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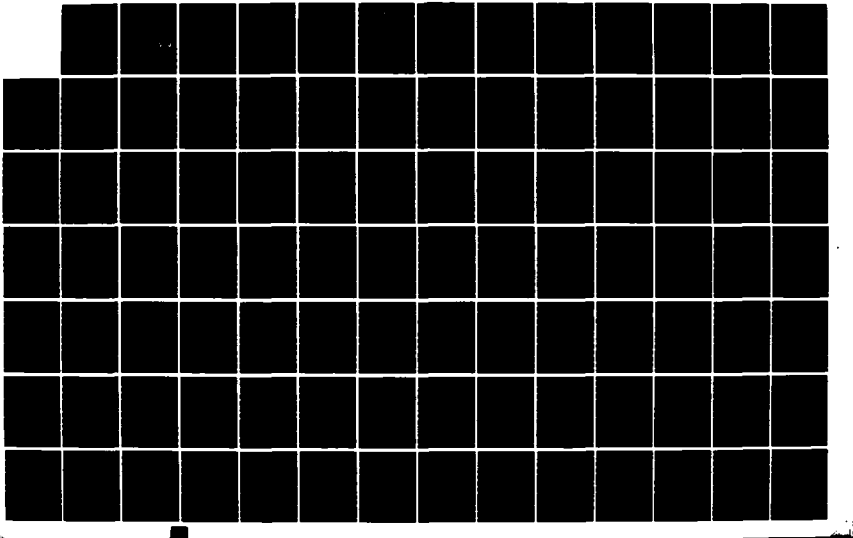

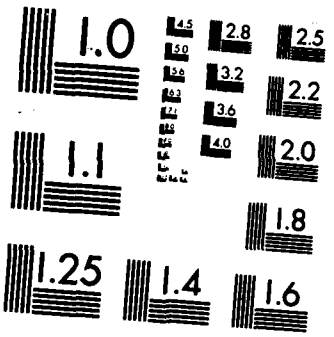

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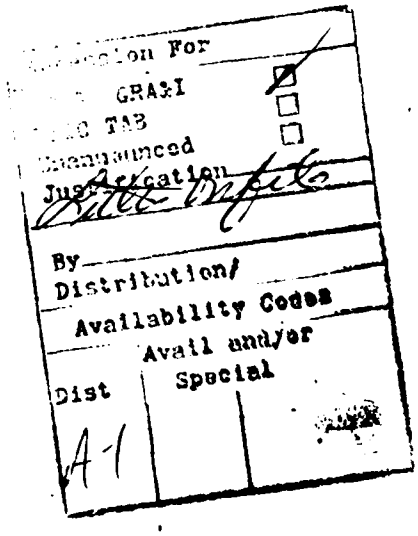

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1. INTRODUCTION

This users manual describes the actions necessary to operate and install the software that comprises the Tactical Interface System (TIS), and documents the usage of the TIS software baseline X002.000, dated 3 February 1983. The TIS software executing in the context of the Virtual Memory System (VMS) Version 3.0 operating system on a Digital Equipment Corporation (DEC) VAX-11/780 processor, provides terminal and batch mode users the capabilities necessary to access and use the AN/GYK-12 Programming Support System (PSS). The TIS software provides the processing necessary to interface the PSS to the VAX-11/780, and allows TIS users to use the job execution facilities of the PSS software. The TIS software interfaces VMS users to the PSS through the Support System Interface Module (SSIM) hardware. The SSIM hardware interface is capable of supporting an AN/GYK-12 computer directly or an emulation of the AN/GYK-12 computer executing on the Microprogrammable Multiprocessor (MMP) system. The TIS software supports one or two SSIM devices, interfacing the VMS users to one or two Programming Support Systems simultaneously.

Section 2 provides an overview of the TIS through discussion of the TIS software, the PSS, and the SSIM hardware, and provides an explanation of the software organization and the processing that is performed.

Section 3 provides instructions on the commands necessary to initialize, initiate, use, control, and determine the status of the TIS software. The use of the TIS software is explained in terms of three functional roles: the TIS Managers, the TIS Operators, and the PSS Users that perform program development under PSS.

Section 4 provides instructions on the procedures to install, update, recompile, and link the TIS software.

Section 5 provides instructions on the use of the ancillary utility programs that allow the user to test the SSIM interface, boot load AN/GYK-12 program images (produced either by the L-3050 Support System (LSS) assembler or by the PSS INITGEN program) into the AN/GYK-12 through the SSIM, convert boot image tapes (either in LSS, MMP, or INITGEN format) to boot image files resident on the VAX-11/780 disks, convert source tapes (written in LSS format or MMP format) into VAX-11 RMS editable files and editable files into LSS or MMP formatted tapes, perform the functions of the PDP-11/70 Smart Peripheral System (SPS) Tape Utility Task (TUT) program, declassify (purge) disk packs containing National Security Information up to and including the SECRET level, to run the TIS Message Generator (TISMSGGEN) error message text file generator program, and to obtain a dump of TIS data structures through the Articulated Dump (ADUMP) program.

A list of references is attached as Appendix A.

The intended audience for the TIS Users Manual is assumed to be basically familiar with the program development functions of the PSS job control language (JCL) and the command language interpreter (CLI) functions of VMS. While sufficient details are given to initialize and operate the PSS using TIS, not all of the PSS program development capabilities (for example, PSS COMPOOL generation) are discussed; additionally, the commands required to log into VMS and to use the other capabilities of VMS (for example, use of the VMS source editors) are not discussed. The TIS software has not changed the format or function of any of the PSS JCL statements or any of the VMS user commands; Appendix B should be consulted for references to VMS and PSS capabilities that are not described in this manual.

2. OVERVIEW OF THE TACTICAL INTERFACE SYSTEM

This section describes the overall structure of the TIS software so that the users will understand the environment within which PSS program development and operation of the PSS and TIS is performed using the VAX-11/780 computer.

2.1 PURPOSE OF THE TIS AND TIS FUNCTIONS

The purpose of the TIS is to interface a VAX-11/780 computer to an AN/GYK-12 computer executing the TACFIRE Programming Support System (PSS) operating system or to the Microprogrammable Multiprocessor (MMP) emulating an AN/GYK-12 computer. The PSS operating system normally executes in combination with the TACFIRE Smart Peripheral System (SPS) software. The SPS executes on the PDP-11/70 computer in the context of the DEC Interactive Applications System (IAS) operating system (and formerly on the PDP-11/35 computer in the context of the DEC RSX-11D operating system). The TIS functions are a superset of the PDP-11/70 SPS functions, implemented with the TIS software executing on the VAX-11/780 computer in the context of the DEC VMS operating system.

The TIS software allows VMS terminal or batch users to use all of the batch job execution, utility execution, and operator communication facilities of the PSS software. Using the TIS, the VAX-11/780 supports the use of PSS similarly to how the PDP-11/70 Smart Peripheral System supports the use of PSS; however, with TIS the users have enhanced capabilities beyond the batch-oriented SPS or the TACFIRE PDP-11/70 Fundamental Interactive Terminal System (FITS). Many of the essential functions performed by TIS to support the use of PSS are very similar to the SPS and FITS since the PSS commands and functionality have not been changed to interface to TIS. PSS jobs are

executed in a distributed environment with the PSS executing on the MMP or AN/GYK-12 computers and the TIS executing on the VAX-11/780.

The TIS provides a physical hardware interface to the AN/GYK-12 Input-Output Unit (IOU) or Microprogrammable Multiprocessor Real Time Equipment (RTE) controller that functionally is highly similar to the PDP-11/70 SPS System Interface Unit (SIU) hardware interface. The TIS hardware interface, the Support System Interface Module (SSIM), interfaces one VAX-11/780 DR11B direct memory access (DMA) device to channels 16_8 and 17_8 on the IOU. The SSIM presents virtually the same (although not identical) interface to the PSS software and TIS software as the PDP-11/70 SIU. Differences in the software use of the SSIM as compared to the SIU are described in Appendix D.

The TIS software allows VMS users to submit files of PSS batch JCL (stored on the VAX-11/780 peripherals) to PSS, execute PSS utility functions, maintain the PSS on-disk database, print output from PSS jobs, service PSS requests for tape mounts, communicate with the PSS operator communications program (SUP11), and downline load a PSS image file (or any other properly formatted AN/GYK-12 bootstrap image file produced by the PSS INITGEN program or the LSS assembler) through the SSIM into the AN/GYK-12 or MMP.

The TIS will support a maximum of 64 VMS users that are using the online facilities of the TIS at any given time. The TIS uses the unique VMS account name (not the VMS user or VMS process name) to determine whether a VMS user is authorized to use the TIS, and, if authorized, to determine the commands that the TIS user may legally execute, and to determine the role of the TIS user, who uses the TIS in one of the Manager, Operator, or PSS User roles. If more than 64 VMS accounts that are authorized to use the TIS are required, duplicate VMS account names can be used to identify more than one authorized VMS user to TIS, allowing an indefinite number of authorized VMS users; however, there may not be more than 64 VMS users that are simultaneously online and using the TIS commands.

5. Length of the actual data buffer that is to be transferred between the PSS and TIS computers.

6. Direct access record number for certain disk file I/O commands.

7. Subcommands for physical tape or logical disk file manipulation, indicating the tape or file operation to be performed.

The second physical I/O operation may transmit the actual data, as indicated by the information in the corresponding ICE packet, through the SSIM. After the TIS processes the ICE packet, the TIS then signals the PSS to begin the second physical I/O operation that is the subject of the information contained in the ICE packet, by placing the PSS I/O queue table number in the SSIM DR11B data buffer register (DRDB) and causing the PSS to be interrupted on AN/GYK-12 cnannel 17_8 (attention interrupt). For read or write operations, the data consists of the appropriate data record; for open file or delete file requests, the second I/O operation consists of a fixed-length string which further identifies the file to be processed by the TIS.

In the case of PSS logical operations that require a status response indicating to the PSS that the TIS has completed the requested operation, a Status ICE packet is sent from the VAX-11/780 to the PSS. The Status ICE packet contains information that identifies the request to the PSS and the TIS completion status of the PSS request.

If an error occurs on the TIS processing of a PSS request, an Error ICE packet is sent from the VAX-11/780 to the PSS. The Error ICE packet contains information that identifies the request to the PSS and the TIS error status of the PSS request.

In general, the JBDRIVER SSIM device driver performs the following primary functions:

1. Defines the characteristics and parameters of the JB devices through the Driver Prologue Table (DPT), the Driver Dispatch Table (DDT), the Function Decision Table, and the Unit Control

Block (UCB) for each SSIM. The JB devices are shareable VMS devices so that more than one VMS I/O channel can be assigned to one SSIM simultaneously.

2. Initializes the JB devices upon initial loading of the JBDRIVER and upon power failure.

3. Performs device dependent I/O preprocessing with Function Decision Table routines to check transfer parameters, check set mode flags, declare an ICE attention Asynchronous System Trap (AST), remove an ICE attention AST, initialize the ICE packet buffer, and to read an ICE packet. Some of these functions are completed entirely within the routine with no device activity required.

4. Translates VMS queue I/O requests into physical SSIM device commands for the DR11B, initiates processing of queue I/O requests depending upon the VMS I/O function code, loads the SSIM DR11B device registers, activates the DR11B and SSIM, responds to interrupts generated by the SSIM and DR11B, and translates DR11B and SSIM hardware completion status into an I/O completion status for the calling process.

5. Performs link level protocol processing for the interface between VMS applications programs and the AN/GYK-12 Programming Support System (PSS) operating system. Two separate sets of two counters, with a transaction counter and a retry counter in each set, are maintained, with one set used to do sequence checking by the PSS for all data transfers that are initiated by the TIS through an AN/GYK-12 channel 17_8 interrupt, and the other set used to do sequence checking by the TIS for all ICE packets sent to the TIS that are initiated by the PSS through a VAX-11/780 Control Information Flag (CIF) interrupt. The values of the transaction counters range between zero and fifteen, and the values of the retry counters may range between zero and seven. The values of the counters in each of the separate sets are not related. The transaction counter for data transfers (placed into the DRDB by the JBDRIVER) must be the next legal value expected from the TIS by the PSS, and each ICE packet read by the TIS from the PSS must contain the next legal value of the ICE transaction counter expected from the PSS by the TIS. Whenever retries of a data transfer are performed by the TIS, the value of the transaction counter for the transfer is held constant while the value of the retry counter for the data transfer is incremented. Whenever retries of an ICE packet transfer are performed by the PSS, the value of the transaction counter for the ICE packet transfer is held constant while the value of the retry counter contained in the ICE packet is incremented. Alternatively, if an entire ICE packet previously received by the TIS is retried (superseded) by

the PSS, the value of the transaction counter for the ICE packet transfer may differ by one less than the next value expected by the TIS, while the ICE retry counter indicates the PSS retry count for the ICE packet transfer. The values of all of the TIS transaction and entry counters are maintained only by the JBDRIVER, and are stored in the UCB for the appropriate JB device. All retries are performed for the applications programs only by the JBDRIVER. Unsolicited ICE packets from PSS are buffered into VMS non-paged dynamic memory, and are checked for proper sequencing and retry counts. The time order of all of the ICE packets sent to the TIS by the PSS is properly maintained.

6. Processes requests to cancel I/O operations, returns device dependent status information through the VMS Get Device/Volume Information, Get Device Information, and Get Channel Information system services, services the VMS sense mode queue I/O, and changes device dependent SSIM operating parameters through the VMS set mode queue I/O.

2.2.2 TIS Detached Processes

VMS detached processes are software processes that run independently of any terminal and that can execute only one image (disk image file). The TIS software includes six detached processes:

1. The ICE Handler Process (ICEHANDLE). The ICEHANDLE detached process functions as a top-level dispatcher to activate the appropriate function based on the PSS Interface Control Element (ICE) packet received from PSS through the SSIM. The ICE packets describe data transfers and control functions that the TIS software must perform for the PSS. The ICEHANDLE process decodes the ICE packets and sends the packet to the appropriate TIS program for processing.

2. The Job Operations Process (JOBOPS). The JOBOPS detached process processes all PSS ICE packets that are related to PSS batch jobs. JOBOPS receives the ICE packets from the ICEHANDLE process.

3. The File Operations Process (FILEOPS). The FILEOPS detached process processes all PSS ICE packets that are related to PSS file requests. FILEOPS receives the ICE packets from the ICEHANDLE process.

4. The Tape Operations Process (TAPEOPS). The TAPEOPS detached process processes all PSS ICE packets that are related to PSS tape requests. TAPEOPS receives the ICE packets from the ICEHANDLE process.

5. The User Message Process (USERMSGP). The USERMSGP detached process receives and routes message output requests from the other five TIS detached processes. USERMSGP formats the messages and displays the resultant text to the appropriate VMS user or to the VMS Master Operator Console (usually device OPA0). PSS operator message ICE packets are also processed by USERMSGP. The PSS operator message ICE packets are received from the ICEHANDLE process.

6. The System Initiator/Terminator Process (SYSINITRM). The SYSINITRM process creates the initial environment in which the other five TIS detached processes execute, initiates and terminates the other detached processes upon user command, and performs recovery for the PSS batch job input queue and punch output queue upon a warm start. SYSINITRM interfaces to the other detached processes to receive and log error and history data. PSS read system file ICE packets are also processed by SYSINITRM. The PSS read system file ICE packets are received from the ICEHANDLE process.

2.2.3 TIS Interactive Process

Interactive processes are created by logging into VMS, are terminal dependent, and can sequentially execute many images. When a VMS user logs into VMS, the VMS JOB_CONTROLLER detached process creates an interactive process for the terminal user. The TIS user interface is provided by the TIS Command Interpreter (CMDINTRP) program, which executes as an image in the interactive process of the VMS user. The only VMS privilege required for a VMS user to use the TIS is the GRPNAM privilege, which allows the VMS user to make entries in the group logical name table for the current UIC (group logical names are referenced by the CMDINTRP program). No extraordinary VMS privileges are required for any VMS user in order to use the CMDINTRP program to access the PSS; however, to install and change the TIS software special VMS privileges are required (these special VMS privileges are listed in Section 4.2). To be authorized to use the TIS, the account name of the VMS user must be known to the TIS (see Section 3.1.1).

The CMDINTRP program interacts with the VMS terminal user, through commands entered from the terminal or supplied in a VMS command procedure or

in a VMS batch stream, to display and modify values in the TIS global data that affect the processing done by the TIS detached processes, allow the user to exercise a measure of control over the TIS, provide the direct user interface to the PSS operator communications SUP11 program, display data to the user that defines the status of the TIS software, and implement all of the other TIS commands available to the terminal user. All commands are checked for the required TIS role and TIS privilege to determine if a user is authorized to execute any given TIS command. The CMDINTRP program interacts with the VMS terminal or batch user in the TIS Command Language (TCL) mode.

A copy of the CMDINTRP CPC executes in the interactive process of each VMS user that is currently in TCL mode. The CMDINTRP program is installed in VMS as a privileged, shareable image. Only the non-shareable (read-write) portions of the CMDINTRP program are duplicated in each user image. The shareable (read-only) portions of the CMDINTRP program are shared among all user images as one copy to conserve VAX-11/780 memory.

2.2.4 TIS Database

The TIS database consists of two separate types of database structures:

1. Globally accessible data. These items are accessed by any of the TIS computer program components and are stored in the TIS global common area (TISGLOBAL) or on the VAX-11/780 disks.

2. Locally accessible data. These items are accessed only by a single TIS process, and are organized into groups of items that are dedicated to the exclusive use of a single TIS process.

All TIS global and local data structures, with the exception of the JBDRIVER local data, are pageable by VMS.

The TIS global database structure consists of two storage methods:

1. On-disk files. These files may be in either VMS Files-11 Level 1 or VMS Files-11 Level 2 format, and are organized by sequential

and direct access methods. The Files-11 Level 1 format is the original file structure used by the IAS, RSX-11M, and RSX-11D operating systems for disk volumes. VAX/VMS supports structure Level 1 for compatibility. The Files-11 Level 2 structure is the second generation disk file structure used by VAX/VMS, and offers improved performance, reliability, named directories and subdirectories, and multiple levels of named subdirectories.

2. In-memory tables that are globally accessible to all components of the TIS, and are organized as linear lists and arrays. Certain tables are accessed for write only through single server, exclusive use procedures contained in the TIS Run Time Library (TISRTL).

The TIS local database (local to each process) consists of three storage methods:

1. Tables and queues organized as linear lists and arrays.

2. Buffer areas organized as contiguous regions of virtual address space.

3. Elemental program state flags and variables.

The TIS database structures serve the following purposes:

1. Files provide storage for infrequently accessed data that requires excessive memory usage if not kept on disk, and provide a permanent record of critical global database values (for example, for the warm restart function).

2. Tables, queues, and state flags provide storage for the control information necessary to properly sequence and supervise the execution of the TIS and to maintain the current state of the functions performed for the PSS by the TIS.

The TIS accesses and maintains the following on-disk files:

1. Job input data for PSS batch jobs. These files are maintained on the VMS device and directory defined by the TIS$JOBQUEUE logical name in the TIS group logical name table.

2. Job output data for PSS batch jobs and PSS utility jobs. These files are maintained on the VMS device and directory defined by the TIS$OUTFILES logical name in the TIS group logical name table.

3. Log files containing all TIS messages and PSS messages related to a given PSS batch job. These files are maintained on the VMS device and directory defined by the TIS$LOGFILES logical name in the TIS group logical name table.

4. Punch data output by PSS batch jobs to the TIS punch queue. These files are maintained on the VMS device and directory defined by the TIS$PUNQUEUE logical name in the TIS group logical name table.

5. The message text for all TIS messages output through the USERMSGP process by the TIS detached processes is stored on the VMS device and directory defined by the TIS$SYSMSGS logical name in the TIS group logical name table.

6. The image file for the TIS global common area (TISGLOBAL) is stored on the VMS device and directory defined by the SYS$SHARE VMS logical name in the system logical name table. The TIS$SYSTEM logical name in the system logical name table indicates the storage area for all of the TIS executable images.

7. The log of all of the TIS error log packets is stored in the VMS device, directory, and file name defined by the TIS$ERRORLOG logical name in the TIS group logical name table.

8. The log of all of the TIS history log packets is stored in the VMS device, directory, and filename defined by the TIS$HISTORYLOG logical name in the TIS group logical name table.

9. All temporary files for PSS zero are stored on the VMS device and directory defined by the TIS$TEMPORARY_SYS0 logical name in the TIS group logical name table. PSS temporary files are created with the VMS filename taken from the PSS filename specified when the temporary file is opened by PSS. The PSS member name is not used for temporary files. All PSS temporary files are given a VMS file type of DAT (data). The VMS version numbers of the PSS temporary files are established as the PSS job slot number of the PSS job slot that owns the temporary file.

10. All temporary files for PSS one are stored on the VMS device and directory defined by the TIS$TEMPORARY_SYS1 logical name in the TIS group logical name table.

11. VMS error log files, which are created by the VMS FORTRAN run-time system if one of the TIS detached processes encounters a run-time error or if the process is aborted by VMS on a fatal error, are maintained on the VMS device and directory defined

by the TIS$LOGFILES logical name in the TIS group logical name table. The VMS error log files contain an explanation of the FORTRAN error, the procedure name (local to the detached process) where the error occurred, the FORTRAN call-back chain (if any) to the error site, and the FORTRAN line number in the procedure where the error occurred. This data is used by the software support and systems programming staff to determine the cause and location of an error.

The following VAX-11 RMS file access modes are used by the TIS:

1. Sequential access, variable or fixed length records. This file organization is primarily intended for TACPOL-B source files and other PSS files containing textual data, which are directly editable, without conversion by the TIS users, by any of the VMS editors (for example, SOS, EDT, or EDI) and is always stored on the VAX-11/780 disks in this format. PSS output listings are also created to be sequential access, variable length record format.

2. Direct access, fixed length records. This file organization is primarily intended to support PSS data-oriented read and write functions, and to support deblocking of PSS object, Communications Pool (COMPOOL), and other data files. Multiple PSS records may be contained in one VAX-11 RMS record, and are deblocked, if necessary, by PSS.

Table 2-1 shows the VAX-11 RMS device and directory, filename, filetype, organization, access method, record attributes, data format, and read/write protection for all files accessed and maintained only by the TIS.

The TIS can access the PSS database on both Files-11 Level 1 media, for direct compatibility with the TACFIRE PDP-11 SPS, and on Files-11 Level 2 media, for operation solely in a VMS environment. The TIS can access a combination of Files-11 Level 1 and Files-11 Level 2 files simultaneously, but a restriction of VMS is that both Files-11 Level 1 and Files-11 Level 2 data cannot reside on the same physical disk pack or disk drive. The TIS can access TACFIRE PDP-11 SPS disk packs mounted as separate Files-11 Level 1 volumes.

Table 2-1. Summary of Files Owned by TIS

FILENAME AND TYPE	DEVICE AND DIRECTORY	PURPOSE	VAX-11 RMS FILE ATTRIBUTES	ACCESS METHOD
"JIQJID".JOB where JIQJID is the 8 character alpha-numeric PSS job name from the ()JOB card.	TIS$JOBQUEUE	Contains all of the input data for a PSS batch job submitted by a TIS user.	Sequential organization, variable length records with maximum length of 80 bytes, ASCII, FD.CR list attribute.	Sequential Read/Write
"JIQJID".LIS	TIS$OUTFILES	Contains all of the output print data for a PSS batch job submitted by a TIS user.	Sequential organization, variable length records with maximum length of 256 bytes or as specified by PSS, ASCII, FD.FTN list attribute.	Sequential Read/Write
"JIQJID".LOG	TIS$LOGFILES	Contains all of the output messages (both TIS and PSS) for a PSS batch job submitted by a TIS user.	Sequential organization, variable length records with maximum length of 256 bytes, ASCII, FD.FTN list attribute.	Sequential Read/Write
"JIQJID".PCH	TIS$PUNQUEUE	Contains all of the output punch data for a PSS batch job submitted by a TIS user.	Sequential organization, variable length records with maximum length of 512 bytes, EBCDIC, no list attribute.	Sequential Read/Write

Table 2-1. Summary of Files Owned by TIS (Continued)

FILENAME AND TYPE	DEVICE AND DIRECTORY	PURPOSE	VAX-11 RMS FILE ATTRIBUTES	ACCESS METHOD
TISUSRMSG.DAT	TIS$SYSMSGS	Contains all of the TIS messages output by the TIS detached processes in template form.	Sequential organization, fixed length records with 256 byte record length, ASCII, FD.CR list attribute.	Direct Read only
ERRPACKS.LIS	TIS$ERRORLOG	Contains TIS error log data logged by the TIS detached processes.	Sequential organization, variable length records with no maximum record length, ASCII, FD.FTN list attribute.	Sequential Write only (Append) Shared
HISPACKS.LIS	TIS$HISTORYLOG	Contains TIS history log data logged by the TIS detached processes.	Sequential organization, variable length records with no maximum record length, ASCII, FD.FTN list attribute.	Sequential Write only (Append) Shared

The PSS Master User File Directory (PSSMUFD) is a pageable in-memory table that provides the information necessary to translate a PSS file specification into a VAX-11 RMS file specification. The description of the PSS database is contained in the PSSMUFD. The PSSMUFD can contain entries for a maximum of 1024 PSS file specifications.

In the TIS, all PSS disk files are stored on the VAX-11/780 disks using SPS (IAS or RSX-11D operating systems) Files-11 Level 1 or VMS Files-11 Level 2 formats. A PSS file specification is in the form:

filename,member,version

where the filename and member name are up to 8 characters in length, and the version symbol is a decimal file version number in the range of 1 to 511. An SPS (IAS/RSX-11D) Files-11 Level 1 file specification is in the form:

DEV:[grp,prog]filename.typ;version

where the DEV: symbol is an IAS/RSX-11D device name, the [grp,prog] symbol contains the components of the IAS/RSX-11D User Identification Code (UIC), the filename is up to 9 characters in length, the typ symbol is an optional filetype 1 to 3 characters in length, and the version symbol is an octal file version number in the range of 1 to 77777. A VMS Files-11 Level 2 file specification is in the form:

DEV:[directory]filename.typ;version

where the [directory] symbol is a directory name that may optionally contain subdirectories, the version symbol is a decimal file version number in the range of 1 to 32767, and the DEV:, filename, and typ symbols are the same as in the IAS/RSX-11D file specification.

Since the PSS file specification does not contain the IAS/RSX-11D device and UIC or the VMS device and directory names, the PSS filename component is made to correspond to an IAS/RSX-11D device and UIC or to a VMS device and directory name. A list of these correspondences is kept in the PSSMUFD in-memory table. The PSSMUFD contains the PSS filename and the VMS device name and directory identifier (the UIC for SPS Files-11 Level 1 files or the VMS directory name for Files-11 Level 2 files) that correspond to the PSS filename, a default value for the PSS blocksize for all members of the PSS file, and a filetype code that identifies all members of the PSS file as to whether the members contain source or binary data. The filetype code determines the organization (and certain attributes of the data format) expected by PSS for the PSS file and defines the conversion to be performed by the TIS before the data records from a PSS file are sent to the PSS through the SSIM.

All source data for PSS is stored in VMS editable format so that PSS source files can be edited directly by the VMS users without the need for conversion into the formats expected by PSS. The TIS will not allow the PSS to open a member in a PSS file (designated as a source-type file) for write access. In the TIS, PSS source files may contain tab characters. Any records read from PSS source files that are longer than 80 characters are truncated by the TIS to 80 characters.

Whenever new PSS filenames are to be added to the PSS database, the appropriate information must be entered by a TIS Manager into the PSSMUFD.

A restriction of the TIS and PSSMUFD is that all members in all of the files in the PSS database must have a VMS or IAS/RSX file type of DAT.

All members of all PSS files are created by the TIS with a VAX-11 RMS file owner UIC that is determined when a PSS batch job is initially submitted or when a PSS utility job is executed. For PSS batch jobs, the VAX-11 RMS file owner UIC is set to be the same as the VAX-11 RMS UIC that is the owning UIC

of tne original JCL input file submitted by the TIS user. For PSS utility jobs, tne VAX-11 RMS file owner UIC is set to be tne same as the VMS UIC of the TIS user that is executing the PSS utility job, and for utility jobs the VMS UIC is taken as the current VMS UIC of tne VMS user that existed when the VMS user entered TCL mode to initiate the PSS utility job through the PSS EXECUTE command. The VMS file protection codes of all members of all PSS files are created by TIS to be the VMS default file protection that was in effect when a TIS Manager or TIS Operator entered TCL mode to initiate the TIS detached processes through the TIS START command. The VMS default file protection is changed through the VMS SET PROTECTION/DEFAULT command, which for VMS establishes the default protection for all files subsequently created during the terminal session or batch job, and for the TIS establishes the VAX-11 RMS file protection of all PSS files (created by the TIS detached processes) subsequent to when the TIS START command is executed in TCL mode by the VMS user.

The VAX-11 RMS protection attributes of the members of the PSS files in the PSS database can be changed by the VMS SET PROTECTION command after the members are created by TIS, but consideration must be given to the effects of VMS file protection upon operation of the TIS and PSS batch jobs. For example, if the VAX-11 RMS file protection is set to not allow deletion of a member in a PSS file, then any PSS batch job that attempts to delete the member will experience an error. Similar examples can be given for not allowing write access to a member in a PSS file; if a PSS batch job opens a member that is protected as read only and the member is accessed for update, an error will occur for the batch job. These VMS protection attributes and the effect on the TIS functions are analogous to the effect of the file protection attributes on the SPS in the context of the PDP-11/70 IAS operating system.

The VAX-11 RMS protection of the VMS directory files that contain the files in the PSS database will affect the creation, reading, updating, and

deletion of PSS members of tne PSS files by the TIS. The VAX-11 RMS protection codes of the VMS directory files (for example, tne protection of the directory file CMDISK:[CM]BNFLIBF.DIR) must be set to allow the appropriate PSS access modes (create, read, update, or delete) by the TIS detached processes to the PSS files contained in the directory. For the read PSS access mode, the VAX-11 RMS protection code must allow the TIS detached processes read access into the VMS directory. For the create, update, and delete PSS access modes, the VAX-11 RMS protection code must allow the TIS detached processes write access into the VMS directory.

