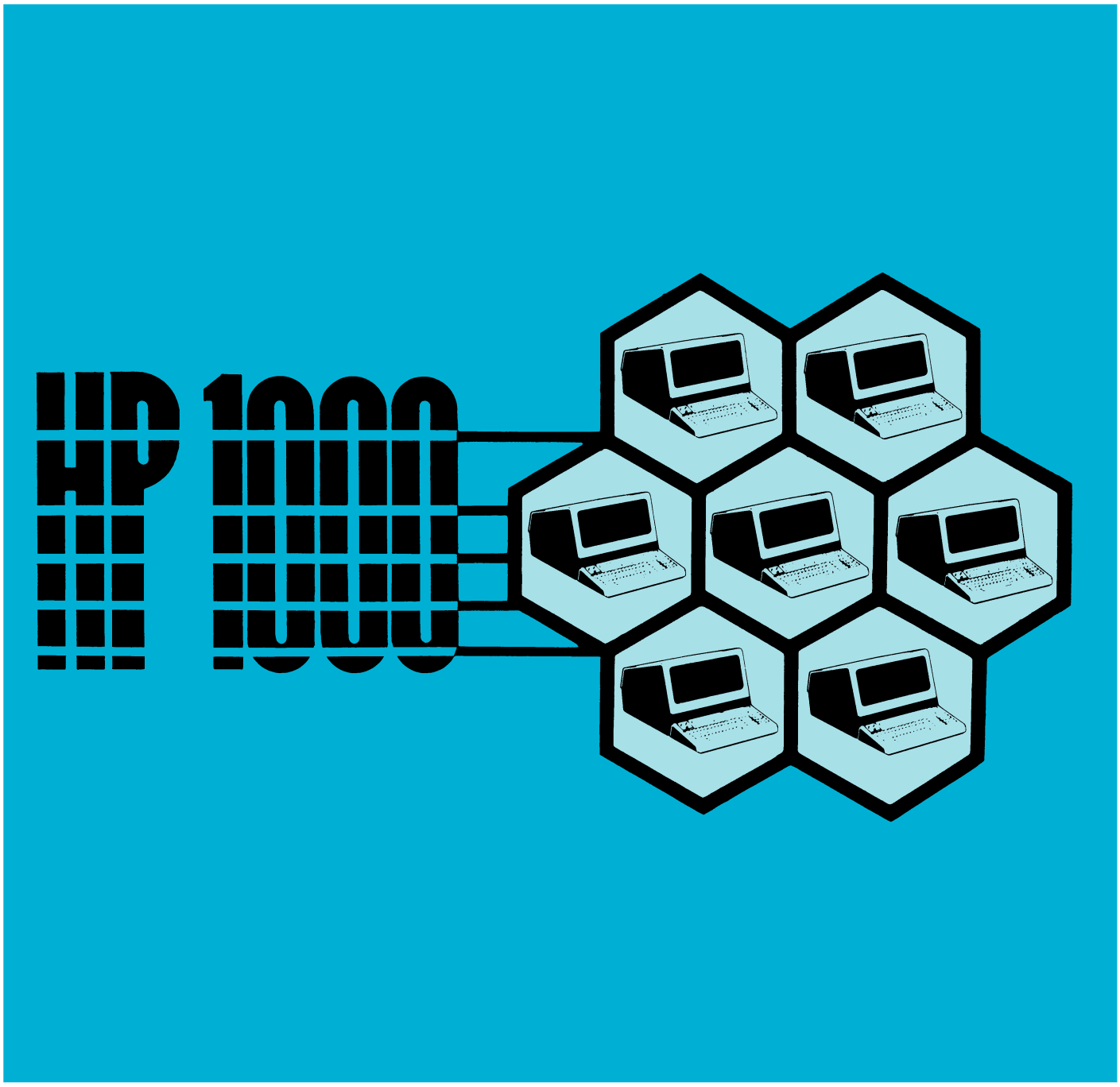
HEWLETT PACKARD

HP 92068E
RTE-IVE Operating System

Reference Manual



RTE-IVE Operating System

Reference Manual

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PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

To determine what manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

First Edition	Jan 1981	
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Preface

RTE-IVE is memory-based, execute-only subset of RTE-IVB. This manual describes aspects of RTE-IVE that differ from RTE-IVB. All RTE-IVE documentation is contained in this manual.

All RTE-IVE software and this manual are included in the RTE-IVB product 92068A. The RTE-IVE product 92068E consists of EMA firmware ROMs and license to execute RTE-IVE software. Software and manual updates are included in RTE-IVB update services.

This manual is organized as follows:

Chapter 1 - General Information.

Chapter 2 - Generating an RTE-IVE Operating System.

Chapter 3 - Booting up RTE-IVE.

Chapter 4 - I/O and Memory Reconfiguration.

Chapter 5 - Loading Programs.

Chapter 6 - File Manager Utility (subset of RTE-IVB FMGR).

Appendix A - Errors.

Appendix B - Loading RTE-IVE Programs.

Appendix C - Sample Startup Program for Automatic DS/1000-IV Initialization.

Appendix D, E, F - RTE-IVE Internal Tables and File Formats.

Appendix G - I/O Control Utility.

Appendix H - Additional Information About Using RTE-IVE With DS/1000-IV.

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Chapter 1
General Information

Product Information

RTE-IVE is a memory-based execute-only system having all of the intrinsic features of the disc-based RTE-IVB operating system, with the exceptions described below. RTE-IVE is primarily intended to function as a DS/1000-IV network node in measurement and control, automatic test, computation, communications processing, and data collection applications. With system generation and program development support provided by a host RTE-IVB system, RTE-IVE can also function as a stand-alone system.

A prerequisite for an RTE-IVE memory-based system is a disc-based HP/1000 system running under RTE-IVB. This "host" system is used to generate the RTE-IVE operating system and to prepare programs that will be run on a memory-based HP/1000 system. The memory-based system with RTE-IVE will be referred to in this manual as the "target" system.

RTE-IVE, product number 92068E, consists of the following:

1. License to generate and execute one RTE-IVE operating system.

2. This manual, part number 92068-90015.

3. EMA firmware ROM's for use on 2109,2111,2113, and 2117 computers.

Listed below are the software modules required to generate and execute an RTE-IVE system. Optional modules are also listed and are flagged with an asterisk (*).

RTE-IVE Software

	File name:	Contents:	Function:
	%CNV4E	CONVM	Program to convert RTE-IVB Generator output into an RTE-IVE absolute boot file. Used only in RTE-IVB host system.
	%CNF4E	$CNFG, $CNFX	RTE-IVE Configurator and Configurator extension.
	%MLD4E	MLOAD	RTE-IVE Relocating Loader. Used only in RTE-IVB host system.
	%APL4E	APLDR (FMP)	RTE-IVE Absolute Program Loader, FMP version.
	%APL4D	APLDR (DS)	RTE-IVE Absolute Program Loader, DS/1000-IV version.
*	%FMG4E	FMGR	RTE-IVE Small File Manager. Loaded online, not to be included in RTE-IVE generations.
*	%D.R4E	D.RTR	RTE-IVE Directory Manager, needed for FMP calls.
*	%XCNTL	I/O Control Utility XCNTL	Utility to perform control operations on terminals, tape units, etc.
	%LIB4E	Replacements	Contains replacement library modules for RTE-IVE (includes SEGLD). Relocated after %BMPG1 and %BMPG2.

RTE-IVB Modules

	File name:	Contents:	Function:
	%CR4S1	Op. Sys.	RTE-IVB Operating System, first of two parts.
	%CR4S2	Op. Sys.	RTE-IVB Operating System, second of two parts.
*	%4MTM	PRMPT, RPN	RTE-IV Multi-Terminal Monitor. Can be used in conjunction with copies of Small File Manager.

RTE-IVB Libraries

	File name:	Contents:	Function:
	%4SYLB		RTE-IVB Operating System Library.
	%BMPG1	FMGR	RTE-IVB File Manager. Needed to satisfy system entry point references. Must be included in every RTE-IVE generation.
	%BMPG3	FMP routines	RTE-IVB File Manager Library. Needed to satisfy system entry point references. Must be included in every RTE-IVE generation.
	$MLIB1		Math Library part 1.
	$MLIB2		Math Library part 2.
	$MLIB3		Math Library part 3.
	%NSESN		RTE-IVB Non-Session Library.
	$LDRLB		RTE Loader Library. Used in RTE-IVB host system only.
*	$PLIB		Pascal/1000 Library. Search when loading %FMG4E.
	$FDSLB		FORTRAN DS Library.
	$FNDLB		FORTRAN Non-DS Library.

The above software is included on RTE-IVB grandfather discs that have software revision code 2126 or higher. RTE-IVE module names are listed with their current revision codes in the RTE-IVB Software Numbering File, revision 2126 or higher.

Summary of Differences Between RTE-IVE and RTE-IVB

Below is a list of differences between RTE-IVE and RTE-IVB operating systems.

- RTE-IVE does not have system disc tracks (LU's 2 and 3).

- RTE-IVE includes a small version of the RTE-IVB file management utility, FMGR.

- The following EXEC calls are not available in RTE-IVE:

CODE	FUNCTION
4	Disc track allocation (local)
15	Disc track allocation (global)
5	Disc track release (local)
16	Disc track release (global)
8	Program segment load (see below)

  Use of the above request codes causes an EXEC "RQ" error (illegal request code in EXEC call).

- The following EXEC call has been modified in RTE-IVE:

  EXEC 6 - Program termination.
  All standard completion calls of the form:

```
EXEC(6,program,0)
```

  are modified by the system to be handled as serially reusable completion, equivalent to:

```
EXEC(6,program,-1)
```

  The section "Absolute Program Loader APLDR" in Chapter 5 contains more information about this modification. For more information about the forms of EXEC 6 program termination requests, refer to the RTE-IVB Programmer's Reference Manual, part number 92068-90004.

- Program loading operations use the RTE-IVE utilities:

  MLOAD - Relocatable module loader (runs on RTE-IVB system)

  APLDR - Absolute program loader (runs on RTE-IVE system)

- Program size modification is accomplished using the MLOAD size command or the APLDR partition number parameter. The program size (SZ) and assign partition (AS) system commands cannot be used to modify program size because programs in RTE-IVE are never in a state (dormant and not currently resident in a partition) to allow modification of page requirement or assignment to a specific partition.

- Segmented programs use the RTE-IVE segment loader SEGLD.

- Output from the On-Line Generator is converted to an absolute boot file by the RTE-IVE program CONVM; the RTE-IVB program SWTCH is not used.

The RTE-IVB services and programs listed below are disc dependent and are therefore not supported under RTE-IVE:

- Programs that allocate system tracks (LU 2 and 3):

  Edit/1000, EDITR, FTN4X, Pascal/1000, etc.

- Session Monitor

- File manager program FMGR

  Note: A modified version of FMGR is provided with RTE-IVE for systems that have a peripheral disc.

- Batch/Spool Monitor

- Program development in general is not supported on RTE-IVE. However, for the purpose of run-time debugging, the RTE-IVB Debug Subroutine DBUGR is supported under RTE-IVE.

- Program swapping.

NOTE: Memory maps for RTE-IVE and RTE-IVB are identical. Refer to RTE-IVB Programmer's Reference Manual.

Overview of Operation

The target RTE-IVE system is generated on a disc-based RTE-IVB host system using the RTE-IVB On-Line Generator program and the conversion program CONVM. CONVM creates an absolute boot file and a snapshot file which is used when loading programs. The system is then transferred to the target system using magnetic tape, minicartridge tape, or DS/1000-IV bootup operations.

The system bootup procedure uses a modified version of the RTE-IVB Configurator program $CNFG. RTE-IVE can be booted up using either the DS/1000 or DS/1000-IV Communications Bootstrap Loader (CBL) ROM, Magnetic Tape Loader (MTL) ROM, or the 264X Cartridge Tape Loader (CTL) ROM.

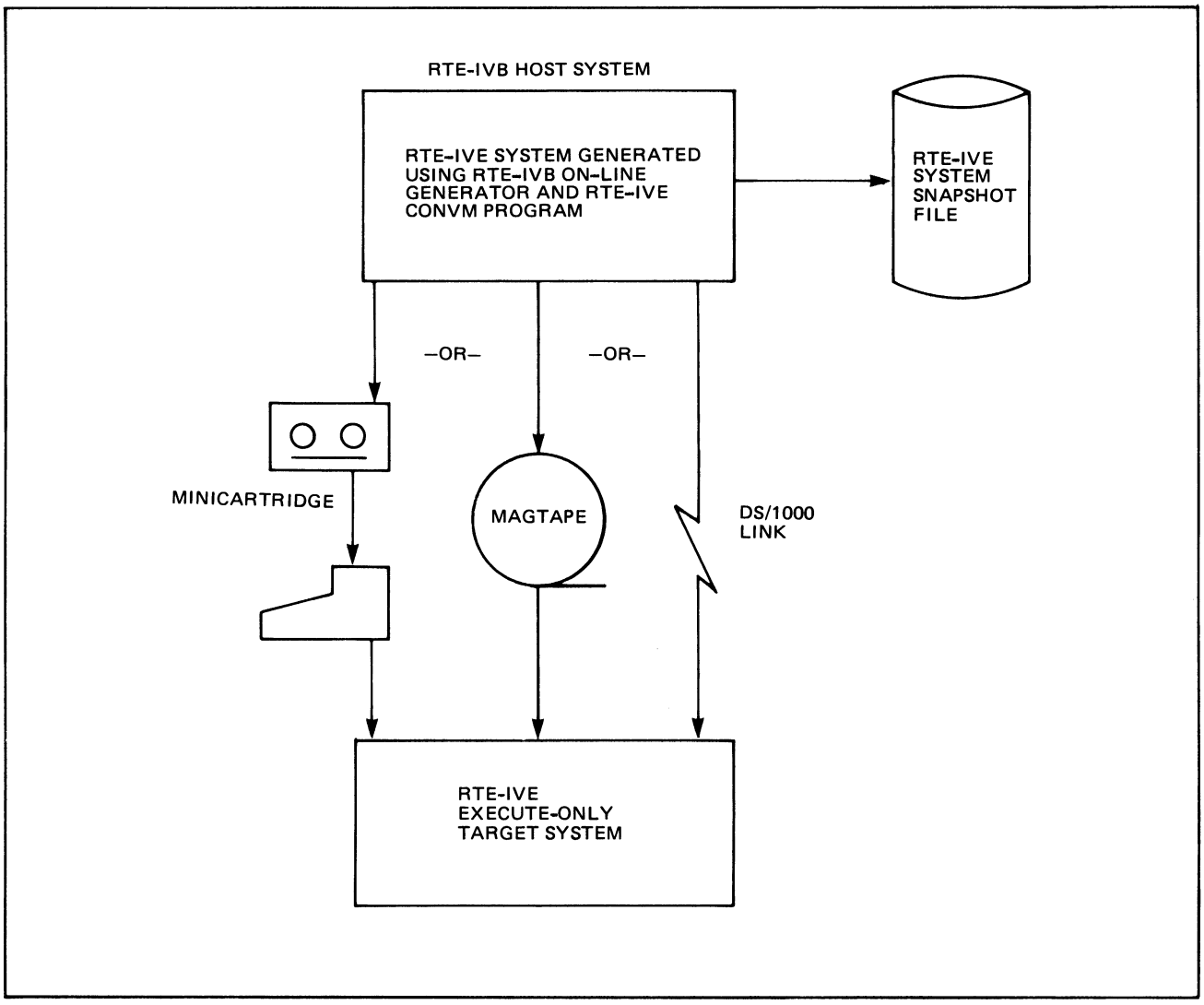


Figure 1-1. System Generation Procedures.

The RTE-IVE relocating loader MLOAD is used to prepare relocatable modules on the host system, which are then transferred to the target system via DS/1000-IV, minicartridge tape, flexible disc, or magnetic tape. Once the programs have been transferred, they are loaded into memory using the RTE-IVE absolute program loader APLDR, which runs on the memory-based system. (Program transfer using DS/1000-IV is performed by APLDR.) The programs are then scheduled for execution using the RTE system "RU" command or the "RU" command provided by the RTE-IVE file management utility FMGR.

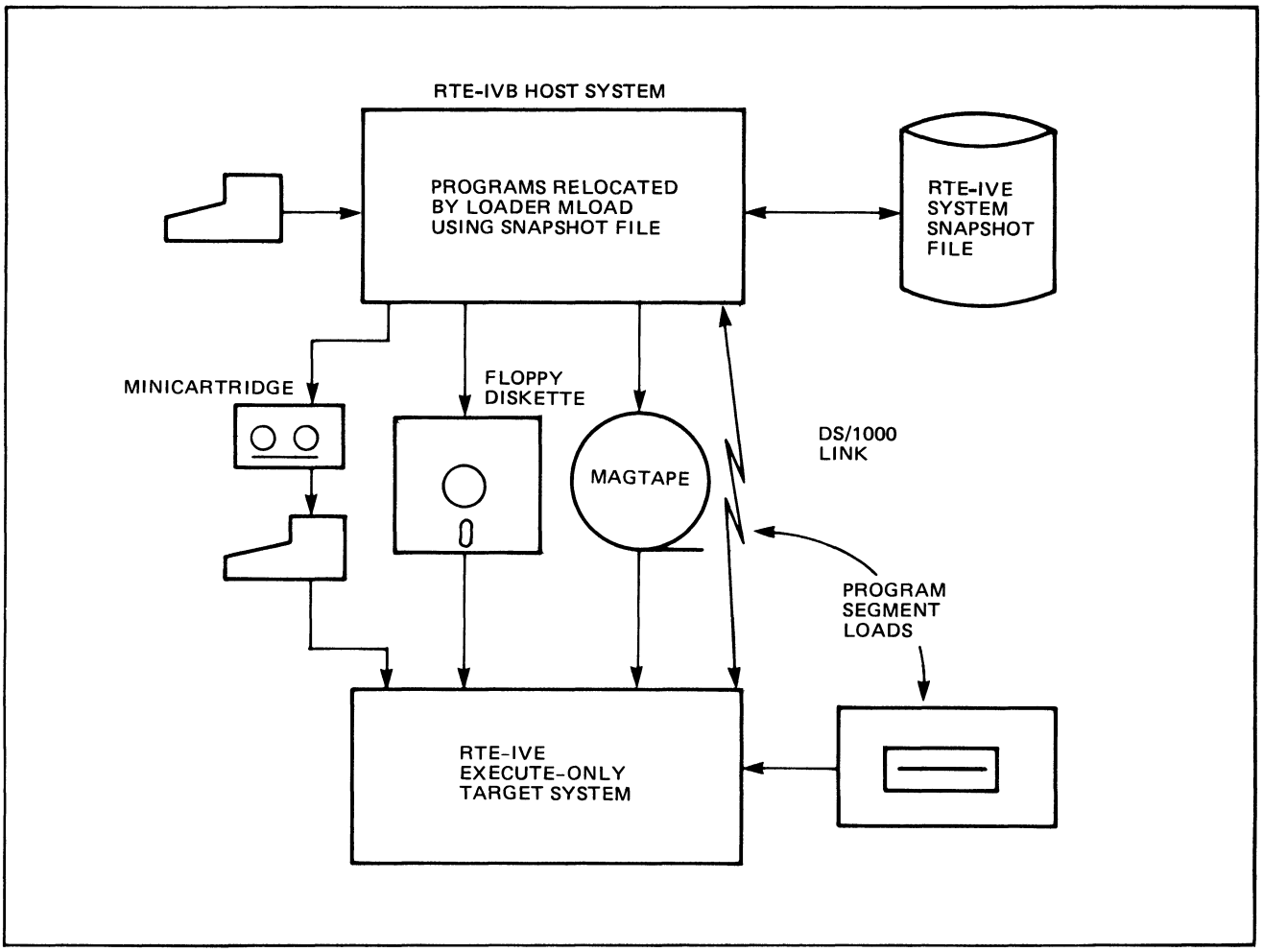


Figure 1-2. Program Loading Procedures

Chapter 2
Generation Information

Differences Between RTE-IVB and RTE-IVE Generation Procedures

In RTE-IVB, a new disc-based system is generated using the On-Line Generator program. The new system produced by the Generator resides on the disc in a Type 1 file. The SWTCH program is then used to transfer the new system to the system disc of the new configuration.

