUNICATOR 1000.

Change notices are free of charge. If you require a change notice only, send your request to:

Software/Publications Distribution
11000 Wolfe Road
Cupertino, CA. 95014

A few words about documentation terms:

*N A new manual refers only to the first printing of a manual. When first printed, a manual is assigned a part number.

*R A revised manual is a printing of an existing manual which incorporates new and/or changed information in its contents. For example, a manual is revised when a change notice is incorporated into the manual: the manual gets a new print date and the change notice disappears. Note that a revision to a manual obsoletes the previous version of the manual.

Change Notice A change notice is a supplement to an existing manual which contains new and/or changed information. It is issued when information must get to customers,yet it is inappropriate to issue a revised manual. A change notice has no part number; it is automatically included when you order the manual with which it is associated.

1000 SYSTEM MANUALS

PART NUMBER	MANUAL TITLE	PRICE	PRINT DATE	CHANGE NOTICE
02170-90006	HP 1000 Computer System Installation and Service	$ 2.50	7/77	
02172-90005	Getting Started with Your HP 1000 Disc Based Computer System (for A computers)	4.00	6/77	
02172-90010	Getting Started with Your HP 1000 Disc Based Computer System (for B computers)	2.50	8/77	
02173-90007	Getting Started with Your HP 1000 System: Models 20 and 21	7.00	8/77	
91780-93001	RJE/1000 Programming Manual	9.50	11/76	6/77

RTE SYSTEMS MANUALS

PART NUMBER	MANUAL TITLE	PRICE	PRINT DATE	CHANGE NOTICE
02313-93002	RTE 2313B Analog-Digital Interface Subsystem Operating and Service Manual	$30.00	8/76	12/77
02320-93002	RTE System Driver DVR76 for HP 2320A Low Speed Data Acquisition Subsystem Programming and Operating Manual	1.00	8/74	
02321-93001	RTE System Driver DVR 74 for HP 2321A Low Speed Data Acquisition Subsystem Programming and Operating Manual	2.00	8/74	
09600-93010	RTE System DVR11 for HP 2892A Card Reader Programming and Operating Manual	1.00	8/74	
09600-93015	91200B TV Interface Kit; Programming and Operating Manual	4.50	7/75	1/76
09601-93005	RTS System Subsoutine for General Purpose Registers	3.00	10/74	10/77
09601-93007	RTE Device Subroutine for HP 5327A/B-H48 Counter	2.50	12/74	
09601-93009	RTE Device Subroutine for HP 5326A-H18 Counter	2.50	12/74	
09601-93015	RTE for 40-bit Output Register #12556B	1.00	10/74	
09601-93017	RTE System Subroutine for HP 12555B D-A Converter	1.00	10/74	10/77
09603-93001	9603A/9604A Control System and Scientific Measurement Operating and Service Manual	7.50	5/76	
09610-93003	ISA FORTRAN Extension Package Reference Manual	4.50	12/77	
09611-90009	9611A Operating 406 Industrial Measurement and Control System	.25	4/75	
09611-90010	HP 6940A/B Multiprogrammer Verification Manual	4.50	8/75	
12604-93002	RTE DVR40 for 12604B Data Source Interface	1.00	8/74	
12665-93001	RTE System Driver DVR65 for HP 12771A Computer Serial Interface Kit	1.00	8/74	
12732-90001	RTE Driver DVR33 Programming Manual	2.00	2/77	
13197-90001	RTE Driver DVR36 Programming and Operating Manual	3.00	9/76	
24998-90001	DOS/RTE Relocatable Library Reference Manual	10.00	10/77	
25117-93003	RTE System Driver DVR24 for HP 7970 Series Digital Magnetic Tape Unit	1.00	8/74	
29003-93001	RTE System Driver DVR66 for HP 12772A Coupler Modem Interface Kit Programming and Operating Manual	1.00	8/74	
29003-93003	RTE System Driver DVR66 for HP 12770A Coupler Serial Interface Kit Programming and Operating Manual	1.00	8/74	
29009-93001	RTE System Driver DVR62 for HP 2313B Subsystem	2.50	8/74	
29028-95001	RTE HP 2610A/2614A Line Printer Driver	1.50	8/73	
29029-95001	Real-Time Executive System Driver DVR00 for Multiple Device System Control Small Programs Manual	1.50	11/75	
29100-93001	RTE System Driver DVR40 (29100-60041) for HP 12604B Data Source Interface Programming and Operating Manual	1.00	8/76	
29101-93001	RTE Core-Based Software System Users Manual	10.00	1/76	
29102-93001	RTE BASIC Software System Programming and Operating Manual	10.00	3/74	8/75
29103-93001	RTE System Cross Loader; Programming and Operating Manual	2.50	12/76	5/77
59310-90063	DVR37 Manual	3.50	6/77	
59310-90064	HP-IB Interface Bus I/O Kit Users Guide	8.50	4/77	6/77
91060-93005	RTE Driver for X-Y Display Storage Subsystem (HP Model 1331C-016) Programming and Operating Manual	1.00	8/74	
91062-93003	Real-Time Executive System Driver for DVM/Scanner Subsystem	9.00	8/74	
91700-93001	Distributed System CCE Operating Manual	20.00	5/77	9/77
91705-93001	Distributed System SCE/5 Operating Manual	15.00	12/76	9/77
91200-90005	RTE Driver DVA13 for TV Interface (HP 91200B)	1.50	5/77	
92001-90015	RTE DVR05 for 264X Terminals	2.00	9/76	
92001-93001	RTE-II Software System Programming and Operating Manual	10.00	7/77	10/77
92060-90004	RTE-III Software System Programming and Operating Manual	12.00	7/77	8/77
92060-90005	RTE Assembler Reference Manual	7.00	11/77*R	
92060-90009	RTE-III General Information Manual	4.00	2/76	
92060-90010	RTE Batch/Spool Monitor and Operating System Pocket Guide	4.50	4/77	
92060-90012	RTE: A Guide for New Users	6.50	7/76	
92060-90013	Batch-Spool Monitor Reference Manual	9.50	10/77	
92060-90014	RTE Interactive Editor Reference Manual	6.00	5/77	
92060-90017	RTE Utility Programs	3.00	3/77	
92060-90020	RTE On-Line Generator	15.00	7/77	10/77

RTE SYSTEMS MANUALS (Continued)

PART NUMBER	MANUAL TITLE	PRICE	PRINT DATE	CHANGE NOTICE
92064-90002	RTE-M Programmer's Reference Manual	$ 14.00	3/77	10/77
92064-90003	RTE-M System Generation Reference Manual	7.50	3/77	10/77
92064-90004	RTE-M Editor Reference Manual	6.00	1/77	
92064-90007	RTE-M Pocket Guide	4.50	6/77	
92200-93001	RTE System Driver DVR12 for HP 2607A Line Printer Programming and Operating Manual	1.00	8/74	
92200-93005	Real-Time Executive Operating System Drivers and Device Subroutine Manual	5.00	10/77	
92202-93001	RTE System Driver DVR23 for HP 7970 Series Digital Mag Tape Units Programming and Operating Manual	1.00	8/74	
92400-93001	92400A Utility Library Subroutine for Sensor-Based Diagnostics	7.50	11/76	
93005-93005	Thermal Line Printer Subsystem for Driver DVR00 (RTE)	2.50	12/74	

