

RSTS/E
System Directives Manual

Order Number: AA-EZ10B-TC

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Order Number: AA-EZ10B-TC

This manual contains general information on run-time systems and describes RSTS/E monitor, RSX emulator, and RT11 emulator directives for the assembly-language programmer.

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Software Version: RSTS/E Version 10.0

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Objectives

This manual describes directives to the RSTS/E monitor, the RSX emulator, and the RT11 emulator that you can use in MACRO programs. To use these directives, you should be familiar with the MACRO-11 assembly language. MACRO is the standard assembler for DIGITAL PDP-11 computers and is available under various operating systems for the PDP-11. Note that the syntax is basically the same for all operating systems.

Manual Structure

This manual contains seven chapters and two appendixes:

Chapter 1	Gives an overview of run-time systems and jobs as they relate to the system directives.
Chapter 2	Describes the RSTS/E environment (memory allocation and job space) for the general monitor directives.
Chapter 3	Contains reference material for the general monitor directives that you can use in programs compiled under either the RSX or RT11 run-time systems.
Chapter 4	Describes the RSX environment for the RSX directives.
Chapter 5	Contains reference material for the directives processed by the RSX emulator or the RSX run-time system.
Chapter 6	Describes the RT11 environment for the RT11 directives.
Chapter 7	Contains reference material for the directives processed by the RT11 emulator in the RT11 run-time system.
Appendix A	Lists the RSTS/E errors you can get during directive processing.
Appendix B	Summarizes MODE and RECORD values and other useful information for disks, flexible diskettes, magnetic tape, line printers, terminals, and pseudo keyboards.

Related Documents

For information about the syntax of MACRO assembly language, see the *PDP-11 MACRO-11 Language Reference Manual*.

Where appropriate, this manual references the following manuals from the RSTS/E documentation set:

RSTS/E System Installation and Update Guide
RSTS/E System Manager's Guide
RSTS/E System User's Guide
BASIC-PLUS Language Manual
RSTS/E Programming Manual
RSTS/E Programmer's Utilities Manual
RSTS/E Task Builder Reference Manual

Conventions

This manual uses the following conventions:

- The arrow means points to, or contains the address of, as when the stack pointer register points to the first item in the stack. For example:
 SP→ item at top of stack
 item one word down from top of stack
- () Parentheses mean the contents of the item that the parentheses surround. For example, the contents of the program counter would be represented as:
 (PC)
- [] Brackets around an item indicate that the item is optional. For example:
 QIO\$ param1 [,param2]
- { } Braces around two or more items indicate that you must choose one of the enclosed items. For example:
 { QIO\$
 QIOW\$ }
- <> Angle brackets around two or more items tell the MACRO assembler that the items make up a list. For example:
 GLOBAL<name1[,name2,...]>

Summary of Technical Changes for V10.0

Significant changes to the *RSTS/E System Directives Manual* are:

- Allowable pack cluster sizes now go up to 64. See Appendix B.
- RSTS/E now supports the RA70, RA90, RD31, RD32, RD53, and RD54 disk drives. See Chapter 2.
- RSTS/E now supports online creation and deletion of the virtual disk (device DV0:). See Chapter 3, the section ".UUO—Execute BASIC-PLUS SYS Call," the subsection "UU.RTS."
- RSTS/E now supports Local Area Transport (LAT) for both in-bound and host-initiated connections. See Chapter 3, the section ".MESAG—Message Send/Receive."
- RSTS/E now supports command recall and command line editing. See Chapter 3, the section ".UUO—Execute BASIC-PLUS SYS Call," the subsection "UU.TRM."
- RSTS/E now has a new in-memory structure called the *job header*, used for user logical names and command line editing information. See Chapter 2 and Chapter 3, the sections "FSS—Check File Specification String" and UU.ASS—Allocate/Reallocate a Device, or Assign or List User Logical."
- RSTS/E now supports extended user and system logical names. See Chapter 2 and Chapter 3, the sections "FSS—Check File Specification String" and UU.ASS—Allocate/Reallocate a Device, or Assign or List User Logical."
- You can now use the UU.FIL call to control a file's BACKUP and IGNORE bits. See Chapter 3, the section ".UUO—Execute BASIC-PLUS SYS Call," the subsection "UU.FIL."
- RSTS/E now supports floating resident libraries. See Chapter 3, the section ".UUO—Execute BASIC-PLUS SYS Call," the subsection "UU.RTS."
- You can now use the UU.CFG call to set Answerback messages for electronic messaging services such as TELEX and TWX. See Chapter 3, the section ".UUO – Execute BASIC-PLUS SYS Call," the subsection "UU.CFG."
- RSTS/E now supports the new RSX emulator directives, EXTM\$, FEADF\$, FEAT\$, MSDS\$, SSTX\$, TFEA\$, and the fast-mapping facility. See Chapter 5.

Part I
Introduction

There are two MACRO assemblers available for the run-time systems on RSTS/E: one for RSX and one for RT-11. You will use one of these two run-time systems to assemble and, in most cases, run your programs. In addition to user programs, you can also write or modify run-time systems that run under direct control of the RSTS/E monitor.

This manual describes the three types of system directives available to RSTS/E assembly language programmers:

- General monitor directives
- RSX emulator directives
- RT-11 emulator directives

Before you start using these directives, it is helpful to understand some basic concepts about RSTS/E run-time systems and jobs.

1.1 Run-Time Systems

A run-time system lets you write code that can be shared by many users when it is in memory. In a time-sharing system such as RSTS/E, shareable code is an important consideration.

Run-time systems are normally written as pure (or shareable) code. This means they have only instructions and fixed data, and contain no variable data. Such code saves space, since many jobs can use it. It also saves time since run-time systems are not swapped in and out of memory like user programs. Because the run-time systems contain no variable data, they do not need to be swapped out to disk; they are simply reloaded when they are needed again.

1.1.1 User Environment

The DCL, BASIC-PLUS, RSX, and RT-11 run-time systems all have a keyboard monitor. That is, they can accept, analyze, and act on commands you type at a terminal keyboard. The *RSTS/E System User's Guide* gives an overview of the user environment these run-time systems provide.

1.1.2 Program Environment

Run-time systems also provide an environment for programs. A run-time system may include:

- A loader. This code loads a program from disk into memory and starts its execution.
- An emulator. This code emulates directives handled by Digital's RT-11 operating system for the PDP-11 computer.
- A command interpreter. This code receives command lines from the user and acts on them.

NOTE

The RSX run-time system provides only a user (command) environment. Both the program loader and the emulation functions for the RSX environment are built into the RSTS/E V10.0 monitor.

A run-time system usually takes up space in the 34K-word area called the user job area. Therefore, it limits the size of your program to less than 32K words. The RT-11 run-time system takes 4K words of virtual memory. Since the monitor emulates the RSX directives, programs running under the RSX run-time system do not give up any addressing space. Chapter 2 explains space requirements in greater detail.

Should you program under the RSX or RT-11 run-time system? RSX is usually a better choice because it is in the monitor and it offers easy access to most resident libraries. Your decision depends on:

- Whether you are coding MACRO subroutines for use in a high-level language program
- Which set of program development tools better satisfies your needs
- Whether you want to use resident libraries
- Whether you need separate Instruction and Data Space (I&D Space) support for programs larger than 32K words

1.1.2.1 High-Level Languages

When you write MACRO subroutines for use in high-level language programs, the high-level language dictates which run-time system you must use. BASIC-PLUS-2, COBOL-81, PDP-11 COBOL, DIBOL, and FORTRAN-77 all run under the RSX emulator, while FORTRAN-IV runs under the RT-11 run-time system. You must compile, link, and run all the modules in your program under the same run-time system, whether your program is written in MACRO or in a high-level language.

1.1.2.2 Program Development Tools

As Table 1-1 shows, RSTS/E provides one set of program development tools for the RSX environment and another set for the RT-11 environment.

Table 1-1: RSX and RT-11 Development Tools

Tool	RSX	RT-11
Assembler	MAC	MACRO
Linker	TKB	LINK
Librarian	LBR	LIBR
Patch Utility	PAT	PAT

While the tools for each environment perform similar functions, they differ in their speed and capabilities:

- **Assemblers**—RSTS/E supports two MACRO-11 assemblers, the RSX-based MAC assembler and the RT-11-based MACRO assembler. The two assemblers are nearly identical in function and performance and produce similar output.
- **Linkers**—RSTS/E supports two linkers: the Task Builder (TKB) for RSX-based programs and LINK for RT-11-based programs. While LINK is faster than the Task Builder, the Task Builder is more powerful. It can link much larger and more complex overlay structures (including co-trees) than LINK. Unlike LINK, the Task Builder has options for linking to resident libraries and support for separation of instructions and data.
- **Librarians**—RSTS/E provides LBR for RSX-based programs and LIBR for RT-11-based programs. You can create object and macro libraries with either utility. LBR also lets you create universal libraries, which can contain any type of file, including text files.
- **Object module patch utilities**—RSTS/E provides a PAT utility for each environment. Both let you update code in a relocatable binary object module.

For details on these program development tools, see the:

- *RSTS/E Task Builder Reference Manual*—Describes the Task Builder
- *RSTS/E Programmer's Utilities Manual*—Describes the RSX-based MACRO assembler, librarian, and object module patch utilities
- *RSTS/E RT-11 Utilities Manual*—Describes the RT-11-based MACRO assembler, librarian, linker, and object module patch utilities
- *PDP-11 MACRO-11 Language Reference Manual*—Describes the MACRO-11 relocatable assembler

1.1.2.3 Resident Libraries

When you program under RSX, you can easily use Digital-supplied resident libraries (such as RMS-11 and FMS-11) as well as create your own resident libraries. Also, because of the Task Builder's cluster library feature, many resident libraries can share the same virtual address space in your program.

You can also use resident libraries under the RT-11 emulator, but the coding is more difficult. Unlike RSX, you must use .PLAS directives to map and create address windows inside your task. Coding these directives can be quite complex. The Task Builder, on the other hand, has options that build tables describing your task and the window to map, and automatically includes the code to perform

the necessary .PLAS directives for you. Thus, RSX is a more practical choice than RT-11 if you plan to use resident libraries.

1.1.2.4 Instruction and Data Space

The manipulation of Instruction and Data Space (I&D Space) is an advanced programming technique that effectively doubles the user's virtual address range from 32K words to 64K words. The memory management unit in some PDP-11 processors can relocate data and instruction references with separate base address values. Thus, it is possible to have a user program of 64K words consisting of 32K words of pure instructions or procedure code and 64K words of data—all within a program's virtual address range.

1.1.3 Directives for Each Programming Environment

RSTS/E has three types of directives:

- Monitor ("native" RSTS/E directives)
- RSX emulator
- RT-11 emulator

Monitor directives are processed directly by the RSTS/E monitor (see Chapter 3). You can assemble monitor directives using either the RSX-based or the RT-11-based MACRO assembler, and you can use these directives in both user programs and run-time systems. (When you write a program to run under the RT-11 run-time system, you must precede all monitor directives with a special "prefix EMT"; see Chapter 6 for details.)

The RSX emulator, which is part of the RSTS/E monitor, processes the RSX emulator directives. These directives, which have basically the same form and function as a subset of the RSX-11M-PLUS operating system monitor directives, perform non-file-structured I/O, trap handling, and memory management. You must use the RSX-based MAC assembler to assemble the RSX emulator directives, and you can use them only in a user program that runs under the RSX emulator. Chapters 4 and 5 describe the RSX run-time system environment and emulator directives in detail.

RT-11 emulator directives are processed by the RT-11 emulator, which is in the RT-11 run-time system. These directives provide most of the single-job programmed requests available to MACRO programmers using the RT-11 operating system. The RT-11 run-time system also provides directives for the RSTS/E environment not available under the RT-11 operating system. You must use the RT-11-based MACRO assembler to assemble RT-11 emulator directives; you can use them only in a user program that runs under the RT-11 run-time system. Chapters 6 and 7 describe the RT-11 run-time system environment and emulator directives in detail.

1.1.4 Writing or Modifying a Run-Time System

If you want to modify an existing run-time system or code your own run-time system, you can use either assembler. You may find the RT-11-based programming tools easier to use for this purpose than the RSX-based programming tools, mainly because it is easier to link run-time systems with the LINK program than with the Task Builder. Run-time systems always have a specific address for their top (highest) address. When you use LINK, you can specify the top address the first time you link the run-time system. But when you use the Task Builder, you

have to link your run-time system twice—once to find its size, and again to adjust its top address to the value you want.

Unlike a program, a run-time system can contain monitor directives only, not RSX or RT-11 emulator directives. In addition, you must store the run-time system file (the product of assembling and linking) on the system disk in save image library (SIL) format. To create a SIL file, use:

- [1,2]MAKSIL.TSK—For run-time systems assembled with MAC and linked with the Task Builder
- [1,2]SILUS.SAV—For run-time systems assembled with MACRO and linked with LINK.

1.2 Jobs

Like run-time systems, you can view "jobs" from several angles. To the RSTS/E monitor, a job is a unit of work generally associated with activity at a terminal. For example, suppose that a user types a line at a previously inactive terminal. The monitor creates a job, assigning a job number and allocating internal tables for bookkeeping. The monitor then passes control to a new-user entry point in the default keyboard monitor, DCL.RTS.

The default keyboard monitor has code at this entry point that causes the LOGIN program to be loaded from the system disk and executed. LOGIN analyzes what was typed and performs the normal log-in dialogue. When LOGIN exits for a valid login, control passes to the default keyboard monitor, which waits for further input from the terminal.

The monitor considers running the LOGIN program and the default keyboard monitor, and whatever else occurs at the terminal until the user logs out as the same job. (If the log-in sequence was not valid, LOGIN exits with the job still logged out. The monitor destroys the job and releases the job number.)

As a MACRO programmer, your awareness of the job concept probably focuses on the work space RSTS/E provides for each job, and the fact that the run-time system can take part of this work space. Chapter 2 describes the allocation of work space.

General RSTS/E Environment

This chapter explains how and why one copy of a run-time system, shared by many users, can still take up space in each user's work area. The sections in this chapter and their purposes are:

- **How RSTS/E Allocates Memory: Physical and Virtual Addressing**

This section provides some background on memory accessing in the PDP-11.

- **Job Space: High Segment and Low Segment**

This section explains how RSTS/E uses memory accessing to define a job space for each user to run programs.

- **Important Installation Options**

This section briefly describes resident libraries and the special-case disappearing RSX run-time system.

- **Low-Segment Details: First 512. Bytes of the Low Segment**

This section gives specifics on how the monitor uses the low 512. bytes of virtual address space.

- **High-Segment Details: Pseudovectors**

This section explains how the monitor and the run-time systems use pseudovectors to communicate with each other.

2.1 How RSTS/E Allocates Memory: Physical and Virtual Addressing

All RSTS/E systems use the memory management feature available on PDP-11 computers. This feature extends the addressable memory range of the PDP-11 processor by using hardware registers called Active Page Registers (APRs).

The PDP-11 processor handles 16-bit operand addresses. The PDP-11 is byte-addressable, so the address range is from 0 through $2^{16} - 1$ (65535 decimal, 177777 octal), which equals 64K bytes or 32K words. With the memory management unit, RSTS/E treats a 16-bit address as a relocatable (virtual) address that is combined with information in an APR to form an 18-bit (22-bit, for the PDP-11/23+, 11/44, 11/53, 11/70, 11/73, 11/83, 11/84, 11/93, and 11/94) physical address. On some PDP-11s (11/44, 11/45, 11/50, 11/53, 11/55, 11/70, 11/73, 11/83, 11/84, 11/93, and 11/94), the memory management unit gives you two areas of 32K words each. You can put code (instructions) in one of these areas and data in the other. RSTS/E requires that you write your program using special techniques to take advantage of both of these areas. This capability is

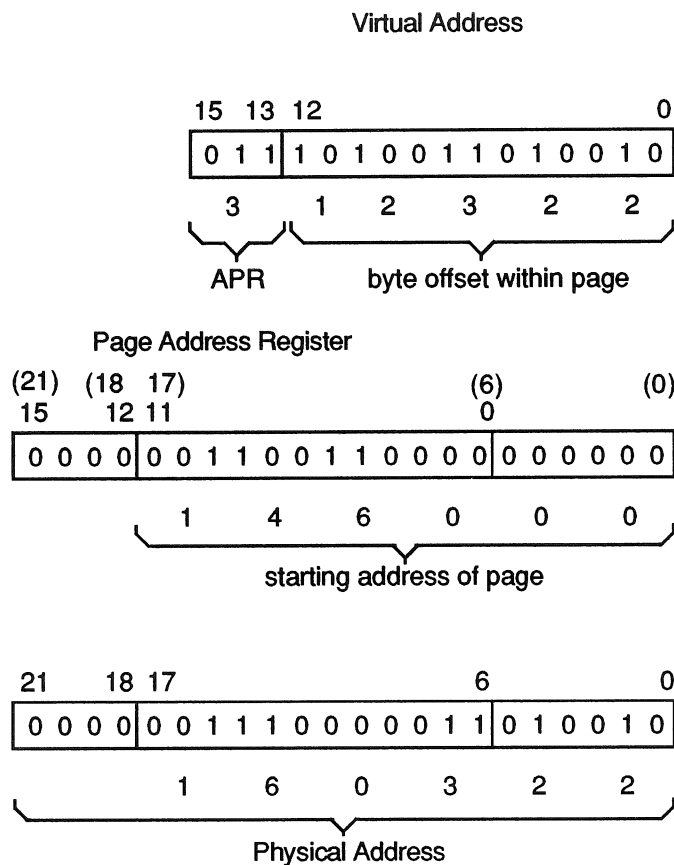
known as Instruction and Data (I&D) Space. You have to use the RSX tools (specifically TKB) to build programs with separate instruction and data sections.

The *PDP-11 Architecture Handbook* explains in detail how the APRs function. Briefly, an APR consists of two 16-bit registers. These registers define a page of contiguous memory. The Page Address Register (PAR) defines the physical memory location where the page begins. The Page Descriptor Register (PDR) defines, among other things, the maximum length of the page and how you can access it (for example, read/write or read-only).

In Figure 2-1, the virtual address of 72322 (octal) identifies APR 3 and byte 12322 (octal) of the page defined by APR 3. The PAR of APR 3 indicates a starting address of 146000 (octal) for the page. The physical address obtained is 146000+012322, or 160322 (octal). The byte offset field in the virtual address is 13 bits long. The maximum size of a page, then, is 2^{13} bytes, or 4096 words. In other words, one APR can map a virtual address range of up to 4K words into an equal extent of physical memory.

Figure 2-1 shows how you can combine a virtual address and a PAR to form a physical address in memory.

Figure 2-1: How a Physical Address Is Formed



The 16-bit virtual address defines which APR the system uses and the byte offset within that page. The system handles the PAR of the indicated APR as though it contains bits 6-17 (6-21 for the PDP-11/23+, 11/24, 11/44, 11/70, 11/73 and 11/84) of an 18-bit (or 22-bit) physical address, defining the start of the page.

The memory management unit on the PDP-11 consists of two sets of APRs; eight in each set on machines without I&D Space, 16 in each set on machines with separate I&D Space. Since each APR can map a 4K segment of virtual memory to physical memory, each set of APRs can provide access to 32K words of physical memory on non-I&D Space machines, or 64K words on machines with I&D Space capability.

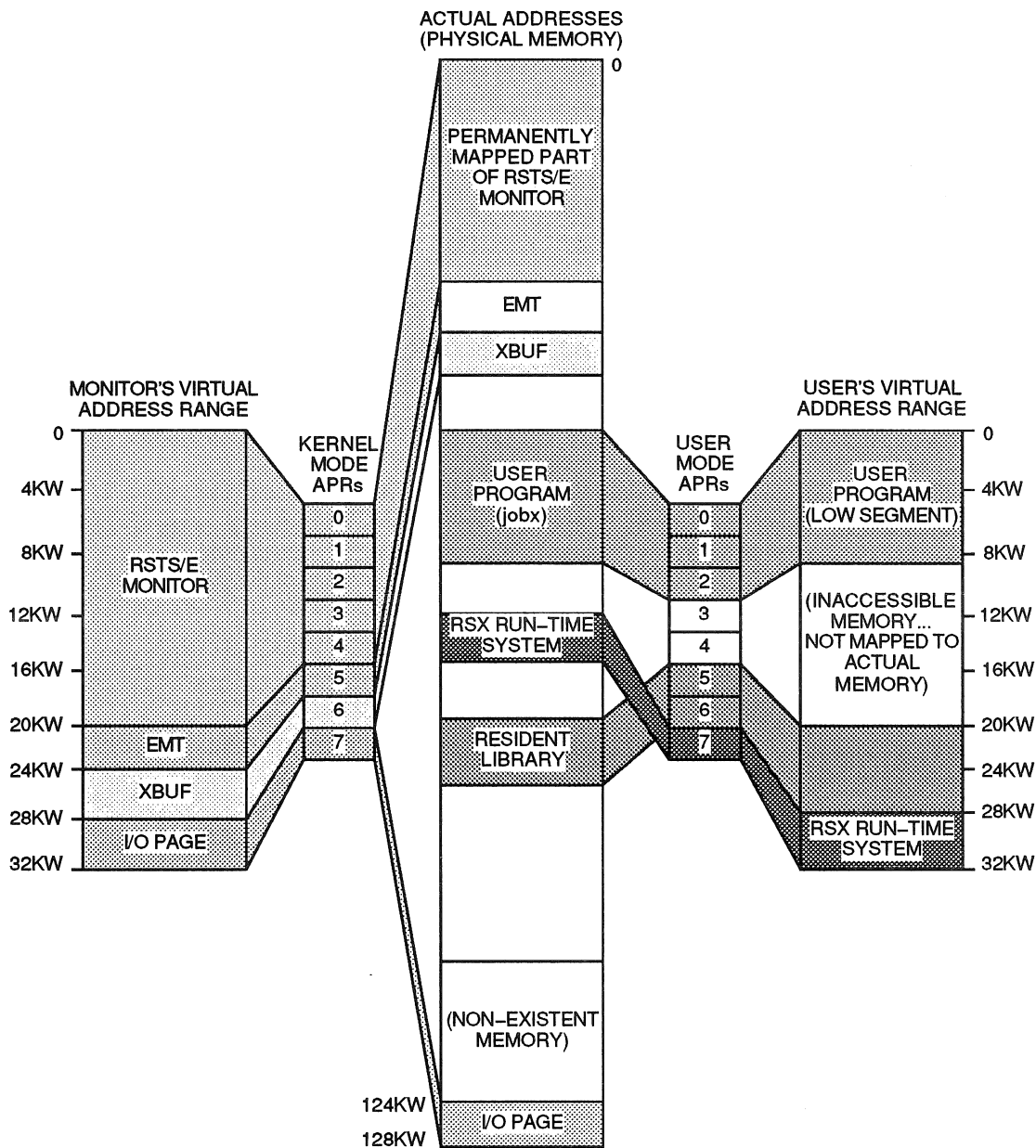
NOTE

The PDP-11/44, 11/45, 11/50, 11/53, 11/55, 11/70, 11/73, 11/83, 11/84, 11/93, and 11/94 have three sets of APRs; the additional set is for supervisor mode mapping. RSTS/E supports supervisor mode only under the RSX run-time system. Using supervisor mode outside the RSX run-time system may cause unpredictable results, including fatal aborts.

The monitor uses one set, called the "kernel mode APRs," to map itself in physical memory. It uses the other set, called the "user mode APRs," to map the job that is active during the current time slice of time-shared processing.

Figure 2-2 shows the concept of mapping with the APRs.

Figure 2-2: Memory Mapping with the APRs



On the PDP 11/44, 11/45, 11/50, 11/53, 11/55, 11/70, 11/73, 11/83, 11/84, 11/93, and 11/94, the RSTS/E monitor can take advantage of a hardware function, called I&D Space. This function lets a program separate its instructions and data into their own virtual address space. On these processors, there are actually two sets of eight APRs for each mode. RSTS/E uses one set to map instructions, and the other set to map data. So, instead of 32K maximum job size, there can be 32K of I-Space and 32K of D-Space.

The monitor may use this type of mapping, depending on the number of small buffers the system manager selects with the INIT option. (The *RSTS/E System Installation and Update Guide* describes INIT.) For example, if the number of

requested small buffers is large enough, the monitor may use D-Space APR 1 to map small buffers and I-Space APR 1 to map common routines.

Figure 2-3 shows a task executing on an I&D-Space system without using separate I&D Space. Note how the I-Space APRs and the D-Space APRs point to the same physical memory.

Figure 2-3: Conventional Task Linked to a Library in an I&D-Space System

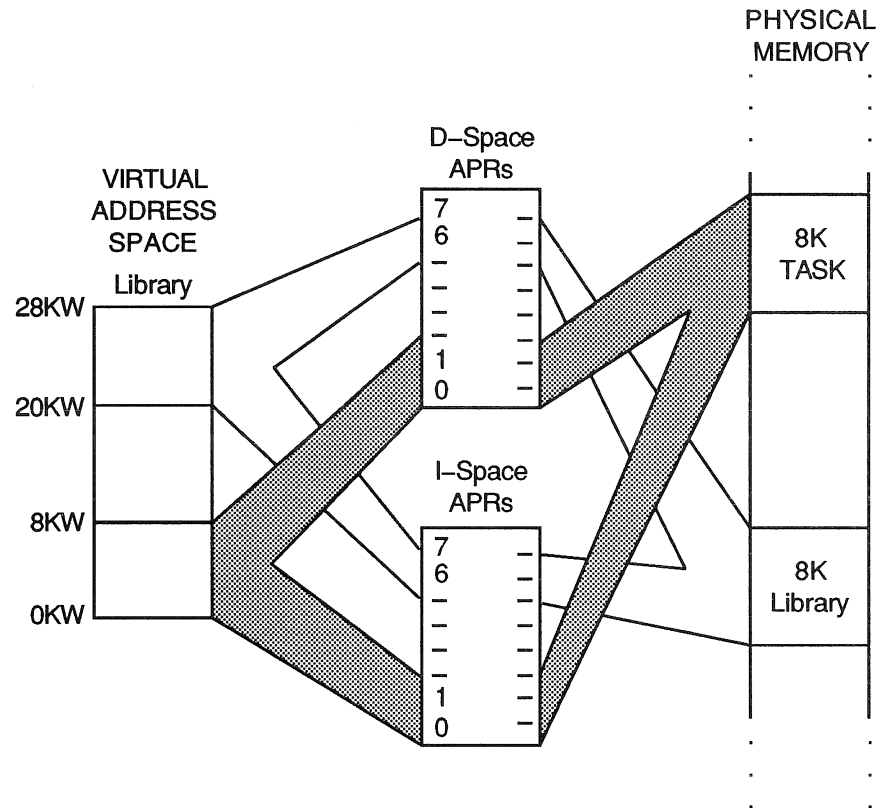
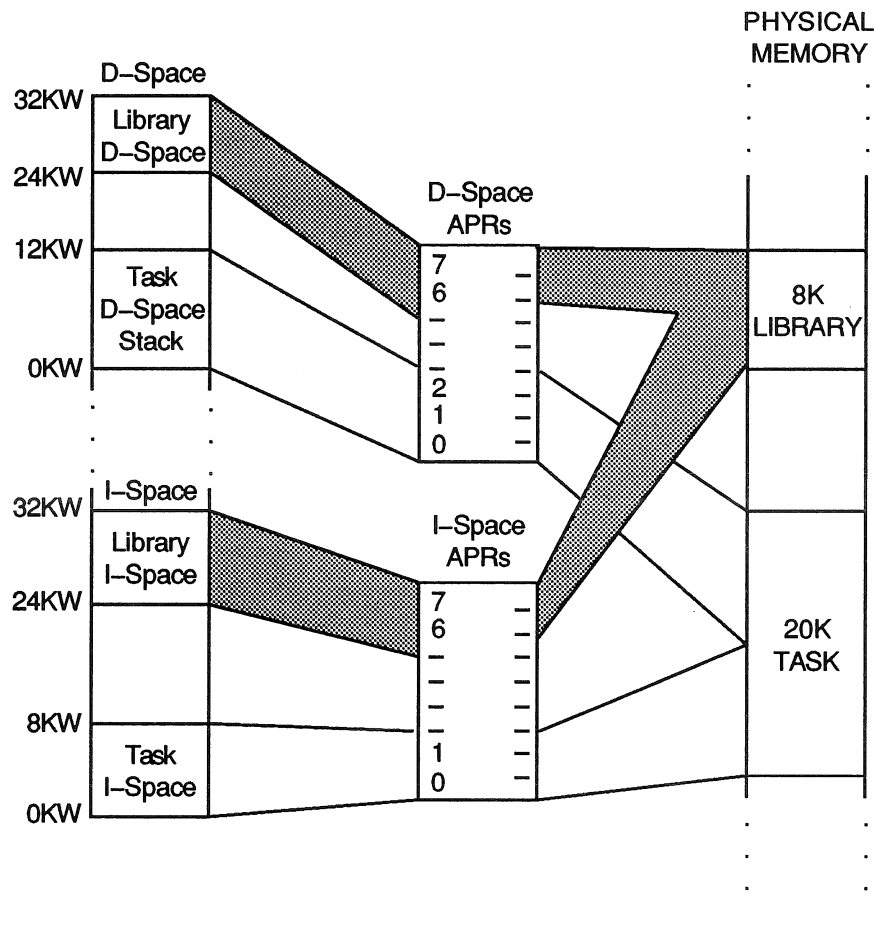


Figure 2-4 shows a task using separate I&D Space. Note how the task's I-Space APRs and D-Space APRs point to different physical memory. User programs can also take advantage of I&D Space to increase their available virtual address space.

Figure 2-4: I&D-Space Task Mapping in an I&D-Space System



2.2 Job Space: High Segment and Low Segment

The RSTS/E monitor is designed to handle work requested by a user through an interface: the run-time system. For example, the BASIC-PLUS, DCL, RSX, and RT-11 run-time systems (available as part of a RSTS/E system) each provide their own keyboard monitor to accept and process user commands. Some of these run-time systems also contain code to handle their own sets of directives, accepting and expanding user program calls to the monitor. For example, the RT-11 run-time system provides I/O calls to the monitor using the monitor requests native to RT-11, which the run-time system translates to the equivalent requests known to RSTS/E, which are handled directly by the monitor.

Thus, the run-time system communicates with both the user program and the monitor. Execution control passes back and forth between these three independent elements; data is passed between them using established ranges of virtual addresses. The monitor must be able to access both the run-time system

and the user job image at any given time. The monitor does this by setting up the run-time system as part of the 32K words accessible through the eight user APRs.

The monitor assigns an area for the run-time system in the high portion of virtual address space, called the high segment. The user job image (that is, the utility program, compiler, assembler, or executable user program that is currently being executed for the job) is in the low portion of virtual address space, called the low segment.

NOTE

If you are using the monitor's RSX emulation, there is no high segment at all.

As part of its housekeeping for each job, the monitor keeps track of:

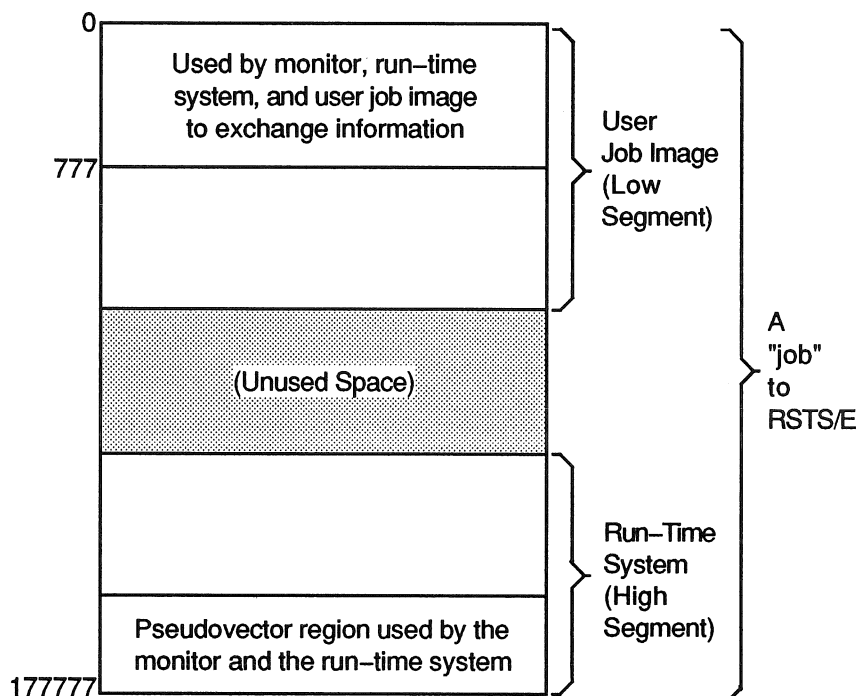
- Where the currently appropriate run-time system is
- Where the user job image is
- What the values were in the program counter register (PC), program status word (PSW), and other job-context information at the end of the last time slice

Before the next time slice for the job, the monitor loads the APRs with the correct values for the job and loads the PC, PSW, and so forth, so execution continues where it left off.

In any case, the high segment or run-time system takes up some multiple of 4K words of virtual address space, due to the APR mapping (see the previous section). For example, the BASIC-PLUS run-time system, can take from 13 to 16K words of physical memory, depending on options selected when the system is installed. Even though the physical memory required may be only 13K words, it still requires four APRs to map this range, leaving four APRs (or a maximum of 16K words) for a user program. The monitor uses certain areas within the high segment and the low segment to get information from the job (defining what work the monitor is to do for it) and to pass information back to the job.

Figure 2-5 shows the job area in virtual addresses. RSTS/E uses the first 512 bytes to pass information between the monitor, the run-time system, and the user job image for certain types of monitor directives. The monitor uses the pseudovector region in high virtual memory to determine, for example, where control is to be passed when a job is initially entered. The run-time system loads this area with entry points and values to define itself to the monitor.

Figure 2-5: Job Area in Virtual Memory



The following subsections give more detail on these areas:

- If you are interested in using the general monitor directives Chapter 3 describes, read the next section in this chapter, "Low-Segment Details: First 512 Bytes of the Low Segment."
- If you want to code your own run-time system or modify one of the existing ones and need to know about the pseudovector region, read the section in this chapter entitled "High-Segment Details: Pseudovectors."
- If you are using only the directives Chapters 5 or Chapter 7 describe, the RSX and RT-11 run-time system directives set up the first 512 bytes of memory for you.

2.2.1 Low-Segment Details: First 512. Bytes of the Low Segment

The monitor attaches special significance to the first 512. bytes of virtual address space in the low segment. The RSX Task Builder and RT-11 Linker automatically allocate this space. These programs always assign relocatable addresses beginning at location 1000 unless you request otherwise. If you want to use the general monitor directives Chapter 3 describes, your program must fill parts of this area with information for the monitor; the monitor passes information back in this area.

Rather than use octal addresses, you can use the COMMON.MAC prefix file, which Chapter 3 describes ("Prefix File COMMON.MAC"), to assign mnemonic names to commonly used addresses and offsets. COMMON.MAC does not allocate space, but rather assigns mnemonic names to areas within the first 512. bytes of virtual address space. Use the mnemonics assigned with COMMON.MAC to make the code more readable and easier to maintain.

Figure 2-6 shows the general regions in this area. Note that a run-time system may use some of the areas differently when it assumes control. For example, the RSX emulator uses the memory labeled default SP stack area as a table of logical units. The Task Builder automatically generates a user stack after the first 512. bytes of virtual address space. The section titled "First 512. Bytes of Low Segment for RSX" in Chapter 4 briefly describes how RSX uses the first 512. bytes.

If you use the general RSTS/E directives, you should reference only the areas that are shown with mnemonics provided by COMMON.MAC. The mnemonics to the right in Figure 2-6 are assigned through COMMON.MAC. A general description of these mnemonics follows Figure 2-6. The general monitor calls in Chapter 3 describe specific formats for the areas the calls use.

Jobs do *not* have access to the job headers as part of the low segment.

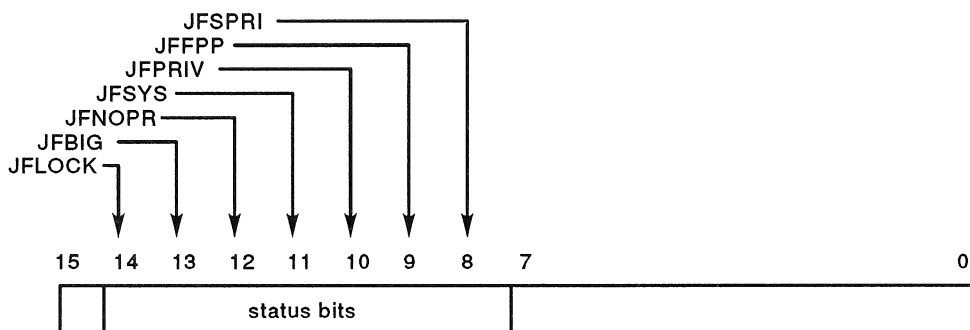
Figure 2-6: First 512. Bytes of Low Segment

controlled solely by job-user job image or run-time system	0
used by monitor for job context information to make job swappable	60
used by monitor for hardware floating-point context information to make job swappable	110
default SP stack area	170
keyword	400 KEY USRSP
file request block	402 FIRQB
transfer request block	442 XRB
core common area	460 CORCMN
controlled solely by job	660
user-assignable project-programmer number	734 USRPPN
user-assignable default protection code	736 USRPRT
old user logical device name table	740 USRLOG
	776

KEY (Keyword)

The keyword defines the job's status in the time-sharing environment; for example, the job's privilege. Bits in the keyword can be set and cleared by the monitor or by the job (either the run-time system or the user job image). The job can manipulate some bits in the keyword with the `.SET` and `.CLEAR` directives.

The keyword is "refreshed" by the monitor at certain points; for example, when a run-time system is entered at `P.RUN`, where the intent is to load and execute a program file in the user job image (`.RUN` directive). For a keyword refresh, the monitor clears bit 15 and bits 7-0 and sets the remaining bits to indicate the job's current status. Only seven bits (8-14) are significant to the monitor. You can use the other bits in whatever manner you want.



The following descriptions apply when the keyword status bit is set to one:

- JFLOCK** The job does not want to be swapped. You can change this bit with `.SET` and `.CLEAR`. When this bit is set, the only normal condition that causes the job to be swapped is when the job asks for a memory size expansion (see `.CORE` directive) and there is not enough room to do the expansion where the job now is in memory.
- JFBIG** The job can exceed its private memory maximum (see `.CORE` directive). This bit is set if the job currently has `EXQTA` privilege, usually because the job is running a privileged program. `JFBIG` is an informational bit that the system updates whenever the `EXQTA` privilege is turned on or off.
- JFNOPR** The job is not yet logged in. `JFNOPR` is an informational bit that the monitor can alter when the job is logged in.
- JFSYS** The job is currently running with temporary privileges. The monitor sets `JFSYS` when a job with insufficient privileges needs to run a privileged program. Once the program is run, the job can regain temporary privilege by setting this bit and can drop privilege temporarily by clearing it.

NOTE

When a job exits from a privileged utility that can be executed by users with insufficient privileges, the monitor clears this bit so another user cannot use the temporary privilege set up for the job.

- JFPRIV** This bit is only for compatibility with `RSTS/E` releases prior to `V9.0`. `JFPRIV` is set if the current job has all of the following privileges: `HWCFG`, `SWCFG`, `SYSIO`, `RDMEM`, and `WWRITE`.

NOTE

Any new software should not reference `JFPRIV`.

- JFFPP** The contents of the hardware floating-point unit (if any) should be part of the context of this job. That is, information in the floating-point registers should be saved and restored along with the rest of the user job image during swapping. Any program that uses the hardware floating-point unit should set this bit. It can be changed with the `.SET` and `.CLEAR` directives.
- JFSPRI** The job is running with a special run priority: 1/2 level higher than normal. This bit can be changed with the `.SET` and `.CLEAR` directives. The monitor clears `JFSPRI` when the program exits.

USRSP (User Space)

`COMMON.MAC` assigns the value 400 to `USRSP`. The monitor automatically loads this value into the stack pointer register (`SP`) when a job is created. `SP` is also reset to this value under certain conditions, effectively establishing a default user stack area for the job beginning at word 376. The user stack area ends at location 170. Any attempt to push the stack past location 170 results in a stack overflow error that is handled by the run-time system (see the description of `P.BAD` later in this chapter).

You can change SP if you want. However, any attempt to reset SP to any location between 0 and 167 causes a stack overflow error. In addition, the monitor resets SP to 400 when a run-time system is entered with a .RUN, .CCL, or .RTS directive, and when certain catastrophic errors occur, such as a fatal disk error while the user job image was being swapped.

NOTE

You need to be aware that the monitor resets SP at these times only if you are coding or modifying a run-time system. The system does not return control to a user program under these conditions, because the program cannot recover.

FIRQB (File Request Block)

The FIRQB is the main communication area between the monitor and the job for monitor directives that involve file or device operations such as open, close, and so forth. Either the run-time system or the user job image can use this area:

- If you use the general monitor directives that Chapter 3 describes, your MACRO program must store values in the FIRQB before issuing some of the directives.
- If you choose to use the directives in the RSX emulator or the RT-11 run-time system, the RSX or RT-11 emulation code intercepts the request, sets up the FIRQB and other relevant areas, then calls the monitor to handle the request.

Figure 2-7 shows the general format of the FIRQB, with all mnemonics that COMMON.MAC assigns. In addition, the size of the FIRQB (32 bytes) has the mnemonic FQBSIZ.

Figure 2-7: General FIRQB Format

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////	0	FIRQB
FQFUN	3	CALFIP/UUO subfnc.	2	FQJOB
FQSIZM	5	MSB of file size	4	FQFIL/ FQERNO
	7	project number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file size	16	FQSIZ
	21	buffer length	20	FQBUFL/ FQNAM2
	23	mode	22	FQMODE
	25	status flags	24	FQFLAG
FQPROT	27	protection code	26	FQPFLG
	31	=0, prot. code real		
	31	device name (2 ASCII characters)	30	FQDEV
	33	=0,unit number real	32	FQDEVN
	33	device unit number		
	35	cluster size	34	FQCLUS
	37	number of entries in directory lookup	36	FQNENT

XRB (Transfer Request Block)

The XRB is the main communication area between the monitor and the user for monitor directives handling file or device I/O. It is also the area in which the monitor stores information requested by straightforward information-request calls. As with the FIRQB, the general monitor directives (see Chapter 3) require that you store and retrieve information directly to and from the XRB. The RSX and RT-11 emulators handle additional directives, which they translate to calls using the XRB (see Chapters 5 and 7). Figure 2-8 shows the general format of the XRB, with all mnemonics that COMMON.MAC assigns. In addition, the size of the XRB (14. bytes) has the mnemonic XRBSIZ.

Figure 2–8: General XRB Format

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	buffer size in bytes	0	XRLEN
	3	number of bytes transferred	2	XRBC
	5	buffer address	4	XRLOC
XRBLKM	7	MSB of block number	6	XRCL
		channel number * 2		
	11	LSB of block number	10	XRBLK
	13	wait time for terminals	12	XRTIME
	15	device modifier	14	XRMOD

A buffer, as defined by XRLOC for its start and (XRLOC+XRLEN)-1 for its last byte, can be either an input buffer or an output buffer. RSTS/E uses input buffers to read data into user memory and output buffers to write data from user memory. These buffers must lie wholly within either the job image (low segment), or the run-time system (high segment), or they must start in a window mapped to some library. Buffers within libraries must lie wholly within the library, but need not be wholly mapped.

For input buffers, the value passed in XRB+XRBC must be zero. For output buffers, the value passed in XRB+XRBC is the number of bytes to be sent and cannot be zero if the value in XRB+XRLEN is nonzero. In addition, input buffers are subject to the following rules:

- If the buffer is in the low segment, the address defined by the contents of XRB+XRLOC must be greater than 170 to avoid destroying the job-context data used in swapping the job.
- If the buffer is in the high segment, it must not fall within the pseudovector region. That is, it must not fall above the location P.OFF. In addition, the run-time system must currently be mapped read/write because the monitor is writing data to the buffer for the receive (see PF.RW bit description in P.FLAG word).
- If the buffer is in a library window, the library must be installed as read/write and must be attached and mapped read/write.

CORCMN (Core Common Area)

The CORCMN is used as a common data exchange area when it is necessary to exchange lengthy data (such as strings) between the monitor and the job or between programs running under the same job number.

For example, the monitor uses CORCMN to pass to the job a string that is the full name of a command that has been recognized as a valid Concise Command Language (CCL) command. The RSTS/E CCL lets users type one-line commands to call utilities that might otherwise require several input lines from the terminal. For example:

CCL Form

```
$ PIP FILE1.=FILE2.
$
```

Regular Form

```
$ RUN $PIP
*FILE1.=FILE2.
*^Z
$
```

To centralize decoding, the monitor analyzes CCL commands by comparing them to those defined by the system manager (usually during system start-up). With the .CCL directive, a job can ask the monitor to analyze a string to see if it is an acceptable command. If it is, the monitor passes control to the run-time system associated with that CCL command and passes the command and any arguments to the job in the CORCMN area.

The general format of the CORCMN area is:

byte 1 of string	number of bytes in string	460 CORCMN
byte 3 of string	byte 2 of string	462
. . . (up to 127. bytes of data)		

USRPPN, USRPRT, USRLOG and the Extended Logical Area

These bytes are set up using the .ULOG directive to store the assigned project-programmer number (USRPPN), default protection code (USRPRRT), and assigned logical device names (USRLOG or the extended logical area of the job header), which the monitor then uses when an .FSS directive is executed. The .FSS directive causes the monitor to convert a file name string to the standard RSTS/E file specification format; that is, to the FIRQB format.

The USRLOG byte is no longer used in RSTS/E V10.0. The information formerly passed in that byte is now passed in the extended logical area of the job header. The .FSS directive first processes the extended logical area of the job header. If there are no logicals there, it checks the old USRLOG area for logicals before returning an error.

The .ULOG and .FSS directives also let you define and use some nonstandard area to contain these values (see Chapter 3). However, the .ULOG directive now sets up the extended logical area of the job header; the .FSS directive expects these values in the same relative locations.

NOTE

The only way you can manipulate the extended logical area of the job header is by using the the .ULOG directive.

2.2.2 High-Segment Details: Pseudovectors

The monitor and the run-time system use the pseudovector region to communicate with each other. Figure 2–9 shows the general layout of this area. As with the low 512 bytes of virtual address space, the file COMMON.MAC assigns mnemonic names to locations in this area. These names are shown to the right in Figure 2–9. The following text describes each of these areas in detail. If you want to modify or code your own run-time system, the format and meaning of these areas is important. Otherwise, you might want to examine them to see how the run-time system and the monitor communicate.

Figure 2–9: Format of Pseudovector Region of High Segment

	Addresses	Mnemonics
flags describing the run-time system	177732	P.FLAG/ P.OFF
normal executable file type	177734	P.DEXT
(reserved)	177736	
minimum size, in K words, of user job image	177740	P.MSIZ
exception address for FIS hardware option	177742	P.FIS
(reserved)	177744	
(reserved)	177746	
entry point for new user	177750	P.NEW
entry point for new user with program to run	177752	P.RUN
exception address for various "bad" errors	177754	P.BAD
exception address for BPT instruction and T-bit	177756	P.BPT
exception address for IOT instruction	177760	P.IOT
exception address for nonmonitor EMT instruction	177762	P.EMT
exception address for all TRAP instructions	177764	P.TRAP
exception address for FPP or FPU	177766	P.FPP
exception address when user types one CTRL/C	177770	P.CC
exception address when user types two CTRL/Cs	177772	P.2CC
maximum size (in K words) of user job image	177774	P.SIZE
(reserved)	177776	

In general, the pseudovector region contains:

- Values and flags that define the capabilities of the run-time system for the monitor. For example, one flag indicates whether the run-time system has a keyboard monitor.

- Addresses pointing to locations in the run-time system where the monitor is to pass control when certain conditions occur. These addresses fall into three categories:
 - Addresses for Synchronous Exceptions. Control passes to these locations when the job executes an instruction that causes a trap to the monitor. The monitor passes control to the run-time system along with the contents of the program counter (PC) and program status word (PSW). The term "synchronous" is used in the sense that the trap occurs at the same time as (and is a direct result of) some instruction executed by the job. These traps may or may not indicate an error. For example (except for the PDP-11/23 PLUS or 11/24), if the job executes an instruction with an odd address, control passes to one of these trap addresses. If the job simply executes a BPT instruction, control passes to another of these addresses.
 - Addresses for Asynchronous Exceptions. Control passes to these locations as a result of some event, which can be either of the following:
 - External to the execution of the job (for example, the user types a Ctrl/C at the terminal)
 - Internal but asynchronous process (such as an error in the hardware floating-point processor, whose execution overlaps that of the PDP-11 CPU)

When such conditions occur, control passes to the monitor, which passes control to the run-time system, along with the contents of the PC and PSW. If a floating-point trap occurred, the monitor also passes along the floating exception code (FEC) and floating exception address (FEA). For the asynchronous traps, the PC and PSW do not refer to the instruction that caused the trap, but to the instruction that was executing in the central processor when the trap occurred.

- Entry Point Addresses. The monitor passes control to the run-time system at entry-point addresses when some major transition point is reached for the job. For example, when you type a RUN or CCL command at the terminal, the monitor passes control to an entry point in the appropriate run-time system, to load and execute the requested program.

NOTE

The term pseudovector arises from the relationship of some of these (one-word) trap addresses in the pseudovector region to the (two-word) vector addresses in kernel-mode memory set up to handle error traps and interrupts in the PDP-11. When the RSTS/E monitor receives control as a result of a trap to certain of these vector addresses, it passes control on to the run-time system at addresses specified in the pseudovector region.

Normally, you code the contents of the pseudovector region as part of the run-time system file. However, the `INSTALL/RUNTIME_SYSTEM` command, used to define a file as an auxiliary run-time system, has qualifiers that cause the monitor to override certain portions of the pseudovector region in the file and use values assigned in the `INSTALL` command. For example, one bit in one word of the pseudovector region states whether the run-time system is read/write or read-only when it is loaded in memory. Normally, this would be read-only, but for debugging a run-time system with the Octal Debugging Tool (ODT), which allows you to change memory, the run-time system must be read/write. The `/NOREAD_ONLY` qualifier in the `INSTALL` command lets you tell the monitor that until further notice, this run-time system is read/write, regardless of what is

specified in the pseudovectors. The *RSTS/E System Manager's Guide* describes the `INSTALL/RUNTIME_SYSTEM` command.

2.2.2.1 Run-Time System Capability and Default Definitions

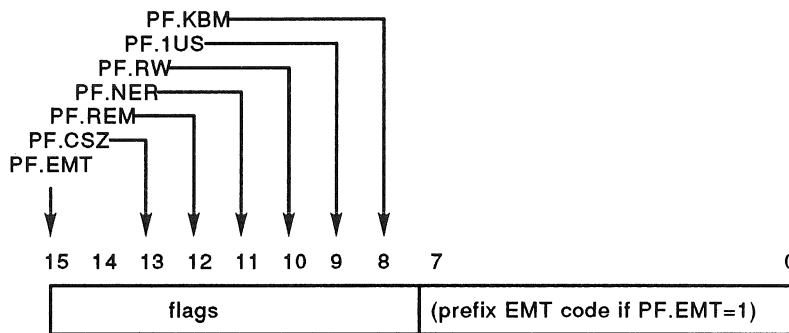
The following mnemonics refer to values and flags that define run-time system capabilities for the monitor.

P.OFF

Use the `P.OFF` mnemonic to define the first word of the pseudovector region. It is currently set equivalent to `177732`, the same as `P.FLAG`.

P.FLAG

The monitor expects the `P.FLAG` word to be set with flags that define the capabilities of the run-time system:



PF.EMT

This bit is set to indicate that the run-time system wants to handle a call that would normally be handled by the monitor. To show how the bit works, it is necessary to first describe what normally happens when a monitor directive is translated and executed.

All of the monitor directives that this manual describes are translated to emulator trap (EMT) instructions. The direct monitor calls are one-for-one translations; that is, one call is translated to one EMT (see Chapter 3). The code to process the call is in the monitor itself.

The `RSX` and `RT-11` emulator calls may be translated to more than one instruction, but the code always contains an EMT. In addition, the direct monitor calls are translated to an EMT with a low byte that is an even number within the range 0 to 114 (octal). When such an instruction is executed, control transfers directly to the monitor, the call is processed, and control returns to the instruction following the EMT.

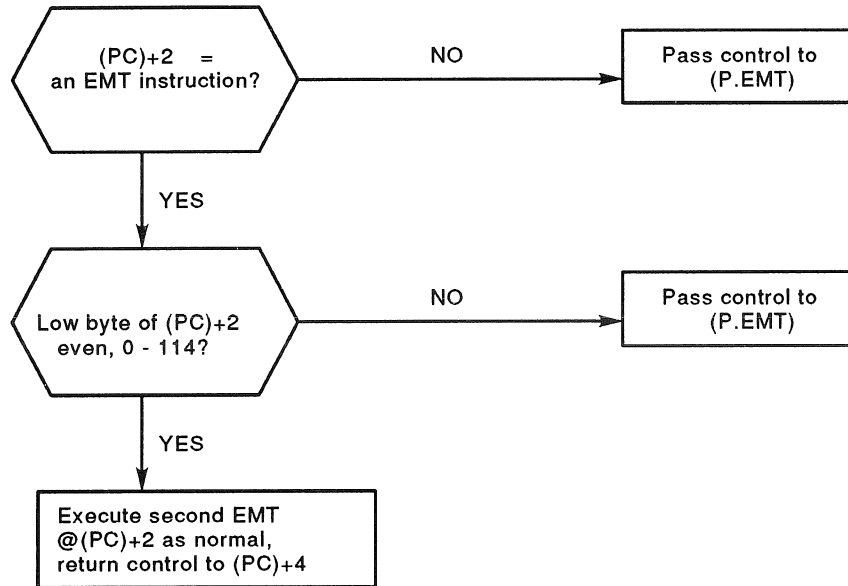
An EMT instruction with an odd value in the range 1 to 113 in the low byte, or any value in the range 115 to 377, also transfer control to the monitor. The monitor examines the low byte, discovers that the EMT is not one of its own, and transfers control to the run-time system at the entry point defined by location `P.EMT` in the pseudovector region.

Now the `PF.EMT` bit is set to one to indicate that the run-time system wants to process EMTs that are normally processed by the monitor, that is, with an even low byte in the range 0 to 114. When `PF.EMT` is set to one, all EMTs cause control to pass to the run-time system at the `P.EMT` entry point, except those

immediately preceded by a special prefix EMT—an EMT whose low byte is equal to the low byte of P.FLAG.