An RTE-IVE system is generated using the RTE-IVB On-Line Generator on the host RTE-IVB disc-based system. The RTE-IVE conversion program CONVM, described in this chapter, is then used to convert the generator's output file into an absolute binary file (type 7) that can be loaded using the Cartridge Tape Loader (CTL) ROM, Magnetic Tape Loader (MTL) ROM, or the Communications Bootstrap Loader (CBL) ROM.

Although the RTE-IVE Operating System does not include a system disc, the following information is required by the RTE-IVB On-Line Generator and must be included in the RTE-IVE generation answer file:

- System disc model
- Select code of RTE-IVB system disc
- Track map table information for RTE-IVB system subchannel
- System subchannel number

Note: All system disc information is required only by the Generator, and will have no effect on the RTE-IVE system being generated.

The system disc model can be any 79xx or 79xxH disc drive. The driver for the system disc, DVA32 or DVR32, must be relocated during generation to satisfy references to this driver that occur during generation.

Enough system tracks must be specified in the system subchannel (LU2) track map table entry to hold the RTE-IVE operating system. The RTE-IVB Generator checks whether this condition has been met. A specification of 256 tracks will ensure that there is enough room on the system subchannel to hold the system. A track map table entry is necessary only for the system subchannel.

A sample generation answer file is contained in the next section.

The files %BMPG1 and %BMPG3, containing the RTE-IVB utility FMGR, must be included in every RTE-IVE generation. They are required to satisfy system entry point references during generation. When these files are relocated, the Generator builds the FMP library used by the RTE-IVE Small File Manager and user programs that use FMP services (on systems that contain a peripheral disc). To save time during generation, the RTE-IVB File Manager and its segments can be changed to type 8 after relocation.

Note: All disc resident programs are removed during system bootup by the RTE-IVE Configurator program $CNFG. An exception is described in the section "Automatic Partition Load Example", in Chapter 2.

Sample Generation Answer File

In this sample answer file, the symbol ">>" in the left margin indicates items that should be noted when preparing an RTE-IVE generation.

This generation is a sample only. Your generation will differ according to your system configuration and current software revision.

NOTE: Modules with CRN "E4" are included with RTE-IVE. RTE-IVB software is indicated by CRN "B4". DS/1000-IV modules have CRN "DS".

```
  *
  "LST4E::B4                * LIST FILE
  *
  *  ANSWER FILE FOR RTE-IVB GENERATOR RT4GN
  *
  *                 ****************************************
  *                 * RTE-IVE EXECUTE-ONLY SYSTEM          *
  *                 * VERSION 2103                         *
  *                 *                                      *
  *                 * INCLUDES:                            *
  *                 *    7906H SYSTEM DISC                 *
  *                 *    9885M PERIPHERAL DISC             *
  *                 *    DS/1000-IV                        *
  *                 *    MULTI-TERMINAL MONITOR            *
  *                 *    FMP LIBRARY                       *
  *                 ****************************************
  *
  *
  ***********************************
  ****** INITIALIZATION PHASE ******
  ***********************************
  *
  YES                       * ECHO ON
  !OUT4E::B4::2500          * OUTPUT FILE
>>7906H                     * SYSTEM DISC
>>15                        * DISC SELECT CODE
  *                         * TRACK MAP TABLE - ENTRY FOR SYSTEM DISC
  *                         * LU 2 IS REQUIRED BY THE RTE-IVB GENERATOR.
  *
>>*MOD#  #TRKS  CYL HEAD #SRF ADDR #SPR  UNIT
  *
  7906H,  256,   0,  0,   2,   0,    6         * SUBCHANNEL  0  (LU2)
  /E
  0                         * SYSTEM SUBCHANNEL
  NO                        * NO AUX DISK
  12                        * TBG
  0                         * NO PRIVILEGED INTERRUPT CARD
  YES                       * MEM. RES. ACCESS TABLE AREA II
  YES                       * RT MEMORY LOCK
  YES                       * BG MEMORY LOCK
  50                        * SWAP DELAY
  512                       * MEM. SIZE
  0                         * NO BOOT FILE
  *
  ***********************************
  ****** PROGRAM INPUT PHASE ******
  ***********************************
  *
  LINKS IN CURRENT
  MAP ALL
  *
  *                  RTE-IVE SYSTEM
  *
  REL,%CR4S1::B4         * RTE-IVB MEM RES OP SYS (PART 1)
```

```
  REL,%CR4S2::B4        * RTE-IVB MEM RES OP SYS WITHOUT CONFIGURATOR
  *                     * PART 2
  *
  *                   RTE-IVE SOFTWARE
  *
>>REL,%CNF4E::E4        * RTE-IVE CONFIGURATOR AND EXTENSION
>>REL,%APL4D::E4        * ABLOLUTE PROGRAM LOADER (DS/1000-IV VERSION)
>>**REL,%APL4E::E4        * ABSOLUTE PROGRAM LOADER (FMP VERSION)
>>REL,%XCNTL::E4        * RTE-IVE I/O CONTROL UTILITY
  *
  *                   SPECIAL SYSTEM SOFTWARE
  *
>>REL,%PASS1::JT        * PASS: DS/1000-IV AUTOMATIC STARTUP PROGRAM
  *                         (USER-WRITTEN), SCHEDULED BY SYSTEM
  *                         AT BOOTUP (CHANGE TYPE TO 81 DURING
  *                         PARAMETER INPUT PHASE)
  REL,%4AUTR::B4        * AUTO RESTART
  *
  *                   DRIVERS
  *
  REL,%DVR00::B4        * TTY OR 2600 CRT
  REL,%4DV05::B4        * 264X TERMINAL
  REL,%DVA12::B4        * 2631A LINE PRINTER
  REL,%DVR23::B4        * 7970 MAGTAPE
>>REL,%DVA32::B4        * 7906H/20H/25H SYSTEM DISC
  REL,%DVR33::B4        * 9885M FLEXIBLE DISC
  REL,%4DP43::B4        * POWERFAIL DRIVER
  *                   NOTE:   DS/1000-IV DRIVERS ARE BELOW
  *
  *                   USER PROGRAMS
  *
  REL,%DBUGR::B4        * DEBUG
  REL,%WHZAT::B4        * RTE-IVB WHZAT
  *
  *                   LIBRARIES
  *
  REL,%4SYLB::B4        * RTE-IVB SYSTEM LIBRARY.  NOTE: %4SYLB
  *                         CONTAINS ENTRY POINT CHANGES FOR M/E/F
  *                         COMPUTERS. THE DS/1000-IV LIBRARY $DSMXL
  *                         ALSO CONTAINS THESE REPLACEMENTS AND
  *                         WILL CAUSE 39 EACH GEN ERR'S 05 AND 08.
  REL,%4MTM::B4         * RTE-IV MULTI-TERMINAL MONITOR
  REL,%NSESN::B4        * NON-SESSION LIBRARY
  REL,$MLIB1::B4        * MATH LIBRARY PART 1
  REL,$MLIB2::B4        * MATH LIBRARY PART 2
  REL,$MLIB3::B4        * MATH LIBRARY PART 3
  REL,$FDSLB::B4        * FORTRAN DS LIBRARY
  **REL,$FNDLB::B4        * FORTRAN NON-DS LIBRARY
>>REL,$PLIB::B4         * PASCAL AND COMPILER LIBRARIES, USED IN THIS
>>REL,%CLIB::B4         *    GEN FOR STARTUP PROGRAM (SEE APPENDIX C).
  *
```

```
*                   DS/1000-IV REQUIRED MODULES
*
REL,%GRPM::DS          * RTE-RTE REQUEST/REPLY PROCESSOR
REL,%QCLM::DS          * COMMUNICATIONS ERROR LOGGER
*                           (MUST BE CHANGED TO MEMORY-RESIDENT)
REL,%QUEUE::DS         * ALLOCATES SAM AND QUEUES MESSAGES TO GRPM
REL,%RTRY::DS          * COMMUNICATIONS ERROR RETRY PROCESSOR
REL,%UPLIN::DS         * COMM. MANAG. TIMEOUT AND RE-ENABLE MODULE
REL,%RESM::DS          * SSGA ENTRY POINTS FOR RTE-IVB W/O SESSION
REL,%DINIS::DS         * DINIT: NETWORK INITIALIZATION, SHUTDOWN
*                           VERSION  (SPECIFY FOR AUTOMATIC
*                           PARTITION LOAD WHEN RUNNING CONVM,
*                           DINIT SCHEDULED BY PASS PROGRAM)
REL,%DSMOD::DS         * DSMOD: NETWORK MODIFY/INITIALIZE PROGRAM
*                           (INCLUDED HERE TO SATISFY UNDEFS, LOADED
*                            ONLINE WITH MLOAD AND APLDR WHEN NEEDED)
*
*                   DS/1000-IV DRIVERS
*
REL,%DVA66::DS         * DRIVER FOR HDLC/BISYNC CARD
REL,%DVA65::DS         * DRIVER FOR 12771/12773 CARD
REL,%MDV00::DS         * DRIVER FOR LU MAPPING
*
*                   DS/1000 LIBRARIES
*
REL,$DSLB1::DS         * REQUIRED IN ALL DS/1000-IV NODES
REL,$DSLB2::DS         * REQUIRED IN ALL RTE-RTE NODES
*
*
REL,$DSLB3::DS         * DS LIBRARY #3 (WITHOUT 3000)
REL,$DSLB4::DS         * REQUIRED IN ALL RTE NODES
REL,$DSMXL::DS         * MICROCODE REPLACEMENTS FOR M/E/F COMPUTERS
*                           (WILL CAUSE 05 AND 08 GEN ERR'S
*                            DUE TO DUPLICATION OF RP'S IN %4SYLB)
REL,$DSLSM::DS         * DS NON-SESSION LIBRARY
**REL,$DSMA::DS          * MESSAGE ACCOUNTING LIBRARY
REL,$DSNMA::DS         * NON MESSAGE ACCOUNTING LIBRARY
**REL,$DSRR::DS          * REROUTING LIBRARY
REL,$DSNRR::DS         * NON REROUTING LIBRARY
REL,%#SPLU::DS         * FOR LU MAPPING
*
*
*                   RTE-IVB FILE MANAGER FMGR
*                   NOTE:  USED ONLY TO BUILD FMP LIBRARY
*
REL,%BMPG1::B4         * RTE-IVB FMGR PROGRAM AND LIBRARY
REL,%BMPG3::B4         * FMP LIBRARY
*
```

```
  *
  *                   RTE-IVE DIRECTORY MANAGER PROGRAM
  *
>>REL,%D.R4E::E4         * RTE-IVE DIRECTORY MANAGER PROGRAM,
  *                           REPLACES RTE-IVB D.RTR
  *
  *                   REQUIRED RTE-IVE LIBRARY $LIB4E
  *                   NOTE: $LIB4E IS RELOCATED AFTER %BMPG1 AND %BMPG3
  *                         $LIB4E WILL CAUSE GEN ERR'S 05 AND 08 FOR
  *                             FSTAT (REPLACES RTE-IVB FSTAT),
  *                             SEGLD (REPLACES RTE-IVB SEGLD), AND
  *                             REIO (REPLACES RTE-IVB REIO).
  *
>>REL,$LIB4E::E4         * RTE-IVE LIBRARY
  *
  DISPLAY UNDEFS
  *
  /E
  *
  ************************************
  ****** PARAMETER INPUT PHASE ******
  ************************************
  *
>>QCLM,17                * DEFAULT TYPE IS 19
>>PASS1,81               * DS/1000-IV STARTUP PROGRAM.
  *                      * MEMORY-RESIDENT WITH AUTOMATIC SCHEDULING.
  *                      * TO INDICATE AUTOMATIC SCHEDULING, THE TYPE
  *                      * MUST BE SPECIFIED HERE (EVEN IF THE NAM
  *                      * RECORD ALREADY CONTAINS TYPE 81).
  *
>>*                   NOTE:  TO SAVE TIME, RTE-IVB FMGR AND ALL FMGR
  *                          SEGMENTS CAN NOW BE CHANGED TO TYPE 8 SO
  *                          THEY WILL NOT BE LOADED.
  FMGR,8
  FMGR0,8
  FMGR1,8
  FMGR2,8
  FMGR3,8
  FMGR4,8
  FMGR5,8
  FMGR6,8
  FMGR7,8
  FMGR8,8
  FMGR9,8
  FMGRA,8
  FMGRB,8
  *
  /E
  *
```

```
  *
  ****** ENTRY POINT CHANGES
  *
  *  EMA SUBSTITUTIONS
  *
  .EMAP,RP,105257
  .EMIO,RP,105240
  MMAP,RP,105241
  *
  *           NO OTHER ENTRY POINT CHANGES. %4SYLB CONTAINS STANDARD
  *           ENTRY POINT REPLACEMENTS IN RPLIB.
  *           (THESE REPLACEMENTS ARE ALSO CONTAINED IN $DSMXL)
  *
  /E
  *
  ************************************
  ****** TABLE GENERATION PHASE ******
  ************************************
  *
  ****** EQUIPMENT TABLE
  *
>>15,DVA32,D,T=200            * EQT  1: 7906H SYSTEM DISC
  17,DVR05,B,T=32767,X=13     * EQT  2: 2645A SYSTEM CONSOLE
  22,DVA12,B,T=100            * EQT  3: 2631A LINE PRINTER
  23,DVR23,D,T=20000          * EQT  4: 7970B MAGNETIC TAPE UNIT
  45,DVR00,B,T=32767          * EQT  5: 2600A OR ASR-33 TELETYPE
  33,DVR05,B,T=32767,X=13     * EQT  6: 2645A TERMINAL
  46,DVR33,D                  * EQT  7: 9885M FLEXIBLE DISC
  11,DVA65,X=7                * EQT  8: DS/1000-IV
  25,DVA66,X=12               * EQT  9: DS/1000-IV HDLC/BISYNC, PSI TX
  25,DVA66                    * EQT 10: DS/1000-IV HDLC/BISYNC, PSI RX
  41,DVV00                    * EQT 11: DS - MAPPING EQT
  41,DVV00,X=11               * EQT 12: DS - MAPPING EQT
  41,DVV00,X=11               * EQT 13: DS - MAPPING EQT
  4,DVP43,M                   * EQT 14: POWER FAIL
  /E
  *
  ****** DEVICE REFERENCE TABLE
  *
  2,0               * LU1 - 2645A SYSTEM CONSOLE
>>1,0               * LU2 - 7906H DISC - SUBCHANNEL 0
  0                 * LU3 - SPARE
  2,1               * LU4 - 2645A SYSTEM CONSOLE - LEFT CTU
  2,2               * LU5 - 2645A SYSTEM CONSOLE - RIGHT CTU
  3                 * LU6 - 2631A LINE PRINTER
  0                 * LU7 - SPARE
  4                 * LU8 - 7970B MAGNETIC TAPE UNIT
  5                 * LU9 - 2600A OR ASR-33 TELETYPE
  7,0               * LU10 - 9885M FLEXIBLE DISC
  6,0               * LU11 - 2645A TERMINAL
  6,1               * LU12 - 2645A TERMINAL - LEFT CTU
  6,2               * LU13 - 2645A TERMINAL - RIGHT CTU
  8,1               * LU14 - DS: 12771/12773 CARD
  9                 * LU15 - DS: HDLC/BISYNC CARD, PSI  TX
```

```
  10                  * LU16 - DS: HDLC/BISYNC CARD, PSI  RX
  11                  * LU17 - DS: RESERVED MAPPING LU
  12                  * LU18 - DS: LU MAPPING #1
  13                  * LU19 - DS: LU MAPPING #2
  0                   * LU20 - SPARE
  0                   * LU21 - SPARE
  0                   * LU22 - SPARE
  0                   * LU23 - SPARE
  0                   * LU24 - SPARE
  0                   * LU25 - SPARE
  0                   * LU26 - SPARE
  0                   * LU27 - SPARE
  14                  * LU28 POWER FAIL
  *
  /E
  *
  ****** INTERRUPT TABLE
  *
  4,ENT,$POWR         * POWER FAIL
  11,EQT,8            * DS/1000
>>15,EQT,1            * SYSTEM DISC
  17,PRG,PRMPT        * 2645A SYSTEM CONSOLE
  22,EQT,3            * 2631A LINE PRINTER
  23,EQT,4            * 7970B MAGNETIC TAPE
  24,EQT,4            * 7970B MAGNETIC TAPE
  33,PRG,PRMPT        * 2645A TERMINAL
  41,PRG,PRMPT        * DS/1000-IV I/O MAPPING ENTRY
  45,PRG,PRMPT        * 2600A OR ASR-33 TELETYPE
  46,EQT,7            * 9885M FLEXIBLE DISC
  *
  /E
  *
  ****** SYSTEM BOUNDARIES
  *
  0                    * CHANGE DRIVER PARTITION SIZE
  0                    * CHANGE RT COMMON SIZE
  0                    * CHANGE BG COMMON SIZE
  *
  ****** RESOURCE TABLES
  *
  48                   * # OF I/O CLASSES
  0                    * # OF BATCH/SPOOL LU MAPPINGS
  32                   * # OF RESOURCE NUMBERS
  100,400              * BUFFER LIMITS
  10                   * # OF BLANK ID SEGMENTS
  15                   * # OF BLANK SHORT ID SEGMENTS
  5                    * # OF BLANK ID EXTENSIONS
  32                   * MAX NUMBER OF PARTITIONS
  *
  ****** PARTITION DEFINITIONS
  *
  TR,1
```

Conversion Program CONVM

General Information

The RTE-IVE conversion program CONVM operates in the host RTE-IVB system. It is used to convert the generator's output file into a loadable absolute binary file which is used by the MTL, CTL, or CBL ROM and by the Configurator during system bootup. The contents of this file can be transferred to minicartridge tape or magnetic tape if the system is to be booted up from tape.