HARDWARE MANUALS

CHANGE NOTICE	MANUAL TITLE	PRICE	PRINT DATE	CHANGE NOTICE
02108-90002	HP 21MX M-Series Computer Reference Manual	$ 5.50	6/76	7/76
02108-90006	HP 21MX M-Series Computer Installation and Service Manual	10.00	7/76	
02108-90004	HP 21MX M-Series Computer Operators Manual	5.00	7/76	
02108-90017	21MX M-Series Computer Engineering and Reference Documentation	125.00	5/77	
02108-90027	21MX K-Series Computer Engineering and Reference Documentation	100.00	5/77	
02109-90001	HP 21MX E-Series Computer Operating and Reference Manual	8.00		
02109-90002	HP 21MX E-Series Computer Installation and Service Manual	15.00	8/76	3/77
02109-90006	HP 21MX M- and E-Series Computer I/O Interfacing Guide	7.00	10/77*R	12/77
02109-90014	21MX E-Series Computer HP 2109B and HP 2113B Operating and Reference Manual	8.00	8/77	
02109-90015	21MX E-Series Computer HP 2109B and HP 2113B Installation and Service Manual	15.00	8/77	9/77
12732-90005	HP 12732A/12733A Flexible Disc Subsystem Operating and Service Manual	5.50	8/77	
12979-90006	HP 12979A I/O Extender Installation and Service Manual	15.00	6/77	9/77
12979-90007	HP 12979A I/O Extender Operating and Reference Manual	5.00	12/75	9/77
12979-90014	HP 12979B Input/Output Extender Operating and Reference Manual	2.00	8/77	
12979-90016	HP 12979B Input/Output Extender Installation and Service Manual	12.00	8/77	8/77
12990-90003	HP 12990A Memory Extender Installation and Service Manual	5.50	4/76	8/76
5950-3765	21MX E-Series Computer Technical Reference Manual	3.50	6/77	

LANGUAGE MANUALS

PART NUMBER	MANUAL TITLE	PRICE	DATE	CHANGE NOTICE
02100-90140	Decimal String Arithmetic Routines	$ 6.50	2/77	
02108-90032	HP 21MX M-Series Computer RTE Microprogramming Reference Manual	15.00	10/76	9/77
02108-90034	HP 21MX M-Series Computer RTE Microprogramming Pocket Guide	2.75	1/77	
02109-90004	21MX E-Series Computer RTE Microprogramming Reference Manual	20.00	3/77	
02109-90008	21MX E-Series Computer RTE Microprogramming Pocket Guide	2.50	11/76	
02116-9014	HP Assembler Manual	6.50	8/75	
02116-9015	HP FORTRAN Manual	6.00	1/77	
02116-9016	Symbolic Editor	4.50	2/74	
02116-9072	ALGOL Reference Manual	10.00	11/76	
12907-90010	Implementing the HP 2100 Fast FORTRAN Processor	1.00	7/76	
24307-90014	DOS-III Assembler Reference Manual	8.00	7/74	
92060-90005	RTE Assembler Reference Manual	7.00	12/76	
92060-90016	Multi-User Real-Time BASIC Reference Manual	12.00	9/77	
92060-90023	RTE FORTRAN IV Reference Manual	10.00	7/77	
92063-90001	IMAGE/1000 Data Base Management System Reference Manual	9.00	10/77*R	12/77
92063-90004	IMAGE/1000 Data Base Management System Pocket Guide	4.00	6/77	
92065-90001	RTE-M Real-Time BASIC Language Reference Manual	8.50	2/77	7/77
02108-90008	HP 21MX M-Series Computer BCS and DOS Microprogramming Reference Manual	7.00	10/77*R	

SOFTWARE UPDATES

Following are cross-reference lists of the available 92001B, 92060B, 92062A, and 92064A (options 20 & 40) software modules, the media on which the software modules are distributed, and the date code or revision of each module up to, and including level 1740. Software modules updated since the last issue are indicated for easy reference.

NOTE:

For each module, interdependencies with other modules may exist (i.e., any updated module may require other updated modules to function properly).

SOFTWARE MODULE NUMBERS: 92001B LEVEL 1740 (RTE II)

The following modules are also available on a 7900 RTE Master Software Disc (#92001-13001), or a 7905 RTE Master Software Disc (#92001-13101).

MODULE	DESCRIPTION	REVISION CODE	MINI CARTRIDGE	PAPER TAPE
!S4LP7	24K SIO LINE PRINTER DRIVER	1538	92001-13305	92007-16004
%DVR15	RTE 7261A DRIVER	A	92062-13304	7961-16021
%DVR33	FLEXIBLE DISC DRIVER	1726	92062-13304	12732-16001
!S4MT1	24K SIO MAG.TAPE DRIVER	1550	92001-13305	1297[illegible]-16004
%DVR30	RTE FIXED HEAD DISC DRIVER	C	92062-13305	2[illegible]-6[illegible]1
%CAL1[illegible]	CAL. PLOTTER DRIVER	B	92062-13302	2[illegible]-6[illegible]1
%CALIB	CAL. PLOTTER LIBRARY	C	92062-13302	2[illegible]-6[illegible]1
%1FTN	FORTRAN MAIN CONTROL	E	92060-13308	2[illegible]-6[illegible]1
%2FTN	FORTRAN PASS 1	E	92060-13308	2[illegible]-6[illegible]2
%3FTN	FORTRAN PASS 2	E	92060-13308	2[illegible]-6[illegible]3
%4FTN	FORTRAN PASS 3	E	92060-13308	2[illegible]-6[illegible]4
%5FTN	FORTRAN PASS 4	E	92060-13308	2[illegible]-6[illegible]5
%ALGOL	RTE/DOS ALGOL PART 1	1643	92060-13305	24129-6[illegible]1
%ALGL1	RTE/DOS ALGOL PART 2	C	92060-13305	24129-6[illegible]2
%FF.N	RTE/DOS FORMATTER	C	92060-13303	24153-6[illegible]1
%DECAR	DOSM ST ARITH PK	A	92060-13303	24306-6[illegible]1
%RLIB1	RTE/DOS LIBRARY PART 1	1740	92060-13302	24998-16001
%RLIB2	RTE/DOS LIBRARY PART 2	1740	92060-13302	24998-16001
%FF4.N	FORTRAN IV FORMATTER	1726	92060-13303	24998-16002
%DVR24	RTE 7970 7T MAG. TAPE DRIVER	D	92062-13305	25117-60459
%DVR31	RTE 7906A DISC DRIVER	1710	92062-13305	29013-6[illegible]1
%DVR12	RTE 2767A DRIVER	A	92062-13303	29028-6[illegible]2
%DVR00	RTE TTY/PUNCH/PHOTO READER	1740	92062-13302	29029-6[illegible]1
%DVR11	RTE 2892A CARD READER DRIVER	1710	92062-13303	29030-6[illegible]1
!S4LP	24K SIO LINE PRINTER	A	92001-13305	29100-6[illegible]17
!S4SYD	24K SIO SYSTEM DUMP	A	92001-13305	29100-6[illegible]18
!S4PHR	24K SIO PHOTO READER	A	92001-13305	29100-6[illegible]19
!S4PUN	24K SIO TAPE PUNCH	A	92001-13305	29100-6[illegible]20
!S4L67	24K SIO 2767 LINE PRINTER	A	92001-13305	29100-6[illegible]22
!S4MT2	24K SIO 7970 MAG. TAPE	A	92001-13305	29100-6[illegible]23
!S4MT3	24K SIO MAG. TAPE	A	92001-13305	29100-6[illegible]49
!S4TER	24K SIO TERMINAL PRINTER	A	92001-13305	29100-6[illegible]50
%1DV37	RTE HP-IB WITHOUT SRQ	1726	92062-13304	59310-16002
%2DV37	RTE HP-IB WITH SRQ	1726	92062-13304	59310-16003
%HPIB	HP-IB DEVICE SUBROUTINE	1710	92062-13304	59310-16004
%SRQ.P	SRQ.P TRAP UTILITY	1710	92062-13304	59310-16005
%1DV10	COMP. 7210A PLOTTER DRIVER	A	92062-13302	72008-60001
%2DV10	MIN. 7210A PLOTTER DRIVER	A	92062-13302	72009-60001
%DVA13	91200A DRIVER	1648	92062-13303	91200-16001
%TVLIB	91200A VIDEO MONITOR LIBRARY	1648	92062-13303	91200-16002
%TVVER	91200A TV INTERFACE VERIFIER	1648	92062-13303	91200-16004
%MTM	MULT. TERMINAL MONITOR	B	92060-13301	92001-16003
%SYLIB	RTE SYSTEM LIBRARY	1740	92060-13301	92001-16005
%AUTOR	AUTO RESTART PROGRAM	1631	92060-13310	92001-16014
%DVA12	2607/10/13/14/17/18 DRIVER	1534	92062-13303	92001-16020
%4DV05	RTE 2644/45 DRIVER	1740	92062-13302	92001-16027