Specifically, when PF.EMT equals one, the monitor handles all EMT instructions as follows:

- Any EMT whose low byte is not equal to the low byte of P.FLAG causes control to pass through the monitor (unprocessed except for examination), and back to the run-time system at the address contained in the P.EMT word.
- An EMT whose low byte is equal to the low byte of P.FLAG causes control to pass to the monitor, which looks at the word following the EMT with the special code; that is, at the word in location (PC)+2. Action is taken according to the value of this word:



In other words, the run-time system does special processing for all EMTs, except those preceded by a special prefix EMT. The RT-11 run-time system uses this feature so it can emulate the RT-11 operating system's directives properly.

PF.CSZ

For a user job image executed as a result of a .RUN directive, the monitor preallocates memory based on information provided by the run-time system under which the image is executing. When this bit is set, the monitor preallocates memory based on the size of the file referenced in the .RUN directive:

$$\text{space (in K words)} = (\text{filesize} + 3)/4$$

Filesize is the number of 512-byte blocks required for the file on disk. (The division by four is performed because there are four 512-byte blocks in 1K word. The addition of three rounds any fraction of the integer divide to the next whole integer.)

When PF.CSZ is clear, the monitor preallocates memory for the image according to the value specified in the P.MSIZ word of the pseudovector region.

PF.REM

When the PF.REM bit is set, the monitor immediately removes the run-time system from memory when no job is using it. When this bit is clear, the monitor leaves the run-time system in memory until the space is actually needed by something else.

PF.NER

When this bit is set, the monitor does not log errors occurring within the run-time system to the system error log.

PF.RW

When this bit is set, the monitor maps the run-time system as read/write. (See the read/write feature of the Page Descriptor Register of an APR, in the section, "How RSTS/E Allocates Memory: Physical and Virtual Addressing.") This is a useful feature when debugging a run-time system. In normal operation, this bit should be clear, indicating that the run-time system is to be mapped read-only.

PF.1US

When the PF.1US bit is set, the monitor allows only one job to use the run-time system; that is, it is not handled as shareable code.

PF.KBM

When this bit is set, the monitor expects that the run-time system can function as a keyboard monitor. Note that the run-time system can function as a job keyboard monitor only when this bit is set. See the .RTS directive in Chapter 3 for a discussion of job keyboard monitors.

P.FLAG COMBINATIONS

The PF.1US, PF.RW, PF.NER, and PF.REM bits are useful flags when you are debugging a run-time system:

- PF.1US limits access to the run-time system to one user.
- PF.RW is necessary if you want to use the ODT routine to change memory.
- PF.NER keeps the run-time system from logging useless errors while debugging.
- PF.REM ensures that the run-time system will be reloaded each time it is used. (Otherwise, an old copy might still remain in memory when you really wanted to debug a new copy.)

P.DEXT

You can set this word to three Radix-50 characters that the monitor uses as a default runnable file type. If a .RUN directive executes with no file type given, the monitor scans its list of installed run-time systems in the order they were installed (see Chapter 3).

NOTE

The order of installation shows up in the display that the SHOW RUNTIME_SYSTEM command produces.

The monitor first checks for .TSK files which are executed by the null run-time system. If such a file is found, it is set up for the .RUN. If no such file is found, the monitor searches for a file with the given file name and the next run-time system's default runnable file type, and so forth. Note that the order in which the file types are chosen does not depend in any way on the run-time system executing the .RUN.

P.MSIZ

The P.MSIZ word gives the minimum allowable size for a user job image, in K words, for this run-time system. The monitor uses this value as a check when the job issues a .CORE directive to change the size of the user job image in memory (see Chapter 3). The value of P.MSIZ must be an integer between 1 and the value in P.SIZE, inclusive.

P.SIZE

The P.SIZE word contains the maximum size, in K words, that a user job image can be for this run-time system. The monitor uses this value as a check when a job issues a .CORE directive to change the size of the user job image in memory. P.SIZE must be an integer between 1. and 32., inclusive. The effective upper limit is 32. minus the size of the run-time system, rounded up to a multiple of four. (Remember that the APR mapping requires that space for the run-time system be allocated in units of 4K words.) Thus, a run-time system that required 5K words could set an upper limit here of 24. (32.-8.). However, it could set P.SIZE to some smaller value.

2.2.2.2 Synchronous Exception Handler Addresses

These mnemonics refer to locations in the run-time system where control is to pass for synchronous exceptions.

P.FIS

The monitor interprets the P.FIS word as the trap address for the hardware floating-point instruction set available on the PDP-11/35 and 40. Whenever an instruction from this set causing a trap to the kernel mode vector at 244 is executed, the monitor passes control to the run-time system at the location specified by the contents of the P.FIS word.

This exception pushes two words onto the user's SP stack: the contents of the PC and PS registers at the time of the exception. For example:

SP → (PC) at the time of the exception
(PS) at the time of the exception
word to which SP pointed before the exception

Whatever action the run-time system wants to take for this exception should be done at the location specified by the contents of P.FIS. A return from interrupt (RTI) instruction returns control to the point where it was when the exception occurred.

P.BAD — Synchronous Exceptions

The monitor passes control to the run-time system at the location specified by the contents of P.BAD when any of the following synchronous exceptions occur:

- Memory management unit exception (trapped to kernel mode vector at 250).
- The job tries to execute a reserved instruction (trapped to kernel mode vector at 10).

- The job issues an instruction with an odd address (trapped to kernel mode vector at 4).

This exception pushes two words onto the user's SP stack: the contents of the PC and PS registers at the time of the exception. For example:

```

SP→      (PC) at the time of the exception
          (PS) at the time of the exception
          word to which SP pointed before the exception

```

The monitor returns an error code in the first byte of the FIRQB so the run-time system can determine which error occurred. The error codes are:

```

B.4      Odd address
B.10     Reserved instruction
B.250    Memory management unit exception

```

The run-time system is responsible for processing these errors in whatever manner it sees fit. In general, most run-time systems provided with RSTS/E systems report the error, using the UU.ERR subfunction of the .UUO directive and perhaps print the PC value from the top of the stack. You can use an RTI instruction to return control to the point where it left off when the exception occurred. Note that some asynchronous exceptions also use this address.

P.BPT

The P.BPT word contains the exception address for a BPT instruction and for T-bit exceptions. When the job issues a BPT instruction or a T-bit exception occurs (to the kernel mode vector at 14), the monitor passes control to the run-time system for the job at the address specified by the contents of this word.

This exception pushes two words onto the user's SP stack: the contents of the PC and PS registers. For example:

```

SP→      (PC) at the time of the exception
          (PS) at the time of the exception
          word to which SP pointed before the exception

```

The run-time system processes these exceptions in any fashion it sees fit at the location specified by the contents of P.BPT. The RTI or RTT instructions can be used to return control to the user's program at the point where it was when the exception occurred.

P.IOT

The P.IOT word contains the exception address for an IOT instruction. Whenever the job issues an IOT instruction (trapped to kernel mode vector at 20), the monitor passes control on to the run-time system at the address specified by the contents of this word.

This exception pushes two words onto the user's SP stack: the contents of the PC and PS registers at the time of the exception. For example:

```

SP→      (PC) at the time of the exception
          (PS) at the time of the exception
          word to which SP pointed before the exception

```

The run-time system can process the exception in any fashion it sees fit. You can use an RTI instruction to return control to the point where it was when the exception occurred.

P.EMT

This word contains the location to which control is transferred for nonmonitor EMT instructions; that is, for EMT instructions whose low byte is odd within the range 1 to 113 or any value in the range 115 to 377. If the PFEMT bit is set in the P.FLAG word in the pseudovector region, control is transferred here for all EMT instructions except those preceded by the special prefix EMT, as described previously.

The exception pushes two words onto the user's SP stack: the contents of the PC and PS registers at the time of the exception. For example:

```
SP→ (PC) at the time of the exception
      (PS) at the time of the exception
      word to which SP pointed before the exception
```

The run-time system is responsible for processing the EMT as it sees fit. You can use the RTI instruction to return control to the point where it was when the exception occurred.

NOTE

All EMT instructions are reserved for use by Digital.

P.TRAP

This is the location to which control is transferred for all TRAP instructions (operation codes 104400 through 104777, inclusive). Whenever the job executes such an instruction (trapped to kernel mode vector 34), the monitor passes control to the run-time system at the location specified by the contents of this word.

This exception pushes two words onto the user's SP stack: the contents of the PC and PS registers at the time of the exception. For example:

```
SP→ (PC) at the time of the exception
      (PS) at the time of the exception
      word to which SP pointed before the exception
```

The run-time system is responsible for processing the exception as it sees fit. You can use an RTI instruction to return control to the point where it was when the exception occurred.

2.2.2.3 Asynchronous Exception Handler Addresses

These mnemonics refer to locations within the run-time system where control is to pass for asynchronous exceptions.

P.FPP

This location is the exception address for the hardware floating-point processor (FPP) for the PDP-11/34A, 44, 45, 50, 53, 55, 60, 70, 73, 83, 84, 93, and 94 asynchronous unit or the KEF11-AA or FPF-11 for the PDP-11/23-PLUS and 24. Whenever the unit takes an exception trap (to kernel mode vector at 244), the monitor passes control to the run-time system at the location specified by the contents of this word. The Floating-point Exception Code (FEC) and Floating-point Error Address (FEA) of this unit are not otherwise accessible.

Therefore, the monitor pushes these two values onto the user's SP stack, in addition to the contents of the PC and PS registers at the time of the interrupt. For example:

```
SP→   FEC
      FEA
      (PC) at the time of the exception
      (PS) at the time of the exception
      word to which SP pointed before the exception
```

The run-time system can process the exception as appropriate, clean the stack (remove the FEC and FEA), and issue an RTI instruction to return control to the user's program at the point where it was when the exception occurred.

P.CC

This is the location to which control passes when a Ctrl/C is entered at any terminal on any channel that this job accepts. The monitor stops further programmed output for the job (Ctrl/O effect) and cancels any pending character output.

The user's SP stack is modified at entry. For example:

```
SP→   (PC) at the time of the exception
      (PS) at the time of the exception
      word to which SP pointed before the exception
```

The run-time system can process the Ctrl/C as you want. All run-time systems supplied with a RSTS/E system abort the job, unless the user job image has indicated that it wants to handle Ctrl/C traps itself (see the SCCA\$\$ and the .SETCC directives).

P.2CC

This is the exception address taken when the user enters a second Ctrl/C before the run-time system has been able to respond to the first Ctrl/C. (That is, the monitor has received two Ctrl/Cs before it has been able to pass control to the run-time system at the location specified by the contents of P.CC in the time-sharing environment.) As with one Ctrl/C, when the P.2CC point is entered, further programmed output is canceled (Ctrl/O effect), and any pending character output is canceled. Two words are pushed onto the user's SP stack. For example:

```
SP→   (PC) at the time of the exception
      (PS) at the time of the exception
      word to which SP pointed before the exception
```

The run-time system can process the condition as you want (BASIC-PLUS exits immediately, returning control to the P.NEW entry point in the default keyboard monitor). An RTI instruction would return control to the point where the program left off, but this annoys the user who entered the two Ctrl/Cs expecting to get out.

P.BAD — Asynchronous Exceptions

The monitor passes control to the location specified by P.BAD whenever any of the following asynchronous errors occur:

- The user's SP stack overflows.
- A fatal disk error occurs when the job is swapped. The original contents of the user job image are lost.
- A memory parity fault occurs in the user job image. The original contents of the user job image are lost.

- A fatal disk error occurs when a run-time system or resident library is loaded. Control passes to P.BAD in the default keyboard monitor when the load error occurs for a run-time system.

None of these errors are recoverable. An error is returned in the first byte of the FIRQB to indicate which error occurred, KEY is refreshed, and the contents of the general registers (R0 through R5) are random. SP is reset to the value USRSP.

In general, most run-time systems provided with RSTS/E systems report the error, using the UU.ERR subfunction of the .UUC directive, and also the ??Program lost-sorry message (UU.ERR call with FUCORE value). Then, the run-time systems exit to the job keyboard monitor, using .RTS. The ??Program lost-sorry message prints to warn you that the program is no longer in memory and your user logical values may have been lost.

The error codes that RSTS/E returns in the first byte of the FIRQB are:

B.STAK	The user's SP stack overflowed
B.SWAP	Fatal disk error on swap
B.PRTY	Memory parity fault
NRRTS	Fatal disk error on run-time system or resident library load

Control is also transferred to P.BAD for some synchronous exceptions.

2.2.2.4 Entry Points

These mnemonics refer to locations within the run-time system where control is to pass at certain transition points for the job.

P.NEW

The monitor passes control to this entry point under the assumption that new user or next request processing is to be done. Compare this to the P.RUN entry point, where a specific program is to be run under this run-time system. P.NEW is commonly used as the entry point to switch back to a job's keyboard monitor. For example, the .EXIT directive passes control to this entry point in the system default keyboard monitor. You can use the .RTS directive to pass control to P.NEW in a job's keyboard monitor or a specifically named run-time system. Note that a job can establish its own job keyboard monitor, which is different from the default keyboard monitor (see the section on .RTS in Chapter 3).

By examining KEY and the XRB, the run-time system can determine how and by whom it was entered at P.NEW, if this is significant. (Run-time systems that do not have keyboard monitors would probably want to exit (using .EXIT) to the default keyboard monitor at P.NEW.)

The three conditions under which control passes to the P.NEW entry are:

- Brand new job on the system—In this case, JFNOPR (bit 12 in KEY) is set (the job is not yet logged in), and the words at location XRB+2 and XRB+4 are zero (the monitor requested the entry, not a run-time system). This indicates that the monitor has passed control to this location, having received input over channel zero in a logged-out state (occurs only for the default keyboard monitor).

The run-time system should run some predetermined program to read (.READ directive) the input line that the monitor has buffered. For example, DCL executes SY:[1,2]LOGIN.* (the LOGIN utility) in this case.

- Switch to this run-time system when job logged out—In this case, JFNOPR (bit 12 in KEY) is set, and the name of the calling run-time system is given as two RAD50 words in locations XRB+2 and XRB+4. The calling run-time system is the run-time system under whose control the directive was issued that caused the switch.

For this case, the run-time system should issue a logged-out prompt message. For example, the BASIC-PLUS run-time system prints "Bye" and returns control to the monitor. (Normally, control does not pass to the run-time system in this case. If LOGIN does not recognize the line that it read (as in previous case), it kills itself, destroying the job and returning control to the monitor.)

- Switch to this run-time system when job logged in—In this case, JFNOPR (bit 12 in KEY) will be clear. The name of the calling run-time system is given as two words of RAD50 in locations XRB+2 and XRB+4 or is zero if this job was just created by UU.JOB (see Chapter 3).

For this situation, the run-time system should issue its logged-in prompt and attempt to read the next command from the terminal open on channel zero. BASIC-PLUS prints "Ready", DCL prints "\$", RSX prints ">", and RT-11 prints ".". Then, all wait for further input.

Keyboard monitors should read channel zero (the job's terminal) using the keyboard monitor wait feature of .READ. The monitor will kill jobs that execute this read in a logged-out state; otherwise, it is an infinite-wait read.

The monitor usually does some housekeeping for the job at the time the P.NEW entry point is entered. Specifically, the word at location FIRQB+FQJOB is always set to two times the job number assigned by the monitor when the job was created, and KEY is refreshed with current information about the job. Third-party privilege checking is turned off if it was on (see UU.3PP). Furthermore, SP is reset to 400 (see USRSP description), all the general registers (R0 through R5) contain zero, and all I/O channels are closed.

On exit from privileged programs, some additional clean-up is done:

- Temporary privileges are dropped
- User memory is cleared (upwards from location 1000)
- User job image size is reset to the value in P.MSIZ

NOTE

This housekeeping is not done if a specific request is made to pass control to a run-time system without changing the job-context information (see the .RTS directive).

The following information exists in the XRB at the time the P.NEW entry point is entered:

XRB on P.NEW Entry

Octal Offset		Octal Offset	Mnemonic
1	1 for switch without housekeeping; else 0	0	XRLEN
3	name of the calling run-time system (2 words in RAD50 format)	2	XRBC
5		4	XRLOC
7	-1 if calling RTS = new RTS; else 0	6	XRCI
11	whatever values were here when the switch was made	10	XRBLK
13		12	XRTIME
15		14	XRMOD

- XRB+0** This word contains a value of one, if control was transferred by an .RTS directive using the switch without changing the job-context option (see Chapter 3).
- XRB+2** The two words beginning here contain the name of the calling run-time system, in RAD50 format. If control was transferred here directly by the monitor, these two words contain zero.
- XRB+6** This word contains minus one if the calling run-time system is the same as the one that now has control. This word is zero otherwise; that is, if the calling run-time system is not the same as the called run-time system.
- XRB+10** The contents of the next three words will be the same as they were when the switch occurred. That is, data can be passed from run-time system to run-time system here. If control has been transferred to P.NEW directly by the monitor, these three words are zero.

P.RUN

The monitor passes control to the P.RUN entry point when an executable program is to be run for a job under control of this run-time system. This can occur as the result of either a .RUN or a .CHAIN directive (in which a job has directly asked for a file to be run) or a .CCL directive (in which a job has asked the monitor to check a string to see if it is a valid CCL command, and if so, execute the appropriate file).

The monitor opens the file to be run (a disk file) on channel 15. However, the file has not been read; it is up to the run-time system to load and execute the file. The run-time system should also reset all I/O channels except 15, in case they are open.

The monitor performs the same housekeeping operations as with P.NEW (reset the stack, and so on). In addition, if the program to be run is a privileged program, and the caller does not have all of the program's privileges, the monitor sets the JFSYS bit in KEY, saves the current privileges, and adds the program's privileges to the current privileges.

The monitor passes data to the run-time system in the XRB, FIRQB, and KEY areas of the user job image (low segment).

XRB on P.RUN Entry

Octal Offset		Octal Offset	Mnemonic
1	flag bits describing entry conditions	0	XRLEN
3	name of run-time system which issued the call to this one	2	XRBC
5		4	XRLOC
7	random value	6	XRCI
11	same value as when the caller issued the .RUN or .CCL	10	XRBLK
13		12	XRTIME
15		14	XRMOD

- XR B+0** This word contains flag bits that describe the entry conditions. (The STATUS variable in BASIC-PLUS returns these values.)
- | Bit | Meaning |
|------|--|
| 0-7 | If the value of these bits is zero, then no special size for this program run is called for. If the value is greater than zero, it indicates the size, in K words, that the program should be run at. If the value is less than zero, the absolute value indicates an increment, in K words, to the size that the program would normally run at. |
| 8-12 | Reserved for future use. |
| 13 | When set, indicates that the caller issued a directive with a /SIZE switch; that is, the file is to be run at a specific size. The size is given in bits 0-7. It is up to the run-time system to set the size as indicated (see the .CORE directive). |
| 14 | When set, indicates the caller issued a .CCL directive with a /DETACH switch, with the intent that this run-time system executes the file in detached mode. It is up to the run-time system to take action on this flag. You can detach a job by using the UU.DET subfunction of the .UJO directive; see Chapter 3. |
| 15 | When set, indicates the entry was made as the result of a .CCL directive. When clear, indicates the entry was made as the result of a .RUN or a .CHAIN directive. |
- XR B+2** These two words contain the name of the run-time system under which the .RUN, .CHAIN, or .CCL directive to this run-time system was issued, in RAD50 format.
- XR B+6** The contents of this word are random.
- XR B+10** The three words beginning here contain the same information that they held when the job issued the .RUN, .CHAIN, or .CCL directive.

FIRQB on P.RUN Entry

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////////////////	0	
	3	//////////	2	FQJOB
	5	////////////////////	4	
	7	project number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	file size in 512-byte blocks	16	FQSIZ
	21	default buffer size for disk	20	FQBUFL
	23	////////////////////	22	
	25	device description	24	FQFLAG
FQPROT	27	protection code	26	FQPFLG
	31	device name (2 ASCII characters)	30	FQDEV
	33	flag byte	32	FQDEVN
	35	file identification index	34	FQCLUS
	37	entry parameter	36	FQNTENT

- FIRQB+FQJOB** The job number (assigned by the monitor when this job was created) times two.
- FIRQB+FQPPN** The project-programmer number for the file that is to be run.
- FIRQB+FQNAM1** The name of the file that is to be run, as two words in RAD50 format.
- FIRQB+FQEXT** The type of the file that is to be run, as one word in RAD50 format.
- FIRQB+FQSIZ** The file size, in 512-byte blocks.
- FIRQB+FQBUFL** The recommended size, in bytes, for the buffer size in a .READ directive for this file.
- FIRQB+FQFLAG** Flag bits defining the device. They are set to indicate that this is a disk file. (See the FQFLAG description in the open function of the CALFIP directive.)
- FIRQB+FQPFLG** The file cluster size, modulo 256. (That is, a file cluster size of 256 is indicated by a zero byte here.) This byte is the same as the FQCLUS value supplied in the open functions of the CALFIP directive, except that it is returned in a byte instead of a word.
- FIRQB+FQPROT** The protection code of the file.
- FIRQB+FQDEV** The device name of the disk device, as two ASCII characters.
- FIRQB+FQDEVN** The unit number of the disk device.

FIRQB+FQDEVN+1	The low-order two bits of this byte are set to indicate whether or not the device is part of the public structure: Bit 0 = 0 The device is in the public structure. = 1 The device is a private disk. Bit 1 = 0 A specific device was not specified in the open function. = 1 A specific device was specified in the open function.
FIRQB+FQCLUS	The file identification index of this file. This word is significant in that you can use it in place of the file name in subsequent opens of the file on disk. You can open the file with the OPNFQ subfunction of CALFIP, using: <ul style="list-style-type: none"> • An explicit PPN in FIRQB+FQPPN • A zero word in FIRQB+FQNAM1 • An explicit device name in FQDEV and FQDEVN • The file identification index in FIRQB+FQNAM1+2
FIRQB+FQNENT	Parameter word from the caller. The .RUN or .CHAIN directive, which causes entry at PRUN in a run-time system, allows the caller to specify a parameter word to be passed to the run-time system. Bit 15 of this word may or may not be the same as the caller passed, however. If the .RUN or .CHAIN directive was issued from a privileged program with temporary privileges enabled, bit 15 is passed by the caller. Otherwise, bit 15 is cleared. For .CCL entries, bit 15 is set by the monitor. If the CCL definition for the CCL being executed has the /PRIVILEGED qualifier included in it, the bit 15 is set; otherwise, it is cleared.

Part II
Monitor Directives

General Monitor Directives

This chapter describes the general directives to the RSTS/E monitor. These directives are available to the MACRO programmer under both the RSX and RT-11 run-time systems. They are Emulator Trap (EMT) instructions that are processed directly by the monitor. A run-time system does not examine or process these general directives.

3.1 Summary of General Monitor Directives

Table 3-1 summarizes the general monitor directives. Detailed descriptions are given in the sections that follow this introductory material. The descriptions are arranged alphabetically by mnemonic name.

Some directives, which cause a change in run-time system or change in job size, should not be executed by a program (user job image) running under the RT-11 run-time system, or unpredictable results may occur. These directives are marked with a dagger (†) or double dagger (‡) in Table 3-1. (Note, however, that these are not restrictions for assembling using MACRO—the assembler for the RT-11 run-time system. If you are coding a run-time system, you use these directives and assemble under either MACRO or MAC.)

Table 3-1: Summary of General Monitor Calls

Name	EMT Code (Octal)	Description
CALFIP	0	Call the File Processor portion of the RSTS/E monitor. Includes "housekeeping" functions for file/device I/O such as OPEN, CLOSE.
.READ	2	Read from a previously opened file or device.
.WRITE	4	Write to a previously opened file or device.
.CORE†	6	Change memory size allocated for user job image.
.SLEEP	10	Sleep job for n seconds.
.PEEK	12	Peek at the monitor's memory.
.SPEC	14	Special function.
.TTAPE	16	Enter tape mode.

†These directives should not be used by a program running under control of the RT-11 run-time system.

(continued on next page)

Table 3-1 (Cont.): Summary of General Monitor Calls

Name	EMT Code (Octal)	Description
.TTECH	20	Enable echo on a channel.
.TTNCH	22	Disable echo on a channel.
.TTDDT	24	Enter ODT submode on a channel.
.TTRST	26	Cancel Ctrl/O effect.
.TIME	30	Get timing information.
.POSTN	32	Get device's horizontal position.
.DATE	34	Get current date.
.SET	36	Set keyword bits.
.STAT	40	Get statistics for job.
.RUN†	42	Run new program (user job image).
.NAME	44	Install a new program name.
.EXIT†	46	Exit to default keyboard monitor.
.RTS†	50	Switch to new run-time system.
.ERLOG	52	Log an error from run-time system.
.LOGS	54	Check for logical devices.
.CLEAR	56	Clear keyword bits.
.MESAG	60	Message send/receive.
.CCL†	62	Check string to see if Concise Command Language (CCL).
.FSS†	64	Scan a string for valid RSTS/E file specifications.
.JUO	66	Execute monitor FIP call (access to BASIC-PLUS SYS calls to FIP).
.CHAIN‡	70	Execute user job image under same run-time system.
.PLAS	72	Access a shared library.
.ULOG	76	Assign/reassign/deassign device or user logical.
.READA	102	Asynchronous read.
.WRITA	104	Asynchronous write.
.ASTX	106	AST exit.
.CMDLN	112	Read/write command line buffer.
.AST	114	AST enable/disable.

†These directives should not be used by a program running under control of the RT-11 run-time system.

‡This directive should not be used by a program running under control of either the RT-11 run-time system or the RSX emulator.

3.1.1 Prefix File COMMON.MAC

The monitor directives that this chapter describes require that you pass parameters to the monitor in the FIRQB and XRB; values are also returned to your program in these areas. The file COMMON.MAC, provided with all RSTS/E kits, relates mnemonics to often-used addresses, offset values, and function codes, eliminating the need for octal coding and addressing. These mnemonics are used in the directive descriptions that follow; Digital recommends their use for readable, maintainable code.

3.1.1.1 How to Assemble with COMMON.MAC

COMMON.MAC is a prefix file; it is assembled with your other MACRO source files under either the RSX or RT-11 run-time systems. For example, under the RT-11 run-time system, the following sequence would assemble the files COMMON.MAC, SRC1.MAC, and SRC2.MAC into the object module file OBJ.OBJ with an assembly listing file OBJ.LST:

```
RUN $MACRO
*OBJ, OBJ=COMMON, SRC1, SRC2
```

Similarly, under the RSX run-time system, this sequence would assemble the files COMMON.MAC, SRC1.MAC, and SRC2.MAC into the object module file OBJ.OBJ with an assembly listing file OBJ.LST:

```
RUN $MAC
MAC>OBJ, OBJ=COMMON, SRC1, SRC2
```

You can also use the `.INCLUDE` assembly directive to include COMMON.MAC. Use the following line as the first line of the source file:

```
.INCLUDE /COMMON/
```

3.1.1.2 Macros Provided in COMMON.MAC

In addition to providing mnemonics, the COMMON.MAC file contains macros that can be used in programs assembled under either the RSX or RT-11 run-time systems, as long as COMMON.MAC is assembled with the source, as described previously. These macros are:

TITLE name,desc,nn,date,editors

The `TITLE` macro sets a title (`.TITLE`) from the name and description (`desc`) parameters and builds an identification (`.IDENT`) from the specified number `nn`. The `IDENT` has the form `xx.xnn`, where `xx.x` is the current RSTS/E version number (09.0 for V9.0), and `nn` is the edit level you specify. Descriptive information is placed in the table of contents as follows:

```
EDIT:          DATE:          BY:
  nn           date           editors
```

ORG section[,offset]

`ORG` defines the origin address of a program section. The first occurrence of an `ORG` with a given section name causes all instructions requiring memory space following the `ORG` to be assigned consecutive relocatable addresses starting with zero or, if an offset is given, with the octal address given. Later occurrences of an `ORG` with the same section name causes resumption of addressing wherever it left off before, because of an intervening `ORG`.

The `ORG` macro also defines a symbol with the same name as the section at the first relative location within the section. Every invocation of `ORG` also defines (or redefines) the section to be returned to by the macro `UNORG`.

DEFORG section

The `DEFORG` macro is the same as the `ORG` macro except that the symbol at relative 0 (the section name) is declared as a global symbol. By convention, the module that defines the section (rather than just uses it) issues the `DEFORG` macro.

TMPORG section[,offset]

TMPORG is the same as ORG except that it does not define (or redefine) the section to be reentered by the UNORG macro. In this way, the module can temporarily enter a new section and then return to the main section using UNORG without having to know the main section name.

UNORG

The UNORG macro will reenter the section most recently declared in an ORG or DEFORG macro.

INCLUDE name1[,name2,...]

The INCLUDE macro indicates that the module issuing the INCLUDE requires the named modules (name1, ...). The name(s) should be declared with DEFORG(s) in the required modules.

INCLUDE declares the listed section names as global symbols and issues the macro directive .SBTTL with the heading "INCLUDE FROM LIBRARY 'name'" to be inserted in the assembly listing table of contents. INCLUDE documents the named sections as required by this section.

.DSECT [start][,cref]

The .DSECT macro starts a dummy program section (with the MACRO directive .ASECT) at relocatable address 0 or at the address given by the optional argument start. If the cross-reference (cref) parameter is given (nonblank), the program section is included in the cross-reference listing, if you request one for the assembly.

The .DSECT macro is used in the file COMMON.MAC to define the system parameters and offsets.

For example, coding of this form is used in COMMON.MAC to assign the proper values to the mnemonics in the pseudo-vector region:

```
.DSECT      177776,NOCREF
           .BLKW   -1
P.SIZE:    .BLKW   -1
P.2CC:     .BLKW   -1
P.CC:      .BLKW   -1
           .
           .
           .
```

NOTE

A .DSECT is used at the end of the file COMMON.MAC. This means that you must explicitly start your MACRO program with an ORG macro or .PSECT directive to begin your program at relocatable address 0. Otherwise, your code will be regarded as a continuation of the .DSECT, and the program will not assemble properly.

.BSECT [HIGH][,cref]

The .BSECT macro is like the .DSECT macro except that the default starting address is 1 instead of 0. If the argument HIGH is used, the starting address is 400 (octal). This starting address lets you use .BSECT to generate bit values. The .BSECT macro is used in COMMON.MAC to define mnemonics for bit locations. For example, the following coding assigns the mnemonics to the bit locations in the keyword (KEY; see Chapter 2). Note that the period (.) after .BLKB is required.

```
.BSECT      HIGH, NOCREF
JFSPR1:    .BLKB  .
JFPP:     .BLKB  .
.
.
.
```

.EQUATE symbol,value

.EQUATE defines the given symbol to have the supplied value (which may be an expression) by using the equivalent of:

```
.DSECT      value
.symbol:
UNORG
```

.BLKW0 [quantity][,value]

The .BLKW0 macro is similar to the MACRO directive .BLKW, which reserves a specified number of words of storage space. The quantity can be any expression, the default is one. While .BLKW just reserves space, .BLKW0 fills the space with the value you specify; the default is zero.

.BLKB0 [quantity][,value]

The .BLKB0 macro is similar to the MACRO directive .BLKB, which reserves a specified number of bytes of storage space. The quantity can be any expression, the default is one. .BLKB0 fills the space with the value you specify; the default is zero.

GLOBAL <name1[,name2,...]>

GLOBAL declares the name symbols as external global symbols.

RETURN [register]

The RETURN macro generates an RTS PC by default but can generate any other RTS instruction if you specify an explicit register.

JMPX label

JMPX is just like the JMP instruction but will also declare the label to be an external global (that is, jump external).

CALL subroutine[,register[,argument list]]

You can use CALL instead of JSR PC to call subroutines. If an explicit register is specified, then the call is JSR using that register. If an argument list is specified, it generates a list of .WORD arguments in line with the subroutine call.

CALLR subroutine

CALLR is equivalent to a CALL to a subroutine immediately followed by a RETURN. CALLR generates a JMP instruction.

CALLX subroutine

CALLX is just like CALL, but it also declares the subroutine name as an external global symbol.

CALLRX subroutine

CALLRX is just like CALLR except that the subroutine name is declared as an external global symbol.

3.1.2 Error Mnemonics: Symbol Table File ERR.STB

When the monitor processes the directives that this chapter describes, any errors that it detects are passed back to the job in the first byte of the FIRQB as a binary value. The ERR.STB file, provided with all RSTS/E kits, relates mnemonic values to these binary codes, so you do not have to analyze and process errors in octal. The descriptions in this chapter all refer to the mnemonics provided by ERR.STB. See Appendix A for a list of all possible errors.

The symbols are automatically resolved at link time if you include ERR.STB with the files you link with either TKB (the Task Builder for the RSX run-time system) or LINK (the linker for the RT-11 run-time system). For example, under the RSX run-time system, the following code links ERR.STB and MAIN.OBJ to produce the executable file IMG1.TSK, a memory allocation file MP1.MAP, and a symbol definition file SF1.STB:

```
RUN $TKB
TKB>IMG1,MP1,SF1=ERR.STB,MAIN
```

Similarly, under the RT-11 run-time system, the following sequence links ERR.STB and MAIN.OBJ to produce the executable file IMG1.SAV, a memory allocation file MP1.MAP, and a symbol definition file SF1.STB:

```
RUN $LINK
*IMG1,MP1,SF1=ERR.STB,MAIN
```

3.1.3 Programming Hints

Preset the FIRQB and XRB to Zero

The monitor directives in this chapter pass information to the monitor in the FIRQB and XRB areas of the low 512. bytes of memory. It is usually a good idea to clear the entire FIRQB and XRB before issuing a call, to ensure that no extraneous information (for example, from data returned on a previous call) has been left in the areas that could affect how the call executes.

In some cases, however, you may want to leave the FIRQB and XRB alone. The .FSS call, for example, scans a string and, if it is a valid file specification, returns to the FIRQB the information needed to open the file with the CALFIP call. You do not want to clear the FIRQB before opening the file with CALFIP.

NOTE

To ensure compatibility with future releases of RSTS/E, you should always set to zero any fields in the FIRQB and XRB diagrams that are shaded or are documented as reserved or not used.

The following example contains three routines that clear the FIRQB and XRB.

CLRFQX clears both the FIRQB and XRB.

CLRFQB clears the FIRQB.

CLRARB clears the XRB.

The values FQBSIZ and ARBSIZ used in these routines are defined in COMMON.MAC.

```
                .ENABL  LSB
CLRFQX::        PUSH  <R0,R1>                ;Save R0,R1
                MOV   #FIRQB,R0             ;Point to FIRQB.
                MOV   #<<FQBSIZ+ARBSIZ>/2>,R1 ;Compute how many words
                BR    10$                   ;to clear.
CLRFQB::        PUSH  <R0,R1>                ;Save R0,R1
                MOV   #FIRQB,R0             ;Point to FIRQB.
                MOV   #<FQBSIZ/2>,R1        ;Compute how many words
                BR    10$                   ;to clear.
CLRARB::        PUSH  <R0,R1>                ;Save R0,R1
                MOV   #ARB,R0               ;Point to ARB
                MOV   #<ARBSIZ/2>,R1        ;Compute how many words
                BR    10$                   ;to clear.
10$:            CLR   (R0)+                  ;Zero it out ...
                SOB   R1,10$                ;'til all done
                POP   <R1,R0>               ;Restore R0,R1.
                RETURN
                .DSABL  LSB
```

Data Returned to FIRQB and ARB

If a call completes without error, the monitor sets byte 0 of the FIRQB to zero. If an error occurs on a call, the monitor sets byte 0 of the FIRQB to an error code. Likewise, the monitor always sets the byte at FIRQB+2 to the current job number times two when a call completes.

In some circumstances, it may be useful to know what happens to the passed-data when a call completes. For instance, is the file name still there? Bytes not specified as containing returned-data are undefined. Do not rely on these values when coding your programs because Digital reserves the right to change the values returned in these bytes at any time. In addition, if an error occurs, the data returned may or may not have replaced the data passed. It depends on how far processing for the call got before the error occurred.

Channel Numbers for I/O

Directives that handle I/O use a channel number to refer to a device. In device or file opens, a channel number is related to a specific device defined in the call. Directives that transfer data (.READ, .WRITE, .READA, .WRITA) can then refer to a channel number rather than define a device or file.

Valid channel numbers range from 0 through 17. Channel 0 is the job's terminal; for example, a .WRITE to channel 0 writes to the terminal which is running the job. Channel 0 is always open. Similarly, the monitor opens a file to be run on channel 17 when control transfers to the PRUN entry point in a run-time system. Thus, user jobs may define and use channels 1 to 16.

Directives That Do I/O

The CALFIP subfunctions OPNFQ, CREFQ, CRBFQ, and CRTFQ open a file or device and relate the specified channel number to that file or device:

- OPNFQ opens a file or device for input
- CREFQ creates a file, that is, opens a file or device for output
- CRBFQ creates a binary (executable) output file on disk
- CRTFQ creates a temporary file on disk

The directives .READ and .WRITE transfer data between memory and a device or file specified by channel number.

The CLSFQ (close) and RSTFQ (reset) subfunctions of CALFIP close a device or file and free the associated channel number so it can be used with another device or file.

Directives That Support I/O

The file string scan (.FSS) directive is useful for programs that process files specified by a terminal user. The .FSS directive examines a string of characters and, if it is a valid RSTS/E file specification, converts it to the FIRQB format used to open a file. Thus, your program can accept a typed string from the job's terminal and use .FSS to convert the string to the FIRQB format to do I/O on the file.

You can use the LOKFQ subfunction of CALFIP to search for disk files that meet wildcard file specifications. For example, you could search an account on disk for all files with names beginning with the characters DD.

3.2 Trap Handling with Supervisor Mode

Although asynchronous I/O calls (.READA and .WRITA) are illegal for a task using supervisor mode, other traps may require handling by a task using supervisor mode. The legal asynchronous system traps for supervisor-mode tasks are:

- FPP exception
- Ctrl/C interception
- all forms of Synchronous Service Traps (SSTs)

The trap service routines for these may be located in either user or supervisor mode. If the service routines reside in supervisor mode, they must adhere to additional requirements that their user mode counterparts do not need:

- The service routine must exit via either the SSTX\$ or ASTX\$ calls. In user mode only, service routines can clean the PC & PSW off the stack and continue without returning, but if supervisor mode is in use, tasks must use an exit call. Note that the hardware prohibits an RTI instruction from returning a task to supervisor mode from a service routine in user mode.
- Routines located in supervisor space must obey all the rules of supervisor library routines such as not calling user mode routines and having no data within the code.

The task tells RSTS/E the space of the service routine when the respective service vectors are set up. The following calls set up the trap service vectors for the task:

- FPPA\$—floating point exception
- SCCA\$—Ctrl/C interception
- SVTK\$—SST trap vector table
- SVDB\$—SST debugging trap vector table

In the FPPA\$ and SCCA\$ calls, the task issues a single address vector. If bit 0 of the vector is zero, the service routine is in user space. If bit 0 is 1 (an odd address vector), the routine is in supervisor space.

In the SVTK\$ and SVDB\$ calls, the task issues a list of vectors associated with the different events (BPT etc.). Bit 0 in each of the individual service routine vector addresses gives the mode the routine is in, but in a different way from FPPA\$ and SCCA\$. If the vector entry is even, the SST routine executes in the same mode (either user or supervisor) that the processor was in when the SVTK\$ or SVDB\$ call was issued. If the vector entry is odd, the SST routine executes in the other mode.

For example, if the processor is in supervisor mode when an SVTK\$ is issued and the vector is odd (bit 0 set), the SST routine executes in the user mode. This method is the same as RSX-11M-PLUS. It lets the individual SSTs be different modes at the same time (BPT in user and address trap in supervisor). Bit 0, which is the flag(s), is a member of the vector list, *not* the address pointer to the vector list.

3.3 .AST—Enable/Disable AST Delivery

Form

.AST

Function

The .AST directive has two functions: disable AST delivery and enable AST delivery. The .AST disable function stalls all AST deliveries from the monitor until the user explicitly enables them with the .AST enable directive.

Privileges Required

None

Data Passed

The only data passed for this directive is in byte 0 of the XRB. If zero, enable AST deliveries. If minus one, disable AST deliveries.

Data Returned

Except for a possible error code in byte 0 of the FIRQB, this directive does not return any meaningful data.

Errors

BADFUO Illegal function code.

3.4 .ASTX—Exit from AST Routine

Form

.ASTX

Function

The .ASTX directive is similar to a RETURN in a normal subroutine. It instructs the monitor that the asynchronous routine has completed and that control should return to the job at the point it was interrupted. All AST routines must finish with a .ASTX directive.

When an AST routine issues the .ASTX directive, the PSW previously stored on the user's stack is validated. The PSW is forced into the standard mode (previous user/current user mode, register set 1, and priority 0). The PC and PSW are then used to return control to the program at the point where it was interrupted.

The XRB and bytes 0, 6, and 7 of the FIRQB are restored. If the user has altered the PC, PSW, or destroyed the stack contents, no specific error is returned. Instead, bad PC and/or stack causes fatal errors which are handled in the usual way (entry to P.BAD in the RTS).

The AST routine must make sure all general registers (R0 to R5) and the stack pointer have the same contents as on entry to the AST routine. In addition, if any part of the FIRQB other than bytes 0, 6, and 7 has been used, the AST routine must restore the contents of the FIRQB to what it had on entry. Failure to observe these rules may produce unexpected results.

3.5 CALFIP — Call the File Processor

Form

CALFIP

Function

The CALFIP directive to the RSTS/E monitor handles housekeeping necessary for input/output on RSTS/E. For example, CALFIP lets you open a channel for file or device I/O.

You select the particular function by setting a function field in the FIRQB (at offset FQFUN). Other parameters are also passed to the monitor in the FIRQB, depending on the function requested.

Table 3-2 lists the CALFIP subfunctions by function code. The sections following Table 3-2 describe the subfunctions in alphabetical order.

Table 3-2: Summary of CALFIP Subfunctions

FQFUN Value (Octal)	Mnemonic	Action Performed (BASIC-PLUS Equivalent)
0	CLSFQ	Close an open channel (CLOSE)
2	OPNFQ	Open a channel (OPEN FOR INPUT)
4	CREFQ	Create/extend a file (file-structured OPEN FOR OUTPUT)
6	DLNFQ	Delete a file by name (KILL)
10	RENFQ	Rename a file (NAME...AS)
12	DIRFQ	Get directory information
14	UUOFQ	Process UUU
16	ERRFQ	Get error message text
20	RSTFQ	Reset (close) a channel or all channels (except channel 0)
22	LOKFQ	Look up a file
24	ASSFQ	Allocate a device
26	DEAFQ	Deallocate a device
30	DALFQ	Deallocate all devices
32	CRTFQ	Create/extend a temporary file on disk
34	CRBFQ	Create/extend a compiled image file on disk (file-structured OPEN FOR OUTPUT, protection code bit 6 always set)

3.5.1 ASSFQ (Allocate a Device)

Form

```

MOV B #ASSFQ, FIRQB+FQFUN
      .
      .
      .
(Set up FIRQB to define device)
      .
      .
      .
CALFIP
  
```

Function

The ASSFQ subfunction reserves a physical device for a job or transfers assignment of a currently owned device to another job. For host-initiated LAT ports, this directive initiates a connection to the server currently assigned to the port.

Privileges Required

DEVICE to allocate a device for the current job if the requested device is restricted. HWCTL to seize a device or reallocate a device to a job in another account.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	ASSFQ (= 24) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	//////// =0,assign;<>0,job no.	10	FQNAM1
	13	////////////////////////////////	12	
	15	DOS or ANS (1 word RAD50) or 0 (magtape)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	mode	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN The function code ASSFQ (octal value = 24).

FIRQB+FQNAM1	This byte is set to zero to indicate an assign; if nonzero, it is used as the job number to which the device is to be reassigned. The high byte of this word (FIRQB+11) must be set to zero. If you do not have HWCTL privilege, you can reassign a device only to a job that is logged in to the same account as your current account.										
FIRQB+FQEXT	When the device is magnetic tape, this word can contain either DOS or ANS in RAD50 format, to indicate DOS or ANSI label format for the tape drive. It can also be set to zero to indicate the system default for the drive.										
FIRQB+FQMODE	This word contains the mode to use when allocating the device. Valid modes are: <table> <thead> <tr> <th>Mode</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>100001</td> <td>Used to allocate a device that is currently allocated to another user. This is a snagging allocation, available to users with the HWCTL privilege.</td> </tr> <tr> <td>100002</td> <td>Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.</td> </tr> <tr> <td>100004</td> <td>Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.</td> </tr> <tr> <td>0</td> <td>Used when you do not want a snagging allocation and when you want the LAT driver to use the port's default queueing setting.</td> </tr> </tbody> </table>	Mode	Description	100001	Used to allocate a device that is currently allocated to another user. This is a snagging allocation, available to users with the HWCTL privilege.	100002	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.	100004	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.	0	Used when you do not want a snagging allocation and when you want the LAT driver to use the port's default queueing setting.
Mode	Description										
100001	Used to allocate a device that is currently allocated to another user. This is a snagging allocation, available to users with the HWCTL privilege.										
100002	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.										
100004	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.										
0	Used when you do not want a snagging allocation and when you want the LAT driver to use the port's default queueing setting.										
FIRQB+FQDEV	Device name, as two ASCII characters.										
FIRQB+FQDEVN	The device unit number is passed here in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no unit number.										

Data Returned

Byte 0 of the FIRQB contains a possible error code. FIRQB+FQFIL contains the previous owner of the device. If the device is a keyboard, FIRQB+FQFIL+1 contains a 0 for an interactive keyboard or a 1 for a LAT port used for host-initiated connections.

Errors

For Assign (byte at FIRQB+FQNAM1 = 0):

NODEVC	The device name specified at FIRQB+FQDEV is not a valid device name.
NOTAVL	The device and unit specified exists on the system, but the attempt to reserve it is prohibited because: <ul style="list-style-type: none"> • The device is currently reserved by another job. • The device or its controller has been disabled by the system manager. • The device is a keyboard line for a pseudo keyboard only.
NOBUFS	No buffers available to initiate the connection to the terminal server.

For Reassign (byte at FIRQB+FQNAM1 ≠ 0):

BDNERR	The job number specified does not exist.
INUSE	The device specified is currently open or has an open file.

- NODEVC** The device name is a logical device name for which a physical device is not currently assigned.
- NOTAVL** (See previous description for Assign.)
- PRVIOL** You do not have HWCTL privilege and you tried to reallocate a device to a job that is logged in to an account other than your current account.

Example

The following code reassigns magnetic tape unit 0 (MT0:) to job 12:

```

MAGT:      .ASCII    /MT/
          CALL      CLRFQB                            ;CALL ROUTINE TO CLEAR FIRQB
          MOVB     #ASSFQ,FIRQB+FQFUN               ;SET FUNCTION CODE
          MOVB     #12.,FIRQB+FQNAM1                ;ASSIGN TO JOB 12
          MOV      #^RANS,FIRQB+14                 ;ANSI-LABEL TAPE
          MOV      MAGT,FIRQB+FQDEV                 ;MAGTAPE DEVICE
          CLRB     FIRQB+FQDEVN                     ;UNIT NO. 0
          MOVB     #377,FIRQB+FQDEVN+1             ;UNIT NO. REAL
          CALFIP
          TSTB     FIRQB                            ;ANY ERRORS?
          BNE      ERRTN                            ;BRANCH TO PROCESS ERROR

```

See the section entitled "Programming Hints" for information on the CLRFQB routine.

3.5.2 CLSFQ (Close a Channel)

Form/Example

```

CHANO=8. ; Set value for channel
MOVB #CLSFQ, FIRQB+FQFUN ; Set function code in FIRQB
MOVB #CHANO*2, FIRQB+FQFIL ; Set channel 8 for CLOSE
CALFIP ; Execute monitor directive

```

Function

The CLSFQ function closes a channel. The specific action taken depends on the device or file that was previously opened on the channel and whether it was opened for input or output, as well as the mode with which it was opened. For example, closing a channel on which a magnetic tape was opened for input in file-structured mode causes the monitor to position the tape at the end-of-file (EOF). See the *RSTS/E Programming Manual* for a description of the actions taken on closing various devices/files.

Requesting CLSFQ for a channel that is not currently open returns with no action taken and no error is indicated.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	CLSFQ (= 0)	2	
	5	////////////////////////////////	4	FQFIL
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN The function code CLSFQ (octal value = 0).
FIRQB+FQFIL Channel number times two; defines the channel to be closed.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the CLSFQ function of CALFIP does not return any meaningful data.

Errors

All errors with the CLSFQ function of CALFIP are device-dependent. See Appendix A for a full list of errors.

Example

The following MACRO code closes the file or device on channel 12:

```
CALL      CLRFBQ           ;CLEAR FIRQB
MOVB     #CLSFQ,FIRQB+FQFUN ;SET FUNCTION CODE IN FIRQB
MOVB     #12.*2,FIRQB+FQFIL ;SET CHANNEL 12 FOR CLOSE
CALFIP   ;EXECUTE MONITOR DIRECTIVE
TSTB     FIRQB           ;TEST BYTE 0 FOR ERROR
BNE      ERRTN           ;BRANCH TO PROCESS ERROR
```

See Programming Hints for information on the CLRFBQ routine.

3.5.3 CRBFQ (Create a Binary [Executable] File and Open It on a Channel)

Form

```

MOVW #CRBFQ,FIRQB+FQFUN ;SET FUNCTION CODE
.
.
.
(Set parameters in FIRQB appropriate to device)
.
.
.
CALFIP
    
```

Function

The CRBFQ function creates and opens a binary (executable) file. It is identical to the CREFQ function, except that the protection code is automatically set to indicate an executable file, and the file must be opened on a disk device.

Privileges Required

TUNE to set caching mode. SYSIO to set the privileged-program bit (bit 7 in FQPROT). A matching PPN, GWRITE, or WWRITE, and/or SYSIO to create or rename a file. You also need write access (by protection code, GWRITE, WWRITE, and/or SYSIO) to supersede an existing file.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	CRBFQ (= 34)	////////////////////////////////	2	
FQSIZM	5	(must = 0)	channel no. * 2	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	(file size in 512-byte blocks)		16	FQSIZ
	21	////////////////////////////////		20	
	23	mode		22	FQMODE
	25	////////////////////////////////		24	
FQPROT	27	file protection	<>0, prot.code.real	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	file clustersize		34	FQCLUS
	37	device cluster number for first block		36	FQNTENT

FIRQB+FQFUN	The function code CRBFQ (octal value = 34).
FIRQB+FQFIL	Channel number times two; defines the channel upon which the file is to be opened.
FIRQB+FQSIZM	On other types of create opens, this byte contains the most significant bits (MSB) of the file size. Executable (binary) files cannot be greater than 65,535 blocks so this byte must always be passed as zero.
FIRQB+FQPPN	The PPN with which the file is to be created. The project number is in the high byte (FQPPN+1) and the programmer number in the low byte (FQPPN). A value of zero in both bytes defaults to the PPN under which the calling program is running.
FIRQB+FQNAM1	The file name created, as two words of RAD50 data.
FIRQB+FQEXT	The file type, as one word of RAD50 data.
FIRQB+FQSIZ	The desired file size, in 512-byte blocks. The file is preextended to the specified size; that is, the space for the file is allocated when the file is opened, rather than as it is written.
FIRQB+FQMODE	The mode with which the file is to be opened; values and actions taken are as described for the MODE modifier in file-structured OPEN FOR OUTPUT statements for disk, as the <i>RSTS/E Programming Manual</i> describes. If a mode value is used, bit 15 of this word must be set to 1.
FIRQB+FQPROT	File protection code; values for this field define read/write and execute access to the created file (see the <i>RSTS/E System User's Guide</i>). If you want a default protection code, then set a full word of zeros at FIRQB+FQPFLG. In this case, either the system default for protection code will be used, or, if the CRBFQ will be deleting a previously existing file with the same file name, type, PPN, and device, the file protection code of the previously existing file will be used. To assign a specific file protection code, a nonzero value is passed in byte FIRQB+FQPFLG (by convention, 255) and the specific file protection code in byte FIRQB+FQPROT. Bit 6 is automatically set, indicating that the file is executable. The <i>RSTS/E System User's Guide</i> describes the protection codes for executable files.
FIRQB+FQDEV	The device name is passed here as two ASCII characters; it must be a disk device. If this word is zero, the public disk structure is assumed.
FIRQB+FQDEVN	The device unit number is passed here in binary. A nonzero value in FQDEVN+1 indicates an explicit device unit number. A zero value in FQDEVN+1 indicates no unit number.
FIRQB+FQCLUS	This parameter has the same function as the CLUSTERSIZE option in BASIC-PLUS. The <i>BASIC-PLUS Language Manual</i> describes the CLUSTERSIZE option for disks.

FIRQB+FQNTENT

Device cluster number for placement of block 1 of the file. When you are creating a new file, you can place block 1 of the file on a particular block by specifying the disk device cluster number in this word. If this word is zero, no placement is done. If it is nonzero, the monitor will try to place the file at the specified device cluster or as near after it as possible.

If the first block of the file can be placed at or after the specified device cluster number, the monitor sets a bit in the file's entry in the User File Directory (UFD). If the first block of the file cannot be placed at or after the specified device cluster number, the file is placed at the lowest free block on the disk, the bit in the file's entry in the UFD is not set, and no error is returned.

A value of -1 specifies the center of the disk; a value of -2 means immediately after the directory.

Data Returned

Mnemonic	Octal Offset	FIRQB		Octal Offset	Mnemonic
	1	////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
FQSIZE	5	(always 0)	channel number * 2	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	(file size in 512-byte blocks)		16	FQSIZ
	21	reasonable buffer size for device		20	FQBUFL
	23	(as passed)		22	FQMODE
	25	device description		24	FQFLAG
FQPROT	27	protection code	clustersize, mod256	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	flag byte	device unit number	32	FQDEVN
	35	file identification index		34	FQCLUS
	37	(as passed)		36	FQNTENT

- FIRQB+FQJOB** Current job number times two.
- FIRQB+FQFIL** Channel number times two; defines the channel on which the file is open.
- FIRQB+FQPPN** The PPN under which the file is open. An actual PPN is returned here even if this word was passed as zero.
- FIRQB+FQNAM1** The file name created, as two words of RAD50 data.
- FIRQB+FQEXT** The file type created, as one word of RAD50 data.
- FIRQB+FQSIZ** The size to which the file was preextended, in 512-byte blocks.