When a PSS filename is specified for access, the TIS searches the PSSMUFD file for the particular filename. If this PSS filename is not found, the TIS returns an error status to the PSS. If the PSS filename is found and if the file type code is legal for the requested PSS access mode, the PSS member name is used as the name of the VAX-11 RMS file to access. If the PSS member (VAX-11 RMS file) is not found or cannot be created, the TIS returns an error status to PSS.

The following major in-memory data structures, that can be displayed and that are indirectly modifiable by the TIS users, are maintained by the TIS:

a. The PSSMUFD is maintained as a pageable table (array) in VAX-11/780 memory.

b. The System Parameter Table (SPT) that contains the current settings and default values for TIS dynamic (changeable online) operating parameters, and data that defines TIS status.

c. The Job Input Queue (JIQ) that contains information defining PSS batch jobs that have been submitted for execution on an AN/GYK-12 by PSS.

d. The Job Control Table (JCT) that contains the current attributes of all of the batch and utility jobs currently under execution by each PSS.

e. The Job Status Table (JST) that defines the status of all of the batch and utility jobs currently under execution by each PSS.

f. The File Attributes Table (FAT) that describes the characteristics of all of the PSS files that are currently accessed by the jobs being executed by each PSS.

g. The Punch Output Queue (PUQ) that contains information defining the output data written by PSS batch and utility jobs to the virtual punch device.

h. The Tape Allocation Table (TAT) that describes the characteristics of all of the PSS tapes that are currently accessed by the jobs being executed by each PSS.

i. The User Status Table (UST) that describes the TIS users that are currently using the TIS and PSS.

j. The Authorized User Table (AUT) that describes all of the VMS account names of the TIS users, the TIS privileges that define the TIS commands that each unique TIS user can execute, and the role (Manager, Operator, or PSS User) of the TIS user.

For each of the major data structures, the TIS allows the following maximum capacities:

a. The PSSMUFD may define 1024 unique PSS filenames.

b. The JIQ may contain 64 submitted and enqueued PSS batch jobs that have not yet been executed by PSS.

c. The FAT may contain 144 PSS file characteristics definition entries, allowing a maximum of 144 simultaneously open files for one or both PSS operating systems supported by the TIS.

d. The PUQ may contain 25 entries for punch output for jobs that have not yet been punched.

e. The TAT may contain 4 entries, with a maximum of 2 entries allowed for each PSS, to define the VAX-11/780 tapes that can be used by both PSS operating systems.

f. The AUT may identify a maximum of 64 unique VMS accounts that are authorized to use the facilities of the TIS.

2.2.5 TIS Run-Time Library

The TIS Run-Time Library (TISRTL) is a pageable, memory-resident, shared global region consisting of read-only data and code. Since the

procedures in the TISRTL call other VMS supplied procedures in the VMS Run-Time Library (VMSRTL) and reference global data structures in the TISGLOBAL global common data area, the TISRTL is also linked to the VMSRTL and the TISGLOBAL shared areas. The TISRTL is installed into the VMS as permanently open (directory information on the TISRTL image file is resident in VMS nonpaged dynamic memory, eliminating the Files-11 directory search necessary to copy pages from the TISRTL image file), header resident (Files-11 file header for the TISRTL image file is resident in VMS nonpaged dynamic memory, eliminating the one disk I/O necessary to read the image file header block whenever page clusters are copied from the TISRTL image file), shared (more than one process can access the TISRTL read-only pages), and protected (pages from the TISRTL image file may not be modified). Although the TISRTL is a read-only shared region, the TISGLOBAL shared global data region, which is referenced by the TISRTL, is installed as writeable (when one or more read-write data pages are removed from physical memory, updates made by accessing processes are preserved, while the initial values are lost); therefore, several processes may create a collided page if the called TISRTL procedures fault for the same TISGLOBAL page. The VMS operating system manages all aspects of the paging environment for the TIS processes, the TISGLOBAL, and the TISRTL, and, due to the design of the TIS software, collided pages will be very unlikely. Wait times for collided pages should be very short, since the VMS has already initiated the procedure to fault the required global page of the TISGLOBAL into the working sets of the faulting processes. The TISRTL and TISGLOBAL shared areas do not contain copy-on-reference pages, but the TISRTL links to the VMSRTL, and the VMSRTL contains copy-on-reference pages; therefore, there may be copy-on-reference pages associated with the TISRTL that are not paged back to the TISGLOBAL image file.

The TISRTL is accessed by all of the TIS detached processes and by the CMDINTRP user interface process. The TIS terminal users access the TISGLOBAL shared data area through the CMDINTRP interactive process, which interprets, displays, and modifies the TIS global data structures (for which

single-server access is required) through calls to procedures in the TISRTL. File protection on the TISRTL image file must be set to read-only access for all users. File protection on the TISGLOBAL image file must be set to read-write access for all users. The TISRTL and TISGLOBAL image files reside on the VMS SYS$SHARE device and directory.

The TISRTL contains FORTRAN-callable procedures, written in the VAX-11 MACRO assembly language, to perform functions that are either common to all of the TIS processes or that must be centralized within the TIS software design. All of the TISRTL procedures are reentrant and position independent. Table 2-2 lists the entry points, source filenames, and functions of all of the TISRTL procedures.

2.2.6 TIS Utility Programs

Seven TIS utility programs allow a user (with the appropriate VMS privileges) to perform the following functions:

1. The SSIMTEST program implements several different diagnostic tests of the SSIM and the JBDRIVER VMS device driver. These tests include:
   a. Set mode queue I/O operations.
   b. DR11B I/O operations with the M968 test board in the user interface slot.
   c. Declaration and removal of an ICE attention Asynchronous System Trap (AST).
   d. Tests of ICE packet transfers from the AN/GYK-12 to the VAX-11/780.
   e. Read and write data tests to and from the AN/GYK-12 with variable data pattern and buffer lengths.
   f. Write ICE and PSS operator messages from the VAX-11/780 to the AN/GYK-12.
   g. Master SSIM reset and parity error reset operations.
   h. Data transfers with AN/GYK-12 attention interrupt on I/O channels 16_8 or 17_8 and AN/GYK-12 I/O completion on either channel.
   i. Optional data reliability checks on read and write data tests.

Table 2-2. TISRTL Procedures

ENTRY POINTS (PROCEDURE NAMES)	SOURCE FILE NAME	FUNCTIONS
GET_PACKET	GETPACKET.MAR	Interprocess communication. Retrieves a TIS mail packet from a specified TIS mailbox, with or without wait if no packet is available.
SEND_PACKET	SENPACKET.MAR	Interprocess communication. Sends a TIS mail packet to a specified TIS mailbox, with or without wait if the target mailbox is full.
ERROR_LOG	ERRORLOG.MAR	Logs data in the TIS Error Log. Standardized procedure to format an error log packet and to write the packet to the mailbox for the TIS Error Log.
SEND_USER_MSG	SENMESSAG.MAR	Sends a message to a TIS user. Standardized procedure to format a TIS message packet and to write the packet to the USERMSGP message mailbox.
HISTORY_LOG	HISTRYLOG.MAR	Logs data in the TIS History Log. Standardized procedure to format a history log packet and to write the packet to the mailbox for the TIS History Log.
SS_HANDLER	SSHANDLER.MAR	Checks status of VMS services, optionally logs an Error Log packet, and optionally sends a standard error message for failures on VMS services.

Table 2-2. TISRTL Procedures (Continued)

ENTRY POINTS (PROCEDURE NAMES)	SOURCE FILE NAME	FUNCTIONS
TIS_SENDICE	SENDICE.MAR	Sends Status ICE, Error ICE, and Test ICE to a specified PSS. An Asynchronous System Trap (AST) entry point is supplied by the caller for I/O completion.
GET_JCT_ENTRY READ_JCT WRITE_JCT RELEASE_JCT_ENTRY GET_JCT_ADDR	JCTPROCS.MAR	Standardized procedures for shared use of entries in the JCT. These procedures allow the caller to obtain exclusive use of a JCT entry, retrieve a JCT entry, write (update) a JCT entry, release exclusive use of a JCT entry, and determine the process virtual address of a data item in a specified JCT entry.
GET_FAT_ENTRY READ_FAT WRITE_FAT RELEASE_FAT_ENTRY GET_FAT_ADDR FIND_FAT_ENTRY	FATPROCS.MAR	Standardized procedures for shared use of entries in the FAT. These procedures allow caller to obtain exclusive use of an FAT entry, retrieve an FAT entry, write (update) an FAT entry, release exclusive use of an FAT entry, determine the process virtual address of a data item in a specified FAT entry, and to allocate a free entry from the FAT.
GET_MUF_ENTRY READ_MUF WRITE_MUF DELETE_MUF_ENTRY TRANSLATE_MUF FIND_MUF_ENTRY GET_FREE_MUF_ENTRY RELEASE_MUF_ENTRY	MUFPROCS.MAR	Standardized procedures for shared use of entries in the PSSMUFD. These procedures allow the caller to obtain exclusive use of a PSSMUFD entry, retrieve a PSSMUFD entry, write (update) a PSSMUFD entry, delete a PSSMUFD entry, translate a PSS member name into a complete VAX-11 RMS file specification, find the PSSMUFD entry for a specified PSS filename, allocate a free entry from the PSSMUFD, and release exclusive use of a PSSMUFD entry.

Table 2-2. TISRTL Procedures (Continued)

ENTRY POINTS (PROCEDURE NAMES)	SOURCE FILE NAME	FUNCTIONS
GET_UST_ENTRY READ_UST WRITE_UST DELETE_UST_ENTRY RELEASE_UST_ENTRY GET_UST_ADDR GET_FREE_UST_ENTRY FIND_UST_ENTRY	USTPROCS.MAR	Standardized procedures for shared use of entries in the UST. These procedures allow the caller to obtain exclusive use of a UST entry, retrieve a UST entry, write (update) a UST entry, delete a UST entry, release exclusive use of a UST entry, determine the process virtual address of a data item in a specified UST entry, allocate a free entry from the UST, and find the UST entry that corresponds to a specified VMS Process Identification (PID).
GET_JIQ GET_JIQ_ENTRY READ_JIQ_ENTRY WRITE_JIQ_ENTRY GET_JIQ_ADDR DELETE_JIQ_ENTRY DEQUEUE_JIQ ENQUEUE_JIQ RELEASE_JIQ RELEASE_JIQ_ENTRY CHECK_JIQ_ENTRY GET_FREE_JIQ_ENTRY	JIQPROCS.MAR	Standardized procedures for shared use of entries in the JIQ. These procedures allow the caller to obtain exclusive use of the JIQ, obtain exclusive use of an entry in the JIQ, retrieve a JIQ entry, write (update) a JIQ entry, determine the process virtual address of a data item in a specified JIQ entry, delete a JIQ entry, dequeue a PSS batch job, enqueue a PSS batch job, release exclusive use of the JIQ, release exclusive use of a JIQ entry, determine the status of a job awaiting execution, and allocate a free entry from the JIQ.

Table 2-2. TISRTL Procedures (Continued)

ENTRY POINTS (PROCEDURE NAMES)	SOURCE FILE NAME	FUNCTIONS
GET_PUQ GET_PUQ_ENTRY READ_PUQ_ENTRY WRITE_PUQ_ENTRY GET_PUQ_ADDR DELETE_PUQ_ENTRY DEQUEUE_PUQ ENQUEUE_PUQ RELEASE_PUQ RELEASE_PUQ_ENTRY CHECK_PUQ_ENTRY GET_FREE_PUQ_ENTRY	PUQPROCS.MAR	Standardized procedures for shared use of entries in the PUQ. These procedures allow the caller to obtain exclusive use of the PUQ, obtain exclusive use of an entry in the PUQ, retrieve a PUQ entry, write (update) a PUQ entry, determine the process virtual address of a data item in a specified PUQ entry, delete a PUQ entry, dequeue a PSS punch job, enqueue a PSS punch job, release exclusive use of the PUQ, release exclusive use of a PUQ entry, determine the status of a PSS punch job, and allocate a free entry from the PUQ.
BUILD_LOG_PARMS	BUILDPARM.MAR	Builds parameter lists for the TIS Error Log and TIS History Log functions, and is used prior to calling the ERROR_LOG or HISTORY_LOG procedures.
BOOT_INFO	BOOTINFO.MAR	Extracts information items from the bootstrap header in an AN/GYK-12 boot image file.

The SSIMTEST program allows the user to bootload AN/GYK-12 program images through the SSIM. These AN/GYK-12 program images must be resident on one of the VAX-11/780 disks. The boot image may be produced either by the LSS assembler and bootmaker (in MMP or LSS format) or by the PSS INITGEN program. Up to 128 Kbytes (16 AN/GYK-12 pages) can be bootstrap loaded into the AN/GYK-12 through the SSIM.

2. The BOOTCOPY program converts boot image tapes, either in LSS, MMP, or INITGEN format, into boot image files resident on the VAX-11/780 disks. An AN/GYK-12 program image up to 128 Kbytes in length can be copied into a VAX-11 RMS disk file.

3. The LSSSIP (LSS Source Interchange Program) converts source tapes, either in LSS or MMP format, into VAX-11 RMS disk files that can be edited directly by one of the VMS source editors (for example, SOS, EDT, TECO, UED, and EDI). Editable VAX-11 RMS disk files can be converted into LSS or MMP formatted tapes for assemblies with LSS executing on the AN/GYK-12 (with required Peripheral Equipment Buffer Unit (PEBU) hardware) or on the MMP.

4. The TAPEUTIL program implements the SPS functions of the Tape Utility Task (TUT) program. Ordinarily, this program will be not used in the TIS unless the tape control functions of the TUT program are to be replicated. The TAPEUTIL program formats the output tape as an ANSI standard labeled tape but according to the interpretation of the labeling standard implemented in the original SPS TUT program, which may be at variance with the actual ANSI standard.

5. The DISKPURGE program declassifies disk packs in accordance with the procedures specified in the Industrial Security Manual (DOD 5220.22-M), Paragraph 116. The DISKPURGE program implements the same declassification procedure as the TACFIRE disk purge program (purge and release for unclassified external storage (PRUNES) program). This procedure is performed as follows:

   a. Write each disk sector with the binary sector number (this is done for a track at a time).

   b. Read each disk sector and verify that the sector number was properly written.

   c. Eack disk sector is overwritten with pseudo-random numbers 3 times.

   d. Each sector is read and the data is compared to the last random number written to the track. The user is notified of any sectors that do not compare correctly.

e. The user is notified of any bad (unaccessible) disk sectors found during the purge process.

6. The TISMSGGEN program generates the TIS user message file that contains the textual templates of all of the messages output through the USERMSGP detached process. The message templates are output to the TISUSRMSG.DAT file. The message text is input to the TISMSGGEN program from the TISMESSAG.TXT file, which is editable by one of the VMS source editors. Ordinarily, the TISMSGGEN program will not be used in the TIS unless a message template must be changed.

7. The Articulated Dump (ADUMP) program displays a formatted dump of the major data structures in the TISGLOBAL global data area, with the variable names in the TISGLOBAL source code that match the data values, and an explanation of the tables and queues. The ADUMP program is used by the software support and systems programming staff to examine and verify the TISGLOBAL data items in debugging problems.

All of the TIS utility programs execute as an image in the interactive process of a VMS terminal user. In most cases, VMS system-level privileges are required to use the utility programs. Specific privileges required are defined in Section 5.

2.3 USER INTERFACES

The TIS software provides three user classes or functional roles:

1. The TIS Manager.
2. The TIS Operator.
3. The PSS User.

The TIS Manager has the capability to control fully the TIS software and queues and the PSS and can perform all of the TIS Command Language (TCL) commands. The TIS Operator has the capability to control the TIS software and queues and the PSS, and can perform a subset of the TCL commands sufficient to intiate and control PSS production runs. The PSS User has the capability to perform a limited subset of the TCL commands, including commands to submit PSS

jobs and to determine job status, sufficient to develop and update PSS programs and applications. Within this manual, the three user functional roles are referred to generically as TIS users.

The allocation of the TIS roles (TIS Manager, TIS Operator, or PSS User) among the TIS users is controlled by the VMS System Manager. The role (and concomitant TIS privileges) is set by a TIS Manager, who may enable more than one VMS user to have the TIS Manager role, or who may allow only one VMS user to have the TIS Manager role. Alternatively, if required, all of the VMS users who are authorized to use the TIS may have the TIS Manager role. This same procedure can be applied to the TIS Operator and PSS User roles, so that the combination of TIS users and TIS roles is controlled entirely by a TIS Manager.

The TIS users (all functional roles) log into VMS by normal VMS procedures. Initially the user will be in VMS Digital Command Language (DCL) mode and can perform any VMS function that has been authorized by the VMS System Manager. To enter TCL mode the TIS user gives the TIS command in response to the VMS prompt (see Section 3.1.1). When prompted by TIS, the TIS user enters the appropriate TIS command to execute the desired TIS function.

The TIS provides the following three classes of commands:

1. Program development. The TIS provides interactive and batch commands to perform PSS job functions.

2. System operations and control. The TIS provides interactive commands to control the software processing by the TIS and the PSS, and to determine the status of the TIS and PSS.

3. System management. The TIS provides interactive and batch commands to add, display, delete, and change the definitions of the files in the PSS database, and to authorize VMS users to use the facilities of the TIS.

The syntax and grammar of the TCL are modeled upon the VMS command language syntax and grammar, while incorporating similar command functions as

the TACFIRE PDP-11 SPS, and providing enhanced user capabilities. In general, the TIS command language contains the following constructs:

1. An imperative verb that indicates which command is to be performed (for example, SHOW).

2. A word that modifies that action of the verb (for example, SHOW/STATUS).

3. A noun that indicates the direct object of the verb (for example, SHOW/STATUS jobnames, where jobnames is the 8 alphanumeric characters from a PSS JOB card).

4. A word that modifies the direct object of the verb (for example, SHOW STATUS jobnames/FULL).

The TIS provides two modes of interface to control, determine status, and submit input to the PSS:

a. Interactive.

b. Batch.

In the interactive mode, a VAX-11 RMS disk file containing PSS JCL can be created by using one of the standard VMS editors, or the JCL can be copied from another VAX-11/780 peripheral, and the PSS JCL file may be submitted directly for execution by the PSS through the TIS SUBMIT command.

In the batch mode, a card deck or VMS command file (VMS command procedure) containing TIS commands and PSS JCL can be processed by the TIS. The VMS command file may also contain VMS commands.

The execution of the TIS commands to submit jobs to the PSS, using VMS batch mode, does not interfere with the facilities of the VMS cardreader spooler and VMS batch. If the VAX-11/780 cardreader is spooled and allocated to the VMS, then PSS job decks are read and executed by the TIS and PSS without VMS operator intervention to deallocate or despool the cardreader. A TIS user has the capability to enter PSS JCL card decks into the TIS for execution

(through the VAX-11/780 cardreader) and to employ both VMS and TIS commands in the same VMS batch stream.

One restriction, upon the capabilities of the TACFIRE PDP-11 SPS supported by the TIS, created by the VMS and the VMS cardreader driver (CRDRIVER) is that input PSS job decks cannot contain embedded punched card PSS object modules. These PSS object modules must be read in binary 12-bit code and the VMS cardreader spooler together with CRDRIVER do not support this capability for VMS batch input spooling of binary format data cards. If this capability is ever required in the TIS, a separate VMS utility program should be written to copy the object card decks into a VAX-11 RMS disk file.

The TIS users have the capability to execute all of the TIS commands in the VMS interactive mode, that is, while logged on to VMS on a CRT or hard-copy terminal. While in TIS interactive mode, any of the TIS commands may be contained in a VMS command file.

The TIS users have the capability to execute most of the TIS commands, with the exception of the TIS commands that start, boot, and stop the TIS and PSS and test the SSIM, in the VMS batch mode by submission of a VMS batch job containing VMS, TIS, and PSS commands.

The TIS users (TIS Managers, TIS Operators, and PSS Users roles) execute TIS commands in TCL mode. TCL command mode is entered from the normal VMS DCL mode by a single command; once TCL mode is entered, only TCL commands are recognized until the TCL mode is terminated by the TIS user.

A TIS user logs into the VAX-11/780 VMS by normal VMS procedures. The TIS does not require that a TIS user have extraordinary VMS privileges. The TIS user has the capability to execute TCL commands from any VMS account and user identification code designated as authorized by a TIS Manager.

Table 2-4. Summary of PSS Program Module Functions

PROGRAM MODULE	MAJOR FUNCTIONS PERFORMED IN THE PSS
EXECUTIVE	Exercises overall control of the AN/GYK-12 CPU, performs resource allocation, schedules job execution, and processes error interrupts. The EXECUTIVE receives and processes all service requests, and internally handles all non-I/O requests.
SUP3	Receives and interprets requests for I/O services and I/O interrupts. SUP3 controls all peripheral device interfaces.
SR4	Performs interrupt processing and contains the PSS idle loop.
SUP2	Processes all file manipulation requests, except core and random access auxiliary memory (RAAM) files, and file close requests.
SETALIAS	Creates an alias for a named file description and links the alias to an existing file description.
DCLFILE	Creates a new file description and modifies an existing file description.
DMSUP2B	Performs open file processing for all files including core and RAAM files.
RSUP2	Processes all requests for addition, deletion, modification, or access to RAAM files.
GETFILE	Retrieves a copy of a file description.
CHKPOINT	Records or restores a copy of the TACFIRE Division or Battalion database for use by an applications program executing in the PSS.
SUP9	Initializes the PSS memory map, job control tables, I/O access tables, and memory management tables.

Table 2-4. Summary of PSS Program Module Functions (Continued)

PROGRAM MODULE	MAJOR FUNCTIONS PERFORMED IN THE PSS
FACA	Reads the PSS load file, unpacks the physical records, and loads the records into the PSS memory.
SUP11	Receives all PSS operator input messages and processes messages addressed to the system. SUP11 generates status, error condition, and hardware malfunction reports.
OPERIN	Routes operator input messages addressed to user jobs.
ATCONV	Performs character conversion between ASCII and typewriter communication code (IBM SELECTRIC).
OPEROUT	Generates the I/O requests necessary to output a message to the PSS operator.
SUP10	Processes JCL card images to create and terminate jobs, to execute programs, and to establish or modify file descriptions. SUP10 supervises the execution of a job in the PSS, collects and displays job statistics, and processes abnormal job termination.
OSDUMP	Prints selected portions of AN/GYK-12 memory.
TPATCH	Processes JCL requests to modify or dump programs, Communications Pool (COMPOOL) pages, core pages, RAAM bands, and direct access file records.
TPBUILD	Converts an object module to a load module that is executable and includes the new program in the PSS list of executable programs.
CARDIN	Reads card-image records from the logical input spool file for each job.
PRINT	Writes printline-image records and card-image records to the logical output spools for each job.

hardware and the TIS software. PSS provides job control, device interface, interrupt handling, scheduling, intertask control, intertask communications and resource allocation, and supports multiprogramming in a batch processing environment using the virtual memory concept. PSS interfaces with the TIS, which connects VAX-11/780 peripherals, including terminals, unit record capabilities, tapes, and disk storage, to the PSS.

In general, PSS provides the following user functions:

1. Program loading.
2. Program patching.
3. Program execution.
4. Dumps (dynamic and static).
5. File management.
6. Communication with system input and output devices.
7. Record/restore of the applications database.
8. Application test support.

The PSS provides the environment for other program develoment functions that are not an embedded part of PSS. These functions are the PSS Compiler/ Assembler for the Tactical Procedure Oriented Language (TACPOL), system generation (including COMPOOL generation), debug aids, and file compare, duplicate, and dump utility functions.

2.4.1.1 Program Loading. The PSS program load function reads an object program from a user-specified file, converts the object program to load form, and makes the program available for execution. This function can load a program either for the current job only, or for the current job and all subsequent jobs.

The PSS program load capability is provided by program TPBUILD, which builds an object program into the system by constructing the program preamble, formatting the object program into load form, and then writing the program out to a disk file, a RAAM file, or a core file, depending on the hardware configuration. If on disk or RAAM, the program is brought into core when executed by the user. TPBUILD loads an object module from cards, tape (labelled or unlabelled), disk, or RAAM files. The object module is placed on a new page boundary.

2.4.1.2 Program Patching. The PSS program patch function applies patches to load-form programs, absolute core locations, and COMPOOL pages. These patches can be in effect either for the current job only, or for the current job and all subsequent jobs. The PSS program TPATCH provides a multipurpose run-time patch supervisor allowing the user the following capabilities:

1. Patch a program in the system program file at the time TPATCH is executing. Functions provided by the TPATCH program patching capability are:
   a. Patch the upper or lower byte of any specified halfword address.
   b. Automatically calculate relative address offsets.
2. Patch any COMPOOL pages (global or superglobal).
3. Patch absolute core locations.
4. Patch specific RAAM bands.
5. Patch specific keyed records in any direct file.

TPATCH also allows the user to perform a number of static dump functions.

2.4.1.3 Program Execution. The user can execute a load-form program with the PSS JCL. PSS allocates the local data and COMPOOL pages required by the program and handles any global calls from the program to other load-form programs. The program is executed through the PSS EXEC JCL operator. The

EXEC operator allows the user to specify the PSS program name, dump option for abnormal termination, and maximum program execution time.

2.4.1.4 Dumps. PSS provides for dynamic dumping of user-selected data areas through global calls within the user program. PSS provides for static dumping of programs, COMPOOL pages, and RAAM and core files.

Various forms of dump processing capabilities are available in the PSS to aid the user in debugging. Dumping is accomplished by two system programs, TPATCH and OSDUMP. TPATCH is used in a static situation, while the program to be dumped is not executing or a data area to be dumped is not being accessed. OSDUMP is used in a dynamic situation, allowing dumps to occur while a program is executing.

Any PSS user may selectively cause dumps to occur while executing by coding calls to the OSDUMP procedure into the TACPOL source program. The OSDUMP procedure provides dumps of program instructions, program local data, registers, and COMPOOL pages.

In addition to allowing the user to cause dumps to occur during program execution, PSS also provides the capability to dump any part of the system as a separate job step without program execution. The user can cause such dumps with the system procedure TPATCH (see Section 2.4.1.2), which allows the user to obtain dumps of the following data structures:

1. An area of a specified program in instruction format.
2. A section of a specified COMPOOL page.
3. Portions of absolute core.
4. Portions of any specified RAAM track.
5. An area of any keyed record of any direct file.

6. Any entire RAAM or core file, record by record.

7. Any block of contiguous RAAM tracks.

2.4.1.5 File Management. File Management is a collection of PSS services for reading and writing named, formal files that reside on unlabelled or labelled commercial tape, militarized Tape Transport Cartridge (TTC), disk, RAAM, and in core. File Management (FM) allows the creation, access, cataloging, and deletion of files. To provide these services, FM obtains and releases system resources as needed, such as tape drives, RAAM bands, core pages, and other I/O devices. FM also provides access to the system input and output streams. However, the system input and output streams are more efficiently accessed through the PSS procedures CARDIN and PRINT (see Section 2.4.1.6).

There are two basic concepts in the use of FM: the use of the File Directory Table (FDT) and the request for service. The FDT must contain an entry for a file before a request for a service on the file is made. An FDT entry consists of the name of the file and all of the information about the file. The request for service consists of the name of the file and all of the information required to service the request.

The FDT must contain an entry for each file referenced by each active job in the system. All entries pertaining to a particular job are deleted at the end of the job. Each active entry contains the name of the file (filename and member name), the number of the job to which the entry belongs, the type of device on which the data is located, device unique pointers to the data records, and the parameters determining usage (disposition, access, and initial disposition). FDT entries can be created or modified by the PSS FILE JCL operator, or under program control through use of PSS global procedures.

FM functions are performed either through explicit calls to PSS global FM procedures, or by using the FM facilties of the TACPOL compiler.

2.4.1.6 Communication with System I/O Devices. Communication with the system input stream, the system output stream, the system punch, and the operator console is provided by global calls within the user program to the PSS procedures that perform these services.

Two programs in the PSS allow user access to the TIS VAX-11/780 unit record equipment (VAX-11/780 line printer output queue, virtual card punch, and virtual card reader). The program CARDIN is used to interface with the Input/Output Control Supervisor (IOCS) for reading card images and punching cards. In addition, these programs perform character-code conversion between internal binary code and the ASCII and EBCDIC codes. Other routines are also available for performing formatted output and conversion between ASCII and EBCDIC, or ASCII and binary, and other code conversions.

The OPERIN and OPEROUT programs provide communication with the operator through the VAX-11/780 operator console. OPERIN can be called by a user program to accept messages from the TIS operator, and OPEROUT can be called by a user program to output messages to the TIS operator.

All unit record capabilities and operator communications are implemented for the PSS by the TIS, using the VAX-11/780 peripherals. Since no punch is present in the VAX-11/780 hardware configuration, a virtual punch is created by the TIS for the PSS. PSS reads card images from the job input stream for a specified PSS job slot, which is maintained as a disk input file by the TIS. PSS print lines are handled by the VMS output print spooler through the TIS.

2.4.1.7 Record/Restore of the Applications Database. PSS provides the following capabilities to record and restore the applications database:

1. Record database for restoration in a PSS system.
2. Record database for restoration in a TACFIRE field system.
3. Restore a database recorded in a PSS system.
4. Restore a database recorded in a TACFIRE field system.

These functions allow testing of applications programs to be performed in a specific database environment.

Salvage Point Recording (SPR) of the applications database is accomplisned by the PSS CHKPOINT program. When the CHKPOINT program is executed to perform a recording of the applications database, an output file is generated containing selected superglobal data pages, FDT entries, and core file pages. When the CHKPOINT program is executed for a restoration, a previously recorded applications database is copied from a user specified file and replaces the existing applications database only for the job in which the CHKPOINT program is executing.

The CHKPOINT program performs three functions for PSS users:

a. Provides applications jobs with unique copies of the applications database.

b. Provides for recording and restoring an applications database.

c. Permits applications databases to be exchanged between the TACFIRE PSS and field systems. An applications database can be recorded within the PSS system, and restored within the TACFIRE field system.

2.4.1.8 Application Test Support. The Application Test Support (ATS) function simulates TACFIRE field operating system interfaces for the development and checkout of TACFIRE applications software. ATS provides each applications job with temporary copies of the dynamic superglobal pages that are accessed, and maintains the integrity of the database for other applications jobs that are executing at the same time and for all subsequent jobs.