(Continued)

SOFTWARE MODULE NUMBERS: 92001B LEVEL 1740 (RTE II)

MODULE	DESCRIPTION	MINI CARTRIDGE	REVISION CODE	PAPER TAPE
↓2GN00	RTE-II 7900 OFF-LINE GEN.	1631	92001-13303	92001-16013
%AUTOR	AUTO RESTART PROGRAM	1631	92001-13302	92001-16014
↓2GNFH	RTE-II FIXED HEAD DISC GEN.	1631	92001-13306	92001-16018
%DVA12	2607/10/13/14/17/18 DRIVER	1534	92062-13303	92001-16020
↓2GN05	RTE-II 7905 OFF-LINE GEN.	1631	92001-13303	92001-16026
%4DV05	RTE 2644/45 DRIVER	1740	92062-13302	92001-16027
%2DV05	RTE 2640A DRIVER	1740	92062-13302	92001-16028
%SCMD2	RTE-II COMMAND PROGRAM	1710	92001-13301	92001-16029
%WHZT2	RTE-II WHZAT PROGRAM	1726	92001-13302	92001-16030
%RT2G1	RTE-II ON-LINE GENERATOR PT. 1	1704	92001-13304	92001-16031
%RT2G2	RTE-II ON-LINE GENERATOR PT. 1	1704	92001-13304	92001-16031
%DVA05	RTE DRIVER 264X MODEM	1740	92062-13302	92001-16035
&AUTOR	AUTO RESTART SOURCE	1631	92001-13302	92001-16014
&AN2F0	RTE-II 7900 GFATHER ANSW FILE	1631	92001-13307	92001-18033
&AN2F5	RTE-II 7905 GFATHER ANSW FILE	1631	92001-13307	92001-18034
%BMPG1	BATCH MONITOR PROGRAM PART 1	1631	92002-13301	92002-12001
%BMPG2	BATCH MONITOR PROGRAM PART 2	1631	92002-13301	92002-12001
%BMPG3	BATCH MONITOR PROGRAM PART 3	1631	92002-13301	92002-12001
%2SPO1	RTE-II SPOOL MONITOR PART 1	1631	92002-13303	92002-12002
%2SPO2	RTE-II SPOOL MONITOR PART 2	1631	92002-13303	92002-12002
%BMLIB	BATCH LIBRARY	1631	92002-13302	92002-16006
%EDITR	RTE EDITOR	C	92002-13302	92002-16010
%ASMB	RTE ASSEMBLER	1634	92060-13304	92060-12004
%CLIB	RTE COMPILER LIBRARY	1726	92060-13315	92060-12005
%XREF	CROSS REFERENCE	A	92060-13304	92060-16028
%DVR32	RTE 7905A DISC DRIVER	A	92062-13305	92060-16031
%SWTCH	RTE-II SWITCH PROGRAM	1710	92001-13304	92060-16038
%SAVE	SAVE PROGRAM	1704	92060-13309	92060-16039
%RESTR	RESTORE PROGRAM	1704	92060-13309	92060-16040
%VERFY	DISC VERIFY PROGRAM	1704	92060-13309	92060-16041
%COPY	DISC COPY PROGRAM	1704	92060-13309	92060-16042
%DBKLB	DISC BACK UP LIBRARY	1704	92060-13309	92060-16043
↓DSKUP	OFF LINE DISC BACK UP	1704	92060-13309	92060-16044
%RDNAM	READ NAME PROGRAM	1631	92001-13302	92060-16045
%KEYS	SOFT KEY UTILITY	1707	92001-13002	92060-16052
%KYDMP	SOFT KEY DUMP UTILITY	1707	92001-13002	92060-16053
%FTN4	RTE FORTRAN IV MAIN	1726	92060-13316	92060-16092
%FFTN4	RTE FORTRAN IV SEG F	1726	92060-13316	92060-16093
%0FTN4	RTE FORTRAN IV SEG 0	1726	92060-13316	92060-16094
%1FTN4	RTE FORTRAN IV SEG 1	1726	92060-13316	92060-16095
%2FTN4	RTE FORTRAN IV SEG 2	1726	92060-13316	92060-16096
%3FTN4	RTE FORTRAN IV SEG 3	1726	92060-13316	92060-16097
%4FTN4	RTE FORTRAN IV SEG 4	1726	92060-13316	92060-16098
&UPDAT	UPDATE TRANSFER FILE	1740	92001-13302	92060-18046
&PKDIS	PACK DISC TRANSFER FILE	1631	92001-13302	92060-18047
%MSAFD	FLEXIBLE DISC BACKUP UTILITY	1740	92060-13309	92064-16086
%DVR23	RTE 7970 9T. MAG. TAPE DRIVER	A	92062-13304	92202-16001
%2DV47	RTE 92900A DRIVER WITHOUT DMS	1643	92062-13302	92900-16002
%3DV47	RTE 92900A DRIVER WITH DMS	1631	92062-13302	92900-16003

SOFTWARE MODULE NUMBERS: 92060B LEVEL 1740 (RTE III)

The following modules are also available on a 7900 RTE Master Software Disc (#92060-13001), or a 7905 RTE Master Software Disc (#92060-13101), or a 7920 RTE Master Software Disc (#92060-13201).

MODULE	DESCRIPTION	REVISION CODE	MINI CARTRIDGE	PAPER TAPE
!S4LP7	24K SIO LINE PRINTER DRIVER	1538	92001-13305	92607-16004
%DVR15	RTE 7261A DRIVER	A	92062-13304	29601-16021
%DVR33	FLEXIBLE DISC DRIVER	1726	92062-13304	12732-16001
!S4MT1	24K SIO MAG. TAPE DRIVER	1550	92001-13305	12970-16004
%DVR30	RTE FIXED HEAD DISC DRIVER	C	92062-13305	20747-60001
%CAL1B	CAL. PLOTTER DRIVER	B	92062-13302	20808-60001
%CALIB	CAL. PLOTTER LIBRARY	C	92062-13302	20810-60001
%1FTN	FORTRAN MAIN CONTROL	E	92060-13308	20875-60001
%2FTN	FORTRAN PASS 1	E	92060-13308	20875-60002
%3FTN	FORTRAN PASS 2	E	92060-13308	20875-60003
%4FTN	FORTRAN PASS 3	E	92060-13308	20875-60004
%5FTN	FORTRAN PASS 4	E	92060-13308	20875-60005
%ALGOL	RTE/DOS ALGOL PART 1	1643	92060-13305	24129-60001
%ALGL1	RTE/DOS ALGOL PART 2	C	92060-13305	24129-60002
%FF.N	RTE/DOS FORMATTER	C	92060-13303	24153-60001
%DECAR	DOSM ST ARITH PK	A	92060-13303	24315-60001
%RLIB1	RTE/DOS LIBRARY PART 1	1740	92060-13302	24998-16001
%RLIB2	RTE/DOS LIBRARY PART 2	1740	92060-13302	24998-16001
%FF4.N	FORTRAN IV FORMATTER	1726	92060-13303	24998-16002
%DVR24	RTE 7970 7T MAG. TAPE DRIVER	D	92062-13305	25117-61499
%DVR31	RTE 7900A DISC DRIVER	1710	92062-13305	29013-60001
%DVR12	RTE 2767A DRIVER	A	92062-13303	29028-60002
%DVR00	RTE TTY/PUNCH/PHOTO READER	1740	92062-13302	29229-60001
%DVR11	RTE 2892A CARD READER DRIVER	1710	92062-13303	29030-60001
!S4LP	24K SIO LINE PRINTER	A	92001-13305	29100-60017
!S4SYD	24K SIO SYSTEM DUMP	A	92001-13305	29100-60018
!S4PHR	24K SIO PHOTO READER	A	92001-13305	29100-60019
!S4PUN	24K SIO TAPE PUNCH	A	92001-13305	29100-60020
!S4L67	24K SIO 2767 LINE PRINTER	A	92001-13305	29100-60022
!S4MT2	24K SIO 7970 MAG.TAPE	A	92001-13305	29100-60023
!S4MT3	24K SIO MAG. TAPE	A	92001-13305	29100-60049
!S4TER	24K SIO TERMINAL PRINTER	A	92001-13305	29100-60050
%1DV37	RTE HP-IB WITHOUT SRQ	1726	92062-13304	59310-16002
%2DV37	RTE HP-IB WITH SRQ	1726	92062-13304	59310-16003
%HPIB	HP-IB DEVICE SUBROUTINE	1710	92062-13304	59310-16004
%SRQ.P	SRQ.P TRAP UTILITY	1710	92062-13304	59310-16005
%1DV10	COMP. 7210A PLOTTER DRIVER	A	92062-13302	72008-60001
%2DV10	MIN. 7210A PLOTTER DRIVER	A	92062-13302	72009-60001
%DVA13	91200A DRIVER	1648	92062-13303	91200-16001
%TVLIB	91200A VIDEO MONITOR LIBRARY	1648	92062-13303	91200-16002
%TVVER	91200A TV INTERFACE VERIFIER	1648	92062-13303	91200-16004
%LDR2	RTE LOADER	1726	92001-13301	92001-16002
%MTM	MULT. TERMINAL MONITOR	B	92001-13301	92001-16003
%2DP43	POWER FAILURE DRIVER	1633	92001-13301	92001-16004
%SYLIB	RTE SYSTEM LIBRARY	1740	92001-13301	92001-16005
%CR2SY	CORE RESIDENT OPERATING SYS.	1740	92001-13301	92001-16012