CONVM builds a snapshot file which is used by MLOAD on a host RTE-IVB system to prepare relocatable modules for subsequent loading into a RTE-IVE system by the absolute program loader APLDR. The snapshot file is a Type 1 file which contains part of the system communication area SCOM, the relocatable library, and the entry points of all modules relocated at generation time. The typical size of a snapshot file is about 30 tracks on a 7906 disc drive (96 sectors per track, 64-word sectors). The format of the snapshot file is shown in Appendix F.

Scheduling CONVM

Schedule CONVM for execution as follows:

```
RU,CONVM,name1,[,name2[,name[,optn[,comment]]]]
```

where:

name1 = Target system file (output produced by RTE-IVB Generator). Filename and subparameters (refer to RTE-IVB Terminal User's Manual under "namr"). Cannot be an LU, and cannot be an extended file. The security code should be specified (if present) since the conversion program CONVM will store "name" and "optn" parameters (see below) in the target system file.

name2 = Filename and subparameters (cannot be an LU) in which the absolute binary code (absolute boot file) is placed. Naming requirements are described below. Default name is P00000. Default cartridge reference number (if omitted or zero) is taken from name1.

name = ASCII name for background disc resident program to be loaded into a partition by the Configurator during bootup. The program will be placed in the first available background partition that is large enough. If there is no background partition large enough, the configurator will purge the ID segment for the program. The program to be loaded should be a background program and should not be a segmented program. This feature is useful for programs that are to be run once after system bootup.

optn = Reconfiguration option. A non-zero parameter will set the option. Default is no reconfiguration.

comment = User defined comment line to be placed in the first record of the snapshot file. The comment line can be up to 64 characters long. Default is no comment line.

Boot File Naming Requirements

The parameter name2 cannot be an LU. The filename in name2 must be a unique name starting with the ASCII character "P" and must contain exactly 5 octal digits (e.g. P00000, P27341, etc.). The filename cannot have a negative security code. The filename should be unique because a cartridge reference number cannot be specified for a system download using the CBL.

NOTE: The file number 77777 is used internally by the DS/1000-IV program down-load monitor PROGL, and should not be used in the absolute boot file name.

Automatic Partition Load Example

The partition load capability allows automatic DS/1000-IV initialization at the RTE-IVE system upon bootup. Also used in this process is the capability provided by RTE to specify that a program is to be scheduled upon system bootup. This is done by adding 80 to the program's type during the Parameter Input Phase of system generation. In RTE-IVE, the "startup" program must have a memory-resident type, such as 81.

In the description of automatic DS initialization below, the following programs are referred to:

DINIT - The DS/1000-IV initialization program. Use either the regular or "shutdown" version.

DSMOD - The DS/1000-IV program used to modify a node that has already been initialized.

PASS - A user-written, memory resident "startup" program, scheduled upon bootup. The program passes answer string buffers to DINIT and DSMOD. Appendix C contains a sample PASS program.

In order to generate and execute an RTE-IVE system that will automatically initialize DS upon system bootup, the following steps must be taken:

1. DINIT must be relocated during system generation.

2. The DS monitor programs required for the use of APLDR must be generated in as memory resident. These monitors are:

   GRPM, QCLM, QUEUE, RTRY, AND UPLIN

   QCLM must be changed to memory-resident during generation.

3. The user-written, memory resident PASS program must be relocated during generation. Add 80 to the program's type during the Parameter Input Phase of generation to specify that the program is to be scheduled upon bootup.

4. DSMOD must be loaded on the neighbor RTE-IVB system using MLOAD. All other DS/1000-IV monitors that will be needed must also be loaded on the disc-based system using MLOAD. Consult the DS/1000-IV Network Manager's Manual to determine which monitors will be needed.

5. When the target system file (RTE-IVB Generator output file) is converted into an absolute boot file by CONVM, DINIT must be specified in the "name" parameter. This will cause DINIT to be loaded into a partition upon bootup.

Given the above prerequisites, the PASS program does the following when it is scheduled upon system bootup:

1. Schedule DINIT (partition resident), which turns on the DS programs required for use of APLDR.

2. Using APLDR, get DSMOD and the necessary DS monitors from the neighbor RTE-IVB system, placing them into partitions in the RTE-IVE system.

3. Schedule DSMOD, which turns on the DS monitors.

4. If necessary, enable peripheral devices, schedule programs, etc.

The advantage of this scheme is that DINIT and DSMOD do not have to be memory resident. DINIT is used only once and can be overlayed by another program. DSMOD can be preserved or removed at the descretion of the system manager.

The sample PASS program in Appendix C shows the method used to pass answer string buffers to DINIT and DSMOD. Since PASS must be memory resident, memory can be conserved by making PASS very small. In Appendix C this is done by dividing PASS into two programs, PASS1 and PASS2. PASS1 performs step 1, above, and then brings PASS2 over from the RTE-IVB node and schedules it. PASS2 performs steps 2 through 4.

For additional information about DS/1000-IV initialization, refer to the DS/1000-IV Network Manager's Manual (part no. 91750-90003).

Reconfiguration Option

Setting the Reconfiguration Option in the CONVM runstring causes a Halt 77B to occur during bootup. This allows the operator to set the S-Register and request I/O and memory reconfiguration (described in the Bootup Procedures chapter). If bootup is from minicartridge tape or magnetic tape, a Halt 77B will always occur; in this case the reconfiguration option has no effect. Note that for a remote system in a DS/1000-IV network, the reconfiguration option should not be set unless there is an operator present at the remote site during system bootup. Also, in order to boot up an RTE-IVE system via DS/1000-IV using the Remote Program Load (RPL) capability, the CPU in the RTE-IVE system must be an E or F series. If an M series CPU is used, there must be an operator present at the RTE-IVE system to perform bootup.

Snapshot File

The filename created for the snapshot file will start with the ASCII character "S" followed by the same 5 octal digits as specified for the absolute boot file <name2>. The snapshot file will have the same security code and reside on the same cartridge as the absolute boot file.

The comment line will appear at the beginning of the first record in the snapshot file. Up to 64 characters can be used to document the snapshot file. If there is not enough room in the run command line for the full comment, the interactive mode described below may be used.

Refer to Appendix F for snapshot file format.

CONVM Interactive Mode

If CONVM is run and no target file is specified, CONVM prompts the user as follows:

```
NAMR(TARGET),NAMR(BOOT),NAME(LOAD),<RECONFG>
```

The user can then enter the target file name and whatever optional parameters are desired.

CONVM will then prompt the user for the comment line:

```
COMMENT(SNAP)
```

The user can then enter a line of up to 64 characters.

Aborting CONVM

To terminate CONVM while it is executing, use the system break command (BR). CONVM will purge the absolute boot file and snapshot file before terminating.

Chapter 3
RTE-IVE System Bootup Procedures

General Information

RTE-IVE can be booted up using the following loader ROM's:

1) Cartridge Tape Loader (CTL) ROM, product number 12992C or part number 1816-0857.

2) DS/1000 Communications Bootstrap Loader (CBL) ROM (using the DS/1000 firmware), part number 91740-80048 (included with 91740A/B/P/R DS/1000 products).

3) DS/1000-IV Programmable Serial Interface (PSI) Communications Bootstrap Loader (CBL) ROM, part number 91750-80001 (included with 91750A/R DS/1000-IV products).

4) Magnetic Tape Loader (MTL) ROM, product number 12992D, or part number 1816-0962. When using the 7970E Magnetic Tape with an HP21MX M-Series computer, the magnetic tape unit should not run above 37.5 ips.

This chapter describes procedures for bootup using magnetic tape, minicartridge tape, or DS/1000-IV loader ROM's. Procedures for reconfiguring I/O and memory during bootup are described in the section at the end of this chapter.

Bootup From Magnetic Tape or Minicartridge Tape

Transferring the System to Magnetic or Minicartridge Tape

In order to boot up the RTE-IVE system from minicartridge tape or magnetic tape, the absolute boot file produced by CONVM must be transferred to tape with all the embedded subfile marks preserved. The absolute boot file (for example, P12345) can be transferred to a tape by using the File Manager store command "ST" with the save option "SA" to transfer embedded subfile marks. For example:

```
:ST,P12345::CN,4,SA
```

A typical RTE-IVE system including DS/1000-IV software will fit onto one minicartridge tape. If the system is very large, however, two tapes may be required. In this case the system can be transferred to tapes as described below.

To transfer the first part of the absolute boot file to minicartridge tape, use the File Manager store command "ST":

```
:ST,P12345::CN,4,,,1
```

For the second tape use the save option "SA" to transfer the remaining subfiles:

```
:ST,P12345::CN,4,SA,2,99
```

where:

P12345 = name of absolute boot file

CN = cartridge reference label or number

4 = LU for CTU containing tape

2 = first subfile to be stored

99 = number of files to be stored (large enough for all subfiles)

Magnetic Tape and Minicartridge Tape Bootup Procedures

If two minicartridges are used to boot up the RTE-IVE system, bootup is started by using the first minicartridge. After the Halt 77B remove the first minicartridge and insert the second minicartridge. Continue the bootup procedure with the second minicartridge.

Insert the first tape into the CTU, and follow the procedures described below to boot up the system.

1. Select the S-Register for display on the computer front panel.

2. Press CLEAR DISPLAY.

3. Set the S-Register bits as follows:

Bits	Enter
0-5	0 (reserved)
6-11	Octal select code of terminal with Cartridge Tape Unit or Magnetic Tape Unit (lower select code).
12-13	0 (reserved)
14-15	Loader ROM selection (number of the ROM cell containing the Cartridge Tape Loader or Magnetic Tape Loader).

4. Press STORE

5. Press PRESET and IBL to load contents of the Cartridge Tape or Magnetic Tape Loader ROM. A successful load is indicated if the OVERFLOW indicator does not light up.

6. Press RUN.

A successful load is indicated if a Halt 77B occurs. For minicartridge bootup, typical loading time for the unmapped portion of the operating system (first subfile of the absolute boot file) is approximately 70 seconds using a 2645A terminal. If two minicartridges were required to store the system, the second tape should be inserted at this time.

At this point, the user has the option of either completing a "standard" system bootup procedure or reconfiguring the current I/O and memory assignments (refer to the RTE-IVE Configurator Program $CNFG chapter). To complete a "standard" system bootup procedure perform the following steps:

1. Select the S-Register for display on the computer front panel.

2. Press CLEAR DISPLAY and STORE.

3. Select the P-Register for display on the computer front panel.

4. Press CLEAR DISPLAY.

5. Set bit 1 (Starting Address = 2).

6. Press STORE.

7. Press RUN.

A successful load is indicated if the message "SET TIME" is displayed on the system console. For minicartridge bootup, typical loading time for the mapped portion of the operating system (remainder of subfiles in absolute boot file) is approximately 100 seconds using a 2645A terminal.

DS/1000-IV (CBL) Bootup Procedures

System bootup procedures for both versions of the Communications Bootstrap Loader are identical.

Requirements for use of the CBL are:

1) The local node must be connected to a neighbor RTE-IVB system which has been initialized via DINIT.

2) If the 91740-80048 CBL is used, the DS/1000-IV firmware must be installed properly in both nodes.

3) The disc-based neighbor system must have the program down-load monitor PROGL as an activated monitor.

4) The RTE-IVE system to be down-loaded must be contained in an absolute boot file created by the conversion program CONVM. The file name must start with a "P" and contain five octal digits. It must not have a negative security code. Its name should be unique since a cartridge reference number cannot be specified for the download.

Below are the procedures for bootup using DS/1000-IV.

1. Select the S-Register for display on the computer front panel.

2. Press CLEAR DISPLAY.

3. Set the S-Register bits as follows:

Bits	Enter
0-5	Not used or boot file number (refer to Optional Timesaving Procedure below).
6-11	Octal I/O select code of the communications interface.
12-13	0 (reserved)
14-15	Loader ROM selection (number of the ROM cell containing the Communications Bootstrap Loader)

4. Press STORE.

5. Press PRESET and IBL. A successful load is indicated if the OVERFLOW indicator does not light up.

6. Clear the S-Register and store the number of the program file in it. The number is the octal number in the file name.

   For example:

   If the file name is P00000 then set the S-Register to 00000B.

   If the file name is P76354 then set the S-Register to 76354B.

7. Press STORE.

8. Press RUN. The S-Register lights will blink as the system load takes place. When the down-load is completed, the communications bootstrap loader will begin execution at location 2. A successful down-load is indicated if the operating system displays "SET TIME" on the system console.

Optional Timesaving Procedure

To save time, step 7 can be avoided by supplying the boot file number (octal number contained in the absolute boot file name) in bits 0 through 5 of the S-Register in Step 3. This can only be done if the Communications Bootstrap Loader ROM is installed in sockets 2 or 3 (selected with bit #15 in the S-Register). The number in the program's file name must be in the range 0 through 77 (octal) inclusive.

To use the time-saving feature, set the S-Register in step 3, press STORE, PRESET, IBL and RUN to start the down-load.

Chapter 4
RTE-IVE Configurator Program $CNFG

General Information

The Configurator program $CNFG can be scheduled during system bootup to allow reconfiguration of I/O and memory assignments.

I/O reconfiguration consists of user re-assignment of I/O devices to octal select codes other than those assigned at generation time. Memory reconfiguration allows the operator to change the size of the System Available Memory (SAM) extension, and to redefine memory partitions. Defective pages in memory (pages with parity errors) can be avoided by redefining the SAM extension and defining user partitions around the defective pages.

Scheduling the Configurator

After the steps outlined in the previous chapter are performed to initiate the bootup process from either the CTL ROM, MTL ROM, or the CBL ROM, the Configurator can be scheduled by setting up the S-register in response to a Halt 77B displayed on the computer's front panel.

Scheduling the Configurator During DS/1000-IV Bootup

A Halt 77B will occur if either version of the CBL ROM is used, and the "Reconfiguration Option" was selected during the RTE-IVE conversion process performed by CONVM.

After the Halt 77B the operator can either bypass the reconfiguration process by pressing RUN, or schedule the Configurator using the following procedure:

1. Select the S-Register for display on the computer front panel.

2. Press CLEAR DISPLAY.

3. Set the S-Register bits as follows:

Bits	Enter
0-5	System console octal select code if either the select code or device type is different from generation specification; otherwise, 0.
6-11	Peripheral disc select code if different from generation specification; otherwise, 0.
12-14	0 (reserved)
15	1 to specify reconfiguration of I/O and/or memory assignments (including console and peripheral disc specified above).

4. Press STORE.

5. Press RUN to perform reconfiguration processes.

Scheduling the Configurator During Magnetic Tape or Minicartridge Tape Bootup

If the CTL or MTL ROM is used, a Halt 77B will always occur during bootup.

At this point the operator can schedule the Configurator using the following procedure:

1. Select the S-Register for display on the computer front panel.

2. Press CLEAR DISPLAY.

3. Set the S-Register bits as follows:

Bits	Enter
0-5	System console octal select code if either the select code or device type is different from generation specification; otherwise, 0.
6-11	Peripheral disc select code if different from generation specification; otherwise, 0.
12-14	0 (reserved).
15	1 to specify reconfiguration of I/O and/or memory assignments (including console and peripheral disc specified above).

4. Press STORE.

5. Select the P-Register for display on the computer front panel.

6. Press CLEAR DISPLAY.

7. Set bit #1 (starting address=2B).

8. Press STORE.

9. Press RUN.

Configurator Operation

The Configurator works interactively with the user to make specified changes to the current I/O and memory configurations. Reconfiguration is performed in accordance with user responses to a series of Configurator prompts and queries output on the system console.

The Configurator program first checks the contents of the S-Register. If bit 15 is set, I/O and memory reconfiguration are performed. The system is reconfigured in accordance with any specified new system disc and console select codes. Entering invalid console select codes in the S-Register will cause the system not to function properly. The Configurator then loads the driver partitions, memory resident library and memory resident programs (if they are defined for the system) into memory.

If bit 15 is not set in the S-Register, control is transferred to the operating system.

Reconfiguration is performed interactively by using the system console and list device. Note that the standard method of getting system attention by pressing any key on the system console will not work during reconfiguration because the system is not yet completely initialized. The bootup procedure must therefore be restarted if any equipment I/O errors occur (e.g., a device not ready error or a parity error).

Configurator Halts and Error Messages

Various halts and Configurator error messages may occur during system bootup or reconfiguration that require corrective action by the operator. Halts are displayed on the computer front panel. System bootup and configuration Halts, their meaning, and required operator action are listed in Appendix A.

If the user enters an invalid response to a Configurator prompt or query, the Configurator will issue an error message in the form:

```
CONFIG ERR xx
```

where xx is a Configurator error code as defined in Appendix A. Following the error message, the Configurator will usually repeat the prompt or query and the user need only enter the correct response. In the reconfiguration procedures given below, only error recovery procedures requiring further action will be described in the text.