The PSS ATS facility provides the capabilities for the development and checkout of applications software that normally executes under the supervision of the field TACFIRE operating system. ATS enables the applications programmer to exercise TACFIRE tactical software for debugging or verification and validation purposes by submitting batch jobs that run under control of PSS. ATS jobs can be multiprogrammed with other jobs (including other ATS jobs). ATS permits the applications programmer to simulate TACFIRE field system user interfaces in a PSS environment. ATS, utilized in conjunction with Salvage Point Recording/Restoration and the PSS Debug Aids, provides a tool for developing and testing TACFIRE applications software.

2.4.1.9 Summary of PSS Job Control Language. This section presents a summary of the PSS JCL as implemented in the TIS. For the JCL operators that have not been enhanced in the TIS implementation, the PSS-B User/Operator Manual, Volume I, Basic Functions Manual for TACFIRE, Section 2, should be used as a reference for further definition of the PSS JCL statements and JCL parameters.

The PSS employs a user-oriented job control language for interpreting job processing requests. The legal set of PSS control language operators are JOB, EXEC, SYS, END, FILE, *, STOP, MSG, CALL, RETN, JCL, and FIN. Some of these operators allow operands to be defined, enabling the user to control execution of the job. The STOP statement is only applicable in a PEBU system environment. The CALL, RETN, JCL, and FIN statements are applicable only in an SPS or TIS environment, and the SYS statement is applicable only in a TIS environment. The general format of the job control cards processed by the TIS and SPS is as follows:

1. Columns 1 and 2 must contain the characters ( ).
2. Columns 3 through 6 is the operator field.
3. Columns 10 through 72 contains any operands for the JCL operator (defined in Columns 3 through 6) or may optionally contain a comment field.
4. Columns 73 through 80 contain an optional sequence number field.

The operands must start in column 10 and must be separated by commas with no embedded blanks, since all data after the first blank encountered in an operand field is treated as a comment. In the TIS, tab characters may optionally be present in the PSS JCL statements, in TACPOL source statements that are included in a PSS batch job, or in data statements read by the PSS utilities as part of the PSS batch job stream.

The PSS and TIS provide the following JCL operators:

1. The JOB operator indicates the start of a new job in the input stream. Each job is associated with a single user. The range of a job begins at the JOB control card and encompasses all job steps until an END card is encountered in the input stream. The JOB operator allows the user to specify an eight character jobname, a one to eight character programmer name, the job class, and, as optional parameters, the maximum number of cards to be punched, the forms type for multipart or special forms processing, the maximum user CPU time, the number of tape drives required (if any), the maximum number of print lines that can be generated by the job, and the National Security classification of the job.

   The PSS Basic Functions Manual states that the JOB parameters may be continued onto one or more continuation cards. In the TIS environment, the JOB parameters may be continued onto only one continuation card. One continuation card is all that is recognized and properly processed by the TIS. One continuation card allows specification of all of the JOB parameters.

   No other changes that affect the JOB operator have been made in the TIS. All JOB parameters are processed as stated in the PSS Basic Functions Manual.

2. The EXEC card starts the execution of a job step. Each job step of a job must begin with an EXEC card, which initiates the execution of a particular program in the PSS. A job may contain any number of job steps (EXEC cards). The end of a job step occurs when another EXEC or END job control card is encountered. The EXEC operator allows the user to specify a program name, dump option for abnormal termination, and maximum CPU time for program execution.

   No changes that affect the EXEC operator have been made in the TIS. All EXEC parameters are processed as stated in the PSS Basic Functions Manual.

3. The SYS operator (a new TIS capability) allows the user to specify the VAX-11 RMS filename of the PSS that is required to execute the PSS batch job. The SYS operator is in effect until an END operator is encountered in the JCL, and only one SYS operator may be specified for each PSS job.

   The effect of the SYS operator is to inhibit execution of the PSS batch job until the bootstrap filename of the PSS requesting a batch job exactly matches the PSS filename specified on the SYS card.

   The bootstrap filename of the requesting PSS is taken to be the bootstrap filename exactly as specified by a TIS Operator or TIS Manager in the TIS BOOT command used to bootstrap the currently running PSS, including any VMS logical names present, VMS device names, directory strings, filenames, filetypes, and file version numbers.

   The PSS bootstrap filename must exactly match the VAX-11 RMS file specification on the SYS card if the batch job is to be executed on the requesting PSS. The SYS operator is optional. If not used, then no new restrictions are created for the job.

   The VAX-11 RMS bootstrap filename is specified on the SYS card beginning in column 10, and may be a maximum of 32 characters, which is the same as the maximum length of the VAX-11 RMS PSS bootstrap filename that can be entered in the TIS BOOT command.

   No checks are made to determine if the PSS bootstrap file specified on the SYS card exists in the VAX-11/780 database, so that if an incorrect filename is used, the job will not execute and must be cancelled and submitted again (see Section 3.1.2.3 and Section 3.1.2.20).

   The SYS field, after processing upon job submission by the TIS, is converted to a PSS comment card and placed into the PSS JCL input stream so that the TIS user has a record of the PSS filename specified for the batch job.

4. The END card indicates the termination of the job that began with the previous JOB card. There are no operands associated with the END card. Each job submitted must have an END card as the last card in the deck; when the END operator is encountered in the input stream, all devices and resources assigned to the job are deallocated and the job statistics are output.

   No changes that affect the END operator have been made in the TIS. All END parameters are processed as stated in the PSS Basic Functions Manual.

5. The FILE card specifies run-time changes, additions, or deletions to the PSS File Directory Table (FDT). The FDT is used by the

File Management Supervisor to access files in the PSS and to provide the user with device independence. The FILE card may appear anywhere in the input stream for a job, but it must appear prior to any usage of the attributes on the FILE card.

The use of the FILE job control card allows the programmer to control file attributes at execution time.

The FILE job control card may be used to modify an existing file description by changing attributes (other than unit) of an existing file, or to add FDT entries to the PSS to permit file access during the job.

No changes that affect the FILE operator have been made in the TIS. All FILE parameters are processed as stated in the PSS Basic Functions Manual.

6. The ( )* comment card may appear anywhere within the job control card sequence to comment the input stream. The card is only printed in the output stream and serves no other purpose.

   No changes that affect the comment operator have been made in the TIS. All comment parameters are processed as stated in the PSS Basic Functions Manual.

7. The STOP card indicates the termination of an input stream. If a STOP operator is included in the job, the card is ignored by the TIS and is passed through to the PSS in the job input stream. There are no associated operands. The STOP operator was originally intended for use by an operator in a PEBU or SPS environment where actual punched cards were read to enter jobs for execution by a PSS. The STOP operator is not used in the TIS.

8. The MSG card is used to send a message to the VAX-11/780 operator on the console. The message is output to the VAX-11/780 operator console and is logged by the TIS in the print output for the job.

   No changes that affect the MSG operator have been made in the TIS. All MSG parameters are processed as stated in the PSS Basic Functions Manual.

9. The JCL CALL statement causes the contents of a file to be inserted in the input stream. There is no limit to the number of CALL statements that may be included in a job. A CALL file (a file inserted by means of a CALL statement) may contain any combination of JCL and data that is legal in a normal job stream, except that the file may not contain a JOB statement, an END statement, or another CALL statement. The CALL file must exist before the job that requires the CALL file is submitted;

otherwise, an error is reported to the TIS user and submission of the job is cancelled.

Significant changes to the CALL capability have been made in the TIS implementation.

The format of the CALL file is not as described in the PSS Basic Functions Manual; instead, the CALL file should be formatted as a VAX-11 RMS source file (sequentially organized, ASCII, with variable or fixed length records less than or equal to 80 bytes) that was created by one of the standard VMS editors (for example, EDI, SOS, EDT, UED, or TECO).

The CALL file specification, which begins in column 10 of the CALL card, may be either a PSS file specification (with filename and member name only) or any valid VAX-11 RMS file specification. The CALL file specification may be a maximum of 64 characters, and may not be continued onto another card. If a VAX-11 RMS file specification is used, logical names may be included. If a PSS file specification is used, the PSS version number must not be present.

The CALL field, after processing upon job submission by the TIS, is converted to a PSS comment card and placed into the PSS JCL input stream so that the TIS user has a record of the CALL files used in the job.

10. The RETN statement is the delimiter required as the last card image in a CALL file.

    The RETN field, after processing upon job submission by the TIS, is converted to a PSS comment card and placed into the PSS JCL input stream so that the TIS user has a record of the end of the previous CALL file.

    If a CALL file is read to end of file by the TIS job submit function without having encountered a RETN statement, the TIS job submit function assumes that an RETN statement was intended by the TIS user, notes the end of the CALL file by placing an RETN comment in the PSS JCL input stream, notifies the TIS terminal or batch user, and continues to process the job for submission.

11. The JCL statement allows PSS JCL to be passed through the job input stream as data. The JCL card is no longer required to create TIS CALL files, but is otherwise processed as specified in the PSS Basic Functions Manual.

    The JCL field, after processing upon job submission by the TIS, is converted to a PSS comment card and placed into the PSS JCL input stream so that the TIS user has a record of the JCL statements used in a PSS batch job.

12. The FIN statement terminates the effect of a previous JCL statement. The FIN card is no longer required to create TIS CALL files, but is otherwise processed as specified in the PSS Basic Functions Manual.

    The FIN field, after processing upon job submission by the TIS, is converted to a PSS comment card and placed into the PSS JCL input stream so that the TIS user has a record of the FIN statements used in a PSS batch job.

2.4.2 PSS Database

The PSS database is maintained on the VAX-11/780 disk drives. All accesses by PSS batch or utility jobs are made through the TIS.

The database for the minimum or barebones PSS consists of two types of files:

1. Source files for the components of the PSS.

2. Binary data files, which may be object modules output by the TACPOL compiler for the components of the PSS, COMPOOL object files, environmental library object files for use by the TACPOL compiler, applications data and temporary storage files, or AN/GYK-12 system images.

For source files, the PSS does not receive the source inputs exactly as stored on the VAX-11/780 disks, since PSS source files are converted by the TIS from VAX-11 RMS source format into the format required by the PSS. Conversion by the TIS is necessary to allow PSS source files to be stored in a format that can be edited directly by standard VMS editor programs from the VAX-11/780 terminals. For binary data files, the PSS receives the data exactly as stored on the VAX-11/780 disks, without conversion by the TIS. The PSS database includes temporary files created by the PSS, such as the RAAMFILE for the PSS disk swapper function, which are treated as binary data files by the TIS.

No changes to the standard TACFIRE PSS database, either for the barebones, DIVARTY, or BATTALION versions of PSS, are required for operation of a PSS with the VAX-11/780 and the TIS. TIS Manager personnel may establish and organize the PSS on-disk database to meet the requirements of the local

installation by creating the appropriate VAX-11 RMS named directories (and optionally subdirectories) on any disk device supported by VMS, and then obtaining the data by copying all of the required PSS files from the configuration management master disk volume in use on the TACFIRE PDP-11/70 SPS. The PSSMUFD must correctly describe the PSS database to the TIS programs (see Section 2.2.4).

The PSS is not permitted to open a source file in the database for write access. When the applications message format library is created with the PSS format library (FORMLIB) program, source files containing TACPOL data declarations are output as binary data files. The applications message library contains the information required to format and deformat the messages received into and transmitted from the TACFIRE field system. The TACPOL data declarations for the message format library are input as a TACPOL source file to the COMPOOL generation function in subsequent steps of a TACFIRE system generation. The binary format source file output by the FORMLIB program must be converted into a VAX-11 RMS source format file so that the COMPOOL generation can be successfully performed. This conversion is accomplished through the PDP-11/70 FITS DCL program, executing as a native-mode FORTRAN program in VMS. The DCL program is not part of the TIS (see the Basic User's Guide for the Fundamental Interactive Terminal System (FITS) in the Smart Peripheral System, Section 7). The FORMLIB function is the only PSS program known to output PSS source files. If further experience shows that other PSS program output source files, then a similar conversion will be necessary. No other such program which outputs source files has been found in extensive testing.

2.5 GENERAL SYSTEM FLOW

This section describes the overall functional flow of the processing that the TIS performs to support a PSS.

The U.S. Army Field Artillery tactical fire direction system (TACFIRE) uses the Programming Support System (PSS) to perform software support and maintenance functions. The PSS executes on the AN/GYK-12 computer and supports compilations, application program debugging and testing, system generations, and standard utilties.

The AN/GYK-12 computer peripherals are militarized, special purpose equipment sets that do not efficiently support program development. To support the program development function, the PSS interfaces to commercial peripherals (such as commercial disk drives, tapes, and line printers) that are controlled by a DEC VAX-11/780 computer. The electrical interface is accomplished through the SSIM. The functional interfaces to the VAX-11/780 peripherals are made for the PSS through the Tactical Interface System (TIS) software. The TIS software executes in the context of the Virtual Memory System (VMS) operating system resident in the VAX-11/780 computer.

The PSS was developed to process batch jobs. Using the facilities of the VMS operating system and associated program development capabilities (such as text editors and VMS utilities), AN/GYK-12 programmers create files containing PSS batch job control language (JCL) and source code to be processed by the PSS and to be compiled using the Tactical Procedure Oriented Language (TACPOL) compiler executing in the context of PSS on the AN/GYK-12. The PSS batch JCL is submitted for execution by PSS through the facilities of the TIS and the processing that the PSS performs is controlled by the computer operations staff through the facilities of the TIS.

In general, the PSS makes requests to the VAX-11/780 for processing of disk file operations (such as open, read, write, close, delete, and manipulate functions), reading from the PSS job input stream, writing to the job output stream for printing, writing messages to the VMS Master Operator Console, punching card images, and tape operations (such as mount, read, write, dismount, and manipulate functions). These requests are received by the TIS software and

the appropriate processing is performed, for example, a tape is forward spaced or a block of data is read from a specified disk file and sent to the PSS through the SSIM. The frequency and types of the requests made by the PSS are determined in part by the number of PSS batch jobs that are being processed, the functions defined by the PSS JCL, and the order in which the TIS completes each request.

The PSS may make multiple requests of the TIS. While one PSS request is being serviced by the TIS, several more requests may be sent to the TIS from the PSS. The order of completion for the PSS requests is not necessarily the same as the order in which the requests were sent by the PSS. The order of completion for the PSS requests depends upon the order in which the TIS completes the processing necessary to satisfy each request.

The TIS functions as five major divisions or groups:

1. PSS Services, implemented as four detached processes (ICEHANDLE, JOBOPS, FILEOPS, and TAPEOPS) that service, monitor, and maintain the state and status of PSS requests.

2. TIS Services, implemented as two detached processes (SYSINITRM and USERMSGP) that primarily provide initialization, termination, recovery, status monitoring, and message output for the PSS Services processes.

3. TIS User Interface, implemented as an image (CMDINTRP) executing in the interactive process of a TIS User of Manager logged into VMS, either through a terminal or by VMS batch.

4. TIS Utilities, implemented as seven separate images (SSIMTEST, BOOTCOPY, LSSSIP, TAPEUTIL, DISKPURGE, TISMSGGEN, and ADUMP programs) that may be executed in the interactive process of any VMS user (with appropriate VMS privileges), either through a terminal or by VMS batch.

5. TIS Internals that provide the mechanisms to establish common and consistent interfaces between cooperating process and to collect, maintain, and provide serialized access to the queues, tables, flags, and parameters that drive the PSS Services function and affect the processing of the TIS, and to define the SSIM devices to VMS and service I/O requests from the

applications-level processes. This functional group includes the PSS Data Manager subroutines, the TISRTL procedures, the TISGLOBAL shared data region, and the JBDRIVER device driver.

The PSS Services modules principally operate upon the queues, tables, and flags contained in the TISGLOBAL shared data region to control overall processing flow while servicing requests from the PSS. The TISGLOBAL shared region contains job-oriented data structures through which the state and sequence of operations for each existing or blocked PSS job is known to all of the detached processes performing the PSS Services function. The states are defined by flags, binary counts, and pointers that indicate actions that have been performed or that must be performed to service the PSS requests, and that indicate which resources (for example, disk files or the VMS print spool) have been accessed by the PSS jobs executing in an AN/GYK-12 or MMP. The detached processes of the PSS Services functional group update and modify the status flags, counts, and pointers in the TISGLOBAL shared area whenever events occur that modify the state of a PSS job (for example, when a PSS Open File ICE attaches a resource, a given disk file known to PSS, to the appropriate job). The PSS Services functional group is further divided into a two-level structure as follows:

1. The ICEHANDLE process functions as a dispatcher, at the top level, to activate the appropriate function based on the PSS request to be processed.

2. The JOBOPS, FILEOPS, and TAPEOPS detached processses execute as a worker processes to actually perform the function specified by a PSS.

The ICEHANDLE process interfaces to the JBDRIVER device driver and receives all PSS ICE packets, performs first-level validation of the packet contents, and examines the ICE packet command field to determine which process will perform the work. ICEHANDLE may pass the ICE packet directly to the TIS Services functional group if the PSS request is a PSS Operator Message (processed by USERMSGP) or a PSS Read System File function (processed by

SYSINTRM). All other ICE packets are processed by the three detached worker processes.

The JOBOPS process interfaces to the ICEHANDLE process and processes all PSS job control ICE. The JOBOPS process maintains the Job Input Queue (JIQ) in cooperation with the CMDINTRP processes, maintains the Job Control Table (JCT), maintains the Job Slot Table (JST), indicates events to the FILEOPS process that affect the FILEOPS functions by modifying flags in the File Attributes Table (FAT), maintains the tape allocation parameters in the Tape Attributes Table (TAT) in cooperation with the TAPEOPS process, and indicates events to the TAPEOPS process that affect the TAPEOPS functions by modifying flags in the TAT. The JOBOPS process is the central PSS job controller. ICE packets defining PSS job-oriented requests are stored in a circular linked list local to the JOBOPS process since the completion of a PSS job request by the JOBOPS process may occur asynchronously in relation to the issuance of the next job-oriented request by PSS for the same PSS job slot.

The FILEOPS process interfaces to the ICEHANDLE process and processes all file-oriented PSS ICE packets. The FILEOPS process maintains the FAT, and examines the status flags and pointers in the JCT and JST to determine if the context is correct for a given PSS file operation request. The FILEOPS process updates and modifies the VAX-11 RMS files in the PSS database through the PSS Data Manager procedures, and updates the appropriate entries in the FAT to indicate the attributes, allocation, and state of all of the files known to PSS and that are currently accessed by PSS jobs. When the JOBOPS process indicates, through modifications to control data in the FAT, that job status has changed, the FILEOPS process determines whether the change in job status affects the current file activity and initiates the corresponding action. ICE packets defining PSS file-oriented requests are stored in a circular list local to the FILEOPS process since the completion of a PSS file request by the FILEOPS process may occur asynchronously in relation to the issuance of the next file-oriented request by PSS for the same PSS job slot or PSS file.

The TAPEOPS process interfaces to the ICEHANDLE process and processes all of the tape-oriented PSS ICE packets. The TAPEOPS process maintains the TAT, and, similarly to the FILEOPS process, examines the status flags and pointers in the JCT and JST to determine if the context is correct for a given PSS tape operation. The TAPEOPS process updates the appropriate entries in the TAT to indicate the state of all of the tape drives known to PSS and that are currently accessed by PSS jobs. When the JOBOPS process indicates, through modifications to control data in the TAT, that job status has changed, the TAPEOPS process determines whether the change in job status affects the current tape activity, and initiates the corresponding action. Since all tape-oriented requests are completed by the TAPEOPS process synchronously with each PSS tape-oriented request, internal queuing of PSS tape-oriented requests is not necessary.

The TIS Services group primarily processes requests from the PSS Services functional group, and process commands initiated by the TIS User Interface. The TIS Services functional group consists of two detached processes, SYSINITRM and USERMSGP.

The SYSINITRM process creates the initial data environment and TIS context in which all of the other TIS processes execute, initiates the TIS detached processes, and checks whether all of the TIS detached processes have successfully completed local initialization procedures. Prior to initialization of the TIS processes, SYSINITRM initializes the contents of the dynamic TISGLOBAL lists and queues. If a warm start is indicated, SYSINITRM reconstructs the JIQ and PUQ. SYSINITRM interfaces to other detached processes to receive and log error and history data. The SYSINITRM process receives Read System File ICE packets from a PSS through the ICEHANDLE process, and retrieves the appropriate group of records from the specified PSS image file during the PSS bootstrap and initialization process.

The USERMSGP process receives and routes message output requests from the other TIS detached processes and the PSS. The USERMSGP process formats

any caller-supplied data according to a template embedded in a specified message, and, by examining the entries in the User Status Table (UST) and determining if the appropriate TIS user or users are still logged into the VMS, displays PSS and TIS messages concerning the results of PSS batch and utility jobs submitted by the TIS users. USERMSGP stores all TIS and job-oriented messages in a log file for each active job and, when the PSS job terminates, all of the messages for the job are appended to the end of the PSS listing output by the JOBOPS process.

The TIS User Interface functional group consists of the CMDINTRP process that executes as an image in the interactive process of a VMS terminal or batch user. The CMDINTRP process interacts with the user to display and modify values in the System Parameter Table (SPT) that affect the processing of the TIS detached processes, allows the user to exercise a measure of control over the PSS Services and TIS Services, provides the direct user interface to PSS, and examines the JIQ, JCT, JST, FAT, TAT, UST, and other tables and queues in the TISGLOBAL shared data region to display PSS job and I/O request status (set by the JOBOPS, FILEOPS, and TAPEOPS processes) to the user. Job state flags in the JST are modified by CMDINTRP to indicate to the JOBOPS process that an event has occurred that will cause the state of a given PSS job to change.

The TIS Utilities execute as separate images in the interactive process of any VMS user with appropriate execute-access and VMS privileges, and are independent of all of the other TIS components. The DISKPURGE image overwrites a user-specified disk pack to declassify National Security data not classified higher than SECRET. The ADUMP image displays the data structures (JIQ, JCT, JST, FAT, TAT, UST, and other queues and tables) in the TISGLOBAL shared region, and prints a formatted, readable dump. The ADUMP image is primarily an aid to debug of the TIS. The TAPEUTIL image provides the SPS tape functions and tape manipulation that the TACFIRE SPS Tape Utility Task (TUT) program provided in the PDP-11/70 SPS environment. Other utility

programs perform SSIM diagnostic functions, convert LSS formatted source files, copy PSS boot tapes from VAX-11/780 tape to a disk file, and generate the TIS message templates.

The TIS Internals functional group consists of the TISRTL procedures, the TISGLOBAL shared data region, the PSS Data Manager subroutines, and the JBDRIVER device driver.

The TISRTL, TISGLOBAL, and the PSS Data Manager functions are all mutually dependent. The TISRTL procedures provide controlled interfaces to queues and tables in the TISGLOBAL data area; the PSS Services processes call the TISRTL procedures to examine, copy, and alter entries in the JIQ, JCT, JST, FAT, TAT, UST, and other tables and queues contained in the TISGLOBAL shared region to ensure consistent single-server access. The TISGLOBAL shared data area contains the flags, binary counts, and pointers that the detached processes of the PSS Services functional group examine and modify to control and properly sequence PSS job-oriented requests, and is read by the TIS User Interface process (CMDINTRP) to display the current status of the PSS jobs currently being processed by the PSS Services functional groups. The PSS Data Management subroutines provide a single centralized, standardized interface from the TIS applications level to the PSS database. The PSS Data Management subroutines, used only by the FILEOPS process, access the TISGLOBAL data structures for the FAT through the TISRTL procedures to determine the context of a given PSS file-oriented request, and update the FAT entries through the TISRTL procedures.

The TISRTL provides, in addition to single-server access to TISGLOBAL data structures, standardized interfaces to the TIS Services for the detached processes of the PSS Services functional group.

The JBDRIVER device driver provides the interface between the PSS Services, TIS Services, and TIS User Interface functional groups, the

VAX-11/780 DR11B hardware device (which interfaces to the SSIM), and the VMS operating system. Applications programs make requests to the JBDRIVER device driver through the standard VMS Queue I/O ($QIO or $QIOW) system service, and obtain device information on the JB devices through standard VMS services. Since multiple TIS functional groups and multiple TIS detached processes interface to the JBDRIVER, the JB devices are shareable (such that the VMS assign ($ASSIGN) system service does not implicitly allocate the JB device).

The PSS Services, TIS Services, and TIS User Interface functional groups are strongly interdependent and cooperatively process PSS inputs and other stimuli to meet the system-level requirements as an event-driven, non-real-time software system. The TIS Internals function provides the primitive interfaces, mechanisms for efficient data sharing, and services to effect coordination.

Conceptually, the combination of the detached processes, shared data and procedures, and the interactivity of the TIS PSS Services, TIS Services, TIS User Interface, and TIS Internals functional groups functions similarly to a rudimentary, clock-interrupt driven operating system, where the state and context of each user job (PSS job) is maintained in a set of lists and tables, and new user jobs (PSS jobs) are dequeued from a FIFO queue, ordered by time. For example, the FILEOPS process is stimulated and receives inputs from a variety of sources; if the JOBOPS process sets a status flag in the FAT entry (which defines the access context for a given member of a PSS file accesed by a PSS job) that changes the context of a PSS file, such as PSS job terminated due to operator CHOP command, then the FILEOPS process must respond to the change in job context, close the appropriate PSS file, and delete the corresponding entry from the FAT by calling the WRITE_FAT TISRTL procedure. In this model of a rudimentary operating system, the JOBOPS process is the job controller that notifies the FILEOPS file access processor when a change in PSS job context occurs. While many of the TIS detached processes are essentially packet-driven (either by PSS ICE packets or by VMS interprocess

communication mail packets), the change in a status flag is not necessarily directly associated with a PSS or VMS packet. In the TIS, the affected process may be notified of the change in status by an external event created through execution of the VMS $WAKE system service. This notification is analogous to a clock interrupt caused by a clock tick in the model operating system. The PSS Services and TIS Services function similarly, where status and operating parameters are often checked without a corresponding input packet.

2.6 HARDWARE REQUIREMENTS

This section summarizes the characteristics of the SSIM and the operating procedures necessary to properly prepare the SSIM for use with the TIS and PSS. For additional information as to the installation, operation, and maintenance procedures for the SSIM, reference should be made to the SSIM Technical Manual.

The SSIM is designed to interface the AN/GYK-12 and the VAX-11/780 computers. The SSIM is functionally equivalent to the System Interface Unit (SIU) that interfaces the AN/GYK-12 and DEC PDP-11/70 and PDP-11/35 computers. The SSIM replaces the SIU when the AN/GYK-12 computer and the PSS are used with the VAX-11/780 computer, such that no major functional software changes to the AN/GYK-12 programs are required to use the SSIM instead of the SIU. All data that formerly passed through the SIU to and from the PDP-11/70 is now passed through the SSIM to and from the VAX-11/780 computer.

The SSIM consists of three major assemblies:

1. The SSIM interfacing and control logic, contained on six printed circuit boards in a free-standing enclosure. The interface and control logic is implemented with TTL circuits which respond to signals present on the cable interface from the AN/GYK-12 Input/Output Unit (IOU) and from the VAX-11/780 through the DR11B interface. The SSIM processes these signals as a state-driven finite automaton (finite-state machine) according to the requirements of the AN/GYK-12 device to computer interface specification and the DR11B interface requirements.

2. A standard DEC DR11B direct memory access (DMA) Unibus interface, which moves data directly between a user device, the Unibus, and the VAX-11/780 memory.

3. The DR11B driver panel, which implements the long distance drivers required to interface the DR11B and the SSIM through 30 feet of signal cable. One DR11B driver panel can interface two SSIM units to two DR11B units. The DR11B driver panel is mounted in the rear of the VAX-11/780 Unibus Expansion cabinet.

AN/GYK-12 device numbers 16_8 and 17_8 are reserved for use with the SSIM. The DR11B is assigned standard register and interrupt vector addresses on the VAX-11/780 Unibus. Table 2-5 lists the DR11B assignments for the TACFIRE installation.

Functionally, the SSIM performs the following actions during data input and output between the AN/GYK-12 and VAX-11/780 computers:

1. Exchanges data and control information with the AN/GYK-12 computer, defined as follows:

   a. Device Command (DEV) instruction or Device Command and Exit (DEX) instruction. The DEV (or DEX) instruction is used to initiate all I/O operations with the SSIM. The DEV instruction (and the associated device control information contained in one byte of the DEV operand) is used to start a data transfer and to optionally interrupt the VAX-11/780 computer, to stop (reset) the SSIM, and to load the SSIM End of Block (EOB) counter.

   b. Input to Register (ITR) instruction. The ITR instruction is used by the AN/GYK-12 software to interrogate the SSIM device to obtain SSIM status. The ITR instruction causes the transfer of four bytes of data from the SSIM to the AN/GYK-12 over the selected channel.

   c. Automatic I/O sequence initiated by a DEV or DEX instruction. The SSIM transfers data between the AN/GYK-12 and VAX-11/780 computers in the direction defined by the DEV or DEX instruction. Automatic I/O operations are controlled by two control words that are initially set by the AN/GYK-12 program, the I/O keyword and the I/O termination word, and by the contents of the DR11B word count register (DRWC) which defines the total number of 16-bit words that are transferred.

Table 2-5. DR11B Register and Interrupt Vector Assignments for the TACFIRE Installation

DR11B NUMBER	VMS DEVICE NAME	AN/GYK-12 SYSTEM NUMBER	DR11B INTERRUPT VECTOR UNIBUS ADDRESS	DR11B REGISTERS UNIBUS ADDRESSES
One	JBA0	Zero	124	772410 DRWC 772412 DRBA 772414 DRST 772416 DRDB
Two	JBB0	One	174	772430 DRWC 772432 DRBA 772434 DRST 772436 DRDB

Notes:

All addresses are octal.
DRWC — DR11B word count register.
DRBA — DR11B bus address register.
DRST — DR11B status and command register.
DRDB — DR11B data buffer register.
Both DR11B devices are assigned Unibus bus request (BR) priority 5, and are connected to Unibus Adapter TR 3.

d. Interrupt sequences are initiated either when the DRWC increments to zero, indicating the end of an automatic I/O operation, upon command from the TIS software to cause an unsolicited interrupt (on device number 16_8 or 17_8) to the AN/GYK-12, or upon detection of a parity error by the SSIM.

e. Other commands initiated by the AN/GYK-12 Input/Output Unit (IOU) are processed. These commands include the master reset, device stop, and EOB sequences.