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SOFTWARE MODULE NUMBERS: 92060B LEVEL 1740 (RTE III)

MODULE	DESCRIPTION	MINI CARTRIDGE	REVISION CODE	PAPER TAPE
%0DV05	RTE 2640A DRIVER	1740	92062-13302	92001-16028
%DVA05	RTE DRIVER 264X MODEM	1740	92062-13302	92001-16035
%AUTOR	AUTO RESTART PROGRAM SOURCE	1631	92060-13310	92001-18014
%BMPG1	BATCH MONITOR PROGRAM PART 1	1631	92002-13301	92002-12001
%BMPG2	BATCH MONITOR PROGRAM PART 2	1631	92002-13301	92002-12001
%BMPG3	BATCH MONITOR PROGRAM PART 3	1631	92002-13301	92002-12001
%BMLIB	BATCH LIBRARY	1631	92002-13302	92002-16006
%EDITR	RTE EDITOR	C	92002-13302	92002-16010
%3SP01	RTE-III SPOOL MONITOR PART 1	1631	92060-13313	92060-12001
%3SP02	RTE-III SPOOL MONITOR PART 2	1631	92060-13313	92060-12001
%CF3SY	MEMORY RESIDENT SYSTEM	1740	92060-13301	92060-12003
%ASMB	RTE ASSEMBLER	1639	92060-13304	92060-12004
%CLIB	RTE COMPILER LIBRARY	1726	92060-13315	92060-12005
%3DF43	POWER FAILURE DRIVER	1633	92060-13301	92060-16001
%LDR3	RTE-III LOADER	1726	92060-13301	92060-16004
%WHAT3	RTE-III WHZAT PROGRAM	1732	92060-13310	92060-16006
%XREF	CROSS REFERENCE	A	92060-13304	92060-16028
13GN00	7900 RTE-III GENERATOR	1631	92060-13311	92060-16029
%DVR32	RTE 7905A DISC DRIVER	A	92062-13305	92060-16031
13GN05	7905 RTE-III GENERATOR	1631	92060-13311	92060-16032
%SPVMP	SPVMP	A	92060-13301	92060-16035
%SCMD3	RTE-III COMMAND PROGRAM	1710	92060-13301	92060-16036
%RT3G1	RTE-III ON-LINE GENERATOR PT.1	1704	92060-13312	92060-16037
%RT3G2	RTE-III ON-LINE GENERATOR PT.2	1704	92060-13312	92060-16037
%SWTCH	RTE-III SWITCH PROGRAM	1710	92060-13312	92060-16038
%SAVE	SAVE PROGRAM	1704	92060-13309	92060-16039
%RESTR	RESTORE PROGRAM (RSTOR)	1704	92060-13309	92060-16040
%VERFY	DISC VERIFY PROGRAM	1704	92060-13309	92060-16041
%COPY	DISC COPY PROGRAM	1704	92060-13309	92060-16042
%DBKLB	DISK BACK UP LIBRARY	1704	92060-13309	92060-16043
!DSKUP	OFF LINE DISK BACK UP	1704	92060-13309	92060-16044
%RDNAM	READ NAMR PROGRAM	1631	92060-13310	92060-16045
%KEYS	SOFT KEY UTILITY	1707	92062-13310	92060-16052
%KYDMP	SOFT KEY DUMP UTILITY	1707	92060-13310	92060-16053
%FTN4	RTE FORTRAN IV MAIN	1726	92060-13316	92060-16092
%FFTN4	FORTRAN IV SEGMENT F	1726	92060-13316	92060-16093
%0FTN4	FORTRAN IV SEGMENT 0	1726	92060-13316	92060-16094
%1FTN4	FORTRAN IV SEGMENT 1	1726	92060-13316	92060-16095
%2FTN4	FORTRAN IV SEGMENT 2	1726	92060-13316	92060-16096
%3FTN4	FORTRAN IV SEGMENT 3	1726	92060-13316	92060-16097
%4FTN4	FORTRAN IV SEGMENT 4	1726	92060-13316	92060-16098
%UPDAT	UPDATE TRANSFER FILE	1740	92060-13310	92060-16046
%PKDIS	PACK DISK TRANSFER FILE	1631	92060-13310	92060-16047
%AN3F0	RTE-III 7900 GATHER ANSW FILE	1726	92060-13314	92060-16050
%AN3F5	RTE-III 9845/20 GATHER ANS FILE	1726	92060-13314	92060-16051
%MSAFD	FLEXIBLE DISC BACKUP UTILITY	1740	92060-13309	92060-16086
%DVR23	RTE 7970 9T. MAG. TAPE DRIVER	A	92062-13304	92062-16001
%2DV47	RTE 9895A DRIVER WITHOUT DMS	1726	92062-13302	92900-16002
%3DV47	RTE 9895A DRIVER WITH DMS	1643	92062-13302	92900-16003

SOFTWARE MODULE NUMBERS: 92062A LEVEL 1740 (RTE III)