Reconfiguration Procedures

The Configurator begins the reconfiguration process by displaying the message:

```
START RECONFIGURATION
```

on the system console, followed by a set of queries to the user on the console. The Configurator will repeat a query if the user response is not what was expected.

The Configurator next displays the query

```
LIST DEVICE LU#?
```

Enter a Logical Unit number to which the Configurator can direct listings or press the space bar and RETURN key on the console keyboard for the default case, which is the system console. Entering a list device other than the system console causes the Configurator to display the following message:

```
LIST DEVICE SELECT CODE#?
```

Enter a list device select code or press the space bar and RETURN key for the default case, where the default is the list device select code configured into the system.

If the entered list device was not the system console, the Configurator displays the query:

```
ECHO? (YES/NO)
```

Enter YES to have all output to the list device echoed on the system console.

The Configurator will then display the I/O reconfiguration already performed (if the select code of the system console or peripheral disc were set in the S-Register during the bootup process, or if a list device select code was specified). Only the select codes for the system console, peripheral disc, or list device (if set in the S-Register during bootup, or if specified at the start of reconfiguration) are reconfigured automatically. All other select codes must be reconfigured during I/O Reconfiguration.

I/O Reconfiguration Steps

I/O reconfiguration is performed by assigning the Interrupt Table and trap cell values for the current select code to the corresponding entries for the new select code.

The Configurator first prompts for I/O reconfiguration by displaying a list of the current I/O configuration, beginning with octal select code 10 for the operating system, in the format:

```
CURRENT I/O CONFIGURATION:

                                        +--          --+
                        EQTyy           |   PNAME     |
  SELECT CODE xx = TBG       [,TYPE nn  |             |
                        PRIV I/O        |   nnnnnn    |
                                        +--          --+
```

where:

xx = octal select code number ranging from 10 to 77.

EQTyy = EQT entry number

TBG = Time Base Generator

PRIV I/O = privileged I/O card

TYPE nn = equipment type code

PNAME = name of program to be automatically scheduled

nnnnnn = absolute instruction to be executed upon interrupt; for example, a JSB LINK,I where LINK contains the entry point address.

The CURRENT I/O CONFIGURATION data is automatically displayed to provide a basis on which to make decisions regarding reconfiguration. If the system disc, system console, or the list device were assigned to a new select code via the S-Register, they have already been configured in memory and must NOT be reconfigured during I/O reconfiguration.

The list does not include the select codes previously configured to the system disc, system console, or list device that have been reconfigured via the S-Register at bootup. However, these previously-occupied select codes are still available for reassignment. Also, those devices formerly occupying the select codes now reconfigured to the system disc, console, or list device may be reassigned if referenced by their old select codes.

Following display of the current configuration, the Configurator then displays the query:

```
I/O RECONFIGURATION?(YES/NO)
```

Enter NO to bypass I/O reconfiguration. The Configurator will skip all further I/O reconfiguration prompts and begin prompting for memory configuration entries (see below).

Enter YES if I/O is to be reconfigured. The Configurator program will then display the message:

```
CURRENT SELECT CODE#,NEW SELECT CODE#?(/E TO END)
-
```

where the hyphen (-) prompts entry of the current and new select code pairs. The current and new select codes response must be in octal and must vary between 10 and 77 octal, in the form:

```
xx,yy
```

followed by a carriage return, where xx is the current select code number and yy is the new select code number. The Configurator's hyphen prompt will be repeated after each successful entry until a /E is entered to terminate the list.

A privileged I/O card's assignment can be removed by entering the current select code number of the privileged I/O card followed by zero, in the form:

```
xx,0
```

where select code 0 is only used to remove the privileged I/O card's assignment. A new value of 0 will be assigned to the privileged I/O card.

```
+--------------------------------------+
|              CAUTION                 |
|              -------                 |
| A privileged driver will not work    |
| correctly if the privileged I/O card |
| has been removed from the system.    |
+--------------------------------------+
```

A privileged I/O card can be added to a system that does not have one by entering the specification:

```
xx,PI
```

where xx is the specified select code in octal, and PI assigns the privileged I/O card to select code xx.

If a /R is entered, I/O reconfiguration is restarted with display of the CURRENT SELECT CODE#, NEW SELECT CODE#?(/E TO END) query.

If the current select code number entry is repeated in more than one response, the last entry is taken as valid and the previous entries are ignored.

Following entry of a /E to terminate select code changes, the Configurator prints a list of the NEW I/O CONFIGURATION. The next query displayed is:

```
OK TO PROCEED? (YES/NO)
```

Enter YES to proceed. If it is desirable to restart I/O reconfiguration for any reason, enter the response:

```
NO
```

and I/O reconfiguration will restart by another display of the list:

```
CURRENT I/O RECONFIGURATION:
```

The list will contain what the I/O configuration was changed to during the reconfiguration just completed.

CAUTIONS:

1. If a device has multiple select codes, make sure that all the appropriate select codes are reassigned and kept in the same relative order.

2. Reassigning devices to empty I/O slots may cause unexpected results.

Memory Reconfiguration Procedures

After the I/O reconfiguration phase is either bypassed or terminated, the Configurator will display the following statement and query:

```
CURRENT PHYSICAL MEM SIZE: xxxx PAGES
MEM RECONFIGURATION?(YES/NO)
```

Enter NO if memory reconfiguration is not desired. The Configurator will then transfer control to the operating system after displaying the message

```
RECONFIGURATION COMPLETED
```

Enter YES if memory is to be reconfigured. The Configurator will then display the query:

```
PHYSICAL MEM SIZE?(#PAGES)
```

Enter the desired total number of memory pages, between 48 and 1024 (decimal).

Excluding Bad Pages

The Configurator program can be used to redefine the SAM extension and user partitions to exclude any bad pages (pages containing parity errors) within these areas. Each user partition must be a contiguous block of memory; therefore, user partitions must be defined on blocks of memory between the bad pages. Bad pages in the system area, driver partitions and the memory resident area cannot be avoided.

The Configurator displays the query:

```
DEFINE BAD PAGES BEGINNING AT PAGE xxxx (/E TO END)
-
```

where the hyphen (-) prompts for the decimal number of a bad memory page. The hyphen is repeated after acceptance of each entry until a /E or 100 bad page numbers are entered, terminating the list. (The Configurator will accept up to 100 bad memory page entries.) The bad page specifications entered can range from xxxx to the maximum page number in physical memory and must be entered in an increasing order.

If /R is entered in reponse to the hyphen prompt, the Configurator will repeat the query:

```
DEFINE BAD PAGES BEGINNING AT PAGE xxxx (/E TO END)
-
```

and the entire list of bad pages must be re-entered.

When a /E is entered either to terminate bad page entries or bypass the entire phase, the Configurator displays the following information:

```
CURRENT SIZE OF SAM
DEFAULT: xxxxx WORDS
EXTENSION: yy PAGES
SAM EXTENSION STARTS AT PHYSICAL PAGE xx
MAX PAGES AVAIL FOR SAM EXTENSION: xx
```

The number of words displayed for default SAM are the decimal number of words assigned to the first block of SAM.

SAM Extension Reconfiguration

The Configurator next prompts for any desired change in the size of SAM extension by displaying the query:

```
CHANGE SAM EXTENSION?(# PAGES/" " CR)
```

Press the space bar and RETURN key (the default case) if no change is desired.

Enter the decimal number of pages desired if the SAM extension is to be changed. The number of pages can vary from 0 (which removes SAM extension) to the maximum number of pages available for the SAM extension. Note that this count must not include any bad pages that fall within the SAM extension (see above).

The Configurator sets up the System Map to avoid bad pages in the SAM extension regardless of whether or not a change was requested.

If the specified SAM extension extends beyond the size of physical memory because of bad pages within this area, the Configurator displays the message:

```
CONFIG ERR 12
CHANGE SAM EXTENSION?(# PAGES/" " CR)
```

Enter a smaller number of pages for SAM extension size. The Configurator allows SAM extension to be divided up into a maximum of five blocks of memory between bad pages. If the number of pages in SAM extension requires division into more than five blocks, the Configurator displays the message:

```
CONFIG ERR 22
```

and the query is redisplayed. Enter a smaller size of SAM extension.

Changing Partition Definitions

The Configurator next displays a list of current partition definitions in the format:

```
CURRENT PART'N DEFINITIONS:

                        +--   --+ +--   --+
                        |  ,RT  | |       |
PART'N nn = pp PAGES|   |  ,BG  | |  ,R   |
                        |  ,RTM | |       |
                        |  ,BGM | |       |
                        |  ,S   | |       |
                        +--   --+ +--   --+
```

where:

nn = the partition number

pp = is the number of pages in partition nn

RT = a real-time partition

BG = a background partition

RTM = a real-time mother partition

BGM = a background mother partition

S = a subpartition

R = a reserved partition

Following the definition list, the Configurator next displays a list of current partition requirements in the form:

```
CURRENT PART'N REQMTS:
REALTIME
PNAME  XX PAGES [E][PART'N=nn]
  .
  .
  .
BACKGROUND
PNAME  XX PAGES [*][E][PART'N=nn]
  .
  .
  .
```

where:

PNAME = the real-time or background program name.

E = indicates an EMA (Extended Memory Area) program.

* = indicates the background program does not include Table Area II (i.e., a Type 4 program).

nn = is the number of the partition into which program PNAME is assigned.

The Configurator then displays the following information:

```
MAX PROGRAM SIZE:
W/OUT COMMON:  xx PAGES
W/COMMON:      xx PAGES
W/TABLE II:    xx PAGES
MAX # OF PART'NS:  xx
PAGES REMAINING:  xx
DEFINE PART'NS FOR xxxx PAGES
#PAGES,RT(M)/BG(M)/S(,R)
PART'N x,pppp(,mmmm) PAGES?
```

where:

MAX PROGRAM SIZE = maximum logical space a program may occupy. However, the partition size may be larger than the stated maximum if the partition will be used for EMA program execution.

MAX # OF PART'NS = decimal number of partitions that can be defined in memory.

PAGES REMAINING = decimal number of pages available for defining user partitions (including bad pages that may have been listed earlier).

#PAGES,RT(M)/BG(M)/S(,R) = indicates the required format for user entries in response to the partition definition prompt described below.

PART'N x,pppp(,mmmm) PAGES? = Configurator program prompt asking the user for the size (in pages) and format for the next partition to be defined. x is the partition number. pppp is the number of contiguous pages to be defined before the next page. mmmm is the number of pages remaining to be defined in the mother partition.

If the maximum number of partitions was defined as 0 during generation time, the Configurator skips the rest of memory reconfiguration and displays the query:

```
OK TO PROCEED? (YES/NO)
```

Since partitions must be defined contiguously, they must be within the section of memory between the bad pages. If a section of memory between bad pages has a size of one page, it is skipped by the Configurator. The Configurator will prompt for a partition definition after each accepted entry until partitions have been defined for all xxxx pages in this section of memory.

As each entry is accepted, the Configurator will reissue the prompt with a consecutively increasing partition number for the next partition. If the number of pages entered for a partition is greater than the maximum logical address space, and RT or BG was specified, the Configurator displays the message:

```
SUBPARTITIONS?(YES/NO)
```

Enter a NO if the Configurator is to ignore subpartition considerations and proceed with the normal partition definitions.

Enter a YES if subpartitions are to be defined. Subpartition definitions are specified by using the following format in response to the prompt:

```
#PAGES,S(,R)
```

where S specifies a subpartition and the optional R specifies the subpartition is to be reserved.

If RTM or BGM is specified, subpartition definition phase is automatically entered. If no subpartitions are to be defined, enter a /E or define the next partition of RT, BG, RTM, or BGM type.

The memory space allocated for subpartitions is the same area occupied by the "mother" partition. Subpartition definition will end as soon as an RT(M) or BG(M) partition is defined, or can be terminated by entering a /E.

When an attempt is made to end the subpartition definition phase by defining a RT or BG partition and there are no more pages left in this section of memory, an ERR 13 will be displayed. In this case, either enter a /E to terminate subpartition definitions and continue partition definitions for the next block of memory, or enter /R to restart the partition definition phase.

The total number of pages defined for subpartitions must not exceed the size of the mother partition or an error code will be issued and the last subpartition must be redefined.

The Configurator analyzes each partition definition for possible errors as soon as it is entered. Any error code issued will be followed by a prompt to redefine the last partition displayed. If /R is entered instead of a partition description, the partition definition phase is restarted from the first partition definition.

Partitions defined for each section of memory between bad pages must be defined for all pages available within the section. A running total is maintained of the number of pages currently defined within a section of good memory. The Configurator will then take one of five possible courses of action, depending upon the prevailing memory structure and size:

1. If the remaining total equals the number of pages available, the Configurator automatically requests partition definitions for the next section of good memory.

2. If the number of pages remaining to be defined is one, the Configurator increments the last defined partition by one page and then requests partition definitions for the next block of good memory.

3. If the running total exceeds the number of available pages defined within the memory block, the Configurator displays an error message and prompts for the last partition to be redefined.

4. If the number of partitions already defined is equal to the maximum number of partitions allowed and more undefined good pages remain, the Configurator displays an error message and all user partitions must be redefined. The Configurator will then prompt for new partition definitions and repeat the prompt after each accepted entry.

5. If the running total is less than the number of pages in the block of memory, the definition for the next partition is requested.

A list of NEW PART'N DEFINITIONS will be issued to the list device when all partitions have been defined.

Changing Program Page Requirements

The Configurator performs a check to ensure that every program assigned to a partition fits its partition size. A program will be unassigned if the program size is larger than the partition size or if the partition number does not exist. Following the check, the Configurator will issue a list under the heading:

```
UNASSIGNED PROGS
     .
     .
     .
```

followed by the query:

```
MODIFY PROG PAGE REQMTS?(/E TO END)
PNAME,#PAGES
-
```

The following Configurator operations, modifying program page requirements and changing program partition assignments, apply only to disc resident programs. Since the ID segments for disc resident programs are wiped out by the RTE-IVE Configurator, these operations have no effect on type 2, 3, and 4 programs. The only exception is a program specified (when running CONVM) to be loaded into a partition at bootup. This is the only program that will be affected by the following two Configurator operations.

Enter the specifications for a disc resident program whose page requirement must be changed, using the format:

```
program name,xx
```

where the number of pages entered for the program must include the base page. The number of pages must be greater than or equal to the program relocation size, and less than or equal to the maximum address space for the program.

The hyphen prompt will be repeated after acceptance of each entry until a /E is entered.

Note that the page requirements for an EMA program cannot be modified.

Program Partition Assignments

The Configurator now asks if a disc resident program needs to be assigned to a partition by displaying the query and prompt:

```
ASSIGN PROG PART'NS?(/E TO END)
PNAME, PART'N#
-
```

where the hyphen prompt will be repeated after each accepted entry until a /E is entered to terminate the list.

Enter the desired program partition assignment in the form:

```
program name,xx
```

where xx is the partition number to which the program is to be assigned. If xx is 0, the program is unassigned and can be dispatched to any partition of the proper type large enough to run the program. When a /E is entered to terminate the list, the Configurator issues the query:

```
OK TO PROCEED? (YES/NO)
```

If YES is entered, the Configurator issues the message:

```
RECONFIGURATION COMPLETED
```

and turns control over to the operating system.

If NO is entered in response to the prompt instead of YES, memory reconfiguration is restarted from the query

```
PHYSICAL MEM SIZE?(#PAGES)
```

and the system is in the state it was changed to during the earlier reconfiguration.

Reconfiguration Example

```
START RECONFIGURATION
LIST DEVICE LU#?
6
LIST DEVICE SELECT CODE#?
22
ECHO?
YES
I/O RECONFIGURATION ALREADY PERFORMED:
CURRENT SELECT CODE#,NEW SELECT CODE#?
13 ,15          *SYSTEM DISC 1
20 ,17          *SYSTEM CONSOLE
21 ,22          *LIST DEVICE
CURRENT I/O CONFIGURATION:
SELECT CODE 11= EQT  8,TYPE 65
SELECT CODE 12= TBG
SELECT CODE 15= EQT  1,TYPE 32
SELECT CODE 17= EQT  2,TYPE  5
SELECT CODE 22= EQT  3,TYPE 12
SELECT CODE 23= EQT  4,TYPE 23
SELECT CODE 24= EQT  4,TYPE 23
SELECT CODE 25= EQT  9,TYPE 66
SELECT CODE 33= EQT  6,TYPE  5  PRMPT
SELECT CODE 41= EQT 11,TYPE  0  PRMPT
SELECT CODE 45= EQT  5,TYPE  0  PRMPT
SELECT CODE 46= EQT  7,TYPE 33
I/O RECONFIGURATION?(YES/NO)
YES
CURRENT SELECT CODE#,NEW SELECT CODE#?(/E TO END)
-
11,10
-
25,29
-
46,42
-
/E
NEW I/O CONFIGURATION:
SELECT CODE 10= EQT  8,TYPE 65
SELECT CODE 12= TBG
SELECT CODE 15= EQT  1,TYPE 32
SELECT CODE 17= EQT  2,TYPE  5
SELECT CODE 22= EQT  3,TYPE 12
SELECT CODE 23= EQT  4,TYPE 23
SELECT CODE 24= EQT  4,TYPE 23
SELECT CODE 31= EQT  9,TYPE 66
SELECT CODE 33= EQT  6,TYPE  5  PRMPT
SELECT CODE 41= EQT 11,TYPE  0  PRMPT
SELECT CODE 42= EQT  7,TYPE 33
SELECT CODE 45= EQT  5,TYPE  0  PRMPT
```