2. Exchanges data and control information with the VAX-11/780 computer, defined as follows:

a. Function code and GO pulse set by the TIS software in the DR11B command and status register (CSR). The function code indicates whether the current I/O operation is to cause an interrupt to the AN/GYK-12, to bootstrap load the AN/GYK-12 memory, to start an I/O operation that has been initiated by the AN/GYK-12, or to perform various resets.

b. Indicates, through status flags in the DR11B DRST register, to the VAX-11/780 that an interrupt from the AN/GYK-12 has occurred, that the SSIM is busy, that a reset has occurred, or that a parity error has occurred.

c. All DMA I/O sequences are processed through the DR11B. The SSIM manipulates a subset of the signals that are made available to the user device to control the operation of the DR11B. These include the data in and data out lines, the control of the direction of the transfer, requesting the transfer of data by initiation of a Unibus cycle, and other operations.

d. Interrupt sequences are initiated by the SSIM to indicate that the AN/GYK-12 program has caused an interrupt to the VAX-11/780, or that an error condition or reset condition has occurred.

The operator skill level required to operate the SSIM is equivalent to the skills required to operate other typical computer peripherals, such as disk drives and lineprinters.

When power is applied or removed from the SSIM, the steps required to power up or power down the interface must be performed in a certain sequence. For power up of the SSIM (assuming that all components are powered off), the sequence is to first power on the DEC Unibus cabinet (BA11-K) power supply,

then to power on the DR11B driver panel mounted in the rear of the VAX-11/780 Unibus Expansion cabinet, and finally to power up the SSIM interface mounted in the free-standing enclosure. Normally, except in certain VAX-11/780 hardware maintenance procedures, the BA11-K power supply is always powered up and remains powered on, since to power off the BA11-K power supply causes the other VAX-11/780 peripheral interfaces (such as the lineprinter and DZ11 terminal interfaces) to also power off. For power down of the SSIM (assuming that all components are powered on), the sequence is to first power off the SSIM interface mounted in the free-standing enclosure, then to power off the DR11B driver panel mounted in the rear of the VAX-11/780 Unibus Expansion cabinet, and finally (only if required) to power off the DEC Unibus cabinet (BA11-K) power supply.

To change AN/GYK-12 cables leading from the SSIM to the AN/GYK-12, the SSIM interface need not be powered off. To change or disconnect cables leading from the SSIM to the DR11B driver panel, the SSIM, the DR11B driver panel, and the BA11-K must be completely powered off, following the sequence described. To change or to disconnect cables leading from the DR11B driver panel to the DR11B in the Unibus box (BA11-K), the SSIM, the DR11B driver panel, and the BA11-K must be completely powered off, following the sequence described (this will be necessary, for example, to put the M968 board in the DR11B user interface slot so that that DEC DR11B diagnostic program (ESDRA) can be used).

Prior to using the PSS with the TIS, the computer operator must ensure that these conditions are met in the following sequence:

1. Power is applied to the DR11B driver panel and the power switch on the driver panel is turned on to power up the panel mounted in the rear of the VAX-11/780 Unibus Expansion cabinet.

2. Power is applied to the SSIM enclosure, and the power switch on the rear of the enclosure is turned on to power up the interface.

3. The SSIM is properly cabled to the AN/GYK-12 IOU. The SSIM uses the 16_8 and 17_8 I/O addresses on the AN/GYK-12 (identically to the PDP-11/70 SIU).

4. The ONLINE/OFFLINE toggle switch on the front panel of the SSIM enclosure is set to the ONLINE position.

5. The ALARM ON/OFF toggle switch on the front panel of the SSIM enclosure is set to the ON position.

6. The RESET pushbutton on the front panel of the SSIM enclosure has been depressed and released, clearing any previous error condition that may exist. The RESET pushbutton causes the SSIM to master reset.

Whenever an SSIM error condition occurs, such as timeout of an AN/GYK-12 bootstrap, the SSIM RESET pushbutton should be depressed and released to clear possible error conditions.

The SSIM enclosure includes an audible alarm (SONALERT). This alarm is activated if an illegal I/O instruction is received from the AN/GYK-12 (such as a DEV instruction with a device command byte that is not a legal SSIM command), or if an SSIM parity error occurs. The SONALERT can be silenced by switching the ALARM ON/OFF toggle switch to the OFF position (this action does not master reset the SSIM or clear the error condition), or by depressing the RESET pushbutton to master reset the SSIM. If an error condition occurs that activates the SONALERT, the circumstances of the error should be logged and the operation should be retried. If the retry is not successful, then the software support or systems programming staff should be notified to determine the cause of the error and to develop a solution.

All hardware operating procedures should be coordinated with the state of the TIS software. While the TIS need not have been started (through the TIS START command) or stopped (through the TIS STOP command) to power up or power down the SSIM, a logical procedure dictates that the TIS software be started after the SSIM power up sequence is complete and stopped before initiating the SSIM power down sequence.

3. INSTRUCTIONS FOR USE

This section explains the commands necessary to use the TIS software in terms of performing three functional roles:

1. Overall control, installation, maintenance, and modification of operating parameters, performed by TIS users that are authorized the privileges associated with the TIS Manager role.

2. Operations functions performed by TIS users that are authorized the privileges associated with the TIS Operator role.

3. PSS applications development functions performed by TIS users that are authorized the privileges associated with the PSS User role.

Once initialized and started, the TIS software does not require that any TIS user be in TIS command mode or that any VMS user be logged into VMS.

Three different sets of privileges are associated with the three TIS user roles. Since the TIS Manager is the only user role that has the privilege to execute all of the TIS commands, the TIS Manager is responsible for ensuring that all of the other users of the TIS are authorized to use the commands that correspond to the appropriate functional role. The TIS Operator role in general has the necessary privileges to execute all of the TIS commands except for the commands that create, alter, or remove entries in the PSSMUFD, authorize VMS users to use the TIS and establish levels of privilege, and display the list of authorized TIS users; these commands are reserved to the TIS Manager role only. The PSS User role in general has only those privileges necessary to perform PSS applications development, such as the ability to cancel a PSS batch job that the same user has submitted, display the contents of the PSSMUFD, enable and disable messages (displayed on the user terminal) resulting from PSS batch jobs that the same user has submitted, display the

list of jobs that are waiting to execute, display the contents of the job input queue and the punch output queue, show the status of a PSS job, and submit PSS batch jobs for execution.

There is not necessarily a direct relationship between the degree of TIS privilege assigned to a TIS user and the degree of VMS privileges assigned to the corresponding VMS user by the VMS System Manager. The only VMS privilege required to use the TIS is the group name (GRPNAM) privilege.

Section 3.1 provides an overview and summary of all of the TIS commands, describing the purpose of the command, the command syntax, inputs, restrictions, expected outputs and results, and the error conditions and messages. Section 3.2 explains the installation, maintenance, and control functions that must be performed by a TIS Manager. Section 3.3 explains the operations and control functions that must be performed by a TIS Operator to initiate, control, terminate, and restart the TIS and PSS, and how to use the PSS and TIS to execute PSS batch and utility jobs. Section 3.4 explains the procedures to perform development of PSS programs using TIS commands by PSS Users.

Throughout this document, all typed TIS commands are always terminated a carriage return (CR). Although all TIS commands are shown in uppercase text, the commands will work equally well in lowercase text, or in a combination of uppercase and lowercase text, when entered from a terminal or VMS batch stream. In the definitions of the TIS commands, spaces are significant. Unless otherwise specified, where spaces are shown in the command syntax all of the spaces are required. Abbreviations of TIS commands or of components within a TIS command are not permitted. All commands and components must be entered as specified.

There are no restrictions upon the use of the TIS caused by terminal type. Any hardcopy or softcopy terminal, either local or remote, that is supported by the VMS operating system is a valid terminal for use of the TIS.

3.1 OVERVIEW OF SYSTEM USAGE AND COMMAND INTERFACE

This section provides an overview of all of the TIS commands and how these commands are used to perform PSS program development using the TIS.

The TIS provides a functional and physical interface to the PSS that is compatible with the PSS/SPS interface implemented on the current TACFIRE PDP-11 software support system, that is, the TIS does not impose any major functional changes or significant new requirements upon the PSS or the PSS programs that use the SSIM I/O interface rather than the SIU. PSS operations are accomplished with the TIS in a very similar manner to the PDP-11/70 SPS.

The TIS provides input queuing of PSS jobs. The PSS job class is checked to determine that the interfacing PSS supports the particular PSS job class. The PSS job control language (JCL) is validated before entry of the batch job into the PSS input queue. Facilities of the PSS JCL dependent upon processing by the SPS (for example, tape allocation or PSS CALL files) are provided by the TIS. Upon request from PSS the job is read from the input queue maintained by the TIS and transferred through the SSIM to the PSS. The TIS maintains the status of the PSS job queue and reports this status to a TIS user upon request. TIS provides operator control of the PSS job queue internal to the TIS, and provides operator control of jobs currently executing in each PSS.

The TIS accepts job output from PSS and interfaces to the VMS print symbiont manager to enter the printed batch output from the PSS into the VMS print queue. The TIS users can determine queue status and change forms by using the standard VMS print queue maintenance commands. The VMS forms type for a PSS output listing is taken from the COPY parameter on the PSS ()JOB operand for batch jobs. The forms type for PSS utility jobs (for example, Standalone Dump (SADUMP)) defaults to one copy.

For punch output from PSS jobs, the TIS maintains an internal queue for the PSS punched data. The TIS provides the user with the capability to

determine the status and to control the punch output queue. In the VAX-11/780 TIS, the use of the PSS punch output option should not normally be required; however, the TIS provides the capability to save punch output, if any, on the appropriate VAX-11/780 disk for subsequent transfer to tape or punching. If the capability to punch cards is ever required, a separate utility program should be written to read the punch card images saved by the TIS and to write the card images to a punch on the VAX-11/780 or another computer, or the TIS software would have to be modified.

The TIS provides PSS file handling functions on the VAX-11/780 disks and tapes. TIS executes PSS requests to open, read, write, close, and delete PSS disk files. The TIS also executes PSS requests to space forward, space backwards, and rewind a PSS disk file.

The TIS reads and writes PSS tape files using the VAX-11/780 magnetic tape drive peripherals. The TIS executes PSS requests to space forward and space backwards tape records and files, and rewinds and unloads tapes upon command from the PSS. The TIS writes tape end-of-file marks and tape end-of-volume marks, logically mounts and dismounts tapes, and senses write protection upon command from the PSS.

The TIS provides a command language to the TIS Managers, the TIS Operators, and the PSS Users. The command language provides commands to control TIS execution, submit PSS jobs, scan and validate the PSS JCL, control and query the PSS job queue and punch queue, downline load each AN/GYK-12 or MMP attached to the VAX-11/780 through an SSIM, initiate SSIM test messages, send operator messages to the PSS, and list and maintain the description of the PSS database.

The TIS can downline load an AN/GYK-12 or the MMP emulator. Upon request, the TIS transfers the initial load module, which for the PSS contains the secondary bootstrap loader, and then reads the AN/GYK-12 System File (upon

command from the PSS secondary loader) from the VAX-11/780 disk and transfers the PSS to the MMP emulator or AN/GYK-12 computer.

The TIS provides an automatic or manually initiated test of the SSIM. The TIS Managers and TIS Operators have the capability to specify if the SSIM test is to execute automatically or execute upon manual initiation. If automatic execution is selected, the time interval between SSIM test messages can be specified. The minimum interval that should be selected is five seconds between SSIM test messages.

The TIS controls resource allocation to prevent or detect deadlocks between PSS jobs executing on one or two AN/GYK-12 or MMP computers. The allocation of tapes and disk files is controlled between PSS jobs, possibly executing under different PSS computers, so that a PSS job will not be aborted due to allocation of a tape or disk file to another PSS job.

The TIS provides an on-disk database purge program necessary for declassifying VAX-11/780 disk packs containing National Security Information up to and including the SECRET (collateral) level.

The TIS provides error and transaction history data logging to monitor the integrity and performance of the TIS software and the PSS database. The error and transaction history data logging can be controlled and the logging results can be displayed.

Functional compatibility with the existing TACFIRE PDP-11 Smart Peripheral System is maintained by the TIS except when constrained by the environmental differences that exist between the VAX-11/780 TIS running under the VMS and the TACFIRE PDP-11/70 SPS running under the Interactive Applications System (IAS) operating system. Appendix D discusses these variances; additionally, these differences are discussed where applicable throughout this manual.

3.1.1 Entering and Exiting TIS Command Language Mode

The TIS user enters TCL mode by typing TIS followed by CR in response to a VMS prompt. The CMDINTRP program then obtains the VMS account name of the VMS user attempting to access the TIS through the VMS $GETJPI (Get Job and Process Information) system service and checks the VMS account name against the entries in the TIS Authorized User Table (AUT). If the TIS Manager has entered the VMS account name into the AUT, the current VMS user is authorized to use the TIS. The process is transparent to the user, and the execution of the authorization check does not create any delay time noticeable to the terminal user. If the authorization check fails, the response to the user is a message that indicates the lack of proper authorization and the user is denied access; if the check is passed, then the response to the user is the TIS> prompt. The TIS terminal or batch user interacts exclusively with the CMDINTRP program (see Section 2.2.3).

The TIS user exits TCL mode by typing control-z in response to the TIS> prompt. The TIS user then returns to the VMS DCL mode.

While in the TCL mode, the special VMS control-y and control-c command sequences have no effect. When TCL mode is terminated by control-z, these VMS command sequences are put back into effect. The state of the VMS control-y and control-c command sequences are saved by the CMDINTRP program when the terminal user enters TCL mode, so that if the user had enabled or disabled control-y before entering TCL mode (through the VMS SET CONTROL=Y or SET NOCONTROL=Y commands), then control-y will be enabled or disabled when the terminal user exits TCL mode.

Before a VMS user can use the TIS, the VMS account must be properly set up for TIS by the VMS System Manager. Assuming that the TIS software has already been installed and that the TIS directories exist (with proper protection attributes), the following actions should be completed by the VMS System Manager to allow a VMS user to enter TCL mode:

1. The VMS account must be given GRPNAM privilege.

2. The VMS account name and appropriate TIS role must be entered into the TIS Authorized User Table through the TIS SET/PARAM USER command (see Section 3.1.2.11.13).

3. The LOGIN.COM command procedure for the VMS account that is to use the TIS must include the VMS command (@TIS$SYSTEM:TIS.COM) to execute the TIS$SYSTEM:TIS.COM command procedure. This command procedure creates entries in the group logical name table for the user that are required by the CMDINTRP program, and creates the TIS symbol that causes the CMDINTRP program to be run upon user demand. Entries in the group logical name table are made only if the entries do not already exist. Group logical names used by the TIS are not superseded.

4. The VMS User Authorization File (UAF) should allow for a working set size (WSDEFAULT and WSQUOTA parameters) of a minimum of 256 pages to prevent thrashing, and an open file limit (FILLM parameter) of a minimum of 16 simultaneously open files (a maximum of six open files is required by the CMDINTRP program). Normal installation defaults should be adequate for the remaining UAF parameters.

3.1.2 Command Summary

This section provides the details of each of the TIS commands. For each command, the command syntax, inputs, restrictions, processing performed, outputs, and possible error messages are described. In addition to the new commands required to perform new functions, the TIS command interface CPC (CMDINTRP) provides functions equivalent to the commands implemented in the TACFIRE PDP-11/780 Smart Peripheral System (SPS), including the TACFIRE PDP-11/70 Fundamental Interactive Terminal System (FITS) commands. Table 3-1 identifies and summarizes all of the TIS commands, and the correspondences that exist between the SPS, FITS, and TIS commands.

Three SPS commands, PQUE, FORM, and RTRY, do not have corresponding TIS commands. One FITS command, EXIT, is not required due to the design of the TIS CMDINTRP user interface CPC.

Table 3-1. Summary of TIS Commands and SPS/FITS Correspondences

TIS COMMAND VERSION X001	COMMAND SUMMARY	COMMAND FROM SPS DESIGN DESCRIPTION 595950-900	COMMAND FROM FITS USER MANUAL
ATTACH	Reserves one of the VAX-11/780 tape drives (previously allocated to PSS through the TIS SET command) for a single PSS batch job that requires tape input or output.	None	None
BOOT	Downline loads a PSS bootstrap image into the specified AN/GYK-12 or MMP computer.	BOOT	Not applicable
CANCEL	Cancels a previously submitted PSS batch job.	None (DACT)	TAK
CHOP	Sets the specified AN/GYK-12 offline from the TIS when PSS has crashed. Accumulated PSS batch job output will be printed.	None	None
CLUP	Creates a logical disconnect between the TIS and the specified PSS with graceful termination of active PSS batch jobs.	CLUP	Not applicable

Table 3-1. Summary of TIS Commands and SPS/FITS Correspondences (Continued)

TIS COMMAND VERSION X001	COMMAND SUMMARY	COMMAND FROM SPS DESIGN DESCRIPTION 595950-900	COMMAND FROM FITS USER MANUAL
CONVERT	Allows PSS source files, stored on-disk in the obsolete block format formerly used by the SPS, to be edited by VMS source editors and allows VMS source files to be converted into the obsolete PSS formats. The CONVERT command is provided for compatibility only.	None	RUN DCL
CREATE	Allows a PSS filename, equivalent VMS directory specification and device name, PSS filetype, and default block size to be added to the PSS database description.	RUN UPCAT (ADDFILE) (ADD)	RUN MUFD (CREATE)
DETACH	Releases a VAX-11/780 tape drive previously reserved for use by a PSS batch job through the ATTACH command.	None	None
DISPLAY	Allows inspection of the PSS database description to determine PSS filenames, equivalent VMS directory specification and device name, PSS filetype, and default blocksize.	RUN UPCAT (DISPLAY)	RUN MUFD (PRINT) (DISPLAY)

Table 3-1. Summary of TIS Commands and SPS/FITS Correspondences (Continued)

TIS COMMAND VERSION X001	COMMAND SUMMARY	COMMAND FROM SPS DESIGN DESCRIPTION 595950-900	COMMAND FROM FITS USER MANUAL
HELP	Displays information available in the TIS help text on TIS commands. The HELP command displays an abstract of each command function, command syntax, and keyword options.	None	None
REMOVE	Removes the definition of a specified PSS file from the PSS database description.	RUN UPCAT (DELETE)	RUN MUFD (REMOVE)
SEND	Provides the TIS user interface to the PSS operator communications. Messages are sent to the PSS to initiate PSS operator commands.	SEND	Not applicable
SET/PARAM	Allows modification of the variables (TIS dynamic parameters) that affect the TIS detached processes, the PSS environment, and the TIS user environment.	None	None
SET/QUEUE	Allows maintenance of the PSS batch queues.	IQUE (M, H, R, D, S)	Not applicable

Table 3-1. Summary of TIS Commands and SPS/FITS Correspondences (Continued)

TIS COMMAND VERSION X001	COMMAND SUMMARY	COMMAND FROM SPS DESIGN DESCRIPTION 595950-900	COMMAND FROM FITS USER MANUAL
SHOW/DATA	Displays the contents of the specified TIS and PSS data structures.	None	None
SHOW/PARAM	Allows inspection of the TIS dynamic parameters that affect the TIS detached processes, the PSS environment, and the TIS user environment.	None	None
SHOW/PERF	Displays performance statistics collected by TIS for a specified PSS job.	None	None
SHOW/QUEUE	Displays information on the status of the batch queue or punch queue maintained by TIS for a specified PSS.	IQUE (P)	Not applicable
SHOW/STAT	Displays information on the status of a specified batch job or of the TIS.	IDNO AJOB STAT CLAS	STATUS

Table 3-1. Summary of TIS Commands and SPS/FITS Correspondences (Continued)

TIS COMMAND VERSION X001	COMMAND SUMMARY	COMMAND FROM SPS DESIGN DESCRIPTION 595950-900	COMMAND FROM FITS USER MANUAL
START/COLD	Initializes the TIS without recovery and reconstitution of the TIS database contents that define the PSS batch queue that existed from the previous run. Any PSS batch jobs from a previous run will not be enqueued for execution.	STRT/COLD	Not applicable
START/WARM	Initializes the TIS with recovery and reconstitution of the TIS database contents that define the PSS batch queue that existed from the previous run. Dormant PSS jobs that were enqueued previously will be enqueued for execution.	STRT/WARM	Not applicable
STOP	Causes the TIS software to exit and returns VMS to the status previous to the execution of the TIS.	STOP	Not applicable
SUBMIT	Initiates a PSS batch job by enqueuing the PSS JCL and data statements for execution on the specified PSS.	ACTV	GIV

Table 3-1. Summary of TIS Commands and SPS/FITS Correspondences (Continued)

TIS COMMAND VERSION X001	COMMAND SUMMARY	COMMAND FROM SPS DESIGN DESCRIPTION 595950-900	COMMAND FROM FITS USER MANUAL
TEST	Causes a Test SSIM ICE packet to be sent to the specified PSS.	SIUT	Not applicable
UPDATE	Allows modification of the PSS database description to change PSS filenames, equivalent VMS directory and device name, PSS filetype, and default blocksize.	RUN UPCAT (DELETE) (ADD or ADDFILE)	RUN MUFD (UPDATE)

In an early version of the SPS, based on the PDP-11/35 computer using the RSX-11D Version 4U and Version 6A operating systems, the RSX-11D operating system did not provide an adequate set of commands to the user to allow for manipulation of the printer queue and for processing of special printer forms. Consequently, a printer queue internal to the SPS software was implemented. The PQUE command (with P, M, H, R, D, I, and U subcommands), and the FORM command were implemented in the SPS to allow the SPS operator to perform the following functions to manipulate the SPS printer queue:

1. Determine the entries in the printer queue and the status of each entry or the entire printer queue.
2. Move an entry to the top of the printer queue.
3. Place an entry or the entire queue on hold.
4. Release an entry or the entire queue from hold.
5. Delete an entry or the entry currently printing.
6. Repeat the entry currently printing.
7. Assign a printer to be dedicated to SPS print jobs.
8. Set and release special forms mode for SPS print jobs on a specified printer.

In the TIS, all printer queues are maintained only by VMS. Using standard VMS operator commands and procedures, the VMS print queues are maintained by the VAX-11/780 operator (see the VAX/VMS System Management and Operations Guide, Section 8.3). The VMS operator commands to manipulate and control the VMS printer queues are a superset of the printer queue commands formerly implemented in the PDP-11/35 SPS.

The SPS RTRY command was provided to allow the SPS operator to retry unrecoverable I/O errors that occurred on the SIU, cardreader, or the SPS printer. In the TIS, these retry functions are handled either by the SSIM device driver (JBDRIVER), which will retry a failed SSIM I/O operation up

to eight times, or by VMS device drivers and operator procedures, which will alert the operator that intervention is required and will automatically retry the failed cardreader or printer operation. Due to the design of the TIS and VMS, the RTRY command is not necessary.

The EXIT command is used in the FITS to terminate the PSS Master User File Directory (PSSMUFD) maintenance program. In the TIS, the PSSMUFD functions have been integrated into the TIS command interface. Due to the design of the TIS command interface, no EXIT command is necessary.

3.1.2.1 Reserve Tape Drive for PSS Batch or Utility Job (ATTACH). The ATTACH command reserves one of the VAX-11/780 tape drives to the exclusive use of a specific PSS batch or utility job for a TIS user. The VMS tape device must have been previously allocated to the exclusive use of PSS by the SET/PARAM command (see Section 3.1.2.11.7). A PSS batch job must be submitted for execution before the ATTACH command is used to reserve a VAX-11/780 tape drive to the exclusive use of the job. To reserve a VAX-11/780 tape drive to the exclusive use of a PSS utility job, the ATTACH command must be used to reserve the tape drive before the PSS utility job is executed. A tape drive cannot be reserved to the exclusive use of an executing PSS job.

3.1.2.1.1 ATTACH Command Syntax and Inputs.

ATTACH PSSnr tapenr jobnames volser

where the components are defined as follows:

PSSnr — Either PSSZERO or PSSONE, indicating the PSS where the job is to execute.

tapenr — Either TAPE0 or TAPE1, indicating the PSS logical unit for the VAX-11/780 drive to be reserved. TAPE0 indicates PSS commercial tape unit 26. TAPE1 indicates PSS commercial tape unit 27.

jobnames — The 8 character alphanumeric job name identifier from the ()JOB card of the PSS batch job that is to use the specified VAX-11/780 tape drive. If the PSS job is a utility job, then the jobnames component must be UTILTYnn, where nn is the two digit PSS job slot number where the job will execute, in the range of 01 to 15 decimal.

volser — The one to five digit volume serial number assigned to the tape mounted on the specified VAX-11/780 tape drive. The volser component must be in the range of 1 to 32767 decimal.

Typical examples of the ATTACH command are as follows:

ATTACH PSSZERO TAPE0 DZBAALT3 11206
Reserves the VMS tape drive specified by the PSS number and the PSS logical unit number 26 to the exclusive use of PSS job DZBAALT3, with tape number 11206 mounted on the drive.

ATTACH PSSZERO TAPE1 DZMBBZG1 11208
Reserves the VMS tape drive specified by the PSS number and the PSS logical unit number 27 to the exclusive use of PSS job DZBBZG1, with tape number 11208 mounted on the drive.

ATTACH PSSONE TAPE0 UTILTY03 11207
Reserves the VMS tape drive specified by the PSS number and the PSS logical unit 26 to the exclusive use of a utility job which will be executed on PSS one in job slot 3, with tape number 11207 mounted on the drive.

ATTACH PSSONE TAPE1 CSSSJ367 8950
Reserve the VMS tape drive specified by the PSS number and the PSS logical unit 27 to the exclusive use of PSS job CSSSJ367, with tape number 8950 mounted on the drive.

3.1.2.1.2 ATTACH Command Restrictions, Processing, and Outputs. The ATTACH command imposes the following restrictions on the TIS user:

1. The TIS user must have either the TIS Manager or the TIS Operator privileges.

2. The PSS number must be either zero (PSSZERO) or one (PSSONE).

3. The tape number must be either zero (TAPE0) or one (TAPE1).

4. The jobname must be either an 8 character alphanumeric PSS batch job name, or the utility job designator (UTILTYnn) with a two digit job slot number in the range of 01 to 15.

5. If a batch job is specified, the PSS job name must be found in the Job Input Queue, indicating that the job has been submitted but is not executing.

6. If a batch job is specified, the PSS job must require one or more tapes as indicated by the TAPE parameter on the PSS ()JOB card.

7. The tape volume serial number must be in the range of 1 to 32767 decimal.

8. The VAX-11/780 tape drive specified by the PSS number and the tape number must have been allocated to the exclusive use of PSS through the SET/PARAM command (see Section 3.1.2.11.7).

9. The specified VAX-11/780 tape drive cannot be already mounted by a PSS batch or utility job.

10. The specified VAX-11/780 tape drive cannot be already attached for use by a PSS batch or utility job.

If all of the checks on the ten specified restrictions are passed, then the CMDINTRP user interface marks the appropriate entry in the TIS Tape Allocation Table with the TIS job number of the specified PSS batch job, the PSS jobname of the batch or utility job reserving the tape drive, the PSS job slot number of the utility job reserving the tape drive, and the volume serial number of the mounted tape, to indicate that the corresponding PSS tape drive is allocated to a specific PSS batch or utility job. If the ATTACH command causes all of the tape requirements for the specified PSS batch job to be satisfied, the PSS batch job is made eligible for execution by removal of the PSS batch job from the tape wait state. Until the ATTACH command is used to dedicate one of the PSS tape drives to a given PSS batch job that requires one or two tape drives, the PSS batch job will remain in a tape wait state. A PSS batch job that requires one or two tape drives will not execute until the correct number of PSS tape drives have been attached to the PSS batch job.

Successful completion of the ATTACH command results in the following output message:

TIS — Tape unit tapenr on PSS PSSnr attached.
Attached for PSS job jobnames.

3.1.2.1.3 ATTACH Command Error Messages. The following error messages can be displayed if an error occurs in the processing of the ATTACH command:

TIS — Insufficient privilege for command.
Attach operation cancelled.

Explanation: The TIS user is not authorized to attach tapes for PSS jobs.

TIS — Attach command has illegal PSS number.
Attach operation cancelled.

Explanation: The target PSS number was not specified as PSSZERO or PSSONE.

TIS — Illegal syntax of command.
Attach operation cancelled.

Explanation: The ATTACH command has one or more components entered incorrectly, or extraneous characters were entered.

TIS — Illegal tape unit number.
Attach operation cancelled.

Explanation: The tape number was not entered as TAPE0 or TAPE1.

TIS — Illegal format of PSS jobname.
Attach operation cancelled.

Explanation: The PSS batch job or PSS utility jobname was not entered correctly or was not recognizable in the command line.

TIS — PSS batch job jobnames not found in JIQ.
Attach operation cancelled.

Explanation: The specified PSS batch job has not been submitted or has been dequeued for execution by a PSS.

TIS — PSS batch job jobnames does not require tapes.
Attach operation cancelled.

Explanation: The specified PSS batch job does not require preallocated tapes or the TAPE parameter was omitted from the ()JOB card for the PSS batch job.

TIS — Illegal format of PSS utility jobname.
Attach operation cancelled.

Explanation: The PSS utility jobname was not entered correctly or the job slot number is not in the range of 01 to 15 decimal.

TIS — Illegal format of tape volume serial number.
Attach operation cancelled.

Explanation: The tape volume serial number was not entered correctly or is not in the range or 1 to 32767 decimal.

TIS — Tape unit tapenr not allocated for PSS PSSnr.
Attach operation cancelled.

Explanation: The PSS tape drive specified in the command line has not been allocated for the exclusive use of the specified PSS by the SET/PARAM command (see Section 3.1.11.7).

TIS — Fatal error accessing Job Control Table.
Run Time library status code (error) dcode
Attach operation cancelled.

Explanation: An internal logic error has occurred while reading an entry from the JCT through the READ_JCT TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified of the error.

TIS — Fatal error accessing Job Input Queue.
TIS Run Time library status code (error) dcode
Attach operation cancelled.

Explanation: An internal logic error has occurred while reading the JIQ through the READ_JIQ_ENTRY TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified.