FIRQB+FQBUFL	Reasonable buffer size for disk reads and writes, in bytes. (Always 512 for disk.)
FIRQB+FQFLAG	Description of the device just opened (the same information as the BASIC-PLUS STATUS variable). The low byte contains the device's handler index, always zero (DSKHND) for disk. The high byte contains a set of status flags, irrelevant here since the device is always disk. (See the OPNFQ subfunction for more information on these settings.)
FIRQB+FQPFLG	The file cluster size, modulo 256. That is, a file cluster size of 256 is indicated by zero. This is the same as the value passed at FIRQB+FQCLUS, except that it is returned in a byte instead of a word.
FIRQB+FQPROT	The protection code of the file. Bit 6 is 1, and bits 5 through 0 are as passed. Bit 7 is as passed if the caller has SYSIO privilege; otherwise it is 0.
FIRQB+FQDEV	The device name of the disk device, as two ASCII characters. The actual device name is returned here, even if this word was passed as zero.
FIRQB+FQDEVN	The device unit number. The actual unit number is returned here, even if FIRQB+FQDEVN+1 was passed as zero.
FIRQB+FQCLUS	The file identification index of this file. This word is significant mainly in that it can be used in place of the file name in subsequent opens of the file on disk. You can open the file with the OPNFQ subfunction of CALFIP using an explicit PPN in FIRQB+FQPPN, a zero word in FIRQB+FQNAM1, an explicit device name in FQDEV and FQDEVN, and the file identification index in FIRQB+FQNAM1+2. Note that there is no performance gain for using the file identification index instead of the file name. The file identification index is provided for compatibility with RSX. Furthermore, the file identification index is changed when the REORDR utility is run (see the <i>RSTS/E System Manager's Guide</i>).

Errors

NOTCLS	The specified channel is already open. It must be closed before it can be opened again.
PRVIOL	The specified device is not a disk device. The CRBFQ function can be executed only for a disk device.
QUOTA	Extending the file causes the disk quota to be exceeded. This error does not occur if the user has EXQTA privilege.
xxxxx	Other errors are device-dependent. See Appendix A for a full list of possible error codes.

Example

The following MACRO code sets up the FIRQB for the CRBFQ function of CALFIP. The PPN is set to 2,210; the file name and type are set to FILNAM.TYP. The protection code is set such that the file is read/write-protected against everyone but the caller (user with PPN 2,210), and execute-protected against all but the caller and those in the caller's project (users with project number = 2). The file is opened on disk unit 2 (DK2:). File size and cluster size are not specified. The cluster size defaults to the pack cluster size and the file size is not preallocated.

```
DK:      .ASCII /DK/
        CALL    CLRFQB                ;CLEAR FIRQB
        MOVB   #CRBFQ,FIRQB+FQFUN     ;SET FUNCTION CODE
        MOVB   #4*2,FIRQB+FQFIL       ;SET CHANNEL = 4
        MOVB   #2,FIRQB+FQPPN+1      ;SET PROJECT NUMBER =2
        MOVB   #210.,FIRQB+FQPPN     ;SET PROG. NO.=210.
        MOV    #^RFIL,FIRQB+FQNAM1    ;SET FILE NAME AND
        MOV    #^RNAM,FIRQB+FQNAM1+2  ;TYPE TO
        MOV    #^RTYP,FIRQB+FQEXT     ;"FILNAM.TYP"
        MOVB   #<8.+16.+32.>,FIRQB+FQPROT ;SET PROTECTION CODE
        MOVB   #255.,FIRQB+FQPFLG    ;SET PROTECTION CODE REAL
        MOV    DK,FIRQB+FQDEV         ;SET DEVICE TO DISK,
        MOVB   #2,FIRQB+FQDEVN        ;UNIT 2
        MOVB   #255.,FIRQB+FQDEVN+1   ;(EXPLICIT DEVICE NO.)
        CALFIP
```

See Programming Hints for information on the CLRFQB routine.

3.5.4 CREFQ (Create a File and Open It on a Channel)

Form

```
MOV#B    #CREFQ,FIRQB+FQFUN    ;SET FUNCTION CODE
      .
      .
      .
      (set parameters appropriate to device)
      .
      .
      .
CALFIP
```

Function

The CREFQ function performs the same action as a file-structured OPEN FOR OUTPUT statement in BASIC-PLUS. Parameters defining the device, file name and type, protection code, mode, file size, and cluster size can be used by setting values in the FIRQB. The choice depends upon the device.

For example, CREFQ with a file name and type on a magtape device with mode = 128 causes an OPEN for APPEND operation. A search for an existing file with the specified name and on the specified device is made; the file would have to be the last file on the tape. When found, the tape is positioned after the last record in the file, ready for data to be written and appended. The *RSTS/E Programming Manual* describes the file-structured OPEN for OUTPUT operation for the various devices.

Privileges Required

TUNE to set caching mode. SYSIO to set the privilege bit (bit 7 in FQPROT). A matching PPN, GWRITE, WWRITE, and/or SYSIO to create or rename a file. You also need write access (by protection code, GWRITE, WWRITE, and/or SYSIO) to supersede an existing file.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	CRBFQ (= 4)	////////////////	2	
FQSIZM	5	MSB of file size	channel no. * 2	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	LSB of file size		16	FQSIZ
	21	////////////////////		20	
	23	mode		22	FQMODE
	25	////////////////////		24	
FQPROT	27	file protection	<>0, prot.code.real	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	file clustersize		34	FQCLUS
	37	device cluster number for first block		36	FQNENT

- FIRQB+FQFUN** The function code CREFQ (octal value = 4).
- FIRQB+FQFIL** Channel number times two; defines the channel upon which the file is to be opened.
- FIRQB+FQSIZM** For large disk files (greater than 65,535 blocks), this byte contains the most significant bits (MSB) of the file size. See **FIRQB+FQSIZ**, for a discussion of the entire 24-bit field used for large files on disk.
- FIRQB+FQPPN** The PPN with which the file is to be created. The project number is in the high byte (**FIRQB+FQPPN+1**), and the programmer number in the low byte (**FIRQB+FQPPN**). A value of zero defaults to the PPN under which the calling program is running.
- FIRQB+FQNAM1** The file name to create, as two words of RAD50 data.
- FIRQB+FQEXT** The file type, as one word of RAD50 data.
- FIRQB+FQSIZ** The desired file size, in 512-byte blocks. This parameter is relevant only for disk and ANSI magtape files. For disk files, this word forms the least significant bits (LSB) of the file size. It is combined with the byte at **FIRQB+FQSIZM** to form a 24-bit integer. The disk file is automatically preextended to the indicated size. (That is, the space for the file is allocated when the file is opened, not as it is written.) If preextending is not desired then this value and **FIRQB+FQSIZM** should be zero.
- For ANSI magtape, this word has the same function as the **FILESIZE** option in BASIC-PLUS (see the *RSTS/E Programming Manual*).

FIRQB+FQMODE	The mode with which the file is to be opened; values and actions taken for specific devices are as described for the MODE modifier for file-structured OPEN for OUTPUT statements in the <i>RSTS/E Programming Manual</i> . If a mode value is used, bit 15 of this word must be set to 1.
FIRQB+FQPROT	File protection code; values for this field define subsequent read and write access to the opened file (see the <i>RSTS/E System User's Guide</i>). If you want a default protection code, then set a full word of zeros at FIRQB+FQPFLG. In this case, either the system default for protection code will be used, or, if the CREFQ will be deleting a previously existing file with the same file name, type, ppn, and device, the file protection code of the previously existing file will be used. To assign a specific file protection code, put a nonzero value in byte FIRQB+FQPFLG (by convention, 255) and the specific file protection code in byte FIRQB+FQPROT. This allows an explicit file protection code of 0.
FIRQB+FQDEV	The device name is passed here as two ASCII characters. A zero word indicates the public disk structure.
FIRQB+FQDEVN	The device unit number is passed here in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no unit number.
FIRQB+FQCLUS	This parameter has the same function as the CLUSTERSIZE option in BASIC-PLUS. It is relevant only for disk files and ANSI magtape files. A description of the CLUSTERSIZE option for disk is given in the <i>BASIC-PLUS Language Manual</i> ; for ANSI magtape, in the <i>RSTS/E Programming Manual</i> .
FIRQB+FQNENT	For disk files, the device cluster number for placement of block 1 of the file. When creating a new file, you can place block 1 of the file on a particular block by specifying the disk device cluster number in this word. If this word is zero, no placement is done. If it is nonzero, the monitor will try to place the file at the specified device cluster or as near after it as possible. If the first block of the file can be placed at or after the specified device cluster number, the monitor sets a bit in the file's entry in the UFD. If the first block of the file cannot be placed at or after the specified device cluster number, the file is placed at the lowest free block on the disk, the bit in the file's entry in the UFD is not set, and no error is returned. A value of -1 means the center of the disk; a value of -2 means immediately after the directory.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
FQSIZM	5	MSB of file size	channel number * 2	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	LSB of file size		16	FQSIZ
	21	reasonable buffer size for device		20	FQBUFL
	23	(as passed)		22	FQMODE
	25	device description		24	FQFLAG
FQPROT	27	protection code	clustersize, mod256	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	flag byte	device unit number	32	FQDEVN
	35	file identification index		34	FQCLUS
	37	(as passed)		36	FQNTENT

NOTE

For nondisk devices, the relevant information returned with the CREFQ subfunction is in the two words at FIRQB+FQBUFL and FIRQB+FQFLAG. All other words are simply returned as passed.

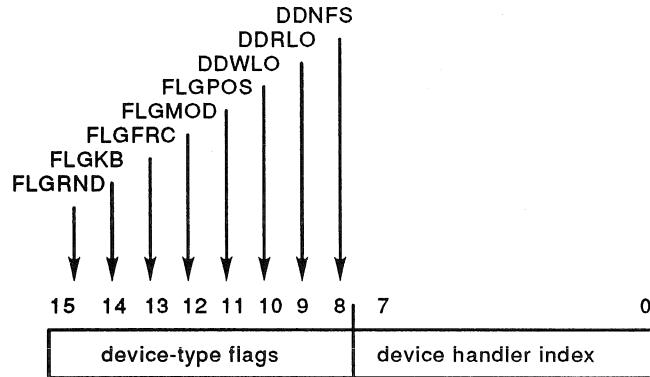
FIRQB+FQJOB	Current job number times two.
FIRQB+FQFIL	Channel number times two; defines the channel on which the file is open.
FIRQB+FQSIZM	For large files, this byte contains the MSB of the size to which the file was preextended, in 512-byte blocks. This byte is combined with the word at FIRQB+FQSIZ to form a 24-bit field giving the file size.
FIRQB+FQPPN	The PPN under which the file is open. An actual PPN is returned here even if this word was passed as zero.
FIRQB+FQNAM1	The file name created, as two words of RAD50 data.
FIRQB+FQEXT	The file type created, as one word of RAD50 data.
FIRQB+FQSIZ	The size to which the file was preextended, in 512-byte blocks.

FIRQB+FQBUFL

Reasonable buffer size for this device, in bytes. If you are doing device-independent I/O (that is, if you do not want to keep track of which device is being opened and perform specific opens, reads, and writes, depending on the device), this value is the monitor's best guess for a buffer size to use in subsequent reads and writes on the opened channel. (See the .READ and .WRITE directives.)

FIRQB+FQFLAG

Description of the device just opened (same information as the BASIC-PLUS STATUS variable). The low byte contains the device's handler index. There is one unique handler index for all device types. The high byte contains a set of status flags to allow for device-independent I/O routines.



High Byte — Device-Type Flags

The bits in the high byte of the flags word are set to indicate the type of file or device just opened:

- | | | |
|--------|-----|--|
| FLGRND | = 1 | The device or file is random-access. |
| | = 0 | The device or file is sequential. |
| FLGKB | = 1 | The file or device is a terminal-type file or device (or is generically a terminal). |
| | = 0 | The file or device is not a terminal-type file or device. |
| FLGFRC | = 1 | The file or device is byte-oriented. That is, the .READ and .WRITE directives handle data in byte units. |
| | = 0 | The file or device is block-oriented. The .READ and .WRITE directives handle data in block units. |
| FLGMOD | = 1 | The file or device accepts modifiers in .READ and .WRITE directives. |
| | = 0 | The file or device does not accept modifiers in .READ and .WRITE directives. |

FLGPOS	= 1	The file or device keeps track of its horizontal position and expands characters such as TAB into whatever is appropriate for the file or device. You can determine the current horizontal position with the .POSTN directive.
	= 0	The file or device does not keep track of its horizontal position.
DDWLO	= 1	The file or device has been write-locked (with the mode value in the open) or is generically a read-only device.
	= 0	The file or device is not write-locked.
DDRLO	= 1	The device is generically a write-only device.
	= 0	The file or device is not read-locked.
DDNFS	= 1	The file or device is non-file-structured (or is generically not a file-structured device).
	= 0	The file or device is file-structured.

Low Byte — Device Handler Index

Bits 0-7 of the flags word contain a handler index that indicates the generic kind of device. The currently defined values follow.

Octal Value	Symbol	Meaning
0	DSKHND	All disks
2	TTYHND	All terminals
4		Reserved
6	LPTHND	All line printers
10		Reserved
12		Reserved
14	CDRHND	Card reader
16	MTAHND	Magnetic tape
20	PKBHND	Pseudo keyboards
22	RXDHND	Flexible diskettes
24		Reserved
26	NULHND	The null device
30-36		Reserved
40	KMCHND	KMC11
42	IBMHND	IBM interconnect
44		Reserved
46	DMPHND	DMP11/DMV11 device
50	ETHHND	Ethernet device

FIRQB+FQPFLG The file cluster size, modulo 256. That is, a file cluster size of 256 is indicated by zero. This is the same as the value passed at **FIRQB+FQCLUS**, except that it is returned in a byte instead of a word.

FIRQB+FQPROT The protection code of the file. Bit 7 is as passed if the caller has SYSIO privilege, and 0 otherwise; bits 6 to 0 are as passed.

FIRQB+FQDEV	The device name of the disk device, as two ASCII characters. The actual device name is returned here, even if this word was passed as zero.
FIRQB+FQDEVN	The device unit number. The actual unit number is returned here, even if FIRQB+FQDEVN+1 was passed as zero.
FIRQB+FQCLUS	The file identification index of this file. This word is significant mainly in that it can be used in place of the file name in subsequent opens of the file on disk. You can open the file with the OPNFQ subfunction of CALFIP using an explicit PPN in FIRQB+FQPPN, a zero word in FIRQB+FQNAM1, and the file identification index in FIRQB+FQNAM1+2. Note that there is no performance gain for using the file identification index rather than the file name. The file identification index is provided for compatibility with RSX. Furthermore, the file identification index is changed when the REORDR utility is run (see the <i>RSTS/E System Manager's Guide</i>).

Errors

NOTCLS	The specified channel is already open. It must be closed before it can be opened again.
QUOTA	Extending the file causes the disk quota to be exceeded. This error does not occur if the user has EXQTA privilege.
xxxxx	Other errors are device-dependent. See Appendix A for a full list of errors.

Example

The following MACRO code sets up the FIRQB for a CREFQ that opens a file called FILE01.LST on the public disk structure. (The assumption here is that previous code has filled the FIRQB with zeros, so the words at FIRQB+FQDEV and FIRQB+FQDEVN are zero, indicating the public disk. Similarly, the mode (FIRQB+FQMODE) and cluster size (FIRQB+FQCLUS) are zero, indicating normal read/write and the default cluster size.) A protection code of 56 is assigned (write-protected against all but the owner, read-protected against all but those in the owner's project).

```

MOV      #CREFQ, FIRQB+FQFUN      ; Set function code in FIRQB
MOV      #5*2, FIRQB+FQFIL        ; Set channel = 5
MOV      #^RFIL, FIRQB+FQNAM1     ; Set file name
MOV      #^RE01, FIRQB+FQNAM1+2   ; and type to
MOV      #^RLST, FIRQB+FQEXT      ; FILE01.LST
MOV      #56., FIRQB+FQPROT       ; Set protection code to
MOV      #255., FIRQB+FQPFLG      ; explicit protection code
CALFIP

```

3.5.5 CRTFQ (Create and Open a Temporary File)

Form

```
MOVW      #CRTFQ,FIRQB+FQFUN
          .
          .
          .
(set appropriate parameters)
          .
          .
          .
CALFIP
```

Function

The CRTFQ function can be used to create and open a temporary file on disk. The file is temporary only in that the monitor generates a file name and type for the file, which is recognized by the LOGOUT utility, and sets the IGNORE attribute for the file, which is recognized by BACKUP. LOGOUT destroys such files when the user logs out; the monitor does not inherently destroy temporary files created with CRTFQ.

Most parameters relevant on an open are defaulted. You do not define or refer to the file by name; subsequent read and write operations refer to the channel on which the temporary file is open.

In addition to the function code, you specify a channel and, if desired, a file size and/or file cluster size. If an explicit cluster size is specified, it is used. A specified file size may or may not be used. The monitor attempts to reuse an existing temporary file for the same job by simply reopening that file. In this case, the file's size is the size of the previous file. If no previous temporary file for the job exists, or if one does exist but is already in use by somebody else, then a new file is created, with the specified file size. A new file is also created if an explicit device name or cluster size is given.

Privileges Required

TUNE to set caching mode. You also need write access (by protection code, GWRITE, WWRITE, and/or SYSIO) to supersede an existing file.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	CRTFQ (= 32)	////////////////////////////////	2	
FQSIZM	5	MSB of file size	channel no. * 2	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	LSB of file size		16	FQSIZ
	21	////////////////////////////////////		20	
	23	mode		22	FQMODE
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	file cluster size		34	FQCLUS
	37	device cluster number for this block		36	FQNTENT

FIRQB+FQFUN

The function code CRTFQ (octal value = 32).

FIRQB+FQFIL

Channel number times two; defines the channel on which the file is to be opened.

FIRQB+FQSIZM

For large disk files (greater than 65,535 blocks), this byte contains the MSB of the file size. See FIRQB+FQSIZ, for a description of how the entire 24-bit field is used.

FIRQB+FQSIZ

This word contains the LSB of the file's size in 512-byte blocks. (It is combined with the byte at FIRQB+FQSIZM.) The file size may or may not be used. If a temporary file already exists that is not in use, the monitor uses the space allocated to the previous temporary file. However, if cluster size is specified, a new file is created, and the file size indicated by the 24-bit file size is used.

FIRQB+FQMODE

The mode with which the file is to be opened. Values are as described for the MODE modifier in OPEN for OUTPUT statements for disk (see the *RSTS/E Programming Manual*). The only relevant modes are for creating a tentative file, creating a contiguous file, creating a conditionally contiguous file, and for data caching. All other mode bits are ignored, except bit 15. If a mode value is used, bit 15 of this word must be set to 1.

FIRQB+FQDEV

The device name is passed here as two ASCII characters; it must be a disk device. A value of zero in this word indicates _SY:, the public disk.

FIRQB+FQDEVN The device unit number is passed here in binary. A nonzero value in the high byte (FIRQB+FQDEVN+1) indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no unit number.

FIRQB+FQCLUS File cluster size. Performs the same function as the CLUSTERSIZE option in BASIC-PLUS.

FIRQB+FQNTENT The device cluster number for placement of block 1 of the file on disk. When creating a new file, you can place block 1 of the file on a particular block by specifying the disk device cluster number in this word. If this word is zero, no placement is done. If it is nonzero, the monitor tries to place the file at the specified device cluster or as near after it as possible.

If the first block of the file can be placed at or after the specified device cluster number, the monitor sets a bit in the file's entry in the UFD. If the first block of the file cannot be placed at or after the specified device cluster number, the file is placed at the lowest free block on the disk, the bit in the file's entry in the UFD is not set, and no error is returned.

A value of -1 means the center of the disk; a value of -2 means immediately after the directory.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
FQSIZM	5	MSB of file size	channel no. * 2	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	LSB of file size		16	FQSIZ
	21	reasonable buffer size for device		20	FQBUFL
	23	(as passed)		22	FQMODE
	25	device description		24	FQFLAG
FQPROT	27	protection code	clustersize, mod256	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	flag byte	device unit number	32	FQDEVN
	35	file identification index		34	FQCLUS
	37	(as passed)		36	FQNTENT

FIRQB+FQJOB Current job number times two.

FIRQB+FQFIL Channel number times two; defines the channel on which the file is open.

FIRQB+FQSZM	For large disk files (greater than 65,535 blocks), this byte contains the MSB of the file size in 512-byte blocks. It is combined with the word at FIRQB+FQSIZ to form a 24-bit field giving the file size.
FIRQB+FQPPN	The PPN under which the file is open. An actual PPN is returned here even if this word was passed as zero.
FIRQB+FQNAM1	The file name created; two words of RAD50 data.
FIRQB+FQEXT	The file type created; one word of RAD50 data.
FIRQB+FQSIZ	The size to which the file was preextended, in 512-byte blocks.
FIRQB+FQBUFL	Reasonable buffer size for disk reads and writes, in bytes. (Always 512. for disk.)
FIRQB+FQFLAG	Description of the device just opened (the same information as the BASIC-PLUS STATUS variable). The low byte contains the device's handler index, always zero (DSKHND) for disk. The high byte contains a set of status flags, irrelevant here since the device is always disk. See the OPNFQ subfunction for more information about these settings.
FIRQB+FQPFLG	The file cluster size, modulo 256. That is, a file cluster size of 256 is indicated by zero. This is the same as the value passed at FIRQB+FQCLUS, except that it is returned in a byte instead of a word.
FIRQB+FQPROT	The protection code of the file.
FIRQB+FQDEV	The device name of the disk device, as two ASCII characters. The actual device name is returned here, even if this word was passed as zero.
FIRQB+FQDEVN	The device unit number. The actual unit number is returned here, even if FIRQB+FQDEVN+1 was passed as zero.
FIRQB+FQCLUS	The file identification index of this file. This word is significant mainly in that it can be used in place of the file name in subsequent opens of the file on disk. You can open the file with the OPNFQ subfunction of CALFIP using an explicit PPN in FIRQB+FQPPN, a zero word in FIRQB+FQNAM1, and the file identification index in FIRQB+FQNAM1+2. Note that there is no performance gain for using the file identification index rather than the file name. The file identification index is provided for compatibility with RSX. Furthermore, the file identification index is changed when the REORDR utility is run on the directory (see the <i>RSTS/E System Manager's Guide</i>).

Errors

QUOTA	Extending the file causes the disk quota to be exceeded. This error does not occur if the user has EXQTA privilege.
xxxxx	All other errors for this directive are device-dependent. See Appendix A for a full list of errors.

Example

The following MACRO code opens a temporary file on channel 13. Assume that the FIRQB has been initialized to all zeros. Hence, the temporary file is created on the public disk structure:

```

MOV B      #CRTFQ, FIRQB+FQFUN          ;SET FUNCTION CODE
MOV B      #13.*2, FIRQB+FQFIL         ;SET CHANNEL TO 13
CALFIP

```

3.5.6 DALFQ (Deallocate All Devices and Deassign All User Logicals)

Form

```
MOVB #DALFQ, FIRQB+FQFUN
CALFIP
```

Function

The DALFQ subfunction deallocates all devices currently allocated to the job and deassigns all user logicals assigned by the job.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////////	0	
FQFUN	3	DALFQ (= 30) | //////////////////////////////////	2	
	5	////////////////////////////////////	4	
	7	////////////////////////////////////	6	
	11	////////////////////////////////////	10	
	13	////////////////////////////////////	12	
	15	////////////////////////////////////	14	
	17	////////////////////////////////////	16	
	21	////////////////////////////////////	20	
	23	////////////////////////////////////	22	
	25	////////////////////////////////////	24	
	27	////////////////////////////////////	26	
	31	////////////////////////////////////	30	
	33	////////////////////////////////////	32	
	35	////////////////////////////////////	34	
	37	////////////////////////////////////	36	

FIRQB+FQFUN The function code DALFQ (octal value = 30).

Data Returned

The DALFQ subfunction of CALFIP does not return any meaningful data.

Errors

No errors are possible with DALFQ.

3.5.7 DEAFQ (Deallocate a Device)

Form

```

MOV B      #DEAFQ, FIRQB+FQFUN
.
.
.
(Define device to be deallocated in FIRQB)
.
.
.
CALFIP
  
```

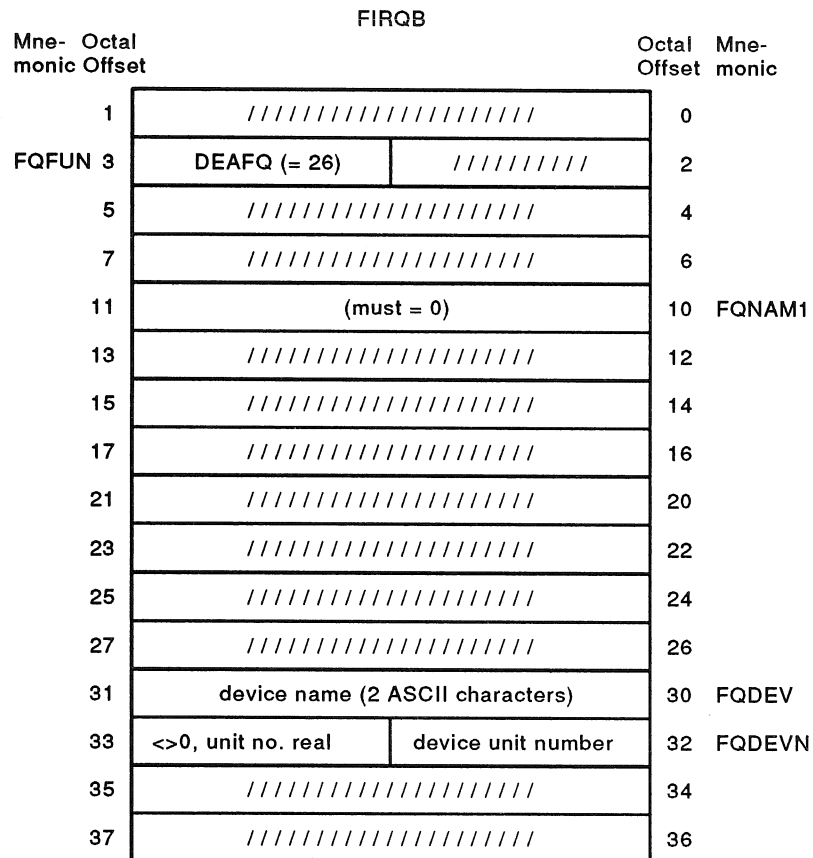
Function

The DEAFQ subfunction deallocates (that is, releases it for use by other jobs) a device from the current job. If the device is an outbound LAT keyboard, DEAFQ terminates any connection before deallocating the keyboards.

Privileges Required

None

Data Passed



FIRQB+FQFUN The DEAFQ function code (octal value = 26).

FIRQB+FQNAM1 The word at this location must be set to zero.

FIRQB+FQDEV The name of the device to be deallocated, as two ASCII characters.
FIRQB+FQDEVN The device unit number is passed here in binary. A nonzero value in **FIRQB+FQDEVN+1** indicates an explicit device unit number, while a zero value indicates no device unit number.

Data Returned

Except for a possible error in byte 0 of the **FIRQB**, the **DEAFQ** subfunction of **CALFIP** does not return any meaningful data.

Errors

NODEV The device or its type specified at **FIRQB+FQDEV** and **FIRQB+FQDEVN** is not part of your system configuration.

Example

The following code deallocates **LP:** from the current job:

```
CALL     CLRFQB                                ; Clear FIRQB
MOVB     #DEAFQ, FIRQB+FQFUN                ; Set function code
MOV      #"LP, FIRQB+FQDEV                 ; Device=line printer
CALFIP
```

See **Programming Hints** for information on the **CLRFQB** routine.

3.5.8 DIRFQ (Get Directory Information)

Form

```
MOVW      #DIRFQ, FIRQB+FQFUN
          .
          .
          .
(Define device for the directory wanted)
          .
          .
          .
CALFIP
```

Function

The DIRFQ subfunction of CALFIP returns directory information about a disk, DECTape, or magtape file. Two forms of the call are available. One leaves a magtape file positioned at the EOF and returns the size of the file as part of the directory information. The second form, for magtape only, leaves a magtape file positioned at the beginning of the file, and does not return the size of the file.

NOTE

For disk directory lookup on a PPN other than that of the caller, DIRFQ returns only those files to which the caller has read or execute access.

Privileges Required

DEVICE to perform a directory lookup or disk lookup on caller's account if the referenced device is restricted. You need read or execute access (by protection code, GREAD, or WREAD) to perform a disk directory lookup on another account.

Data Passed — Directory Lookup on Index

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	DIRFQ (= 12) //////////////////////////////////	2	
	5	index of file to read	4	FQFIL
	7	project number programmer number	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN

The function code DIRFQ (octal value = 12).

FIRQB+FQFIL

The index of the file to read. If this word is zero, the monitor returns data for the first file in the directory. For some positive value n, the monitor returns data for the n+1 file in the directory. For magtape, a value of zero causes the monitor to rewind the tape before it gets the information for the first file (by reading the label record of the file). The monitor then spaces the tape forward to the next EOF record and calculates the number of records in the file. The tape is left in that position. A nonzero value performs the same action, except that the tape is not rewind.

For DECTape, the first call issued must have a value of zero in this word to read the directory blocks from the tape before reading the first file. Subsequent calls with this word nonzero read the directory from the BUFF.SYS file. (Directory information for DECTape is kept in this system file on disk to speed up DECTape file processing: see the *RSTS/E Programming Manual*.)

FIRQB+FQPPN

The PPN of the directory to look up, for disk or magnetic tape. (The monitor does not use these bytes if the device is DECTape but simply returns information for each file read on the device.)

If this word is zero and the device is disk, this directive returns information for the PPN under which this job is being executed.

If this word is zero and the device is magnetic tape, this directive returns information for each file read, regardless of the PPN under which it was written.

- FIRQB+FQDEV** The device name, as two ASCII characters. Must be disk, magnetic tape, or DECTape. If this word is zero, the public disk structure (_SY:) is used.
- FIRQB+FQDEVN** The device unit number is passed here in binary. A nonzero value in FQDEVN+1 indicates an explicit device unit number. A zero value in FQDEVN+1 indicates no unit number.

Data Passed — Special Magnetic Tape Lookup

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	DIRFQ (= 12) | //////////////////////////////////	2	
	5	index of file to read	4	FQFIL
	7	must = 177777 for magnetic tape lookup	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real | device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

- FIRQB+FQFUN** The function code DIRFQ (octal value = 12).
- FIRQB+FQFIL** Index number of the file to be read. If this word is zero, information is returned for the first file in the directory. If this word is some positive value n, information is returned for the n+1 file in the directory. A value of zero causes the monitor to rewind the tape before getting information from the first file (by reading the label record). It then back spaces the tape one record, leaving it positioned at the beginning-of-file (BOF). (This action leaves the tape positioned such that an open on this file will succeed on a single read from tape.)

A nonzero value does not cause the tape to be rewound; the next record is read (it must be a label), and the tape is backspaced one record. When you are searching a tape for specific files to read, the normal action is to execute this directive with a value of zero first. If the file is one to be read, open the file requesting no rewind, process the file, and close it to position the tape at the EOF. If the file is not one to be read, space the tape forward to the next EOF. (You can do this in MACRO with the .SPEC directive.) Then issue the DIRFQ call with a nonzero value in the word beginning at FIRQB+FQFIL, and continue the process.

- FIRQB+FQPPN This word must be set to 177777 for the special magnetic tape lookup operation.
- FIRQB+FQDEV The device name as two ASCII characters. The device must be a magnetic tape drive.
- FIRQB+FQDEVN The device unit number, in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no unit number.

Data Returned (Both)

FIRQB			
Mne- monic	Octal Offset	Octal Offset	Mne- monic
	1	0	
	3	2	FQJOB
	5	4	FQFIL
	7	6	FQPPN
	11	10	FQNAM1
	13	12	
	15	14	FQEXT
	17	16	FQSIZ
	21	20	FQNAM2
	23	22	FQMODE
	25	24	FQFLAG
	27	26	FQPFLG
	31	30	FQDEV
	33	32	FQDEVN
	35	34	FQCLUS
	37	36	FQNENT

- FIRQB+FQJOB The current job number times two.
- FIRQB+FQPPN The PPN of the file. The project number is in the high byte (FIRQB+FQPPN+1) and the programmer number is in the low byte (FIRQB+FQPPN).

FIRQB+FQNAM1	The file name; two words in RAD50 format.
FIRQB+FQEXT	The file type; one word in RAD50 format.
FIRQB+FQSIZ	The LSB of the file size, in 512-byte blocks. This word is combined with the byte at FIRQB+21 to form a 24-bit value giving the file's size.
FIRQB+FQNAM2	The protection code of the file.
FIRQB+FQNAM2+1	The MSB of the file's size in 512-byte blocks (see FIRQB+FQSIZ).
FIRQB+FQMODE	The date the file was last accessed, in system internal format: <i>[(year/1970) * 1000.] + day-within-year</i> See the .DATE directive for a discussion of the system internal format for dates.
FIRQB+FQFLAG	The date the file was created, in system internal format.
FIRQB+FQPFLG	The time that the file was created, in system internal format: minutes before midnight, where midnight = 1440. (See the .DATE directive for a discussion of the system internal format for time.)
FIRQB+FQCLUS	The file cluster size for disk devices. It is not used for tape.
FIRQB+FQNENT	Number of entries returned: 8 for disk; 6 for tape.
FIRQB+FQNENT+1	Internal flag information (disk only):
	Bit Meaning When Set
	1 File is placed
	2 Some job has write access now
	3 File is open in update mode
	4 File is contiguous; no extend allowed
	5 No delete or rename allowed
	7 File is marked for deletion

Errors

DEVNFS	The device specified is not a file-structured device.
NOSUCH	Either account (PPN) does not exist on the device specified, or no more files exist on the account (the index number is greater than the number of files on the account). Or, for the special magnetic tape lookup, no more files exist on the tape.
xxxxx	Other errors are device-dependent. See Appendix A for a full list of errors.

Example

The following code searches the disk directory to examine files for user [2,101]:

```

LOOP:   MOVB     #DIRFQ,FIRQB+FQFUN           ;SET FUNCTION CODE
        CLR     FIRQB+FQFIL
        MOV     #<2.*400+101.>,FIRQB+FQPPN   ;SET PROJ.,PROG.NO.
        CLR     FIRQB+FQDEV                 ;SEARCH SYSTEM DISK
        CLR     FIRQB+FQDEVN
        CALFIP
        .
        .
        .
        (Error processing, examine file name, process file)
        .
        .
        .
        INCB    FIRQB+FQFIL                 ;INCREMENT INDEX
        JMP     LOOP                       ;GO BACK FOR NEXT ROUND

```

3.5.9 DLNFQ (Delete a File)

Form

```

MOVW      #DLNFQ, FIRQB+FQFUN
      .
      .
      .
(Define file to be deleted in FIRQB)
      .
      .
      .
CALFIP
  
```

Function

The DLNFQ function of CALFIP deletes a file from disk or DECTape. The monitor's internal data on the location of the file are destroyed, and the file's space on the device is made available for general use.

Privileges Required

DEVICE to delete a DECTape file if the referenced device is restricted. You need write access (by protection code, GWRITE, WWRITE, and/or SYSIO) to delete a disk file. Note that files marked nondeletable (using SET FILE/NODELETE) cannot be deleted regardless of the caller's privileges.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	DLNFQ (= 6) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	project number programmer number	6	FQPPN
	11	file name in RAD50 format	10	FQNAM1
	13	(2 words)	12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN	The function code DLNFQ (octal value = 6).
FIRQB+FQPPN	The PPN of the file to deleted. The project number is in the high byte (FIRQB+FQPPN+1), and the programmer number is in the low byte (FIRQB+FQPPN). A value of zero defaults to the PPN under which the calling program is running.
FIRQB+FQNAM1	The name of the file to be deleted, as two words of RAD50 data.
FIRQB+FQEXT	The file type, as one word of RAD50 data.
FIRQB+FQDEV	The name of the device containing the file to be deleted, as two ASCII characters; it must be a disk or DECTape device. A value of zero in this word indicates the public disk structure (_SY:).
FIRQB+FQDEVN	The device unit number, in binary. A nonzero value in FQDEVN+1 indicates an explicit device unit number. A zero value in FQDEVN+1 indicates no unit number.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the DLNFQ function of CALFIP does not return any meaningful data.

Errors

NOSUCH	The file specified in the data passed cannot be found.
PRVIOL	Protection violation. An attempt was made to delete a file that is either write-protected against the caller or marked for no delete.

Example

The following code deletes the file MYFIL.LST from the user's account on the public structure. Assume that the FIRQB has been filled with zeros previously:

```

MOV      #DLNFQ, FIRQB+FQFUN
MOV      #^RMYF, FIRQB+FQNAM1          ; SET FILE NAME
MOV      #^RILE, FIRQB+FQNAM1+2       ; AND TYPE
MOV      #^RLST, FIRQB+FQEXT          ; TO "MYFILE.LST"
CALFIP

```

3.5.10 ERRFQ (Return Error Message Text)

Form/Example

```

MOV B    #ERRFQ, FIRQB+FQFUN
MOV B    #ERR, FIRQB+FQERNO
    
```

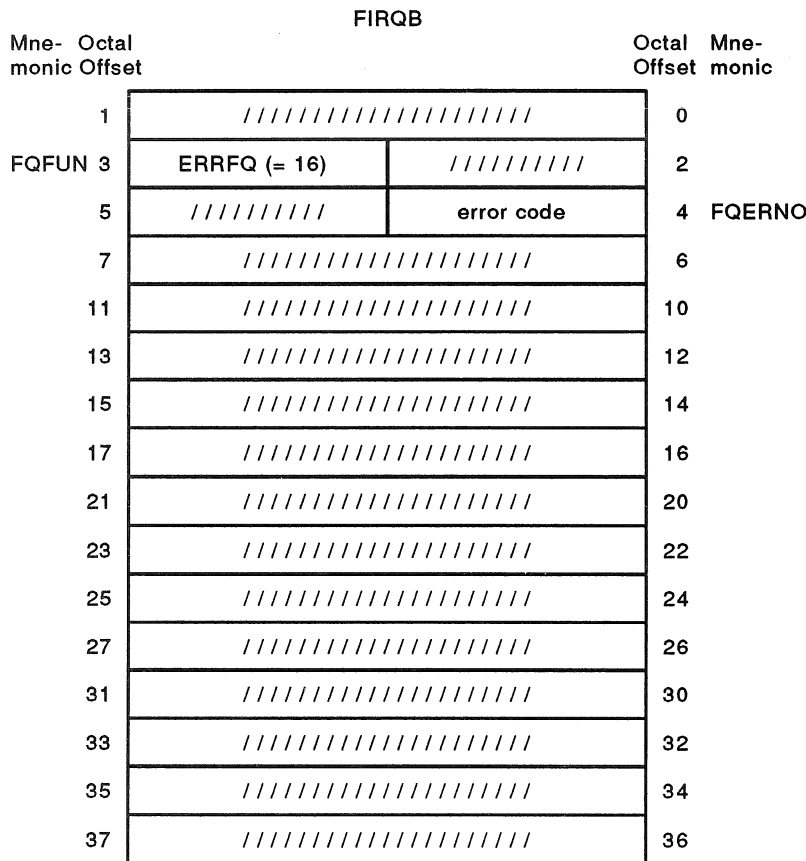
Function

The ERRFQ subfunction of CALFIP returns error message text from the system error message file or from the default error message file if an error message file is not currently installed. The text is associated with the value of the error code passed as byte 4 of the FIRQB. This call returns the full RSTS/E error message text associated with errors returned in byte 0 of the FIRQB on all the monitor directives.

Privileges Required

None

Data Passed



FIRQB+FQFUN The function code ERRFQ (octal value = 16).
 FIRQB+FQERNO The error code value (in binary) for which the corresponding error message text is to be returned.

Errors

The ERRFQ subfunction of CALFIP does not return any errors.

Data Returned

		FIRQB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	////////////////////		0	
	3	KB*2(-1-KB*2,detach)	job number * 2	2	FQJOB
	5	error message-padded with nulls to 28 characters (ASCII format)		4	FQFIL
	7			6	
	11			10	
	13			12	
	15			14	
	17			16	
	21			20	
	23			22	
	25			24	
	27			26	
	31	30			
	33	32			
	35	34			
	37	36			

FIRQB+FQJOB

The current job number times two.

FIRQB+3

If the job is attached, two times the currently attached keyboard number. If the job is detached, the one's complement of two times the currently detached keyboard number. For example, if the keyboard number is 5, the value in FIRQB+3 is: 12 for an attached job and 365 (377-12) for a detached job.

FIRQB+FQFIL

The error message text begins in this byte. The text is padded with zeros to 28 characters, if necessary.

3.5.11 LOKFQ (Disk File/Wildcard Lookup)

Form

```
MOVB      #LOKFQ, FIRQB+FQFUN
          .
          .
          .
(Set up FIRQB to define file/wildcard)
          .
          .
          .
CALFIP
```

Function

The LOKFQ subfunction of CALFIP does one of two actions:

- Looks for a file on disk by name and returns directory information (date of creation, and so forth)
- Performs a wildcard file search

For example, with a file name and type in the FIRQB of *.TXT it searches an account for a file with any file name and a type of .TXT. By incrementing an index and reexecuting LOKFQ, you can search through an entire directory for all such files.

NOTE

For disk directory lookup on a PPN other than that of the caller, LOKFQ returns only files to which the caller has read or execute access.

Privileges Required

DEVICE to perform a disk directory lookup on the caller's account if the referenced device is restricted. You need read or execute access (by protection code, GREAD, or WREAD) to perform a disk directory lookup on another account.

Data Passed — Disk Directory Lookup

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
QFQUN	3	LOKFQ (= 22) //////////////////////////////////	2	
	5	(must equal 177777 octal)	4	FQFIL
	7	project number programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (disk) (2 ASCII characters)	30	FQDEV
	33	<>0, device no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+QFQUN

The function code LOKFQ (octal value = 22).

FIRQB+FQFIL

The word beginning at this location must be set to 177777 (octal) to indicate the "disk directory lookup by file name" option of LOKFQ.

FIRQB+FQPPN

The PPN for the file to be looked up. A value of zero for this word defaults to the PPN under which the calling program is running.

FIRQB+FQNAM1

The file name to be looked up; two words in RAD50 format.

FIRQB+FQEXT

The file type of the file to be looked up; one word in RAD50 format.

FIRQB+FQDEV

The device name (must be disk), as two ASCII characters. If both bytes are zero, the public disk structure (_SY:) is used.

FIRQB+FQDEVN

The disk device unit number is passed here in binary. A nonzero value in FQDEVN+1 indicates an explicit device unit number. A zero value in FQDEVN+1 indicates the system default.

Data Returned — Disk Directory Lookup by File Name

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	//////////	0	
	3	////////// | job number * 2	2	FQJOB
	5	same as data passed (177777 octal)	4	FQFIL
	7	project number | programmer number	6	FQPPN
	11	file name in RAD50 format	10	FQNAM1
	13	(2 words)	12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file length in 512-byte blocks	16	FQSIZ
	21	MSB of file length | protection code	20	FQNAM2
	23	date of last access	22	FQMODE
	25	date of creation	24	FQFLAG
	27	time of creation	26	FQPFLG
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real | device unit number	32	FQDEVN
	35	file clustersize	34	FQCLUS
	37	file identification index	36	FQNTENT

FIRQB+FQJOB	The current job number times two.
FIRQB+FQFIL	The word at this location is the same as the data passed, in this case, 177777 (octal).
FIRQB+FQPPN	The PPN of the file (same as data passed).
FIRQB+FQNAM1	The file name; two words in RAD50 format (same as data passed).
FIRQB+FQEXT	The file type; one word in RAD50 format (same as data passed).
FIRQB+FQSIZ	The LSB of the file's size in 512-byte blocks. This word is combined with the byte at FIRQB+21 to form a 24-bit field giving the file size.
FIRQB+FQNAM2	The file's protection code, in binary, is returned in this byte.
FIRQB+21	The MSB of the file size in 512-byte blocks. It is combined with the word at FIRQB+FQSIZ to form a 24-bit field giving the file size.
FIRQB+FQMODE	The date the file was last accessed, in system internal format: <i>[(year - 1970) * 1000.] + day-within-year.</i> See the .DATE directive for a discussion of the system internal format for dates.
FIRQB+FQFLAG	The date the file was created, in system internal format (see FIRQB+FQMODE).
FIRQB+FQPFLG	The time the file was created, in system internal format: minutes until midnight, with 1440 equal to midnight.

FIRQB+FQDEV	The device name, as two ASCII characters. Always a specific name, even if zero was passed here.
FIRQB+FQDEVN	The device unit number, in binary. A specific number is always returned here; FIRQB+FQDEVN+1 is always nonzero.
FIRQB+FQCLUS	The file cluster size is returned in this word.
FIRQB+FQNENT	The file identification index is returned in this word. You can use the file identification index instead of the file name to open a file on disk with the OPNFQ subfunction of CALFIP. To do so, specify an explicit device name at FIRQB+FQDEV, a device unit number at FIRQB+FQDEVN, an explicit PPN at FIRQB+FQPPN, a zero word at FIRQB+FQNAM1, and the file identification index at FIRQB+FQNAM1+2. (The file identification index is used by utilities that access software subroutines in the RMS libraries, for example.) Note that there is no performance gain in using the file identification index instead of the file name. The file identification index is provided for compatibility with RSX. Furthermore, the file identification index is changed when the REORDR utility is run on the directory (see the <i>RSTS/E System Manager's Guide</i>).

Errors

BADNAM	The file name in bytes FIRQB+FQNAM1 through FIRQB+13 is missing or invalid.
NOSUCH	The device specified at FIRQB+FQDEV is not disk, or the file specified does not exist on the specified disk. This error also occurs when a user does not have read or execute access to the specified file.

Example

The following code looks for the file MATRIX.DAT on the system disk:

```
CALL      CLRFQB                      ;CLEAR FIRQB
MOV       #LOKFQ, FIRQB+FQFUN         ;SET FUNCTION CODE
MOV       #177777, FIRQB+FQFIL        ;FILENAME LOOKUP
CLR       FIRQB+FQPPN                 ;CALLER'S ACCOUNT
MOV       #^RMAT, FIRQB+FQNAM1        ;SET FILENAME
MOV       #^RRIX, FIRQB+FQNAM1+2     ;AND TYPE
MOV       #^RDAT, FIRQB+FQEXT        ;TO "MATRIX.DAT"
CLR       FIRQB+FQDEV                 ;SYSTEM DISK
CLR       FIRQB+FQDEVN                ;DEVICE
CALFIP
```

See Programming Hints for information on the CLRFQB routine.

Data Passed — Disk Wildcard Directory Lookup

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	LOKFQ (= 22)	////////////////////////////////	2	
	5	index: n means search for n+1 occurrence		4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	wildcard file name specification in RAD50 format (2 words)		10	FQNAM1
	13			12	
	15	wildcard file type in RAD50 format (1 word)		14	FQEXT
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	marked-for-delete flag		22	FQMODE
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	device name (disk) (2 ASCII characters)		30	FQDEV
	33	<>0, device no. real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFUN	The function code LOKFQ (octal value = 22).
FIRQB+FQFIL	An index number specifying the occurrence of the file name meeting the wildcard specifications. A value of zero in this word causes the monitor to search for the first file name in the directory that meets the specification. A value of one causes the monitor to search for the second file name, and so forth.
FIRQB+FQPPN	The PPN of the account whose directory of disk files is to be searched.
FIRQB+FQNAM1	The wildcard file name; as two words in RAD50 format. Either an asterisk (*) character can replace the entire file name, or a question mark (?) character can replace any character in the file name. For example, a file name of FILE?? would cause the monitor to search the directory for any file name beginning with the characters FILE. An * character indicates that the file name does not matter in the search.
FIRQB+FQEXT	The wildcard file type; as one word in RAD50 format. An * character can replace the entire file type, or a ? character can replace any character in the file type. For example, a file type of BA? causes the monitor to search the directory for any file type beginning with the characters BA. An * character indicates that the file type does not matter in the search.
FIRQB+FQMODE	If bit 14 is set, LOKFQ returns information about marked-for-delete files.

FIRQB+FQDEV The name of the device to be searched (must be disk). A value of 0 in this word indicates the public disk structure (_SY:).

FIRQB+FQDEVN The device unit number in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates the system default.

Data Returned — Disk Wildcard Directory Lookup

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	//////////	2	FQJOB
	5	(as passed)	4	FQFIL
	7	project number	6	FQPPN
	11	file name in RAD50 format	10	FQNAM1
	13	(2 words)	12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file length in 512-byte blocks	16	FQSIZ
	21	MSB of file length	20	FQNAM2
	23	protection code	22	FQMODE
	25	date of last access (disk only)	24	FQFLAG
	27	date of creation	26	FQPFLG
	31	time of creation	30	FQDEV
	33	(as passed)	32	FQDEVN
	35	file clustersize (disk only)	34	FQCLUS
	37	USTAT byte	36	FQNTENT
		//////////		

FIRQB+FQJOB The current job number times two.

FIRQB+FQPPN The PPN of the file (same as data passed).

FIRQB+FQNAM1 The actual file name of a file meeting the wildcard specification in the data passed; two words in RAD50 format.

FIRQB+FQEXT The actual file type of a file meeting the wildcard specification in the data passed; one word in RAD50 format.

FIRQB+FQSIZ The LSB of the file's size in 512-byte blocks. This word is combined with the byte at FIRQB+21 to form a 24-bit field giving the file's size.

FIRQB+FQNAM2 The file's protection code, in binary, is returned in this byte.

FIRQB+21 The MSB of the file's size in 512-byte blocks. The byte is combined with the word at FIRQB+FQSIZ to give the file's size.

FIRQB+FQMODE The date the file was last accessed, in system internal format:
*[(year - 1970) * 1000.] + day-within-year.*
 See the .DATE directive for a discussion of the system internal format for dates.

FIRQB+FQFLAG	The date the file was created, in system internal format (see FIRQB+FQMODE).
FIRQB+FQPFLG	The time the file was created, in system internal format: minutes until midnight, with 1440 equal to midnight.
FIRQB+FQDEV	The device name, as two ASCII characters. Always a specific name, even if zero was passed here.
FIRQB+FQDEVN	The device unit number, in binary. A specific number is always returned here; FIRQB+FQDEVN+1 is always nonzero.
FIRQB+FQCLUS	The file cluster size is returned in this word.
FIRQB+FQNTENT+1	Internal flag information:
	Bit Meaning When Set
	1 File is placed
	2 Some job has write access now
	3 File is open in update mode
	4 File is contiguous; no extend allowed
	5 No delete or rename allowed
	7 File is marked for deletion

Errors

BADNAM	No file specification appears at FIRQB+FQNAM1 or the file name is invalid.
NOSUCH	Either the device specified at FIRQB+FQDEV and FIRQB+FQDEVN is not a disk, or no match exists for the occurrence specified in the word at FIRQB+FQFIL.
PAKLCK	The disk is restricted and the caller does not have DEVICE privilege.

Example

The following code asks the monitor to search the directory for account [2,130] for the first occurrence of a file specification beginning with the letter X:

```

CALL      CLRFBQ          ;MAKE SURE FIRQB
CALL      CLRXRB          ;AND XRB ARE CLEAR
MOV       #FILNAM,XRB+XRLOC ;POINT TO FILE NAME
MOV       #NAMSIZ,XRB+XRLEN ;SET ITS LENGTH
MOV       #NAMSIZ,XRB+XRBC  ;AND AGAIN
.FSS      ;CONVERT TO FIRQB FORMAT
MOVB     #LOKFQ,FIRQB+FQFUN ;SET FUNCTION CODE
CALFIP

FILNAM:   .ASCII "[2,130]X?????.*" ;STRING FOR .FSS TO CONVERT
NAMSIZ =  .-FILNAM             ;AND ITS LENGTH

```

See Programming Hints for information about the CLRFBQ and CLRXRB routines.

3.5.12 OPNFQ (Open a File/Device on a Channel)

Form

```
MOVW      #OPNFQ, FIRQB+FQFUN
          .
          .
          .
(Set parameters appropriate to file or device)
          .
          .
          .
CALFIP
```

Function

The OPNFQ function has the same effect as an OPEN FOR INPUT statement in BASIC-PLUS; it opens a device or existing file on a channel. Parameters defining the device, file name and type, protection code, and mode are passed to the monitor in the FIRQB. If a file name is given in the FIRQB, a file-structured open for input is performed. If no file name is given, a non-file-structured open for input is performed. The *RSTS/E Programming Manual* describes file- and non-file-structured OPEN FOR INPUT statement and the actions taken for the mode parameter (MODE modifier in BASIC-PLUS) for each device.

If the device being opened is an outbound LAT keyboard, OPNFQ initiates a connection to the terminal server if no such connection already exists.

NOTE

Privileges are required to open a disk for non-file-structured processing. Whenever you use a disk as a non-file structured device, be aware that all RSTS/E data structures you access are subject to change at any time. The same applies if you open a UFD as a file.

Privileges Required

No privileges are required to open the caller's UFD for read-only access.

Privileges are needed to perform the following:

- GREAD to open the UFD of any other account in the caller's group for read-only access
- WREAD to open the UFD of any account outside the caller's group for read-only access
- DEVICE to open a restricted device
- Read access (protection code, GREAD, or WREAD) to open a disk file for read-only access
- Write access (protection code, GWRITE, WWRITE, and/or SYSIO) to open a disk file for write access
- EXQTA to specify detach on close option on a pseudo keyboard
- TUNE to select data caching mode on open
- RDNFS to gain non-file-structured read access to a disk
- SYSMOD to gain non-file-structured write access to a mounted disk
- WRTNFS to gain non-file-structured write access to a disk, or to gain write access to a UFD

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	OPNFQ (= 2) //////////////////////////////////	2	
	5	//////////////////////////////// channel number * 2	4	FQFIL
	7	project number programmer number	6	FQPPN
	11	file name in RAD50 format	10	FQNAM1
	13	(2 words)	12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	receive buffer size for DMC11/DMR11	16	FQSIZ
	21	////////////////////////////////	20	
	23	mode	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	no. rec. bfrs. to allocate for DMC11/DMR11	34	FQCLUS
	37	////////////////////////////////	36	

FIRQB+FQFUN	The function code OPNFQ (octal value = 2).
FIRQB+FQFIL	Channel number times two; defines the channel on which the file is to be opened.
FIRQB+FQPPN	The PPN of the file to be opened. The project number is in the high byte (FQPPN+1), and the programmer number in the low byte (FQPPN). A value of zero defaults to the PPN under which the calling program is running. (Zero for non-file-structured open.)
FIRQB+FQNAM1	The file name to be opened; two words of RAD50 data. May also be specified as a zero word followed by the file identification index (see LOKFQ). (Must be two zero words for a non-file-structured open.)
FIRQB+FQEXT	The file type; one word of RAD50 data. (Must be zero for a non-file-structured open.)
FIRQB+FQSIZ	This parameter has the same function as the FILESIZE option in BASIC-PLUS. It is only used for the DMC11/DMR11, where it specifies the receive buffer size. You can specify a value between 1 and 632 (1170 octal). See the <i>RSTS/E Programming Manual</i> for more information.
FIRQB+FQMODE	The mode with which the file is to be opened; values and actions taken are as described for the MODE modifier in OPEN FOR INPUT and non-file-structured OPEN statements for various devices, as described in the <i>RSTS/E Programming Manual</i> . If you use a mode value at all, you must set bit 15 of this word to 1.