Figure 4-1. Reconfiguration Example

```
RTE-IVE Configurator Program $CNFG


OK TO PROCEED?(YES/NO)
YES
CURRENT PHYSICAL MEM SIZE:   512 PAGES
MEM RECONFIGURATION?(YES/NO)
YES
PHYSICAL MEM SIZE?(#PAGES)
256
DEFINE BAD PAGES BEGINNING AT PAGE  47 (/E TO END)
-
52
-
62
-
/E
CURRENT SIZE OF SAM:
DEFAULT:  3666 WORDS
EXTENSION:   8 PAGES
SAM EXTENSION STARTS AT PHYSICAL PAGE   47
MAX PAGES AVAIL FOR SAM EXTENSION:   8
CHANGE SAM EXTENSION?(#PAGES/" "CR)
4
CURRENT PART'N DEFINITIONS:
PART'N   1 =  10  PAGES,BG
PART'N   2 =  10  PAGES,BG
PART'N   3 =  10  PAGES,BG
PART'N   4 =  10  PAGES,BG
PART'N   5 =  10  PAGES,BG
PART'N   6 =  20  PAGES,BG
PART'N   7 =  20  PAGES,BG
PART'N   8 =  20  PAGES,BG
PART'N   9 =  20  PAGES,BG
PART'N  10 =  20  PAGES,BG
PART'N  11 =  20  PAGES,BG
PART'N  12 =  20  PAGES,BG
PART'N  13 =  20  PAGES,BG
PART'N  14 =  20  PAGES,BG
PART'N  15 =  20  PAGES,BG
PART'N  16 =  28  PAGES,BG
PART'N  17 =  28  PAGES,BG
PART'N  18 =  28  PAGES,BG
PART'N  19 =  28  PAGES,BG
PART'N  20 =  95  PAGES,BG
PART'N  21 =  15  PAGES,S
PART'N  22 =  20  PAGES,S
PART'N  23 =  20  PAGES,S
PART'N  24 =  20  PAGES,S
PART'N  25 =  20  PAGES,S
```

Figure 4-1. Reconfiguration Example (Cont.)

```
CURRENT PART'N REQMTS:
REALTIME
AUTOR     2 PAGES
BACKGROUND
$CNFX     3 PAGES
PROGL     7 PAGES
DINIT    10 PAGES
DSMOD     8 PAGES
MAX PROGRAM SIZE:
W/OUT COMMON: 29 PAGES
W/ COMMON:    27 PAGES
W/ TABLE II:  24 PAGES
MAX # OF PART'NS: 32
PAGES REMAINING:   205
DEFINE PART'NS FOR   9 PAGES:
#PAGES,RT(M)/BG(M)/S(,R)
PART'N   1,     9 PAGES?
2,BG
PART'N   2,     7 PAGES?
3,BG
PART'N   3,     4 PAGES?
4,BG
DEFINE PART'NS FOR 193 PAGES:
#PAGES,RT(M)/BG(M)/S(,R)
PART'N   4,   193 PAGES?
10,BG
PART'N   5,   183 PAGES?
10,BG
PART'N   6,   173 PAGES?
10,BG
PART'N   7,   163 PAGES?
28,BG
PART'N   8,   135 PAGES?
28,BG
PART'N   9,   107 PAGES?
28,BG
PART'N  10,    79 PAGES?
79,BG
SUBPARTITIONS?(YES/NO)
YES
PART'N  11,     0,(  79) PAGES?
23,S
PART'N  12,     0,(  56) PAGES?
28,S
PART'N  13,     0,(  28) PAGES?
28,S
```

Figure 4-1. Reconfiguration Example (Cont.)

```
NEW PART'N DEFINITIONS:
PART'N   1 =   2  PAGES,BG
PART'N   2 =   3  PAGES,BG
PART'N   3 =   4  PAGES,BG
PART'N   4 =  10  PAGES,BG
PART'N   5 =  10  PAGES,BG
PART'N   6 =  10  PAGES,BG
PART'N   7 =  28  PAGES,BG
PART'N   8 =  28  PAGES,BG
PART'N   9 =  28  PAGES,BG
PART'N  10 =  79  PAGES,BG
PART'N  11 =  23  PAGES,S
PART'N  12 =  28  PAGES,S
PART'N  13 =  28  PAGES,S
UNASSIGNED PROGRAMS:
MODIFY PROG PAGE REQMTS?(/E TO END)
PNAME,#PAGES
-
/E
ASSIGN PROG PART'NS?(/E TO END)
PNAME,PART'N#
-
/E
OK TO PROCEED?(YES/NO)
YES

SET TIME
```

Figure 4-1. Reconfiguration Example (Cont.)

Chapter 5
Program Loading Procedures

General Information

RTE-IVE program loading procedures are summarized below.

- Relocate program module using MLOAD on the host system. MLOAD uses the snapshot file, created by CONVM, to get entry points.

- Transfer absolute program file to target system using tape, minicartridge, magnetic tape, diskette, or DS/1000-IV link through APLDR.

- Load absolute program using APLDR. APLDR gets the program from a local LU, flexible disc cartridge, or from a neighbor node cartridge. It then loads the program into a partition, and sets up the program's ID segment.

- Run the program using the RTE RU command or the RTE-IVE Small File Manager RU command.

RTE-IVE Relocating Loader MLOAD

The RTE-IVE Relocating Loader MLOAD is a modified version of the RTE-IVB Relocating Loader. MLOAD incorporates the capability to search a snapshot file, created by CONVM, and produce a memory image file (type 6) containing the relocated absolute load module. For segmented programs, the memory image file also contains the program segments. Refer to Appendix D for the format of the memory image file.

The absolute load module must then be moved to the target system and loaded into a memory partition by APLDR before the program can be executed. APLDR must be a memory resident program in the RTE-IVE system, relocated at generation time.

Note: MLOAD executes only in a disc-based RTE-IVB system.

If MLOAD is scheduled using the RU or ON command with a runstring containing run parameters, a partition cannot be specified and the default for the snapshot file (S00000) and output file are used.

Command Descriptions

This section describes the differences between the RTE-IVB Relocating Loader, LOADR, and the RTE-IVE Relocating Loader, MLOAD. For a complete description of the RTE-IVB Relocating Loader refer to the RTE-IVB Terminal User's Reference Manual.

In addition to the RTE-IVB LOADR commands, the following commands are included in MLOAD:

SNAPSHOT,<name>

where: <name> = filename and file subparameters of snapshot file to be searched. Cannot be an LU.

This command defines the snapshot file to be searched to satisfy undefined externals. (The snapshot file was produced by the conversion program CONVM.) If a SNAPSHOT command is not specified before loading begins, the loader defaults the snapshot file name to S00000.

The SNAPSHOT command must precede specification of any RELOCATE or SEARCH command. Otherwise, the command will be ignored if entered from an interactive device, or cause errors if entered from a command file. Only the first two characters "SN" need be specified.

OUTPUT,<name>

where: <name> = filename and file subparameters of output file for the absolute load module. Cannot be an LU.

This command defines the type 6 memory image file in which to load the relocated program. In addition to the specification of the filename for the memory image file, the OUTPUT command copies this filename into the program's ID segment information. The ID segment information is contained in the first record of the memory image file. Thus, the OUTPUT command can be used to rename a program. Appendix D shows the format of the memory image program file.

If the OUTPUT command is used, the output file must not already exist. If a file with the same name already exists, MLOAD issues the error "FMGR-002", duplicate file name.

If the OUTPUT command is not specified before the loading begins, the loader will create an output file with the main program's name on the first cartridge available. If the program has the same name as a file already defined on the cartridge, the loader will rename the output file by replacing the first two characters of the name with period characters and try again. If, for example, a file currently exists with the name WHZAT, and a main program with the name WHZAT is to be loaded without specifying an output file name, the loader will create an output file named ..ZAT. If the file ..ZAT already exists, MLOAD issues the error "L-DU PGM", duplicate program.

The OUTPUT command must precede specification of any RELOCATE or SEARCH command. Otherwise, the command will be ignored if entered from an interactive device, or cause errors if entered from a command file. Only the first two characters "OU" need be specified.

Deleted Opcodes and Commands

The following RTE-IVB LOADR opcodes and commands are not available in MLOAD:

Opcodes:

LI -- list all active programs
PU -- purge a program
PE -- load a permanent program
RP -- replace a permanent program
DC -- don't copy, multiple copies of the program are not desired.

Commands:

AS,xx -- Assign the program to partition xx. Note: APLDR allows a relocated program to be assigned to a partition.

Absolute Program Loader APLDR

The absolute program loader APLDR loads absolute programs from a remote node, a local lu, or a local flexible disc.

APLDR runs only on the target RTE-IVE system, and must be a memory resident program, relocated during generation.

To schedule APLDR, use the RTE or FMGR "RU" command:

```
RU,APLDR,<namr>[,[<pttn#>] [,<node#>]]
```

where:

<namr> file name of the file containing the program, or the lu number of a local device. The CRN in <namr> should be specified for segmented programs. This results in faster segment loading.

<pttn#> the number of the partition into which the program is to be loaded. If this parameter is not specified, APLDR will choose the smallest available partition that is large enough to hold the program. If a partition number was specified for a non-EMA program, APLDR will assign the pages of unused memory between the end of the program and the end of the partition to the program, but not exceeding the 32K word program address space.

If a partition number was specified for an EMA program and the EMA default size was taken, the EMA size is determined at the time of the first dispatch as the program's partition size minus program size.

NOTE: EMA or MSEG size cannot be modified online.

The program WHZAT can be used to obtain a partition list.

<node#> indicates the remote node on which the file specified by <namr> is to be found. The node # may not be specified if an LU # is given.

APLDR also loads program segments. This capability is invoked by using SEGLD. No error messages are printed on the terminal for a segment load. For more information refer to the Program Segmentation section in this chapter.

As mentioned in Chapter 1, all program completions are modified to be handled as serially reusable. In RTE-IVB, the result of a standard completion is that the program is reloaded from disc into memory each time it is scheduled. When a program is rescheduled in RTE-IVE, the memory resident version is run, since the previous termination of the program was handled as serially reusable. If the program does not reside in a memory partition and it is scheduled using the FMGR "RU" command, the error "FMGR 67" (program not found) will be displayed. If the program was scheduled using the system "RU" command, the error "NO SUCH PROGRAM" will be displayed. This will occur if the program has been overlayed (with another program by APLDR) after its ID segment has been cleared using the system "OF" command in the form:

```
OF,program,8
```

Note that because RTE-IVE modifies program's to terminate serially reusable, programs should initialize their own variables, buffers, and other storage locations. Programs that do not initialize their data in memory should be reloaded into memory using APDLR before they are rescheduled.

Scheduling APLDR Programmatically

If APLDR is scheduled programmatically to load a program, parameters must be passed to it through a runstring in the EXEC scheduling request. They are retrieved by APLDR using an EXEC 14 string passage request. The first parameter passed through the ID segment (first optional integer parameter in the EXEC scheduling request) should be a zero to indicate a program load.

APLDR Return Parameters

The program that scheduled APLDR can use the routine RMPAR to recover Return Parameters to determine if the load was successful or why the load failed.

If the load was successful the program name is returned in IPRAM(1) through IPRAM(3). If the program was renamed by APLDR from XXXXX to ..XXX, the name ..XXX is returned in IPRAM(1) through IPRAM(3).

If the load was not successful the first parameter, IPRAM(1), is a negative error code. Refer to Appendix A for descriptions of these error codes.

DS and Non-DS Versions of APLDR

RTE-IVE Non-DS Version of APLDR (%APL4E)

This version executes FMP calls and is useful in a stand-alone environment, where program files are loaded from local LU's or from a local peripheral disc.

RTE-IVE DS/1000-IV Version of APLDR (%APL4D)

This version executes Remote File Access (RFA) calls and is only useful in a DS/1000-IV environment. The local node must be initialized (via DINIT) and the DS/1000-IV monitors GRPM, QUEUE, RTRY, UPLIN and QCLM must be scheduled (via DINIT) before APLDR can be used to load program files from another node.

If a local peripheral disc is used to load program files with APLDR, the local node must be initialized (via DINIT) and RFAM must be present and scheduled (via DINIT or DSMOD) before any program file can be accessed with RFA calls. If the RFAM monitor has not been scheduled via DINIT or DSMOD, program files cannot be loaded from a local peripheral disc (they can still be loaded from local LU's).

For more information, refer to the DS/1000-IV Network Manager's Manual.

Program Segmentation - RTE-IVE Segment Loader SEGLD

Program segments can be loaded from a flexible disc or from a disc-based node via DS/1000-IV. Segments are loaded by the RTE-IVE routine SEGLD. The calling sequence for SEGLD is identical to that of the RTE-IVB segment load routine SEGLD. The EXEC 8 segment load request is not available in RTE-IVE.

In RTE-IVE, segments are contained in the type 6 file along with the main program. When SEGLD is called, it schedules APLDR which loads the segment based on parameters passed to it and the parameter table in the program's partition. The parameter table is constructed by APLDR when the main program is loaded into memory.

Each execution of a program that uses segments will consume a single short ID segment. The ID segment will be allocated on the first SEGLD call, and simply modified thereafter. When a segmented program is terminated by the user with the command "OF,PROG,8", the user should remove the last segment that was loaded, using the command "OF,SEG,8". Since the short ID segment is not used by RTE-IVE (it is provided only to facilitate user routines that examine it), no checking is performed to ensure that the name of the short ID segment is unique. Thus, more than one short ID segment can have the same name.

The format for calls to SEGLD is:

```
SEGLD (INAM,IERR[,IP1][,IP2][,IP3][,IP4][,IP5])
```

where:

INAM - Segment name. Three-word array containing the ASCII name of the segment to be loaded.

IERR - Error return. 0 if load was successful; 05 if load could not be performed.

IP1 thru IP5 - Optional one-word parameters; passed to segment INAM.

Chapter 6
RTE-IVE File Manager Program FMGR

General Information

The RTE-IVE Small File Manager is an interactive file management utility program for use in the RTE-IVE operating system. It can be used for file management on RTE-IVE systems that include peripheral flexible or hard discs. RTE-IVE Small File Manager supports the following subset of the RTE-4B FMGR commands (with certain modifications):

```
CL -- list mounted cartridges
CR -- create a disc file
DC -- dismount cartridge
DL -- directory list
DU -- transfer data to an existing file
EX -- exit from FMGR
LI -- list file contents
LL -- change list device
MC -- mount cartridge
PU -- purge a file
RU -- run a program
ST -- transfer and create a file
SY -- execute RTE system command from FMGR
?? -- give error explanation
```

In addition to the above commands, Small File Manager has a 'run-by-default' feature. That is, any program that can be run by the command 'RU,<program name and parameters>' can also be run by the command '<program name and parameters>'. The leading 'RU,' is not needed.

The RTE-IVB FMGR "initialize" command IN is not implemented in the RTE-IVE Small File Manager. Disc cartridges must be prepared on a disc-based RTE-IVB system. The medium must be formatted using the FORMT utility, and the formatted disc must be initialized using the RTE-IVB FMGR IN command. The Track Map Tables in the RTE-IVE and RTE-IVB systems must be the same.

The RTE-IVB FMGR "pack" command PK is not implemented in the RTE-IVE Small File Manager. Cartridges must be packed on an RTE-IVB system using the FMGR PK command. The Track Map Tables in both systems must be the same.

The RTE-IVB terminal control command CT is not included in the Small File Manager. Use the RTE-IVE utility, XCNTL, described in Appendix G, or use an EXEC 3 control request in the system startup program to enable terminals.

Note: All Small File Manager output is preceded by two blanks. This prevents interference with carriage control characters when FMGR output is directed to a line printer.

Appendix B contains information about loading Small File Manager.

FMGR With Multi-Terminal Monitor

If multiple copies of the Small File Manager are needed for a multi-terminal environment, use the store (ST) command to create the copies. For example, the following command creates a copy for terminal LU11:

```
:ST,FMGR::PR,FMG11::PR
```

When the file FMG11 is loaded, APLDR will use the name FMG11 for that copy of the Small File Manager. When using Multi-Terminal Monitor (MTM), this copy of FMGR will be scheduled in response to a keystroke on the terminal whose LU number is 11. To remove FMG11 and obtain the system prompt, use the command OF,FMG11,8. One copy of the Small File Manager should be loaded for each terminal.

If automatic scheduling is not desired, use another name for Small File Manager.

NOTE: Terminals should be enabled using XCNTL (refer to Appendix G) or in the system startup program using an EXEC 3 control request.

Command Format

Upon receiving the FMGR prompt (:), commands may be entered in the general form:

```
:XX [,parameters]
```

where XX is the two letter command specification. Immediately upon input of the command string, all lower case letters in the command string are converted to upper case; thus, case has no meaning to FMGR. For a FMGR command to be recognized as such, the two letter command specification must be immediately followed by a carriage return, a comma, or a blank. For example, if 'DLER' is entered, FMGR will attempt to run the program DLER; if 'DL ER', 'DL,', or 'DL' is entered, FMGR will execute a directory list command. The only exception to these rules is the SY command. In the SY command, the system command to be executed should be prefaced with 'SY' (or 'sy' or 'sY', etc.) with no delimiters, e.g., SYTI.

Command Descriptions

CL (List Mounted Cartridges)

Displays list of all cartridges in system cartridge list. The cartridge list is issued to the list device (default is the user's terminal). Cartridges can reside on peripheral flexible or hard discs.

syntax: CL

CR (Create a Disc File)

syntax: CR, <namr>

<namr> - File descriptor; must not be a logical unit number; omitted subparameters default to zero; file type and size must be specified as greater than zero; record size need be specified only for type 2 files. For more information refer to the Terminal User's Manual.

DC (Dismount Cartridge)

Deletes cartridge entry in system cartridge list.

syntax: DC, cartridge

cartridge - Cartridge identifier; positive or alphanumeric cartridge reference number assigned to cartridge, or negative logical unit number associated with cartridge.

DL (Directory List)

Provides a list of all FMP files on a specified cartridge, a list of all system cartridges, or a list of files with common <namr> characteristics.

There is no master security code in the RTE-IVE operating system. The DL command provides all file information, including file security codes.

syntax: DL [,cartridge]
or
DL,<namr>

cartridge - cartridge identifier; positive for cartridge reference number, negative for logical unit number; if omitted or zero, the directories of all system cartridges are listed.

<namr> - File descriptor; must not be a logical unit number; omitted subparameters default to zero. As described below, minus signs (-) can be used as place holders to allow more flexibility. When this format is used, the following conditions must be met before a given file entry will be listed:

a. The file name must match the name portion of <namr>, except that the minus sign "-" in <namr>, if used, matches any character.

b. Zero as a subparameter matches any actual subparameter. If a non-zero subparameter is used, however, it must match the file's actual parameter.

c. The standard security code match is used, i.e.:

-n matches n and -n
+n matches n only

* An asterisk preceding the word BLKS in the directory listing indicates that the file size is printed in 128-block multiples. A minus sign following a program name in the OPEN TO column indicates that the file is opened exclusively to that program.