TIS — Tape unit tapenr for PSS PSSnr has mounted tape.
Tape volume serial number
Job is executing on PSS number
PSS job slot number
TIS job number
PSS jobname
Submitted by VMS user name
Attach operation cancelled.

Explanation: The PSS tape drive specified in the command line has a mounted tape. The volume serial number, PSS number, job slot number, TIS job number, PSS jobname, the VMS process name of the submitter of the job, and the terminal where the job was submitted are displayed for the PSS batch job that has already allocated and mounted the tape.

TIS — Tape unit tapenr for PSS PSSnr has mounted tape.
Tape volume serial number
Job is executing on PSS number
PSS job slot number
TIS job number
PSS job is a utility job
Attach operation cancelled.

Explanation: The PSS tape drive specified in the command line has a mounted tape. The volume serial number, PSS number, job slot number, and TIS job number are displayed for the PSS utility job that has already allocated and mounted the tape.

TIS — Tape unit tapenr on PSS PSSnr already attached.
Attached for PSS job.
Tape volume serial number.
Attach operation cancelled.

Explanation: The PSS tape drive specified in the command line has already been attached for a PSS batch or utility job. The PSS jobname and the tape volume serial number are displayed.

3.1.2.2 Bootstrap PSS (BOOT). The BOOT command causes the specified AN/GYK-12 bootstrap image file to be boot loaded through the specified SSIM into the connecting AN/GYK-12 computer. Ordinarily the bootstrap image to be boot loaded through the specified SSIM will be contained in a PSS System File, although any properly formatted AN/GYK-12 bootstrap image can be loaded with the BOOT command. If an AN/GYK-12 computer is to be boot loaded independently of the TIS software, the SSIMTEST utility program should be used (see Section 5.1). The AN/GYK-12 to be boot loaded must be logically disconnected from the TIS (see Section 3.1.2.4 CHOP command and Section 3.1.2.5 CLUP command).

The AN/GYK-12 bootstrap image file to be boot loaded must be contained in a VAX-11 RMS disk file on a Files-11 Level 1 or Level 2 disk volume. Bootstrap tapes written in PSS format (PSS boot tape format) can be copied to a VAX-11 RMS disk file by the TIS BOOTCOPY utility (see Section 5.2) or the PSS System Tape Copy (STPCOPY) utility. PSS bootstrap images in Files-11 tape format can be copied to a VAX-11 RMS disk file by standard VAX/VMS utilities. PSS bootstrap images in DOS-11 or RT-11 tape format can be copied to a VAX-11 RMS disk file by the VAX/VMS File Transfer (FLX) utility. The FLX program converts the format of the input tape to an output disk file in VAX-11 RMS Files-11 Level 1 or Level 2 format (see the VAX-11 Utilities Reference Manual, Chapter 8).

3.1.2.2.1 BOOT Command Syntax and Inputs.

BOOT PSSnr file-specification

where the components are defined as follows:

PSSnr — The unit number of the SSIM to be used for the boot load operation. The PSSnr parameter must be alphabetic, and must be either ZERO or ONE.

file-specification — Any valid VAX-11 RMS disk file specifier. The file-specification parameter may be a VMS logical name or may contain a VMS logical name that defines the VMS device, or the VMS device and directory where the bootstrap image file is stored. An indefinite number of VMS logical name translations are attempted until no translation is found to exist; the result is used as the ultimate file specification of the bootstrap file.

Typical examples of the BOOT command are as follows:

BOOT ZERO DMA1:[TIS.JBDRIVER]V040.DAT — The PSS contained in the file V040.DAT, located on RK07 unit one in the JBDRIVER subdirectory of the TIS directory, is boot loaded through SSIM zero.

BOOT ONE TIS$SYSTEM:V042.DAT — The PSS contained in the file V042.DAT, located on the VMS device and directory defined by the TIS$SYSTEM logical name, is boot loaded through SSIM one.

BOOT ONE PSS$SYSTEM: — The PSS contained in the file defined by the PSS$SYSTEM logical name is boot loaded through SSIM one.

BOOT ZERO CMDISK:[CM.PSS]V050.DAT — The PSS contained in the file DRB1:[CM.PSS]V050.DAT is boot loaded through SSIM zero.

3.1.2.2.2 BOOT Command Restrictions, Processing, and Outputs. The BOOT command imposes the following restrictions on the TIS user:

1. The TIS user must have either the TIS Manager or the TIS Operator privileges.

2. The BOOT command cannot be executed from a VMS batch job.

3. The PSSnr parameter must be an alphabetic ZERO or ONE.

4. The file-specification parameter cannot be more than 32 characters.

5. The file-specification parameter must be a valid VAX-11 RMS file specification, identifying a PSS system file that exists on one of the VAX-11/780 disk drives.

6. The specified SSIM must be online to VMS (physically present in the VAX-11/780 hardware configuration).

7. The specified SSIM must not already support an active PSS.

8. Automatic SSIM test mode must be disabled for the specified PSS.

9. A manual mode SSIM test command must not be in progress.

10. The TIS detached processes must be active (started by the TIS START command).

11. A previous bootstrap attempt must not still be in progress.

12. The PSS system file must contain a legal AN/GYK-12 bootstrap header.

13. The computer operator must push the Channel 11 Load pushbutton on the AN/GYK-12 IOU panel.

If all of the checks on the thirteen specified restrictions are passed, the CMDINTRP user interface checks the bootstrap image file defined by the file-specification parameter. If the file-specification parameter defines a valid, existing VAX-11 RMS file, then the CMDINTRP process checks the first seven longwords of the bootstrap image file for the existence of a valid AN/GYK-12 bootstrap header. If the bootstrap header is valid, the status of the SSIM specified by the PSSnr parameter is checked; the SSIM status must show that the target AN/GYK-12 is logically disconnected from the TIS. If all checks are successfully passed, then the CMDINTRP user interface process copies the file-specification parameter into a buffer in the TISGLOBAL global data area that is accessible to the SYSINITRM process that services the PSS Read System File ICE packets. The CMDINTRP process then performs the actual SSIM I/O operations to boot load the primary bootstrap image into the specified AN/GYK-12. The computer operator is notified to push the Channel 11 Load pushbutton on the AN/GYK-12 IOU panel. The Channel 11 Load pushbutton must be activated within three minutes, or the AN/GYK-12 bootstrap operation times out. The VMS control-y sequence is enabled during the bootstrap operation so that a computer operator is able to cancel an AN/GYK-12 bootstrap without having to wait for the three minute timer to expire.

Successful processing of the AN/GYK-12 initial bootstrap results in the following output message:

```
TIS — PSS initial bootstrap successfully completed.
      Final SSIM I/O status (success)
      Total SSIM I/O byte count
      Bootstrap was done in nn SSIM transfers.
      Bootstrap file has mm records in boot image.
```

The SSIM queue I/O status, total number of bytes transferred, number of SSIM transfer operations, and the total number of records read from the PSS system file are displayed.

When the bootstrapped PSS is started through the AN/GYK-12 Computer Test Set (CTS), additional messages are displayed by the TIS ICEHANDLE and SYSINITRM detached processes as PSS initialization progresses. These messages are defined in Section 3.3.2.1.2, Initialization of PSS.

3.1.2.2.3 BOOT Command Error Messages. The following error messages can be displayed if an error occurs in the processing of the BOOT command:

```
TIS — Insufficient privilege for command.
      Boot operation cancelled.
```

Explanation: The TIS user is not authorized to bootstrap a PSS.

```
TIS — Boot command has illegal syntax.
      Boot operation cancelled.
```

Explanation: The PSSnr parameter or the bootstrap filename cannot be found in the command line, or extraneous characters were entered.

```
TIS — Boot command illegal in batch mode.
      Boot operation cancelled.
```

Explanation: The TIS boot command is illegal when executed in a VMS batch job.

```
TIS — Too many characters in bootstrap filename.
      There are x characters in excess of y allowed.
      Boot operation cancelled.
```

Explanation: The bootstrap filename in the command line is too long. The number of excess characters and the maximum number of characters allowed is displayed.

TIS — Cannot access bootstrap file.
FORTRAN I/O status (error)
Boot operation cancelled.

Explanation: The specified bootstrap file cannot be opened for read-only access, or the file-specification parameter is not a legal VAX-11 RMS file specification. The decimal FORTAN I/O error status is displayed.

TIS — Specified bootstrap file does not exist.
Bootstrap operation cancelled.

Explanation: The VAX-11 RMS file specification was valid, but the specified PSS system file was not found in the VAX-11/780 database.

TIS — Specified SSIM is not online to TIS.
Bootstrap operation cancelled.

Explanation: The SSIM specified by the PSSnr parameter is not physically present in the VAX-11/780 hardware configuration.

TIS — Specified SSIM still has an active PSS.
Bootstrap operation cancelled.

Explanation: The PSS and SSIM specified by the PSSnr parameter has not been chopped off or closed up through the TIS CHOP or CLUP command.

TIS — Automatic SSIM test enabled for system PSSnr.
Bootstrap operation cancelled.

Explanation: Automatic SSIM test mode for the SSIM specified by the PSSnr parameter is enabled, and must be disabled through the TIS SET/PARAM command, the TIS CHOP command, or the TIS CLUP command.

TIS — Manual test still in progress for system PSSnr.
Bootstrap operation cancelled.

Explanation: A TIS Manager or TIS Operator has previously initiated a manual mode SSIM test through the TIS TEST command. The SSIM specified by the PSSnr parameter must be chopped off (through the TIS CHOP command) before the bootstrap can be performed.

TIS — TIS detached processes are not active.
Bootstrap operation cancelled.

Explanation: The TIS detached processes have not been started through the TIS START command.

TIS — Previous bootstrap not terminated.
Bootstrap operation cancelled.

Explanation: A previous bootstrap operation for the SSIM specified by the PSSnr was not chopped off through the TIS CHOP command.

TIS — Cannot open bootstrap image file.
target-file-specification
FORTRAN I/O status (error)
Boot operation cancelled.

Explanation: The specified bootstrap file cannot be opened for read-only access. The actual (after all logical name translations) target bootstrap filename is displayed, and the decimal FORTRAN I/O status is displayed.

TIS — FORTRAN read I/O error on bootstrap file.
FORTRAN I/O status (error)
Boot operation cancelled.

Explanation: An unrecoverable I/O error occurred while reading the PSS system file. The decimal FORTRAN I/O error status is displayed.

TIS — Bootstrap image file has illegal boot header.
AN/GYK-12 bootstrap image length
AN/GYK-12 bootstrap keyword
AN/GYK-12 bootstrap I/O mode
AN/GYK-12 bootstrap extension bits
Boot operation cancelled.

Explanation: The PSS system file does not contain a legal bootstrap header in the first seven longwords of the boot image. The decimal bootstrap image length in bytes, and the hexadecimal keyword, I/O mode, and bootstrap extension bits taken from the bootstrap header are displayed.

TIS — Error on assign of SSIM I/O channel.
VMS assign status (error)
Boot operation cancelled.

Explanation: A VMS I/O channel could not be successfully assigned to the SSIM specified by the PSSnr parameter. The hexadecimal VMS error code is displayed. This error indicates that an internal logic error has occurred, and that the software support staff should be notified.

TIS — Queue I/O error on SSIM set mode function.
VMS queue I/O initiation status
VMS queue I/O completion status

Explanation: The SSIM specified by the PSSnr parameter could not be successfully set offline and online to purge any outstanding ICE packets. This error indicates that an internal logic error has occurred, and that the software support staff should be notified.

TIS — **** Waiting for Channel 11 Load pushbutton.

Explanation: The computer operator must push the Channel 11 Load pushbutton on the AN/GYK-12 IOU panel to initiate the bootstrap load. Three minutes are allowed before the bootstrap will time out.

TIS — SSIM queue I/O error on system PSSnr.
VMS queue I/O initiation status
VMS queue I/O completion status
Bootstrap transfer length
Boot operation cancelled.

Explanation: An SSIM I/O error has occurred during the bootstrap transfer. The hexadecimal VMS queue I/O initiation status and queue I/O completion status are displayed, and the decimal number of bytes transferred are displayed. The SSIM error codes are listed in Section 5.1.

TIS — FORTRAN read I/O error from bootstrap file.
Record number in bootstrap file in error
FORTRAN I/O status (error)
Bootstrap operation cancelled.

Explanation: An unrecoverable I/O error occurred while reading the PSS system file. The decimal record number where the error occurred and the decimal FORTRAN I/O error status are displayed.

3.1.2.3 Cancel PSS Batch and Utility Jobs (CANCEL). The CANCEL command allows the user, with appropriate TIS privilege, to cancel a PSS batch or utility job in the following cases:

1. Cancel a PSS batch job that has been submitted but that has not yet been dequeued from the TIS job input queue for execution by a PSS. If the TIS user does not have TIS Manager or TIS Operator privileges, then the TIS user is a PSS user and cannot cancel a batch job unless the job was submitted by the same PSS user that is attempting the cancel operation. If the TIS user has TIS Manager or TIS Operator privilegs, then any PSS batch job (that has not been dequeued) submitted by any TIS user can be cancelled.

   A message is written to the VMS Master Operator Console (if enabled and if the terminal of the user cancelling the job is not the same as the VMS Master Operator Console) that indicates the date and time of the cancellation, the PSS jobname of the cancelled job, and the VMS process name and VMS terminal of the user cancelling the job, so that the computer operator has a record of every job cancellation.

2. An active PSS batch or utility job can be cancelled using a panic cancel command if the TIS user has TIS Manager or TIS Operator privileges. The panic cancel command is intended to allow the user to cancel PSS jobs without regard to whether the PSS that is executing the job is active. An important caution in the use of the panic cancel command is that the job is cancelled by TIS but not by PSS, so that any further requests for the cancelled job received from PSS by the TIS will be disregarded and will be reported as illegal. Normally the computer operator will use the TIS SEND command to send a PSS operator command to the PSS (CANCEL jn, where jn is the PSS job slot number) to cause the job to be cancelled through the PSS. The panic cancel feature is to be used only when an active job cannot be cancelled through the TIS SEND command. No message to the VMS Master Operator console is displayed when an active PSS job is cancelled.

When an active PSS job is cancelled through the panic feature, accumulated print output for the job is printed on the VAX-11/780 lineprinter, and all open files are closed with the final disposition specified when the files were opened.

If the cancelled PSS batch job was not being executed by PSS, the job had attached tapes (see Section 3.1.2.1), and the cancel operation was not for a panic cancel, the tapes are immediately detached from the exclusive use of the batch job when the batch job is successfully cancelled. Tapes are not immediately detached from the exclusive use of a batch or utility job if the batch or utility job was being executed by PSS and the cancel operation was for a panic cancel; instead, any tapes used by a cancelled, active PSS batch or utility job are dismounted and detached by the TAPEOPS process when the job terminates. If an active PSS batch or utility job is cancelled through a panic cancel and the job is never terminated by the TIS, the computer operator will have to manually detach the tapes from the exclusive use of the job through the TIS DETACH command (see Section 3.1.2.7).

Whenever an active PSS batch or utility job that has attached tapes is terminated normally without a panic cancel (through the TIS SEND command to

send a CANCEL job slot command to the PSS), any attached tapes are dismounted and detached for the job by the TAPEOPS process when the job terminates in the TIS.

If the TIS user does not have TIS Manager or TIS Operator privileges, tne TIS user is a PSS user and four restrictions are enforced as follows:

1. The TIS user cannot use the panic cancel form of the cancel command.

2. The TIS user cannot cancel PSS utility jobs.

3. The TIS user can cancel only those PSS batch jobs that were submitted by the user. This determination is made by comparing the VMS User Identification Code (UIC) of the TIS user that submitted tne PSS batch job to the VMS UIC of the TIS user that is attempting to cancel the PSS batch job. If these two character strings match, tne TIS user is permitted to cancel the batch job (if the checks on all of the other restrictions are passed).

4. The TIS user cannot cancel an active PSS batch job regardless of whether the TIS user that is attempting to cancel the batch job is the same TIS user that submitted the batch job.

3.1.2.3.1 CANCEL Command Syntax and Inputs.

CANCEL jobnames

where the single component is defined as follows:

jobnames — the 8 character alphanumeric job name identifier from the ()JOB card of the PSS batch job to be cancelled. This command cancels a previously submitted PSS batch job that has not been dequeued for execution (is not being executed) by PSS.

CANCEL jobnames/PANIC
This command cancels an active PSS batch job regardless of whether the PSS that is executing the batch job has cancelled the job (see caution, Section 3.1.2.3).

CANCEL UTILTYnn/PANIC PSSnr

where the components are defined as follows:

UTILTYnn — the jobname for a utility job, where nn is the two digit PSS job slot where the utility job is executing, in the range of 01 to 15 decimal.

PSSnr — Either PSSZERO or PSSONE, indicating the PSS where the utility job is executing. This command cancels an active PSS utility job regardless of whether the PSS that is executing the utility job has cancelled the job (see caution, Section 3.1.2.3).

Typical examples of the cancel command are as follows:

CANCEL REALSTUF
Cancels the PSS batch job named REALSTUF.

CANCEL CSSSJ367/PANIC
Cancels the active PSS batch job named CSSSJ367, without notifying the PSS that is executing the job. All subsequent requests for the job from PSS will be reported as illegal by TIS.

CANCEL UTILTY10/PANIC PSSZERO
Cancels the active PSS utility job being executed in job slot 10 by PSS zero, without notifying the PSS that is executing the job. All subsequent requests for the job will be reported as illegal by TIS.

CANCEL UTILTY03/PANIC PSSONE
Cancels the active PSS utility job being executed in job slot 3 by PSS one, without notifying the PSS that is executing the job. All subsequent requests for the job will be reported as illegal by TIS.

3.1.2.3.2 CANCEL Command Restrictions, Processing, and Outputs. The CANCEL command imposes the following restrictions on the TIS user:

1. The user must specify a legal name for a PSS batch or utility job.

2. If the job is a utility job, then the panic qualifier and PSS number must be specified.

3. If the jobname indicates a batch job and the panic qualifier is not specified, the batch job must not be under execution by PSS, and the batch job must be found in the job input queue.

4. If the jobname indicates a batch job, and the panic qualifier is specified, the batch job must be under execution by PSS.

5. If the jobname indicates a utility job, the utility job must be under execution by the specified PSS in the specified job slot.

6. If the cancel operation is for a panic cancel, the TIS user must have either the TIS Manager or TIS Operator privileges.

7. If the cancel operation is not for a panic cancel and the TIS user does not have either the TIS Manager or TIS Operator privileges, then the job that is to be cancelled must have been submitted by the same user that is cancelling the job.

8. If the cancel operation is for a panic cancel, the TIS detached processes must be active (started by the TIS START command).

If all of the checks on the eight specified restrictions are passed, the CMDINTRP user interface processes the cancel operation either for a batch job or a utility job.

If the job to be cancelled is a batch job that is being executed by a PSS, flags are set in the appropriate entry in the Job Status Table to indicate to the JOBOPS process that the job is to be cancelled, and the JOBOPS process performs the cancel operation.

If the job to be cancelled is a batch job that is not being executed by a PSS, the CMDINTRP user interface marks the entry for the job in the Job Input Queue as cancelled, deletes the entry for the batch job from the Job Input Queue, and deletes the copy of the JCL input file (stored in the VMS device and directory defined by the TIS$JOBQUEUE logical name in the TIS group logical name table) that was to be sent to the PSS upon execution of the job, and immediately detaches any tapes that were attached for the exclusive use of the job. A message is broadcast to the VMS Master Operator Console (if the VMS Master Operator Console is enabled and if the VMS Master Operator Console is not the same as the terminal of the TIS user that is cancelling the job) to record the cancellation of the batch job.

If the job to be cancelled is a utility job, flags are set in the appropriate entry in the Job Status Table to indicate to the JOBOPS process that the job is to be cancelled, and the JOBOPS process performs the cancel

operation. A message is not broadcast to the VMS Master Operator Console if the job to be cancelled is a utility job.

Successful cancellation of an inactive PSS batch job results in the following output message:

```
TIS — Entry deleted from Job Input Queue
       PSS job name jobnames
       Submitted by VMS user name
       Submitted from VMS terminal
       Submitted on
       Cancelled job did not have tapes attached (OR)
       nn tapes detached for cancelled job
```

The PSS jobname, the VMS process (user) name of the submitter, the VMS name of the terminal where the job was submitted, the date and time that the job was submitted, and whether tapes were detached for the batch job are displayed.

Successful cancellation of an active PSS batch job results in the following output message:

```
TIS — Active job jobnames is cancelled.
       Job was executing on PSS PSSnr
       TIS job number
       Job was executing in PSS job slot nn
       Submitted by VMS user name
       Submitted from VMS terminal
```

The PSS jobname, the PSS number where the job was executing, the TIS job number, PSS job slot number where the job was executing, the VMS process (user) name of the submitter, and the VMS name of the terminal where the job was submitted are displayed.

Successful cancellation of an active PSS utility job results in the following output message:

```
TIS — Active utility job UTILTY nn is cancelled.
       Job was executing on PSS PSSnr
       TIS job number
```

Job was executing in PSS job slot nn
Job began execution on

The PSS jobname, the PSS number where the job was executing, the TIS job number, the PSS job slot where the job was executing, and the date and time that the utility job began execution are displayed.

Whenever an active PSS batch or utility job is terminated by TIS, the JOBOPS process displays information about the termination of the job, and possible error mesages may be displayed. These messages are defined in Appendix C.

3.1.2.3.3 CANCEL Command Error Messages. The following error messages can be displayed if errors occur in the processing of the CANCEL command:

TIS — Insufficient privilege for command.
Cancel operation cancelled.

Explanation: The TIS user cannot execute the specified cancel command without proper authorization (see Section 3.1.2.3).

TIS — Illegal syntax of Cancel command.
Cancel operation cancelled.

Explanation: One or more of the components of the cancel command cannot be recognized or were in an illegal format, or extraneous characters were entered.

TIS — Illegal command to cancel a utility job.
Cancel operation cancelled.

Explanation: A PSS utility jobname was specified, but the panic command modifier is not present in the command line. PSS utility jobs can be cancelled only through the panic cancel command, or by normal PSS operator procedures.

TIS — Illegal format of PSS utility jobname.
Cancel operation cancelled.

Explanation: The job slot number in the name of a PSS utility job is not in the range of 01 to 15 decimal, or extraneous characters were entered.

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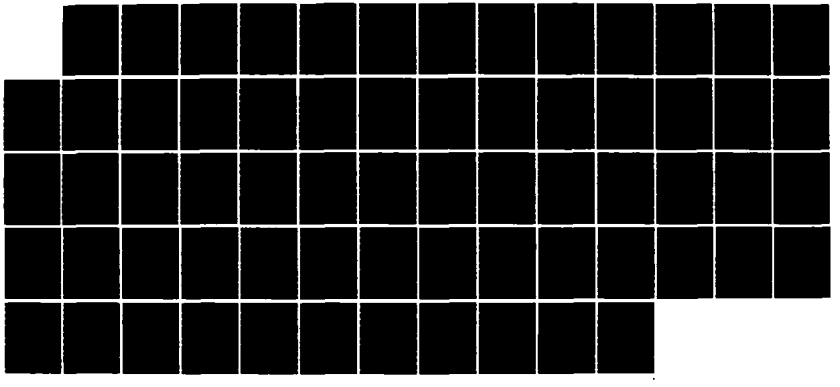

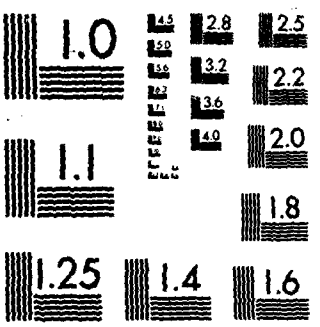

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TIS — Fatal error accessing Job Control Table.
TIS Run Time library status code (error) dcode
Cancel operation cancelled.

Explanation: An internal logic error has occurred while reading an entry from the JCT through the READ_JCT TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified of the error.

TIS — Fatal error accessing Job Input Queue.
TIS Run Time library status code (error) dcode
Cancel operation cancelled.

Explanation: An internal logic error has occurred while reading the JIQ through the READ_JIQ_ENTRY TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified of the error.

TIS — Specified job UTILTYnn is not a utility job.
Job is executing in job slot nn
Job is executing on PSS PSSnr
PSS batch jobname is jobnames
Submitted by VMS user name
Submitted from VMS terminal
Cancel operation cancelled.

Explanation: The PSS job identified by the TIS user as a utility job is not a utility job but is a PSS batch job. The PSS job slot number where the job is executing, the PSS number where the job is executing, the PSS batch jobname, the VMS process (user) name of the submitter, and the VMS name of the terminal where the job was submitted are displayed.

TIS — Specified utility job UTILTYnn is not active.
Job slot nn for PSS PSSnr is not active.
Cancel operation cancelled.

Explanation: The PSS utility job specified by the TIS user is not active in the job slot and PSS number specified by the TIS user in the command line.

TIS — PSS batch job jobnames not found in Job Input Queue.
Cancel operation cancelled.

Explanation: The PSS batch job identified by the TIS user has not been submitted, or has been submitted and dequeued from the JIQ for execution by PSS (specified PSS batch job is active and cancel operation is not a panic cancel).

TIS — User cannot cancel job jobnames.
PSS job was submitted by VMS user

Job is owned by user code
Cancel operation cancelled.

Explanation: The TIS user did not submit the specified PSS batch job, and is not authorized to cancel jobs submitted by different TIS users. The VMS process (user) name of the submitter and the VMS UIC of the submitter are displayed.

TIS — PSS batch job jobnames is active.
Cancel is not a panic cancel.
Job is executing on PSS PSSnr
Job is executing in PSS job slot nn
Submitted by VMS user name
Submitted from VMS terminal name
Cancel operation cancelled.

Explanation: The PSS batch job identified by the TIS user is active (being executed by PSS) and the cancel operation is not a panic cancel command. The PSS number where the job is executing, the PSS job slot number where the job slot number where the job is executing, the VMS process (user) name of the submitter, and the VMS name of the terminal where the job was submitted are displayed.

TIS — System Initiator/Terminator process is not active.
Cancel operation cancelled.

Explanation: An active job cannot be cancelled unless the TIS detached processes are active in VMS and have been started through the TIS START command.

3.1.2.4 Disconnect from Crashed PSS (CHOP). The CHOP command creates an immediate logical disconnect between the TIS software and the PSS executing on the specified AN/GYK-12 when graceful termination of PSS is not possible or desirable. After the CHOP command has been executed for a PSS, the TIS will not honor any requests from the PSS for service, and the AN/GYK-12 must be bootstrap loaded to establish communication (see Section 3.1.2.2). The CHOP command is used to terminate processing for a specified PSS without graceful termination of PSS batch jobs (see Section 3.1.2.5, Disconnect Gracefully from PSS (CLUP) if graceful termination is required).

The CHOP command takes immediate effect for the specified PSS. The TIS forces termination of all active PSS jobs regardless of the state of the associated AN/GYK-12. If any job output print data exists, the output is

queued for printing by VMS. Entries in the TIS Job Input Queue for PSS batch jobs that were executing on the specified PSS are not deleted from the JIQ to allow possible resubmittal in a future session.

3.1.2.4.1 CHOP Command Syntax and Inputs.

CHOP PSSnr

where the single component is defined as follows:

PSSnr — The unit number of the SSIM with the PSS that is to be immediately disconnected from the TIS. The PSSnr parameter must be alphabetic, and must be either ZERO or ONE.

Typical examples of the CHOP command are as follows:

CHOP ZERO — Communication with a PSS through SSIM zero immediately terminated. All further requests from the PSS specified by the sysnr parameter are ignored.

CHOP ONE — Communication with a PSS through SSIM one is immediately terminated. All further requests from the PSS specified by the sysnr parameter are ignored.

3.1.2.4.2 CHOP Command Restrictions, Processing, and Outputs. The CHOP command imposes the following restrictions on the TIS user:

1. The TIS user must have either the TIS Manager or the TIS Operator privileges.
2. The CHOP command cannot be executed from a VMS batch job.
3. The specified SSIM must be online to VMS (physically present in the VAX-11/780 hardware configuration).
4. The TIS detached processes must be active (started by the TIS START command).

If all of the checks on the four specified restrictions are passed, the CMDINTRP user interface flags the specified SSIM to indicate that the corresponding PSS is offline to the TIS, searches the Job Status Table for any

PSS jobs that were being executed by the specified PSS and, if any active jobs are found, marks the jobs for immediate termination, and notifies all of the TIS detached processes that the specified PSS is to be chopped off.

Succeessful processing of the chop off operation results in the following output message:

TIS — System PSSnr chopped off.

The PSS number of the specified SSIM is displayed.

Depending upon the conditions present, additional messages will be displayed by the TIS detached processes as PSS batch and utility jobs are terminated or if a previous bootstrap attempt is cancelled. These messages are defined in Appendix C.

3.1.2.4.3 CHOP Command Error Messages. The following error messages can be displayed if errors occur in the processing of the CHOP command:

TIS — Insufficient privilege for command.
Chop Off operation cancelled.

Explanation: The TIS user cannot execute the chop off operation without TIS Manager or TIS Operator privileges.

TIS — Chop Off command has illegal syntax.
Chop Off operation cancelled.

Explanation: The PSSnr parameter was not correctly entered, or extraneous characters were entered.

TIS — Chop Off command illegal in batch mode.
Chop Off operation cancelled.

Explanation: The TIS chop command is illegal when executed in a VMS batch job.

TIS — Specified SSIM is not online to the TIS.
Chop Off operation cancelled.

Explanation: The SSIM specified by the PSSnr parameter is not physically present in the VAX-11/780 hardware configuration.

TIS — System Initiator/Terminator process is not active.
PSS PSSnr set to inactive mode.
Chop Off operation cancelled.

Explanation: The TIS detached processes have not been started through the TIS START command. The SSIM specified by the PSSnr parameter is flagged to indicate that the corresponding PSS is not supported by the TIS (the PSS is set to offline mode).

TIS — VMS status of chop off operation (error)
Chop Off operation not successful.

Explanation: One of the TIS detached processes that is to be notified of the chop off condition was not active in VMS. The hexadecimal VMS error status code is displayed. The software support staff should be notified.