MODULE	DESCRIPTION	REVISION CODE	MINI CARTRIDGE	PAPER TAPE
%DVR15	RTE 7261A DRIVER	A	92062-13304	09601-16021
%DVR33	FLEXIBLE DISC DRIVER	1726	92062-13304	12732-16001
%DVR30	RTE FIXED HEAD DISC DRIVER	C	92062-13305	20747-60001
%CAL1M	CAL. PLOTTER DRIVER	B	92062-13302	20608-60001
%CALIB	CAL. PLOTTER LIBRARY	C	92062-13302	20610-60001
%DVR24	RTE 7970 7T MAG. TAPE DRIVER	D	92062-13305	25117-6x499
%DVR31	RTE 7900A DISC DRIVER	1710	92062-13305	29013-60001
%DVR12	RTE 2767A DRIVER	A	92062-13303	29026-60002
%DVR00	RTE TTY/PUNCH/PHOTO READER	1740	92062-13302	29029-60001
%DVR11	RTE 2892A CARD READER DRIVER	1710	92062-13303	29030-60001
%1DV37	RTE HP-IB WITHOUT SRQ	1726	92062-13304	59310-16002
%2DV37	RTE HP-IB WITH SRQ	1726	92062-13304	59314-16003
%HPIB	HP-IB DEVICE SUBROUTINE	1710	92062-13304	59310-16004
%SRQ.P	SRQ.P TRAP UTILITY	1710	92062-13304	59314-16005
%1DV10	COMP. 7210A PLOTTER DRIVER	A	92062-13302	72008-60001
%2DV10	MIN. COMP. 7910A PLOTER DRIVE	A	92062-13302	72009-60001
%DVA13	9120A DRIVER	1648	92062-13303	9120-16001
%TVLIB	9120A VIDEO MONITOR LIBRARY	1648	92062-13303	9120-16002
%TVVER	9120A TV INTERFACE VERIFIER	1648	92062-13303	9120-16004
%DVA12	2607/10/13/14/17/18 DRIVER	1534	92062-13303	92001-16020
%4DV05	RTE 2644/45 DRIVER	1740	92062-13302	92001-16027
%0DV05	RTE 2640A DRIVER	1740	92062-13302	92001-16028
%DVA05	RTE DRIVER 264X MODEM	1740	92062-13302	92001-16035
%DVR32	RTE 7905A DISC DRIVER	A	92062-13305	92060-16031
%DVR23	RTE 7970 9T. MAG. TAPE DRIVER	A	92062-13304	92202-16001
%2DV47	RTE 9290A DRIVER WITHOUT DMS	1643	92062-13302	92900-16002
%3DV47	RTE 9290A DRIVER WITH DMS	1643	92062-13302	92900-16003

SOFTWARE MODULE NUMBERS: 92064A OPTIONS 20 & 40 LEVEL 1740 (RTE-M)

The following modules are unique in that they are available on Flexible disc as well as Paper Tape and Mini-Cartridge.

STRUCTURE

The RTE-M operating system is divided into three groups. Refer to the RTE-M Programmer's Reference Manual (part no. 92064-90002) for a description of the operating systems.

Within this list the modules that correspond with each operating system are described as MI, MII, or MIII.

CARTRIDGE TAPES

There are three cartridge tapes that contain the three operating systems. The part numbers of these cartridge tapes and the corresponding operating systems follow:

92064-13301	RTE-MI
92064-13302	RTE-MII
92064-13303	RTE-MIII

Modules that correspond with two or all three operating systems and are contained on more than one cartridge tape contain (MI), (MII), or (MIII) in their description.

Modules that do not directly relate to the operating systems are contained on the other cartridge tapes.

FLEXIBLE DISCS

There are two flexible discs referred to as GEN DISC and APP DISC. The GEN DISC (92064-13401) contains all the software that can be loaded at generation. The APP DISC (92064-13402) contains all the application software that can be loaded on-line. As with the cartridge tapes, some of the modules can be found on both flexible discs.

The Generation disc contains the following:

- Off-line generator
- All operating system software
- I/O drivers
- Certain HP user programs

The Applications disc contains the following:

- HP applications programs — Assembler
  FORTRAN compiler
  Editor
  Cross reference program
- Certain relocatable system software
- Certain user programs

Modules that appear on both flexible discs contain (GEN DISC) or (APP DISC) in their description.

SOFTWARE MODULE NUMBERS: 92064A OPTIONS 20 & 40 LEVEL 1740 (RTE-M)

MODULE	DESCRIPTION	REVISION CODE	MINI CARTRIDGE	PAPER TAPE	FLEXIBLE DISC
%DVR15	RTE 7261A CARD READER DRIVER	A	92062-13304	09601-16021	92064-13401
%DVR33	FLEXIBLE DISC DRIVER	1650	92062-13304	12732-16001	92064-13401
%CAL10	RTE PLOTTER DRIVER	B	92062-13302	20806-60001	92064-13401
%CALIB	CAL. PLOTTER LIBRARY	C	92062-13302	20810-60001	92064-13401
%FF.N	RTE/DOS FORTRAN FORMATTER	C	92060-13303	24153-60001	92064-13402
%FF.N	RTE/DOS FORTRAN FORMATTER	C	92060-13303	24153-60001	92064-13401
%DECAR	DOSM STRING ARITH PK	A	92060-13303	24306-60001	
%RLIB1	RTE/DOS LIBRARY	1740	92060-13302	24998-16001	92064-13401
%RLIB1	RTE/DOS LIBRARY	1740	92060-13302	24998-16001	92064-13402
%RLIB2	RTE/DOS LIBRARY	1740	92060-13302	24998-16001	92064-13402
%RLIB2	RTE/DOS LIBRARY	1740	92060-13302	24998-16001	92064-13401
%FF4.N	FORTRAN IV FORMATTER	1624	92060-13303	24998-16002	92064-13402
%FF4.N	FORTRAN IV FORMATTER	1624	92060-13303	24998-16002	92064-13401
%DVR12	RTE 2767A DRIVER	A	92062-13303	29028-60002	92064-13401
%DVR00	RTE TTY/PUNCH/PHOTO READER	1740	92062-13302	29029-60001	92064-13401
%DVR11	RTE 2892A CARD READER DRIVER	1710	92062-13303	29030-60001	92064-13401
%1DV37	HP-IB WITHOUT SYSTEM REQUEST	1710	92062-13304	59310-16002	92064-13401
%2DV37	HP-IB WITH SYSTEM REQUEST	1710	92062-13304	59310-16003	92064-13401
%HPIB	HP-IB RTE UTILITY	1710	92062-13304	59310-16004	92064-13401
%SRQ.P	SRQ.P TRAP UTILITY	1710	92062-13304	59310-16005	92064-13401
%1DV10	COMP. 7210A PLOTTER DRIVER	A	92062-13302	72008-60001	92064-13401
%2DV10	MIN. COMP. 7210A PLOTTER DRIVE	A	92062-13302	72009-60001	92064-13401
%DVA13	91200 TV INTERFACE DRIVER	1648	92062-13303	91200-16001	92064-13401
%TVLIB	VIDEO MONITOR LIBRARY	1648	92062-13303	91200-16002	92064-13401
%TVVER	TV INFT VERIF	1648	92062-13303	91200-16004	92064-13401
%DVA12	2607/10/13/14/17/18 DRIVER	1534	92062-13303	92001-16020	92064-13401
%4DV05	RTE 2644/45 DRIVER	1740	92062-13302	92001-16027	92064-13401
%0DV05	RTE 2640A DRIVER	1740	92062-13302	92001-16028	92064-13401
%DVA05	RTE DRIVER 264X MODEM	1740	92062-13302	92001-16035	92064-13401
%KEYS	SOFT KEY UTILITY	1707	92064-13304	92060-16052	92064-13402
%KYDMP	SOFT KEY DUMP UTILITY	1707	92064-13304	92060-16053	92064-13402
%FTN4	FORTRAN IV MAIN	1726		92060-16092	92064-13402
%FFTN4	RTE FORTRAN IV SEG ID SUB	1726		92060-16093	92064-13402
%0FTN4	FORTRAN IV SEGMENT 0	1726		92060-16094	92064-13402
%1FTN4	FORTRAN IV SEGMENT 1	1726		92060-16095	92064-13402
%2FTN4	FORTRAN IV SEGMENT 2	1726		92060-16096	92064-13402
%3FTN4	FORTRAN IV SEGMENT 3	1726		92060-16097	92064-13402
%4FTN4	FORTRAN IV SEGMENT 4	1726		92060-16098	92064-13402
%FMPC	CARTRIDGE FMP/FMPCR (LIB)	1709	92064-13306	92064-12005	92064-13401
%FMPF	FLEX DISC FMGR LIB (GEN DISC)	1726		92064-12006	92064-13401
%FMPF	FLEX DISC FMGR LIB (APP DISC)	1726		92064-12006	92064-13402
%CLIBM	RTE COMPILER LIBRARY	1726		92064-12007	92064-13402
%MSY1	MI OPERATING SYSTEM	1726	92064-13301	92064-16001	92064-13401
%MSY2	MII OPERATING SYSTEM	1726	92064-13302	92064-16002	92064-13401
%MSY3	MIII OPERATING SYSTEM	1726	92064-13303	92064-16003	92064-13401
%MBU	MI BUFFERING	1650	92064-13301	92064-16005	92064-13401