DU (Transfer Data to Existing File)

Transfers data from an existing file or logical unit to another existing file or logical unit.

syntax: DU, <namr1>, <namr2> [, record format]

<namr1>	- file name of existing file or logical unit number; data is transferred from <namr1>.
<namr2>	- File name of existing file or logical unit number; data is transferred to <namr2>.
record format	- Format of data in <namr1>; default is derived from file type of <namr1> or is ASCII; refer to the following section on record format.

EX (Exit FMGR)

Terminates FMGR program.

syntax: EX

LI (List File Contents)

Lists the contents of a file, file directory information, or data stored on a logical unit on the list device.

syntax: LI,<namr> [,format [,L1 [,L2]]]

<namr> - File name or logical unit number; if file is protected by a negative security code, it must be specified; if cartridge reference number is included, that cartridge is searched for the file name, otherwise, the first found with that name is listed.

format - Specifies list format:

S ASCII source format
B binary format
D directory information only

If omitted, file type determines format: S if file is type 0, 3, or 4; B for all other types.

L1, L2 - Starting and ending line numbers of file being listed in the specified format. L1 defaults to line 1, and L2 defaults to the last line of the file. If L1 is greater than L2, no lines are listed.

LL (Change List Device)

Changes current list device assignment.

syntax: LL,<namr>

<namr> - New list device; may be a file or a logical unit number. The default list device is the user's terminal.

MC (Mount Cartridge)

Makes an unmounted disc cartridge available to the user.

syntax: MC, lu [,last track]

lu - Logical unit number of cartridge to be mounted (can be positive or negative).

last track - The last track of the cartridge. First track is 0 and last track is (last track) - 1.

NOTE: An error occurs if the cartridge has not been initialized. Cartridges must be initialized on a disc-based RTE-IVB system.

PU (Purge a File)

Removes a file and its extents from the system.

syntax: PU, <namr>

<namr> - File decriptor: enter file name and, optionally, security code and cartridge reference.

RU (Run Program)

Searches for and excecutes a named program.

syntax: RU, program

program - Program name: 5 (or less) character name of program to be executed.

The 'RU,' portion of this command need not be included.

ST (Transfer Data and Create File)

Transfers data from a file or logical unit to a disc file or logical unit; the receiving file is created by the command unless it is a logical unit. To transfer data to an existing file the DU command may be used.

syntax: ST,<namr1>,<namr2> [,record format]

<namr1> - File name of existing file or non-disc logical unit number; data is transferred from <namr1>.

<namr2> - File name or logical unit to which data is transferred from <namr1>. If <namr2> is a file name, the file is created using the last three subparameters of <namr> if they are supplied.

If not supplied, the subparameters default to the corresponding subparameters of <namr1> (which do not need to be specified in the command), assuming that <namr1> is a disc file. If <namr1> is not a disc file, then the file size of <namr2> defaults to 24 blocks, and the default file type of <namr2> is based on the record format of <namr1>, as follows:

type 3 - If record format is AS or is omitted.

type 5 - If record format is BR or BN.

type 7 - If record format is BA.

record format - Format of data in <namr1>; default is derived from file type of <namr1> or is ASCII; refer to the following section on record format.

If the size parameter in the destination file namr is specified to be -1, the ST command will truncate the file after the data is transferred.

SY (Execute System Command from FMGR)

Allows execution of system command from FMGR. RTE-IVE system commands are the same as RTE-IVB system commands. Refer to the RTE-IVB Terminal User's Manual for descriptions of system commands.

syntax: SY<command>

<command> - The system command mnemonic code. No delimiter is permitted between SY and the command.

?? (Give Error Explanation)

Gives a short description of the meaning of a specified RTE-IVE FMGR error number or the last occurring error.

syntax: ?? [,error number]

error number - An RTE-IVE FMGR error number. If not specified, the last FMGR error to occur (excluding any EXEC errors) is described. RTE-IVE FMGR errors are described in Appendix A.

Record Format

Record formats are:

AS - ASCII records are transferred.

BA - Binary absolute records are transferred; checksum is performed.

BR - Binary relocatable records are transferred; checksum is performed.

BN - Same as BR, but without checksum.

If a record format is omitted in a DU or ST command, the file type of <namr1> is used to derive the format:

If file type is 0 (non-disc files), 3, or 4 (disc files), then record format is AS (ASCII).

If file type is 5, then record format is BR (binary relocatable).

If file type is 7, then record format is BA (binary absolute).

Appendix A
RTE-IVE Errors

APLDR Error Messages

BAD FILE CHECKSUM

The checksum of the first 33 words of the first record does not equal the checkword. The file has been corrupted.

CAN'T LOAD FROM REMOTE LU'S

Programs can only be loaded from local files or LU's, or from remote files. Copy the program to one of these places.

PROGRAM ..... READY (completion message)

This message is displayed after a successful load.

DUPLICATE PROGRAM

There is already a program or segment with the given name in a partition. An attempt to rename the program by replacing the first two characters with ".." failed because a program with that name was also already present.

EXEC ERROR xxnn (e.g., IO02)

An EXEC error occurred while reading from a local LU. The number is the EXEC error code.

FILE ERROR nnnn (e.g., -006)

If the NON-DS version of APLDR is used, the file error refers to a FMGR error code. Refer to the RTE-IVB Terminal User's Reference Manual for FMGR error messages.

If the DS version of APLDR is used, the file error refers to a DS/1000 Numeric Error Code. Refer to the DS/1000-IV Network Manager's Manual for Numeric Error Codes.

LU NUMBER OUT OF RANGE

The LU number specified is zero, negative, or greater than 63. Use the correct LU number.

MISSING FILE

The file specified does not exist.

NO ID EXTENSIONS FREE

All ID extensions are in use. An EMA program must be removed before the program can be loaded.

NO ID SEGMENTS FREE

All ID segments are in use. A program or segment must be removed before another can be added.

NO PARTITION BIG ENOUGH

APLDR was requested to load the program into the smallest available partition. This request failed because no unoccupied partition is big enough. Remove a program from a partition of sufficient size, or clear the subpartitions of a mother partition to free a partition of the required size. Remove programs using the command OF,program,8.

PARTITION IS OCCUPIED

The requested partition is unavailable because another program is in it.

PARTITION TOO SMALL

The partition requested is not large enough to hold the program.

PROGRAM IS NOT A MAINLINE

The program was not loaded as a type 2, 3, or 4 program. Check the NAM record, program statement, or compiler option in the source file.

PROGRAM RENAMED TO ..XXX (warning)

There is already a program or segment with the default name in a partition. The name has been changed to the indicated name; loading continues.

SEGMENTED PROGRAMS CAN'T BE LOADED FROM LU'S

This is a restriction on segmented programs.

SUBPARTITION OCCUPIED

The partition requested is a mother partition and one or more of its subpartitions are occupied.

SYSTEM CHECKSUM DOESN'T MATCH

The checksum of entry point $OPSY added to base page locations 1650-1657, 1742-1747, and 1751-1764 (octal) does not equal the checkword in the file. This indicates that the file was created for a different system or system generation.

UNDEFINED PARTITION

The partition specified is not defined.

UNEXPECTED END OF FILE

When reading from a local or remote file, an end-of-file was returned by FMP when more data was expected. The file has been corrupted.

APLDR Error Codes

The error codes in Table A-1 are returned to the father (program that scheduled APLDR). The negative error code is retrieved using RMPAR, and is returned in the first parameter, IPRAM(1). (For error codes -74 and -75, IPRAM(2) and IPRAM(3) are also used.)

Table A-1. APLDR Error Codes

CODE	DESCRIPTION
-61	DUPLICATE PROGRAM
-62	NO PARTITION BIG ENOUGH
-63	PARTITION TOO SMALL
-64	NO ID SEGMENTS FREE
-66	SYSTEM CHECKSUM DOESN'T MATCH
-69	PROGRAM IN NOT A MAINLINE
-70	UNEXPECTED END OF FILE
-71	BAD FILE CHECKSUM
-72	MISSING FILE
-73	CAN'T LOAD FROM REMOTE LU'S
-74	FILE ERROR nnnn (e.g., -006) This error will also return the error code nnnn (e.g., -006) in the second parameter retrieved by RMPAR.
-75	EXEC ERROR xxnn (e.g., IO02) This error will also return the error type in the second parameter and the error code in the third parameter retrieved by RMPAR (e.g., for IO02, IPRAM(2)=2HIO and IPRAM(3)=2H02).
-76	SEGMENTED PROGRAMS CAN'T BE LOADED FROM LU'S
-77	UNDEFINED PARTITION
-78	LU NUMBER OUT OF RANGE
-79	PARTITION IS OCCUPIED
-80	SUBPARTITION OCCUPIED
-81	NO ID EXTENSIONS FREE

Bootup and Reconfiguration Halts (Non-CBL)

During either system bootup or reconfiguration, various Halts (of the form 1020xx) may be issued on the computer front panel. The meaning of these halts and any required operator action are given below. Halts that can occur when using CBL bootup are described in Table A-3.

Table A-2. Bootup and Reconfiguration Halts (Non-CBL)

HLT	Meaning	User Action
0	Device error. No tape in CTU or magnetic tape unit, or read error.	Restart system bootup procedure.
4	Powerfail occurred and powerfail automatic restart is enabled.	Restart system bootup procedure.
5	Memory protect switch was set and memory parity error occurred.	Restart system bootup procedure.
10B	FMGR or D.RTR cannot be scheduled at startup because there is not a large enough partition (issued by the system).	Restart system bootup and redefine memory to include a partition large enough for FMGR and D.RTR
11B	Attempt was made to re-execute a non-RPL compatible ROM Loader Part # 12992A, or Bootstrap Loader. -or- Checksum error; minicartridge tape or magnetic tape (record data incorrect).	Reload the ROM Loader or Bootstrap Loader before re-executing. Restart system bootup procedure.
22B	One of the following conditions was encountered: 1. $CNFG cannot find an ID segment for Configurator extension $CNFX. 2. $CNFX is not a Type 3 program. 3. A contiguous memory block of three good pages cannot be found in the user partition area.	Restart system bootup procedure. If memory reconfiguration is desired $CNFX must be permanently loaded as a Type 3 program and there must be at least 3 good pages of contiguous memory in the user partition area.

CONTINUED ON NEXT PAGE

Table A-2. Bootup and Reconfiguration Halts (Non-CBL) (Cont.)

HLT	Meaning	User Action
30B	Error was encountered in the disc I/O process by one of the RPL-compatible ROM Loaders Part #12992B & 12992F. If the disc is a 7900 the disc status is displayed in the A-Register. If the disc is a 7905/20 the disc status word 1 is displayed in the B-Register and disc status word 2 in the A-Register.	Retry the system bootup procedure.
31B	Error encountered in the disc I/O process by the Boot Extension. If the disc is a 7900, the disc status is displayed in the A-Register. If the disc is 7905 or 7920, the disc status word 1 is displayed in the B-Register and disc status word 2 is displayed in the A-Register.	Retry the system bootup procedure.
33B	Illegal boot device.	Restart system bootup procedure.
55B	An EQT with the equipment type code of console cannot be found. -or- Address error; minicartridge tape. (record exceeds available memory)	Restart bootup procedure with a console for which an EQT is generated in the system. Restart system bootup procedure.

Bootup Error Codes (CBL)

If an error occurs during bootup using either version of the Communications Bootstrap Loader, one of the halts below (halt 55B, with S-Register contents in the form 17777x) may be issued on the front panel. The meaning of these halts is given in Table A-3.

Table A-3. Bootup Error Codes (CBL)

S-Register contents	Explanation
177777B (-1)	An error occurred when an attempt was made to "open" the file specified. Possibilities include: file does not exist under the name specified (refer to the Scheduling CONVM section), the file does not reside on a system cartridge, the file has a negative security code is currently shared by eight programs, used exclusively by an active program, or the disc is locked. These possibilities are described in the RTE-IVB Programmer's Reference Manual.
177776B (-2)	File read error or the checksum word in the record did not match the value computed by PROGL. The file specified exists but is not in binary absolute format or has been corrupted. Refer to the error possibilities for the subroutine "READF" in the RTE-IVB Programmer's Reference Manual.
177775B (-3)	An error was detected by the remote system driver. Possibilities include: parity error, line timeout on local side, and improper installation of either DS/1000-IV Communication Firmware or CBL Firmware.

Configurator Error Codes

If a user response to a Configurator prompt is illegal or inappropriate, the Configurator issues an error message in the form:

CONFIG ERR xx

Configurator error codes are listed sequentially in Table A-4.

Table A-4. I/O and Memory Reconfiguration Error Codes

CONFIG ERR	Meaning	User Action
1	Invalid LU number or a bit bucket LU.	Enter valid logical unit number.
2	Illegal select code number.	Enter valid number that must be between 10 and 77 octal.
3	New select code entered is identical to new select code assigned to disc, system console or list device, or else the current select code entered is identical to the old select code for disc, system console or list device (i.e., do not reconfigure that which was already done via the S-Register).	Enter different select code.
10	Specified total number of pages outside the range.	Enter valid number in the range 48-1024 for physical memory size and between 0 and maximum pages available for SAM extension.
11	Invalid bad page number.	Enter valid number greater than the previous entry and less than the physical memory size, or enter /E to terminate the list.

CONTINUED NEXT PAGE

Table A-4. I/O and Memory Reconfiguration Error Codes (Cont.)

CONFIG ERR	Meaning	User Action
12	Specified SAM extension entry beyond physical memory size due to bad pages.	Enter smaller number of pages for SAM extension.
13	Current running total exceeds available pages in block of good memory or exceeds size of mother partition.	Redefine last partition or subpartition size. If there are no more pages available in the block of memory to be defined, /E or /R are the only responses accepted.
14	Second parameter of partition definition entry other than RT, BG or S, or else S was entered when a subpartition definition was not expected.	Reenter definition with correct parameter.
15	Third parameter of partition definition entry other than R.	Reenter definition with R as third parameter if partition is to be reserved.
16	No such program, or the name of a segment was entered or invalid type was entered for partition assignment.	Reenter assignment with correct program name or type or /E to end this sequence.
17	Invalid partition number.	Enter valid number or /E to end this sequence.
18	Program does not fit in the assigned partition.	Assign program to larger partition if available, or continue without assigning the program.

CONTINUED NEXT PAGE

Table A-4. I/O and Memory Reconfiguration Error Codes (Cont.)

CONFIG ERR	Meaning	User Action
19	Invalid number of pages was entered for program size.	Enter valid number of pages for program, between the size of the program at load time and the maximum logical address space for the program.
20	Number of defined partitions already equal to allowed maximum number and more undefined pages remain.	Redefine all partitions
21	Page requirements of an EMA program cannot be modified.	Entry is skipped.
22	Number of pages in SAM extension requires division into more than five blocks.	Enter a smaller size of SAM extension

CONVM Error Messages

/CONVM: FMGR-nnn ERROR ON FILE xxxxxx

This error may occur when CONVM encounters an FMP error while accessing the file xxxxxx. Check error code -nnn in FMGR error messages index.

/CONVM: ILLEGAL FILE TYPE

This error may occur if an invalid file name was specified for the system target file, the file has extents, or the file has been corrupted. The system target file must be of type 1 and must be an output file produced by the RTE-IVB On-Line Generator.

/CONVM: ILLEGAL FILE NAME

This error may occur if the file name for the absolute boot file did not start with an ASCII character "P" followed by five octal digits.

/CONVM: ILLEGAL PARAMETER

This error may occur if an LU was specified instead of a file name. CONVM only accepts file names for the system target file and for the absolute boot file.

/CONVM: INVALID PROGRAM yyyyy

Warning message that the program yyyyy, from the CONVM "name" parameter, was not relocated at generation time.

/CONVM: END

This message is displayed when the CONVM program terminates without any errors.

/CONVM: ABORTED

This message is displayed when CONVM terminates due to errors or was aborted by the user using the system break command (BR). When CONVM terminates in this manner it purges the absolute boot file.

FMGR Error Message Format

Error messages have two formats. The first format is:

FMGR xxx

where xxx is an error message code. All error message codes are identical to RTE-IVB FMGR error message codes in both number and meaning, except for two. The FMGR -007 error, which in IVB FMGR means 'Illegal security code or an illegal write on LU 2 or 3', means 'Illegal security code' in RTE-IVE FMGR. The other error is FMGR -103, which means that the cartridge specified in the MC command has an invalid (corrupt) 16 word directory label entry, either on the last track specified in the MC command at sector zero, or, if no last track was specified, on the last track of the cartridge at sector zero.

The second error message format is:

FMGR EXEC ERROR : XXYY

where XXYY is a four character executive error code. With the exception of the SC05 EXEC error (which is reported as a FMGR 067 error in RTE-IVE), all EXEC errors occurring within RTE-IVE FMGR are reported in this format.

If an EXEC error occurs on an attempt by FMGR to write to the scheduling device (terminal), FMGR aborts itself since it cannot communicate with that device.

FMGR Error Codes and Meanings

A list of all RTE-IVE FMGR error codes of the first format follows, along with a short description of each. More detailed descriptions may be found in the RTE-IVB Terminal User's Guide for all FMGR errors except the -103 error.

Error Code	Meaning
-103	Bad cartridge directory label entry
-102	Illegal D.RTR call sequence
-101	Illegal parameter in D.RTR call
-099	Directory manager EXEC request aborted
-046	Greater than 255 extents
-036	Lock error on device
-035	Already 63 discs mounted to system
-034	Disc already mounted
-033	Not enough room on cartridge
-032	Cartridge not found
-030	Value too large for parameter
-020	Illegal access LU
-018	Illegal LU; LU not assigned to system
-017	Illegal read/write on type 0 file
-016	Illegal type 0 or size=0
-015	Illegal file name
-014	Directory full
-013	Disc locked
-012	Eof or sof error
-008	File open or lock rejected
-007	Illegal security code
-006	File not found
-005	Record length illegal
-004	More than 32767 records in a type 2 file
-002	Duplicate file name
-001	Disc error
000	Break
007	Checksum error
012	Duplicate disc label or LU
020	Illegal type 0 file
054	Disc not mounted
055	Missing parameter
056	Bad parameter
067	Program not found

MLOAD Error Codes

MLOAD uses the same error codes as the RTE-IVB Relocating Loader. Refer to the RTE-IVB Terminal User's Manual. The following error codes were added to MLOAD:

ERROR CODE	MEANING
L-IL SNP	Illegal snapshot file.
*W-DU OUT	Duplicate output file name. (Warning message only, the loader will rename the output file xxxxx to ..xxx)
*L-DU OUT	Duplicate output file name. (The output file was already renamed by the loader from xxxxx to ..xxx)

* These errors are reported only if the OUTPUT command is not used. If the OUTPUT command is used and a file with the specified name already exists, then FMGR-002 (duplicate file name) is reported.