3.1.2.5 Disconnect Gracefully from PSS (CLUP). The CLUP (Close Up) command creates a logical disconnect between the TIS software and the PSS executing on the specified AN/GYK-12. After the CLUP command has been completed for a PSS, all PSS jobs are allowed to be terminated by PSS, but the specified PSS is not allowed to start any new batch or utility jobs. After all PSS jobs have terminated, the TIS will not honor any further requests from the PSS for service, and the AN/GYK-12 must be bootstrap loaded to establish communication (see Section 3.1.2.2). The CLUP command is used to terminate processing for a specified PSS with graceful termination of PSS batch jobs.

The CLUP command causes the TIS to refuse further PSS requests for batch jobs to execute, but allows active PSS batch jobs to be terminated by the SEND command or to complete execution before creating a software disconnection from the specified PSS. Termination of PSS batch and utility jobs is processed the same way that termination of a PSS job is processed when a CLUP condition does not exist. Output from PSS jobs will be printed upon job termination. All PSS disk files are closed with the final disposition specified when the files were opened. Any attached tapes are dismounted and detached by the TAPEOPS process when the job terminates in the TIS. As the PSS batch jobs terminate, the corresponding entries are deleted from the TIS Job Input Queue. Disconnection from PSS occurs when there are no more active PSS batch or utility jobs.

3.1.2.5.1 CLUP Command Syntax and Inputs.

CLUP PSSnr

where the single component is defined as follows:

PSSnr — The unit number of the SSIM with the PSS that is to be gracefully disconnected from the TIS. The PSSnr parameter must be alphabetic, and must be either ZERO or ONE.

Typical examples of the CLUP command are as follows:

CLUP ZERO — The PSS communicating with the TIS through SSIM zero is logically disconnected from the TIS. All further requests for starting new jobs from the PSS specified by the PSSnr parameter are ignored, and when all of the active PSS jobs terminate, the PSS will be set offline from the TIS.

CLUP ONE — The PSS communicating with the TIS through SSIM one is logically disconnected from the TIS. All further requests for starting new jobs from the PSS specified by the PSSnr parameter are ignored, and when all of the active PSS jobs terminate, the PSS will be set offline from the TIS.

3.1.2.5.2 CLUP Command Restrictions, Processing, and Outputs. The CLUP command imposes the following restrictions on the TIS user:

1. The TIS user must have either the TIS Manager or the TIS Operator privileges.

2. The CLUP command cannot be executed from a VMS batch job.

3. The specified SSIM must be online to VMS (physically present in the VAX-11/780 hardware configuration).

4. The PSS specified by the PSSnr parameter must be active and online to the TIS.

5. The TIS detached processes must be active (started by the TIS START command).

If all of the checks on the five restrictions are passed, then the CMDINTRP user interface flags the specified PSS to indicate that a close up

operation is in progress to prevent dequeuing of any further PSS batch jobs for the specified PSS, and notifies the TIS detached processes that the close up operation is in progress. The JOBOPS detached process terminates the PSS batch and utility jobs as terminate commands are received from the specified PSS. When all of the PSS jobs for the specified system have terminated, the ICEHANDLE detached process issues a VMS set mode queue I/O system service to disconnect the PSS from the TIS in the JBDRIVER device driver. Successful initiation of the close up operation results in the following output messages:

TIS — System PSSnr closed up.

The PSS number of the specified SSIM is displayed.

Depending upon the conditions present, additional messages will be displayed by the ICEHANDLE process and the JOBOPS process as the PSS jobs are terminated by PSS. These messages are defined in Section 3.3.2.3.3, Complete Shutdown of PSS.

3.1.2.5.3 CLUP Command Error Messages. The following error messages can be displayed if errors occur in the processing of the CLUP command:

TIS — Insufficient privilege for command.
Close Up operation cancelled.

Explanation: The TIS user cannot execute the close up command without TIS Manager or TIS Operator privileges.

TIS — Close up command has illegal syntax.
Close Up operation cancelled.

Explanation: The PSSnr parameter was not correctly entered, or extraneous characters were entered.

TIS — Close up command illegal in batch mode.
Close Up operation cancelled.

Explanation: The TIS close up command is illegal when executed in a VMS batch job.

TIS — Specified SSIM is not online to the TIS.
Close Up operation cancelled.

Explanation: The SSIM specified by the PSSnr parameter is not physically present in the VAX-11/780 hardware configuration.

TIS — Specified SSIM does not have an active PSS.
Close Up operation cancelled.

Explanation: The PSS corresponding to the SSIM specified by the PSSnr parameter is not online to the TIS, and no PSS batch or utility jobs are active for the specified PSS.

TIS — System Initiator/Terminator process is not active.
Close Up operation cancelled.

Explanation: The TIS detached processes have not been started through the TIS START command.

TIS — VMS status of close up operation (error)
Close up operation not successful.

Explanation: One of the TIS detached processes that is to be notified of the close up condition was not active in VMS. The hexadecimal VMS error status code is displayed. The software support staff should be notified.

3.1.2.6 Create and Define Entry in PSS Database Description (CREATE). The CREATE command makes an entry in the PSS Master User File Directory (PSSMUFD) to establish a correspondence between a specified PSS filename and a VAX-11 RMS device and directory, and to define the file type and the default blocksize of the members contained in the PSS file. The PSSMUFD is explained in Section 2.2.4, TIS Database.

3.1.2.6.1 CREATE Command Syntax and Inputs.

CREATE/SRC72/BL:n PSSfilename device-directory

CREATE/SRC80/BL:n PSSfilename device-directory

CREATE/OTHER/BL:n PSSfilename device-directory

where the components are defined as follows:

PSSfilename — Any valid PSS filename from 1 to 8 alphanumeric characters in length. The PSS filename may not be a VMS logical name.

device-directory — A valid VAX/VMS device and directory specification that is to correspond to the PSS filename specified by the PSSfilename parameter. The device and directory specifications, which may be either a VAX-11 RMS Files-11 Level 2 or Files-11 Level 1 device and directory specification, identifies the VAX-11 RMS device and directory within the device where all of the members of the PSS file are stored. The device-directory parameter may not contain VMS logical names. The device portion must be five characters, with the first three characters comprising the two alphabetic characters of the VAX-11 device name and the one alphabetic character of the Unibus adaptor designation, the fourth character defining the device unit number in the range of 0 to 7, and the fifth character must be a colon (:) that indicates the end of device parameter. The directory portion may be from 3 to 32 alphanumeric characters in length including two left and right brackets and any subdirectory separators (periods) or UIC separator (comma) present.

Command qualifiers explicitly define the file type and default blocking of all of the members of the PSS file. Command qualifiers are as follows:

/SRC72 — The PSS expects that all of the members of this PSS file (defined by the PSSfilename parameter) are stored in Smart Peripheral System Librarian (SPSLIB) 72 byte source library format. The TIS converts the data read from the editable VAX-11 RMS files (that are the members of the PSS file) to SPSLIB 72 byte source format before the data is sent through the SSIM to PSS.

/SRC80 — The PSS expects that all of the members of this PSS file (defined by the PSS filename parameter) are stored in SPSLIB 80 byte source library format. The TIS converts the data read from the editable VAX-11 RMS files (that are the members of the PSS file) to SPSLIB 80 byte source format before the data is sent through the SSIM to PSS.

/OTHER — The PSS handles any conversion required for the data contained in the VAX-11 RMS files that are the members of the PSS file. The TIS does not convert the data read from any member of the PSS file before the data is sent through the SSIM to PSS.

/BL:n — The default blocksize of each of the members of the PSS file defined by the PSSfilename parameter. The numeric value n is the blocksize in AN/GYK-12 fullwords, where n is in the range $0<n<2048$ decimal. If the blocksize of the file is not explicitly specified on the ()FILE card in the PSS batch JCL, the default

blocksize will be used. If the blocksize of the file is explicitly specified on the ()FILE card in the PSS batch JCL, the default blocksize in the PSSMUFD will be superseded by the blocksize specified on the ()FILE card.

Typical examples of the CREATE command are as follows:

CREATE/SRC72/BL:126 PSSTEST DRB1:[CM.PSTEST]
Creates an entry in the PSSMUFD for the PSS filename PSSTEST, containing the members of the PSS file on the VAX-11 device DRB1: in the [CM.PSSTEST] directory. The default blocksize is defined to be 126 AN/GYK-12 fullwords, and the PSS filetype is SPSLIB 72 byte source format.

CREATE/SCR80/BL:126 BMAPSRCE DRB1:[CM.BMSOURCE]
Creates an entry in the PSSMUFD for the PSS filename BNAPSRCE, containing the members of the PSS file on the VAX-11 device DRB1: in the [CM.BNSOURCE] directory. The default blocksize is defined to be 126 AN/GK-12 fullwords, and the PSS filetype is SPSLIB 80 byte source format.

CREATE/OTHER/BL:120 PSSFOBJ DRC0:[PSS.TEST.PSSFOBJ]
Creates an entry in the PSSMUFD for the PSS filename PSSFOBJ, containing the members of the PSS file on the VAX-11 device DRC0: in the [PSS.TEST.PSSFOBJ] directory. The default blocksize is defined to be 120 AN/GYK-12 fullwords, and the PSS filetype indicates that no conversion is to be performed by the TIS when data are read from the file by the PSS.

CREATE/SRC72/BL:126 NEAL02 DM1:[100,117]
Creates an entry in the PSSMUFD for the PSS filename NEAL02, containing the members of the PSS file on the VAX-11 device DM1: (in Files-11 Level 1 format) in the Files-11 Level 1 directory specified by the [100,117] UIC. The default blocksize is defined to be 126 AN/GYK-12 fullwords, and the PSS filetype is SPSLIB 72 byte source format.

3.1.2.6.2 CREATE Command Restrictions, Processing, and Outputs. The CREATE command imposes the following restrictions on the TIS user:

1. The TIS user must have the TIS Manager privileges.

2. One of the SRC72, SRC80, or OTHER command qualifiers must be present in the command line.

3. The BL command qualifier must be present in the command line.

4. The default blocksize specified by the BL command qualifier must be in the range of 1 to 2048 decimal.

5. The PSS filename parameter must be a valid PSS filename.

6. The device-directory parameter must be a valid VAX-11 RMS Files-11 Level 1 or Files-11 Level 2 device and directory specification. No check is made by the CMDINTRP process as to whether the specified device and directory exist in the VMS. Syntax is the only check that is enforced.

7. The PSS filename (specified by the PSS filename parameter) must not already exist in the PSSMUFD.

8. The PSSMUFD must not be full. The PSSMUFD may contain a maximum of 1024 entries corresponding to 1024 PSS filenames.

If all of the checks on the eight restrictions are passed, then the CMDINTRP user interface allocates and obtains exclusive use of a free entry from the PSSMUFD table (contained in the TISGLOBAL shared data region) through the TISRTL GET_FREE_MUF_ENTRY procedure, fills in the required information in the allocated PSSMUFD entry through the TISRTL WRITE_MUF procedure, releases exclusive use of the allocated PSSMUFD entry through the TISRTL RELEASE_MUF_ ENTRY procedure, and reads the new entry made in the PSSMUFD table for display to the TIS user.

Successful entry of the data specified by the TIS user into the PSSMUFD results in the following output message:

```
TIS — Entry successfully made in PSS Mater User File Directory
       PSS filename
       VMS Device/Directory
       Default PSS blocksize
       PSS file format type code
```

The PSS filename, equivalent VAX-11 RMS device and directory, default PSS blocksize in decimal AN/GYK-12 full words, and the PSS filetype code (either 1 for 72 byte SPSLIB format, 2 for 80 byte SPSLIB format, or 3 for no format specification) are displayed.

3.1.2.6.3 CREATE Command Error Messages. The following error messages can be displayed if errors occur in the processing of the CREATE command:

TIS — Insufficient privilege for command.
Create operation cancelled.

Explanation: The TIS user cannot execute the create command without TIS Manager privileges.

TIS — Create command has illegal syntax.
Create operation cancelled.

Explanation: One or more required components of the create command were not specified, cannot be recognized, or were in an illegal format, or extraneous characters were entered.

TIS — Default blocksize of n is invalid.
Create operation cancelled.

Explanation: The default PSS blocksize was not in the range of 1 to 2048 decimal, or contained illegal characters.

TIS — Illegal format of PSS filename.
Create operation cancelled.

Explanation: The PSS filename parameter cannot be found in the command line, or contains more than eight characters.

TIS — PSS filename of PSSfilename is invalid.
Create operation cancelled.

Explanation: The PSSfilename parameter contains illegal characters that are not alphanumeric.

TIS — VMS Device/Directory of device-directory is invalid.
Create operation cancelled.

Explanation: The device-directory parameter contains an illegal device specification, contains an illegal directory specification, or contains a directory specification longer than 32 characters.

TIS — Illegal syntax of VMS Device/Directory.
Create operation cancelled.

Explanation: The device-directory parameter cannot be recognized in the command line.

TIS — PSS filename PSSfilename is already in PSSMUFD.
Create operation cancelled.

Explanation: The PSS filename specified by the PSSfilename parameter has already been entered in the PSSMUFD.

TIS — Internal error on PSS filename check.
TISRTL status (error) dcode.

Explanation: An internal logic error has occurred while attempting to determine whether the PSS filename specified by the PSSfilename parameter exists in the PSSMUFD through the FIND_MUF_ENTRY procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified.

TIS — PSS Master User File Directory is full.
Create operation cancelled.

Explanation: The PSSMUFD table is full with 1024 PSS filenames, and the PSS filename specified by the PSSfilename parameter cannot be added to the PSSMUFD. The software support staff should be notified.

TIS — Internal error on allocation of free entry.
TIS Run Time Library status (error) dcode.

Explanation: An internal logic error has occurred while attempting to allocate a free entry from the PSSMUFD table through the GET_FREE_MUF_ENTRY TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified.

TIS — VMS device name devicenm is invalid.

Explanation: The VMS device name component of the device-directory parameter is not a legal syntax.

TIS — VMS directory of directnm is invalid.

Explanation: The VMS directory string component of the device-directory parameter is not in a legal syntax.

TIS — Internal logic error on write to PSSMUFD.
TIS Run Time Library status (error) dcode.

Explanation: An internal logic error has occurred while attempting to write a PSSMUFD entry (allocated from the PSSMUFD table) through the WRITE_MUF TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified.

TIS — Internal error on deallocation of entry.
TIS Run Time Library Status (error) dcode.

Explanation: An internal logic error has occurred while attempting to deallocate a PSSMUFD entry (allocated from the PSSMUFD table) through the RELEASE_MUF_ENTRY TISRTL procedure. The dcode symbol is a negative TISRTL error code. The software support staff should be notified.

TIS — Internal error reading PSSMUFD entry.
TIS Run Time Library status (error) dcode.

Explanation: An internal logic error has occurred while attempting to read a PSSMUFD entry through the READ_MUF TISRTL procedure. The dcode symbol is a negative TISRTL error code. The software support staff should be notified.

3.1.2.6.4 Release Tape Drive from PSS Batch or Utility Job (DETACH). The DETACH command releases a VMS tape drive, previously reserved by the ATTACH command, from exclusive use by a PSS batch or utility job. The VMS tape device must have been previously attached to a PSS batch job, and must have been previously allocated to the exclusive use of PSS by the SET/PARAM command. A VMS tape drive cannot be detached from the exclusive use of the active PSS batch or utility job; the active job must be terminated before the specified tape drive can be detached.

3.1.2.6.4.1 DETACH Command Syntax and Inputs.

DETACH PSSnr tapenr jobnames

where the components are defined as follows:

PSSnr — Either PSSZERO or PSSONE, indicating the PSS where the batch or utility job executed or where the batch or utility job was to execute.

tapenr — Either TAPE0 or TAPE1, indicating the PSS logical unit for the VAX-11/780 drive that was reserved. TAPE0 indicated PSS commercial tape unit 26. TAPE1 indicates PSS commerical tape unit 27.

jobnames — The 8 character alphanumeric job name identifier from the ()JOB card of the PSS batch job that was to use the specified VAX-11/780 tape drive. If the PSS job was a utility job, then the jobnames component must be UTILITYnn, where nn is the two digit PSS job slot number where the utility job executed or where the utility job was to execute, in the range of 01 to 15 decimal.

Typical examples of the DETACH command are as follows:

DETACH PSSZERO TAPE0 DZBAALT3
Releases the VMS tape drive specified by the PSS number and the PSS logical unit number 26 from exclusive use of PSS job DZBAALT3.

DETACH PSSZERO TAPE1 DZMBBZG1
Releases the VMS tape drive specified by the PSS number and the PSS logical unit number 27 from exclusive use of PSS job DZMBBZG1.

DETACH PSSONE TAPE0 UTILITY03
Releases the VMS tape drive specified by the PSS number and tne PSS logical unit number 26 from exclusive use of a utility job that executed (or that was to execute) on PSS one in job slot 3.

DETACH PSSONE TAPE1 CSSSJ367
Releases the VMS tape drive specified by the PSS number and tne PSS logical unit number 27 from exclusive use of PSS job CSSSJ367.

3.1.2.6.4.2 DETACH Command Restrictions, Processing, and Outputs. The DETACH command imposes the following restrictions on the TIS user:

1. The TIS user must have either the TIS Manager or the TIS Operator Privileges.

2. The PSS number must be either zero (PSSZERO) or one (PSSONE).

3. The tape number must be either zero (TAPE0) or one (TAPE1).

4. The jobname must be either an 8 character alphanumeric PSS batch job name, or the utility job designator (UTILITYnn) with a two digit job slot number in the range of 01 to 15.

5. The VAX-11/780 tape drive specified by the PSS number and the tape number must have been allocated to the exclusive use of PSS through the SET/PARAM command (see Section 3.1.2.11.7).

6. The VAX-11/780 tape drive specified by the PSS number and the tape number must not be mounted by an active PSS batch or utility job.

7. The VAX-11/780 tape drive specified by the PSS number and the tape number must have been attached for the exclusive use of the PSS batch or utility job specified by the jobnames command line parameter.

If all of the checks on the seven specified restrictions are passed, then the CMDINTRP user interface zeros the information in the appropriate entry in the Tape Allocation Table (TAT) indicating that the corresponding

VAX-11/780 tape drive is not allocated for exclusive use. Allocation information in the TAT zeroed to release the specified VAX-11/780 tape drive consists of the TIS job number of the owning PSS batch or utility job, the jobname of the owning PSS batch or utility job, the PSS job slot number of the owning PSS batch or utility job, and the tape volume serial number of the tape reserved for the exclusive use of the PSS batch or utility job. When the detach operation is completed, the corresponding VAX-11/780 tape drive is available to be attached for the exclusive use of any other PSS batch or utility job.

Successful completion of the DETACH command results in the following output message:

TIS — Tape unit tapenr on PSS PSSnr detached.
Detached for PSS job jobnames.

3.1.2.6.4.3 DETACH Command Error Messages. The following error messages can be displayed if an error occurs in the processing of the DETACH command:

TIS — Insufficient privilege for command.
Detach operation cancelled.

Explanation: The TIS user is not authorized to detach tapes for PSS jobs.

TIS — Detach command has illegal PSS number.
Detach operation cancelled.

Explanation: The target PSS number was not specified as PSSZERO or PSSONE.

TIS — Illegal syntax of command.
Detach operation cancelled.

Explanation: The DETACH command has one or more components entered incorrectly, or extraneous characters were entered.

TIS — Illegal tape unit number.
Detach operation cancelled.

Explanation: The tape number was not entered as TAPE0 or TAPE1.

TIS — Illegal format of PSS jobname.
Detach operation cancelled.

Explanation: The PSS batch job or PSS utility jobname was not entered correctly or was not recognizable in the command line.

TIS — Illegal format of PSS utility jobname.
Detach operation cancelled.

Explanation: The PSS utility jobname was not entered correctly or the job slot number was not in the range of 01 to 15 decimal.

TIS — Tape unit tapenr not allocated for PSS PSSnr.
Detach operation cancelled.

Explanation: The PSS tape drive specified in the command line has not been allocated for the exclusive use of the specified PSS by the SET/PARAM command (see Section 3.1.11.7).

TIS — Fatal error accessing Job Control Table.
TIS Run Time Library status code (error) dcode.
Detach operation cancelled.

Explanation: An internal logic error has occurred while reading an entry from the JCT through the READ_JCT TISRTL procedure. The dcode symbol is a negative decimal error code. The software support staff should be notified of the error.

TIS — Fatal error accessing Job Input Queue.
TIS Run Time Library status code (error) dcode.
Detach operation cancelled.

Explanation: An internal logic error has occurred while reading the JIQ through the READ_JIQ_ENTRY TISRTL procedure. The dcode symbol is a negative decimal TISRTL error code. The software support staff should be notified.

TIS — Tape unit tapenr for PSS PSSnr has mounted tape.
Tape volume serial number
Job is executing on PSS number
PSS job slot number
TIS job number
PSS jobname
Sumitted by VMS user name
Submitted from terminal
Detach operation cancelled.

Explanation — An active PSS batch job has mounted the specified VAX-11/780 tape drive through PSS. The volume serial number, PSS number, job slot number, TIS job number, PSS jobname, the VMS process name of the submitter of the job, and the terminal where the job was submitted are displayed for the PSS batch job that has mounted the tape.

TIS — Tape unit tapenr for PSS PSSnr has mounted tape.
Tape volume serial number
Job is executing on PSS number
PSS job slot number
TIS job number
PSS job is a utility job.
Detach operation cancelled.

Explanation: An active PSS utility job has mounted the specified VAX-11/780 tape drive through PSS. The volume serial number, PSS number, job slot number, and TIS job number are displayed for the PSS utility job that has mounted the tape.

3.1.2.6.5 Display PSS File Names and PSS File Attributes (DISPLAY). The DISPLAY command shows the VMS device and directory that correspond to a specified PSS filename, and shows the default blocksize and filetype for the members contained in the PSS file. The data are taken from the PSS Master User File Directory (PSSMUFD). The PSSMUFD is explained in Section 2.2.4, TIS Database.

3.1.2.6.5.1 DISPLAY Command Syntax and Inputs.

DISPLAY PSSfilename

DISPLAY/PRINT

PSSfilename — Any valid PSS filename from 1 to 8 alphanumeric characters in length.

One optional command qualifier, if present, indicates that all of the PSS filenames and the corresponding VMS device and directory and the default blocksize and filetype for all of the entries in the PSSMUFD are to be printed on a lineprinter defined by VMS logical name SYS$PRINT.

/PRINT — If present, the contents of the PSSMUFD are printed on a lineprinter.

3.1.2.6.6 Eliminate Entry from PSS Database Description (REMOVE). The REMOVE command deletes an entry from the PSS Master User File Directory (PSSMUFD) for the specified PSS filename. The deletion destroys any correspondence between

the specified PSS filename and the associated VMS device and directory information, and the default blocksize and filetype are eliminated. The REMOVE command has the effect of making the specified PSS filename unknown to the TIS, since the PSS database description in the PSSMUFD will no longer define the specified PSS file.

3.1.2.6.6.1 REMOVE Command Syntax and Inputs.

REMOVE PSSfilename

PSSfilename — Any valid PSS filename from 1 to 8 alphanumeric characters in length.

3.1.2.6.7 Communicate with PSS Using PSS Operator Commands (SEND). The SEND command writes the message text input by the TIS user to the SSIM that corresponds to the PSS number specified by the TIS user. The message is sent to the PSS formatted as a PSS operator message.

The SEND command is the only direct interface between the TIS user and the PSS operator communications program SUP11. The SEND command allows TIS Managers (and designated PSS users) to control PSS processing.

3.1.2.6.7.1 SEND Command Syntax and Inputs.

SEND n:m message-text

where the components are defined as follows:

n — PSS number identifying the PSS operating system that is to receive the message text. May only be zero or one.

m — PSS job slot number (decimal) identifying the program within the specified PSS operating system that is to receive the message text.

message text — A string of ASCII alphanumeric characters, up to a maximum of 40 characters, that is the data to be sent to the AN/GYK-12 program executing in job slot m in PSS operating system n.

Ordinarily, the SEND command is used to perform PSS operator functions such as starting and cancelling PSS job slots, obtaining listings of PSS active jobs and known AN/GYK-12 devices, or setting the time and date upon PSS initialization. Typical examples are as follows:

SEND 0:1 LJ ALL — Obtains a listing of the status of all of the PSS job slots on the PSS zero.

SEND 0:1 LD ALL — Obtains a listing of the status of all of the AN/GYK-12 peripherals known to the PSS zero.

SEND 0:1 S 3 — Starts job slot 3 on the PSS zero. The PSS will send a request to the TIS for batch job input (job control language) to execute in job slot 3.

SEND 0:1 C 3,DUMP — Cancels (with a dump) the PSS batch executing in job slot 3 on the PSS zero.

SEND 0:1 W 4 — Places the PSS job executing in job slot 4 on the PSS zero in a wait (suspend) state.

SEND 0:1 R 4 — Reactivates the PSS job executing in job slot 4 on the PSS zero that was placed in a wait state.

SEND 1:1 DATE 01JUN82,1000 — Sets the date and time on the PSS one to the specified values (a 24-hour clock is used).

SEND 1:1 LM — Causes the PSS one to list a report on AN/GYK-12 memory errors.

SEND 1:1 LT — Lists the availability, job slot assignment, and volume serial number for each commercial tape unit online to PSS one (on the VAX-11/780).

SEND 0:1 LU ALL — Causes the PSS zero to list program usage statistics for all of the programs in the TACFIRE Program List (TPL).

SEND 1:1 EXECUTE 5,CLST,26,ALL — Causes the TAPEOUT utility to be executed in job slot 5 on PSS one. All of the TACPOL listing files on PSS on PSS tape unit 26 will be printed in non-merged format. (Note: PSS tape unit 26 must have been previously attached for use by a PSS utility job on PSS one by the TIS ATTACH command.)

SEND 0:1 EXECUTE 4,TPOS,27,FR,6 — Causes the TAPEOS utility to be executed in job slot 4 on PSS zero. The tape mounted on PSS

tape unit 27 will be forward spaced 6 records. (Note: PSS tape unit 27 must have been previously attached for use by a PSS utility job on PSS zero by the TIS ATTACH command.)

3.1.2.6.7.2 SEND Command Restrictions, Processing, and Outputs. The SEND command imposes the following restrictions on the TIS user:

1. The TIS user must have proper authorization to execute the SEND command.
2. The n parameter, identifying the PSS system which is to receive the message text, must be equal to zero or one.
3. The m parameter, identifying the PSS job slot which is to receive the message text, must be in the range of 0 to 15 decimal.
4. The message text must contain at least one character. If more than 132 characters are entered, the message text will be truncated to 132 characters.
5. The PSS specified by the n parameter must be online to TIS and marked as active in the TIS status data.

If all of the checks on the five specified restrictions are passed, then the CMDINTRP user interface CPC initiates a VMS queue I/O system service (with a queue I/O function code of IO$_WRITEMSG) to the appropriate SSIM. Automatic SSIM error retries are disabled to prevent a long wait if the associated PSS does not accept the message (within ten seconds of initiation of the message transfer); otherwise, a wait of up to 80 seconds could be experienced if the specified PSS does not service the input message request.

Successful completion of the SEND operation results in the following output message:

TIS — Message sent, completion status normal.

If the message was a PSS operator message, and if the SEND operation was successful, then operator messages from PSS (resulting from the message sent) will be displayed on the initiating VAX-11/780 terminal.

3.1.2.6.7.3 SEND Command Error Messages. The following error messages can be displayed if errors occur in the processing of the SEND command:

TIS — Illegal command format.
Explanation: The SEND command was not entered in the required syntax (see Section 3.1.1.12.1).

TIS — User not authorized to execute command.
Explanation: The TIS user does not have the proper privilege entry in the TIS User Data File that defines all TIS user accounts.

TIS — Illegal PSS number.
Explanation: The PSS number (n parameter) was not zero or one, or was not identifiable in the command line.

TIS — Illegal PSS job slot number.
Explanation: The PSS job slot number (m parameter) was not in the range of 0 to 15 decimal or was not identifiable in the command line.

TIS — Illegal message text format.
Explanation: The message text was not specified or was not identifiable in the command line.

TIS — Specified PSS or SSIM not active.
Explanation: The PSS or SSIM specified by the PSS number (n parameter) is not currently connected (physically or logically) to TIS.

TIS — SSIM I/O error on unit zero (one).
VMS queue I/O initiation status a

where a is a hexadecimal VMS system service error code defined in the JBDRIVER CPC (see Appendix C). The system error message text will be displayed.
Explanation: The probable cause is an internal software error.

TIS — SSIM I/O error on unit zero (one).
VMS queue I/O completion status b

where b is a hexadecimal I/O status error code. Expected values for b are defined in the JBDRIVER CPC (see Appendix C). The system error message text will be displayed.
Explanation: A hardware or software error occurred subsequent to initiation of the VMS queue I/O system service to the SSIM specified in the SEND command. The I/O status error code provides further explanation as defined in Appendix C.

3.1.2.6.8 Change TIS Dynamic Parameter, PSS Control Parameter, or User Session Parameter (SET/PARAM).

Set VMS terminal name for logging TIS and PSS messages.

SET/PARAM CONSOLE VMS terminalname.

Disable logging of TIS and PSS messages.

SET/PARAM NOCONSOLE

Enable logging of TIS error log data.

SET/PARAM ERROR ON

Disable logging of TIS error log data.

SET/PARAM ERROR OFF

Enable logging of TIS history log data.

SET/PARAM HISTORY ON

Disable logging of TIS history log data.

SET/PARAM HISTORY OFF

Enable automatic SSIM test.

SET/PARAM AUTO_TEST ZERO ON
SET/PARAM AUTO_TEST ONE ON

Disable automatic SSIM test.

SET/PARAM AUTO_TEST ZERO OFF
SET/PARAM AUTO_TEST ONE OFF

Set delta time for automatic SSIM test.

SET/PARAM AUTO_TIME ZERO 0 00:00:10.00
sets time between Test ICE packets to ten seconds.

SET/PARAM AUTO_TIME ONE 0 00:00:30.00
sets time between Test ICE packets to thirty seconds.

Set delta time for response to Test ICE packet sent to PSS.

SET/PARAM RESPONSE_TIME ZERO 0 00:00:05.00
sets time within which PSS must respond to five seconds.

SET/PARAM RESPONSE_TIME ONE 0 00:00:45.00
sets time within which PSS must respond to 45 seconds.