FIRQB+FQDEV The device name is passed here as two ASCII characters. A value of zero indicates "SY", public disk.

FIRQB+FQDEVN The device unit number is passed here in binary. A nonzero value in the high byte of this word (FIRQB+FQDEVN+1) indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no unit number.

FIRQB+FQCLUS This parameter has the same function as the CLUSTERSIZE option in BASIC-PLUS. For OPNFQ, it is used only for the DMC11/DMR11, where it specifies the number of receive buffers to allocate. You can specify a value between 1 and 127, but values greater than four are not recommended. See the *RSTS/E Programming Manual* for more information.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
FQSIZM	5	MSB of file size	channel no. * 2	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	LSB of file size		16	FQSIZ
	21	reasonable buffer size for device		20	FQBUFL
	23	(as passed)		22	FQMODE
	25	device description		24	FQFLAG
FQPROT	27	protection code	clustersize, mod256	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	flag byte	device unit number	32	FQDEVN
	35	file identification index		34	FQCLUS
	37	////////////////////		36	FQNTENT

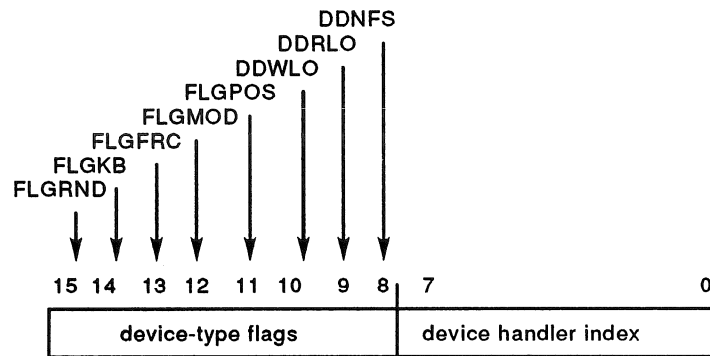
NOTE

For nondisk devices, the relevant information returned with the OPNFQ subfunction is in the two words at FIRQB+FQBUFL and FIRQB+FQFLAG. All other words are returned as passed.

FIRQB+FQJOB The current job number times two.

FIRQB+FQFIL Channel number times two; defines the channel on which the file is open.

FIRQB+FQSIZM	For large disk files (greater than 65,535 blocks), this byte contains the MSB of the file's size in 512-byte blocks. This byte is combined with the word at FIRQB+FQSIZ to form a 24-bit field giving the file size.
FIRQB+FQPPN	The PPN under which the file is open. An actual PPN is returned here even if this word was passed as zero.
FIRQB+FQNAM1	The file name; two words of RAD50 data.
FIRQB+FQEXT	The file type; one word of RAD50 data.
FIRQB+FQBUFL	Reasonable buffer size for this device, in bytes. If you are doing device-independent I/O (that is, if you do not want to keep track of which device is being opened and perform specific opens, reads, and writes, depending on the device), this value is the monitor's best guess for a buffer size to use in subsequent reads and writes on the opened channel. (See the .READ and .WRITE directives.)
FIRQB+FQFLAG	Description of the device just opened. The low byte contains the device's handler index. There is one unique handler index for all device types. The high byte contains a set of status flags to allow for device-independent I/O routines.



High Byte — Device-Type Flags

The bits in the high byte of the flags word are set to indicate the type of file or device just opened.

FLGRND	= 1	The device or file is random-access.
	= 0	The device or file is sequential.
FLGKB	= 1	The file or device is a terminal-type file or device (or is generically a terminal).
	= 0	The file or device is not a terminal-type file or device.
FLGFRC	= 1	The file or device is byte-oriented. That is, the .READ and .WRITE directives handle data in byte units.
	= 0	The file or device is block-oriented. The .READ and .WRITE directives handle data in block units.

FLGMOD	= 1	The file or device accepts modifiers in .READ and .WRITE directives.
	= 0	The file or device does not accept modifiers in .READ and .WRITE directives.
FLGPOS	= 1	The file or device keeps track of its horizontal position and expands characters such as TAB into whatever is appropriate for the file or device. You can determine the current horizontal position with the .POSTN directive.
	= 0	The file or device does not keep track of its horizontal position.
DDWLO	= 1	The file or device has been write-locked (with the protection code or mode value in the open) or is generically a read-only device.
	= 0	The file or device is not write-locked.
DDRLO	= 1	The file or device has been read-locked (with the protection code in the open) or is generically a write-only device.
	= 0	The file or device is not read-locked.
DDNFS	= 1	The file or device is non-file-structured (or is generically not a file-structured device).
	= 0	The file or device is file-structured.

Low Byte — Device Handler Index

Bits 0-7 of the flags word contain a handler index that indicates the generic kind of device. The currently defined values follow.

Octal Value	Symbol	Meaning
0	DSKHND	All disks
2	TTYHND	All terminals
4	DTAHND	DECTape
6	LPTHND	All line printers
10	PTRHND	Paper tape reader
12	PTPHND	Paper tape punch
14	CDRHND	Card reader
16	MTAHND	Magnetic tape
20	PKBHND	Pseudo keyboards
22	RXDHND	Flexible diskettes
24	RJEHND	2780 remote job entry
26	NULHND	The null device
30	DMCHND	The DMC11/DMR11 DDCMP interface
36		Reserved
40	KMCHND	KMC11
42	IBMHND	IBM interconnect
46	DMPHND	DMP11/DMV11 device
50	ETHHND	Ethernet device

FIRQB+FQPFLG	The file cluster size, modulo 256. That is, a file cluster size of 256 is indicated a zero.
FIRQB+FQPROT	The protection code of the file.
FIRQB+FQDEV	The device name; two ASCII characters. (For disk, the actual device name is returned, even if a zero word was passed in this word.)
FIRQB+FQDEVN	The device unit number. (For disk devices, the actual unit number is returned here, even if FIRQB+FQDEVN+1 was passed as zero.)
FIRQB+33	For a file-structured open, this byte contains two relevant bits: Bit 0 = 0 The device is in the public structure Bit 0 = 1 The device is a private disk Bit 1 = 0 A specific device was not specified Bit 1 = 1 A specific device was specified These bits are meaningless for a non-file-structured open.
FIRQB+FQCLUS	The file identification index of this file. This word is significant mainly in that it can be used in place of the file name in subsequent opens of the file on disk. You can open the file with the OPNFQ subfunction by using an explicit PPN in FIRQB+FQPPN, a zero word in FIRQB+FQNAM1, and the file identification index in FIRQB+FQNAM1+2. Note that there is no performance gain in using the file identification index instead of the file name. The file identification index is provided for compatibility with RSX. Furthermore, the file identification index is changed when the REORDR utility is run on the directory (see the <i>RSTS/E System Manager's Guide</i>).

Errors

NOBUFS	No buffers are available to initiate the connection to the terminal server.
NOTCLS	The specified channel is already open. It must be closed before it can be opened again.
PRVIOL	You do not have the necessary privilege and you tried to: <ul style="list-style-type: none"> • Open a disk for non-file-structured access. • Open a device that the system manager has restricted to users with DEVICE privilege.
xxxxxx	All other possible errors are device-dependent. See Appendix A for a full list of errors.

Example

The following MACRO code sets up the FIRQB for the OPNFQ function. A non-file-structured open of magnetic tape unit 2 is done on channel 3:

```

MAG:      .ASCII  /MT/
          .
          .
          .
          CALL   CLRFQB                ;CLEAR FIRQB
          MOVB   #OPNFQ,FIRQB+FQFUN    ;SET FUNCTION CODE
          MOVB   #3*2,FIRQB+FQFIL      ;SET CHANNEL = 3
          MOV    MAG,FIRQB+FQDEV       ;SET DEVICE = MT
          MOVB   #377,FIRQB+FQDEVN+1  ;SET FLAG DEVICE NO. EXPLICIT
          MOVB   #2,FIRQB+FQDEVN      ;SET DEVICE NO. = 2
          CALFIP

```

See Programming Hints for information on the CLRFQB routine.

3.5.13 RENFQ (Rename a File)

Form

```

MOV#    #RENFQ, FIRQB+FQFUN
.
.
.
(Define file to be renamed and new name in FIRQB)
.
.
.
CALFIP
  
```

Function

The RENFQ function renames an existing file on disk or DECTape and, if requested, deletes any existing file with the new name.

Privileges Required

DEVICE is required if the device is restricted. Create/rename access (GWRITE, WWRITE, and/or SYSIO) to rename a disk file outside the caller's account. SYSIO to set the privilege bit (bit 7 in FQPROT).

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	RENFQ (= 10) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	project number programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	-1 to delete existing file (disk only)	16	FQSIZ
	21	new file name in RAD50 format (2 words)	20	FQNAM2
	23		22	
	25	new file type in RAD50 format (1 word)	24	FQFLAG
FQPROT	27	file protection = 0 if no change	26	FQPFLG
	31	device name (disk) (2 ASCII characters)	30	FQDEV
	33	<>0, device no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN	The function code RENFQ (octal value = 10).
FIRQB+FQPPN	The PPN of the existing file to be renamed. The project number is in the high byte (FIRQB+FQPPN+1), and the programmer number is in the low byte (FIRQB+FQPPN). A value of zero defaults to the PPN under which the calling program is running.
FIRQB+FQNAM1	The old (existing) name for the file; two words of RAD50 data.
FIRQB+FQEXT	The old (existing) type for the file; one word of RAD50 data.
FIRQB+FQSIZ	This word is set to -1 to indicate that any existing file on the specified device with the new name is to be deleted. If any other value is given here and a file already exists with the new name, the RENFQ function will return an error.
FIRQB+FQNAM2	The new file name and type; three words of RAD50 data. You can use RENFQ to change the protection code on a file by setting FQPROT and making these three words the same as the three words beginning at FIRQB+FQNAM1.
FIRQB+FQPROT	The new protection code for the file, if any, is specified in this byte. To retain the old protection code, this entire word (FIRQB+FQPFLG and FIRQB+FQPROT) must be zero. If the word is nonzero, the high byte will be used as the new protection code.
FIRQB+FQDEV	The device name is passed here as two ASCII characters. It must be a disk or DECTape device. A value of zero in this word indicates the public disk structure (_SY:).
FIRQB+FQDEVN	The device unit number is passed here in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates the system default.

Data Returned

Other than a possible error in byte 0 of the FIRQB, the RENFQ function of CALFIP does not return any meaningful data.

Errors

FIEXST	The new file name specified already exists.
NOSUCH	The old file specified cannot be found.

Example

The following code renames the file OLDNAM.TXT to NEWNAM.TXT on the public disk structure under the caller's account. FQSIZ is set to -1, so any existing file named NEWNAM.TXT is deleted:

```

CALL      CLRFQB                      ;CLEAR FIRQB
MOVB     #RENFQ, FIRQB+FQFUN          ;SET FUNCTION CODE
MOV      #^ROLD, FIRQB+FQNAM1        ;SET OLD FILE NAME
MOV      #^RNAM, FIRQB+FQNAM1+2      ;AND TYPE
MOV      #^RTXT, FIRQB+FQEXT         ;TO "OLDNAM.TXT"
MOV      #-1, FIRQB+FQSIZ            ;DELETE EXISTING FILE
MOV      #^RNEW, FIRQB+FQNAM2        ;SET NEW FILE NAME
MOV      #^RNAM, FIRQB+FQNAM2+2      ;AND TYPE
MOV      #^RTXT, FIRQB+FQNAM2+4      ;TO "NEWNAM.TXT"
CALFIP

```

See Programming Hints for information about the CLRFQB routine.

3.5.14 RSTFQ (Reset a Channel)

Form

```
MOVB      #RSTFQ, FIRQB+FQFUN
.
.
.
(Define channel to be reset)
.
.
.
CALFIP
```

Function

The RSTFQ function closes a channel, all channels, or all channels except one without performing any of the normal clean-up operations. For example, no trailer tape is written to paper tape punch; no form feed is given on the line printer; and no trailer labels are written to magnetic tape. This function is useful as a backup to a normal close operation. If a normal close fails, RSTFQ will close the channel regardless. You can also use RSTFQ to close a channel on which a tentative file is open if you do not want to make the file permanent. The RSTFQ directive functions the same as a CLOSE statement with a negative channel number in BASIC-PLUS. See the *RSTS/E Programming Manual* for description of tentative files.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	RSTFQ (= 20)	////////////////////////////////	2	
	5	////////////////////////////////	channel number * 2	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFUN The function code RSTFQ (octal value = 20).

FIRQB+FQFIL The value is set as follows:

- To reset one channel, set **FIRQB+FQFIL** to the channel number to reset times two
- To reset all channels, set **FIRQB+FQFIL** to zero
- To reset all but one channel, set **FIRQB+FQFIL** to -(channel number times two); that is, the negative of two times the channel number to remain open

Data Returned

The RSTFQ function does not return any meaningful data.

Errors

No errors are possible with the RSTFQ function. If the channel or channels specified are not open, the call simply returns without error.

Example

The following code resets all channels currently open for the job, except channel 2:

```
CALL      CLRFQB                ;CLEAR FIRQB
MOV      #RSTFQ, FIRQB+FQFUN    ;SET FUNCTION CODE
MOV      #-4, FIRQB+FQFIL       ;RESET ALL CHANNELS BUT 2
CALFIP
```

See Programming Hints for information about the CLRFQB routine.

3.5.15 UUOFQ (Hook to File Processor)

Form

```
MOVB      #UUOFQ, FIRQB+FQFUN
.
.
.
(Set up FIRQB for UUOFQ subfunction)
.
.
.
CALFIP
```

Function

The UUOFQ subfunction of CALFIP performs the same operations as the .UUO directive. The same subfunctions are available, and a similar format is used for the data passed. The data returned is in the same format as for the .UUO directive.

The data passed for the UUOFQ subfunction of CALFIP is moved down one byte from the .UUO subfunction format. The value UUOFQ is stored in byte 3 in the FIRQB, the UU.xxx code is stored in byte 4 in the FIRQB, whatever is shown in byte 4 for .UUO is stored in byte 5 for UUOFQ, and so forth.

The UUOFQ subfunction of CALFIP is not recommended (although it does work), because values that are normally set up as whole words must be stored as a high-byte in location n and a low-byte in location n+1.

For example:

.UUO form:	<table border="1"><tr><td>y</td><td>x</td></tr></table>	y	x	n		
y	x					
UUOFQ form:	<table border="1"><tr><td>x</td><td>///</td></tr><tr><td>///</td><td>y</td></tr></table>	x	///	///	y	n n+1
x	///					
///	y					

Privileges Required

See the .UUO directive.

3.6 .CCL — Check String for CCL Command

Form

.CCL

Function

The .CCL directive asks the monitor to check a string (defined in the XRB) to see if it is a valid Concise Command Language (CCL) command. If the string is a valid CCL command, the monitor passes control to the appropriate run-time system for that CCL (as defined by the system manager), using the equivalent of a .RUN directive. If the directive is successful, control does not return in line.

Control passes to the run-time system at the location specified in the P.RUN word in the pseudovector region (Chapter 2). Data in the job's CORCMN, XRB, FIRQB, and KEY areas in the low segment are passed to the run-time system because they are of interest to the run-time system being entered as a result of a .CCL, not to the caller. The file containing the program to be run as a result of the .CCL command is opened on channel 15. See Chapter 2 for a description of these areas in the P.RUN word.

If the string is not a valid CCL command, the monitor returns control to the caller (the run-time system or user job image that issued the .CCL directive) with no error. Control resumes with the instruction following the .CCL. Since control would not be returned here otherwise, the program does whatever housekeeping it deems necessary here for an unsuccessful CCL.

The system manager defines the CCL command, an abbreviation point, the name of the file that is to be executed when the command is given, and an entry point for the program (see the *RSTS/E System Manager's Guide*).

The command can be a string from one to nine characters long. The allowed single-character commands are A through Z, @, \$, and #. Commands that are longer than one character must begin with a letter; the remaining characters can be letters or digits.

The abbreviation point defines how many characters must be specified before the command is accepted as valid. For example, if "DIRECTORY" were defined as a CCL command, the system manager could indicate three characters as the abbreviation point for the command. Then DIR, DIRE, DIREC and so forth, up to the full DIRECTORY, would all be interpreted by the monitor as correct CCL commands. (The monitor always fills in the full CCL command in CORCMN when it passes control to the appropriate run-time system.) When you issue a .CCL directive, the monitor compares the indicated string with the commands defined by the system manager:

- All null (ASCII code 000) and delete (ASCII code 177) characters are ignored and are never passed on to the run-time system in CORCMN.
- ASCII code 200 is ignored and is never passed on to the run-time system in CORCMN.
- Leading spaces (ASCII code 040) and tabs (ASCII code 011) are ignored and are never passed on to the run-time system in CORCMN.

- When not enclosed by the quote characters " (ASCII code 042) and ' (ASCII code 047):
 - All tabs (ASCII code 011) are changed to spaces (ASCII code 040).
 - All control characters (ASCII codes 001 through 037, inclusive, and ASCII codes 201 through 237, inclusive) are ignored and never passed in CORCMN.
 - Adjacent spaces (ASCII code 040) are merged into a single space.
 - All lowercase alphabets (ASCII codes 141 through 172, inclusive, and ASCII codes 341 through 376, inclusive) are changed into their uppercase equivalents (ASCII codes 101 through 132, inclusive, and ASCII codes 301 through 336, inclusive).
- When enclosed by the quote characters " (ASCII code 042) and ' (ASCII code 047), all characters are kept as is and passed on to the run-time system in CORCMN.

Immediately following the CCL command text (for example, DIR/SI:n/DET) the monitor also analyzes two switches. These switches are passed on to the run-time system as status flags set in the XRB (see the P.RUN description in Chapter 2). The two switches may appear in either order, but must immediately follow the command. Both are optional switches.

The /SIZE switch has the format:

```
[space]/SI[Z[E]]:[+][#]n[.]
```

where n indicates the size, in K words, of the user job image that the program, when executed, will require. If the + sign is given, n indicates the additional amount of space, in K words, that the file will require over that indicated by the computed size or minimum size (see the description of the PF.CSZ bit in P.FLAGS word, Chapter 2). If the + sign is omitted, then n simply indicates the size, in K words, at which the invoked file should run. If the # sign is given, n is assumed to be octal. If the period (.) is given, n is assumed to be decimal. If both are given, an error is returned, and if neither is given, n is assumed to be decimal. The value of n must be between 1 and the system-wide maximum for a user job image (see the SWAP MAX discussion in the *RSTS/E System Installation and Update Guide*). If you run the program with separate D-Space, /SIZE only increases the D-Space. Otherwise, it increases the overall program size.

The /DETACH switch has the format:

```
[space]/DET[A[C[H]]]
```

This switch indicates that the invoked program should be run detached. In this state, channel 0 (the terminal associated with the job) is marked as detached while the program is running. This switch is useful for noninteractive programs; it frees the terminal for other use and prevents the user from interrupting the job by entering a Ctrl/C.

Remember that the monitor simply examines these switches and passes the information on to the run-time system. The run-time system is responsible for doing the appropriate processing. For more information on the CCL facility, see the *RSTS/E Programming Manual*.

NOTE

Do not use this directive from a user job image running under the RT-11 run-time system, since the lowest 512 bytes are used by RT-11 differently from other run-time systems. Instead, use .DOCCL (see Chapter 7).

Privileges Required

Execute access (by protection code, GREAD, or WREAD) is needed to execute a program for a CCL command.

Data Passed

		XRB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	length of proposed command string, bytes		0	XRLEN
	3	length of proposed command string, bytes		2	XRBC
	5	starting address of command string		4	XRLOC
	7	////////////////////////////////		6	
	11	(passed to		10	XRBLK
	13	new run-time system		12	
	15	unaltered)		14	

XRB+XRLEN	The length of the proposed CCL command string, in bytes.
XRB+XRBC	The length of the proposed CCL command string, in bytes, is also passed in this word.
XRB+XRLOC	The starting address of the proposed CCL command string. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)
XRB+XRBLK	The remaining three words are unaltered here if the string is indeed a CCL command and the monitor takes over and does the equivalent of a .RUN directive. That is, the run-time system that is given control as a result of this command finds the same three words here that the caller left. These three words are also be unchanged if control returns back to the caller for any reason. See the .RUN monitor call in this Chapter and the P.RUN entry point in Chapter 2 for details.

Data Returned

No useful data is returned to the calling program. (The P.RUN description describes the data passed to the run-time system if the call is successful.) If the call is unsuccessful, the last three words of the XRB are unaltered, but the first four words are random. In addition, an error code is returned in the first byte of the FIRQB.

Errors

(none)	No error is returned if the command part of the string passed was not a valid CCL command. The contents of CORCMN have not been altered; the XRB (except for the last three words) has been altered.
BADCNT	The first three words of the XRB, which describe the CCL command string, are illegal.
BADSWT	An illegal switch was given in the CCL command string.
BDNERR	An illegal number was the argument to one of the switches found in the CCL command string. For example, the n value in the /SIZE switch was greater than the system-wide maximum for a user job image (see the SWAP MAX discussion in the <i>RSTS/E System Installation and Update Guide</i>).
LINERR	The indicated string is too long to be passed in CORCMN.
xxxxxx	Any other error returned results from the monitor's execution of a .RUN directive for the program. See the .RUN directive in this chapter.

Example

The following example asks the monitor to check a 72-byte string beginning at location BUFFER to see if it is a CCL command:

```
BUFFER:  .BLKB  72.  
        .  
        .  
        .  
        CALL   CLRXRB           ; Clear XRB  
        MOV    #72., XRB+XRLEN  ; Set length  
        MOV    #72., XRB+XRBC   ; Set length again  
        MOV    #BUFFER, XRB+XRLOC ; Set starting address  
        .CCL
```

See the section entitled "Programming Hints" for information on the CLRXRB routine.

3.7 .CHAIN — Execute Under Same RTS

Form

.CHAIN

Function

The .CHAIN directive is the same as the .RUN directive, except that it returns an error if the program to be run would cause a new run-time system to be entered. That is, if the call succeeds, the current run-time system is entered at the PRUN entry point (see Chapter 2). In addition, there is no change in the user job image size. Otherwise, the error code NORTS is returned in byte 0 of the FIRQB.

Use this call to bypass the special protection afforded by the compiled-file bit in the protection code. The run-time system can use this directive to access an executable file without the problem of possibly losing control (unlike .RUN, which can transfer control to a different run-time system). The .CHAIN directive reenters the run-time system so a user cannot take control of the file once it is open on channel 15.

See the .RUN directive, for Data Passed, Data Returned, and Errors. For the example, substitute .CHAIN for .RUN.

NOTE

Do not use this directive from a user job image running under the RT-11 run-time system. Use the RT-11 .CHAIN directive (see Chapter 7) to transfer control to another program running under RT-11.

Privileges Required

Execute access (by protection code, GREAD, or WREAD) is required to execute a program.

3.8 .CLEAR — Clear Keyword Bits

Form

.CLEAR

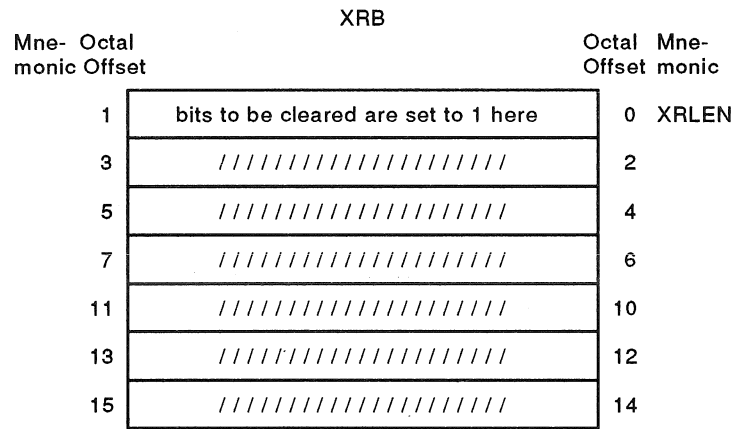
Function

Use the .CLEAR directive to clear certain bits in the keyword (KEY) location in the user job image. The XRB passes the bits to be cleared to the monitor.

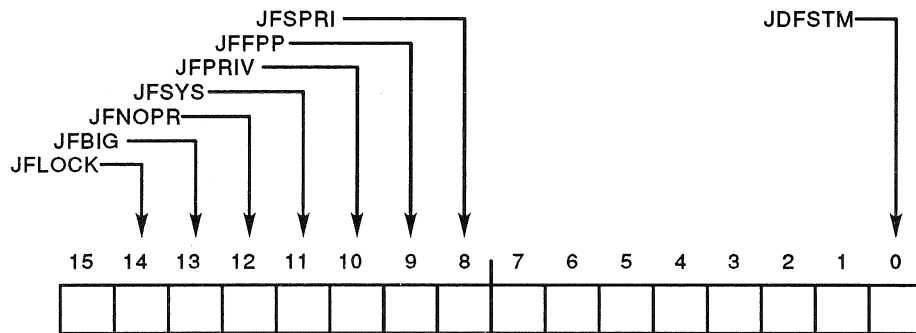
Privileges Required

None

Data Passed



XRB+XRLLEN The bits to be cleared are set to 1 here.



- JFLOCK** Clearable by any caller. Clearing JFLOCK indicates that the job wants to be swapped. When JFLOCK is clear, the monitor swaps the job (that is, the user job image) to and from disk as necessary.
- JFBIG** Not clearable by any caller; masked off. That is, the corresponding bits in KEY cannot be cleared by the job with the .CLEAR directive.
- JFNOPR** Not clearable by any caller; masked off.
- JFSYS** Clearable by any caller. If the job has temporary privileges and this bit is cleared in a .CLEAR call, the temporary privileges are temporarily lost.

- JFPRIV** If a `.CLEAR` directive is issued with this bit indicated for clearing, any temporary privileges that the job has or had are permanently lost.
- JFFPP** Clearable by any caller. Clearing `JFFPP` indicates that this job no longer wants the state of the hardware floating-point unit (if any) to be swapped along with the job's normal context information.
- JFSPRI** Clearable by any caller. Clearing `JFSPRI` lowers the job's run priority by one-half step. That is, it clears bit 2 of the system- controlled low-order three bits of the run priority. See the `SET JOB` command *RSTS/E System Manager's Guide*.
- JDFSTM** Clearable by any caller. Deactivates the fast-map facility and restores normal IOT trapping. If you leave this bit set, clear all the others.

All other bits in the `XRFB` are masked off.

Data Returned

The `.CLEAR` directive does not return any meaningful data.

Errors

No errors are possible with the `.CLEAR` directive.

Example

The following code clears the `JFLOCK` bit:

```
CALL    CLRXRFB                ;CLEAR XRFB
MOV     #JFLOCK, XRFB+XRLEN    ;SET JFLOCK FOR CLEAR
.CLEAR
```

See *Programming Hints* for information on the `CLRXRFB` routine.

3.9 .CMDLN—Read/Write Command Line

Form

.CMDLN

Function

The .CMDLN directive lets programs pass up to 1K words of data (2048 characters) when chaining to another program. DCL uses this capability to pass long command lines to some server programs. If possible, the .CMDLN directive stores the data in core common. If not, it stores the data in XBUF.

NOTE

The read function deletes the command line after it has been read, therefore the command line can only be read once.

Privileges Required

None

Data Passed (Write a Command Line)

		XRB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
1		length of command line to write		0	XRLEN
3		length of command line to write		2	XRBC
5		address of command line to write		4	XRLOC
7		////////////////////////////////		6	
11		////////////////////////////////		10	
13		////////////////////////////////		12	
15		////////////////////////////////		14	

- XR+XRLEN** The length of the command line to be written, in bytes.
- XR+XRBC** The length of the command line to be written, in bytes.
- XR+XRLOC** The starting address of the command line to be written. (See the section "XR (Transfer Request Block)" in Chapter 2 for more information.)

Errors

- BADCNT** XRB parameters were invalid, or the command line was too long.
- NOBUFS** Not enough XBUF was available to store the command line.

Data Passed (Read a Command Line)

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	length of buffer to receive command line		0	XRLEN
	3	zero		2	XRBC
	5	address to place command line		4	XRLOC
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRLEN** The length of the buffer to receive the command line, in bytes.
- XRBC** Zero to indicate a read operation.
- XRLOC** Starting address of the area where the command line is placed. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)

Data Returned

- XRBC** The length of the command line read, in bytes.

Errors

- NOSUCH** There was no command line to be read.
- LINERR** The command line was too long for the user's buffer.

3.10 .CORE — Change Memory Size

Form

.CORE

Function

The .CORE directive asks the monitor to change the amount of memory currently allocated for the user job image (low segment) for this job. The monitor preallocates space for a user job image at the time a .RUN directive is issued. The space is based on the size of the file (if PF.CSZ = 1 in the P.FLAG word of the pseudovector region) or is equal to the P.MSIZ word in the pseudovector region.

NOTE

If the I&D Space split is enabled, .CORE alters only the size of the D-Space.

You can change this initial size with the .CORE directive as many times as you want, as long as the requested size falls within the minimum and maximum memory range for the current run-time system.

The monitor first checks the size requested against maximum and minimum values, using this algorithm:

$$1\text{Kword} \leq \text{P.MSIZ} \leq \begin{array}{c} \text{size requested} \\ \text{with .CORE} \end{array} \leq \begin{array}{c} \text{private} \\ \text{maximum} \\ \text{for job} \end{array} \leq \text{P.SIZE} \leq \begin{array}{c} \text{system} \\ \text{maximum} \end{array}$$

The monitor determines the maximum allowable amount of space for a user job image as follows:

- Set <max> (the maximum size that a job image can be) to the system-wide maximum. This maximum is set by the system manager at startup time (see the SWAP MAX discussion in the *RSTS/E System Installation and Update Guide*).
- If the maximum user job image size imposed by the run-time system (P.SIZE in the pseudovectors) is less than the current <max>, set <max> to P.SIZE.
- If the job's private memory maximum is less than <max> and if the caller does not have EXQTA privilege, then set <max> to the job's private memory maximum. The system manager can set a particular job's private memory maximum with the SET JOB/SIZE=n command. You can also set a private memory maximum with the UU.PRI subfunction of the .UUO directive (in this chapter). A job's private memory maximum is initially defaulted to the system maximum.
- The size of I-Space and the size of D-Space can not exceed 32K words each.

Thus, the size requested with .CORE is checked against <max>, as determined by the four previous steps. The size requested with .CORE is also checked against a minimum (the P.MSIZ word in the pseudo vectors, which must be greater than or equal to 1K words). Any size between P.MSIZ and <max>, inclusive, is legal.

There are two special cases:

- If the size requested with .CORE is exactly equal to the run-time system's minimum size (PMSIZ), that request is considered legal even if the requested size is greater than the job's private maximum.
- If the size requested with .CORE is less than the job image's current size and within the allowable bounds for the run-time system, but it is still larger than the private maximum, that request is considered legal. This could happen if the caller had EXQTA privilege, allowing the current size to be greater than the private maximum, and then dropped EXQTA privilege. The monitor would still allow the size greater than the private maximum.

If .CORE requests a decrease in job image size, no further checks are made. If .CORE requests an expansion and the size is legal according to the cases previously described, the monitor then determines if the expansion overlaps any windows created by CRAFQ or CRAW\$. If there are no overlaps, .CORE proceeds. If there is an overlap, the monitor rejects the .CORE expansion under any of the following conditions:

- If separate I- and D-Space hardware does not exist.
- If the APR mask value in XRB+XRBC is zero.
- If the overlapped window was created in D-Space (WS.UDS bit is set). Mapping a dynamic region can produce this.
- If the expansion would use an APR marked for protection by the APR mask in XRB+XRBC.

The APR mask tells the monitor how to handle the D-Space mapping when using concurrent APR windows. The possible options are:

Mask Value	Meaning
0	Concurrent window usage is not allowed. The monitor rejects .CORE with an error if it finds any overlap with a created window. The RSTS/E RSX emulator handles the EXTK\$ directive in the same way. This insures that all I-Space libraries in use also have D-Space as well.
1	Concurrent window usage is allowed and all libraries in use are presumed to be I-only code and all D-Space is available for the task. The RSX-11/M-PLUS native operating system handles the EXTK\$ directive in the same way.

Mask Value	Meaning
1+n	The value n is the inclusive OR of values representing the D-Space APRs being protected. If an APR is protected, it means the D-Space for that APR remains mapped along with the I-Space window at the same APR. If the .CORE expansion also requires this APR, the request is rejected with an error. This is the equivalent of the EXTM\$ directive under both RSX-11/M-PLUS and the RSTS/E RSX emulator. Bit 0 must be set.

Value	D-Space APR Protected
--------------	------------------------------

1	None, all 8 APRs are available for task data
3	APR 1 and above protected
5	APR 2 and above protected
11	APR 3 and above protected
21	APR 4 and above protected
41	APR 5 and above protected
101	APR 6 and above protected
201	APR 7 and above protected

This mask should be treated as a fence; that is, the lowest bit (other than bit 0) determines the protection. (41 and 341 are equivalent and protect in APRs 5,6 and 7.)

This mask passes the information to the monitor at execution time about the D-Space requirements for the libraries associated with this job, accumulated by the Task Builder. The Task Builder, if requested, passes this mask in a location called \$\$TSKP. See the *RSTS/E Task Builder Manual* for more details.

If .CORE requests a legal expansion that cannot be made in place, that is, if there is not enough free memory available for the expansion, the job is swapped out and swapped back in at the larger size. (This swap occurs even when JFLOCK = 1 in the keyword (KEY).)

When a user job image expands, the content of the newly added memory is zeroed as protection against a malicious user reading memory to look for passwords.

NOTE

Do not use this directive from a user job image running under the RT-11 run-time system. Expanding memory size should be done through the RT-11 emulator, using the appropriate RT-11 directive.

When the image runs under the RSX run-time system, use the EXTK\$ or EXTM\$ directive to extend the task size, so that subsequent GTSK\$ directives can return the task size correctly.

Privileges Required

EXQTA to exceed private memory maximum.

Data Passed

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	I&D flag	desired size, K words	0	XRLEN
	3	//////////	0 or D-APR mask	2	XRBC
	5	////////////////////////////////////		4	
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRLEN	The desired size for the user job image, in K words.
XRLEN+1	If this byte contains a -1, the user is requesting that the I&D APRs be split to map different physical memory. XRLEN is the requested size of the D-Space. The I-Space size is fixed at the job's current size. If this byte contains a -1 and XRLEN contains a zero, the I&D split is disabled.
XRBC	Either zero or the D-Space APR mask. If the value is zero, .CORE acts as the EXTK\$ directive; otherwise, .CORE acts as the EXTM\$ directive. See Chapter 5 for descriptions of these directives. If you use the D-Space APR mask, the first bit must be set.

Data Returned

Other than a possible error in the byte 0 of the FIRQB, the .CORE directive does not return any meaningful data.

Errors

BADFUO	The program is requesting that the I&D Space be split, but it cannot be split or is already split.
EDBMCE	The requested user job image size is illegal. It is either too large or too small, or it overlaps a mapped window.
ERRERR	The program is requesting use of separate I&D Space but the hardware does not exist on this system.
INUSE	There is outstanding asynchronous I/O for this job.

Example

The following code requests a user job image of 24K words:

```
CALL      CLRXRB                ;CLEAR THE XRB
MOV      #24., XRB+XRLEN      ;SET XRB TO INDICATE 24K WORDS
.CORE
```

See the section "Programming Hints" for information on the CLRXRB routine.

3.11 .DATE — Return Current Date and Time

Form

.DATE

Function

The .DATE directive returns the current date and time, the current program name (as installed by the .NAME directive), and the current run-time system name in the XRB.

Privileges Required

None

Data Passed

The .DATE directive does not pass any meaningful data.

Data Returned

XRB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	current date, in system internal format		0 XRLEN
	3	minutes until midnight		2 XRBC
	5	ticks until second	seconds until minute	4 XRLOC
	7	program name in RAD50 format (2 words)		6 XRCI
	11	(as installed with .NAME)		10
	13	run-time system name in RAD50 format (2 words)		12 XRTIME
	15			14

XRB+XRLEN

The current date, in system internal format. The monitor calculates the date as:

$$[(year - 1970) * 1000.] + day-within-year$$

where *day-within-year* is 1 for January 1, 2 for January 2, and so forth. (Every leap year, the day-within-year value for March 1 and following is one higher than in other years.)

XRB+XRBC

The number of minutes until midnight. A value of 1440 is midnight; 720 is noon; 0 is never returned.

XRB+XRLOC

The number of seconds until the next minute. A value of 60 is xx:xx:00; 1 is xx:xx:59; 0 is never returned.

XRB+5

The number of ticks until the next second. A tick is either 1/60th or 1/50th of a second, depending on the clock in use and/or the line frequency. (Systems running with the KW11P clock at crystal speeds, rather than at line frequency, or systems running the 11/73, 11/83, 11/84, 11/93, or 11/94 800 Hertz clock, have a tick of 1/50th of a second. Otherwise, if the system is operating with a 60 Hz power line, a tick is 1/60th of a second.)

XRB+XRCI

The current program name (as set by the most recent **.NAME** directive); two words in RAD50 format.

XRB+XRTIME

The current run-time system name; two words in RAD50 format.

Errors

No errors are possible with the **.DATE** monitor call.

Example

Since no data is passed to the monitor, the call is:

.DATE

3.12 .ERLOG — Log an Error from RTS

Form

.ERLOG

Function

You can issue the .ERLOG directive only from the high segment (run-time system). It allows the run-time system to log an error into the RSTS/E error log file, which can then be printed by the system manager (see the *RSTS/E System Manager's Guide*). For example, you might want to place an entry into the RSTS/E error logging scheme on a hardware floating-point unit exception that has an illegal error code because the monitor makes no such checks.

You can issue this directive only from the job's current run-time system (high segment). Since this call does not require privilege, the monitor does not let users fill up the system error log with unimportant errors. If .ERLOG is issued from the user job image (low segment), RSTS/E ignores it.

Privileges Required

None

Data Passed

The .ERLOG directive records in the system error log file the contents of the program counter (PC) and program status word (PS) at the time of the call, as well as the contents of the general registers (R0 through R5). These registers will then be displayed at the system manager's request. Hence, the registers should contain whatever information you want to record when the .ERLOG is executed.

Data Returned

The .ERLOG directive does not return any meaningful data.

Errors

No error is possible with .ERLOG.

Example

If the general registers contain relevant information, the call is:

.ERLOG

3.13 .EXIT — Exit to Default Keyboard Monitor

Form

`.EXIT`

Function

The `.EXIT` directive returns control to the system default keyboard monitor (DCL) at the `P.NEW` entry point (see Chapter 2). When a program exits, it normally passes control to the job's keyboard monitor with the `.RTS` directive. You can use the `.EXIT` call as a backup to return control to the default keyboard monitor if the `.RTS` fails, or for any other reason when you want to enter the default keyboard monitor at the entry point specified by `P.NEW`. The `.EXIT` directive needs no arguments and never returns in line to the caller.

Privileges Required

None

Data Passed

The `.EXIT` directive needs no arguments; however, the three words beginning at `XRB+10` are passed unaltered to the default keyboard monitor. The monitor also passes information to the default keyboard monitor when `.EXIT` is executed. See the discussion of the `P.NEW` entry point in Chapter 2.

Data Returned

The `.EXIT` directive does not return any meaningful data; control never returns in line.

Errors

No errors are possible with `.EXIT`.

Example

Since no data is passed or returned with `.EXIT`, the call is:

```
.EXIT
```

NOTE

Do not use this `RSTS/E` directive from a user job image running under the RT-11 run-time system. The correct way to terminate such a program is to exit to the RT-11 emulator, which then returns control to the job's keyboard monitor.

3.14 .FSS — Check File Specification String

Form

.FSS

Function

The .FSS directive examines a string of characters presumed to be a file specification and, if possible, converts it to the internal RSTS/E file specification format (FIRQB format). The monitor returns information to the XRB describing what it found in the string and returns the converted file specification to the FIRQB. Thus, programs that manipulate files can use .FSS to translate a user-typed string to the FIRQB format.

The monitor examines the string from left to right and stops without error when it finds:

- The end of the string.
- An equal sign (=), which is ASCII code 075.
- A semicolon (;), which is ASCII code 073.
- A slash (/), which is ASCII code 057, that is followed by anything other than the following switches, which the monitor translates to the FIRQB format:
 - /CL[USTERSIZE]:[-][#]n[.]
where n is the cluster size used in opening files and devices. The variable n can specify a value ranging from -32768 through 32767.
 - /MO[DE]:[#]n[.]
where n is the mode used in opening files and devices. The variable n can specify a value between 0 and 32767.
 - /FI[LE]SIZE:[#]n[.] or /SI[ZE]:[#]n[.]
where n is the filesize used in opening files and devices. The value of n defines the file's size in 512-byte blocks and can be in the range 0 to 8,388,607 blocks.
 - /PO[SITION]:n
where n is the position used in creating files (to position block 1 of the file at a device cluster). The variable n can specify a value between -2 and 65,535.
 - /PR[OTECTION]:[#]n[.]
where n is the protection code used in opening or creating files. The variable n can specify a value between 0 and 255. The value of n determines the file's protection from users; see the *RSTS/E System User's Guide*.

The brackets ([]) in the previous switches enclose optional characters. Where more than one character is enclosed in brackets, any or all of the enclosed characters can be omitted. For example, MO, MOD, and MODE would all be accepted and the following quantity translated to the mode location in the FIRQB.

The value n is assumed to be decimal, unless the optional pound sign [#] appears, indicating that n is octal. The optional decimal point also indicates a decimal value.

- A comma (,), which is ASCII code 054. An exception is the comma separating the project and programmer numbers in a PPN.

The monitor translates the components in a file specification string as follows:

device name A device name can be either a logical device name or a physical device name:

logical A logical device name is a string of alphanumeric characters or dollar sign (\$) or underscore (_), terminated with a colon (:). The logical name can contain the \$ character anywhere except as the first character. Only the first 15 characters are examined; the remainder are ignored. If the logical name does not contain a \$ character, the monitor checks the name against the user's own logical device name assignments in the extended logical portion of the job header. If the monitor finds a definition, it returns the physical device name associated with that logical device name to the FIRQB. If the logical name is not found in the user-logical area or if the logical name contains a \$ character, the monitor makes a search of systemwide logical names. If the logical is not found in the logical lists, the monitor searches the logical table given in the XRB. If the logical name is not found, the monitor returns the logical device name and sets a flag in the XRB to indicate that it could make no association. For a logical device name beginning with an underscore (_), the monitor does not attempt any translation to a physical device name.

physical: A physical device name consists of two alphabetic characters optionally followed by digits and ended with a colon (:). The digits are translated as decimal and must have a value between 0 and 127 (decimal). Leading zeros are allowed.

For some devices (for example, terminals) a physical name can also be specified as a two-letter device name, a one-letter controller identifier, and a number specifying the unit on that controller. For example, TTG2: is the third terminal on a DZ11 controller.

account or PPN

A PPN can be expressed either as a single special character or as two separate numbers enclosed in square brackets [] or parentheses () and separated by a comma.

The following special characters are translated as:

- \$ The dollar sign (\$) is equivalent to [1,2].
- ! The exclamation point (!) is equivalent to [1,3].
- % The percent sign (%) is equivalent to [1,4].
- & The ampersand (&) is equivalent to [1,5].
- # The number sign (#) is translated to the caller's group library. It is always equivalent to [proj,0] where proj is the project number of the user issuing the .FSS directive.
- @ The at sign (@) is translated to the caller's assignable PPN, the USRPPN value (see Chapter 2). If USRPPN is set, its value is placed in the FIRQB at offset FQPPN. If USRPPN is zero, a string with an @ causes an error.

NOTE

Digital does not recommend the use of the special characters !, %, &, #, or @. They are provided only for compatibility with pre-V9.0 releases of RSTS/E.

- [n,m] This is the explicit construct for a PPN. The value n specifies the project number, and m specifies the programmer number. The variables n and m can specify any value from 0 through 254, except for [0,0]. If a number sign (#) precedes either n or m, the string is assumed to specify an octal value. Either n or m, or both, can also be the asterisk (*). The * is converted to 255 and placed in its corresponding FIRQB location. The asterisk character indicates a wildcard specification. Either n or m, or both, can be omitted; in that case, the monitor uses the corresponding part of the user's PPN. For example, [,] or [] specifies the user's PPN; [,0] is equivalent to #.
- (n,m) This is an alternate way to specify an explicit PPN. The same rules for n and m apply as when they are enclosed by brackets.

NOTE

Digital does not recommend the use of parentheses in the PPN specification. This format is provided only for compatibility with pre-V9.0 releases of RSTS/E.

file name	A file name can consist of alphanumeric characters and the question mark (?). It is the only field in the file specification with no explicit delimiter. Only the first six characters are examined; the rest are ignored. The asterisk character (*) is also an acceptable file name. It is translated to two words of RAD50, where each RAD50 character is the unused code (29). Each ? character is also converted to this unused code. This indicates that the file name field is a wildcard. (The LOKFQ subfunction of CALFIP and UU.LOK subfunction of .UUO can be used to look up wildcard files.) The asterisk can also represent trailing question marks. *.FIL and A*.FIL are legal file names; A*Z.FIL is illegal.
type	A file type can consist of alphanumeric characters and the ? character, preceded by a . character. The * character is also an acceptable file type. It is translated to one word of RAD50, where each RAD50 code is the unused code (29). Each ? character in the file type is also converted to this unused code. This indicates that the file type field, or character in the file type field, is a wildcard. The asterisk can also represent trailing question marks. FILE.* and FILE.A* are legal file names; FILE.*Z is illegal. If given, the file type must always follow the file name.
protection code	A file protection code can consist of numeric digits enclosed by angle brackets <>. The general form of a protection code is <nnn>, where n may be numeric characters indicating a value from 0 through 255. If the numeric characters are preceded by a # character, they are converted as specifying an octal value. Alternatively, the protection code can be specified using the /PROTECTION switch. If no file protection code is specified in the string and a default value has been assigned in USRPRT (see Chapter 2), the default value is placed in the FIRQB.

These special characters can appear in the string in any order, with the exception of the file type and PPN. The file type must follow the file name, if specified.

In addition, if the device name is a system or user logical device name that has an account (PPN) associated with it, the position of an explicit PPN in the file specification string is significant. If the order is *device:[PPN]*, then the explicit PPN overrides the PPN associated with the logical device name. If the order is *[PPN]device*;, RSTS/E displays the error message ?Illegal device name.

NOTE

Do not use this directive from a user job image running under the RT-11 run-time system, since the user logical area is not in the standard location.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	XRBB	Octal Offset	Mne- monic
	1	length of the string, bytes	0	XRLEN
	3	length of the string, bytes	2	XRBC
	5	starting address of the string	4	XRLOC
	7	////////////////////////////////	6	
	11	length of nonstandard user defaults	10	XRBLK
	13	starting address of nonstandard users	12	XRTIME
	15	////////////////////////////////	14	

XRBB+XRLEN

The length of the character string to be translated, in bytes.

XRBB+XRBC

The length of the character string to be translated, in bytes.

XRBB+XRLOC

The starting address of the string to be translated. (See the section "XRBB (Transfer Request Block)" in Chapter 2 for more information.)

XRBB+XRBLK

If the user logical information (USRPPN, USRPRT, and the extended logical area of the job header) is in its standard location, this word is passed as zero. If the user logical information is in some nonstandard location, the beginning address goes here. Digital does not support the nonstandard location and strongly recommends you use only standard locations.

XRBB+XRTIME

If the word at XRBB+XRBLK is nonzero, then this word defines the starting location for the user logical information. (The order of the information is assumed to be the same as in its standard location; that is, the user logical PPN, user logical protection code, user logical device name table. The format is also expected to be the same (see the descriptions of USRPPN, USRPRT, and the USRLOG area in Chapter 2 for details).

Data Returned

Mne- monic	Octal Offset	XRBB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	number of untranslated characters in string	2	XRBC
	5	address of first untranslated character	4	XRLOC
	7	////////////////////////////////	6	
	11	flag word 2	10	XRBLK
	13	flag word 1	12	XRTIME
	15	device description	14	XRMOD

XRBC+XRBC	A count of the untranslated characters in the string. If all characters were translated, the value of this word is zero.
XRBC+XRLOC	The address of the first untranslated byte of the string. If XRBC+XRBC is zero, this word identifies the end of the string. (See the section "XRBC (Transfer Request Block)" in Chapter 2 for more information.)
XRBC+XRBLK	Bit flags describing the translated string. Note that this word is the same as "flag word 2" for the BASIC-PLUS file name string scan SYS call (see the <i>RSTS/E Programming Manual</i>).

Bit	Setting	Meaning
0	Set	A file name was found in the source string; two words in RAD50 format at FIRQB+FQNAM1.
	Clear	No file name was found (and bits 1 and 2 of this word are also 0).
1	Set	The translated file name consisted of a single * character and has been translated to two words at FIRQB+FQNAM1 consisting of the RAD50 representation of the string "?????".
	Clear	The translated file name was not an * character.
2	Set	The file name contained at least one ? character.
	Clear	The file name did not contain any ? characters.
3	Set	A period (.) was found in the source string.
	Clear	No period was found, implying that no file type was specified (and bits 4, 5, and 6 of this word are also 0).
4	Set	A file type was found; that is, the field after the period was not null.
	Clear	No file type was found (the field after the period was null), and bits 5 and 6 of this word are also 0.
5	Set	The file type was an * character and is returned in the word at FIRQB+FQEXT as the RAD50 representation of the string "???".
	Clear	The file type was not an * character.
6	Set	The file type contained at least one ? character.
	Clear	The file type did not contain any ? characters.
7	Set	A PPN was found in the source string.
	Clear	No PPN was found (and bits 8 and 9 of this word are also 0).

8	Set	The project number was an * character. That is, the PPN was of the form [* ,n].) RSTS/E returns a value of 377 at FIRQB+FQPPN+1.
	Clear	The project number was not an * character.
9	Set	The programmer number was an * character. That is, the PPN was of the form [n,*]. RSTS/E returns a value of 377 at FIRQB+FQPPN.
	Clear	The programmer number was not an * character.
10	Set	A valid protection code was found.
	Clear	No protection code was found.
11	Set	No file protection code was found in the string, but there was a default output file protection code in location USRPRT. The default has been returned in the FIRQB.
	Clear	The user-assignable default protection code (at location USRPRT) was not used. Either zero or the protection code given in the string is returned to the FIRQB.
12	Set	A colon (:), but not necessarily a device name, was found in the source string.
	Clear	No colon was found (no device was specified); bits 13, 14, and 15 of this word are also 0.
13	Set	A device name was found in the source string.
	Clear	No device name was found; bits 14 and 15 of this word are also 0.
14	Set	The device name in the string was a logical device name.
	Clear	The device name in the string was an actual device name; bit 15 of this word is also 0.
15	Set	This bit set indicates an invalid device name. (The characters that were specified are simply returned at FIRQB+FQDEV, FIRQB+FQDEVN, and FIRQB+FQFLAG as three words in RAD50 format.) This bit can be set in one of two ways: <ul style="list-style-type: none"> • If the device name contained an underscore but was not a recognizable device name for any device on the system, this bit is set. • If the device name did not contain an underscore but the name could not be translated to a physical device name, this bit is set.
	Clear	The device name specified, if any, was either an actual device name or a logical device name to which a physical device has been assigned. The physical device name has been returned to the word at FIRQB+FQDEV as two ASCII characters, and the unit information has been returned appropriately at FIRQB+FQDEVN.

XRB+XRTIME

Remaining bit flags describing what was translated. Some of these bits duplicate information returned at XRB+XRBLK. Digital recommends that you use the bits at XRB+XRBLK to allow for enhancements in future releases. Note that this word is the same as "flag word 1" for the BASIC-PLUS file name string scan SYS call, see the *RSTS/E Programming Manual*.

Bit	Setting	Meaning
0	Set	The /CLUSTERSIZE:n switch was specified.
	Clear	The /CLUSTERSIZE:n switch was not specified.
1	Set	Either the /MODE:n or /ONLY switch was specified.
	Clear	Neither the /MODE:n nor the /ONLY switch was specified.
2	Set	The /FILESIZE:n or /SIZE:n switch was specified.
	Clear	Neither the /FILESIZE:n nor the /SIZE:n switch was specified.
3	Set	The /POSITION:n switch was specified.
	Clear	No /POSITION:n switch was specified.
4-7		(Not currently used.)
8	Set	A file name was found in the source string; two words in RAD50 format at FIRQB+FQNAM1. Note that this is the same meaning as for bit 0 at XRB+XRBLK.
	Clear	No file name was found in the source string.
9	Set	A period (.) was found in the source string. Note that this is the same meaning as for bit 3 at XRB+XRBLK.
	Clear	No period was found in the source string, implying that no file type was specified either.
10	Set	A PPN was found in the source string. Note that this is the same meaning as for bit 7 at XRB+XRBLK.
	Clear	No PPN was found.
11	Set	A valid protection code was found. Note that this is the same meaning as for bit 10 at XRB+XRBLK.
	Clear	No protection code was found.
12	Set	A colon (but not necessarily a device name) was found in the source string. Note that this is the same meaning as for bit 12 at XRB+XRBLK.
	Clear	No colon was found, implying that no device could have been specified.

13	Set	Device name was specified and was a logical device name. Note that this is the same meaning as for bit 14 at XRB+XRBLK.
	Clear	Device name (if specified) was an actual device name. (If device name was not specified, this bit is also 0.)
14		(Not currently used.)
15	Set	Source string contained wildcard characters (either ?, *, or both) in file name, type, or PPN fields. In addition, the device name specified, although a valid logical device name, does not correspond to any of the logical device assignments currently in effect or contains an underscore as the first character. Flag word 2 contains more specific information.

XRB+XRMOD

The device description (the same information returned by the BASIC-PLUS STATUS variable and returned at FIRQB+FQFLAG when a file or device is opened with the OPNFQ or CREFQ subfunctions of CALFIP). The device handler index is in the low byte and descriptive flags are in the high byte.