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SOFTWARE MODULE NUMBERS: 92064A OPTIONS 20 & 40 LEVEL 1740 (RTE-M)

MODULE	DESCRIPTION	REVISION CODE	MINI CARTRIDGE	PAPER TAPE	FLEXIBLE DISC
%MMP	MI SCHEDULING OPTION	1650	92064-13301	92064-16006	92064-13401
%MTI	TIMER OPTION (MII)	1650	92064-13302	92064-16008	92064-13401
%MTI	TIMER OPTION (MIII)	1650	92064-13303	92064-16008	92064-13401
%MTI	TIMER OPTION (MI)	1650	92064-13301	92064-16008	92064-13401
%MTS	TIME SCHEDULING OPTION (MIII)	1650	92064-13303	92064-16009	92064-13401
%MTS	TIME SCHEDULING OPTION (MII)	1650	92064-13302	92064-16009	92064-13401
%MTS	TIME SCHEDULING OPTION (MI)	1650	92064-13301	92064-16009	92064-13401
%MOP	OPERATOR COMMAND OPTION (MIII)	1650	92064-13303	92064-16010	92064-13401
%MOP	OPERATOR COMMAND OPTION (MII)	1650	92064-13302	92064-16010	92064-13401
%MOP	OPERATOR COMMAND OPTION (MI)	1650	92064-13301	92064-16010	92064-13401
%MCL	CLASS I/O OPTION (MII)	1726	92064-13302	92064-16011	92064-13401
%MAP	MI/II ABSOLUTE PROGRAM LOADER	1726	92064-13305	92064-16012	92064-13401
%MDMLB	DUMMY LIBRARY (MII)	1650	92064-13302	92064-16013	92064-13401
%MDMLB	DUMMY LIBRARY (MI)	1650	92064-13301	92064-16013	92064-13401
%MDMLB	DUMMY LIBRARY (MIII)	1650	92064-13303	92064-16013	92064-13401
%MCL3	CLASS I/O OPTION (MIII)	1726	92064-13303	92064-16015	92064-13401
%MAP3	MIII ABSOLUTE PROGRAM LOADER	1726	92064-13305	92064-16016	92064-13401
%FMGC0	CARTRIDGE FILE MANAGER	1709	92064-13305	92064-16017	92064-13401
%DRC	CARTRIDGE DIR HAN PROGRAM	1650	92064-13304	92064-16018	92064-13401
%TBLCR	CARTRIDGE DIRECTORY TABLES	1650	92064-13304	92064-16019	92064-13401
%DRC1	MI CARTRIDGE DIRECTORY SUBR	1650	92064-13306	92064-16021	92064-13401
%RTMGN	SYSTEM GENERATOR	1726	92064-13305	92064-16022	92064-13401
%RTMLD	RELOCATING LOADER (GEN DISC)	1726	92064-13305	92064-16023	92064-13401
%RTMLD	RELOCATING LOADER (APP DISC)	1726	92064-13305	92064-16023	92064-13402
%RTMSC	LOADER SUB CONTROL (APP DISC)	1726	92064-13305	92064-16024	92064-13402
%RTMSC	LOADER SUB CONTROL (GEN DISC)	1726	92064-13305	92064-16024	92064-13401
%MEDIT	EDITOR	1703		92064-16025	92064-13402
%MASM6	CROSS REFERENCE SEGMENT	1650		92064-16026	92064-13402
%MPF	MI/II POWER FAIL	1650	92064-13304	92064-16027	92064-13401
%MPF3	MIII POWER FAIL	1650	92064-13304	92064-16029	92064-13401
%MAUTO	AUTOR REL	1650	92064-13304	92064-16030	92064-13401
%MRN	RESOURCE NUMBER MNGR (MIII)	1650	92064-13303	92064-16031	92064-13401
%MRN	RESOURCE NUMBER MANAGER (MII)	1650	92064-13302	92064-16031	92064-13401
%ONMTM	MULTI TERMINAL MONITOR (APP D)	1650	92064-13305	92064-16032	92064-13402
%ONMTM	MULTI TERMINAL MONITOR (GEN D)	1650	92064-13305	92064-16032	92064-13401
%MCGEN	ABSOLUTE CARTRIDGE GENERATOR	1726	92064-13307	92064-16033	
%SGPRP	SEGMENT PROGRAM PREP	1650		92064-16034	92064-13402
%MPRMP	PROMPT (MTM)	1650	92064-13305	92064-16035	92064-13401
%MRSPN	RESPONSE (MTM)	1650	92064-13305	92064-16036	92064-13401
%MASM0	ASSEMBLER MAIN CONTROL	1650		92064-16040	92064-13402
%MASM1	ASSEMBLER SEGMENT 1	1650		92064-16041	92064-13402
%MASM2	ASSEMBLER SEGMENT 2	1650		92064-16042	92064-13402
%MASM3	ASSEMBLER SEGMENT 3	1650		92064-16043	92064-13402
%MASM4	ASSEMBLER SEGMENT 4	1650		92064-16044	92064-13402
%MFTN0	FORTRAN MAIN CONTROL	1650		92064-16045	92064-13402
%MFTN1	FORTRAN SEGMENT 1	1650		92064-16046	92064-13402

(Continued)
SOFTWARE MODULE NUMBERS: 92064A OPTIONS 20 & 40 LEVEL 1740 (RTE-M)

MODULE	DESCRIPTION	REVISION CODE	MINI CARTRIDGE	PAPER TAPE	FLEXIBLE DISC
%MFNT2	FORTRAN SEGMENT 2	1650		92064-16047	92064-13402
%MASM5	ASSEMBLER SEGMENT 0	1650		92064-16050	92064-13402
%MXRF0	CROSS REFERENCE MAIN	1650		92064-16051	92064-13402
%DIRD	CARTRIDGE DIRECTORY READ	1650	92064-13304	92064-16054	92064-13401
%FMGF0	FLEX DISC FILE MNGR (GEN DISC)	1709		92064-16055	92064-13401
%FMGF0	FLEX DISC FILE MNGR (APP DISC)	1709		92064-16055	92064-13402
%DRF	F DISC DIRECT PROG (APP DISC)	1650		92064-16056	92064-13402
%DRF	F DISC DIRECT PROG (GEN DISC)	1650		92064-16056	92064-13401
%TBLFP	FLEXIBLE DISC DIRECT TABLES	1709		92064-16057	92064-13401
%DRF1	F DISC DIRECTORY SUB (APP D)	1650		92064-16060	92064-13402
%DRF1	F DISC DIRECTORY SUB (GEN D)	1650		92064-16060	92064-13401
IMFGEN	ABSOLUTE FLEXIBLE DISC SYSTEM	1726		92064-16075	92064-13401
%STRTM	RTE-M SYSTEM START-UP	1709	92064-13304	92064-16080	92064-13401
%MSYLB	RTE-M SYSTEM LIBRARY (GEN DISC	1709	92064-13306	92064-16081	92064-13401
%MSYLB	RTE-M SYSTEM LIBRARY (APP DISC	1709	92064-13306	92064-16081	92064-13402
%MSAFD	FLEXIBLE DISC BACKUP UTILITY	1740	92060-13309	92064-16086	92064-13402
&TBLCR	CARTRIDGE DIRECTORY TBLS SOURC	1650	92064-13306	92064-18059	92064-13402
&MHELP	EDITOR HELP FILE SOURCE	1650		92064-18126	92064-13402
&MAUTO	AUTOR SOURCE	1650	92064-13306	92064-18141	92064-13402
&TBLFP	FLEXIBLE DISC DIRECTORY SOURCE	1709		92064-18171	92064-13402
%DVR23	RTE 7970 9T, MAG. TAPE DRIVER	A	92062-13304	92202-16001	92064-13401
%2DV47	RTE 92900A DRIVER WITHOUT DMS	1643	92062-13302	92900-16002	92064-13401
%3DV47	RTE 92900A DRIVER WITH DMS	1643	92062-13302	92900-16003	92064-13401

TRAINING SCHEDULE

The schedule for customer training courses on Data Systems Division products has been expanded to include courses offered at our European training centers. Listed below are courses offered in the U.S. and in Europe during the period May 1977 through August 1977.