Allocate tape drive for PSS.

SET/PARAM PSSZERO TAPE0 MFA0:
PSSONE TAPE1 logicalname
VMSdevicename

Enable roll-out of TIS global data.

```
SET/PARAM ROLL_OUT ON
```

Disable roll-out of TIS global data.

```
SET/PARAM ROLL_OUT OFF
```

Set delta time for roll-out of TIS global data.

```
SET/PARAM ROLL_TIME 0 00:05:00.00
```
sets roll-out delta time to five minutes.

Disable TIS messages broadcast from detached processes, sent by PSS, and from PSS batch jobs.

```
SET/PARAM MESSAGES OFF
```

Enable TIS messages broadcast from detached processes, sent by PSS, and from PSS batch jobs.

```
SET/PARAM MESSAGES ON
```

Set the specified SSIM online to TIS.

```
SET/PARAM SSIM ZERO ONLINE
SET/PARAM SSIM ONE ONLINE
```

Set the specified SSIM offline to TIS.

```
SET/PARAM SSIM ZERO OFFLINE
SET/PARAM SSIM ONE OFFLINE
```

Enable a specified VMS account to use the TIS.

```
SET/PARAM USER VMSaccount/PRIV:(USER)
```
authorizes a VMS account to use the TIS in the user role.

```
SET/PARAM USER VMSaccount/PRIV:(MANAGER)
```
authorizes a VMS account to use the TIS in the manager role.

Disable a previously enabled VMS account to use the TIS.

```
SET/PARAM NOUSER VMSaccount
```

Set TIS queues on hold, release TIS queues from hold, set individual entries in the specified queue on hold, and release individual entries in the specified queue from hold.

```
SET/QUEUE INPUT HOLD
```
sets the job input queue on hold.

```
SET/QUEUE INPUT RELEASE
```
releases the jo› input queue from hold.

```
SET/QUEUE INPUT jobnames HOLD
```
sets specified PSS batch job on hold.

SET/QUEUE INPUT jobnames RELEASE
releases specified PSS batch job from hold.

SET/QUEUE PUNCH jobnames HOLD
sets specified entry in punch output queue on hold.

SET/QUEUE PUNCH jobnames RELEASE
releases specified entry in punch output queue from hold.

3.1.2.6.9 Show Status of Queues, Parameters, Users, and Processing (SHOW).

Show contents of TIS queues.

SHOW/QUEUE INPUT
lists contents of batch job input queue.

SHOW/QUEUE PUNCH
lists contents of punch output queue.

SHOW/QUEUE INPUT jobnames.
SHOW/QUEUE PUNCH jobnames.

Show values of TIS parameters.

SHOW/PARAM
lists the values of all of the TIS parameters.

Show the contents of the TIS authorized user table.

SHOW/USER
lists the VMS account names authorized to use the TIS.

Show status of TIS and PSS processing.

SHOW/STATUS/ALL ZERO
SHOW/STATUS/ALL ONE
shows status data for all PSS jobs known to TIS.

SHOW/STATUS jobnames
SHOW/STATUS UTILITYnn PSSZERO
SHOW/STATUS UTILITYnn PSSONE
shows status data for the specified PSS batch job.

3.1.2.6.10 Start the TIS Processes (START).

START/COLD
runs TIS without recovery of the job input queue and punch

output queue.

START/WARM
runs TIS with recovery of the job input queue and punch output queue.

3.1.2.6.11 Stop the TIS Software (STOP).

STOP
initiates a graceful termination of all TIS detached processes.

STOP/PANIC
forces all TIS detached processes to immediately terminate.

3.1.2.6.12 Submit PSS Batch Jobs for Execution (SUBMIT).

SUBMIT VMSfilespecification/PRINT
causes specified file of PSS job control language to be read and enqueued for execution with output printed.

SUBMIT VMSfilespecification/SCROLL
causes specified file of PSS job control language to be read and enqueued for execution with output held for scrolling.

SUBMIT VMSfilespecification/NULL
causes specified file of PSS job control language to be read and enqueued for execution with no output regardless of whether the job causes printing of output data.

SUBMIT/SCAN VMSfilespecification
causes specified file of PSS job control language to be read and syntax checked without enqueuing job.

SUBMIT/HOLD VMSfilespecification/PRINT
SUBMIT/HOLD VMSfilespecification/SCROLL
SUBMIT/HOLD VMSfilespecification/NULL
causes specified file of PSS job control language to be read and enqueued with the job initially put on hold.

3.1.2.6.13 Test the Specified SSIM (TEST).

TEST ZERO
TEST ONE
causes a Test ICE packet to be sent to the specified PSS.

3.1.2.6.14 Change Entry in PSS Database Description (UPDATE). The UPDATE command modifies an entry in the PSS Master User File Directory (PSSMUFD).

Any of the elements of the description of the PSS database for a specified PSS file can be changed, including the VMS device and directory that correspond to the PSS filename, the default blocksize of all of the members of the PSS file, and the filetype. The UPDATE command has the effect of changing the PSS database description contained in the PSSMUFD. The PSSMUFD is explained in Section 2.2.4, TIS Database.

3.1.2.6.14.1 Update Command Syntax and Inputs.

UPDATE PSSfilename device-directory

UPDATE/SRC72/BL:n PSSfilename device-directory

UPDATE/SRC80/BL:n PSSfilename device-directory

UPDATE/OTHER/BL:n PSSfilename device-directory

PSSfilename — Any valid PSS filename with 1 to 8 alphanumeric characters in length.

device-directory — Any valid VAX/VMX device and directory specification. The device-directory parameter is optional and specifies the new VAX/VMS device and directory that is to be associated with the PSS file identified by the PSS filename parameter.

Command qualifiers explicitly define the new values of the file type and default blocksize that are to optionally replace the previously existing values. Command qualifiers are as follows:

/SRC72 — All of the members of the PSS file (specified by the PSSfilename parameter) are to be considered to be stored in SPSLIB 72 byte source format.

/SRC80 — All of the members of the PSS file (specified by the PSSfilename parameter) are to be considered to be stored in SPSLIB 80 byte source format.

/OTHER — All of the members of the PSS file (specified by the PSSfilename parameter) are stored in PSS internal format.

/BL:n — The numeric value n is the new default blocksize in AN/GYK-12 fullwords, where n is in the range $0 \leq n \leq 2048$, for all of the members in the PSS file specified by the PSSfilename parameter.

3.2 OPERATIONS AND CONTROL FUNCTIONS FOR A TIS MANAGER

3.2.1 Operations and Control Commands

A TIS Manager can execute all of the TCL commands. There can be as many TIS Managers as there are available entries in the TIS User Status Table (UST).

A TIS Manager can execute the following functions that a PSS User is not ordinarily authorized to execute:

1. Attach a PSS tape unit to any PSS job through the ATTACH command.
2. Downline load a PSS bootstrap image through the BOOT command.
3. Cancel any PSS job submitted by any TIS user through the CANCEL command.
4. Set a specified PSS offline from TIS (when the PSS crashes) through the CHOP command.
5. Cause the TIS software to terminate a PSS gracefully and to declare a PSS logically offline through the CLUP command.
6. Alter entries in the PSS Master User File Directory (PSSMUFD) that describe the PSS on-disk database through the CREATE, REMOVE, and UPDATE commands.
7. Detach a PSS tape unit from any PSS job through the DETACH command.
8. Display entries in the PSSMUFD through the DISPLAY command.
9. Send a message to PSS (SUP11 operator communications program) through the SEND command.
10. Change all TIS parameters and all entries in the TIS queues through the SET/PARAM and SET/QUEUE commands.
11. Display all TIS parameters, queues, and internal data through the SHOW/DATA, SHOW/PARAM, SHOW/PERF, SHOW/QUEUE, and SHOW/STATUS commands.
12. Initialize the TIS software through the START/COLD and START/WARM commands.

13. Cause the TIS software to terminate and exit through the STOP command.

14. Submit batch jobs to PSS through the SUBMIT command.

15. Cause the TIS software to transmit an SSIM test message through the TEST command.

3.3 PSS APPLICATIONS FUNCTIONS FOR A PSS USER

A PSS User can ordinarily (unless otherwise authorized by a TIS Manager) execute only the following commands:

1. Attach PSS tape units to PSS batch jobs that the PSS User has submitted through the ATTACH command.

2. Cancel jobs (that the same user has submitted) through the CANCEL command.

3. Detach PSS tape units from PSS batch jobs that the PSS User has submitted through the DETACH command.

4. Display entries in the PSS Master User File Directory (PSSMUFD) through the DISPLAY command.

5. Change parameters that modify the PSS User environment through the SET/PARAM command.

6. Change the status of TIS queues (for PSS batch jobs that the same user has submitted) through the SET/QUEUE command.

7. Display all TIS parameters, queues, and internal data (except for passwords in the TISUDF) through the SHOW/DATA, SHOW/PARAM, SHOW/PERF, SHOW/QUEUE, and SHOW/STATUS commands.

8. Submit batch jobs to PSS through the SUBMIT command.

4. SOFTWARE INSTALLATION AND MAINTENANCE

The installation and maintenance of the TIS software is done by executing VMS command procedures. To compile and link the TIS software, the command procedure TIS$BUILD:BUILDTIS is executed. To install TIS components, the command procedure TIS$SYSTEM:TISINSTAL is executed. To take a backup, the command procedure [TIS]BACKUP is executed.

4.1 COMPILE/ASSEMBLE AND LINK TIS SOFTWARE

To execute the command procedure TIS$BUILD:BUILDTIS enter the VMS commands:

```
SET DEF [TIS.BUILD]
@BUILDTIS
```

This procedures interacts with the user, allowing the user to select the compilation function. If this function is selected, the user is queried as to whether or not listing files should be created for all or some of the components. Also, if listings files are to be created, the user has the option to select the cross reference listing option. The command procedure then queries the user, module by module, as to whether or not this module should be compiled. If the user answers yes, then the module is compiled. A module may contain many source files to be compiled. If an error is encountered in the compilation of a source file, the remaining source files in that module are not compiled. The user is queried for the next module. The object and list files created during compiles/assemblies reside in TIS$OBJECTS.

After the compilation phase, the command procedure queries the user as to whether or not any modules should be linked. If the user selects the link phase, the user has the option to create link map files. If link map

files are created the user has the option to select the cross reference capability to install the TIS global area, the TIS Run Time Library, the CMDINTRP and SYSINITRM processes. Like in the compilation phase, the command procedure queries the user, module by module, as to whether or not the particular module should be linked. The link map files created reside in TIS$OBJECTS. The executable images created reside in TIS$SYSTEM, the global area.

The command procedure can be exited at any time by entering CNTRL Y. The files created up to after new objects and executable images are created, old versions are purged. That point will still exist. Figure 4-1 is an example of the execution of the command procedure to rebuild the entire system.

To compile and link the TIS utilities, the command procedure TIS$BUILD:BUILDUTL is executed. This command procedure is used in the same manner as TIS$BUILD:BUILDTIS. The object, list, and link map files reside in TIS$UTILITIES rather than TIS$OBJECTS.

4.2 INSTALLATION OF TIS

The TIS system can be completely installed by executing the command procedure TIS$SYSTEM:TISINSTAL. To execute this procedure either answer yes to the login prompt:

```
Do you want to install TIS [Y/N]?
```

or enter the VMS command:

```
@TIS$SYSTEM:TISINSTAL.
```

This command procedure connects the TIS SSIM device driver, installs the TIS global areas, installs the Command Interpreter (CMDINTRP) interactive process, and installs the System Initiator/Terminator detached process. Also, if SYS$PRINT is defined as a logical name in the system logical name table,

```
$ SET DEF [TIS.BUILD]
$ @BUILDTIS
$!
$!      T I S $ B U I L D : B U I L D T I S . C O M
$!
$!      This command file performs all of the actions necessary to
$!      build and link the components of the TIS from source.  The
$!      terminal user is queried as to whether or not listing files
$!      should be created and as to whether or not link map files
$!      should be created.  If listing or map files are created, the
$!      terminal user may optionally create cross reference listings.
$!      Optionally, the user may generate listings and cross reference
$!      maps by selecting the desired components to be listed.  This
$!      command file should reside in the TIS$BUILD directory to be
$!      used properly.
$!              This command file does not build and link the TIS
$!      utility programs.  The file TIS$BUILD:BUILDUTL.COM is used
$!      to build and link all of the TIS utility programs.
$!              There are commands in this procedure which cannot be
$!      successfully executed if there are VMS users that are executing
$!      any of the TIS programs, particularly the commands to remove
$!      and install global and process images, concurrently with the
$!      execution of this command procedure.
$!
$!      Last edit:  19-NOV-82.
$!      Version:  X001.
$!
$SET DEF TIS$BUILD:
$SET NOVERIFY
Do you want to compile any TIS components?[Y/N]: Y
Do you want to make full listings for all components?[Y/N]: Y
Do you want to make cross reference listings?[Y/N]: Y
Do you want to compile the TISGLOBAL CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E G L O . C O M
$!      Compile and assemble all of the components of the TIS
$!      global data common region (TISGLOBAL).
$!      Last edit:  09-SEP-82.
$!
$SET DEF TIS$SHARED:
$FOR/OBJ/NODEB/CHECK:ALL/LIST/CROSS TIS$GLOBAL:TISGLOBAL
$MAC/OBJ/NODEB/LIST/CROSS TIS$GLOBAL:RTLDATA.DEF
$PURGE TISGLOBAL.*
$PURGE RTLDATA.*
$MAKEND:
$SET NOVERIFY
```

Figure 4-1. Execution of the Command Procedure

```
$!
$!      T I S $ B U I L D : M A K E . C O M
$!      Assemble all of the modules in the TIS Run Time Library
$!      (TISRTL).
$!      Last edit:  21-SEP-82.
$!
$SET DEF TIS$SHARED:
$MAC/OBJ/LIST/CROSS TIS$RTL:TISRTL
$MAC/OBJ/LIST/CROSS TIS$RTL:GETPACKET
$MAC/OBJ/LIST/CROSS TIS$RTL:SENPACKET
$MAC/OBJ/LIST/CROSS TIS$RTL:ERRORLOG
$MAC/OBJ/LIST/CROSS TIS$RTL:SENMESSAG
$MAC/OBJ/LIST/CROSS TIS$RTL:HISTRYLOG
$MAC/OBJ/LIST/CROSS TIS$RTL:SSHANDLER
$MAC/OBJ/LIST/CROSS TIS$RTL:SENDICE
$MAC/OBJ/LIST/CROSS TIS$RTL:JCTPROCS
$MAC/OBJ/LIST/CROSS TIS$RTL:FATPROCS
$MAC/OBJ/LIST/CROSS TIS$RTL:MUFPROCS
$MAC/OBJ/LIST/CROSS TIS$RTL:USTPROCS
$MAC/OBJ/LIST/CROSS TIS$RTL:JIOPROCS
$MAC/OBJ/LIST/CROSS TIS$RTL:PUQPROCS
$MAC/OBJ/LIST/CROSS TIS$RTL:BUILDPARM
$MAC/OBJ/LIST/CROSS TIS$RTL:BOOTINFO
$MAC/OBJ/LIST/CROSS TIS$PARMS:RTLPARMS.PRM
$PURGE TIS$SHARED:*.OBJ
$PURGE TIS$SHARED:*.LIS
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.SHARED]*.LIS;
$MAKEND:
$SET NOVERIFY
Do you want to assemble the JBDRIVER CPC?[Y/N]: Y
$!
$!
$!      T I S $ B U I L D : M A K E D R V . C O M
$!      Assemble the JBDRIVER CPC.
$!      Last edit:  10-SEP-82.
$!
$SET DEF TIS$JBDRIVER:
$MAC/OBJ/LIST/CROSS -
TIS$JBDRIVER:JBDRIVER.MAR+SYS$LIBRARY:LIB.MLB/LIBRARY
$PURGE TIS$JBDRIVER:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the CMDINTRP CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E C M D . C O M
$!      Compile all modules in the TIS CMDINTRP CPC.
$!      Last edit:  17-DEC-82.
$!
$SET DEF TIS$OBJECTS:
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDINTRP.FOR
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSUBS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDBOOT.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDCANCEL.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDCLUP.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDCHOP.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDCREATE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDDETACH.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDDISPLY.FOR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$CMDINTRP:CMDJCLOPN.MAR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDREMOVE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSEND.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSET.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSETQUE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSETPRM.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSHOW.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSHOJOB.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSHOPRM.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSHOQUE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSHOSTS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSHOUSR.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSTART.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSTOP.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDSUBMIT.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDTEST.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$CMDINTRP:CMDUPDATE.FOR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the DATAMANAGER CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D  : M A K E D A T . C O M
$!      Compile all modules in the TIS DATAMANGR CPC.
$!      Last edit:  27-JAN-83.
$!
$SET DEF TIS$OBJECTS:
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$DATAMANGR:PSSCLOSE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$DATAMANGR:PSSDELETE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$DATAMANGR:PSSOPEN.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$DATAMANGR:PSSREAD.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$DATAMANGR:PSSWRITE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$DATAMANGR:RSXSTATUS.FOR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$DATAMANGR:SETUICOPN.MAR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the FILEOPS CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D  : M A K E F I L . C O M
$!      Compile all modules in the TIS FILEOPS CPC.
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
$!
$SET DEF TIS$OBJECTS:
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$FILEOPS:FILEOPS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$FILEOPS:FILOPEN.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$FILEOPS:FILREAD.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$FILEOPS:FILWRITE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$FILEOPS:FILCLODEL.FOR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the ICEHANDLER CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E I C E . C O M
$!      Compile all modules in the TIS ICEHANDLE CPC.
$!      Last edit:  09-SEP-82.
$!
$SET DEF TIS$OBJECTS:
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$ICEHANDLE:ICEHANDLE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$ICEHANDLE:ICEPROCS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$ICEHANDLE:ICEFUNCS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$ICEHANDLE:ICEVAL.FOR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the JOBOPS CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E J O B . C O M
$!      Compile all modules in the TIS JOBOPS CPC.
$!      Last edit:  27-JAN-83.
$!
$SET DEF TIS$OBJECTS:
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$JOBOPS:JOBOPS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$JOBOPS:JOBSTART.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$JOBOPS:JOBREAD.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$JOBOPS:JOBWRITE.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$JOBOPS:JOBPUNCH.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$JOBOPS:JOBTERM.FOR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$JOBOPS:SENDMESS.MAR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$JOBOPS:USEROPEN.MAR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$JOBOPS:BIOOPEN.MAR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$JOBOPS:BIOWRITE.MAR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the SYSINITRM CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E S Y S . C O M
$!      Compile all of the components in the TIS SYSINITRM CPC.
$!      Last edit: 306-JAN-83.
$!
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:SYSINITRM.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:STARTSYS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITFLAGS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITCNTRL.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITSTATS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITDEVNM.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITLOGS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITBOXES.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITGLOB.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITJOBQ.FOR
$MAC/OBJ/DEB:ALL/LIST/CROSS TIS$SYSINITRM:COMPMAGS.MAR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITPUNQ.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:INITPROCS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:CHECKSYS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:HANDLPKT.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:ERRPROC.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:SYSPROC.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:HISPROC.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:TERMSYS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:CHECKPROC.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:ROLLGLOB.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:ASTPROC.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:TIMPROC.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:GETMSG.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$SYSINITRM:MSGALONE.FOR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the TAPEOPS CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E T A P . C O M
$!      Compile all modules in the TIS TAPEOPS CPC.
$!      Last edit:  09-SEP-82.
$!
$SET DEF TIS$OBJECTS:
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$TAPEOPS:TAPEOPS.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$TAPEOPS:TAPMOUNT.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$TAPEOPS:TAPPROCIO.FOR
$FOR/OBJ/DEB:ALL/CHECK:ALL/LIST/CROSS TIS$TAPEOPS:TAPIOCMPL.FOR
$PURGE TIS$OBJECTS:*.*
$MAKEND:
$SET NOVERIFY
Do you want to compile the USERMSGP CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : M A K E U S E . C O M
$!      Compile all modules in the TIS USERMSGP CPC.
$!      Last edit:  09-SEP-82.
$!
$SET DEF TIS$OBJECTS:
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
$PURGE TIS$OBJECTS:*.*
$LNKEND
$SET NOVERIFY
$!
$! Determine if the user wants to link any of the TIS components.
$!
$SET DEF TIS$BUILD:
$SET NOVERIFY
Do you want to link any TIS components?[Y/N]: Y
Do you want to make maps for all components?[Y/N]: Y
Do you want to make link cross reference maps?[Y/N]:: Y
Do you want to link the TISGLOBAL CPC?[Y/N]: Y
!
!       T I S $ B U I L D :  L I N K G L O . C O M
!       Last edit:  09-SEP-82.
!
$SET DEF TIS$SHARED:
$LINK/SHARE/NOSYSLIB/MAP/FULL/CROSS/EXEC:TIS$SHARED:TISGLOBAL.EXE -
TISGLOBAL, RTLDATA, -
TIS$BUILD:TISGLOBAL.OPT/OPT
UNIVERSAL=TIS_PIDNUM
UNIVERSAL=ICEPID,JOBPID,FILPID,TAPPID,USEPID,SYSPID
UNIVERSAL=TIS_MAILNUM
UNIVERSAL=ERROR_SEQ_NR,ERROR_PC_VALUE
UNIVERSAL=HISTORY_SEQ_NR,HISTORY_PC_VALUE
UNIVERSAL=LCKSEQ
UNIVERSAL=JIQLCK,PUQLCK,JCTLCK,FATLCK,MUFLCK,USTLCK
UNIVERSAL=JOB_QUEUE_LOCK,PUN_QUEUE_LOCK
UNIVERSAL=JIQ,JCT,FAT,TAT,PUQ,PSSMUFD_FILE,PSSMUFD_LOC,UST
UNIVERSAL=JIQ_COUNT,JIQ_HOLD
UNIVERSAL=PUQ_COUNT,PUQ_HOLD
UNIVERSAL=JIQ_LIST,PUQ_LIST
UNIVERSAL=OP_CONSOLE
UNIVERSAL=JOB_MSG_TABLE
UNIVERSAL=CLASS_LIST,GYK_STATE
UNIVERSAL=PSS_JOBNR
UNIVERSAL=BOOTFILE_ZER,BOOTFILE_ONE
$PURGE TIS$SHARED:*.*
$LNKEND:
$SET NOVERIFY
Do you want to link the TISRTL CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K R T L . C O M
$!      Last edit: 21-SEP-82.
$!      Link all of the modules in the TIS Run Time Library.
$!
$SET DEF TIS$SHARED:
$LINK/SHARE/MAP/FULL/CROSS/EXEC:TIS$SHARED:TISRTL.EXE -
TISRTL, GETPACKET, SENPACKET, ERRORLOG, HISTRYLOG, SENMESSAG, -
SSHANDLER, SENDICE, JCTPROCS, FATPROCS, MUFPROCS, USTPROCS, JIQPROCS, -
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
TIS$BUILD:TISRTL-OPT/OPT
_$SH  ../MSR  .HAR  .COP  G$SH  :TI  BAL  RE:I  .PY
UNIVERSAL=GET_PACKET
UNIVERSAL=SEND_PACKET
UNIVERSAL=ERROR_LOG
UNIVERSAL=SEND_USER_MSG
UNIVERSAL=HISTORY_LOG
UNIVERSAL=SS_HANDLER
UNIVERSAL=TIS_SENDICE
UNIVERSAL=GET_JCT_ENTRY,READ_JCT,WRITE_JCT,RELEASE_JCT_ENTRY
UNIVERSAL=GET_JCT_ADDR
UNIVERSAL=GET_FAT_ENTRY,READ_FAT,WRITE_FAT,RELEASE_FAT_ENTRY
UNIVERSAL=GET_FAT_ADDR,FIND_FAT_ENTRY
UNIVERSAL=BUILD_LOG_PARMS
UNIVERSAL=BOOT_INFO
UNIVERSAL=GET_MUF_ENTRY,READ_MUF,WRITE_MUF,RELEASE_MUF_ENTRY
UNIVERSAL=TRANSLATE_MUF,FIND_MUF_ENTRY,GET_FREE_MUF_ENTRY
UNIVERSAL=DELETE_MUF_ENTRY
UNIVERSAL=GET_UST_ENTRY,READ_UST,WRITE_UST,DELETE_UST_ENTRY
UNIVERSAL=RELEASE_UST_ENTRY,GET_UST_ADDR,GET_FREE_UST_ENTRY
UNIVERSAL=FIND_UST_ENTRY
UNIVERSAL=GET_JIQ,GET_JIQ_ENTRY,READ_JIQ_ENTRY
UNIVERSAL=WRITE_JIQ_ENTRY,GET_JIQ_ADDR,DELETE_JIQ_ENTRY,DEQUEUE_JIQ
UNIVERSAL=ENQUEUE_JIQ,RELEASE_JIQ,RELEASE_JIQ_ENTRY,CHECK_JIQ_ENTRY
UNIVERSAL=GET_FREE_JIQ_ENTRY
UNIVERSAL=GET_PUQ,GET_PUQ_ENTRY,READ_PUQ_ENTRY,WRITE_PUQ_ENTRY
UNIVERSAL=GET_PUQ_ADDR,DELETE_PUQ_ENTRY,DEQUEUE_PUQ,ENQUEUE_PUQ
UNIVERSAL=RELEASE_PUQ,RELEASE_PUQ_ENTRY,CHECK_PUQ_ENTRY
UNIVERSAL=GET_FREE_PUQ_ENTRY
$PURGE TIS$SHARED:*.*
$LNKEND:
$SET NOVERIFY
Do you want to install the TIS global areas?[Y/N]: Y
TIS command interface program successfully removed.
TIS System Initiator/Terminator program successfully removed.
TIS global areas successfully removed.
$!
$!      T I S $ B U I L D : D E L G L O B A L . C O M ; 1
$!      Delete TIS global data area and run time library
$!      from the SYS$SHARE device and directory.
$!      Last edit:  02-AUG-82.
$!
$!
$! Delete TISGLOBAL and TISRTL.
$!
$SET PROT:(SY:RWED,OW:RWED,GR:RWED,WO:RWED) SYS$SHARE:TISGLOBAL.EXE;*
$ON SEVERE_ERROR THEN $CONTINUE
$SET PROT:(SY:RWED,OW:RWED,GR:RWED,WO:RWED) SYS$SHARE:TISRTL.EXE;*
$ON SEVERE_ERROR THEN $CONTINUE
$DELETE/NOCONFIRM SYS$SHARE:TISGLOBAL.EXE;*
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
$DELETE/NOCONFIRM SYS$SHARE:TISRTL.EXE;*
    SET   ERR    HEN    NTI
$SET NOVERIFY
$!
$!      T I S $ B U I L D : C O P G L O B A L . C O M ; 1
$!      Copy TIS global data area and run time library
$!      to the SYS$SHARE device and directory.
$!      Last edit:  09-SEP-82.
$!
$!
$! Copy TISGLOBAL and TISRTL.
$!
$COP TIS$SHARED:TISGLOBAL.EXE SYS$SHARE:TISGLOBAL.EXE
$COP TIS$SHARED:TISRTL.EXE SYS$SHARE:TISRTL.EXE
$!
$! Set protection on global image files.
$!
$SET PROT:(SY:RWE,OW:RWE,GR:RWE,WO:RWE) SYS$SHARE:TISGLOBAL.EXE
$SET PROT:(SY:R,OW:R,GR:R,WO:R) SYS$SHARE:TISRTL.EXE
$SET FILE/OWNER_UIC=PARENT SYS$SHARE:TISGLOBAL.EXE;*
$SET FILE/OWNER_UIC=PARENT SYS$SHARE:TISRTL.EXE;*
$SET NOVERIFY
TIS global areas successfully installed.
TIS command interface program successfully installed.
TIS System Initiator/Terminator program successfully installed.
Do you want to link the JBDRIVER CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K D R V . C O M
$!      Create JBDRIVER image.
$!      Last edit:  10-SEP-82.
$!
$LINK/NOTRACE/NODEBUG/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:JBDRIVER.EXE -
TIS$JBDRIVER:JBDRIVER, -
SYS$SYSTEM:SYS.STB/SEL, -
TIS$JBDRIVER:JBDRIVER.OPT/OPT
BASE = 0
%LINK-W-USRTFR, image DRA0:[TISEXE]JBDRIVER.EXE;4 has no user transfer address
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
Do you want to link the CMDINTRP CPC?[Y/N]: Y
TIS command interface program successfully removed.
$!
$!      T I S $ B U I L D : L I N K C M D . C O M
$!      Link all of the components in the CMDINTRP CPC.
$!      Last edit:  17-DEC-82.
$!
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:CMDINTRP.EXE -
CMDINTRP, CHECKUSER, CMDSUBS, CMDATTACH, CMDBOOT, CMDCANCEL, CMDCLUP, -
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
CMDSENP, CMDSET, CMDSETPRM, CMDSETQUE, CMDSHOW, CMDSHOJOB, CMDSHOPRM, -
CMDSHOQUE, CMDSHOUSR, CMDSTA..., CMDSTOP, CMDSUBJSTS, CMDSU...., -
CMDTEST, CMDUPDATE, -
TIS$SHARED:RTLPARMS, -
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
$PURGE TIS$OBJECTS:*.*
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
TIS command interface program successfully installed.
Do you want to link the FILEOPS CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K F I L . C O M ; 1
$!      Link all of the components in the FILEOPS CPC.
$!      Last edit:  27-JAN-83.
$!
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:FILEOPS.EXE -
FILEOPS, FILOPEN, FILREAD, FILWRITE, FILCLODEL, PSSOPEN, PSSWRITE, -
PSSREAD, PSSCLOSE, PSSDELETE, RSXSTATUS, SETUICOPN, -
TISDUMP,-
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
$PURGE TIS$OBJECTS:*.*
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
Do you want to link the ICEHANDLER CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K I C E . C O M
$!      Link all of the components in the ICEHANDLE CPC.
$!      Last edit:  10-SEP-82.
$!
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:ICEHANDLE.EXE -
ICEHANDLE, ICEPROCS, ICEFUNCS, ICEVAL, -
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
$PURGE TIS$OBJECTS:*.*
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
Do you want to link the JOBOPS CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K J O B . C O M ; 1
$!      Link all of the components in the JOBOPS CPC.
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:JOBOPS.EXE -
JOBOPS, JOBSTART, JOBREAD, JOBWRITE, JOBPUNCH, JOBTERM, -
SENDMESS, USEROPEN, BIOOPEN, BIOWRITE, -
RSXSTATUS, -
TISDUMP,-
TIS$SHARED:RTLPARMS, -
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
$PURGE TIS$OBJECTS:*.*
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
Do you want to link the SYSINITRM CPC?[Y/N]: Y
TIS System Initiator/Terminator program successfully removed.
$!
$!      T I S $ B U I L D : L I N K S Y S . C O M
$!      Link all of the components in the SYSINITRM CPC.
$!      Last edit:  26-JAN-83.
$!
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:SYSINITRM.EXE -
SYSINITRM, STARTSYS, CHECKSYS, HANDLPKT, ERRPROC, SYSPROC, -
HISPROC, DYNPARMS, INITFLAGS, INITCNTRL, INITSTATS, INITDEVNM, -
INITLOGS, INITBOXES, INITGLOB, INITJOBQ, COMPMAGS, INITPUNQ, -
INITPROCS, ROLLGLOB, TERMSYS, CHECKPROC, -
TIMPROC, ASTPROC, GETMSG, MSGALONE, -
TIS$SHARED:RTLPARMS,-
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
$PURGE TIS$OBJECTS:*.*
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
TIS System Initiator/Terminator program successfully installed.
Do you want to link the TAPEOPS CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K T A P . C O M ; 1
$!      Link all of the components in the TAPEOPS CPC.
$!      Last edit:  09-SEP-82.
$!
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:TAPEOPS.EXE -
TAPEOPS, TAPMOUNT, TAPPROCIO, TAPIOCMPL, -
TIS$SHARED:RTLPARMS,-
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
```

Figure 4-1. Execution of the Command Procedure (Continued)

```
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
Do you want to link the USERMSGP CPC?[Y/N]: Y
$!
$!      T I S $ B U I L D : L I N K U S E . C O M
$!      Link all of the components in the USERMSGP CPC.
$!      Last edit:  09-SEP-82.
$!
$SET DEF TIS$OBJECTS:
$LINK/MAP/FULL/CROSS/EXEC:TIS$SYSTEM:USERMSGP.EXE -
USERMSGP, -
TIS$BUILD:GETGLOBAL.OPT/OPT
SYS$SHARE:TISRTL/SHARE:NOCOPY
$PURGE TIS$OBJECTS:*.*
%PURGE-I-NOFILPURG, no files purged for DRA1:[TIS.OBJECTS]*.*;
$PURGE TIS$SYSTEM:*.*
$LNKEND:
$SET NOVERIFY
$
```


Figure 4-1. Execution of the Command Procedure (Continued)

this procedure will deassign the logical name and initialize and start the queue SYS$PRINT.