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	//////////	current job no. * 2	2	FQJOB
FQSIZM	5	MSB of file size	//////////	4	
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format		10	FQNAM1
	13	(first 2 words)		12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	LSB of file size		16	FQSIZ
	21	////////////////////		20	
	23	mode parameter		22	FQMODE
	25	3rd word of logical name (not translated)		24	FQFLAG
FQPROT	27	protection code	=255, explicit prot.	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	cluster size parameter		34	FQCLUS
	37	position parameter (DCN for first block)		36	FQNTENT

NOTE

For each of the following field definitions that begin with the word "If," a corresponding statement applies: "If not, the field is left alone." That is, you can insert values in the FIRQB before executing the .FSS to serve as default values for fields when the .FSS returns no result.

FIRQB+FQJOB	The current job number times two.
FIRQB+FQSIZM	If a /FILESIZE:n or /SIZE:n switch was specified, the most significant bits of the file size are contained in this byte.
FIRQB+FQPPN	If a PPN was part of the translated string or if a logical name was found to be the same as a system or user logical name with an associated PPN, this word contains the binary value of that PPN. The project number is in the high byte; the programmer number in the low byte. Any value returned here by .FSS has been verified by the monitor as being within the range for PPNs on a RSTS/E system.
FIRQB+FQNAM1	If a file name was encountered, it is translated to two words of RAD50, beginning at this location. If less than 6 characters, the file name is left-justified and padded with blanks (0 RAD50 characters).
FIRQB+FQEXT	If a file type was encountered, it is translated to one word of RAD50, beginning at this location. If less than 3 characters, the file type is left-justified and padded with blanks (0 RAD50 characters).
FIRQB+FQSIZ	If a /FILESIZE:n or /SIZE:n switch was encountered, the value of n is translated to binary and the LSB of the value are placed in this word. The MSB are placed in the byte at FIRQB+FQSIZM.
FIRQB+FQMODE	If a /MODE:n switch was encountered, the value specified is translated to binary and returned in this word. Bit 15 is set to indicate that a mode switch was translated and to differentiate between a mode of 0 and no mode at all. (Note that bit 15 must be set for a mode value to work on opens.)
FIRQB+FQPFLG	If a file protection code was encountered, a word is returned here. The high byte (FIRQB+FQPROT) is the binary value of the protection code, and the low byte (FIRQB+FQPFLG) is 255. Setting the low byte indicates that a protection code was specified and differentiates a protection code of zero from no protection code at all.
FIRQB+FQDEV	If a device name was specified, it is returned here as two ASCII characters. If less than two characters were specified, the device name is left-justified and padded with spaces (ASCII 32.).
FIRQB+FQDEVN	If a device name but no explicit unit number was specified, this word is zero. If an explicit unit number was specified, then that unit number is in the low byte and 255 is in the high byte. Setting the high byte indicates an explicit device number and differentiates a device number of zero from no device number at all.

NOTE

If a syntactically correct logical device name was encountered that could not be translated to a physical device name, then the first six characters of the logical device name are returned as two words of RAD50 starting at offset FQDEV and the next three characters are returned as one word of RAD50 at offset FQFLAG. Characters beyond the first nine are not returned.

FIRQB+FQCLUS If a /CLUSTERSIZE:n switch was encountered, the value of n is returned here, in binary.

FIRQB+FQNTENT If a /POSITION:n switch was encountered, the value of n is returned here, in binary. (The value n is the device cluster number for the first block of the file.)

Errors

BADCNT The first three words of the XRB are illegal, or an odd or illegal address for nonstandard user logical table.

BADNAM Some illegal specification occurred in the string. .FSS found a sign bit set on at least one character.

BADSWT Some .FSS switch was encountered, but it was in an illegal format.

BDNERR The numeric argument to one of the .FSS switches was illegal.

Example

The following code causes the monitor to scan a string beginning at location BUFFER as a possible file name. BUFFER is defined as an 80-byte area and is filled with zeros to terminate the string scan if what the user typed did not fill the buffer. For example:

```

BUFFER:      .BLKW0    40.
             .
             .
             .
             (read string into BUFFER from terminal)
             .
             .
             .
             CALL    CLRXRB
             MOV     #80.,XRB+XRLEN        ;DEFINE LENGTH
             MOV     #80.,XRB+XRBC        ;DEFINE LENGTH AGAIN
             MOV     #BUFFER,XRB+XRLOC    ;START OF BUFFER
             .FSS
             (test for error; if none, try open)

```

3.15 .LOGS — Check for Logical Device Names

Form

.LOGS

Function

The .LOGS directive:

- Translates a system logical device name to a physical device name
- Translates a user logical device name to a physical device name
- Translates RAD50 format to ASCII
- Verifies that a physical device name is valid
- Obtains generic information about a particular device

You specify either a logical device name, a physical device designation (name and, if relevant, unit number), or both, in the XRB and the FIRQB. The monitor compares the logical device name specified, if any, against the selected logical list (system or user). If it finds a match, the monitor returns the device designation associated with the logical device name to the FIRQB. This physical device designation consists of a name, unit number, and in some cases, a PPN.

You can use the .LOGS directive simply to translate the RAD50 text stored in the XRB into ASCII text using the same rules of translation that .FSS uses. The number of words that are illegal in RAD50 and the number of translation rule violations are returned to the caller.

The underline character () is illegal in RAD50 but legal in logical names. To resolve this, RSTS/E stores underline characters as periods (.) internally. When a logical name that includes an underline is translated to RAD50, you must substitute the period character. (If you use .FSS to generate the RAD50 text, this substitution happens automatically.)

RSTS/E provides two translation functions: one returns a period when it finds a period, and the other returns an underline when it finds a period. In each case, the input data is in the XRB in RAD50 format. XRB+0 must be nonzero; otherwise .LOGS just returns the device status of the device in FQDEV.

.LOGS Subfunctions: There are six subfunctions of the .LOGS directive.

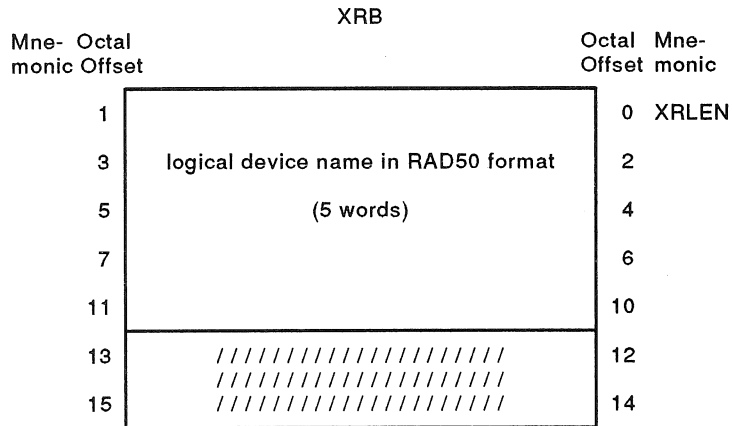
FQDEV Value	Meaning
-2	Translate the logical in the XRB, using the user logical list instead of the system logical list.
-3	Translate the RAD50 data in the XRB into an ASCII string, using the rules for logicals (". " maps to "_").
-4	Translate the RAD50 data in the XRB into an ASCII string without mapping (". " is returned as ".").
-1	Translate the logical in the XRB using the system logical list.
0	Use SY: as the physical device name.
Physical device name	As two ASCII characters, overridden if the logical contains a device also.

Next, the monitor checks the physical device designation (either the one passed or the one returned by the monitor in the logical-name translation) to be sure it is valid. If so, information describing the device is returned in the FIRQB.

Privileges Required

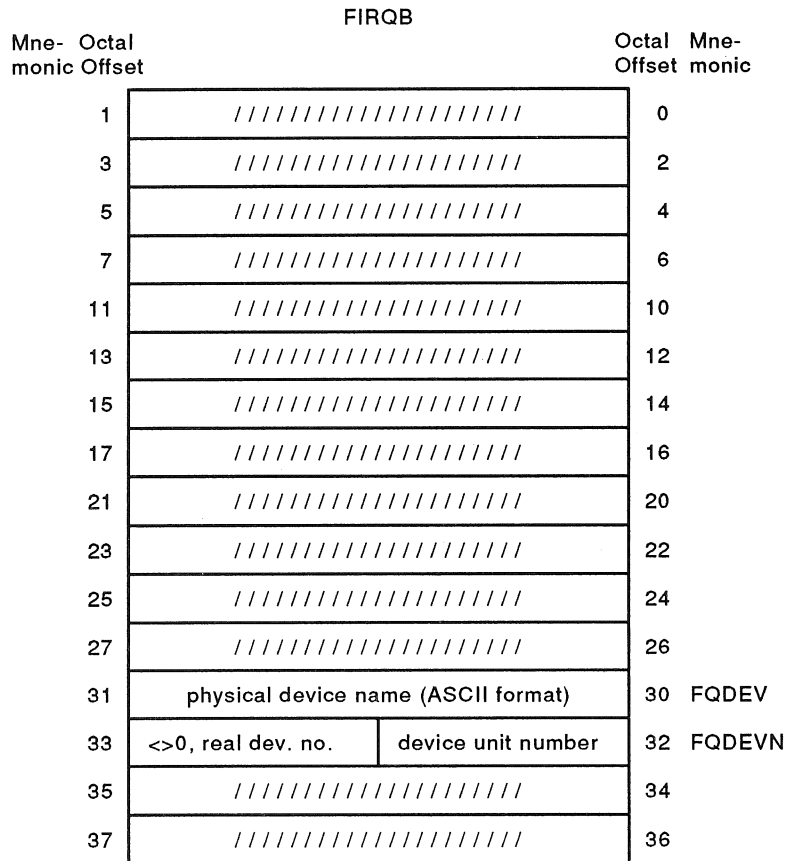
None

Data Passed



XRB+XRLEN

The logical device name to be checked is passed as five words in RAD50 format beginning at this location. If only a physical device name check or description is needed, then the first word of the XRB should be passed as zero. The physical device name is passed in the FIRQB.



FIRQB+FQDEV

The physical device name, as two ASCII characters, or one of the following codes:

- 0 For the public disk structure (SY:). (You must also have 0 at offset FIRQB+FQDEVN).
- 1 For a translation from a logical device name to a physical device name. (A -1 is guaranteed not to be a valid physical device name.)
- 2 For a translation of the logical name passed in the XRB using the user logical table rather than the system logical table, which is the default.
- 3 For a translation of the RAD50 data passed in the XRB to ASCII data using special conversion rules. RAD50 dot (.) characters are translated as underscores (_).
- 4 For a translation of the RAD50 data passed in the XRB to ASCII data without using conversion rules.
- Other For a translation of the logical name passed in the XRB using the system logical tables only.

If the first word of the XRB is zero, the .LOGS directive makes no translations and returns generic information about the device specified in FQDEV and FQDEVN.

FIRQB+FQDEVN

The unit number of the physical device name is passed in this byte, in binary. To indicate an explicit device number, set the high byte (at FIRQB+FQDEVN+1) to some nonzero value. If the physical device name is of the form "XY:" (that is, no unit number is specified), then set the entire word at this offset to zero to indicate no explicit unit number.

Data Returned

Mne- monic	Octal Offset	XRB	Octal Offset	Mne- Offset monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	logical device flag: -1=N, -2=Y, 0=N.A.	4	XRLOC
	7	device description	6	XRCI
	11	reasonable buffer size for device	10	XRBLK
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	

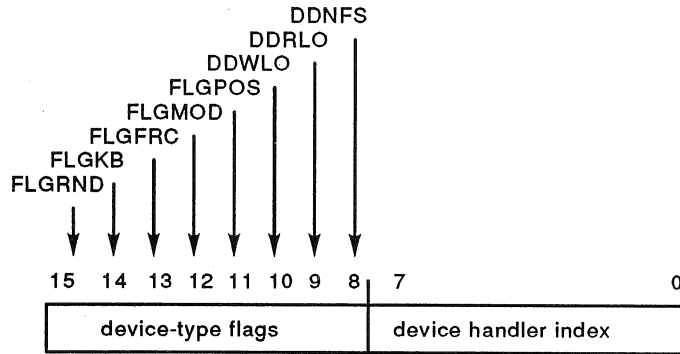
XRLOC

If there was no logical device name specified or if the logical device name cannot be translated to a physical device name, this word is returned as zero.

If the passed logical device name has a PPN associated with it, this word is returned as -2. If not, -1 is returned.

XRCI

Description of the device. The low byte contains the device's handler index. The high byte contains a set of status flags.



High Byte — Device-Type Flags

The bits in the high byte of the flag word are set to indicate the type of device specified:

FLGRND	= 1	The device is random-access.
	= 0	The device is sequential.
FLGKB	= 1	The device is a terminal-type device.
	= 0	The device is not a terminal-type device.
FLGFRC	= 1	The device is byte-oriented. That is, the .READ and .WRITE directives handle data in byte units.
	= 0	The device is block-oriented. The .READ and .WRITE directives handle data in block units.
FLGMOD	= 1	The device accepts modifiers in .READ and .WRITE directives.
	= 0	The device does not accept modifiers in .READ and .WRITE directives.
FLGPOS	= 1	The device keeps track of its horizontal position and expands characters such as TAB to whatever is appropriate for the device. You can determine the current horizontal position with the .POSTN directive.
	= 0	The device does not keep track of its horizontal position.
DDWLO	= 1	The device is a read-only device.
	= 0	The device is not write-locked.
DDRLO	= 1	The device is a write-only device.
	= 0	The device is not read-locked.
DDNFS	= 1	The device is non-file-structured.
	= 0	The device is file-structured.

Low Byte — Device Handler Index

Bits 0-7 of the flags word contain a handler index that indicates the generic kind of device. The currently defined values follow.

Octal Value	Symbol	Meaning
0	DSKHND	All disks
2	TTYHND	All terminals
4		Reserved
6	LPTHND	All line printers
10		Reserved
12		Reserved
14	CDRHND	Card reader
16	MTAHND	Magnetic tape
20	PKBHND	Pseudo keyboards
22	RXDHND	Flexible diskettes
24		Reserved
26	NULHND	The null device
30	DMCHND	The DMC11/DMR11 DDCMP interface
32-36		Reserved
40	KMCHND	KMC11
42	IBMHND	IBM interconnect
44		Reserved
46	DMPHND	DMP11/DMV11 device
50	ETHHND	Ethernet device

XRBLK

If the physical device name is valid (either the one returned by the monitor's translation of logical device name or the one passed), this word contains the monitor's "best guess" as a reasonable buffer size for this device. See the .READ and .WRITE directives in this chapter.

Mne- Octal monic Offset		FIRQB		Octal Mne- Offset monic
1		////////////////////////////////////		0
3		////////////////////////////////////		2
5		////////////////////////////////////		4
7		project number	programmer number	6 FQPPN
11		////////////////////////////////////		10
13		////////////////////////////////////		12
15		////////////////////////////////////		14
17		////////////////////////////////////		16
21		////////////////////////////////////		20
23		////////////////////////////////////		22
25		////////////////////////////////////		24
27		////////////////////////////////////		26
31		device name (2 ASCII characters)		30 FQDEV
33		<>0, unit no. real	device unit number	32 FQDEVN
35		////////////////////////////////////		34
37		////////////////////////////////////		36

FIRQB+FQPPN

If a logical device name was passed and it was translated to a device designation with an associated PPN, the PPN is returned in this word. Otherwise, this word is the same as before the .LOGS call was executed.

FIRQB+FQDEV

The physical device name, either the one returned when a successful translation of logical device name is made or the one passed, if no logical device name was passed. The physical device name is returned as two ASCII characters.

FIRQB+FQDEVN

The physical device unit number, either the one returned when a successful translation of logical device name is made or the one passed, if no logical device name was passed. The low byte contains the unit number, in binary. The high byte (at FIRQB+FQDEVN+1) is either zero, to indicate no explicit device number, or nonzero, to indicate an explicit device number.

Data Returned—RAD50 Translation Subfunctions

If -3 or -4 is passed at FIRQB+FQDEV, the return FIRQB contains the ASCII translation of the RAD50 logical names.

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	ASCII data translated from RAD50	4	FQFIL
	7		6	
	11		10	
	13		12	
	15		14	
	17		16	
	21		20	
	23		22	
	25		24	
	27		26	
	31	////////	30	FQDEV
	33	# illegal RAD50 wds # illegal chars	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL The ASCII translation of the RAD50 data passed in the XRB. Any unused bytes translate as zeroes. Each RAD50 word translates as three ASCII characters. Translation ends at the first zero encountered in the XRB. Illegal RAD50 word values translate as three question marks (???).

FIRQB+FQDEVN The number of illegal characters encountered. The subfunctions search for the following errors:

- Leading spaces. (Trailing spaces are legal.)
- Dollar sign (\$) characters. (Only system logicals may have \$ characters.)
- Question mark (?) characters.
- Dot (.) characters (subfunction -4 only).

FIRQB+FQDEVN+1 The number of illegal RAD50 word values detected.

Errors

NODEVC The physical device name (either the one passed or the one corresponding to the logical device name) is invalid.

Example

The following code asks the monitor to check the name `SYSDEV` to see if it is a defined system logical device name and, if so, to return the physical device name and characteristics to the `XRB` and `FIRQB`:

```
CALL      CLRXRB
MOV       #^RSYS, XRB+XRLEN           ;SET XRB TO TRANSLATE LOGICAL
MOV       #^RDEV, XRB+XRBC           ;DEVICE NAME "SYSDEV"
.LOGS
```

3.16 .MESAG — Message Send/Receive

Form

```
      .  
      .  
      .  
(Load FIRQB and/or XRB for appropriate subfunction)  
      .  
      .  
      .  
.MESAG
```

Function

The .MESAG directive provides access from a MACRO program to the RSTS/E local message send/receive services and, if your system is a DECnet/E system, to DECnet/E network message send/receive services.

This section contains FIRQB and XRB formats and error descriptions for local message send/receive. (Unless data passed and returned show specific values for the XRB, it should be all zeros.) When using SEND/RECEIVE calls, you must clear both FIRQB and XRB, even if XRB is not used.

For detailed information about each call, see the *RSTS/E Programming Manual*. For information about network message send/receive, see *RSTS/E DECnet/E Network Programming in MACRO-11*.

3.16.1 Declare Receiver Subfunction

Privileges Required

SYSIO to declare a receiver with an unrestricted name, network server, or local object. EXQTA to suppress RIB or message quota checks.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
	3	////////////////////////////////////		2		
	5	////////	function code = 1	4	FQFIL	
	7	receiver name in ASCII (space fill to six bytes)		6	FQPPN	
	11				10	
	13				12	
	15	access	object type	14	FQEXT	
	17	buffer maximum		16	FQSIZ	
	21	inbound link max	message max	20	FQBUFL	
	23	packet maximum		22	FQMODE	
	25	pkts/msg	outbound link max	24	FQFLAG	
	27	////////////////////////////////////		26		
	31	////////////////////////////////////		30		
	33	////////	RIB number	32	FQDEVN	
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

- FIRQB+FQPPN** If the caller does not have SYSIO privilege, the fifth and sixth characters of the receiver name must be the caller's job number as two ASCII digits.
- FIRQB+FQMODE** Specifies the maximum number of packets that can be queued at any one time. See the *RSTS/E Programming Manual* for more information. Used only in an EMT logging program.
- FIRQB+FQFLAG+1** Specifies the number of packets that make up a complete message. See the *RSTS/E Programming Manual* for more information. Used only in an EMT logging program.

Data Returned

Except for a possible error code in byte 0 of the FIRQB, the declare receiver subfunction of .MESAG does not return any meaningful data.

Errors

- BADCNT** The specified packet maximum is out of range.
- BADFUO** The receiver name, object type, and access parameters passed are inconsistent.

BADNAM	This error can occur for one of the following reasons: <ul style="list-style-type: none"> • The receiver name passed contains nonprintable characters or leading or embedded spaces • A job without SYSIO privilege passed a nonblank receiver name whose fifth and sixth characters are not its job number • The specified local object type is invalid
ERRERR	The call you attempted requires an optional feature (such as EMT logging or DECnet) that is not available on your system.
FIEXST	The receiver name passed is being used by another receiver, or the local object type you specified is single instance and is already in use.
INUSE	The calling job already exists in the system's list of declared receivers. This error may indicate a logic error in the program or that a previous program running under the same job number failed to remove itself from the receiver list before terminating. In the last case, issue a remove receiver call, and then reissue the declare receiver. (It is common practice to code a remove receiver immediately before the declare receiver call.)
NOBUFS	There were no small buffers available to hold the arguments passed in the declaration. Since the system's use of small buffers is dynamic, a retry may succeed.
PRVIOL	This can occur for one of the following reasons: <ul style="list-style-type: none"> • The specified RIB number is out of range • The caller does not have the privilege required for a particular option
QUOTA	You have exceeded the RIB or message quotas.

3.16.2 Remove Receiver Subfunction

Privileges Required

JOBCTL to remove the RIB of another job.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
FQSIZM5	5	(See discussion.)	function code = 0	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	<>0, remove all RIBs	RIB number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQSIZM The value is two times the job number of the receiver (s) you want to remove or zero if the receiver (s) belong to your own job. To specify a conditional remove, set the sign bit. For example, to conditionally remove receivers for your own job, set this byte equal to 200.
When the sign bit is set, the remove operation is rejected if there are any messages pending for the receiver.

Data Returned

Except for a possible error code in byte 0 of the FIRQB, the remove receiver subfunction of .MESAG does not return any meaningful data.

Errors

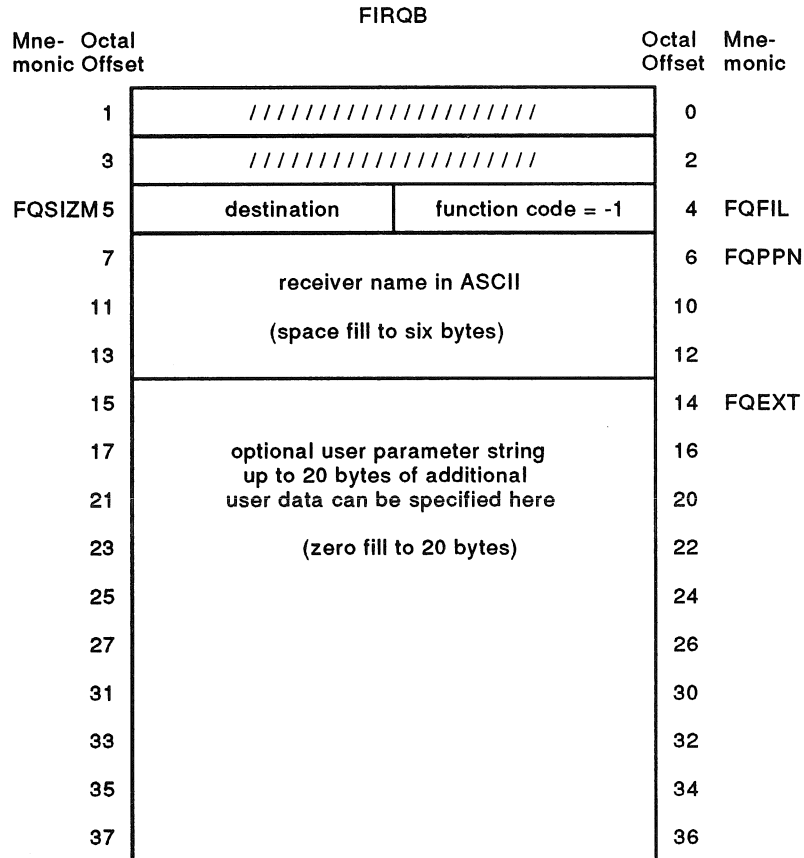
- BADFUO** The argument at FIRQB+FQSIZM was odd. It must be zero to remove the calling program or job number times two to remove another job.
- INUSE** Occurs on a conditional remove if there are messages pending for the receiver.
- PRVIOL** The caller does not have JOBCTL privilege and has attempted to remove the receiver ID block (RIB) of another job (that is, FIRQB+FQSIZM is nonzero).

3.16.3 Send Local Data Message Subfunction

Privileges Required

SEND to send to a restricted receiver.

Data Passed



FIRQB+FQSIZM

You can specify the destination in one of three ways:

- A zero value indicates that the destination is the receiver name that starts at FIRQB+FQPPN.
- A value equal to the job number times two indicates that the destination is this job number. If you do not specify a name (FIRQB+FQPPN = 0), the system locates the receiver by job number; this works only when the the receiving job is receiving messages on RIB 0. If you specify a name, the system sends to the specified receiver name. However, the system also checks that the receiver's job number matches the value in FIRQB+FQSIZM.
- A value equal to the local object type (LOT) plus 200 indicates that the destination is the receiver for the specified local object type number. Only single-instance object types are valid (see the *RSTS/E Programming Manual*). Legal values are:

LOT	Receiver
1	Error logger
2	EMT logger
3	PBS—command interpreter
4	PBS—server interpreter
5	PBS—user request packet
6	OPSER
13	OMS

FIRQB+FQPPN

Specifies the receiver name. If FIRQB+FQSIZM is zero, this field must be nonzero.

		XRB		
Mne-	Octal		Octal	Mne-
monic	Offset		Offset	monic
1		length of output buffer, in bytes, 0-512	0	XRLEN
3		number of bytes to send, 0 to buffer length	2	XRBC
5		starting address of buffer	4	XRLOC
7		////////////////////////////////////	6	
11		////////////////////////////////////	10	
13		////////////////////////////////////	12	
15		////////////////////////////////////	14	

XRB+XRLEN

Length of the output buffer, in bytes. This value can range from zero through 512.

XRB+XRBC

The number of bytes to be sent. This value can range from zero through the size of the buffer, as specified at XRB+XRLEN.

XRB+XRLOC

Starting address of the output buffer. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
FQSI	5	job no.*2 of rec. job	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Errors

BADCNT	The XRB+XRLEN value is illegal. It can range from 0 through 512.
BADFUO	The value at FIRQB+FQSI is odd. It must be zero or the receiver's job number times two.
NOBUFS	System buffers are currently not available to store this message for the intended local receiver. A later retry may proceed without error.
NOROOM	The number of pending messages for the intended local receiver is at its declared maximum, or the receiving program is hibernating. This program should try again later. If this error occurs repeatedly, the receiver is not processing messages often enough.
NOSUCH	The intended local receiver could not be located in the system's list of declared receivers. The receiver must be declared (with a declare receiver) before any data can be transmitted to it.
PRVIOL	Some access violation has occurred. Either the receiver does not allow any local senders, or the sender does not have SEND privilege and the receiver allows only restricted senders.

3.16.4 Receive Subfunction

Privileges Required

None

Data Passed

		FIRQB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
FQSIZM	5	receive modifier	function code = 2	4	FQFIL
	7	qualifier (norm = 0)	sender select	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	sleep time, in seconds		22	FQMODE
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	//////////	RIB number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

		XRB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	buffer size in bytes, or 0		0	XRLEN
	3	must be 0		2	XRBC
	5	starting address of buffer		4	XRLOC
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRB+XRLEN** The size of the receive buffer, in bytes. This word can be zero if no user data is desired on the receive. The amount of data transferred from a pending message will never be greater than the buffer size.
- XRB+XRBC** This word must be passed as zero. The monitor returns the actual number of bytes of user data transferred in this word location, as shown in the Data Returned sections.
- XRB+XRLOC** The starting address of the receive buffer. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)

Data Returned

The Receive call returns data to the FIRQB and XRB, identifying the type of message received and user data, if any, to the buffer defined in the data passed.

The FIRQB and XRB formats for the local data message follow.

Data Returned (Local Data Message)

Mne- Octal		FIRQB		Octal	Mne-
monic	Offset			Offset	monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSZM5	5	job number * 2	function code = -1	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	////////	sender KB no. or 377	10	FQNAM1
	13	remainder (number of bytes not transferred)		12	
	15	Data passed as parameters by the sender of this message.		14	FQEXT
	17			16	
	21			20	
	23			22	
	25			24	
	27			26	
	31			30	
	33			32	
	35			34	
	37			36	

FIRQB+FQNAM1 A value of 377 means the sender is detached.

3.16.4 Receive Subfunction

Privileges Required

None

Data Passed

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
FQSIZM	5	receive modifier	function code = 2	4	FQFIL
	7	qualifier (norm = 0)	sender select	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	sleep time, in seconds		22	FQMODE
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	//////////	RIB number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	buffer size in bytes, or 0		0	XRLEN
	3	must be 0		2	XRBC
	5	starting address of buffer		4	XRLOC
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRB+XRLEN** The size of the receive buffer, in bytes. This word can be zero if no user data is desired on the receive. The amount of data transferred from a pending message will never be greater than the buffer size.
- XRB+XRBC** This word must be passed as zero. The monitor returns the actual number of bytes of user data transferred in this word location, as shown in the Data Returned sections.
- XRB+XRLOC** The starting address of the receive buffer. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)

Data Returned

The Receive call returns data to the FIRQB and XRB, identifying the type of message received and user data, if any, to the buffer defined in the data passed.

The FIRQB and XRB formats for the local data message follow.

Data Returned (Local Data Message)

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSZM5		job number * 2	function code = -1	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	////////	sender KB no. or 377	10	FQNAM1
	13	remainder (number of bytes not transferred)		12	
	15	Data passed as parameters by the sender of this message.		14	FQEXT
	17			16	
	21			20	
	23			22	
	25			24	
	27			26	
	31			30	
	33			32	
	35			34	
	37			36	

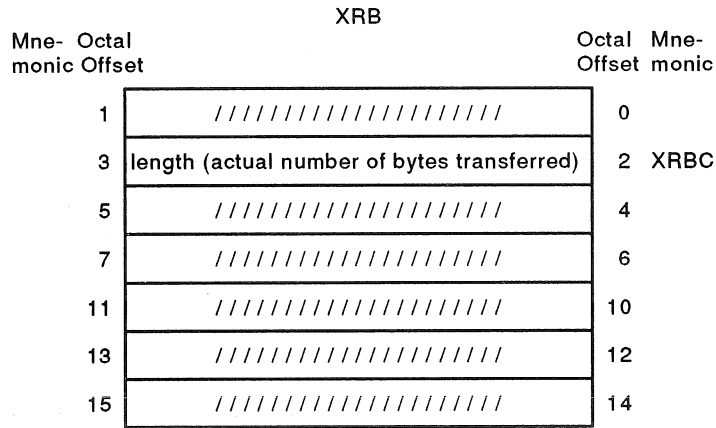
FIRQB+FQNAM1 A value of 377 means the sender is detached.

FIRQB+FQEXT

For an EMT logger message, the monitor returns three values:

- Bytes 14-15 contain the number of data packets not transferred.
- Bytes 16-17 contain the number of EMTs your program missed, either because it is not processing data packets quickly enough, or because not enough XBUF is available to store all the data packets that the monitor is creating.
- Bytes 20-21 contain the number of data packets transferred.

See the *RSTS/E Programming Manual* for more information.



Errors

- BADCNT** The buffer descriptor in the first three words of the XRB is invalid.
- BADFUO** Not a declared receiver. Before any receive can succeed, you must execute a declare receiver call to define the RIB number you want to use.
- NOSUCH** For a receive without sleep (bit 0 in receive modifier = 0), this error indicates that no appropriate messages are pending. For a receive with sleep (bit 0 in receive modifier = 1), this error is returned when the program is awakened from the sleep. The program must execute another receive call to retrieve any pending messages.

3.16.5 Send Privileges Subfunction

This subfunction provides a method for a program to tell another program about a job's current privileges and guarantees that the data cannot be falsified. Data can be sent at the same time.

Privileges Required

SEND to send to a restricted receiver.

Data Passed - Send Privileges

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
FQSIZM	5	destination | function code = -11	4	FQFIL
	7	receiver name in ASCII	6	FQPPN
	11	(space fill to six bytes)	10	
	13		12	
	15	////////////////////////////////	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	optional user parameter string	24	
	27	(up to 12 bytes of additional	26	
	31	user data can be specified here,	30	
	33	zero fill to 12 bytes)	32	
	35		34	
	37		36	

FIRQB+FQSIZM

You can specify the destination in one of three ways:

- A zero value indicates that the destination is the receiver name that starts at FIRQB+FQPPN.
- A value equal to the job number times two indicates that the destination is this job number. If you do not specify a name (FIRQB+FQPPN = 0), the system locates the receiver by job number; this works only when the the receiving job is receiving messages on RIB 0. If you specify a name, the system sends to the specified receiver name. However, the system also checks that the receiver's job number matches the value in FIRQB+FQSIZM.
- A value equal to the local object type (LOT) plus 200 indicates that the destination is the receiver for the specified local object type number. Only single-instance object types are valid (see the *RSTS/E Programming Manual*). Legal values are:

LOT	Receiver
1	Error logger
2	EMT logger
3	PBS—command interpreter
4	PBS—server interpreter
5	PBS—user request packet
6	OPSER
13	OMS

FIRQB+FQPPN

Specifies the receiver name. If FIRQB+FQSIZM is zero, this field must be nonzero.

Mne- monic	Octal Offset	XRFB	Octal Offset	Mne- monic
1		length of output buffer, in bytes, 0-512	0	XRLEN
3		number of bytes to send, 0 to buffer length	2	XRBC
5		starting address of buffer	4	XRLOC
7		////////////////////////////////	6	
11		////////////////////////////////	10	
13		////////////////////////////////	12	
15		////////////////////////////////	14	

XRFB+XRLEN

Length of the output buffer, in bytes. This value can range from zero through 512.

XRFB+XRBC

The number of bytes to be sent. This value can range from one through the size of the buffer, as specified at XRFB+XRLEN. If the value in XRFB+XRLEN is zero, this value must be zero.

XRFB+XRLOC

Starting address of the output buffer. (See the section "XRFB (Transfer Request Block)" in Chapter 2 for more information.)

Data Received by Receiver

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSZM5	5	job number * 2	function code = -11	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	////////	sender KB no. or 255	10	FQNAM1
	13	remainder (number of bytes not transferred)		12	
	15	sender's privilege mask		14	FQEXT
	17	(4 words)		16	
	21			20	
	23			22	
	25	data passed as parameters by the sender of this message		24	
	27			26	
	31			30	
	33			32	
	37			34	
				36	

Errors

BADCNT	The XRB+XRLEN value is illegal. It can range from 0 through 512.
BADFUO	The value at FIRQB+FQSZM is odd. It must be zero or the receiver's job number times two.
NOBUFS	System buffers are currently not available to store this message for the intended local receiver. A later retry may proceed without error.
NOROOM	The number of pending messages for the intended local receiver is at its declared maximum, or the receiving job is hibernating. This program should try again later. If this error occurs repeatedly, the receiver is not processing messages often enough.
NOSUCH	The intended local receiver could not be located in the system's list of declared receivers. The receiver must be declared (with a declare receiver) before any data can be transmitted to it.
PRVIOL	Some access violation has occurred. Either the receiver does not allow any local senders, or the sender does not have SEND privilege and the receiver allows only restricted senders.

3.16.6 Create Local LAT Port

This directive creates a local LAT port for the host to use to initiate LAT connections. You can specify the name and unit number of the port to be created; if you specify no name, the monitor selects the next available port. The directive returns the name and unit number of the local LAT port created in the FIRQB.

Privileges Required

SWCTL

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
FQSIZM	5	4	-14 octal	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	"KB"		30	FQDEV
	33	unit number flag	unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQFIL Specifies the SET LAT function.
- FIRQB+FQSIZM Specifies Create Local LAT Port.
- FIRQB+FQDEV Must be the ASCII characters "KB" or zero. If zero, the monitor selects the next available port.
- FIRQB+FQDEVN Unit number of the port to be created.
- FIRQB+FQDEVN+1 Must be nonzero.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	error code or 0	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	"KB"	30	FQDEV
	33	-1 | unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+0 Error code or zero.
FIRQB+FQDEV The two ASCII characters "KB".
FIRQB+FQDEVN Unit number of the port created.
FIRQB+FQDEVN+1 Nonzero value.

Errors

ERRERR LAT is not installed on the system.
INUSE The device specified is currently in use.
NOBUFS Not enough small buffers are available to create the local LAT port.
NODEV The device specified is not a dynamic keyboard.
PRVIOL The caller does not have the SWCTL privilege.

3.16.7 Delete Local LAT Port

This directive deletes the local LAT port created by the Create Local LAT Port directive. The caller passes the name of the port in the FIRQB. If a session is active on the port, the port is deleted once the session has finished. The caller can request that the session be terminated immediately by setting the abort bit in the flag byte.

Privileges Required

SWCTL

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSIZM	5	5	-14 octal	4	FQFIL
	7	////////	Flag	6	FQPPN
	11	////////////////////////////////		10	
	13	////////////////////////////////		12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	"KB"		30	FQDEV
	33	unit number flag	unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

- FIRQB+FQFIL Specifies the SET LAT function.
- FIRQB+FQSIZM Specifies Delete Local LAT Port.
- FIRQB+FQPPN The flag byte. If bit zero is set to one, the directive aborts any currently active session on the specified port.
- FIRQB+FQDEV Must be the ASCII characters "KB".
- FIRQB+FQDEVN The unit number of the port to be deleted.
- FIRQB+FQDEVN+1 Must be nonzero.

Data Returned

		FIRQB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	error code or 0		0	
	3	////////////////////////////////////		2	
	5	////////////////////////////////////		4	
	7	//////////	Flag	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQPPN The flag byte. If bit zero is set to one, the port to be deleted has an active session.

Errors

BADFUO No port name was specified.
ERRERR LAT is not installed on the system.
NODEVC The port named is not a local LAT port.
PRVIOL The caller does not have the SWCTL privilege.

3.16.8 Assign a Local LAT Port

This directive lets the caller specify the server name and the remote LAT port name, the remote service name that the port will be assigned to, or both. It also lets the user set the default of whether or not requests can be queued. The caller must specify the server name as well as the remote port name, the remote service name, or both. The directive returns an error if any data is missing.

Privileges Required

SWCFG

Data Passed

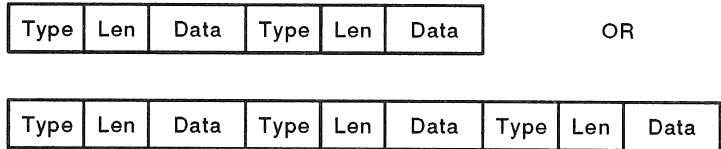
Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
FQSIZM5		6	-14 octal	4	FQFIL
	7	////////////////////////////////	0 (assign)	6	FQPPN
	11	set default flags	clear default flags	10	FQNAM1
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	"KB"		30	FQDEV
	33	unit number flag	unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQFIL Specifies the SET LAT function.
- FIRQB+FQSIZM Specifies Set Local LAT Port.
- FIRQB+FQPPN Must be zero for Assign Port.
- FIRQB+FQNAM1 Default settings to clear. If bit seven is set to one, access type is set to NOQUEUED.
- FIRQB+FQNAM1+1 Default settings to set. If bit seven is set to one, access type is set to QUEUED.
- FIRQB+FQDEV Must be the ASCII characters "KB".
- FIRQB+FQDEVN The unit number of the port to be mapped.
- FIRQB+FQDEVN+1 Must be nonzero.

Mne- Octal monic Offset		XRB		Octal Mne- Offset monic
1		length of buffer, in bytes		0 XRLEN
3		number of bytes used in buffer		2 XRBC
5		starting address of buffer		4 XRLOC
7		////////////////////////////////		6
11		////////////////////////////////		10
13		////////////////////////////////		12
15		////////////////////////////////		14

- XRLEN** Specifies the length of the buffer. Must not be zero.
- XRBC** Specifies the number of bytes used in the buffer.
- XRLOC** Specifies the starting address of the buffer. The buffer must start on a word boundary or an error will be returned.

The XRB describes a buffer used to pass the remote server, and either the service name, the port name, or both. The format of the buffer is:



The buffer has the long format if all three names are used.

- Type** A one-byte unsigned value specifying the type of name that follows. The valid types are:
 - 0 remote server name
 - 1 remote service name
 - 2 remote port name
- Len** A one-byte unsigned value specifying the length of the data field that follows. The maximum length is 16 bytes.
- Data** The name of the server, service, or remote port.

The names may contain alphanumeric characters, eight-bit characters with ASCII values of 192 to 253 decimal, dollar sign (\$), hyphen (-), period (.), or underscore (_). Note that spaces are invalid characters.

Data Returned

Except for a possible error code in byte 0 of the FIRQB, the assign local LAT port directive of .MESAG does not return any meaningful data.

Errors

BADCNT	The length of the fields specified in the user buffer exceeds the length of the buffer as given in XRB+XRLEN, or the buffer address was not on a word boundary.
BADFUO	This error can occur for the following reasons: <ul style="list-style-type: none">An invalid type code was found in the user buffer.The remote server, service, or port name length was not in the range of 1 to 16 decimal bytes.The remote server, service, or port had no name specified.No local LAT port name was specified.
BADNAM	The remote server, service, or port name contained invalid characters.
ERRERR	LAT is not installed on the system.
INUSE	The port is currently in use.
NODEV	The port named is not a local LAT port.
PRVIOL	The caller does not have the SWCFG privilege.

3.16.9 Deassign Local LAT Port

This directive lets the caller disassociate the local LAT port from the server it was assigned to. Once deassigned, the LAT port cannot be used for host-initiated connections until it is once more assigned to a server.

Privileges Required

SWCFG

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSIZM5	6	6	-14 octal	4	FQFIL
	7	////////	1 (deassign)	6	FQPPN
	11	////////////////////////////////		10	
	13	////////////////////////////////		12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	"KB"		30	FQDEV
	33	unit number flag	unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

- FIRQB+FQFIL Specifies the SET LAT function.
- FIRQB+FQSIZM Specifies Set Local LAT Port.
- FIRQB+FQPPN Must be one for Deassign Port.
- FIRQB+FQDEV Must be the ASCII characters "KB".
- FIRQB+FQDEVN The unit number of the port to be unmapped.
- FIRQB+FQDEVN+1 Must be nonzero.

Data Returned

Except for a possible error code in byte 0 of the FIRQB, the deassign local LAT port directive of .MESAG does not return any meaningful data.

Errors

BADFUO	No local LAT port name was specified.
ERRERR	LAT is not installed on the system.
INUSE	The port is currently in use.
NODEV	The port named is not a local LAT port.
PRVIOL	The caller does not have the SWCFG privilege.

3.16.10 Return Local LAT Port Status

This directive lets the caller get current information on the status of the local LAT port. The caller must specify the port name of the local LAT port.

Privileges Required

No privileges required.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSIZM	5	7	+14 octal	4	FQFIL
FQPPN+1	7	1	0	6	FQPPN
	11	////////////////////////////////		10	
	13	////////////////////////////////		12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	"KB"		30	FQDEV
FQDEVN+1	33	unit number flag	unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

- FIRQB+FQFIL Specifies the SHOW LAT function.
- FIRQB+FQSIZM Specifies the Show Local LAT Port subfunction.
- FIRQB+FQPPN Must be zero.
- FIRQB+FQPPN+1 Must be one to return status.
- FIRQB+FQDEV The local port name, always the ASCII characters "KB".
- FIRQB_FQDEVN The local port unit number.
- FIRQB+FQDEVN+1 The unit number real flag.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	error code or 0		0	
	3	////////////////////////////////		2	
	5	////////////////////////////////		4	
	7	status	port char	6	FQPPN
	11	queue position		10	FQNAM1
	13	reject reason code	error code	12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////	owning job #	26	FQPFLG
	31	"KB"		30	FQDEV
	33	-1	unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

FIRQB+0

Error code or zero.

FIRQB+FQPPN

The port characteristics bit mask.

Bit	Description
0	Set if application (host-initiated) port
1	Set if interactive (server-initiated) port
2	Set if dialup
7	Set if access type is QUEUED

FIRQB+FQPPN+1

The status bit mask.

Bit	Description
0	Set if connected
1	Set if connection failed
2	Set if connection in progress

FIRQB+FQNAM1

Entry position in queue (if bit 2 in Status is 1).

FIRQB+FQNAM1+2

RSTS/E error code (if bit 1 in Status is 1).

Value	Meaning
10	Connection request rejected by server
16	No response from server
40	Insufficient resources on this system to initiate a connection

FIRQB+FQNAM1+3 Reject reason code (if bit 1 in Status is 1). The reject reason code is returned by the server when a request has been rejected. The codes (octal) are defined as follows:

Value	Meaning
0	Reason is unknown.
1	User requested disconnect.
2	System shutdown in progress.
3	Invalid slot received.
4	Invalid service class.
5	Insufficient resources to satisfy request.
6	Service in use.
7	No such service.
10	Service is disabled.
11	Service is not offered by the requested port.
12	Port name is unknown.
13	Invalid password.
14	Entry is not in the queue.
15	Immediate access rejected.
16	Access denied.
17	Corrupt solicit request.
20	Command type is illegal or not supported.
21	Can't send start slot.
22	Queue entry is deleted by local node.
23	Inconsistent or illegal request parameter.

FIRQB+FQEXT Owning job number.
 FIRQB+FQDEV Local port name, always the ASCII characters "KB".
 FIRQB+FQDEVN Local port unit number.
 FIRQB+FQDEVN+1 Unit number real flag.

Errors

BADFUO No local LAT port name specified.
 ERRERR LAT is not installed on the system.
 NODEVC The port named is not a local LAT port.

3.16.11 Return Local LAT Port Characteristics

This directive lets the caller get information on the current characteristics of the local LAT port. The caller must provide a buffer of at least 132 octal bytes. The information returned is:

- Local LAT port name
- Port type (Application or Interactive)
- Actual remote server name
- Actual remort port name
- Specified remote server name (Application only)
- Specified remote LAT port name (Application only)
- Specified remote service name (Application only)
- Queued port characteristic
- Status
- Queue position
- Error code
- Reject reason code
- Owning job number

The caller can request information for a specific port by providing the port name or by index. When using the index, the caller must specify the port type, which determines the list to search for the *n*th port. The directive returns information on only one port at a time. To get information about all local LAT ports of a given type, the caller must issue the directive repeatedly, incrementing the index each time. When there are not more ports of that type, the directive returns the error NOTAVL (ERR=8). An index value of zero means that the port name has been provided; the directive then returns information on the named port. If the index is zero and no name is provided, the directive returns an error.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
FQSIZM	5	7	+14 octal	4	FQFIL
FQPPN+1	7	0	port index	6	FQPPN
	11	////////	port type	10	FQNAM1
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	"KB"		30	FQDEV
FQDEVN+1	33	unit number flag	unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQFIL** Specifies the SHOW LAT function.
FIRQB+FQSIZM Specifies Show Local LAT Port.
FIRQB+FQPPN Index value. Zero if port name is specified.
FIRQB+FQPPN+1 Must be zero to return port characteristics.
FIRQB+FQNAM1 One of the following port type codes:

Value	Meaning
0	Specific port requested
1	Application (host-initiated) port
2	Interactive (server-initiated) port

FIRQB+FQDEV Must be the ASCII characters "KB" if index=0.
FIRQB+FQDEVN The unit number of the local port to be shown if index=0.
FIRQB+FQDEVN+1 Must be nonzero if index=0.

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	length of buffer, in bytes		0	XRLEN
	3	0		2	XRBC
	5	starting address of buffer		4	XRLOC
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRB+XRLEN** Specifies the length of the buffer. Must be at least 132 octal bytes long.
- XRB+XRBC** Must be zero.
- XRB+XRLOC** Specifies the starting address of the buffer. The buffer must start on a word boundary or an error will be returned.

The XRB describes a buffer used to return information to the caller. The buffer must be at least 132 octal bytes long. If there is not enough room in the buffer, some information will not be returned. The number of bytes actually used in the buffer is returned in XRB+XRBC.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	error code or 0		0	
	3	////////////////////////////////		2	
	5	////////////////////////////////		4	
	7	status	port char	6	FQPPN
	11	queue position		10	
	13	reject reason code	error code	12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////	owning job #	26	FQPFLG
	31	"KB"		30	FQDEV
	33	-1	unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

Error code or zero.

FIRQB+FQPPN

The port characteristic bit mask.

Bit	Description
0	Set if application (host-initiated) port
1	Set if interactive (server-initiated) port
2	Set if dialup
7	Set if the access type is QUEUED

FIRQB+FQPPN+1

The status bit mask.

Bit	Description
0	Set if connected
1	Set if connection failed
2	Set if connection in progress

FIRQB+FQNAM1

Entry position in queue (if bit 2 in Status is 1).

FIRQB+FQNAM1+2

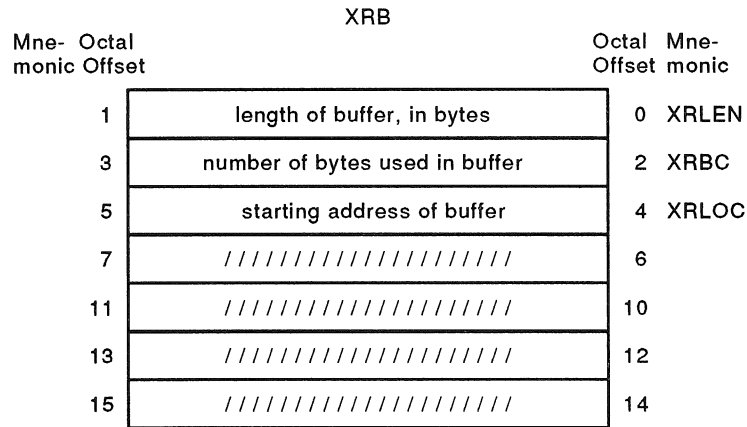
RSTS/E error code (if bit 1 in Status is 1).

Value	Meaning
10	Connection request rejected by server.
16	No response from server.
40	Insufficient resources on this system to initiate a connection.

FIRQB+FQNAM1+3 Reject reason code (if bit 1 in Status is 1). The reject reason code is returned by the server when a request has been rejected. The codes (octal) are defined as follows:

Value	Meaning
0	Reason is unknown.
1	User requested disconnect.
2	System shutdown in progress.
3	Invalid slot received.
4	Invalid service class.
5	Insufficient resources to satisfy request.
6	Service in use.
7	No such service.
10	Service is disabled.
11	Service is not offered by the requested port.
12	Port name is unknown.
13	Invalid password.
14	Entry is not in the queue.
15	Immediate access rejected.
16	Access denied.
17	Corrupt solicit request.
20	Command type is illegal or not supported.
21	Can't send start slot.
22	Queue entry is deleted by local node.
23	Inconsistent or illegal request parameter.

FIRQB+FQPFLG Owning job number
 FIRQB+FQDEV Local port name, always the ASCII characters "KB".
 FIRQB+FQDEVN Local port unit number.
 FIRQB+FQDEVN+1 Unit number real flag.



XRFB+XRLEN Specifies the length of the buffer. Must not be zero.
 XRFB+XRBC Specifies the number of bytes used in the buffer.

XRB+XRLOC Specifies the starting address of the buffer. The buffer must start on a word boundary or an error will be returned.

The XRB describes a buffer used to pass additional information about the local LAT port. The format of the buffer is:

Type	Len	Data	Type	Len	Data	...
------	-----	------	------	-----	------	-----

The buffer always includes at least two names. For server-initiated connections, it contains the names of the actual server and the remote port. For host-initiated connections, it contains the name of the specified server and the name of either the specified service or the specified remote port. The buffer may also contain as many as five names if the port is used for host-initiated connections and is connected.

Type	A one-byte unsigned value specifying the type of name that follows. The valid types are: 1 specified server name 2 specified service name 3 specified remote port name 4 actual server, if connected 5 actual remote port, if connected
Len	A one-byte unsigned value specifying the length of the data field that follows. The maximum length is 16 bytes.
Data	The name of the server, service, or remote port.

The names may contain alphanumeric characters, eight-bit characters with ASCII values of 192 to 253 decimal, dollar sign (\$), hyphen (-), period (.), or underscore (_). Note that spaces are invalid characters.

Errors

BADCNT	Either the length of the user buffer is zero and the Get Port Information form of the SHOW PORT directive was used, or the buffer address is not on a word boundary.
BADFUO	This error can occur for the following reasons: The value in FIRQB+FQPPN was not 0 or 1. An invalid port type code was specified. No port name was specified with an index value of zero.
ERRERR	LAT is not installed on this system.
NODEVC	The port name specified is not a local LAT port.
NOTAVL	No match for index specified.

3.16.12 Show LAT Sessions

This directive lets the caller get information on the LAT sessions currently active on the host node. The caller must provide a buffer of at least 65 octal bytes. The information returned includes:

- The number of the keyboard the user is currently using.
- The node name of the server the user is on.
- The name given to the server port the user is on.

Session information can be accessed in three ways:

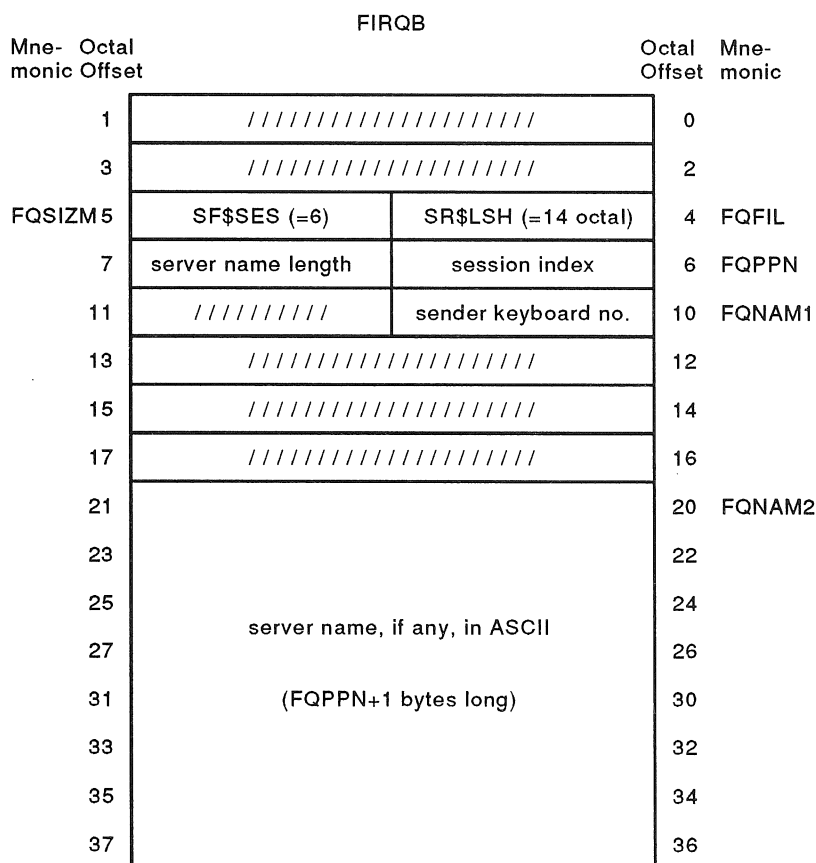
- By index across all servers.
- By index for a particular server.
- By keyboard number.

If no session matches the specified index, the directive returns the error NOTAVL (ERR=8).