You can also obtain a copy of the training schedule from your local HP sales office. A European course schedule is available through the sales offices in Europe; a U.S. schedule through U.S. sales offices.

*Prices quoted are for courses at the two U.S. training centers only. For prices of courses at European training centers please consult your local HP Sales Office.

REGISTRATION

Requests for enrollment in any of the above courses should be made through your local HP representative. He will supply the Training Registrar at the appropriate location with the course number, dates, and requested motel reservations. Enrollments are acknowledged by a written confirmation indicating the Training Course, time of class, location and accommodations reserved.

ACCOMMODATIONS

Students provide their own transportation, meals and lodging. The Training Registrar will be pleased to assist in securing motel reservations at the time of registration.

CANCELLATIONS

In the event you are unable to attend a class for which you are registered please notify the Training Center Registrar immediately in order that we may offer your seat to another student.

TRAINING CENTER ADDRESSES

Cupertino

11000 Wolfe Road
Cupertino, California 95014
(408) 257-7000

Sunnyvale

974 East Arques
Sunnyvale, California

Rockville

4 Choke Cherry Road
Rockville, Maryland 20850
(301) 948-6370

Boise

P.O. Box 15
15 N. Phillippi Street
Boise, Idaho 83707
(208) 376-6000
TWX: 910-970-5784

Boblingen

Kundenschulung
Herrenbergerstrasse 110
D-7030 Boblingen, Wurttemberg
Tel: (07031) 667-1
Telex: 07265739
Cable: HEPAG

Winnersh

King Street Lane
GB-Winnersh, Wokingham
Berks RG11 5 AR
Tel: Wokingham 784774
Cable: Hewpie London
Telex: 847178 9

Grenoble

5, avenue Raymond-Chanas
38320 Eybens
Tel: (76) 25-81-41
Telex: 980124

Milan

Via Amerigo Vespucci, 2
1-20124 Milan
Tel: (2) 62 51
Cable: HEWPACKIT Milano
Telex: 32046

Madrid

Jerez No 3
E-Madrid 16
Tel: (1) 458 26 00
Telex: 23515 hpe

Stockholm

Enighetsvagen 1-3, Fack
S-161 20 Bromma 20
Tel: (08) 730 05 50
Cable: MEASUREMENTS
Stockholm
Telex: 10721

TITLE TRAINING COURSE RATES AND CENTER LOCATION

Course Number	Length	Price	Cupertino	Sunnyvale	Rockville	Boise	Boblingen	Winnersh	Grenoble	Milan	... Madrid	Stockholm	Amsterdam/ Brus.
01ETC	RTE II/III Driver Writing Course												
	3 days	$300											
22940A	2100 Maint.			Apr 3									
	10 days	1000											
22941A	21MX Maint.			Mar 13 Mar 27 Apr 17 Apr 24					May 22				
	5 days	500											
22942A	7900 Maint.			Mar 27 Apr 17 Apr 24					Apr 24				
	5 days	500											
22943A	7970B Maint.					Apr 10							
	5 days	600											
22944A	7970E Maint.					Apr 3							
	5 days	600											
22945A	7905 Maint.			Mar 6 Apr 10					Mar 6 Mar 13 May 15 May 22				
	5 days	500											
22950A	2100 Ser. Assm.		Apr 17		Mar 6 Apr 10		Mar 13 Apr 17 May 29	Apr 12		Mar 20		Mar 6 Apr 24	Apr 10
	5 days	500											
22965B	RTE-II/III		Mar 27 Apr 10 Apr 24		Mar 27 Apr 17		Mar 6 Apr 3 Apr 24 May 29	May 8		Apr 10		Apr 10 May 22	May 1
	10 days	1000											
	(Course includes RTE-II/III operating system, batch spool monitor and file manager.)												
22969A	Distr. Sys.		Apr 24					May 29	Apr 24				
	5 days	500											
22977A	Image/DBMS 1000		Mar 13 Apr 10										
	5 days	500											
22980B	HPIB Minicomputer Environment		Mar 13 Apr 24				May 15		Mar 6	Mar 6			
	4 days	400											

TITLE			TRAINING COURSE RATES AND CENTER LOCATION										
Course Number	Length	Price	Cupertino	Sunnyvale	Rockville	Boise	Boblingen	Winnersh	Grenoble	Milan	*** Madrid	Stockholm	Amsterdam/ Brus.
22983A	21MX E-Micro-programming		Mar 6						May 22				
	5 days	500											
22984A	7920 Maint.												
	5 days	500											
22985A	RTE-M		Apr 17		Mar 13 Apr 17								
	5 days	500											
22987A	DS 1000 Level 1		Apr 3										
	5 days	500											
22988A	DS 1000 Level 2		Apr 10		Apr 24								
	5 days	500											
22990A	RTE Driver Writing		Apr 3		Mar 20								
	3 days	300											
92780A	ATS-80 Automatic Test System		Mar 27										
	5 days	1000											

*NOTE: Dates within brackets are starting dates for week 1 and week 2 of the RTE course. In some cases there is a break between the two weeks of the class. Course 22977A, IMAGE/DBMS 1000 replaces 22953A (2100 IMAGE); the new class adds additional material and extends the training from 3 to 5 days.

***We have not yet received dates for Madrid or Amsterdam/Brus.

NEW CONTRIBUTED PROGRAMS

Melanie Van Vliet/DSD

This article serves as an update for the Data Systems LOCUS Program Catalog (22000-90099).

The new contributed programs listed below are now available. Contact your local HP Sales Office to order Contributed Library material, or (if you are in the U.S.) you can use the Direct Mail Order form at the back of the COMMUNICATOR 1000.

22682-13388 FSORT ALL ASCII FMGR FILES WITHOUT EXTENTS

FSORT is a very quick sink-or-swim core sort which can sort up to 80 fields with a maximum of 40 words (80 characters) total. FSORT will sort all ASCII FMGR file types in ascending sequence. The files must be without extents or truncation will occur. The program can be scheduled from FMGR, operator, or another program will accept string passage of required input. A maximum of 32767 records can be sorted with a maximum length as written of 128 words. However the user can easily modify the length requirements to fit his need. Minimum system requires one 7905 disc, one FTN4 compiler, one 21MX or 2100 HP system with at least 11K partitions. FSORT is set up for 15K partitions, but with minor modifications will fit in partitions from 11 - 16K. Decimal string arithmetic package is also required. Detailed information on modifications and execution are included within the program comments. Execution time varies with size of file and length of sort. Four thousand records of 72 characters were sorted on 18 columns in approximately 6 minutes. Time is dependent on system configuration.

22682-18988	PT	$40.00
22682-13388	mini-cartridge	$40.00

The following programs have been revised:

RTE SYSTEM DATE & TIME AUTO SCHEDULE
22682-18964 (all options)

RTE-II/III FMGR FILE TYPE 2 ASCII,
22682-10967 (all options)
INTEGER & REAL SORT PROGRAM PACKAGE

The following program has been withdrawn from the LOCUS and is no longer orderable:

22682-13363 ENCRYPTION FOR RTE FMGR FILES (all options)

The mini-cartridge option of the following program has had a price change:

22682-13328 RTE ADM Package $325.00

Please photocopy this order form if you do not want to cut the page off. You will automatically receive a new order form with your order.

HEWLETT hp PACKARD

CONTRIBUTED SOFTWARE
Direct Mail Order Form

NOTE: No direct mail order can be shipped outside the United States.