4.3 TIS BACKUP

To backup all TIS and SPS files onto magnetic tape, the command procedure [TIS]BACKUP.COM is executed by entering the VMS commands:

```
SET DEF [TIS]
@ BACKUP
```

The procedure queries the user as to whether or not to mount the magnetic tape. If "Y" is entered the tape device is initialized and mounted. Using the VMS Backup Utility, the procedure backs up the [TIS] directory and all subdirectories, the [SPS] directory and all subdirectories, and the TISSYSTEM directory. The user can select a listing of the SAVESET. The procedure also updates the backup message displayed at login. It requires the SETPRV privilege to do this.

5. TIS UTILITY PROGRAMS

This section provides instructions on the use of the standalone TIS Utility Programs. These programs are:

1. The Articulated Dump program (ADUMP), which displays, in articulated format, the TIS Global Area.

2. The disk purge program (DISKPURGE), which declassifies disk packs that contain national security information up to the SECRET level.

3. The Tape Utility Program (TAPEUTIL), which provides magnetic tape manipulation and labeling functions.

4. The SSIM Test Program (SSIMTEST), which tests the SSIM, the DR11-B in test mode, and some JBDRIVER function.

5. The TIS Message Generation Program (TISMSGGEN), which creates the TIS message file.

5.1 ADUMP

The ADUMP program is run by entering the symbol ADUMP, which is defined to be:

```
ADUMP==:RUN TIS$UTILITIES:ADUMP
```

The ADUMP writes its output to the logical unit FOR006. Since the ADUMP program accesses the TIS global area, it must be relinked whenever a change is made to the global area. The program can be exited with CNTRL Y. Figure 5-1 is an example of the ADUMP output.

5.2 DISKPURGE

The disk purge program requires that the disk volume to be purged be mounted foreign. Enter the VMS command:

```
 RUN ADUMP
 ADUMP  "RUN TIS$UTILITIES:ADUMP"
 ADUMP
 ICEHANDLE VMS Process Identification (PID):        0
 ADEOPS VMS PID:          0           FILEOPS VMS PID:        0
 SAFEOPS VMS PID:          0          USERMSGP VMS PID:        0
                                      SYSINITRM VMS PID:        0
 ON_STATE SSIM online/offline flags:     0     0
 AUTO_TEST flag for system zero is     0
 AUTO_TEST flag for system one is     0
 LINK_INTERVAL VMS format time is         0         0
 ICE_INTERVAL VMS format time is         0         0
 MANUAL_TEST flag for system zero is     0
 MANUAL_TEST flag for system one is     0
 Delta time between TIS initiated Test ICE packets --
 System  0 is 17-NOV-1858 00:00:00.00
 System  1 is 17-NOV-1858 00:00:00.00
 Delta time within which PSS must respond to Test ICE packets --
 System  0 is 17-NOV-1858 00:00:00.00
 System  1 is 17-NOV-1858 00:00:00.00
 ICEHANDLE initialization status        0
 ADEOPS initialization status        0
 FILEOPS initialization status        0
 SAFEOPS initialization status        0
 USERMSGP initialization status        0
 SYSINITRM initialization status        0
 KEY_ZER length of SSIM zero pseudo-name:      0
 KEY_ONE length of SSIM one pseudo-name:      0
 Data for SSIM device unit zero --
 Class:        0 Independent chars:        0
 Dependent chars (primary):        0 Dependent chars (secondary):        0
 Default buffer size:        0
 Operations count:           0 Error count:          0
 Reference count:        0
 VMS device data for SSIM unit one --
 Class:        0 Independent chars:        0
 Dependent chars (primary):        0 Dependent chars (secondary):        0
 Default buffer size:        0
 Operations count:           0 Error count:          0
 Reference count:        0
 Bootstrap filename for SSIM zero is all zeros.
 Bootstrap filename for SSIM one is all zeros.
 Error log open flag:      0 Number of errors logged:      0
 Error log open status:      0      0
 History log open flag:      0 Number of history events logged:      0
 History log open status:      0      0
 Mail packet sequence counters --
 T-ERI  LE...  ...ORG...  0 R...OPL...
```

Figure 5-1. ADUMP Output

```
                0 JOBOPS:       0 FILEOPS:      0
 0 USERMSGF:     0 SYSINITRM:      0
 Virtual address of errors logged (PC value) --
 CHANNEL_ERRPC:        0 JOBOPS_ERRPC:        0 FILEOPS_ERRPC:        0
 USERMSGF_ERRPC:        0 SYSINITRM_ERRPC:        0
 Internal sequence number used in History Log --
 CHANNEL:      0 JOBOPS:       0 FILEOPS:      0
 USERMSGF:      0 SYSINITRM:      0
 Virtual address of events logged (PC value) --
 CHANNEL_HISPC:        0 JOBOPS_HISPC:        0 FILEOPS_HISPC:        0
 USERMSGF_HISPC:        0 SYSINITRM_HISPC:        0
 Error log enable flag:    0
 History log enable flag:    0
 SYSINITRM CPC command flags --
 START command:     0 Warm start:     0 Cold start:     0 STOP command:     0
 CLUP system zero:     0 CLUP system one:     0
 CHOP system zero:     0 CHOP system one:     0
 BOOT system zero:     0 BOOT system one:     0
 SYSINITRM SSIM zero bootstrap status flags --
 Bootstrap in progress for SSIM zero:    0
 Bootstrap file open for SSIM zero:    0
 Bootstrap has reached end of file:    0
 Current record number in boot file:            0
 Count of Read System File Packets processed:            0
 SYSINITRM SSIM one bootstrap status flags --
 Bootstrap in progress for SSIM one:    0
 Bootstrap file open for SSIM one:    0
 Bootstrap has reached end of file:    0
 Current record number in boot file:            0
 Count of Read System File Packets processed:            0
 Current VAX-11 RMS file status for bootstrap:            0
 I/O queue I/O completion status:        0
 I/O transfer length:            0
 SYSINITRM CPC ***command in progress*** flags --
 START command:     0 STOP command:     0
 CLUP system zero:     0 CLUP system one:     0
 CHOP system zero:     0 CHOP system one:     0
 BOOT system zero:     0 BOOT system one:     0
 CHANNEL CPC status data --
 SSIM unit number:     0 SSIM zero channel nr:     0 SSIM one channel nr:     0
 SSIM zero ICS ICE channel nr:     0
 SSIM one ICS ICE channel nr:     0
 SSIM zero ICE I/O status:         0         0
 SSIM one ICE I/O status:         0         0
 Time ICI received for SSIM zero: 0.00000000E+00
 Time ICI received for SSIM one: 0.00000000E+00
 ICF buffer for SSIM zero
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
 ICF buffer for SSIM one
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

Figure 5-1. ADUMP Output (Continued)

```
Input ICE packet count for SSIM one:          0
Count of errors on input ICE packets for SSIM zero:          0
Count of errors on input ICE packets for SSIM one:          0
Output ICE packet count for SSIM zero:          0
Output ICE packet count for SSIM one:          0
Count of errors on output ICE packets for SSIM zero:          0
Count of errors on output ICE packets for SSIM one:          0
All of the class list array is zero.
All of the queue table array is zero.
M_CONSOLE VMS Master Console name is all zero.
Job Input Queue lock variable is       0
All of the Job Input Queue locks are zero.
All of the JIQ list is zero.
All of the entries in the Job Input Queue are zero.
Job Input Queue Job count is      0
Job Input Queue hold flag is     0
Next available TIS Job number is      0
Count of FSS Jobs active for system zero      0
Count of FSS Jobs active for system one      0
All of the Job Control Table locks are zero.
All of the Job Control Table is zero.
All of the Job Status Table is zero.
All of the File Attributes Table locks are zero.
All of the File Attributes Table is zero.
*****Data for Tape Attributes Table entry          1
infATT FSS Job ident of attached Job
inf_IO_JFI pointer      0 TATSYS FSS number      0
infSLT FSS Job slot number      0
infOPT tape manipulation subcommand      0
infJNR TIS Job number of owning Job      0
infMOU JCT entry nr of mounting FSS Job      0
infVOL FSS volume serial number      0
infDEV TAPEOPS channel number for drive      0
infLUN FSS logical unit number for drive      0
infNAM VMS device name of tape drive
infNAM in Z-bytes is as follows --
     0    0    0    0    0    0    0    0
     0    0    0    0    0    0    0    0
infREL number of records or files to skip      0
infQNR current FSS I/O queue table number      0
infIOS VMS I/O status block for tape(Z)       0       0
infIOS_SSIM SSIM I/O status block for tape(Z)       0       0
infBAD current I/O buffer address      0
infBSZ I/O buffer length in bytes(Z)      0
infSTA_FLAGS entry status flags(Z)      0
*****Data for Tape Attributes Table entry          2
infATT FSS Job ident of attached Job
inf_IO_JFI pointer      0 TATSYS FSS number      0
inf_FSS Job slot number      0
```

Figure 5-1. ADUMP Output (Continued)

```
[illegible] JCT entry nr of mounting PSS job      0
[illegible] PSS volume serial number      0
[illegible] TAPEOFS channel number for drive      0
[illegible] PSS logical unit number for drive      0
[illegible] VMS device name of tape drive
[illegible] in 2 bytes is as follows --
    0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0
[illegible] number of records or files to skip      0
[illegible] current PSS I/O queue table number      0
[illegible] VMS I/O status block for tape(2)          0          0
[illegible] SSIM SSIM I/O status block for tape(2)          0          0
[illegible] current I/O buffer address          0
[illegible] I/O buffer length in bytes(2)      0
[illegible] entry status flags(2)      0
[illegible] for Tape Attributes Table entry          3
[illegible] PSS job ident of attached job
[illegible] pointer      0 TATSYS PSS number      0
[illegible] PSS job slot number      0
[illegible] tape manipulation subcommand      0
[illegible] TTS job number of owning job      0
[illegible] JCT entry nr of mounting PSS job      0
[illegible] PSS volume serial number      0
[illegible] TAPEOFS channel number for drive      0
[illegible] PSS logical unit number for drive      0
[illegible] VMS device name of tape drive
[illegible] in 2 bytes is as follows --
    0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0
[illegible] number of records or files to skip      0
[illegible] current PSS I/O queue table number      0
[illegible] VMS I/O status block for tape(2)          0          0
[illegible] SSIM SSIM I/O status block for tape(2)          0          0
[illegible] current I/O buffer address          0
[illegible] I/O buffer length in bytes(2)      0
[illegible] entry status flags(2)      0
[illegible] for Tape Attributes Table entry          4
[illegible] PSS job ident of attached job
[illegible] pointer      0 TATSYS PSS number      0
[illegible] PSS job slot number      0
[illegible] tape manipulation subcommand      0
[illegible] TTS job number of owning job      0
[illegible] JCT entry nr of mounting PSS job      0
[illegible] PSS volume serial number      0
[illegible] TAPEOFS channel number for drive      0
[illegible] PSS logical unit number for drive      0
[illegible] VMS device name of tape drive
[illegible] in 2 bytes is as follows --
    0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0
```

Figure 5-1. ADUMP Output (Continued)

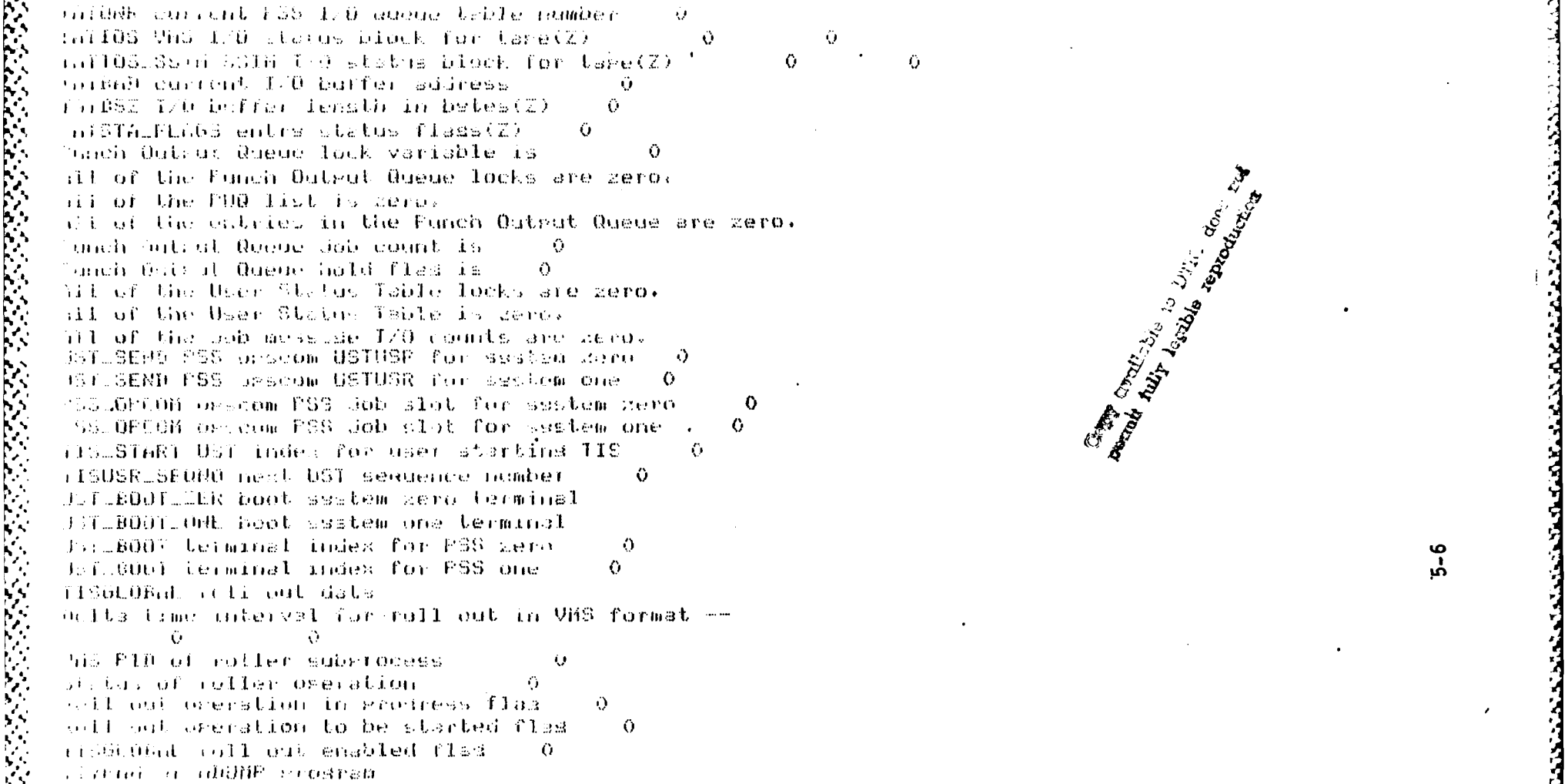

Figure 5-1. ADUMP Output (Continued)

MOUNT/FOREIGN device-name label

to mount the disk foreign. To run the program enter the VMS commands:

```
SET DEFAULT TIS$UTILITIES
RUN DISKPURGE
```

The program will respond with the query:

Enter the VMS device name to be purged.

Enter the disk device to be purged such as DRC0:

As an added precaution the program will respond with:

```
VMS device name is:  DRC0
Do you want to continue [Y/N]?
```

Enter "Y" to continue. The program will then execute a $GETDUI system source to check the device type. The device types supported are: RM03, RM05, RP06, RP07, and RK07. The program will display the device type with the message:

Device type is a RM0J.

The program then overwrites the entire disk a track at a time. Once with a track number and three times with a random number. If a data check or parity error is encountered the message:

Data check error. Cylinder track sector will be displayed.

If any other QIO system service error is returned during the write, the message:

Non data check I/O error. Status is ZZZZ where ZZZZ is the VMS system service status code.

When the purge is complete the message:

DISKPURGE complete is displayed.

5.3 TAPEUTIL

The Tape Utility program requires the tape to be mounted foreign. Enter the VMS command:

```
Mount/foreign device-name label
```

To run the Tape Utility program enter the following commands:

```
SET DEFAULT TIS$UTILITIES
RUN TAPEUTIL
```

The program will respond with a menu of functions:

```
Tape Utility functions are:
1.  Scratch the Tape.
2.  Write Tape Mark.
3.  Rewind.
4.  Rewind and unload.
5.  Label type (ASCII).
6.  Label type (EBCIDIC).
7.  Skip records.
8.  Skip files.
9.  Exit.
Enter function (1-9):
```

If function 5 or 6 is selected, the program will ask for the six character label. If function 7 or 8 is selected the program will ask for the number to skip.

All operations are performed with the system service $QIOW. Thus, if an error is encountered, the status code is the standard QIO system service status code defined in the $SSDEF macro. When a function is completed the menu is again displayed until the exit function is chosen or CNTRL 7 is entered.

5.4 SSIMTEST

The SSIMTEST program resides in the TIS$JBDRIVER directory. To run the program, enter the following VMS commands:

```
SET DEFAULT TIS$JBDRIVER:
R SSIMTEST
```

The program responds with:

```
Enter the VMS device name of SSIM to the tested (A):
Enter JBA0: or JBB0:.
```

The program then queries:

```
Allocate SSIM for dedicated use [Y/N]?
```

Enter "Y" if exclusive use of the DR-11B is desired.

The program can test various functions of the device driver, JBDRIVER. These functions are:

1. Set mode QIOs.
2. Sense mode QIOs.
3. Read ICE packet.
4. Declare/remove ICE attention ASTs.
5. Get device/volume information.

To execute a function, answer "Y" to the prompt for that particular function. To test the DR-11B with the test board, execute the set mode to test SSIM with the M968 board.

The SSIMTEST program also tests the downline load function. To downline load the AN/GYK-12, answer "Y" to the query:

```
Do bootstrap image downline load? [Y/N]
```

The program will respond with:

Enter bootstrap image filename:

Enter the filename, such as: TIS$JBDRIVER:SSIMTEST.IMG. The program will read the bootstrap header and display information about the header. If an error is encountered reading the header the FORTRAN I/O status as defined in SYS$LIBRARY:FORIOSDEF is displayed. Select the desired options for the operation and answer "Y" to the query:

Start bootstrap image load? [Y/N]

Follow the normal AN/GYK-12 load procedures. When the SSIMTEST.IMG is loaded, the AN/GYK-12 is ready to read and write data.

The SSIMTEST.IMG program is an LSS program that is set up to receive interrupts on channel 17 and read and write data in 4096 byte blocks. To exercise this program select the number of iterations desired. The SSIMTEST program will then query for the operations to be performed. Select write and read. Also the user can specify the data pattern and have the VAX perform data reliability checks. Select the interrupt channel to be channel 17 and the block size to be 4096. When the test is started, the VAX will write 4096 bytes to the AN/GYK-12 and then read it back. Any errors detected will be repeated. The status codes are the standard VAX VMS System Service codes defined in $SSDEF. Figure 5-2 is a sample run of SSIMTEST showing the queries and outputs of the program.

5.5 TISMSGGEN

The TIS message generator program converts the sequential message text file TISMESSAG.TXT to the direct access file TISUSRMSG.DAT file. These files and the TISMSGGEN program reside in TIS$UTILITIES:.

```
[illegible]
[illegible] full name of path to be reset [illegible]
[illegible] SSIM for device ed use?[Y/N]:n
[illegible] free-form set mode queue I/O?[Y/N]:n
Execute set mode to put SSIM offline?[Y/N]:
[illegible] set mode status for offline call is          1
First longword of I/O status block:          1
Second longword of I/O status block:          0
Execute set mode to test SSIM with M968 board?[Y/N]:n
Execute set mode to put SSIM online?[Y/N]:
SSIM set mode status for online mode is          1
First longword of I/O status block:          1
Second longword of I/O status block:          0
Declare ICE attention AST?[Y/N]:n
Remove ICE attention AST?[Y/N]:n
Test sense mode queue I/O?[Y/N]:y
Sense mode queue I/O initiation status:          1
First longword of I/O status block:          1
Characteristics longword:    80000
Execute Get Device/Volume Information service?[Y/N]:y
Get Device/Volume Information status:          1
SSIM device name _JBA0:
SSIM device characteristics:2C050000
SSIM device class:     60
SSIM primary characteristics:    80000
SSIM secondary characteristics:        0
SSIM default buffer size:        0
SSIM device operations count:            5
SSIM device error count:           0
SSIM device reference count:            1
Attempt to read an ICE packet?[Y/N]:n
Do you want to hibernate now?[Y/N]:n
Do bootstrap image downline load?[Y/N]:y
Enter bootstrap image filename:tis$system:v042.dat
Cannot open bootstrap image file tis$system:v042.dat
Fortran I/O status      29
Enter bootstrap image filename:dbc0:[tis.\.\exe]v042.dat
Cannot open bootstrap image file dbc0:[tisexe]v042.dat
Fortran I/O status      29
Enter bootstrap image filename:ssimtest.ims
Bootstrap header data successfully read from file.
Length of the bootstrap record in longwords  4135
Length of the bootstrap image in longwords         4128
AN/GYK-12 bootstrap keyword  40C0000
AN/GYK-12 I/O mode for bootstrap            3
Block length extension bits         2
Bootstrap header data
      2F        D0         4         C         0         0         20
```

Figure 5-2. Sample Run of SSIMTEST

```
To the length of the bootstrap record correct?[Y/N]:y
[1] bootstrap image records read from between files
Final Fortran I/O status          0
Number of complete 512 byte records read      22
Number of final record read      33
Bytes used from final record read     136
Do bootstrap load in one SSIM write?[Y/N]:y
Report bootstrap status continuously?[Y/N]:n
Terminate SSIM bootstrap on the first error?[Y/N]:y
Loop on bootstrap image load?[Y/N]:n
Short bootstrap image load?[Y/N]:y
This bootstrap load requires      1 SSIM transfers.
Iteration nr              1 Queue I/O bootstrap status

First longword of device status       1F4
Second longword of device status        0
Execute set mode to put SSIM online?[Y/N]:y
SSIM set mode status for online mode is         1
First longword of I/O status block:        1
Second longword of I/O status block:         0
Declare ICE attention AST?[Y/N]:n
Remove ICE attention AST?[Y/N]:n
Test sense mode queue I/O?[Y/N]:n
Execute Get Device/Volume Information service?[Y/N]:n
Attempt to read an ICE packet?[Y/N]:n
Do you want to hibernate now?[Y/N]:n
Do bootstrap image downline load?[Y/N]:n
Enter number of iterations(I):1
Do SSIM write operations?[Y/N]:y
Use specified bit pattern?[Y/N]:n
Do SSIM read operations?[Y/N]:y
Do data reliability checks?[Y/N]:y
Do ICE operations?[Y/N]:n
Do Write PSS Message operations?[Y/N]:n
Do SSIM reset operations?[Y/N]:n
Enter channel for interrupt -- 16 or 17:17
Inhibit error retries on data transfers?[Y/N]:y
Enter transfer length in bytes(I):4096
Report status continuously?[Y/N]:n
Report status every -n- iterations?[Y/N]:n
Terminate SSIM tests on the first error?[Y/N]:y
Commence SSIM tests?[Y/N]:y
Iteration nr              1 Queue I/O write status         1
First longword of device status       1F4
Second longword of device status        0
Enter number of iterations(I):
```

Figure 5-2. Sample Run of SSIMTEST (Continued)

To run TISMSGGEN enter the following VMS commands:

```
SET DEFAULT TIS$UTILITIES:
RUN TISMSGGEN
```

The program will display the record number and record length in bytes as the output file is being created from the input file. All errors are FORTRAN I/O errors defined in SYS$LIBRARY:FORIOSDEF. When complete the number of records is displayed.

APPENDIX A

REFERENCES

APPENDIX A. REFERENCES

A.1 GOVERNMENT DOCUMENTS

The following documents provide supplementary reference material for the Tactical Interface System Users Manual:

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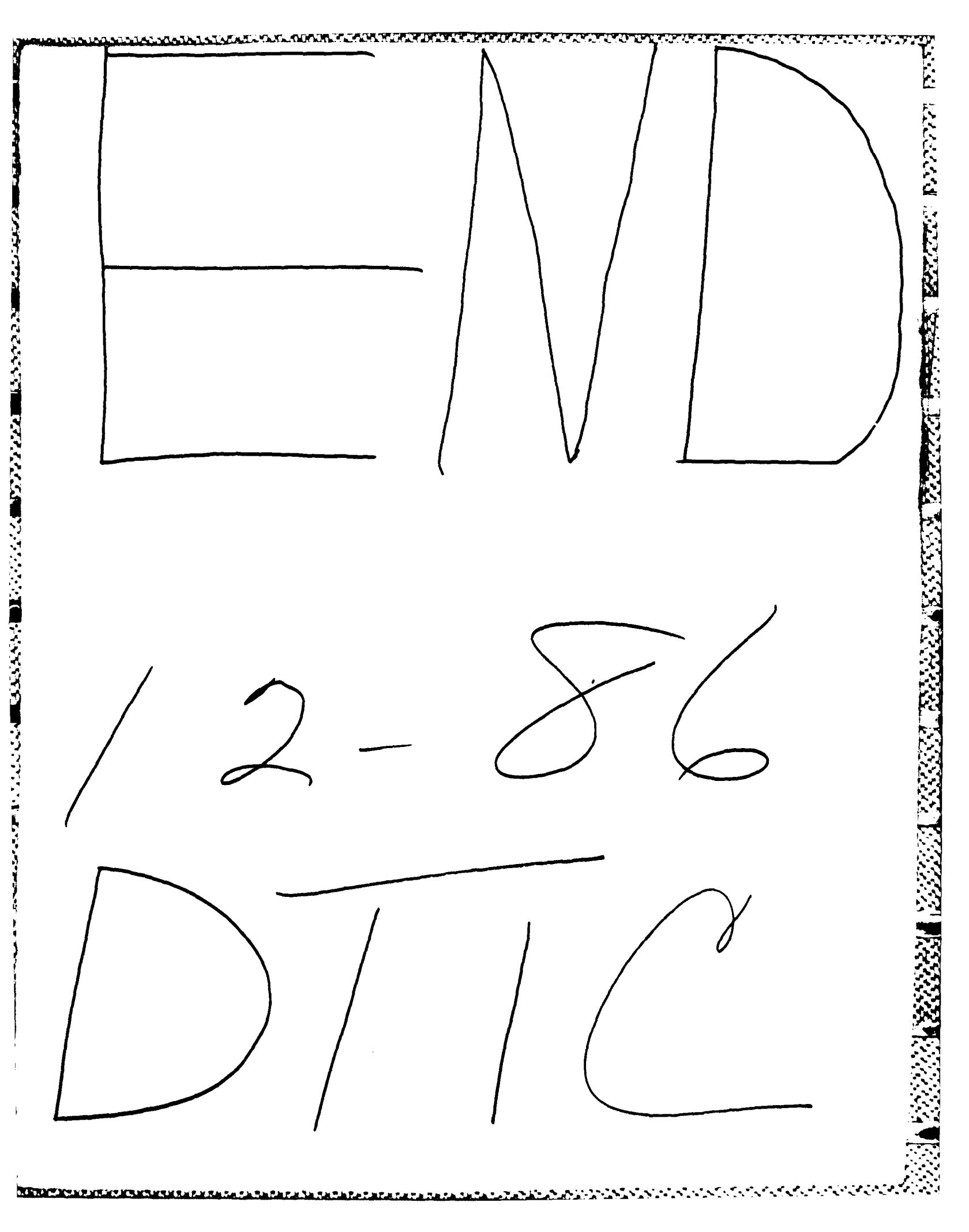
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