Privileges Required

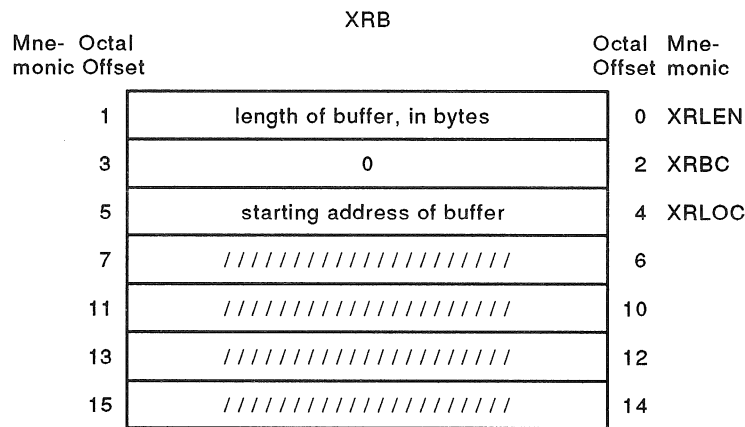
None

Data Passed



FIRQB+FQFIL Specifies the SHOW LAT function.

FIRQB+FQSIZM	Specifies Show LAT Sessions.
FIRQB+FQPPN	Index value. If there is no session matching this index, the directive returns the NOTAVL error. A value of one returns the first session. A value of zero means the keyboard number is passed in FIRQB+FQNAM1
FIRQB+FQPPN+1	The length of the server name starting at FQNAM2. A non-zero value means this is an index lookup by server name. A value of zero means that no server is specified and information is returned on all servers known to the LAT host node, by index. This byte is ignored if FIRQB+FQPPN is zero.
FIRQB+FQNAM1	The keyboard number for which the session information is returned. This byte is ignored if FIRQB+FQPPN is non-zero.
FIRQB+FQNAM1	If FIRQB+FQPPN+1 is non-zero, then FQNAM2 is the start of the name of the server for which session information is returned. All lowercase characters in the service name are converted to uppercase for comparison.



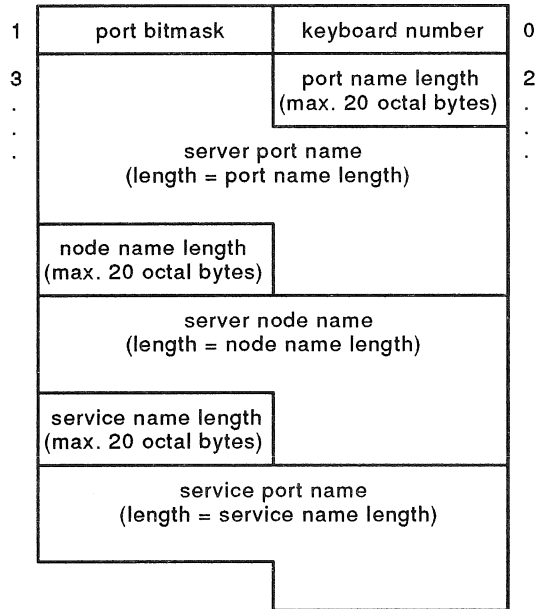
XRLEN	Specifies the length of the buffer. Must be at least 65 octal bytes long.
XRBC	Must be zero.
XRLOC	Specifies the starting address of the buffer. The buffer must start on a word boundary or an error will be returned.

The XRB describes a buffer used to return information to the caller. The buffer must be at least 65 octal bytes long. If there is not enough room in the buffer, some information will not be returned. The number of bytes actually used in the buffer is returned in XRBC.

Data Returned

The data returns in a buffer at most 65 octal bytes long. The number of bytes actually used is returned in XRB+XRBC. The buffer contains information on the session requested by specific index or by keyboard number. The format of the buffer is:

Buffer Contents On Return



Keyboard Number

A 1-byte unsigned value giving the number of the keyboard on which the session is currently active.

Port Bitmask

A 1-byte bitmask describing the port.

Bit	Description
-----	-------------

0-6	Reserved
-----	----------

7	Set if the port is a dialup line; otherwise clear.
---	--

Port Name Length

A 1-byte unsigned value indicating the length, in bytes, of the server port name that follows. The maximum length of the server port name is 20 octal bytes.

Server Port Name

The name of the port on the server on which the user is physically connected.

Node Name Length

A 1-byte unsigned value indicating the length, in bytes, of the server node name that follows. The maximum length of the server node name is 20 octal bytes.

Server Node Name

The name of the server on which the user is connected.

Service Name Length

A 1-byte unsigned value indicating the length, in bytes, of the service name that follows. The maximum length of the service name is 20 octal bytes.

Service Name

The name of the service that the user is currently running.

Errors

BADCNT	The buffer address is not on a word boundary.
BADFUO	The server name length in FQPPN+1 was larger than 20 octal.
ERRERR	LAT is not installed on this system.
NODEVC	The keyboard number specified at FQNAM1 is not a valid keyboard number.
NOTAVL	No match for the index specified.
NOSUCH	There was no server matching the server specified in the FIRQB.

3.17 .NAME — Set Program Name

Form

.NAME

Function

The .NAME directive sets the program name in the monitor tables. The monitor enters the name in an internal table; otherwise, it makes no use of the program name. However, the SHOW USERS command uses the names in listing current information for jobs (under the "What" column) on the system. The BASIC-PLUS run-time system uses this directive when the user issues an OLD, NEW, or RENAME command.

The program name is passed as two words of RAD50 data in the FIRQB. Note that the data is passed in the same location in the FIRQB where the file name exists at the P.RUN entry point into a run-time system. If you are coding or modifying a run-time system, one of the first things to do on entry at P.RUN is to set the program's name. Thus, the file name's position in the FIRQB at this point is convenient for use.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
1		////////////////////////////////	0	
3		////////////////////////////////	2	
5		////////////////////////////////	4	
7		////////////////////////////////	6	
11		program name in RAD50 format (2 words)	10	FQNAM1
13			12	
15		////////////////////////////////	14	
17		////////////////////////////////	16	
21		////////////////////////////////	20	
23		////////////////////////////////	22	
25		////////////////////////////////	24	
27		////////////////////////////////	26	
31		////////////////////////////////	30	
33		////////////////////////////////	32	
35		////////////////////////////////	34	
37		////////////////////////////////	36	

FIRQB+FQNAM1 The program name to be set; two words in RAD50 format.

Data Returned

The **.NAME** directive does not return any meaningful data.

Errors

No errors are possible with the **.NAME** directive.

Example

The following code sets the name **PROGRM** in the monitor tables:

```
MOV      #^RPRO,FIRQB+FQNAM1      ; Set FIRQB to declare
MOV      #^RGRM,FIRQB+FQNAM1+2    ; Name of "PROGRM"
.NAME
```

3.18 .PEEK — Look at Monitor Memory

Form

.PEEK

Function

The .PEEK directive returns the contents of one word of the monitor's memory; that is, the memory mapped by the kernel mode APRs (see Chapter 2). Only a job with the required privileges can execute the .PEEK directive. (However, you should not base any of your code on the contents of monitor memory because Digital Reserves the right to change the monitor structure and internal addresses at any time, except for the addresses listed in Table 3-3.)

Privileges Required

RDMEM to read kernel memory other than the I/O page and WRTMEM to read the I/O page.

Data Passed

Mne- monic	Octal Offset	XRB	Octal Offset	Mne- monic
	1	virtual address of desired monitor word	0	XRLLEN
	3	////////////////////////////////////	2	
	5	////////////////////////////////////	4	
	7	////////////////////////////////////	6	
	11	////////////////////////////////////	10	
	13	////////////////////////////////////	12	
	15	////////////////////////////////////	14	

XRB+XRLLEN

The virtual address of the data word in monitor memory whose contents are to be returned. The value must be even, since word addresses on the PDP-11 are always even. Peeking at data in the I/O page (kernel APR 7, or 111 (binary) in bits 15, 14, and 13) can cause unpredictable system results; Digital does not recommend this. Furthermore, using .PEEK to obtain data in APRs 5 or 6 returns data in the file processor's private buffer pool.

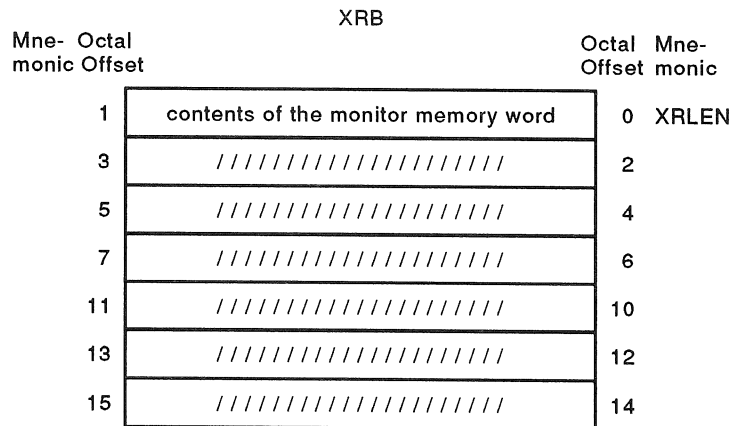
Use .PEEK to examine addresses returned by get monitor tables calls or addresses of fixed monitor locations.

Table 3-3 shows fixed monitor locations and their addresses. The *RSTS/E Internals Manual* lists other monitor data structures and their locations in memory, but the locations listed in Table 3-3 will not change in future releases of RSTS/E.

Table 3-3: Fixed Monitor Locations

Address (Octal)	Name	Meaning
44(word)	IDATE	The date when the system was last started by START.
46(word)	ITIME	The time of day when the system was last started by START.
1000(word)	DATE	Current system date.
1002(word)	TIME	Current time of day.
1006(byte)	JOB	Job number times 2 of the job currently running (always the user's own job number.)
1010(word)	JOBDA	Address of the job data block (JDB) of the currently running job (always the user's own JDB).
1012(word)	JOBF	Address of the JDFLG word in the JDB of the currently running job (always the user's own JDB).
1014(word)	IOSTS	Address of the JDIOST (low) byte and JDPOST (high) byte in the JDB of the currently running job (always the user's own JDB).

Data Returned



XRB+XRLEN The contents of the requested monitor memory location.

Errors

- B.4 The address specified caused a trap to the kernel mode vector at 4 (UNIBUS timeout, odd address, and so forth).
- B.250 The address specified caused a memory management unit violation (trap to the kernel mode vector at 250).
- PRVIOL The caller does not have the required privilege.

Example

The following code obtains the contents of monitor memory location 1006 (the low byte of which is the current job number times two):

```
MOV     #JOB,XRB+XRLEN        ; Set address to that of "JOB"
.PEEK
```

3.19 .PLAS — Access Resident Library

The .PLAS (Program Logical Address Space) directive has six subfunctions that allow a MACRO program to access a resident library. Resident libraries must be so defined by the system manager with the `INSTALL LIBRARY` command (see the *RSTS/E System Manager's Guide*). As noted in Chapter 2, the easiest way to do this is to link the resident library to your program using TKB, the Task Builder that links modules assembled or compiled under the RSX run-time system or its derivatives. However, you can use .PLAS subfunctions to directly access resident libraries.

Table 3-4 lists the .PLAS subfunctions by function code. The following subsections describe the subfunctions in alphabetical order.

Table 3-4: Summary of .PLAS Subfunctions

FQFUN Value (Octal)	Mnemonic	Action Performed
0	ATRFQ	Attach resident library. Attaches the job to a resident library; necessary before the job can map a window to the library.
2	DTRFQ	Detach resident library. Detaches the job from a resident library.
4	CRAFQ	Create address window. Defines a range of virtual addresses to be a window for looking at all or some portion of a resident library. Optionally, CRAFQ maps the window to all or some portion of a resident library. (The mapping can be done separately with MAPFQ.) The CRAFQ subfunction reserves one or more APRs, so CRAFQ takes space in the job area even though the window may not actually be mapped.
6	ELAFQ	Eliminate address window. Releases the APRs used by a particular window.
10	MAPFQ	Map window. Maps an already created address window of virtual addresses to actual memory locations in an attached resident library. The monitor loads the library from disk if necessary.
12	UMPFQ	Unmap address window. Releases a window of virtual addresses from a mapping to actual memory locations.

When a program exits or a user logs out, the monitor automatically detaches all libraries and unmaps and eliminates all windows for the job.

Privileges Required

Depends on the subfunction; refer to the individual descriptions that follow this introductory information on the .PLAS directive.

3.19.1 ATRFQ (Attach Resident Library)

Form

```
MOVW  #ATRFQ, FIRQB+FQFIL
      .
      .
      .
(set appropriate parameters)
      .
      .
      .
.PLAS
```

Function

The ATRFQ subfunction of .PLAS declares your intent to access a resident library. The type of access is specified in the call. The number of resident libraries that can be attached to a job at any given time is unlimited (subject to the availability of system small buffers).

The job's ability to access the resident library depends upon the protection assigned to the library by the system manager when the library was installed. The default protection grants read access to all users and denies write access to all users.

If the calling job can access the library in the specified fashion, the monitor sets up its own internal tables, which lay the groundwork for the job to map windows to the library. Note, however, that the resident library does not take up space in the job area (virtual memory) with an attach. APRs are assigned (virtual memory in the job area is taken) when a window is created (using CRAFQ).

Privileges Required

Read-only or read/write access to the library. The protection code is interpreted exactly like a file protection code; as with files, access is granted either on the basis of the protection code or because of GREAD, GWRITE, WREAD, or WWRITE privileges.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////// | ATRFQ (= 0)	4	FQFIL
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	resident library name in RAD50 format (2 words)	12	
	15		14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	access mode	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL

The function code ATRFQ (octal value = 0).

FIRQB+12

The name of the resident library to which the job is to be attached; two words in RAD50 format.

Resident libraries are made known to the monitor by the system manager with the INSTALL/LIBRARY command (see the *RSTS/E System Manager's Guide*). With this command, the system manager defines a file (filename.LIB) as a resident library. The monitor regards "filename" as the resident library's name.

FIRQB+FQMODE

The low-order two bits of this word define the way the job wants to access the library:

Bit 0 = 1 Read-only access is desired.

Bit 1 = 1 Read/write access is desired.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
1		////////////////////////////////	0	
3		////////// current job no. * 2	2	FQJOB
5		////////////////////////////////	4	
7		resident library identification	6	FQPPN
11		size, in 32-word blocks, of the library	10	FQNAM1
13		////////////////////////////////	12	
15		////////////////////////////////	14	
17		////////////////////////////////	16	
21		////////////////////////////////	20	
23		////////////////////////////////	22	
25		////////////////////////////////	24	
27		////////////////////////////////	26	
31		////////////////////////////////	30	
33		////////////////////////////////	32	
35		////////////////////////////////	34	
37		////////////////////////////////	36	

FIRQB+FQJOB

The current job number times two.

FIRQB+FQPPN

This word is an identifier that must be used, rather than the resident library name, in subsequent calls to identify a resident library. Thus, you use this identifier to detach the job from the library (DTRFQ) and map and unmap windows to the library (MAPFQ and UMPFQ).

FIRQB+FQNAM1

The size of the resident library, in 32-word blocks.

Errors

NOSUCH

The resident library specified in the data passed is not known to the monitor. The system manager must install a resident library before it can be used.

PRVIOL

The attach did not succeed because the caller's privilege did not allow the access specified in the data passed. This could happen either:

- Because the access code specified in the data passed is not compatible with the possible access defined when the library was installed by the system manager.
- Because the protection code associated with the resident library file excludes access by the user.

Example

The following code attaches the job to a resident library called DATBAS. The access desired is defined as read/write:

```
MOVB      #ATRFQ, FIRQB+FQFIL           ;DEFINE FUNCTION CODE
MOV       #^RDAT, FIRQB+12             ;LIBRARY NAME IS
MOV       #^RBAS, FIRQB+FQEXT         ;DEFINED AS "DATBAS"
MOV       #2, FIRQB+FQMODE            ;ACCESS=READWRITE
.PLAS
```

3.19.2 CRAFQ (Create Address Window)

Form

```
MOVW    #CRAFQ,FIRQB+FQFIL
        .
        .
        .
(set up parameters)
        .
        .
        .
.PLAS
```

Function

The CRAFQ subfunction of .PLAS can be used either to create a window (a range of virtual addresses) or to create a window of virtual addresses and map it to a range of actual addresses in an attached library. You define the range of addresses by:

- Naming a base APR (which defines the starting address of the window)
- Specifying the size of the window in 32-word blocks

Thus, a window always begins on a 4K-word boundary in virtual memory and always takes at least 4K words. It may take more than 4K words, depending on the size of the window.

If the required hardware is not present, the CRAFQ fails with an error.

If the address range overlaps the user job image, the call fails with an error. The address range cannot overlap the run-time system (high segment). However, if the job is currently running under RSX emulation, this is not a consideration. APR 7, normally used to map a run-time system, can be used instead to map a window to a resident library.

The difference between creating a window and creating and mapping a window is best shown by example. By using create without map, you can define one window, which can be mapped to a library or portion of a library and then remapped to another portion of the same library or another library, as many times as desired, using the MAPFQ subfunction of .PLAS.

For example, suppose your program takes up 24K words and you want to access a 24K-word resident library of data values. You can use create without map to set up a 4K-word window in APR 6. You can then map the window (using MAPFQ) to the first 4K words of the library, process the data, map to the next 4K words of the library, and so forth. If, on the other hand, you had a 4K program and still wanted to access a 24K-word library, you could use CRAFQ to create a 24K-word window and map it to the entire library in APR 1 to 6.

A job can create a maximum of seven windows. A window takes at least one APR (it may take more, depending on the size you specify for the window). Thus, the maximum of seven assumes seven windows in APR 1 to 7. APR 0 can never be used to create a window, since the user program takes at least this much space. As mentioned previously, a window cannot overlap the user job image; thus, the size of the user job image determines the lowest base APR that can be used. If the program (user job image) is less than 4K words, APR 1 and up (to the limit imposed by the run-time system boundary) can be used to create windows. If the user job image is between 4K words and 8K words, APR 2 and up can be used to create windows, and so forth.

If a window is created that overlaps an already existing window, the old window is eliminated. For example, if you create a 6K-word window using a base APR of 5, the window uses APR 5 and APR 6. If you then create a 4K-word window using a base APR of 6, the entire old window is eliminated. APR 5 is then free for other use; APR 6 is used for the new window.

Privileges Required

RDMEM to map physical memory other than I/O page read-only. SYSMOD to map physical memory read/write or to map the I/O page read/only.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	//////////	4	FQFIL
	7	base APR (1-7)	6	
	11	////////////////////////////////	10	
	13	size of windows, in 32-word blocks	12	
	15	library identification (for map only)	14	FQEXT
	17	offset, in 32-word blocks (for map only)	16	FQSIZ
	21	length, in 32-word blocks (for map only)	20	FQBUFL
	23	access flags	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

- FIRQB+FQFIL The function code CRAFQ (octal value = 4).
- FIRQB+7 The base APR of the window, 1 to 7. Implicitly defines the starting virtual address of the window. This byte cannot be zero; in addition, it cannot name an APR already being used to map the user job image.
- FIRQB+12 The desired size of the window, in 32-word blocks. For example, a value of 128. equals 4K words.
- FIRQB+FQEXT The identifier of the resident library to which the window is to be mapped. (This is the value returned by the ATRFQ function of .PLAS at FIRQB+FQPPN.) This word is ignored for calls requesting a create without mapping (bit 7 at FIRQB+FQMODE equals 0). You can also map the window to physical memory by passing a value of -4. See MAPFQ for details.

FIRQB+FQSIZ The offset, in 32-word blocks, from the start of the library where the mapping is to begin. This word is ignored if no mapping is requested (bit 7 at **FIRQB+FQMODE** equals 0).

A value of zero for this word indicates the window is to be mapped beginning at the first byte of the library. A value of one indicates the window is to be mapped beginning at the 33rd word of the library (starting address + 64), and so forth.

FIRQB+FQBUFL The length, in 32-word blocks, of the area to be mapped (ignored if bit 7 at **FIRQB+FQMODE** equals 0). This value cannot be greater than the size of the window specified at **FIRQB+12**. Furthermore, this value, combined with the offset value at **FIRQB+FQSIZ**, cannot indicate an address beyond the end of the library or into the high segment (run-time system).

A value of zero for this word defaults to either the size of the window (specified at **FIRQB+12**) or the space remaining in the library, whichever is smaller.

The octal value to set **WS.MAP** is 200; the value to set **WS.WRT** is 2. Thus, an octal value of 202 for this word requests mapping and write access. A separate setting for write access in **CRAFQ** and in **ATRFQ** allows you to attach to a library read/write and map a portion of the library read-only.

If neither **WS.UDS** nor **WS.SIS** is set, then **CRAFQ** uses I-Space, and D-Space too if it is available. There is a functional correspondence between **WS.UDS** and **WS.SIS** in the **CRAFQ** mode byte and the region options available in **TKB**. This correspondence is as follows:

RESCOM & COMMON **WS.UDS** set

RESSUP & SUPLIB **WS.SIS** set

RESLIB & LIBR neither, **WS.UDS** and **WS.SIS** clear

If **WS.UDS** = 1, the window is created in the D-Space **APR** only; no mapping in the I-Space is done. If another window is already created in both the I- and D- Spaces at this **APR**, the I-Space window remains as it is, but the D window is moved to the requested area. If a **CRAFQ** is done to the same **APR** with neither **WS.UDS** nor **WS.SIS** set, the resulting mapping is such that the D-Space **APR** is given to the **CRAW** with **WS.UDS** set and the I-Space **APR** is assigned to the region of the second **CRAFQ**.

It is illegal to **CRAFQ** a region with both **WS.UDS** and **WS.SIS** set. With this directive, supervisor Data Space is always mapped the same as user Data Space. See Chapter 5, the section on **MSDS\$**, for information on changing supervisor Data Space under **RSX**.

The octal value to set WS.MAP is 200; the value to set WS.WRT is 2. Thus, an octal value of 202 for this word requests mapping and write access. A separate setting for write access in CRAFQ and in ATRFQ allows you to attach to a library read/write and map a portion of the library read-only.

If neither WS.UDS nor WS.SIS is set, then CRAFQ uses I-Space, and D-Space too if it is available. There is a functional correspondence between WS.UDS and WS.SIS in the CRAFQ mode byte and the region options available in TKB. This correspondence is as follows:

- RESCOM & COMMON WS.UDS set
- RESSUP & SUPLIB WS.SIS set
- RESLIB & LIBR neither, WS.UDS and WS.SIS clear

If WS.UDS = 1, the window is created in the D-Space APR only; no mapping in the I-Space is done. If another window is already created in both the I- and D- Spaces at this APR, the I-Space window remains as it is, but the D window is moved to the requested area. If a CRAFQ is done to the same APR with neither WS.UDS nor WS.SIS set, the resulting mapping is such that the D-Space APR is given to the CRAW with WS.UDS set and the I-Space APR is assigned to the region of the second CRAFQ.

It is illegal to CRAFQ a region with both WS.UDS and WS.SIS set. With this directive, supervisor Data Space is always mapped the same as user Data Space. See Chapter 5, the section on MSDS\$, for information on changing supervisor Data Space under RSX.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
1		////////////////////////////////	0	
3		////////// current job no. * 2	2	FQJOB
5		////////////////////////////////	4	
7		////////// window ID	6	FQPPN
11		starting virtual address of new window	10	FQNAM1
13		////////////////////////////////	12	
15		////////////////////////////////	14	
17		////////////////////////////////	16	
21		mapped length, in 32-word blocks	20	FQBUFL
23		status flags	22	FQMODE
25		////////////////////////////////	24	
27		////////////////////////////////	26	
31		////////////////////////////////	30	
33		////////////////////////////////	32	
35		////////////////////////////////	34	
37		////////////////////////////////	36	

FIRQB+FQJOB	The current job number times two.
FIRQB+FQPPN	The window ID. Use in later MAPFQ calls to map the newly created window; it must be used in any ELAFQ calls to eliminate the newly created windows. The value returned may be from 1 to 7.
FIRQB+FQNAM1	The starting virtual address of the new window.
FIRQB+FQBUFL	Length actually mapped by the window, in 32-word blocks.
FIRQB+FQMODE	Status flags. The monitor returns the status of the new window as follows: <ul style="list-style-type: none"> Bit 15 = 1 Window was created successfully. <li style="padding-left: 2.5em;">= 0 Window was not created successfully. Bit 14 = 1 An existing window was unmapped because it overlapped the newly created mapping. <li style="padding-left: 2.5em;">= 0 No existing windows were unmapped by this mapping. Bit 13 = 1 An existing window was eliminated because it overlapped the newly created window. <li style="padding-left: 2.5em;">= 0 No existing windows were eliminated by this create.

Errors

BADFUO	Either the base APR and window length specified were invalid, or the offset and mapping length values specified were invalid. (For example, an offset indicating a starting address for the mapping that is beyond the end of the library or into the run-time system is invalid.)
NOBUFS	Creating a window requires a small buffer; a small buffer is not currently available.
NOROOM	You attempted to create more than seven address windows.
NOSUCH	The library ID specified for mapping is not a library currently attached to the job.
PRVIOL	The create was unsuccessful because the user privileges do not allow the access desired. At this point, since the library has been attached successfully with some access defined, this error means that the access requested in the CRAFQ is not allowed by the access requested in the ATRFQ.

Example

The following code creates a 4K-word address window and maps it to the beginning of a library whose ID (returned from a previous ATRFQ) has been stored at location LIBID:

```

MOV#B      #CRAFQ, FIRQB+FQFIL      ;DEFINE FUNCTION CODE
MOV        #6, FIRQB+7              ;BASE APR = 6
MOV        #200, FIRQB+12           ;WINDOW = 4K WORDS
MOV        LIBID, FIRQB+FQEXT       ;SET LIBRARY ID
CLR        FIRQB+FQSIZ              ;OFFSET = 0
CLR        FIRQB+FQBUFL            ;MAP 4K WORDS OR TO
                                           ;END OF LIBRARY
MOV        #200, FIRQB+FQMODE       ;MAP WINDOW, READ-ONLY
.PLAS

```

3.19.3 DTRFQ (Detach Resident Library)

Form

```

MOV B    #DTRFQ,FIRQB+FQFIL
      .
      .
      .
(define library to be detached)
      .
      .
      .
.PLAS
  
```

Function

The DTRFQ subfunction of .PLAS detaches a previously attached resident library. Any windows mapped to the library by the calling job are unmapped. If no other jobs are currently attached to the library and it was installed with the /UNLOAD option, the monitor removes the library from memory.

If this is a dynamic region and there are no other jobs currently attached to it, and the region is marked for deletion after the last job detaches, the monitor removes the region from memory and deletes it from the resident library list.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
1		////////////////////////////////	0	
3		////////////////////////////////	2	
5		////////// DTRFQ (= 2)	4	FQFIL
7		library identification (returned by ATRFQ)	6	FQPPN
11		////////////////////////////////	10	
13		////////////////////////////////	12	
15		////////////////////////////////	14	
17		////////////////////////////////	16	
21		////////////////////////////////	20	
23		////////////////////////////////	22	
25		////////////////////////////////	24	
27		////////////////////////////////	26	
31		////////////////////////////////	30	
33		////////////////////////////////	32	
35		////////////////////////////////	34	
37		////////////////////////////////	36	

3.19.4 ELAFQ (Eliminate Address Window)

Form

```

MOVb    #ELAFQ, FIRQB+FQFIL
      .
      .
      .
(set up parameters in FIRQB)
      .
      .
      .
.PLAS
  
```

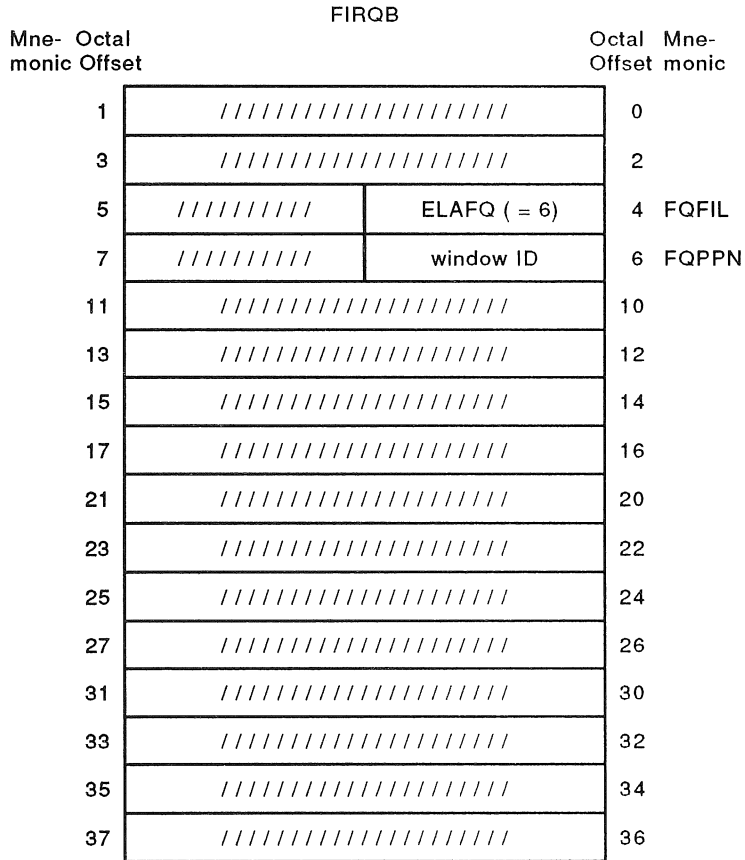
Function

The ELAFQ subfunction of .PLAS eliminates an address window that was created by the job, unmapping the window if necessary. ELAFQ frees the APRs used by the window and makes them available for creating another window or for expanding the user job image size.

Privileges Required

None

Data Passed



FIRQB+FQFIL

The function code ELAFQ (octal value equals 6).

FIRQB+FQPPN

The ID of the window to be eliminated (returned at FIRQB+FQPPN by the CRAFQ that created the window).

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// | current job no. * 2	2	FQJOB
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	status flags	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQJOB

The current job number times two.

FIRQB+FQMODE

Two bits in this word indicate the status of the window:

- Bit 13 = 1 The window was successfully eliminated.
- = 0 The window was not eliminated.
- Bit 14 = 1 The address window was mapped to a resident library and has been unmapped.
- = 0 The address window was not mapped; no unmap-
ping was done.

Errors

BADFUO

An invalid window ID was given in the data passed at FIRQB+FQPPN (outside the range 1 through 7).

NOSUCH

The window ID specified at FIRQB+FQPPN is in the range 1 through 7 but matches no currently created window for this job.

Example

The following code eliminates an address window whose ID is stored in location WINID:

```
MOVW    #ELAFQ, FIRQB+FQFIL    ;SET FUNCTION CODE
MOVW    WINID, FIRQB+FQPPN     ;SET WINDOW ID
.PLAS
```

3.19.5 MAPFQ (Map Address Window)

Form

```
MOVB    #MAPFQ,FIRQB+FQFIL
        .
        .
        .
(set up parameters)
        .
        .
        .
.PLAS
```

Function

The MAPFQ subfunction of .PLAS maps a previously created address window to an attached resident library. In other words, the MAPFQ relates the virtual address range defined by a CRAFQ to actual locations in memory within a resident library that has been attached to the job by an ATRFQ. MAPFQ maps the window in the address space given by the CRAFQ, supervisor I-Space, user I-Space, or user D-Space.

If the window specified is already mapped, it is unmapped from its previous actual memory locations and remapped to the new area. A job may map a maximum of seven address windows at any given time.

If the resident library being mapped is not in memory when the MAPFQ is executed, the system makes the library memory resident at that time.

Privileges Required

None, except to map physical memory (see the section "Map Physical Memory").

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	//////////	4	FQFIL
	7	//////////	6	FQPPN
	11	MAPFQ (=10)	10	
	13	window ID	12	
	15	resident library ID	14	FQEXT
	17	offset, in 32-word blocks	16	FQSIZ
	21	length, in 32-word blocks, to be mapped	20	FQBUFL
	23	desired access mode	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL

The function code MAPFQ (octal value equals 10).

FIRQB+FQPPN

The ID of the window to be mapped (returned at FIRQB+FQPPN by the CRAFQ subfunction call that created the window). The window ID can be for any current window that uses some D-Space; it cannot refer to a window using only I-Space.

FIRQB+FQEXT

The ID of the resident library to which the window is to be mapped (returned as a full word at FIRQB+FQPPN by the ATRFQ subfunction call that attached the job to the resident library).

FIRQB+FQSIZ

The offset from the start of the library where the mapping is to begin, in 32-word blocks.

A value of zero for this word indicates the window is to be mapped beginning at the first byte of the library. A value of 1 indicates that the window is to be mapped beginning at the 33rd word of the library (starting address = 64), and so forth.

FIRQB+FQBUFL

The length of the area to be mapped, in 32-word blocks. This value cannot be greater than the size of the window (specified at FIRQB+12 in the CRAFQ which created the window). Furthermore, this value, combined with the offset value at FIRQB+FQSIZ, cannot indicate an address beyond the end of the library.

A value of 0 for this word defaults to either the size of the window specified in FIRQB+12 in the CRAFQ or the space remaining in the library, whichever is smaller.

FIRQB+FQMODE

Bit 1 of this word specifies whether the window is to be mapped read/write or read-only:

- Bit 1 = 1 Read/write access.
 = 0 Read-only access.

A separate setting for access in MAPFQ and in ATRFQ allows you to attach to a library read/write and map a portion of the library read-only. You cannot, however, attach to a library read-only and then map to the library read/write.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	//////////	2	FQJOB
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	length, in 32-word blocks, actually mapped	20	FQBUFL
	23	status flag	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQJOB

The current job number times two.

FIRQB+FQBUFL

Length actually mapped by the call, in 32-word blocks.

FIRQB+FQMODE

Bit 14 of this word is a status flag:

- Bit 14 = 1 The window specified was already mapped; the window was unmapped before this mapping was done.
 = 0 The window specified had no previous mapping; no unmapping was done for this call.

Errors

- BADFUO** The offset and length specified are inconsistent; either the mapping attempted to go beyond the end of the library or the length is greater than the created window.
- NOSUCH** Either the resident library ID or the address window ID is incorrect. (The job is not currently attached to the specified resident library or no address window has been created with the specified window ID.)

Example

The following code maps a window whose ID is stored at WINID to the attached library whose ID is stored at LIBID. The offset of 256 indicates that the mapping is to begin 8K words from the start of the library. Access to the library is read-only. For example:

```
MOV#B      #MAPFQ, FIRQB+FQFIL      ; SET FUNCTION CODE
MOV#B      WINID, FIRQB+FQPPN      ; SET WINDOW ID
MOV#B      LIBID, FIRQB+FQEXT      ; SET LIBRARY ID
MOV#B      #256., FIRQB+FQSIZ      ; OFFSET 8K WORDS
CLR#B      FIRQB+FQBUFL            ; MAP WINDOW SIZE OR
                                ; TO END OF LIBRARY
CLR#B      FIRQB+FQMODE            ; READ-ONLY ACCESS
.PLAS
```

Map Physical Memory

You can also use MAPFQ to map a window to physical memory. The data passed is the same as for a resident library except FIRQB+FQEXT contains -4. The data returned is the same.

You can map to monitor memory, XBUF, user memory, and so on, but not to locked memory (including virtual disk), or non-existent memory. If you try to map to locked or non-existent memory, you get a privilege violation error.

Privileges

You need RDMEM to map read/write or read-only. You need SYSMOD to map read/write. If the starting address in memory is 17760000 or higher (block number 177600), you also need SYSMOD for read-only.

Data Passed (Map Physical Memory)

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	//////////	4	FQFIL
	7	//////////	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	-4	14	FQEXT
	17	starting address, in 32-word blocks	16	FQSIZ
	21	length, in 32-word blocks, to be mapped	20	FQBUFL
	23	desired access mode	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL	The function code MAPFQ (octal value equals 10).
FIRQB+FQPPN	The ID of the window to be mapped (returned at FIRQB+FQPPN by the CRAFQ subfunction call that created the window).
FIRQB+FQEXT	4 to indicate map to physical memory.
FIRQB+FQSIZ	The offset from the start of memory where the mapping is to begin, in 32-word blocks. A value of zero for this word indicates the window is to be mapped beginning at the first byte of physical memory. A value of 1 indicates that the window is to be mapped beginning at the 33rd word of physical memory (starting address = 64), and so forth.
FIRQB+FQBUFL	The length of the area to be mapped, in 32-word blocks. This value cannot be greater than the size of the window (specified at FIRQB+12 in the CRAFQ which created the window). Furthermore, this value, combined with the offset value at FIRQB+FQSIZ, cannot indicate an address beyond the end of physical memory. A value of zero for this word defaults to either the size of the window or the space remaining in physical memory, whichever is smaller.

FIRQB+FQMODE Bit 1 of this word specifies whether the window is to be mapped read/write or read-only:
 Bit 1 = 1 Read/write access.
 = 0 Read-only access.

You need SYSMOD privilege to map read/write. You need RDMEM privilege to map either way. If you want to map the I/O page by specifying a starting address of 17760000 or higher (block number 177600), you need SYSMOD privilege to map either way.

You can map to monitor memory, XBUF, or user memory, but not to locked memory (including virtual disk), or nonexistent memory.

Errors

PRVIOL The mapping was unsuccessful because user privileges did not allow the access desired or you attempted to map to locked or nonexistent memory.

3.19.5.1 Fast-Mapping Facility

You may want to use the fast-mapping facility instead of the MAPFQ subfunction. It enhances performance and is compatible with the fast-mapping facility of RSX-11M-PLUS. The RSTS/E RSX emulator also provides the following features:

- The Task Builder /FM switch.
- The TFEA\$ RSX monitor call can tell a program if fast-mapping is enabled.
- The .SET and .CLEAR monitor calls allow a task to enable and disable fast-mapping.

You can use fast-mapping if your program does not use any IOT instructions except to perform the fast-map operations. To use the fast-mapping facility, set parameters as shown in the following calling sequence, then issue an IOT instruction:

Calling Sequence

R0 parameter 1 see table of APR parameter values
 R1 parameter 2 offset field, 32 decimal words from library base
 R2 parameter 3 optional length specification (if used, bit 15 in R0 must =1)
 IOT calls the monitor to execute mapping

Returned Data

R0 Status IS.SUC if successful
 IE.TIS or IE.ALG if unsuccessful
 R2 length mapped if successful length actually mapped in slivers
 R1 & R3 indeterminate

Table of Parameter Values

Space	Base APR	If No Length Given	If Length Given
User-I	0		APR I-0 cannot be changed
User-I	1	000010	100010
User-I	2	000020	100020
User-I	3	000030	100030
User-I	4	000040	100040
User-I	5	000050	100050
User-I	6	000060	100060
User-I	7	000070	100070
User-D	0		APR D-0 cannot be changed
User-D	1	000110	100110
User-D	2	000120	100120
User-D	3	000130	100130
User-D	4	000140	100140
User-D	5	000150	100150
User-D	6	000160	100160
User-D	7	000170	100170

The fast-mapping facility has the following restrictions:

- The fast-mapping facility can modify only the map field (FQSIZE) and, optionally, the length to the map field (FQBUFL).
- The interface to the fast-mapping facility is designed for speed, not for ease of programming. It may be harder to debug a task using fast-mapping than one using the .PLAS directive. The only validation fast-mapping does is to protect the operating system and its data structures
- The interface uses the IOT instruction. Tasks that use fast-mapping cannot use the IOT instruction for any other purpose.
- The interface uses registers to pass parameters instead of using a FIRQB. This means that the MACRO-11 programmer must be careful about register use when fast-mapping.

Examples

Change the window offset in an I-Space library:

```
MOV    #60,R0           ;I-Space window in APR 6
MOV    #200,R1          ;offset 4K words from the beginning of library
                          ;R2 not used
IOT                    ;do the re-map
TST    R0               ;any errors?
BMI    ERROR           ;if minus yes, otherwise ok
```

Change the D-Space window offset and the actual window length:

```
MOV    #100150,R0      ;D-Space window in APR 5, length to be given
MOV    #400,R1         ;offset 8K words from library base
MOV    #500,R2         ;length to be 10K words (use APR 5,6 &7)
IOT                    ;issue instruction
TST    R0               ;any errors?
BMI    ERROR           ;if minus yes, otherwise ok
```

3.19.6 UMPFQ (Unmap Address Window)

Form

```

MOVb    #UMPFQ, FIRQB+FQFIL
.
.
.
(set up parameters)
.
.
.
.PLAS
  
```

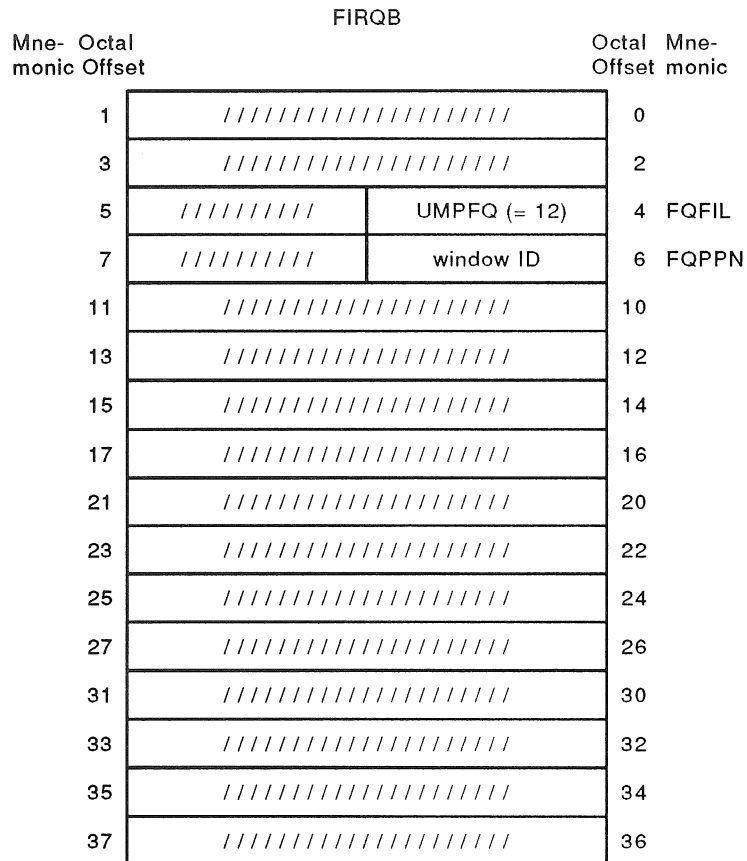
Function

The UMPFQ subfunction of .PLAS unmaps a specified address window from a resident library. (Note that a MAPFQ on an already mapped window unmaps the existing windows.)

Privileges Required

None

Data Passed



FIRQB+FQFIL
 FIRQB+FQPPN

The function code UMPFQ (octal value equals 12).
 The ID of the window to be unmapped (returned at FIRQB+FQPPN by the CRAFQ that created the window).

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// | current job no. * 2	2	FQJOB
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	status flag	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQJOB The current job number times two.

FIRQB+FQMODE Bit 13 of this word is set if the unmapping was successful.

Errors

BADFUO The window ID specified is invalid (not in the range 1 to 7).

NOSUCH The window ID specified is in the range 1 to 7, but no such window is currently created for the job.

Example

The following code unmaps the window whose ID is stored at WINID:

```

MOVW    #UMPFQ, FIRQB+FQFIL          ;SET FUNCTION CODE
MOVW    WINID, FIRQB+FQPPN
.PLAS

```

3.20 .POSTN — Return Current Horizontal Position

Form

.POSTN

Function

The .POSTN directive returns the maximum line width and the current horizontal position of devices for which this information is relevant (line printers and terminals). Data is passed in the XRB defining the channel where the device is currently opened. The information is returned in the XRB.

Privileges Required

None

Data Passed

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////////////////		2	
	5	////////////////////		4	
	7	////////	channel number * 2	6	XRCI
	11	////////////////////		10	
	13	////////////////////		12	
	15	////////////////////		14	

XRB+XRCI

Channel number times two; defines the channel on which the file or device is open.

Data Returned

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////	maximum line length	0	XRLEN
	3	////////	current position	2	XRBC
	5	////////////////////		4	
	7	////////////////////		6	
	11	////////////////////		10	
	13	////////////////////		12	
	15	////////////////////		14	

XRB+XRLEN The file or device's maximum line length plus one. For example, a value of 81. would indicate a maximum line length of 80. bytes.

XRB+XRBC The file or device's current horizontal position is returned here. The value can range from zero (leftmost character) to the value returned at XRB+XRLEN minus one (rightmost character). If the device does not keep track of its own horizontal position, then this value is zero. The FLGPOS status bit returned in the FIRQB when the file or device was opened indicates whether the value returned here is meaningful.

Errors

NOTOPN No file or device is open on the specified channel.

DETKEY The device is a terminal that is detached.

Example

The following code requests the current horizontal position of the device open on channel 4:

```
MOVB    #4*2,XRB+XRCI            ;SET CHANNEL TO 4
.POSTN
```

3.21 .READ — Read Data from File or Device

Form

.READ

Function

The .READ directive reads data from a file or device previously opened on a channel. The amount of data read depends on the device and the size of the buffer area, as defined in the XRB. The number of bytes transferred is always less than or equal to the buffer size. The actual number of bytes read is returned in the XRB when the directive is complete. Specific details for each device are given in Table 3-5. The "best guess" buffer sizes (returned by the monitor at FIRQB+FQBUFL when the device was opened) are also shown, for comparison.

When you do I/O to or from a resident library mapped in D-Space, such as a dynamic region, you can use I/O buffer sizes larger than the greatest size that can be mapped into the program's virtual address space. You can get single I/O block sizes up to 65,534 bytes (177776 octal). Note that not all devices can use such large block sizes.

You only need to map the first word of the I/O buffer into the the virtual address space, so the monitor can locate the buffer in the resident library. However, the entire buffer must reside in the resident library; otherwise, the monitor rejects the I/O request. This feature is available only for resident libraries mapped in D-Space.

Table 3-5: Data Input with .READ

Device	Block Size, Bytes (Decimal)	"Best Guess," Bytes (Decimal)	.READ's Intent to Deliver	What Happens When	
				Buffer Size >= Intent	Buffer Size < Intent
Byte-Oriented Devices (FLGFRC=1, FLGRND=0)					
Keyboard (Terminal)	N/A	128	1 line ¹	1 line ¹	Fill buffer; next .READ reads next part of line.
Pseudo Keyboard	N/A	128	Full buffer	N/A	N/A
Paper Tape Reader	N/A	128	Full buffer	N/A	N/A
Card Reader	N/A	160	1 card	1 card	Fill buffer; next .READ reads next part of card.
Block-Sequential Devices (FLGFRC=0, FLGRND=1)					
Magnetic Tape	18 to 32,767	512	1 block	1 block	Fill buffer; next .READ starts with new block. (Error returned.)
DECtape (file-structured)	510	510	1 block	1 block	Fill buffer; next .READ starts with new block. (No error returned.)
DMC/DMR	1 to 632	512	1 message	1 message	Delivers partial message. Next .READ delivers next message.
Block-Random Devices (FLGFRC=0, FLGRND=0)					
Disk	18 to 32,767	512	Full buffer	Fills buffer; next .READ starts with new block. ²	
Flexible Diskette	³	512	Full buffer	Fills buffer; next .READ starts with new block or sector. ²	
DECtape (non-file-structured)	512	512	1 block	1 block	Fill buffer; next .READ starts with new block. (No error returned.)

¹A line is any number of characters terminated by RETURN, LINE FEED, ESCAPE, FORM FEED, Ctrl/Z, Ctrl/D, Ctrl/C, or a user-set private delimiter.

²If the buffer size is not a multiple of the blocksize, the remainder of the last block is not read. The next .READ starts with a new block: either the next sequential block (XRB+XRBLK=0) or the nth block (XRB+XRBLK=n). No error is returned.

³512 (block mode) or 128 (RX01 or RX02 single-density sector mode) or 256 (RX02 double-density sector mode)

Privileges Required

None

Data Passed

		XRB		Octal	Mne-
Mne-	Octal			Offset	monic
monic	Offset				
	1	size of the buffer in bytes, must $\neq 0$		0	XRLEN
	3	(must be 0)		2	XRBC
	5	starting address of buffer		4	XRLOC
XRBLKM	7	MSB of block number	channel number * 2	6	XRCI
	11	LSB of block number to begin (0 = next)		10	XRBLK
	13	wait time for terminal input		12	XRTIME
	15	device-dependent modifier		14	XRMOD

XRB+XRLEN

The length of the input buffer, in bytes. This word must be nonzero. The amount of data read depends on both the device and the buffer size. However, the amount of data is never more than the buffer size. See Table 3-5 for details on reads for specific devices.

XRB+XRBC

This word must be passed as zero. The monitor returns the actual number of bytes transferred in this word location (see the Data Returned section).

XRB+XRLOC

The starting address of the buffer. For disk, flexible diskette, and magtape devices, this address must be on a word boundary. For all other devices, the buffer can begin on an odd address. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)

XRB+XRCI

Channel number times two; defines the channel for the read, as previously defined in an open (OPNFQ, CRTFQ, CREFQ, or CRBFQ functions of CALFIP).

XRB+XRBLKM

For files on disk, this byte contains the MSB of the block number to begin the read. This byte is combined with the word at XRBLK to form a 24-bit field defining the block number. This byte is ignored for nondisk devices.

XRB+XRBLK

For channels opened as file-structured, this word defines the starting block number for this read. (For large files, this word forms the LSB of the block number to start the read.) The value performs the same action as the BLOCK option for disk and the RECORD option for flexible diskette and non-file-structured DECTape (see the *RSTS/E Programming Manual*). Note that this word is ignored if the device is not a random-access device.

If the device is random-access and this field is nonzero, it is interpreted as the block number where the read is to start (1 to n, where n is the length of the file, in 512-byte blocks). If the field is zero, the next sequential block is read. For example, if a disk file is being read with a 1024-byte buffer size, a .READ with this parameter equal to four would cause the fourth and fifth blocks of the file (512 bytes each) to be read into the buffer.

For channels opened on disk as non-file-structured MODE 0, this word defines the device cluster number where the read is to begin. In this case, each .READ begins with a new device cluster, so the buffer size at XRB+XRLEN should be a multiple of the device cluster size.

XRB+XRTIME If positive, the maximum time to wait for terminal input data, in seconds. Zero indicates an infinite wait. A negative value (bit 15 equals 1) indicates an infinite keyboard monitor wait. This wait is used by run-time systems that act as keyboard monitors for their command input. This type of wait time acts as a flag to the monitor and to the batch subsystem that the job is in a command input wait state.

XRB+XRMOD Input operation modifier; significant only for card reader, terminal, DMC/DMR, or paper tape devices. (The monitor informs you with the FLGMOD bit of the flag word returned at FIRQB+FQFLAG on the open whether or not the device accepts modifiers.) This parameter performs the same action as the RECORD modifier in BASIC-PLUS for these devices (see the *RSTS/E Programming Manual*).

Data Returned

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	actual number of bytes read		2	XRBC
	5	////////////////////////////////////		4	
XRBLKM7		MSB of block number	////////////////////////////////	6	
	11	LSB of block number where .READ began		10	XRBLK
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRB+XRBC Actual number of bytes just read. The value is between zero and the value of XRB+XRLEN passed in the XRB. If an error is returned on the read (as indicated by byte 0 of the FIRQB), this word may or may not be zero. That is, data may be input even if an error occurs. For example, if the card reader detects an illegal card column punch combination, it places the decoded card data in the input buffer, substituting a special character for the bad column. The XRB+XRBC field is correctly set for the number of characters input, and an error is returned.

XRB+XRBLKM For disk files, this byte contains the MSB of the block number just read. (See XRB+XRBLK.)

XRB+XRBLK For random-access devices (see Table 3-5), this word contains the block number of the block just input with this .READ. Block numbers range from 1 to n (where n is the length of the file, in 512-byte blocks); they define the order in which the file was written. (For disks opened non-file-structured MODE 0, this is the device cluster number.)

Errors

The possible device-independent errors are:

BADCNT	The first three words of the XRB describing the input buffer are illegal. (Illegal byte count for I/O.)
BSERR	The specified channel number is illegal.
NOTOPN	No file or device is open on the specified channel number.
PRVIOL	The file or device open on the specified channel is write-only, or the caller did not obtain read access to the file or device when it was opened.

All other errors are device-dependent. Some common errors are:

DATERR	Some data error occurred. There may or may not be any valid data in the input buffer. This error is issued for parity errors, bad card columns, and so on.
HNGDEV	Some hard device I/O error occurred. There is usually no data in the input buffer when this error occurs. (For example, a .READ for an off-line device causes this error.)

Example

In this example, we assume that a disk file has been opened on channel 2. Space for the buffer is allocated with the .BLKB directive, and the buffer size and location are defined. The next sequential block in the file is to be read (XRB+XRBLK is zero).

```
BUFFER:  .BLKB  512.                ;ALLOCATE SPACE FOR BUFFER
          .
          .
          .
          CALL  CLRXRB
          MOV   #512.,XRB+XRLEN      ;SET BUFFER SIZE TO 512. BYTES
          MOV   #BUFFER,XRB+XRLOC    ;STARTING ADDRESS OF BUFFER
          MOVB  #2*2,XRB+XRCI        ;CHANNEL 2 FOR INPUT
          .READ
```

3.22 .READA—Read Data from a Device (Asynchronous)

Form

.READA

Function

The asynchronous read directive (.READA) performs the same basic functions as the synchronous read directive (.READ): both move data between a device and a user program. The difference lies in the completion of the request. While synchronous read requests stall the job's execution until the request completes, asynchronous read requests do not stall; the program continues to run while the I/O request completes in parallel with program execution. The mechanism that the RSTS operating system uses to notify the user job upon I/O completion is an asynchronous completion routine.

When you do I/O to or from a resident library mapped in D-Space, such as a dynamic region, you can use I/O buffer sizes larger than the greatest size that can be mapped into the program's virtual address space. You can get single I/O block sizes up to 65,534 bytes (177776 octal). Note that not all devices can use such large block sizes.

You only need to map the first word of the I/O buffer into the the virtual address space, so the monitor can locate the buffer in the resident library. However, the entire buffer must reside in the resident library; otherwise, the monitor rejects the I/O request. This feature is available only for resident libraries mapped in D-Space.

Privileges Required

TUNE is required to perform multiple asynchronous read functions.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	Completion Routine Address	4	FQFIL
	7	User-supplied parameter	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL

Identifies the address in the user job where program flow should begin when the asynchronous read completes. If FIRQB+FQFIL is zero, no AST completion routine is executed. In this case, it is understood that the user is using some other mechanism to determine whether the I/O request has successfully completed.

FIRQB+FQPPN

This field is used by the user job to communicate information to the AST completion routine with the user's program. If FIRQB+FQFIL is zero, this value is ignored.