Appendix B
Loading RTE-IVE Modules

Loading CONVM

Use the following RTE-IVB LOADR commands to load CONVM:

```
RE,%CNV4E::E4
EN
```

Loading MLOAD

Use the following RTE-IVB LOADR commands to load MLOAD:

```
SZ,16                                OP,LB
LI,$LDRLB::LB          -or-          SZ,26
RE,%MLD4E::E4                        LI,%LDRLB::LB
EN                                   RE,%MLD4E::E4
                                     EN
```

Loading Small File Manager

The RTE-IVE Small File Manager must not be relocated at generation time. It should be relocated using MLOAD and loaded on the target system using APLDR.

Below is an MLOAD command sequence for loading the Small File Manager.

```
* MLOAD command file for RTE-IVE Small File Manager
SN,S00000::SY      * Namr of snapshot file
OU,FMGR::PR        * Namr of output file, program name will be
                   *    taken from this namr (optional).
LI,$PLIB::LB       * Pascal library
RE,%FMG4E::E4
EN
```

Appendix C
Sample DS/1000-IV Startup Program

The two programs in this appendix are used together to perform DS/1000-IV initialization and other system startup operations at an RTE-IVE system. The first program, PASS1, initializes DS so that programs can be loaded over the communications link using APLDR. It then brings over PASS2 and schedules it. PASS2 completes the DS initialization using DSMOD and performs other system startup operations required at the RTE-IVE system. Using two PASS programs conserves memory, since PASS1 must be memory resident, and it allows the system startup procedures to be changed without requiring a new system generation.

```
$PASCAL '1,30 DS Initializer for Node 500'
$HEAP 0, RECURSIVE OFF
PROGRAM PASS1;

{ DS/1000-IV initialization program for node 500. Neighbor 4B system
  is node 600. A remote 4B system, node 100, is also included.
  PASS1 is type 1, memory resident. The type must be changed to
  81 during the Parameter Input Phase of generation to specify
  automatic scheduling at system bootup. The program schedules
  DINIT, turning on the DS programs (memory resident) needed to
  use APLDR. DINIT has been placed into a partition using the CONVM
  partition load capability. PASS1 brings over PASS2 from the 4B
  system using APLDR, and then schedules PASS2 which completes the
  system startup sequence.
}

CONST
   len_answrs = 12;
      { Answers for DINIT are 12 characters long }
   rec_len = len_answrs DIV 2;
      { Records (1 per answer) are 6 words long  }
   num_answrs_DINIT = 13;   { Number of answers for DINIT  }
   buff_len_DINIT = num_answrs_DINIT * rec_len;
                            { DINIT buffer length in words }
      { Note: buffer length for DINIT must be 128 words or less }

TYPE
   int = -32768..32767;
   string5 = PACKED ARRAY[1..5] OF CHAR;
   string10 = PACKED ARRAY[1..10] OF CHAR;
   string20 = PACKED ARRAY[1..20] OF CHAR;
   str = PACKED ARRAY[1..len_answrs] OF CHAR;
            { All answer strings must be the same size }
   buff = ARRAY[1..num_answrs_DINIT] OF str;
```

```
VAR
   class_num : int;

CONST
   { ansbuff_DINIT contains the answers to be passed to DINIT }
   ansbuff_DINIT = buff
          [ str ['YES          '],  {  1000 connected?                }
            str ['NO           '],  {  3000 connected?                }
            str ['/D           '],  {  No. of transactions?           }
            str ['3            '],  {  No. of nodes?                  }
            str ['500          '],  {  Local node = 500               }
            str ['500          '],  {  Node 500 - local 4E            }
            str ['600,14,,1,N  '],  {  Node 600 - neighbor 4B         }
            str ['100,14,,1    '],  {  Node 100 - remote 4B           }
            str ['14           '],  {  Enable LU 14                   }
            str ['/E           '],  {  Last LU                        }
            str ['/E           '],  {  Don't schedule monitors        }
            str ['DS           '],  {  Access security code           }
            str ['DS           ']   {  Manager security code          }
          ];  { end of DINIT_ansbuff }

PROCEDURE schedule     { EXEC schedule request, used to schedule      }
   $ALIAS 'EXEC'$      {    DINIT.                                    }
   (icode : int;       { icode = 9 for schedule with wait             }
                       { icode = 23 for queued schedule with wait     }
    pname : string5;   { pname = program name                         }
    i1,                { negative value tells DINIT to use class I/O  }
    i2,                { class number                                 }
    i3 : int);         { pass constant rec_len (answer size) to DINIT }
   EXTERNAL;

PROCEDURE sched_wbuff { EXEC schedule request with buffer            }
                      { passage; used to schedule APLDR              }
   $ALIAS 'EXEC'$
   (icode : int;      { icode = 9 for schedule with wait             }
                      { icode = 23 for queued schedule with wait     }
    pname : string5;  { pname = program name                         }
    i1,               { pass i1 = 0 when scheduling APLDR            }
    i2,               { i2 through i5 are place holders              }
    i3,
    i4,
    i5 : int;
    bufr : STRING20;  { bufr = complete runstring                    }
    length : int);    { length = length of runstring                 }
   EXTERNAL;          {    (+words or -characters)                   }
```

```
PROCEDURE class_write_read
   $ALIAS 'EXEC^$
   (icode : int;       { icode = 20 for class write/read              }
    icnwd : int;       { icnwd = 0                                    }
    bufr  : buff;      { data buffer                                  }
    length : int;      { pass constant buff_len for length in words   }
    place1 : int;      { place holder                                 }
    place2 : int;      { place holder                                 }
    VAR class_no : int);  { class number returned here                }
   EXTERNAL;

PROCEDURE sycon        { Used to report PASS1 completion at system    }
   $ALIAS 'SYCON'$     {    console                                   }
   (buf : string10;    { buf = message buffer                         }
    len : int);        { len = length of message (+ words, - chars)   }
   EXTERNAL;

BEGIN  { pass1 }

   { DINIT  is  partition resident. It was  placed in a partition at
     bootup  by  using  the  CONVM  partition  load  capability. The
     startup process performed PASS1 is as follows:

        1. Schedule  DINIT, passing the answers via class I/O. DINIT
           will  schedule the following memory resident DS programs,
           which are required for use of APLDR:
              GRPM, QUEUE, RTRY, UPLIN,
              QCLM  (default type of QCLM is disc resident; change
                     to memory resident during generation)

        2. Load PASS2 from node 600 into a partition using APLDR.

        3. Schedule  PASS2.  PASS2  performs  any  necessary system
           startup  procedures.  PASS2 can be  changed to perform a
           different  bootup  sequence  without  generating  a  new
           system.
   }

{ Inform DINIT that class I/O will be used, class_num = 0 }
schedule(23,'DINIT',-1,0,rec_len);
{ Pass answers to DINIT through a class buffer }
class_num := 0;
class_write_read(20,0,ansbuff_DINIT,buff_len_DINIT,0,0,class_num);
{ Schedule DINIT, passing the class number }
schedule(23,'DINIT',-1,class_num,rec_len);
{ Load PASS2 from node 600 into a partition }
sched_wbuff(9,'APLDR',0,0,0,0,0,'RU,APLDR,PASS2,,600 ',-20);
{ Schedule PASS2 to perform system startup procedures }
schedule(23,'PASS2',0,0,0);
{ Report completion at system console }
sycon('END PASS1 ',-10);

END.  { pass1 }
```

Sample DS/1000-IV Startup Program

```
$PASCAL '2,31 Startup Program for Node 500'
$HEAP 0, RECURSIVE OFF
PROGRAM PASS2;

{ This  program  is scheduled by PASS1.  It  is not gen'd in, so its
  size  is  not critical and it can  be changed without generating a
  new system.  PASS1 brings over DSMOD and DS programs from Node 600
  using  APLDR.  DSMOD is then scheduled to turn on the DS programs.
  Finally, terminals are enabled.
}

CONST
   len_answrs = 6;
      { Answers for and DSMOD are 6 characters long }
   rec_len = len_answrs DIV 2;
      { Records (1 per answer) are 3 words long }
   num_answrs_DSMOD = 7;     { Number of answers for DSMOD  }
   buff_len_DSMOD = num_answrs_DSMOD * rec_len;
                            { DSMOD buffer length in words }
      { Note: buffer length for DSMOD must be 128 words or less }


TYPE
   int = -32768..32767;
   string5 = PACKED ARRAY[1..5] OF CHAR;
   string10 = PACKED ARRAY[1..10] OF CHAR;
   string20 = PACKED ARRAY[1..20] OF CHAR;
   str = PACKED ARRAY[1..len_answrs] OF CHAR;
            { All answer strings must be the same size }
   buff = ARRAY[1..num_answrs_DSMOD] OF str;

VAR
   class_num : int;

CONST
   { ansbuff_DSMOD contains the answers to be passed to DSMOD }
   ansbuff_DSMOD = buff
          [ str ['/S    '],   {  Schedule monitors:           }
            str ['EXECW '],   {  Remote schedule monitor      }
            str ['EXECM '],   {  Remote EXEC monitor          }
            str ['OPERM '],   {  Remote operator commands     }
            str ['PTOPM '],   {  PTOP comm. slave monitor     }
            str ['/E    '],   {  Last monitor                 }
            str ['/E    ']    {  Terminate DSMOD              }
          ];  { end of DSMOD_ansbuff }
```

```
PROCEDURE schedule     { EXEC schedule request, used to schedule      }
   $ALIAS 'EXEC'$      {    DSMOD.                                    }
   (icode : int;       { icode = 9 for schedule with wait             }
                       { icode = 23 for queued schedule with wait     }
    pname : string5;   { pname = program name                         }
    i1,                { negative value tells DSMOD to use class I/O  }
    i2,                { class number                                 }
    i3 : int);         { pass constant rec_len (answer size) to DSMOD }
   EXTERNAL;

PROCEDURE sched_wbuff  { EXEC schedule request with buffer            }
                       { passage; used to schedule APLDR              }
   $ALIAS 'EXEC'$
   (icode : int;       { icode = 9 for schedule with wait             }
                       { icode = 23 for queued schedule with wait     }
    pname : string5;   { pname = program name                         }
    i1,                { pass i1 = 0 when scheduling APLDR            }
    i2,                { i2 through i5 are place holders              }
    i3,
    i4,
    i5 : int;
    bufr : STRING20;   { bufr = complete runstring                    }
    length : int);     { length = length of runstring                 }
                       {    (+words or -characters)                   }
   EXTERNAL;

PROCEDURE class_write_read
   $ALIAS 'EXEC'$
   (icode : int;       { icode = 20 for class write/read              }
    icnwd : int;       { icnwd = 0                                    }
    bufr  : buff;      { data buffer                                  }
    length : int;      { pass constant buff_len for length in words   }
    place1 : int;      { place holder                                 }
    place2 : int;      { place holder                                 }
    VAR class_no : int);  { class number returned here                }
   EXTERNAL;

PROCEDURE enable       { Used to enable terminals                     }
   $ALIAS 'EXEC'$
   (icode : int;       { icode = 3 for control request                }
    icnwd : int);      { icnwd = LU + function code                   }
   EXTERNAL;

PROCEDURE sycon        { Used to report PASS completion at system     }
   $ALIAS 'SYCON'$     {    console                                   }
   (buf : string10;    { buf = message buffer                         }
    len : int);        { len = length of message (+ words, - chars)   }
   EXTERNAL;
```

```
BEGIN  { pass2 }

   { The startup process performed by this program is as follows:

        1. Load the following DS monitors from 4B neighbor node
           into partitions using APLDR:

              EXECM, EXECW, OPERM, PTOPM

        2. Load DSMOD from 4B neighbor into a partition via APLDR.

        3. Schedule DSMOD, passing the answer buffer via class I/O.
           DSMOD will then schedule the monitors loaded by APLDR in
           step 1, above.
        4. Enable terminal LUs.
        5. Report completion of PASS2.
   }

{ Load the required monitors from node 600 into partitions }
sched_wbuff(9,'APLDR',0,0,0,0,0,'RU,APLDR,EXECW,,600 ',-20);
sched_wbuff(9,'APLDR',0,0,0,0,0,'RU,APLDR,EXECM,,600 ',-20);
sched_wbuff(9,'APLDR',0,0,0,0,0,'RU,APLDR,OPERM,,600 ',-20);
sched_wbuff(9,'APLDR',0,0,0,0,0,'RU,APLDR,PTOPM,,600 ',-20);
{ Load DSMOD from node 600 into a partition }
sched_wbuff(9,'APLDR',0,0,0,0,0,'RU,APLDR,DSMOD,,600 ',-20);
{ Inform DSMOD that class I/O will be used, class_num = 0 }
schedule(23,'DSMOD',-1,0,rec_len);
{ Pass answers to DSMOD through class buffer }
class_num := 0;
class_write_read(20,0,ansbuff_DSMOD,buff_len_DSMOD,0,0,class_num);
{ Schedule DSMOD, passing the class number }
schedule(23,'DSMOD',-1,class_num,rec_len);
{ Enable terminal LU 11.  Control word = 1035 = 2013B }
{ Note that this can be done online using XCNTL }
enable(3,1035);
{ Report completion at system console }
sycon('END PASS2 ',-10);

END.  { pass2 }
```

Appendix D
Memory Image Program File Format

The RTE-IVE loader MLOAD loads the relocated program into a memory image program file; FMP file type 6. The first 128-word record of the memory image program file contains the program's ID segment information. If the program is segmented, then the first record is followed by additional records, one for each segment, containing ID segment information for each of the segments. Following the ID segment records is an exact copy of the program and its segments, if any. Segments start at record boundaries. Figure D-1 shows the overall layout. Figure D-2 shows the detailed program. Figure D-3 shows the format of records containing ID segment information for a program segment.

NOTE: For each execution of a program that uses segments, a single short ID segment is allocated on the first SEGLD call. This ID segment is then modified for subsequent segment loads. The short ID segment is provided only for user programs that examine it; it is not used by RTE-IVE. Thus, it is possible to have more than one segment with the same name.

Typical layout for a segmented program. Each block represents a 128-word record.