Please Print:

Name _____ **Title** _____

Company _____

Street _____

City _____ **State** _____ **Zip Code** _____

Country _____

Item No.	Part No.	Qty.	Description	List Price Each		Extended Total	

Sub-total		
Your State & Local Sales Taxes*		
Handling Charge	1	50
TOTAL		

*Tax is verified by computer according to your ZIP CODE. If no sales tax is added, your state exemption number must be provided: # _____.
If not, your order may have to be returned.

Domestic Customers: Cash required on all orders less than $50.00. Mail the order form with your check or money order (payable to Hewlett-Packard Co.) or your U.S. Company Purchase Order to:

HEWLETT-PACKARD COMPANY
Contributed Software
P.O. Box 61809
Sunnyvale, CA 94088

International Customers: Order through your local Hewlett-Packard Sales office. No direct mail order can be shipped outside the United States.

All prices domestic U.S.A. only. Prices are subject to change without notice.

ORDERING INFORMATION

Programs are available individually in source language on either paper tape, magnetic tape, or cassettes as indicated in the abstracts.

To order a particular program, it is necessary to specify the program identification number, together with an option number which indicates the type of product required. The program identification number with the option number composes the ordering number.

For example:

22113A-K01

The different options are:

K01 — Source paper tape and documentation
K21 — Magnetic tapes and documentation

NOTE

Specify 800 BPI or 1600 BPI Magnetic tape.

B01 — Binary tape and documentation
D00 — Documentation
L00 — Listing

Not all options are available for all programs.

Ten-digit numbers do not require additional option numbers such as K01, K21, etc. The 10-digit number automatically indicates the option or media ordered.

For example:

22681-18901 — The digits 189 indicate source paper tape plus documentation.
22681-10901 — The digits 109 indicate source magnetic tape plus documentation (800 BPI magnetic tape)
22681-11901 — The digits 119 indicate source magnetic tape plus documentation (1600 BPI magnetic tape)
22681-13301 — The digits 133 indicate source cassettes plus documentation

Only those options listed in each abstract are available.

Refer to the Price List for prices and correct order numbers.

Hewlett-Packard offers no warranty, expressed or implied and assumes no responsibility in connection with the program material listed.

HEWLETT-PACKARD
COMPUTER SYSTEMS COMMUNICATOR ORDER FORM

Please Print:

Name _____ **Title** _____

Company _____

Street _____

City _____ **State** _____ **Zip Code** _____

Country _____

☐ HP Employee Account Number _____ Location Code _____

☐ **DIRECT SUBSCRIPTION**

Part No.	Description	Qty	List Price	Extended Dollars	Total Dollars
5951-6111	COMMUNICATOR 1000	_____	$48.00	_____	
	(if quantity is greater than 1 discount is 40%)			_____	
	TOTAL DOLLARS for 5951-6111				_____
5951-6112	COMMUNICATOR 2000	_____	25.00	_____	
	(if quantity is greater than 1 discount is 40%)			_____	
	TOTAL DOLLARS for 5951-6112				_____
5951-6113	COMMUNICATOR 3000	_____	48.00	_____	
	(if quantity is greater than 1 discount is 40%)			_____	
	TOTAL DOLLARS for 5951-6113				_____

☐ **BACK ISSUE ORDER FORM (cash only in U.S. dollars)**
(subject to availability)

Part No.	Description	Issue No.	Qty	List Price	Extended Dollars	Total Dollars
5951-6111	COMMUNICATOR 1000	_____	_____	$10.00	_____	
		_____	_____	10.00	_____	
		_____	_____	10.00	_____	
	TOTAL DOLLARS					_____
5951-6112	COMMUNICATOR 2000	_____	_____	$ 5.00	_____	
		_____	_____	5.00	_____	
		_____	_____	5.00	_____	
	TOTAL DOLLARS					_____
5951-6113	COMMUNICATOR 3000	_____	_____	$10.00	_____	
		_____	_____	10.00	_____	
		_____	_____	10.00	_____	
	TOTAL DOLLARS					_____
TOTAL ORDER DOLLAR AMOUNT						_____

☐ **SERVICE CONTRACT CUSTOMERS**

You will receive one copy of either COMMUNICATOR 1000, 2000, or 3000 as part of your contract. Indicate additional copies below and have your local office forward. Billing will be included in normal contract invoices.

Number of additional copies _____

FOR HP USE ONLY

CONTRACT KEY

5951-6111 Number of additional copies _____
5951-6112 Number of additional copies _____
5951-6113 Number of additional copies _____

Approved _____

HEWLETT-PACKARD
COMMUNICATOR SUBSCRIPTION AND ORDER INFORMATION

The Computer Systems COMMUNICATORS are bi-monthly systems support publications available from Hewlett-Packard on an annual (6 issues) subscription.

The following instructions are for customers who do not have Software Service Contracts.

1. Complete name and address portion of order form.
2. For new direct subscriptions (see sample below):
   a. Indicate which COMMUNICATOR publication(s) you wish to receive.
   b. Enter number of copies per issue under Qty column.
   c. Extend dollars (quantity x list price) in Extended Dollars column.
   d. Enter discount dollars on line under Extended Dollars. (If quantity is greater than 1 you are entitled to a 40% discount.*)
   e. Enter Total Dollars (subtract discount dollars from Extended List Price dollars).

   **To qualify for discount all copies of publications must be mailed to same name and address and ordered at the same time.*

SAMPLE

☒ **DIRECT SUBSCRIPTION**

Part No.	Description	Qty	List Price	Extended Dollars	Total Dollars
5951-6111	COMMUNICATOR 1000	3	$48.00	$144.00	
	(if quantity is greater than 1 discount is 40%)			57.60	
	TOTAL DOLLARS for 5951-6111				$86.40

3. To order back issues (see sample below):
   a. Indicate which publication you are ordering.
   b. Indicate which issue number you want.
   c. Enter number of copies per issue.
   d. Extend dollars for each issue.
   e. Enter total dollars for back issues ordered.

   All orders for back issues of the COMMUNICATORS are cash only orders (U.S. dollars only) and are subject to availability.

SAMPLE

☒ **BACK ISSUE ORDER FORM (cash only in U.S. dollars)**
(subject to availability)

Part No.	Description	Issue No.	Qty	List Price	Extended Dollars	Total Dollars
5951-6111	COMMUNICATOR 1000	XX	1	$10.00	$10.00	
		XX	2	10.00	20.00	
				10.00		
	TOTAL DOLLARS					$30.00

4. Domestic Customers: Mail the order form with your U.S. Company Purchase Order or check (payable to Hewlett-Packard Co.) to:

   HEWLETT-PACKARD COMPANY
   Computer Systems COMMUNICATOR
   P.O. Box 61809
   Sunnyvale, CA 94088
   U.S.A.

5. International Customers: Order by part number through your local Hewlett-Packard Sales Office.

HEWLETT-PACKARD
LOCUS CONTRIBUTED SOFTWARE CATALOG
DIRECT MAIL ORDER FORM

Please Print:

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip Code _____

Country _____

☐ HP Employee Account Number _____ Location Code _____

Part Number	Description	Qty.	List Price Each	Extended Total
22000-90099	Locus Contributed Software Catalog		$15.00	
*If no sales tax is added, your state exemption number must be provided: #_____		Your State & Local Sales Taxes*		
If not, your order may have to be returned.		Handling Charge		1.50
		TOTAL		

Domestic Customers: Mail the order form with your check or money order (payable to Hewlett-Packard Co.) to:

HEWLETT-PACKARD COMPANY
LOCUS CATALOG
P.O. Box 61809
Sunnyvale, CA 94088

International Customers: Order by part number through your local Hewlett-Packard Sales Office.

NOTE: No direct mail order can be shipped outside the United States. All prices domestic U.S.A. only. Prices are subject to change without notice.

Although every effort is made to ensure the accuracy of the data presented in the **Communicator,** Hewlett-Packard cannot assume liability for the information contained herein.

Prices quoted apply only in U.S.A. If outside the U.S., contact your local sales and service office for prices in your country.

Printed in U.S.A. 2/78

Part No. 5951-6111