Mne- monic	Octal Offset	XRBLKM7	XRBLKM7	Octal Offset	Mne- monic
	1	size of the buffer in bytes, must <> 0		0	XRLEN
	3	(must be 0)		2	XRBC
	5	starting address of buffer		4	XRLOC
	7	MSB of block number	channel number * 2	6	XRCL
	11	LSB of block number to begin (0 = next)		10	XRBLK
	13	wait time for terminal input		12	XRTIME
	15	device-dependent modifier		14	XRMOD

XRB+XRLEN	The length of the input buffer, in bytes. This word must be nonzero. The amount of data read depends on both the device and the buffer size. However, the amount of data can never be more than the buffer size. See Table 3-5 for details on reads for specific devices.
XRB+XRBC	This word must be passed as zero. The monitor returns the actual number of bytes transferred in this word location (see the Data Returned section).
XRB+XRLOC	The starting address of the buffer. For disk, flexible diskette, and magtape devices, this address must be on a word boundary. For all other devices, the buffer can begin on an odd address. (See the section "XRB (Transfer Request Block)" in Chapter 2 for more information.)
XRB+XRCCI	Channel number times two; defines the channel for the read, as previously defined in an open (OPNFQ, CRTFQ, CREFQ, or CRBFQ functions of CALFIP).
XRB+XRBLKM	For files on disk, this byte contains the MSB of the block number to begin the read. This byte is combined with the word at XRBLK to form a 24-bit field defining the block number. This byte is ignored for nondisk devices.
XRB+XRBLK	For channels opened as file-structured, this word defines the starting block number for this read. (For large files, this word forms the LSB of the block number to start the read.) The value performs the same action as the BLOCK option for disk and the RECORD option for flexible diskette and non-file-structured DEctape (see the <i>RSTS/E Programming Manual</i>). Note that this word is ignored if the device is not a random-access device. If the device is random-access and this field is nonzero, it is interpreted as the block number where the read is to start (1 to n, where n is the length of the file, in 512-byte blocks). If the field is zero, the next sequential block is read. For example, if a disk file is being read with a 1024-byte buffer size, a .READA with this parameter equal to four would cause the fourth and fifth blocks of the file (512 bytes each) to be read into the buffer. For channels opened on disk as non-file-structured MODE 0, this word defines the device cluster number where the read is to begin. In this case, each .READA begins with a new device cluster, so the buffer size at XRB+XRLEN should be a multiple of the device cluster size.
XRB+XRTIME	If positive, the maximum time to wait for terminal input data, in seconds. Zero indicates an infinite wait. A negative value (bit 15 equals 1) indicates an infinite keyboard monitor wait. This wait is used by run-time systems that act as keyboard monitors for their command input. This type of wait time acts as a flag to the monitor and to the batch subsystem that the job is in a command input wait state.
XRB+XRMOD	Input operation modifier. For disk asynchronous reads, a value of one in this byte indicates that a read check should be performed. A read check does not transfer any data. The buffer address specified in the XRB is compared with the data on the disk.

Data Returned on Completion of the Directive

No meaningful data is returned by the directive except for a possible error code in byte 0 of the FIRQB. Useful data is returned instead to the completion routine.

Data Returned to the Completion Routine

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	//////////	error code	0	
	3	//////////	job number * 2	2	FQJOB
	5	////////////////////////////////////		4	
	7	User-supplied parameter		6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	actual number of bytes read		2	XRBC
	5	////////////////////////////////////		4	
XRBLKM7		MSB of block number	//////////	6	
	11	LSB of block number where .READ began		10	XRBLK
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRB+XRBC

Actual number of bytes just read. The value is between zero and the value of XRB+XRLEN passed in the XRB. If an error is returned on the read (as indicated by byte 0 of the FIRQB), this word may or may not be zero. That is, data may be input even if an error occurs.

XRB+XRBLKM

For disk files, this byte contains the MSB of the block number just read. (See XRB+XRBLK.)

XRB+XRBLK For random-access devices (see Table 3-5), this word contains the block number of the block just input with this .READA. Block numbers range from 1 to n (where n is the length of the file, in 512-byte blocks); they define the order in which the file was written. (For disks opened non-file-structured MODE 0, this is the device cluster number.)

Errors

There are three classes of errors that can cause the failure of an asynchronous I/O request: directive errors; system-driver errors; and device-dependent errors.

Directive errors are immediately visible upon examination of the FIRQB on return from the directive. These errors are similar to the syntax errors checked by a compiler. If an error is found, the I/O is not attempted, and the error is reported through the standard FIRQB+0 mechanism. Some common directive errors are:

BADCNT	The completion routine address is invalid or odd.
BSERR	The specified channel number is illegal.
NOTOPN	No file or device is open on the specified channel number.
PRVIOL	The file or device open on the specified channel is write-only, or the caller did not obtain read access to the file or device when it was opened.

System-driver errors occur before the asynchronous request is issued to the appropriate device driver. These errors are related to the lack of system resources, for example:

INUSE	Too much outstanding I/O for the job, or the job does not have the TUNE privilege and already has outstanding asynchronous I/O.
NOBUFS	The system could not get a small buffer for the request.

Any of the previous errors are reported on return from the .READA directive. If none of these errors occurred, the read operation is started and the directive returns a value of 0 in FIRQB+0. The read operation may still fail at a later point; its success or failure is indicated in FIRQB+0 when the completion routine is entered.

Other system-driver errors are reported within the AST completion routine:

EOF	End-of-file (EOF) on the specified device.
NOROOM	No room for the user on the specified device.

Device-dependent errors can only be found during the attempt of the actual I/O transfer. These errors can only be reported to the job in the asynchronous I/O completion routine. Some common device-dependent errors are:

DATERR	Some data error occurred. There may or may not be any valid data in the input buffer. This error is issued for parity errors, bad card columns, and so on.
HNGDEV	Some hard device I/O error occurred. There is usually no data in the input buffer when this error occurs. (For example, a .READA for an off-line device causes this error.)

Example

The following is an example of an asynchronous disk-to-disk copy. The program initially issues three read requests (.READA, which requires the TUNE privilege for multiple read operations) on the first disk and issues a corresponding write request (.WRITA) on the second device when each .READA completes. After each .WRITA completes, another advanced .READA is issued. Thus, there is always one outstanding .READA and at least one outstanding .WRITA. Each new I/O

request within the routine uses the same buffer address as the request that has just finished. This is an easy way to keep track of the free buffers.

Note that the program does not handle bad blocks efficiently; nor does it prompt for the disk specifications. All errors are treated as fatal.

```

; Register usage:
; R2 = Input block number
; R4 = Buffer number (carried in the user-created parameter field)

.PSECT    CODE
START:    CALL    CLRFBQ          ; Clear FIRQB
;
; Open input disk device = DL0:
;
        MOV     #OPNFQ,FIRQB+FQFUN ; Function code
        MOV     #3*2,FIRQB+FQFIL   ; Set input channel = 3
        MOV     #"DL,FIRQB+FQDEV   ; on an RL02
        MOV     #377*400+0,FIRQB+FQDEVN ; unit 0, device real
        MOV     #200*400+8192.,FIRQB+FQMODE ; read-only mode
        CALFIP                                ; Go for it
        MOV     FIRQB,R0                ; Error?
        BNE     FATAL                  ; Stop and check it out
;
; Open output disk device = DL1:
;
        MOV     #OPNFQ,FIRQB+FQFUN ; Function code
        MOV     #4*2,FIRQB+FQFIL   ; Set output channel = 4
        MOV     #"DL,FIRQB+FQDEV   ; on an RL02
        MOV     #377*400+1,FIRQB+FQDEVN ; unit 1, device real
        CALFIP                                ; Go for it
        MOV     FIRQB,R0                ; Error?
        BNE     FATAL                  ; Stop and check it out
;
; Issue the first three initial reads
;
        CALL    CLRFBQ          ; Clear FIRQB & XRB
        MOV     #3,R1           ; 1 read + 2 read-aheads
        CLR     R2              ; Start at virtual block zero
        MOV     #BUFFER,R4     ; Load 1st buffer address
10$:    MOV     #512.,XRB+XRLEN ; Set buffer size to 512.
        CLR     XRB+XRBC       ; XRBC = 0
        MOV     R4,XRB+XRLOC   ; Set our next buffer address
        MOV     #3*2,XRB+XRCI  ; Input channel times 2
        INC     R2             ; Next input block number
        MOV     R2,XRB+XRBLK   ; Read that block
        MOV     #R$AST,FIRQB+FQFIL ; Go to R$AST after read
        MOV     R4,FIRQB+FQPPN ; User-created parameter
        .READA                                ; Do an asynchronous read
        MOV     FIRQB,R0        ; Directive error?
        BNE     FATAL          ; Yes, stop
        ADD     #512.,R4       ; Get next buffer address
        SOB    R1,10$         ; Issue next read-ahead
20$:    MOV     #100001, XRB+0 ; Conditional sleep
        .SLEEP
        BR     20$           ; and do that until done
;
;All .READA's come here at completion time
;
R$AST:  MOV     FIRQB,R0        ; Error?
        BEQ    60$            ; No, continue
        CMPB  #13,R0          ; End-of-disk (EOD) ?
        BEQ    CLSIN          ; Yes, close I/O disks
        BR    FATAL          ; No, unexpected error, stop

```

```

60$:      MOV      #512.,XRB+XRLEN      ; Reset buffer size
          MOV      #512.,XRB+XRBC      ; Want to write entire buffer
          MOV      FIRQB+FQPPN,XRB+XRLOC ; Use the same buffer address
          MOVB     #4*2,XRB+XRCI       ; Output channel * 2
          ; XRBLC has block number
          MOV      #W$AST,FIRQB+FQFIL   ; Completion routine address
          .WRITA   ; Write that block
          BR       ASTDON               ; Join the common code

;
; All .WRITA's come here at completion time
;
W$AST:    MOV      FIRQB,R0              ; Error?
          BEQ      70$                   ; No, continue
          CMPB     #13,R0                 ; End-of-disk (EOF) ?
          BEQ      CLSIN                  ; Yes, close I/O disks
          BR       FATAL                  ; No, unexpected error, stop

70$:      MOV      #512.,XRB+XRLEN      ; Set buffer size
          CLR      XRB+XRBC              ; XRBC = zero
          MOV      FIRQB+FQPPN,XRB+XRLOC ; Use the same buffer address
          MOVB     #3*2,XRB+XRCI       ; Input channel * 2
          INC      R2                     ; Increment to next block
          MOV      R2,XRB+XRBLK         ; XRBLK has block number
          MOV      #R$AST,FIRQB+FQFIL   ; Completion routine address
          .READA   ; Read that block
          BR       ASTDON               ; Join the common code

;
; AST common code
;
ASTDON:   MOV      FIRQB,R0              ; Any directive errors
          BNE      FATAL                  ; Yes, stop
          .ASTX                            ; No, just return to mainline

;
.SBTTL    FIRQB/XRB clearing routines
.ENABL    LSB

CLRFQX:   PUSH     <R0,R1>               ; Save R0, R1
          MOV      #FIRQB,R0             ; Point to FIRQB
          MOV      #<<FQBSIZ+XRBSIZ>/2>,R1 ; Compute how many words
          BR       200$

CLRFQB:   PUSH     <R0,R1>               ; Save R0, R1
          MOV      #FIRQB,R0             ; Point to FIRQB
          MOV      #<FQBSIZ/2>,R1; Compute how many words
          BR       200$

CLRARB:   PUSH     <R0,R1>               ; Save R0, R1
          MOV      #ARB,R0               ; Point to ARB
          MOV      #<ARBSIZ/2>,R1; Compute how many words

```

```

200$:   CLR      (R0)+           ; Zero it out
        SOB      R1,200$       ; Until all done
        POP      <R1,R0>       ; Restore R0, R1
        RETURN

;
; Errors (code in R0) come here
;
FATAL:   BPT                    ; All errors come here
OUT:     .EXIT                   ; All done
;
; Close input disk (may still have outstanding .READAs)
;
CLSIN:   CALL     CLRFBQ         ; Clear FIRQB
        MOV      #CLSFQ,FIRQB+FQFUN ; CLOSE function
        MOV      #3*2,FIRQB+FQFIL  ; Set channel = 3
        CALFIP                    ; Do it
;
; Close output disk (may still have outstanding .WRITAs)
;
CLSIN:   CALL     CLRFBQ         ; Clear FIRQB
        MOV      #CLSFQ,FIRQB+FQFUN ; CLOSE function
        MOV      #4*2,FIRQB+FQFIL  ; Set channel = 4
        CALFIP                    ; Do it
        BR      OUT              ; Then, exit

.PSECT   DATA
BUFFER:  .BLKB   512.            ; Buffer one
        .BLKB   512.            ; Buffer two
        .BLKB   512.            ; Buffer three
BUFEND:  ; Address for EOB

.END     START

```

3.23 .RTS — Pass Control to Run-Time System

Form

.RTS

Function

The .RTS directive passes control to a run-time system at the P.NEW entry point, where the intent is not to run an executable file (see Chapter 2). .RTS performs one of four functions:

- Passes control to the job's keyboard monitor
- Passes control to a named run-time system
- Passes control to a named run-time system and establishes it as the job's keyboard monitor
- Passes control to a named run-time system without changing job context information

The first function is generally part of a run-time system's exit processing; you do not normally use .RTS for this purpose in a user program. The following code shows how .RTS is used in exit processing (for example, in the RT-11 run-time system's .EXIT directive):

```
EXIT:      CALL      CLRFQB          ; Clear FIRQB
           .RTS          ; Exit to default KBM
           JMP        PROMPT        ; If that's this KBM, then
                                   ; prompt for another command
```

The other three functions of .RTS apply to both user programs and run-time systems.

Note that once established, a job's keyboard monitor replaces the default keyboard monitor as the one to which control passes by default. This concept is best explained by example.

The SET JOB/KEYBOARD_MONITOR command uses the .RTS directive to establish the run-time system to which it passes control as the job's keyboard monitor (see the *RSTS/E System Manager's Guide*). Consider the following sequence:

```
$ SET JOB/KEYBOARD_MONITOR=RT11
.MAC
MAC>CTRL/C
.CTRL/C
.$SET JOB/KEYBOARD_MONITOR
$
```

The first line shows the DCL prompt (\$), indicating that the user is in the DCL keyboard monitor. Then:

1. The user executes the SET JOB/KEYBOARD_MONITOR command to pass control to the RT-11 run-time system. This command establishes RT-11 as the job's keyboard monitor. The RT-11 run-time system displays the period prompt.
2. The user runs MAC, the RSX assembler. Control passes to the RSX emulator, which loads the assembler and runs it. MAC displays the "MAC>" prompt.
3. The user, realizing the mistake in typing MAC instead of MACRO, enters Ctrl/C to exit. Since RT-11 has been established as the job's keyboard monitor, control passes back to RT-11, and it displays the period prompt.

4. The user, wanting to get back to DCL, enters another Ctrl/C. Since RT-11 is the job's keyboard monitor, however, another period prompt appears.
5. The user finally issues the SET JOB/KEYBOARD_MONITOR command (with the \$ prefix to indicate that it is a DCL command), leaving out the run-time system name. This command transfers control back to the system default keyboard monitor (DCL), establishing it once again as the job's keyboard monitor.

The four cases in which the .RTS directive can be used are:

- In the first case, the .RTS directive is used to switch control back to the run-time system already established as the job's keyboard monitor. In this case, the name of the run-time system is not known. The word in the FIRQB that would contain the first part of the run-time system name is zero. If the run-time system that issues the .RTS is not itself the job's keyboard monitor, or the currently running program is a privileged program, control is passed to the job keyboard monitor at entry point P.NEW. If the run-time system that issues the .RTS is the job's keyboard monitor and the current program is not a privileged program, control returns to the instruction following the .RTS with no error indicated.
- In the second case, the .RTS directive is used to switch control to the run-time system named in the FIRQB. (Run-time systems are made known to the monitor by the system manager with the INSTALL/RUNTIME_SYSTEM command. With this command, the system manager defines a file (filename.RTS) as an auxiliary run-time system. The monitor regards "filename" as the run-time system's name.) If the run-time system that issues the .RTS directive is not itself the named run-time system, or the currently running program is a privileged program, control passes to the named run-time system at the P.NEW entry point. If the run-time system that issues the .RTS directive is the named run-time system and the current program is not a privileged program, control returns to the instruction following the .RTS with no error indication. If the named run-time system does not exist or is not available for some reason, control returns to the instruction following the .RTS with an error in byte 0 of the FIRQB.
- In the third case, the .RTS directive is used to switch control to a named run-time system and establish it as the job's keyboard monitor. If the run-time system that issues the .RTS is not itself the named run-time system, or the currently running program is a privileged program, control passes to the named run-time system at the P.NEW entry point, and the named run-time system is established as the job's keyboard monitor. If the run-time system that issues the .RTS names itself as the run-time system and the current program is not a privileged program, control returns to the instruction following the .RTS with no error, and the run-time system is established as the job's keyboard monitor. If the named run-time system does not exist or is unavailable, control returns to the instruction following the .RTS with an error in byte 0 of the FIRQB.
- In the fourth case, the .RTS directive is used to switch control to a named run-time system preserving the job's current job-context information. Control passes to the named run-time system at the P.NEW entry point, but the monitor does not refresh the keyword, reset the stack pointer, or perform any of the initialization operations (see the discussion of P.NEW in Chapter 2).

In the first three cases, if the program currently running had temporary privileges in effect at one time (whether it has since dropped them or not), then the transfer of control to the P.NEW entry point is unconditional. In addition, all of the user's memory above NSTORG is cleared to ensure any restricted data kept by the program is erased from memory. Finally, the monitor drops temporary privileges.

NOTE

Do not use this directive from programs running under the RT-11 run-time system, because RT-11 uses the lowest 512 bytes differently than other run-time systems. The correct way to terminate a program running under RT-11 is to exit through the RT-11 emulator.

Although you can use this directive to terminate a program running under the RSX run-time system, Digital recommends that you use the RSX EXIT\$ or EXST\$ directive instead (see Chapter 5). Using .RTS may cause unexpected results.

Privileges Required

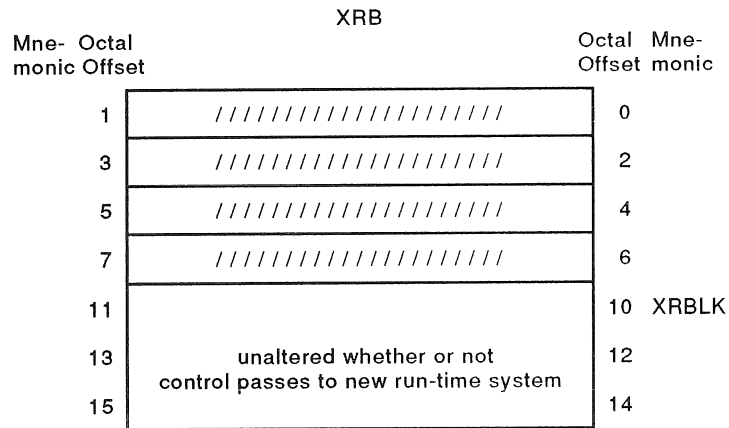
None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	run-time system name	10	FQNAM1
	13	(2 words of RAD50)	12	
	15	-1, Switch Kbm.; -2, don't change context	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQNAM1 If control is being passed to a named run-time system (cases 2, 3, and 4 described previously), the name of the run-time system is stored as two words in RAD50 format beginning here. If control is being passed to the job's keyboard monitor (case 1), the word beginning here must contain a value of zero.

FIRQB+FQEXT To establish a named run-time system as the job's keyboard monitor (case 3), set this word to -1. To switch control to a named run-time system without altering job-context information (case 4), set this word to -2. When the word at **FIRQB+FQNAM1** is zero, this word is ignored.



XRBLK The three words starting at this location pass unaltered to the new run-time system. They are also unaltered if control returns in line.

Data Returned

Since control usually passes to some other run-time system at its P.NEW entry point, no arguments as such are returned by .RTS. The three words starting at **XRBLK** remain unaltered if control returns in line.

Errors

NORTS No run-time system exists with the specified name.

PRVIOL The named run-time system does exist but cannot be switched to for some reason. (For example, if the switch is made to a named run-time system with the intent of establishing it as the job's keyboard monitor and its PF.KBM bit in the P.FLAG word is not set to 1.)

Example

The following example establishes NEWRTS (which the system manager must have installed with **INSTALL/RUNTIME_SYSTEM/KEYBOARD_MONITOR** command) as the job's keyboard monitor:

```
MOV      #^RNEW, FIRQB+FQNAM1      ; Set run-time system
MOV      #^RRTS, FIRQB+FQNAM1+1    ; Name to "NEWRTS"
MOV      #-1, FIRQB+FQEXT          ; Establish as job kbm
.RTS
```

3.24 .RUN — Run a Program

Form

.RUN

Function

The .RUN directive searches for a binary (executable) file (defined in the FIRQB), opens it on channel 15, and passes control to the P.RUN entry point of the run-time system associated with the file. The associated run-time system is identified in the file's directory information. This directory information is initially set to indicate the run-time system under which the file was created. The system manager can change the run-time system associated with the file with the SET FILE/RUNTIME_SYSTEM command (see the *RSTS/E System Manager's Guide*).

The run-time system is responsible for loading and executing the file (see the P.RUN description in Chapter 2). Control is not returned in line unless an error occurs. The monitor drops any temporary privileges in effect under the previously running program.

Privileges Required

File execute access required; either by protection code or privilege (GREAD or WREAD).

Data Passed

		FIRQB		
Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	project number | programmer number	6	FQPPN
	11	file name in RAD50 format	10	FQNAM1
	13	(2 words)	12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real | device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	entry parameter	36	FQNTENT

FIRQB+FQPPN	The PPN of the file to be opened. The project number is specified in the high byte, the programmer number in the low byte. If this word is passed as zero, the PPN defaults to the PPN of the job that issues the .RUN directive.
FIRQB+FQNAM1	The file name of the file to be opened; two words in RAD50 format.
FIRQB+FQEXT	The file type for the file to be opened; one word in RAD50 format. If you set this word to -1, the monitor will search for the file name supplied, substituting the default file type for the currently installed set of run-time systems until a file with the given name and one of the default file types is found.
FIRQB+FQDEV	The device name of the file to be opened, as two ASCII characters. If the device name is not a disk, the .RUN directive returns in line with one of the soft errors described in the Errors section. If you pass a full word of zero here and in FIRQB+FQDEVN, the public disk structure (SY:) is searched for the named file.
FIRQB+FQNENT	A 16-bit parameter word can be passed to the run-time system here. If the calling program has temporary privileges in effect, bit 15 is unchanged. Otherwise, bit 15 is cleared. The monitor takes no other action as a result of the contents of this word; any processing is up to the run-time system. (See the P.RUN entry point, Chapter 2.)

Errors

When an error occurs in a .RUN, FIRQB+FQFLAG is set to zero to indicate a hard error or -1 to indicate a soft error.

A hard error means the .RUN failed. A soft error also means the .RUN failed, but the run-time system may be able to recover. For example, when you use the BASIC-PLUS RUN command, BASIC-PLUS first executes a .RUN. If the .RUN returns a soft error, BASIC-PLUS performs an OLD (which compiles the program) and then executes .RUN again.

Hard Errors

BADNAM	The specified file name was zero. This is an illegal file name for disk files.
DEVNFS	The specified disk device is currently being used non-file-structured.
NOTCLS	Channel 15 is currently open. It must be closed before any .RUN call. (This error occurs only if channel 15 is open on a nondisk device. If a disk file is open, the channel is closed automatically.)
NODEVC	The specified device does not exist or is in an illegal format.
NORTS	The run-time system named in the file's directory information has not been installed.
NOTMNT	The specified disk device is not now mounted.
PAKLCK	The disk pack on which the file exists is locked against further file opens.

Soft Errors

NOSUCH	The file was not found. Note that if FIRQB+FQEXT was -1 in the data passed, the monitor has looked for the given file name with all default runnable file types for the currently installed run-time systems. In this case, a source version of the file may still exist.
PRVIOL	The device is not disk but is still a legal device on the system. Or the file was found and is on disk but does not have the compiled program bit set in its file protection code (bit 6).

Example

The following example uses the .FSS directive to translate a user-typed string to the FIRQB format. If no errors in the .FSS occur, a test is made to see if a file type was specified. If not, a -1 is supplied in FIRQB+FQEXT so the monitor searches for the given file name with all possible default file types that are runnable.

(read user-typed line, set up FIRQB for .FSS)

```
      .
      .
      .
      .FSS
TSTB  FIRQB          ; Error on .FSS?
BNE   ERRTN         ; Branch to process error
BIT   #100000,XRB+XRBLK ; Invalid device name?
BNE   BADDEV       ; Branch to process error
BIT   #10,XRB+XRBLK ; File type given?
BNE   SKIP1        ; Yes, skip next
MOV   #-1,FIRQB+FQEXT ; No, search all
SKIP1: CLR  FIRQB+FQEXT ; Entry parameter is zero
      .RUN
```

3.25 .SET — Set Keyword Bits

Form

.SET

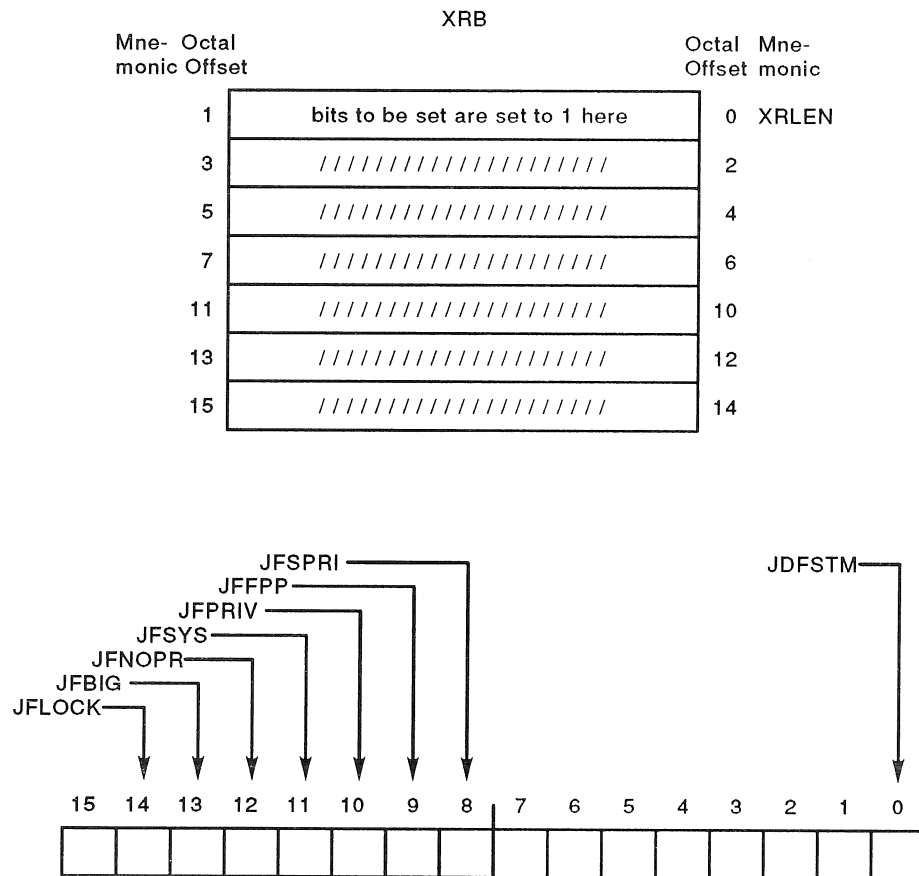
Function

The .SET directive sets certain bits in the keyword (KEY) location in the user job image (see Chapter 2). The bits to be set are passed to the monitor in the XRB.

Privileges Required

TUNE is required to set the special run priority bit (JFSPRI) or the lock in memory bit (JFLOCK).

Data Passed



JFLOCK

Can be set only by jobs with TUNE privilege. When this bit is set, the monitor swaps the user job image out of memory only when:

- The job issues a .CORE directive to expand the memory allocated for the user job image, and there is not sufficient room in physical memory to do the expansion. In this case, the job is swapped out to disk and back in at the indicated size.
- A fatal error, such as a memory parity failure, occurs.

JFBIG	Cannot be set by any job; masked off, that is, the corresponding bits in KEY cannot be set by the job with the .SET directive.
JFNOPR	Cannot be set by any job; masked off.
JFSYS	Can be set by a job only if JFSYS was set at one time and the temporary privileges gained were only temporarily dropped. (See description of KEY , Chapter 2 and the .CLEAR directive.)
JFPRIV	Cannot be set by any job; masked off.
JFFPP	Can be set by any caller if the PDP-11/45 compatible hardware floating-point unit exists; masked off if it does not exist. When this bit is set, the monitor will save information in the floating-point unit as part of the job-context information kept when jobs are swapped in and out of memory.
JFSPRI	Can be set only by a caller with TUNE privilege. Setting JFSPRI raises the job's run priority by one-half step. (That is, it sets bit 2 of the system-controlled low-order three bits of the run priority. Priorities are normally set by the system manager.)
JDFSTM	Can be set by any caller. Enables the fast-mapping facility for the current job. If you set this bit, clear all the others.

All other bits in the **XRB** word are masked off.

Data Returned

The **.SET** directive does not return any meaningful data.

Errors

No errors are possible with the **.SET** directive.

Example

The following code sets **JFLOCK**, allowing the job to remain locked in memory:

```
MOV      #JFLOCK, XRB+XRLEN      ;SET JFLOCK
.SET
```

3.26 .SLEEP — Suspend Job

Form

.SLEEP

Function

The .SLEEP directive causes the monitor to suspend the job for some specified time interval or until an event occurs that the job should be aware of. Optionally, the monitor checks, before the job is suspended, to see if some event has already occurred which would cause it to awaken. If so, the job is not suspended. Control returns in line in either case.

When a .SLEEP is executed, execution of the job is suspended until one of the following happens:

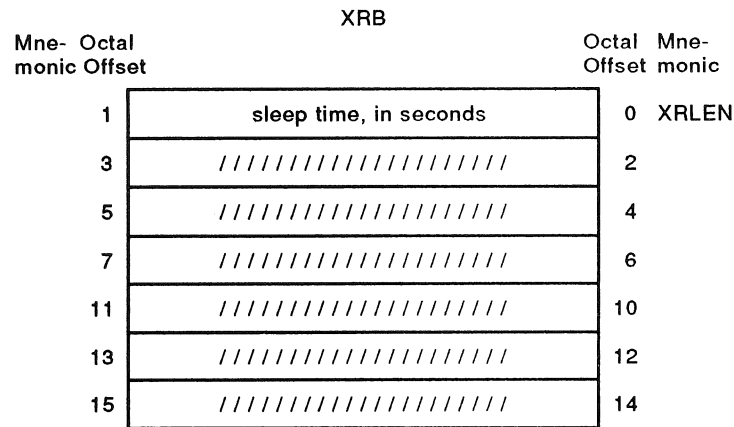
- The sleep time (specified in the XRB) expires.
- A local or network message is queued for the job assuming that the job is using local or network send/receive services. (See the .MESAG directive.)
- A delimiter is typed on a terminal that this job has opened or assigned.
- The system manager disables logins. (This could occur if the system is being shut down.)
- A state change occurs on a pseudo keyboard assigned to the job. (The job has printed output for the controlling job to read or has entered an input wait state.)
- The DMC11/DMR11 driver (XM:) is open and a message is pending for the job.
- An AST completion is queued.
- The system time is changed.

If you request it, the monitor checks for the following conditions before suspending the job:

- A delimiter has been typed on any terminal opened by the job or any terminal assigned to the job if the job also has a keyboard open on a nonzero channel.
- A message has been queued for the job.
- A state change has occurred on a pseudo keyboard opened by the job.
- The job has a DMC11/DMR11 device driver open and a message has been received by that device driver.
- One or more AST completion routines are pending.

If the monitor determines that any of these conditions are true, it does not execute the .SLEEP. This feature is known as conditional sleep.

Data Passed



XRB+XRLEN

This word defines the sleep interval, in seconds. If the value is zero, then `.SLEEP` returns immediately. If bit 15 is set, the monitor performs the conditional sleep checks. If any of the previously listed conditions are present, the `.SLEEP` is not executed.

Data Returned

The `.SLEEP` directive does not return any meaningful data.

Errors

No errors are possible with the `.SLEEP` directive.

Example

```
MOV      #5,XRB+XRLEN      ; Set timer to 5 seconds
.SLEEP
```

3.26 .SLEEP — Suspend Job

Form

`.SLEEP`

Function

The `.SLEEP` directive causes the monitor to suspend the job for some specified time interval or until an event occurs that the job should be aware of. Optionally, the monitor checks, before the job is suspended, to see if some event has already occurred which would cause it to awaken. If so, the job is not suspended. Control returns in line in either case.

When a `.SLEEP` is executed, execution of the job is suspended until one of the following happens:

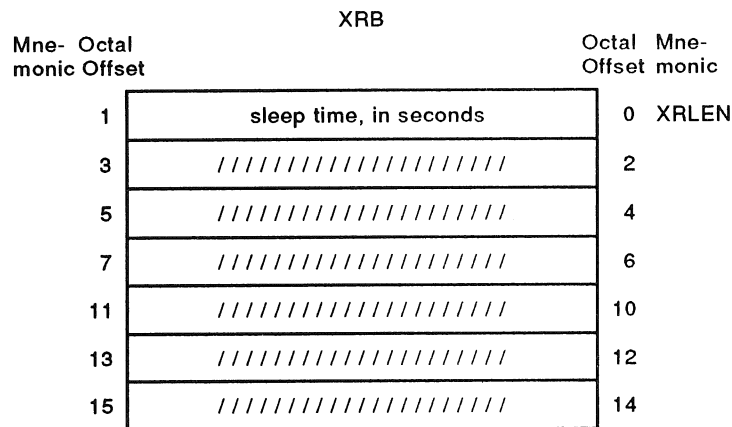
- The sleep time (specified in the XRB) expires.
- A local or network message is queued for the job assuming that the job is using local or network send/receive services. (See the `.MESAG` directive.)
- A delimiter is typed on a terminal that this job has opened or assigned.
- The system manager disables logins. (This could occur if the system is being shut down.)
- A state change occurs on a pseudo keyboard assigned to the job. (The job has printed output for the controlling job to read or has entered an input wait state.)
- The DMC11/DMR11 driver (XM:) is open and a message is pending for the job.
- An AST completion is queued.
- The system time is changed.

If you request it, the monitor checks for the following conditions before suspending the job:

- A delimiter has been typed on any terminal opened by the job or any terminal assigned to the job if the job also has a keyboard open on a nonzero channel.
- A message has been queued for the job.
- A state change has occurred on a pseudo keyboard opened by the job.
- The job has a DMC11/DMR11 device driver open and a message has been received by that device driver.
- One or more AST completion routines are pending.

If the monitor determines that any of these conditions are true, it does not execute the `.SLEEP`. This feature is known as conditional sleep.

Data Passed



XRB+XRLEN

This word defines the sleep interval, in seconds. If the value is zero, then `.SLEEP` returns immediately. If bit 15 is set, the monitor performs the conditional sleep checks. If any of the previously listed conditions are present, the `.SLEEP` is not executed.

Data Returned

The `.SLEEP` directive does not return any meaningful data.

Errors

No errors are possible with the `.SLEEP` directive.

Example

```
MOV      #5,XRB+XRLEN      ; Set timer to 5 seconds
.SLEEP
```

3.26 .SLEEP — Suspend Job

Form

`.SLEEP`

Function

The `.SLEEP` directive causes the monitor to suspend the job for some specified time interval or until an event occurs that the job should be aware of. Optionally, the monitor checks, before the job is suspended, to see if some event has already occurred which would cause it to awaken. If so, the job is not suspended. Control returns in line in either case.

When a `.SLEEP` is executed, execution of the job is suspended until one of the following happens:

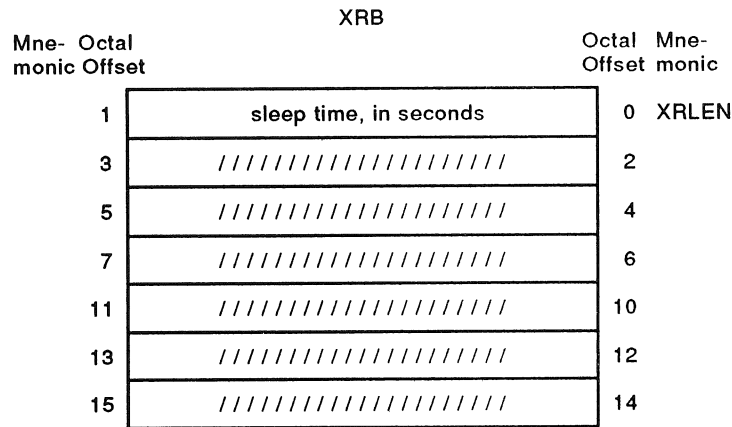
- The sleep time (specified in the XRB) expires.
- A local or network message is queued for the job assuming that the job is using local or network send/receive services. (See the `.MESAG` directive.)
- A delimiter is typed on a terminal that this job has opened or assigned.
- The system manager disables logins. (This could occur if the system is being shut down.)
- A state change occurs on a pseudo keyboard assigned to the job. (The job has printed output for the controlling job to read or has entered an input wait state.)
- The DMC11/DMR11 driver (XM:) is open and a message is pending for the job.
- An AST completion is queued.
- The system time is changed.

If you request it, the monitor checks for the following conditions before suspending the job:

- A delimiter has been typed on any terminal opened by the job or any terminal assigned to the job if the job also has a keyboard open on a nonzero channel.
- A message has been queued for the job.
- A state change has occurred on a pseudo keyboard opened by the job.
- The job has a DMC11/DMR11 device driver open and a message has been received by that device driver.
- One or more AST completion routines are pending.

If the monitor determines that any of these conditions are true, it does not execute the `.SLEEP`. This feature is known as conditional sleep.

Data Passed



XRB+XRLEN

This word defines the sleep interval, in seconds. If the value is zero, then `.SLEEP` returns immediately. If bit 15 is set, the monitor performs the conditional sleep checks. If any of the previously listed conditions are present, the `.SLEEP` is not executed.

Data Returned

The `.SLEEP` directive does not return any meaningful data.

Errors

No errors are possible with the `.SLEEP` directive.

Example

```
MOV      #5,XRB+XRLEN      ; Set timer to 5 seconds
.SLEEP
```

3.27 .SPEC—Special Functions for I/O

Form

```
      .  
      .  
(set XRB for special function)  
      .  
      .  
      .SPEC
```

Function

The .SPEC directive performs special functions for:

- Disks
- Flexible diskettes
- Line printers
- Magnetic tapes
- Pseudo keyboards
- Terminals
- Ethernet devices

3.27.1 .SPEC for Disk

For disk, the .SPEC directive lets you explicitly lock up to seven disk blocks on a file open for update (mode parameter). A locked block cannot be accessed by another user (or from another channel). This extends the implicit lock feature, by which the last block or blocks read on a file open for update cannot be accessed by anyone else. The disk special functions also let you release explicit and implicit locks. (All locks, both explicit and implicit, are released when the file is closed.)

There are also two other .SPEC options:

- Perform a comparison operation between the contents of a buffer and one or more blocks of a disk file.
- Truncate a file on an open channel.

Privileges Required

None

Data Passed (Disk—Except Compare and Truncate)

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	special function code		0	XRLEN
	3	LSB of block number (release)		2	XRBC
	5	////////	MSB of block no. (rl)	4	XRLOC
XRBLKM	7	DSKHND (=octal 0)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRBC+XRLEN

Defines function to be performed:

Code	Meaning
0	Release any implicit lock and all explicit locks. The monitor deallocates the extended internal table space it needed to do the explicit locks. (See code 3.)
1	Release implicit lock.
2	Make implicit lock into explicit lock.
3	Release the explicit lock on the block specified by the word at XRBC+XRBC (LSB) and the byte at XRBC+XRLOC (MSB). If all three bytes are zero, all explicit locks are released, but the monitor does not deallocate the extra space needed to do explicit locks. (This is useful if you intend to use the explicit lock feature again during this run. An error occurs if no space is available for this purpose.)
4	Make implicit lock into explicit lock and release the implicit lock.
5	Truncate the file on <i>channel</i> * 2 (XRBC+XRBCI) at the block number given in XRBC+XRBC and XRBC+XRLOC.

**XRBC+XRBC
XRBC+XRLOC**

Both these bytes specify the starting block number for releasing an explicit lock. If these bytes are zero, all explicit locks are released, but the monitor retains the extended table area it needs to maintain these locks. (This is useful if you want to use this capability again during a run.)

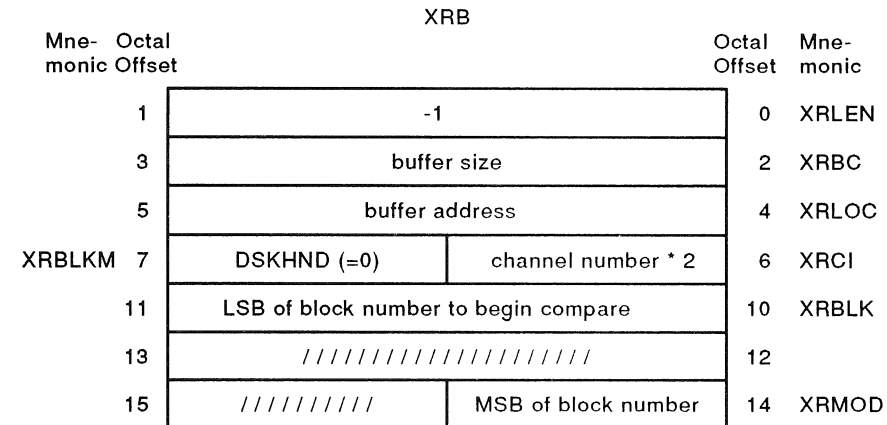
XRBC+XRBCI

Channel number times two; defines the channel for the lock/unlock operation.

XRBC+XRBLKM

Handler index for disk: DSKHND (octal value = 0).

Data Passed (Disk—Compare)



XRBC+XRBC

Size of the data buffer to be compared.

XRBC+XRLOC

Address of the data buffer to be compared.

XRBC+XRBLK

LSB of the first block number on the disk to be compared with the data buffer.

XRBC+XRMOD

MSB of the first block number on the disk to be compared with the data buffer.

Data Passed (Disk—Truncate)

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	5		0	XRLEN
	3	////////////////////		2	XRBC
	5	////////////////////		4	XRLOC
XRBLKM	7	DSKHND (=0)	channel number * 2	6	XRCI
	11	LSB of block number to become last block		10	XRBLK
	13	////////////////////		12	
	15	////////	MSB of block number	14	XRMOD

XRBLK+XRBLK LSB of the block number on the disk to become the last block of the file.

XRBLK+XRMOD MSB of the block number on the disk to become the last block of the file.

Data Returned

Except for a possible error code in byte 0 of the FIRQB, the disk subfunctions of .SPEC do not return any meaningful data.

Errors

For subfunction code 1:

DATERR The data in the buffer does not match the data on the disk.

For subfunction code 2:

INTLCK Occurs if the implicit lock overlaps any current explicit lock. For example, if you read blocks 1 and 2 into a 1024-byte buffer in update mode, an implicit lock exists on blocks 1 and 2. If you explicitly locked these blocks, and then read blocks 2 and 3 and tried to explicitly lock blocks 2 and 3, you would get this error. An exact match is legal (for example, if the second read also read blocks 1 and 2) and results in a no operation.

NOBUFS Occurs if the monitor needs to expand its internal table space but memory is not available.

NOROOM There are already seven explicit locks on this channel.

PRVIOL There is no current implicit lock; that is, no blocks have been read.

For subfunction code 3:

NOSUCH The block number specified does not correspond to the first block number of an explicit lock.

3.27.2 .SPEC for Ethernet Interface

The following functions allow the user to manipulate and monitor the Ethernet interface.

3.27.2.1 Set New Physical Address

The Set New Physical Address .SPEC function changes the physical address of the Ethernet controller.

The following figure illustrates the Physical Address Buffer:

byte 1	byte 0	0
byte 3	byte 2	2
byte 5	byte 4	4

NOTE

This call succeeds only if the portal requesting the physical address change is the only portal currently open on the controller. The Set Physical Address .SPEC function requires SWCTL privilege.

Data Passed

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	special function code (-4)		0	XRLEN
	3	must be 6		2	XRBC
	5	starting address		4	XRLOC
XRBLKM	7	ETHHND (= octal 50)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRB+XRLEN Special function code -4; defines function to be performed.
- XRB+XRBC Must be 6, denoting a 6-byte physical address.
- XRB+XRLOC Starting address of the Physical Address Buffer.
- XRB+XRCI Channel number times two; defines the channel.
- XRB+XRBLKM Device handler index: ETHHND.

The following errors may occur on a Set Physical Address call:

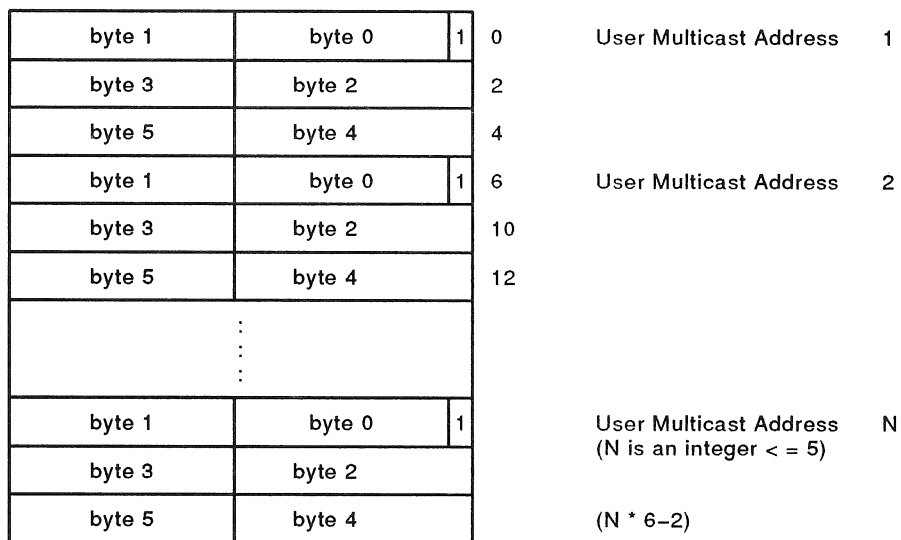
Errors

BADCNT	XRBC not equal to six, can't be a valid physical address.
BADNAM	Invalid physical address (Least Significant Bit must be 0).
HNGDEV	Controller is disabled or inoperative.
INUSE	Other portals are currently open on the controller.
PRVIOL	You do not have appropriate privilege (SWCTL).

3.27.2.2 Enable Multicast Addresses

Use the Enable Multicast Addresses function to let the portal and controller receive multicast messages. The XRB contains pointers identifying the User Multicast Address Buffer. RSTS/E allows a maximum of five multicast addresses per portal on an Ethernet channel.

The following figure illustrates the User Multicast Buffer:



The addresses are loaded into the user buffer with the least significant byte loaded in Byte 0 of the address block and the most significant byte loaded in Byte 5 of the address block.

Each portal can have a maximum of five six-byte multicast addresses. Each time the Enable Multicast Address call is issued, the new addresses supersede the old list.

You can specify a null list (by issuing the call with XRBC = 0) that will supersede the old list, thus disabling all multicast reception for that portal.

Data Passed

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	special function code (-3)		0	XRLEN
	3	number of multicasts * 6 bytes		2	XRBC
	5	starting address		4	XRLOC
XRBLKM7		ETHHND (= octal 50)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRLEN	Special function code -3; defines function to be performed.
XRBC	Number of multicasts times 6 (byte count of buffer). Maximum size is 30 bytes. You can issue a byte size of zero to remove all enabled multicasts from the portals list without replacing them with new ones.
XRLOC	Starting address of Multicast Buffer.
XRCI	Channel number times two; defines the channel.
XRBLKM	Device handler index: ETHHND.

The following errors may occur on an Enable Multicast Address call:

Errors

BADCNT	Attempt to add too many multicast addresses, or buffer size input was not a multiple of six bytes, indicating an incomplete address.
BADNAM	At least one address is not a valid multicast address, that is, the least significant bit of the address is not equal to one.
HNGDEV	The controller is disabled or inoperative.

3.27.2.3 Get Circuit Counters

Use the Get Counters function to bring the counters up to date. The controllers maintain counters in several places. You must tell the data link layer when you want to collect them. The controllers update line or circuit counters only when you issue the call. This call does not require privileges.

Data Passed

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	special function code (0)		0	XRLLEN
	3	////////////////////////////////////		2	
	5	////////////////////////////////////		4	
XRBLKM	7	ETHHND (= octal 50)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRBLKM+XRLLEN Special function code 0; defines function to be performed.

XRBLKM+XRCI Channel number times two; defines the channel.

XRBLKM+ETHHND Device handler index: ETHHND.

All other fields are reserved. The XRB is not modified on return.

The following errors may occur on a Get Circuit Counters call:

Errors

HNGDEV The controller is disabled or inoperative.

3.27.2.4 Get Line Counters

Use the Get Line Counters function before a Transfer Line Counters function to instruct the data link layer to update the appropriate counters. This call does not require privileges. Wait a couple of seconds before issuing the Transfer Line Counters call.

Data Passed

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	special function code (-1)		0	XRLLEN
	3	////////////////////////////////////		2	
	5	////////////////////////////////////		4	
XRBLKM	7	ETHHND (= octal 50)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRBLKM+XRLLEN Special function code -1; defines function to be performed.

XRBLK Channel number times two; defines the channel.
XRBC Device handler index: ETHHND.

All other fields are reserved. The XRBLK is not modified on return.

The following errors may occur on a Get Line Counters call:

Errors

HNGDEV The controller is disabled or inoperative.

3.27.2.5 Transfer Circuit Counters

Use the Transfer Counter function to read the counter information from the data link layer to the user space once you have updated the information with the Get Counters function.

Data Passed

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	special function code (1)		0	XRLEN
	3	byte count of transfer		2	XRBC
	5	start address of user buffer		4	XRLOC
XRBLKM	7	ETHHND (= octal 50)	channel number * 2	6	XRCI
	11	////////	clear after read	10	XRBLK
	13	////////////////////////////////		12	
	15	////////////////////////////////		14	

XRLEN Special function code 1; defines function to be performed.
XRBC Length (in bytes) of transfer. There are up to 32 (octal) bytes of counters to return. RSTS/E returns fewer counters if requested, but will not transfer an odd number of bytes.
XRLOC Start address of user buffer to receive transfer counters. It must start on a word boundary.
XRCI Channel number times two; defines the channel.
XRBLKM Device handler index: ETHHND.
XRBLK If XRBLK is zero, it means you only wish to read counters. If XRBLK is nonzero, it means the circuit counters will be cleared after they are transferred, if:

- You have SWCTL privilege
- All circuit counters are read. A partial read of counters succeeds, but the counters are not reset after the read.

All other fields are reserved.

Data Returned

Mne- monic	Octal Offset	XRBC	Octal Offset	Mne- monic
	1	////////////////////////////////		
	3	0	2	XRBC
	5	////////////////////////////////		
	7	////////////////////////////////		
	11	////////////////////////////////		
	13	////////////////////////////////		
	15	////////////////////////////////		

XRBC+XRBC

Cleared. All other fields are reserved and contents are not guaranteed.

Buffer Contents on Return

current date/time	0
	2
date/time last	4
zeroed	6
bytes received (MSB)	10
bytes received (LSB)	12
bytes sent (MSB)	14
bytes sent (LSB)	16
packets received (MSB)	20
packets received (LSB)	22
packets sent (MSB)	24
packets sent (LSB)	26
user buffer unavailable	30

- 0-2 Current date/time stored in standard RSTS/E format.
- 4-6 Date/time of last zeroing returned in standard RSTS/E format.
- 10-12 Bytes received, stored as an unsigned 32-bit number.
- 14-16 Bytes sent, stored as an unsigned 32-bit number.
- 20-22 Packets received, stored as an unsigned 32-bit number. The number of messages received for this portal, regardless of length.

- 24–26 Packets sent, stored as an unsigned 32-bit number. The number of packets sent by this portal.
- 30 User buffer unavailable. The number of times that messages received for this portal had to be discarded because all of its allocated system receive buffers contained pending messages. This is kept as a single 16-bit word.

Any counters exceeding their maximum value stay at that maximum value (65,535 for a single word, 4,294,967,295 for a long word).

The following errors may occur on a Get Line Counters call:

Errors

- BADCNT** Returned if:
 - The user buffer did not start on a word boundary
 - The requested transfer size is not for all counters and is for an odd number of bytes.
- HNGDEV** The controller is disabled or inoperative.
- MAGRLE** A record length error is returned if the transfer requests less than the actual number of counters available. However, as many counters as requested are transferred into the user buffer. If a clear after transfer was requested, it was *not* done.
- PRVIOL** If a transfer and clear operation was attempted and the user doesn't have SWCTL privileges, this error is returned and no operation is performed.

3.27.2.6 Transfer Line Counters

Use the Transfer Line Counters function to read the counter information from the data link layer to the user space. Issue this call a short time after issuing the Get Line Counters function.

Data Passed

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	special function code (-2)		0	XRLEN
	3	byte count of transfer		2	XRBC
	5	start address of user buffer		4	XRLOC
XRBLKM7		ETHHND (= octal 50)	channel number * 2	6	XRCI
	11	////////	clear after read	10	XRBLK
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRB+XRLEN** Special function code -2; defines function to be performed.
- XRB+XRBC** Length (in bytes) of transfer. There are up to 76 (octal) bytes of counters to return. RSTS/E returns fewer counters if requested, but will not transfer an odd number of bytes.
- XRB+XRLOC** Start address of user buffer to receive transfer counters. It must start on a word boundary.

XRBC+XRBCI Channel number times two; defines the channel.
XRBC+XRBLKM Device handler index: ETHHND.
XRBC+XRBLK If XRBLK is zero, it means you only wish to read counters. If XRBLK is nonzero, it means the circuit counters will be cleared after they are transferred, if:

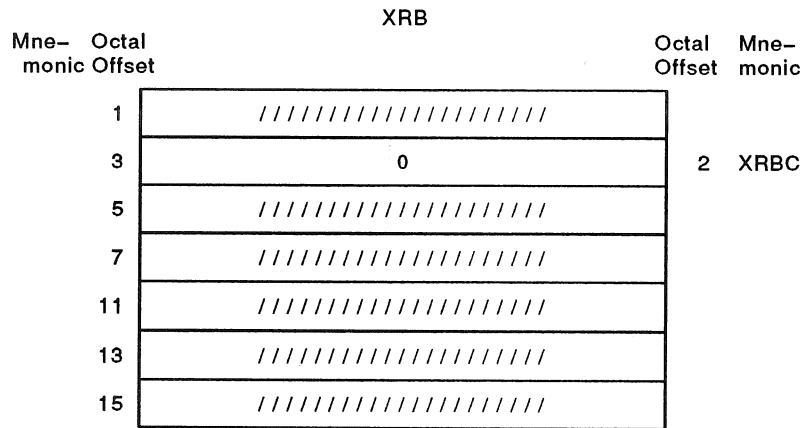
- You have SWCTL privilege
- All circuit counters are read. A partial read of counters succeeds, but the counters are not reset after the read.