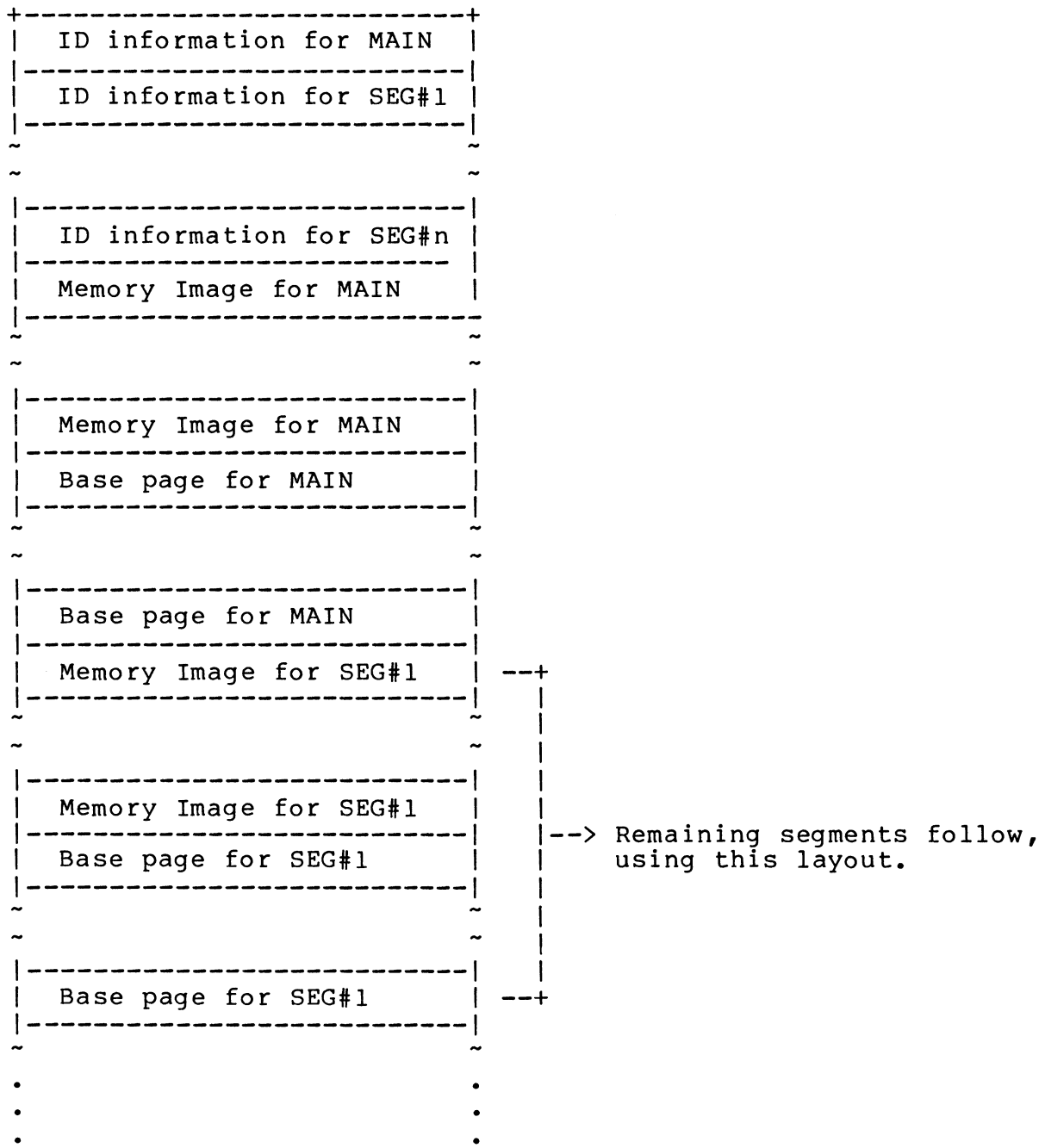


Figure D-1. Memory Image Program File (Type 6) Layout

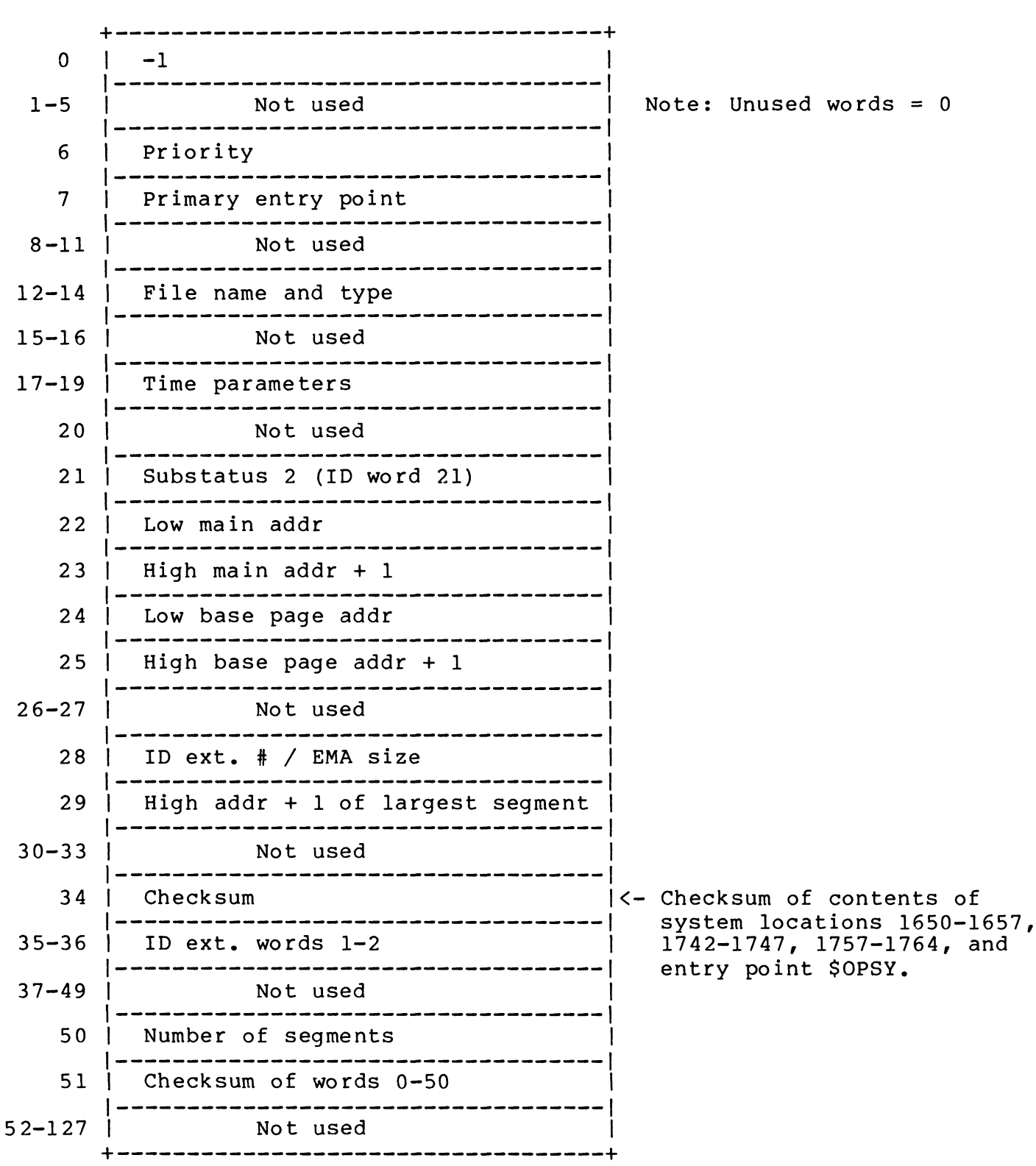


Figure D-2. Main Program ID Information Record

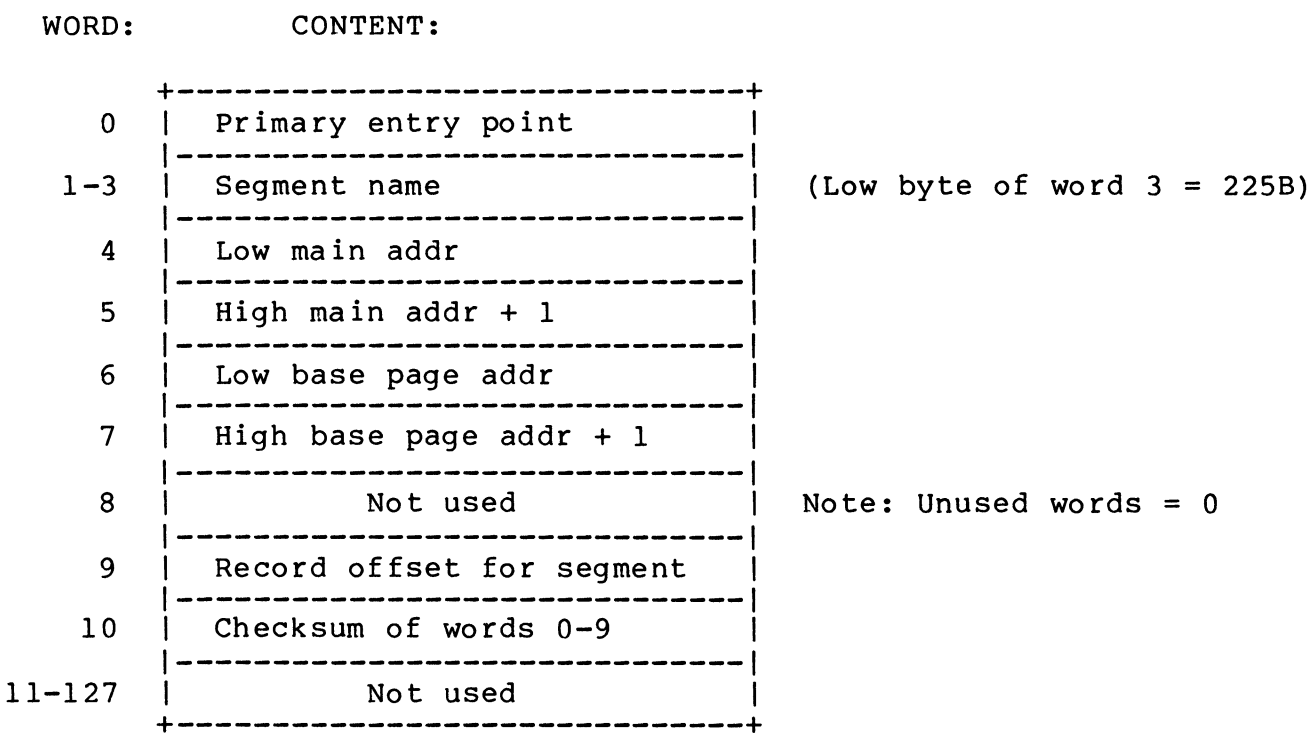


Figure D-3. Program Segment ID Information Record

Appendix E
APLDR Parameter Table

When a program is loaded, APLDR saves the <namr> and node number in a parameter table. The table, allocated by MLOAD, is words 2 through 11 of a partition resident program. The information stored in the table is used by SEGLD to load program segments. Figure E-1 shows the format and contents of the table.

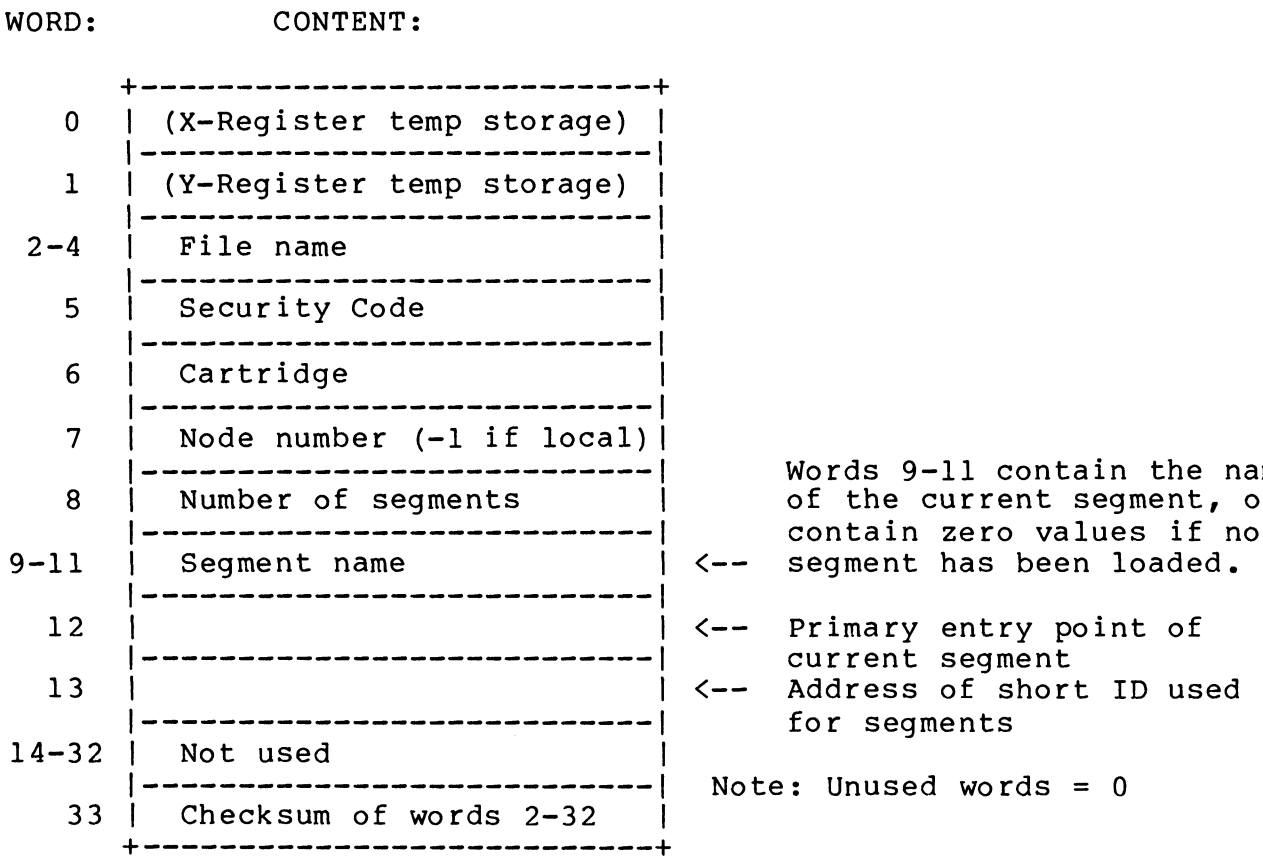
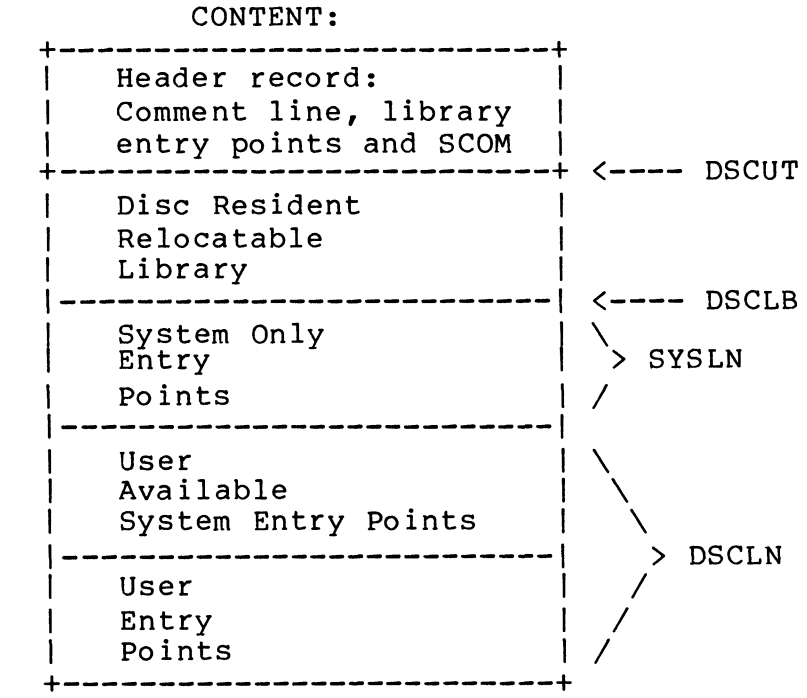


Figure E-1 APLDR Parameter Table

Appendix F
Snapshot File Format



DSCUT - Disc address of relocatable disc resident library
DSCLB - Disc address of library entry points
SYSLN - Number of system library entry points
DSCLN - Number of user available library entry points

Figure F-1. Snapshot File (Type 1) Layout

WORD:	CONTENTS:
0-39	OPTIONAL COMMENT LINE
40	$OPSY (from disc library)
41	$PLP (from disc library)
42	$DLP (from disc libray)
43	$SDA (from disc libray)
44	$COML (from disc libray)
45	MXCHN (Max. Mother prnt)
46	MXPRT (Max. RT/BG prtn)
47	LSOFF (lib. sec. offset)
48-118	not used (zero)
119	RTCOM (from SCOM)
120	RTORG (from SCOM)
121	BPA2 (from SCOM)
122	BGCOM (from SCOM)
123	BGORG (from SCOM)
124	DSCLN (from SCOM)
125	SYSLN (from SCOM)
126	SYSTEM CHECKSUM (see note)
127	CHECKSUM OF WORDS 40-126

Note: Sum of contents of words in base page:
1650B through 1657B
1742B through 1747B
1757B through 1764B
and entry point $OPSY

Figure F-2. Snapshot File Header Record (128 words)

WORD:	CONTENT:	
0	ENT. NAME 1	ENT. NAME 2
1	ENT. NAME 3	ENT. NAME 4
2	ENT. NAME 5	TYPE
3	VALUE	

TYPE:	MEANING:	VALUE
0	OP SYS Entry Point	Address of Entry Point
1	Disc Res Subroutine	Library Sector Offset
2	not used	
3	Absolute	Absolute Value
4	Microcoded Macro	Control Store Address

Figure F-3. Entry Point Format

Appendix G
I/O Control Utility XCNTL

The utility XCNTL may be used to initiate various I/O control (EXEC 3) operations on a specific LU. Operations include enabling terminals, positioning or rewinding a tape, etc. For a complete list of function codes refer to the RTE-IVB Programmer's Reference Manual.

Schedule XCNTL as follows:

```
:RU,XCNTL,lu,funtion,subfunction
```

where,

```
lu = LU number
function = function code
subfunction = optional subfunction
```

XCNTL executes the call

```
EXEC(3,ICNWD,SFCTN)
```

where,

```
ICNWD = bits 0-5  :  LU number
        bits 6-10 :  function code
SFCTN = optional subfunction
```

Examples:

```
:RU,XCNTL,9,20B           Enable terminal LU 9
:RU,XCNTL,4,27B,3         Locate file #3 on CTU LU 4
```

If an error ocurrs, XCNTL reports the type of the error (IO) and the error number (02, 03, etc.).

For example, if an illegal LU number is specified, XCNTL issues the message:

```
/XCNTL:  EXEC ERROR IO02
```

Appendix H
Using RTE-IVE With DS/1000-IV

Updated DS/1000-IV Software

The DS/1000-IV modules below have been updated for use with RTE-IVE at software revision 2126. (Prior to software revision 2126, RTE-IVE versions of these files were distributed with RTE-IVE. Starting with revision 2126, use the files supplied with DS/1000-IV.)

File name:	Content:	Generation/Loading Information:
%DINIT	DS initialization program, non-shutdown version	Relocate during RTE-IVE generation to satisfy entry point references. Load online or during bootup (refer to CONVM).
%DINIS	DS initialization program, shutdown version	Same as for %DINIT.
%DEXEC	Remote EXEC request processor	Starting with revision 2126, this file should not be used; the correct DEXEC module is contained in the DS/1000-IV library $DSLB2.
%DSMOD	DS modification program	Load online using MLOAD and APLDR.
%PROGL	Remote program download program	Relocate during RTE-IVB (host system) generation.
%REMAN	Operator interface program	Relocate during RTE-IVB (host system) generation. Load online for use on RTE-IVE system.
%RFAM2	Remote file access with multiple DCB's	Relocate during generation of systems where RTE-IVE system will require remote file access.
$DSRR	Message rerouting library	Relocate during RTE-IVE generation if rerouting is required.
%#SEND	Rerouting message sender	Relocate during generation or load online if rerouting is required.

Modem Restriction

Downloading systems and programs to an RTE-IVE system over a dialup modem using DS/1000-IV HDLC Modem Interface, product number 12794A, is currently not supported.

REMAT Commands

LO (load program)

The REMAT LO command is used to load programs on RTE-L and RTE-MIII systems. A different procedure is used to load programs on RTE-IVE systems. The format of the LO command is:

```
RTE-MIII systems:  #LO[,namr[,partition[,pages]]]

   RTE-L systems:  #LO,namr
```

To load programs on an RTE-IVE system use the following command:

```
#RW,APLDR,namr [,[partition] [,node#] ]
```

PL (list programs and number of available ID segments)

The PL command does not work with RTE-IVE.

Remote I/O Mapping

All remote I/O mappings, both to and from the RTE-IVE node, must be disabled before shutting down DS at the RTE-IVE node.

All interactive devices for which an I/O mapping exists must have a non-zero timeout value. This applies to mappings both to and from the RTE-IVE node. Also, it is recommended that prompt mode be used (bit 14 set in the IOMAP destination LU parameter) when mapping interactive devices.

READER COMMENT SHEET

RTE-IVE OPERATING SYSTEM
Reference Manual

92068-90015 **July 1981**

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Casilla 256-V
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***BOMBAY** 400 025*
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Blue Star Ltd.
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***BOMBAY** 400 025*
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*Alkapuri, **BORODA**, 390 005*
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***SECUNDERABAD** 500 003*
Tel: 72057
Telex: 0155-459
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T.C. 7/603 Poornima
Maruthankuzhi
***TRIVANDRUM** 695 013*
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Arranged alphabetically by country

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BERCA Indonesia P.T.
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I-16156 **GENOVA PEGLI**
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I-10144 **TORINO**
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