All other fields are reserved.

NOTE

If DECnet/E is operating on the controller, as well as a user portal, Digital recommends that the line counters only be cleared using the NCP Zero Line Counters function. This helps in troubleshooting line problems by keeping all the line counters in one place.

Data Returned



XRBC+XRBC Cleared. All other fields are reserved and contents are not guaranteed.

Buffer Contents on Return

current date/time		0
		2
date/time last		4
zeroed		6
bytes received	(MSB)	10
	(LSB)	12
bytes sent	(MSB)	14
	(LSB)	16
multicast bytes	(MSB)	20
	(LSB)	22
packets received	(MSB)	24
	(LSB)	26
packets sent	(MSB)	30
	(LSB)	32
multicast packets received	(MSB)	34
	(LSB)	36
packets sent, initially deferred	(MSB)	40
	(LSB)	42
packets sent, single collision	(MSB)	44
	(LSB)	46

: :

: :

packets sent, multiple collision	(MSB)	50
	(LSB)	52
transmit failures (count)		54
transmit failures (type)		56
collision detect check failure		60
RCV failures (count)		62
RCV failures (flag)		64
unrecognized destination		66
data overrun		70
system buffer unavailable		72
user buffer unavailable		74

- 0-2 Current date/time stored in standard RSTS/E format.
- 4-6 Date/time of last zeroing returned in standard RSTS/E format.
- 10-12 Bytes received on channel, stored as an unsigned 32-bit number.
- 14-16 Bytes sent on channel, stored as an unsigned 32-bit number.
- 20-22 Multicast bytes received, stored as an unsigned 32-bit number. (Also included in the total bytes received, above.)
- 24-26 Packets received on channel, regardless of length, stored as an unsigned 32-bit number. The number of messages received for this portal, regardless of length.
- 30-32 Packets sent on channel, regardless of length stored as an unsigned 32-bit number. The number of packets sent by this portal.
- 34-36 Multicast packets received on channel, regardless of length, stored as an unsigned 32-bit number. (Also included in total number of packets received, above.)
- 40-42 Packets sent but initially deferred, stored as an unsigned 32-bit number. This indicates that transmission of a packet was delayed because the Ethernet cable was busy when it was first attempted. Subsequent transmission was successful.
- 44-46 Packets sent with a single collision, stored as an unsigned 32-bit number. This indicates that a collision occurred during the first attempted transmission of the packet. The second attempt succeeded.
- 50-52 Packets sent with multiple collisions, stored as an unsigned 32-bit number. This indicates that a collision occurred during more than one attempted transmission of the packet. Eventually, it succeeded.
- 54 Transmit failed count, stored as an unsigned 16-bit number. The number of failed transmissions that have occurred on the line.
- 56 Transmit failure flag word. This word contains bits indicating the causes for transmission failures:
- 1—indicates transmission failed because of too many collisions. The data link layer typically tries 16 times to put a message on the Ethernet.
 - 2—indicates a loss of carrier on the last transmission attempt.
 - 10—indicates that the attempted transmission length was greater than 1518 bytes long. This should not occur on RSTS/E systems.
 - 20—indicates that a late collision happened on the last transmission attempt.
- 60 Collision detect check failures, stored as an unsigned 16-bit word.
- 62 Receive failure count, stored as an unsigned 16-bit word.
- 64 Receive failure flag word. This word contains bits indicating what types of receive failures have occurred since the counters were last cleared:
- 1—CRC was invalid indicating garbled reception
 - 2—Framing error. Invalid CRC and a partial byte received.
 - 4—Message exceeded Ethernet maximum length of 1518 bytes.
- 66 Unrecognized destination, stored as an unsigned 16-bit word. This is a count of the number of times that the controller received messages destined for the physical address of this controller, but with unrecognized protocol type field. That is, there is no portal open to process messages of this type but someone is still sending them.
- 70 Data overrun, stored as an unsigned 16-bit word.

- 72 System buffer unavailable, stored as an unsigned 16-bit word. This contains a count of the number of times the controller had to throw away received messages because there were no buffers available at the time.
- 74 User buffer unavailable, stored as an unsigned 16-bit word. The number of times that messages received for this portal had to be discarded because all of its allocated receive buffers contained pending messages.

If any counters exceed their maximum value, they stay at that maximum value (65,535 for a single word, 4,294,967,295 for a long word).

The following errors may occur on a Get Line Counters call:

Errors

- BADCNT** Returned if:
- The user buffer did not start on a word boundary
 - The buffer size in XRBC is less than the total line counters and is for an odd number of bytes.
- DATERR** The data link layer has not yet finished processing the Get Line Counters function. Try again in a few seconds.
- HNGDEV** The controller is disabled or inoperative.
- MAGRLE** A record length error is returned if the transfer requests less than the actual number of counters available. However, as many counter as requested are transferred into the user buffer. If a clear after transfer was requested, it was *not* done.
- PRVIOL** If a transfer and clear operation was attempted and the user doesn't have SWCTL privileges, this error is returned.

3.27.3 .SPEC for Flexible Diskette

For RX02 flexible diskette devices, the .SPEC directive lets you:

- Obtain the density (single or double) of the current flexible diskette
- Mount a new flexible diskette and recompute the density
- Reformat an RX02 flexible diskette for a desired density

Because the RX02 flexible diskette drive supports single and double density flexible diskettes, the .SPEC function is especially useful for programmed flexible diskette operations. For example, .SPEC allows you to mount a series of single and double density flexible diskettes without having to close and reopen the device for each mount. Normally, the driver computes density once: during the initial open. If you insert a second flexible diskette that is incompatible with the initially computed density, a read or write operation fails. .SPEC lets you include an instruction in your program that causes the driver to recompute the density. In addition, for RX02 flexible diskette drives, .SPEC permits you to specify a density reformat operation.

.SPEC can require as much as 20 seconds to reformat the density of the RX02 flexible diskette and cannot be interrupted with Ctrl/C. Note that if the operation is interrupted (by power failure or catastrophic error), the flexible diskette is rendered unusable. That is, the flexible diskette contains both single and double density. To recover, you must reformat the flexible diskette.

Privileges Required

None

Data Passed (Flexible Diskette)

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	special function code		0	XRLEN
	3	parameter word		2	XRBC
	5	////////////////////////////////////		4	
XRB LKM	7	RXDHND (=octal 22)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XR B+XRLEN

Function code specifying the desired operation:

Code	Meaning
0	Returns density of currently mounted flexible diskette. (The parameter word at XR B+XRBC must be zero.)
1	Recomputes density and returns density. (The parameter word at XR B+XRBC must also be zero.) This code must be issued prior to any I/O operation on the flexible diskette.
2	Reformats the current flexible diskette to the density specified in the parameter word at XR B+XRBC. Allowed only on RX02 drives.

XR B+XRBC

Must equal zero when the function code equals zero or one. Otherwise, the parameter word can be:

Value	Meaning
1	Reformats as single-density (one sector equals 128 bytes)
2	Reformats as double-density (one sector equals 256 bytes)

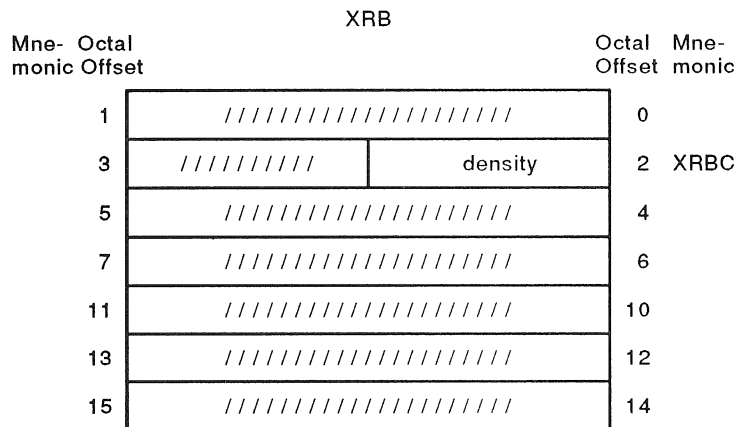
XR B+XRCI

Channel number times two; defines the channel on which the flexible diskette is currently open.

XR B+XRBLKM

Handler index for flexible diskette: RXDHND (octal value equals 22).

Data Returned



XR B+XRBC

Density; only returned when the data passed in XR B+XRLEN is one or zero. The possible values are:

- 1 Single-density (sector equals 128 bytes)
- 2 Double-density (sector equals 256 bytes)

Errors

ERRERR You tried to reformat on an RX01 flexible diskette drive. You can use .SPEC to reformat flexible diskette density only on RX02 drives.

HNGDEV A hardware error occurred. This can often be a transient condition. Retry the operation.

3.27.4 .SPEC for Line Printer

Privileges Required

None

Data Passed (Line Counter Subfunction)

Mne- monic	Octal Offset	XRBC	Octal Offset	Mne- monic
	1	= 0 for line counter	0	XRLEN
	3	////////////////////////////////	2	XRBC
	5	////////////////////////////////	4	XRLOC
XRBLKM	7	LPAHND (= 6) | channel number * 2	6	XRCI
	11	////////////////////////////////	10	XRBLK
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	

XRBC+XRLEN The special line printer function to be performed.

XRBC+XRCI Channel number times two; defines the channel on which the line printer is currently open.

XRBC+XRBLKM Handler index for line printer: LPAHND (octal value equals 6).

Data Returned (Line Counter Subfunction)

Mne- monic	Octal Offset	XRBC	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	LSB of the 32-bit line counter	2	XRBC
	5	MSB of the 32-bit line counter	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	

XRBC+XRBC The value of the 32-bit line counter. The LSB are returned in XRBC+XRBC and the MSB are in XRBC+XRBC+2. The counter is reset to zero when the line printer is opened.

Data Passed (Line Position Subfunction)

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	= 1 for line position		0	XRLEN
	3	////////////////////////////////////		2	XRBC
	5	////////////////////////////////////		4	XRLOC
XRBLKM	7	LPAHND (= 6)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	XRBLK
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRBLKM** The special line printer function to be performed.
- XRCI** Channel number times two; defines the channel on which the line printer is currently open.
- XRLOC** Handler index for line printer: LPAHND (octal value equals 6).

Data Returned (Line Position Subfunction)

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	curr horiz position	curr vert position	2	XRBC
	5	////////////////////////////////////		4	
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRBC** The current vertical line position. The value is in the range 0 (top of page) to L-1, where L is the page length.
- XRBC+1** The current horizontal line position. The value is in the range 0 (left margin) to W-1, where W is the page width.

Errors (Line Printer)

BSERR	An illegal channel number is specified at XRB+XRCI.
NOTOPN	The channel specified at XRB+XRCI is not open.
PRVIOL	Privilege violation; one of the following conditions has occurred: <ul style="list-style-type: none">• The calling job does not own the specified printer and does not have DEVICE privilege.• The function code is not 0 or 1.• The device open on the channel specified at XRB+XRCI is not a line printer.

3.27.5 .SPEC for Magnetic Tape

On MT, MM, and MU tape drives, to set the drive density (function code = 13), you must mount a tape and position it at the beginning-of-tape (BOT) mark. You do not need to mount a tape to check legal densities of a drive or to return the current density.

NOTE

Any density changes you make with this call remain in effect until either a new density is set, or you read a magnetic tape that has a density different than the one formerly set. This action is equivalent to the STAY value 8192% in the Set Density and Parity function (function code = 6).

Privileges Required

None

Data Passed (Magnetic Tape)

		XRB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	special function code		0	XRLEN
	3	parameter		2	XRBC
	5	////////////////////////////////////		4	
XRBLKM	7	MTAHND (=octal 16)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

- XRBLKM
XRLEN
The special magnetic tape function to be performed (see Table 3-6). For a detailed discussion of these functions, see the discussion of the MAGTAPE function in the *RSTS/E Programming Manual*.
- XRBC
The meaning of this word varies according to the special function code specified at XRB+XRLEN. Table 3-6 summarizes these values; for a detailed discussion, see the MAGTAPE function description in the *RSTS/E Programming Manual*.
- XRCI
Channel number times two; defines the channel on which the tape is currently open.
- XRBLKM
Handler index for magnetic tape: MTAHND (octal value equals 16).

Table 3-6: Special Functions for Magnetic Tape

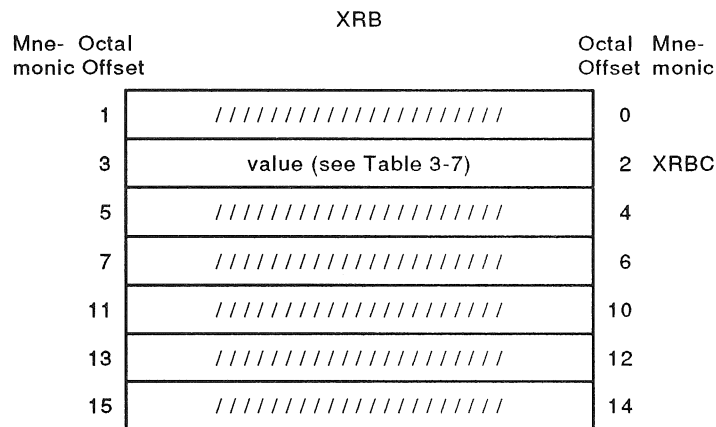
Code	Action	Parameter	Value Returned
0	Rewind and off-line	Unused	0
1	Write end-of-file	Unused	0
2	Rewind	Unused	0
3	Skip record	# records to skip	# records not skipped
4	Backspace over record	# records to backspace	# records not backspaced
5	Set density and parity	D+P+S ¹	0
6	Tape status function	Unused	(see Table 3-7)
7	File characteristics	Unused	(see Table 3-7)
10	Rewind on close	Unused	0
11	End of volume	Unused	0
12	Error condition acknowledged	Unused	0
13	Extended set density	²	(see Table 3-7)
D =	Density		
	14 = 800. bpi		
	400 = 1600. bpi, phase-encoded		
P =	Parity (0 = odd, 1 = even) ³ (800. bpi only)		
S =	Stay		
	0 = MODE value specified in OPEN does not stay on CLOSE		
	20000 = MODE value specified in OPEN is retained after CLOSE		
0	Current density		
∅	If bit 15 is set, the density is set according to the value in Bits 0-14 as follows:		
	77777 = highest legal density for the drive		
	1 = lowest legal density for the drive		
	n = set to n, if legal; otherwise unchanged		
∅	If Bit 15 is clear, the density is unchanged but the value passed is tested		

¹Parameter word for function code 5:

²Parameter word for function code 13:

³Digital recommends that you use odd parity. When you use even parity, you cannot write binary data. In addition, many operating systems and tape drives do not support even parity.

Data Returned (Magnetic Tape)



XRBC+XRBC

The meaning of this word varies according to the value at XRBC+XRLEN in the data passed. Table 3-7 summarizes these values. For a detailed discussion, see the MAGTAPE function description in the *RSTS/E Programming Manual*.

Table 3-7: Value Returned by .SPEC for Magnetic Tape

Bit	Octal Value	Meaning
Value Returned at XRBC+XRBC for Function Code 6 (Magnetic Tape Status Word)		
15	100000	Last command caused an error.
14-13	If bit 3 = 0, these bits indicate density:	
	00000	Reserved
	20000	Reserved
	40000	800. bpi
	60000	Reserved
	If bit 3 = 1, these bits indicate density:	
	00000	1600. bpi
	20000	Reserved
	40000	Reserved
	60000	Reserved
12	00000	9-track tape
	10000	Reserved
11	0000	Odd parity
	4000	Even parity
10	2000	Magnetic tape is physically write-locked
9	1000	Tape is beyond end-of-tape (EOT) marker
8	400	Tape is at beginning-of-tape (BOT)
7	200	Last command detected an end-of-file (EOF)
6	100	The last command was .READ and the record read was longer than the I/O buffer size; that is, part of the record was lost
5	40	Unit is nonselectable (off-line)

(continued on next page)

Table 3-7 (Cont.): Value Returned by .SPEC for Magnetic Tape

Bit	Octal Value	Meaning
Value Returned at XRB+XRBC for Function Code 6 (Magnetic Tape Status Word)		
4	00	Unit does not accept 1600. bpi
	20	Unit accepts 1600. bpi
3	00	See values for bits 14-13
	10	See values for bits 14-13
2-0		Indicates last command issued: 0 = Off-line 1 = Read 2 = Write 3 = Write EOF 4 = Rewind 5 = Skip record 6 = Backspace record

Value Returned at XRB+XRBC for Function Code 7 (File Characteristics Word)

word = 0, DOS format or ANSI U (undefined) format

word ≠ 0, ANSI format, with bit meanings:

15-14	40000	F (fixed-length)
	100000	D (variable-length)
	140000	S (spanned)†
13-12	00000	Carriage control embedded 'M'
	10000	FORTTRAN carriage control 'A'
	20000	Implied LF/CR before record ' '
11-0	- - -	For Format F, this value is the record length, in bytes. For Format D, this value is the maximum record length, in bytes.

Value Returned at XRB+XRBC for Function Code 13 (File Characteristics Word)

If value passed was zero, the value returned is the current density

If value passed was nonzero, the value returned depends on the value passed as follows:

Bits	Passed	Returned
14-0	77777	Highest legal density for the drive
	1	Lowest legal density for the drive
	n	Nearest legal density for the drive not greater than n

†ANSI format S is not supported by RSTS/E systems.

Errors (Function Code = 13)

- BDNERR** The value passed in bits 0-14 of XRB+XRBC is not legal for the specified tape drive. The density of the drive is unchanged.
- NOTMTA** An attempt was made to set the density of an MT, MM, or MU tape drive for which no tape was mounted, or the tape was not at BOT. When you specify a density that is not a valid density, the next highest density for the drive is returned. If the specified density is higher than the maximum density for the drive, the maximum density is returned.

3.27.6 .SPEC for Pseudo Keyboards

For pseudo keyboards, the .SPEC function lets you:

- Disable and enable echo at the controlled job's keyboard (that is, the KB side of the pseudo keyboard).
- Read a flag word that tells you whether echo is ON or OFF at the controlled job's keyboard.
- Determine the current exit status of the controlled job.

A pseudo keyboard receives two kinds of output from a controlled job: character echo, which is done by the RSTS/E monitor, and program output, which occurs when a program writes to the controlled job's keyboard. The .SPEC function affects only character echo, not program output.

Character echo is enabled by default. However, in some pseudo keyboard applications, it is more convenient to disable character echo. For example, in a pseudo keyboard application that uses both a terminal and a pseudo keyboard, you get character echo from the terminal. You also get character echo and program output from the pseudo keyboard. You can use this function to disable character echo at the pseudo keyboard.

Privileges Required

None

Data Passed

		XRB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	special function code		0	XRLOC
	3	parameter		2	XRBC
	5	////////////////////////////////////		4	
XRBLKM	7	PKHND (= 20)	channel number * 2	6	XRCI
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	

XRBLKM+XRLOC

The special function codes; the possible values are:

Code	Meaning
0	Enable/disable echo or read flag.
1	Read exit status.

XRBC+XRBC

The action to be performed for the special function code.

Value Meaning

- 0 Read the flag word
- 255 Enable echo
- 1 Disable echo

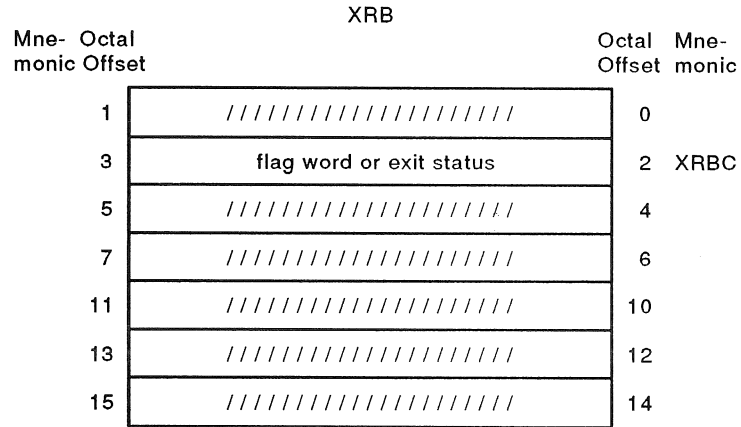
XRBC+XRBCI

Channel number times two; defines the channel on which the pseudo keyboard is open.

XRBC+XRBLKM

Handler index for pseudo keyboard PKHND (octal value = 20).

Data Returned



XRBC+XRBC

For special function code 0:

- If bit 5 = 0 Keyboard echo is enabled.
- = 1 Keyboard echo is disabled.

For special function code 1, the exit status for the job you are controlling. The current exit status value is returned in bits 0-2. The values have the following meanings:

- 0 Warning
- 1 Success
- 2 Error
- 4 Severe error

Errors

No errors are possible with the pseudo keyboard subfunction of .SPEC.

3.27.7 .SPEC for Terminal

The .SPEC directive for terminals has two forms. The first form lets you perform several different functions, such as cancel Ctrl/O, set modes for tape, echo, and ODT, and cancel type-ahead. The second form lets you set, read, and clear private delimiters.

Privileges Required

SEND to broadcast a message to a terminal. SYSIO to force a command to a terminal.

Data Passed (Terminal—Except Private Delimiters)

Mne- monic	Octal Offset	XRBLKM	XRBLK	XRBLK	Octal Offset	Mne- monic
	1			special function code	0	XRLEN
	3			KB number or number of bytes to send/force	2	XRBC
	5			starting address of bytes to send/force	4	XRLOC
	7	XRBLKM		TTYHND (=octal 2) | channel number * 2	6	XRCI
	11			KB number (XRBLK+XRLEN = 5, 6, or 12)	10	XRBLK
	13			////////////////////////////////	12	
	15			////////////////////////////////	14	

XRBLK+XRLEN

Defines a special function:

Code	Meaning
0	Cancel Ctrl/O (see the .TTRST directive)
1	Set tape mode (see the .TTAPE Set tape mode directive)
2	Enable echo and clear tape mode (see the .TTECH directive)
3	Disable echo (see the .TTNCH directive)
4	Set ODT mode (see the .TTDDT directive)
5	Force to keyboard (SYSIO privilege required)
6	Broadcast to keyboard (SEND privilege required)
7	Cancel all type-ahead
10	Reserved
11	Multiple private delimiters
12	Read Ctrl/C flag

For XRBLK+XRLEN = 12, if the caller owns the terminal being checked, the Ctrl/C flag is cleared after it is read. Otherwise, the flag is just read.

XRB+XRBC For XRB+XRLEN = 0, 1, 2, 3, 4, 7, or 12:
 When XRB+XRBC equals 0, these functions take place on the terminal currently open for this job. When XRB+XRBC does not equal 0, these functions take place on the keyboard number specified in XRB+XRBC. This keyboard must be assigned to but not opened by the calling job.
 For XRB+XRLEN = 5 or 6:
 XRB+XRBC is the number of bytes to send or force.

XRB+XRLOC For XRB+XRLEN equal to 5 or 6, this word contains the starting address of the bytes to be sent or forced.

XRB+XRCCI Channel number times two; defines the channel for the terminal specified at XRB+XRBC.

XRB+XRBLKM Handler index for terminals; TTYHND (octal value = 2).

XRB+XRBLK For XRB+XRLEN = 5, 6, or 12, this word contains the keyboard number to which the data is to be sent or forced.

Data Returned (Terminal—Except Private Delimiters)

		XRB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
1		//////////	CTRL/C flag	0	XRLEN
3		number of bytes not sent		2	XRBC
5		////////////////////////////////////		4	
7		////////////////////////////////////		6	
11		////////////////////////////////////		10	
13		////////////////////////////////////		12	
15		////////////////////////////////////		14	

XRB+XRLEN A value of zero indicates the Ctrl/C flag was not set. A value of 377 indicates the Ctrl/C flag was set. This value is only meaningful when the data passed in XRB+XRLEN was 12.

XRB+XRBC Number of bytes that could not be sent (returned only when XRB+XRLEN in the data passed was six).

Errors (Terminal—Except Private Delimiter)

BSERR An illegal channel number is specified at XRB+XRCCI.

NOTOPN The channel specified at XRB+XRCCI is not open.

PRVIOL Privilege violation; one of the following conditions has occurred:

- The calling job does not own the specified keyboard and does not have DEVICE privilege
- The function code is not 0 to 7 or 11 (returned for all .SPEC calls for terminals)
- An illegal terminal number at XRB+XRBLK
- The device open on the channel at XRB+XRCCI is not a terminal

Private Delimiters

A private delimiter is a character used as a delimiter within a program. You can define any printing or nonprinting character to be a private delimiter, for example:

- A letter
- A function key such as DELETE
- A control character such as Ctrl/Z
- A standard delimiter such as LINE FEED

A private delimiter is useful on a data entry terminal with a specialized keyboard. You can use a large or conveniently located key as the delimiter key. Private delimiters are also useful in keypad applications.

You can declare one character as a private delimiter or you can declare up to 256 multiple private delimiters.

Multiple private delimiters let you do special character processing without using single character I/O. For example, by combining escape sequences with private delimiters, you can define your own function keys in keypad applications.

The rest of this section:

- Provides general information about private delimiters
- Shows the XRB layouts for setting, reading, and clearing private delimiters
- Lists all private delimiter masks

Characteristics of Private Delimiters

Declaring a character as a private delimiter with the .SPEC directive overrides the existing interpretation for the character. Thus, unlike a standard delimiter such as RETURN or LINE FEED, a private delimiter does not echo at the terminal. In addition, a special character no longer performs its normal function. For example, when the DELETE key is a private delimiter, it does not erase the last character typed.

A private delimiter has basically the same characteristics as a standard delimiter. Like a standard delimiter, it:

- Terminates a .READ on the terminal.
- Cannot be deleted except by Ctrl/X. The DELETE key and Ctrl/U do not affect private delimiters in the type-ahead buffer. (Ctrl/X cancels all type-ahead buffering.)
- Causes the system to awaken a sleeping job when typed at a terminal that the job has open or assigned.

Once set, a private delimiter remains in effect for a terminal until one of the following occurs:

- The program clears it
- The job releases the terminal by deassigning it or by closing the I/O channel where the terminal is open
- The job terminates

In addition, the system clears private delimiters when a dial-up line gets hung up or the job controlling the terminal is killed.

Private delimiters change the way characters are processed in binary mode (MODE 1). When a terminal is open in binary mode and no private delimiter is in use, the system terminates a read after every character. However, if one or more private delimiters are in use, the system terminates a read only when a private delimiter is typed.

The system processes private delimiters after processing Ctrl/S and Ctrl/Q (if the TTSYNC characteristic is set) and escape sequences (if the terminal is in escape sequence mode). This feature prevents a terminal from becoming permanently stalled, and it also lets you use private delimiters and escape sequences in the same program.

The system processes private delimiters before all other characters, including control characters such as Ctrl/C. Thus, when you use a standard delimiter character as a private delimiter, it does not echo on the terminal.

Programming Hint

By combining escape sequences with private delimiters, you can define your own function keys without using single character I/O. For example:

1. Make sure the keypad is in the right mode for your application
2. Define each function as the PF1 key followed by a character
3. Define each character as a private delimiter so it does not echo on the terminal

For example, you might define PF1 + A as one function and PF1 + M as another function.

Data Passed (Terminal — Private Delimiters)

Mne- monic	Octal Offset	XRB		Octal Offset	Mne- monic
	1	= octal 11 for private delimiters		0	XRLEN
	3	0 or byte count when XRB+XRMOD = 1 or 2		2	XRBC
	5	0 or address when XRB+XRMOD = 1 or 2		4	XRLOC
XRBLKM	7	TTYHND (=octal 2)	channel number * 2	6	XRCI
	11	flag byte	KB number	10	XRBLK
	13	must = 0		12	XRTIME
	15	subfunction code = 0, 1, or 2		14	XRMOD

XRB+XRLEN

Function code; set to octal 11 for private delimiter mask.

XRB+XRBC

For XRB+XRMOD equals zero, this word must be set to zero. For XRB+XRMOD equals one (set private delimiter mask), this word is the byte count for the private delimiter bit mask. For XRB+XRMOD equals two (read private delimiter mask), this word is the buffer length for a buffer into which the mask is to be read. For XRB+XRMOD equals one or two, the value of XRB+XRBC must be less than or equal to 32.

XR B+XRLOC

For XR B+XRMOD equals zero, this word must be set to zero.
 For XR B+XRMOD equals one, this word is the address of the private delimiter mask. The mask itself can be up to 32 bytes long (32 bytes = 256 bits). Each bit in the mask represents an ASCII character (see Table 3-8). Setting a bit indicates that the associated ASCII character is to serve as a private delimiter. For XR B+XRMOD equals two, this word is the address of a buffer into which the terminal's private delimiter mask is to be read.

Table 3-8: Private Delimiter Masks

Octal Value	ASCII Character	Byte, address+n	Bit	Byte Value	
				Octal	Decimal
0 †	NUL	n=0	0	1	1
1	SOH	0	1	2	2
2	STX	0	2	4	4
3	ETX (Ctrl/C)	0	3	10	8
4	EOT	0	4	20	16
5	ENQ	0	5	40	32
6	ACK	0	6	100	64
7	BEL	0	7	200	128
10	BS (backspace)	1	0	1	1
11	HT (horizontal tab)	1	1	2	2
12	LF (line feed)	1	2	4	4
13	VT (vertical tab)	1	3	10	8
14	FF (form feed)	1	4	20	16
15	CR (carriage return)	1	5	40	32
16	SO	1	6	100	64
17	SI (Ctrl/O)	1	7	200	128
20	DLE	2	0	1	1
21	DC1 (Ctrl/Q)	2	1	2	2
22	DC2	2	2	4	4
23	DC3 (Ctrl/S)	2	3	10	8
24	DC4	2	4	20	16
25	NAK (Ctrl/U)	2	5	40	32
26	SYN	2	6	100	64
27	ETB	2	7	200	128
30	CAN	3	0	1	1
31	EM	3	1	2	2
32	SUB (Ctrl/Z)	3	2	4	4
33	ESC (ESCAPE)	3	3	10	8
34	FS	3	4	20	16
35	GS	3	5	40	32

† Octal code 0 can be used only for terminals opened in binary mode because nulls are ignored in normal mode.

(continued on next page)

Table 3-8 (Cont.): Private Delimiter Masks

Octal Value	ASCII Character	Byte, address+n	Bit	Byte Value	
				Octal	Decimal
36	RS	3	6	100	64
37	US	3	7	200	128
40	SP (space)	4	0	1	1
41	!	4	1	2	2
42	"	4	2	4	4
43	#	4	3	10	8
44	\$	4	4	20	16
45	%	4	5	40	32
46	&	4	6	100	64
47	' (apostrophe)	4	7	200	128
50	(	5	0	1	1
51	)	5	1	2	2
54	, (comma)	5	4	20	16
55	- (dash/minus)	5	5	40	32
56	. (period)	5	6	100	64
57	/	5	7	200	128
60	0	6	0	1	1
61	1	6	1	2	2
62	2	6	2	4	4
63	3	6	3	10	8
64	4	6	4	20	16
65	5	6	5	40	32
66	6	6	6	100	64
67	7	6	7	200	128
70	8	7	0	1	1
71	9	7	1	2	2
72	:	7	2	4	4
73	;	7	3	10	8
74	<	7	4	20	16
75	=	7	5	40	32
76	>	7	6	100	64
77	?	7	7	200	128
100	@	10 (8)	0	1	1
101	A	10 (8)	1	2	2
102	B	10 (8)	2	4	4
103	C	10 (8)	3	10	8
104	D	10 (8)	4	20	16
105	E	10 (8)	5	40	32

(continued on next page)

Table 3-8 (Cont.): Private Delimiter Masks

Octal Value	ASCII Character	Byte, address+n	Bit	Byte Value	
				Octal	Decimal
106	F	10 (8)	6	100	64
107	G	10 (8)	7	200	128
110	H	11 (9)	0	1	1
111	I	11 (9)	1	2	2
112	J	11 (9)	2	4	4
113	K	11 (9)	3	10	8
114	L	11 (9)	4	20	16
115	M	11 (9)	5	40	32
116	N	11 (9)	6	100	64
117	O	11 (9)	7	200	128
120	P	12 (10)	0	1	1
121	Q	12 (10)	1	2	2
122	R	12 (10)	2	4	4
123	S	12 (10)	3	10	8
124	T	12 (10)	4	20	16
125	U	12 (10)	5	40	32
126	V	12 (10)	6	100	64
127	W	12 (10)	7	200	128
130	X	13 (11)	0	1	1
131	Y	13 (11)	1	2	2
132	Z	13 (11)	2	4	4
133	[	13 (11)	3	10	8
134	\	13 (11)	4	20	16
135	]	13 (11)	5	40	32
136	^ or *	13 (11)	6	100	64
137	_ or ←	13 (11)	7	200	128
140	` (grave accent)	13 (12)	0	1	1
141	a	13 (12)	1	2	2
142	b	13 (12)	2	4	4
143	c	13 (12)	3	10	8
144	d	13 (12)	4	20	16
145	e	13 (12)	5	40	32
146	f	13 (12)	6	100	64
147	g	13 (12)	7	200	128
150	h	15 (13)	0	1	1
151	i	15 (13)	1	2	2
152	j	15 (13)	2	4	4
153	k	15 (13)	3	10	8

(continued on next page)

Table 3-8 (Cont.): Private Delimiter Masks

Octal Value	ASCII Character	Byte, address+n	Bit	Byte Value	
				Octal	Decimal
154	l	15 (13)	4	20	16
155	m	15 (13)	5	40	32
156	n	15 (13)	6	100	64
157	o	15 (13)	7	200	128
160	p	16 (14)	0	1	1
161	q	16 (14)	1	2	2
162	r	16 (14)	2	4	4
163	s	16 (14)	3	10	8
164	t	16 (14)	4	20	16
165	u	16 (14)	5	40	32
166	v	16 (14)	6	100	64
167	w	16 (14)	7	200	128
170	x	17 (15)	0	1	1
171	y	17 (15)	1	2	2
172	z	17 (15)	2	4	4
173	{	17 (15)	3	10	8
174	| (vertical)	17 (15)	4	20	16
175	}	17(15)	5	40	32
176	~ (tilde)	17 (15)	6	100	64
177	DEL (RUBOUT)	17 (15)	7	200	128
200-377	Can only be used for terminals with the /EIGHT_BIT characteristic set or open in binary mode; the 8th bit is cleared in normal mode for terminals with the /NOEIGHT_BIT characteristic.				

XRb+XRcI	Channel number times two. When this byte equals zero, it indicates the job's keyboard. When this byte does not equal zero, a keyboard must be open on the indicated channel.
XRb+XRbLkM	Handler index for terminals; TTYHND (octal value is 2).
XRb+XRbLk	Specifies the keyboard number that the subfunction is to take place on. If this byte and the byte at XRb+11 equal zero, then the subfunction is performed on the terminal open on the channel indicated by XRb+XRcI.
XRb+11	Flag byte. If bit 7 of this byte is set (byte equals 128), it indicates that the keyboard number at XRb+XRbLk is real. (When XRb+XRbLk is zero, this bit set indicates that KB0: is the desired terminal. If this bit is cleared and XRb+XRbLk is zero, it indicates that the keyboard open on the channel indicated at XRb+XRcI is the desired terminal.) All other bits must equal zero.
XRb+XRtIME	This word must be set to zero.

XRB+XRMOD

Subfunction code:

- 0 = Clear private delimiter mask.
- 1 = Set private delimiter mask.
- 2 = Read private delimiter mask.

Once set, private delimiters remain in effect for a terminal until cleared (XRB+XRMOD = 0) or until implicitly cleared by:

- Deassigning or closing the terminal
- Killing the job or hanging up the line
- Keyboard monitor read (negative wait time on .READ)

Note that clearing the delimiter mask to all zeros is not the same as issuing the clear subfunction (XRB+XRMOD = 0). Use the clear subfunction to free system resources used when any mask is set.

Data Returned (Terminal—Private Delimiters)

Except for a possible error in byte 0 of the FIRQB, the private delimiter subfunctions of .SPEC do not return any meaningful data.

Errors (Terminal—Private Delimiters)**BADCNT**

One of the following conditions has occurred:

- Byte count at XRB+XRBC does not equal zero or is greater than 32
- Invalid address at XRB+XRLOC

BSERR

An illegal channel number is specified at XRB+XRCI.

ERRERR

Multiple delimiter feature is not included in the monitor.

NOBUFS

The monitor needs to expand its internal buffer space, but memory is not available; a retry may succeed.

NOSUCH

You are trying to read the private delimiter mask, but no private delimiters are set.

NOTOPN

The channel specified at XRB+XRCI is not open.

PRVIOL

Privilege violation; one of the following conditions has occurred:

- Job does not own the specified keyboard and does not have the required privilege
- Subfunction code at XRB+XRMOD is not 0, 1, or 2
- Function code is not 0 through 7 or 11 (returned for all .SPEC calls for terminals)
- An illegal terminal number is specified at XRB+XRBLK
- The device open on the channel specified at XRB+XRCI is not a terminal

3.28 .STAT — Return Job Statistics

Form

.STAT

Function

The .STAT directive returns current statistics on the job to the XRB.

Privileges Required

TUNE is required to read the current run priority or run burst settings.

Data Passed

The .STAT directive does not pass any meaningful data.

Data Returned

Mne- monic	Octal Offset	XRB	Octal Offset	Mne- monic
	1	current job image size, in K words	0	XRLEN
	3	current run-time system size, in K words	2	XRBC
	5	current private memory max, in K words	4	XRLOC
	7	maximum job image size, in K words	6	XRCI
	11	current PPN	10	XRBLK
	13	current run priority	12	XRTIME
	15	current run burst	14	XRMOD

XRLEN The current size of the user job image for this job, in K words. If I&D Space is enabled, this is the size of only the D-Space of the task.

XRBC The size of the current run-time system for this job, in K words.

XRLOC The current private memory maximum for the user job image, in K words. If the job has an unlimited memory maximum or if its private memory maximum is larger than the possible maximum size allowed by its current run-time system, then the value returned here is the maximum size possible for the current run-time system, in K words. If the job's private maximum is less than the run-time system minimum, then the value returned here is the run-time system's minimum size (see the .CORE directive). In all cases, this value represents the maximum size of the user job image under its current run-time system.

XRCI The maximum job image size possible (under the current run-time system), in K words. If I&D Space is enabled, this is the maximum size to which D-Space can expand.

XRBLK The job's current PPN is returned here. The programmer number is returned as a binary value in the low byte (XRBLK), the project number as a binary value in the high byte (XRBLK+11). If the job is not logged in, a value of 0 is returned here.

XRB+XRTIME

The job's current run priority (if caller has TUNE privilege; otherwise, .STAT returns zero). Run priority may range from -128, indicating a suspended job, to +127, the highest priority. The monitor schedules jobs for time-shared execution according to this priority. When a user first logs in to RSTS/E, LOGIN is run with priority 0. LOGIN sets the user's job run priority to -8. Only in unusual cases should the run priority be changed. It can be changed by a user with TUNE privilege for any job with the SET JOB/PRIORITY command. It can also be changed with the UU.PRI subfunction of the .UUO directive. It can be modified by the job by one-half step (4) with the .SET and .CLEAR directives. The special-case value of -128 indicates that the job is never scheduled to run; it is suspended.

XRB+XRMOD

The job's current run burst (if caller has TUNE privilege; otherwise, .STAT returns zero). The run burst is the amount of time that the job is allowed to execute compute-bound before the next job in the schedule is given control. The units of run burst are 1/60ths or 1/50ths of a second, depending on the clock in use and/or the line frequency. (Systems running with the KW11-P clock at crystal speeds, rather than at line frequency, or 11/83, 11/84, 11/93, or 11/94 systems with 800 Hertz clocks, have a run burst unit of 1/50th of a second. Otherwise, if the system is operating with a 60 Hz power line, one run burst unit equals 1/60th of a second.) The range of values for run burst is from 1 to 127. When a job is created, the monitor sets the run burst to a value of six. This value can be modified by the system manager for a particular job with the SET JOB/RUN_BURST command. It can also be modified with the UU.PRI subfunction of the .UUO directive.

Errors

No errors are possible on this directive.

Example

Since the .STAT directive does not pass any data to the monitor, the call is simply:

.STAT

3.29 .TIME — Return Timing Information

Form

.TIME

Function

The .TIME directive returns job timing information: elapsed CPU time, elapsed time connected to a user terminal (channel 0), elapsed device time, and memory utilization.

Privileges Required

None.

Data Passed

The .TIME directive does not pass any meaningful data.

Data Returned

		XRB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
1		low 16 bits of elapsed CPU time, .1 sec.		0	XRLEN
3		elapsed connect time to channel 0, min.		2	XRBC
5		low 16 bits of memory utilization, KCTs		4	XRLOC
7		elapsed device time, minutes		6	XRCI
11		high 16 bits of elapsed CPU time, .1 sec.		10	XRBLK
13		////////////////////////////////////		12	
15		high 16 bits of memory utilization, KCTs		14	XRMOD

XRB+XRLEN	The low-order 16 bits of the job's elapsed CPU time, in tenths of a second of CPU utilization.
XRB+XRBC	The elapsed time that the job has been connected to a channel 0 terminal, in minutes.
XRB+XRLOC	The low-order 16 bits of the job's memory utilization, in kilo-core-ticks (KCTs). A kilo-core-tick is the use of 1K of memory for one-tenth of a second.
XRB+XRCI	The job's elapsed device time. Device time is the use of an allocatable device for one minute. If a job owns two devices for one elapsed minute, then two units of device time are accrued.
XRB+XRBLK	The high-order 16 bits of the job's elapsed CPU time (see XRB+XRLEN).
XRB+XRMOD	The high-order 16 bits of the job's memory utilization (see XRB+XRLOC).

Errors

No errors are possible with the `.TIME` directive.

Example

Since the `.TIME` directive does not pass any data, the call is simply:

```
.TIME
```

3.30 .TTAPE — Enter Tape Mode

Form

.TTAPE

Function

The **.TTAPE** directive enters tape mode on the job's terminal (channel 0). Use this directive when it is necessary to read data from the low-speed paper tape reader available on some terminals. Make sure the terminal is open on channel 0, and call this directive before the **.READ** directive. Three things happen:

- No incoming characters are echoed, preventing needless output at the terminal while the tape is being read.
- The **DELETE** character (ASCII code 177) is ignored, rather than deleting the previous character.
- A **LINE FEED** character (ASCII code 012) is not automatically appended to an incoming **RETURN** (ASCII code 015).

The **.TTECH** directive returns character processing to normal on channel 0.

Privileges Required

None

Data Passed

The **.TTAPE** directive does not pass any data.

Data Returned

The **.TTAPE** directive does not return any data.

Errors

DETKEY Channel 0 is not currently available for this job; it is running detached.

Example

Since the **.TTAPE** directive does not pass or return any data, the call is simply:

.TTAPE

3.31 .TTDDT — Disable Full-Line Buffering

Form

.TTDDT

Function

The .TTDDT directive disables the monitor's usual practice of buffering a full line of data from the user's terminal (channel 0) before passing it on to the job on a .READ directive.

The monitor accepts data typed at a user terminal and stores it in a buffer until the job associated with the terminal reads the data. Normally, a .READ causes the monitor to pass a line to the job's buffer. (A line is any number of characters ending with a RETURN, LINE FEED, ESCAPE, FORM FEED, or Ctrl/D combination.) If a full line is not in the monitor's buffer, the monitor stalls the job until it gets a delimiter and then awakens the job and passes the line on to the job's buffer.

The .TTDDT directive tells the monitor that, when the next .READ on the user's terminal is issued, it is to pass on whatever is currently in the monitor's buffer, whether or not a delimiter has been typed. If no characters are in the monitor's buffer, the job is stalled until at least one character has been typed.

.TTDDT is a one-shot directive: it affects only the next .READ on the user's terminal. If you want to do this type of input consistently, you must execute a .TTDDT before each .READ.

This type of input is useful when you want to respond to each character that a user types. (Note that more than one character may be in the monitor's buffer. If you really want only one character, use .TTDDT before each .READ, and define a 1-character input buffer for the .READ.) For example, the ODT utility (see the *ODT Reference Manual*) uses this capability to accept commands without requiring that you type a delimiter. This type of input puts a high load on the system; Digital does not recommend its use except in unusual circumstances.

Privileges Required

None

Data Passed

The .TTDDT directive does not pass any data.

Data Returned

The .TTDDT directive does not return any data.

Errors

DETKEY Channel 0 is not currently available for this job; the job is running detached.

Example

Since the .TTDDT directive does not pass any data, the call is simply:

```
.TTDDT
```

3.32 .TTECH — Undo .TTAPE or .TTNCH

Form

.TTECH

Function

The .TTECH directive causes the monitor to resume normal character input processing on channel 0 when it has been disabled with either a .TTAPE directive or a .TTNCH directive.

Privileges Required

None

Data Passed

The .TTECH directive does not pass any data.

Data Returned

The .TTECH directive does not return any data.

Errors

DETKEY Channel 0 is not available for this job; the job is running detached.

Example

Since the .TTECH directive does not pass any data, this call is simply:

.TTECH

3.33 .TTNCH — Stop Echo

Form

.TTNCH

Function

The .TTNCH directive disables terminal echo on the job's terminal (channel 0). That is, whatever the user types is accepted, but it is not echoed back for display on the terminal. Otherwise, all normal character processing occurs. (The .TTECH directive returns character processing to normal on channel 0.)

Privileges Required

None

Data Passed

The .TTNCH directive does not pass any data.

Data Returned

The .TTNCH directive does not return any data.

Errors

DETKEY Channel 0 is not available for this job; the job is running detached.

Example

Since the .TTNCH directive does not pass any data, the call is simply:

.TTNCH

3.34 .TTRST — Restart Output

Form

.TTRST

Function

The .TTRST directive restarts program output to the user's terminal when such output has been stopped by the user's typing a Ctrl/O or Ctrl/C.

Terminal service in the RSTS/E monitor maintains a "discard all program output" indicator for each terminal. When this indicator is set, the driver ignores a .WRITE directive to the terminal rather than display the data at the user's terminal. When the indicator is clear, a .WRITE to the terminal is processed normally. The .TTRST directive clears this indicator.

The driver sets the indicator when the user enters a Ctrl/C combination. It reverses the indicator when the user enters a Ctrl/O combination. A .READ directive to the user's terminal clears the indicator.

One use of .TTRST is in run-time systems with keyboard monitors. By issuing .TTRST before displaying any prompt, you can ensure that the prompt is actually displayed at the user's terminal.

Privileges Required

None

Data Passed

The .TTRST directive does not pass any data.

Data Returned

The .TTRST directive does not return any data.

Errors

DETKEY The user's terminal is not currently available for this job; the job is running detached.

Example

Since the .TTRST directive does not pass any data, the call is simply:

.TTRST

3.35 .ULOG — Modify User Logical

Form

.ULOG

Function

The .ULOG directive has three subfunctions. You select the particular action desired by setting a function field in the FIRQB (at offset FQFUN). Table 3–9 lists the subfunctions by function code. The following sections describe the subfunctions in alphabetical order.

Table 3–9: Summary of .ULOG Subfunctions

FQFUN Value (Octal)	Mnemonic	Action Performed
12	UU.ASS	Allocate, reallocate, assign, or reassign a device, or assign or list user logicals
13	UU.DEA	Deallocate a device or deassign a user logical
14	UU.DAL	Deallocate all devices and deassign all user logicals

Privileges Required

See the descriptions of each .ULOG subfunction.

3.35.1 UU.ASS (Allocate/Reallocate a Device, or Assign or List User Logical)

Form

```
MOVb      #UU.ASS, FIRQB+FQFUN
          .
          .
          .
(set up FIRQB and XRB)
          .
          .
          .
.ULOG
```

Function

The UU.ASS subfunction of .ULOG lets you do one of four things:

- Allocate a device to a job. If you assign a LAT port for host-initiated connections, this directive initiates a connection to the server currently assigned to the port.
- Reallocate a device to another job.
- Enter a user logical. This feature lets you:
 - Assign a logical name to a device. The monitor then uses this assignment for logical-to-physical device translation by the .FSS directive.
 - Associate a PPN with a particular logical name. This user logical PPN is used if the associated logical name (but no PPN) is found in a string scanned by .FSS. Use this feature if you want to override a system-wide logical name with an associated PPN. For example, the logical name LB is commonly associated with a disk on the public structure and some specific PPN (usually [1,1]). With this feature, you can set up a different device and PPN for the logical name LB.
 - Assign a PPN to be substituted for an at sign (@) character encountered in a file specification string scanned by an .FSS directive.
 - Assign a protection code to be used as a default if no protection code is specified in a file specification string translated by an .FSS directive.
- List all assigned user logical names by index.

NOTE

Assigning user logicals assigns values to the USRPPN and USRPRT areas in the low 1000 bytes of virtual memory and to the extended logical area of the job header (see Chapter 2).

CAUTION

Digital strongly recommends you do not write or run programs that directly manipulate user logicals in low core. Such programs may perform erratically. Instead, use the .ULOG directive.

Privileges Required

No privileges are required to manipulate user logicals or deallocate a device. DEVICE is required to allocate a restricted device. HWCTL is required to seize a device or reallocate a device to a job in another account.

Data Passed — Allocate/Reallocate Device

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.ASS (= octal 12)	2	
	5	////////////////////////////////	4	
	7	(must be 0)	6	FQPPN
	11	(must be 0) 0=assign; <>0=job	10	FQNAM1
	13	////////////////////////////////	12	
	15	DOS or ANS in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	mode	22	FQMODE
	25	////////////////////////////////	24	
	27	(must be 0)	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN

The function code UU.ASS (octal value = 12).

FIRQB+FQNAM1

For allocating a device, the two bytes beginning here must equal zero. For reallocating a device, this byte is the job number to which the device is to be reallocated. The byte at FIRQB+FQNAM1+1 must equal zero. If you do not have HWCTL privilege, you can reallocate a device only to a job that is logged in to the same account as your current account.

FIRQB+FQEXT

For allocating or reallocating a magnetic tape device, this word is either DOS or ANS (in RAD50 format) to indicate DOS or ANSI label format for the magnetic tape drive.

FIRQB+FQMODE	This word contains the mode to use when allocating the device. Valid modes are:										
	<table> <thead> <tr> <th>Mode</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>100001</td> <td>Used to allocate a device that is currently allocated to (but not opened by) another user. This is a snagging allocation, available to users with the HWCTL privilege.</td> </tr> <tr> <td>100002</td> <td>Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.</td> </tr> <tr> <td>100004</td> <td>Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.</td> </tr> <tr> <td>0</td> <td>Used when you do not want a snagging allocation and when you want the LAT driver to use the port's default queueing setting.</td> </tr> </tbody> </table>	Mode	Description	100001	Used to allocate a device that is currently allocated to (but not opened by) another user. This is a snagging allocation, available to users with the HWCTL privilege.	100002	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.	100004	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.	0	Used when you do not want a snagging allocation and when you want the LAT driver to use the port's default queueing setting.
Mode	Description										
100001	Used to allocate a device that is currently allocated to (but not opened by) another user. This is a snagging allocation, available to users with the HWCTL privilege.										
100002	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.										
100004	Only used when allocating a LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.										
0	Used when you do not want a snagging allocation and when you want the LAT driver to use the port's default queueing setting.										
FIRQB+FQDEV	Device name to be allocated or reallocated, specified as two ASCII characters. If this word is zero, the public disk structure is assumed.										
FIRQB+FQDEVN	Device unit number, passed as a binary value in byte FIRQB+FQDEVN. A nonzero value in byte FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in byte FIRQB+FQDEVN+1 indicates no device unit number.										

NOTE

The XRB should be cleared to zeros for an allocate or reallocate device operation.

Data Passed — Enter User Logical

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.ASS (= octal 12)	////////////////////////////////	2		
	5	////////////////////////////////	no-replace flag	4	FQFIL	
	7	project number	programmer number	6	FQPPN	
	11	user logical device name in RAD50 format (5 words)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23	////////////////////////////////////		22		
	25	////////////////////////////////////		24		
FQPROT	27	protection code	255=assign prot. code	26	FQPFLG	
	31	device name (2 ASCII characters)		30	FQDEV	
	33	<>0, unit no. real	device unit number	32	FQDEVN	
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

- FIRQB+FQFUN** The function code UU.ASS (octal value = 12).
- FIRQB+FQFIL** The no-replace flag. Set bit 7 of this byte to 1 to avoid replacing existing user logicals.
- FIRQB+FQPPN** The PPN for those features that use a PPN (see the discussion under Function at the beginning of this section). For a user-assignable PPN, this is the PPN to be used to replace an @ sign in a string parsed by an .FSS directive. In this case, the two bytes at FIRQB+FQNAM1 and FIRQB+FQNAM1+1 must be zero. If the four bytes FIRQB+FQNAM1 through FIRQB+FQNAM1+3 contain a logical device name, and a PPN is to be associated with that name, specify the PPN here. If no PPN is to be associated with the logical device name, set this word to zero.
- FIRQB+FQNAM1** To assign a user logical name to a device, set the five words beginning here to the logical name, in RAD50 format. Otherwise, set these bytes to zero.
- FIRQB+FQPFLG** To assign a user-assignable default protection code, set this byte to nonzero. (See FIRQB+FQPROT.)
- FIRQB+FQPROT** The protection code to be used as a default if no protection code is specified in a string scanned by an .FSS directive. The byte at FIRQB+FQPFLG must be nonzero, and the two words at FIRQB+FQPPN and FIRQB+FQNAM1 must be zero.
- FIRQB+FQDEV** Device name for assigning a logical name to be associated with a device. Specify the device as two ASCII characters. If this word is zero, the public disk structure is assumed.

FIRQB+FQDEVN

Device unit number for assigning a logical name to be associated with a device. The device unit number is passed as a binary value in byte FIRQB+FQDEVN. A nonzero value in byte FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in byte FIRQB+FQDEVN+1 indicates no device unit number.

		XRB	
Mne- monic	Octal Offset		Octal Mne- Offset monic
	1	length of user logical information	0 XRLEN
	3	length of user logical information	2 XRBC
	5	starting address for user logical info.	4 XRLOC
	7	////////////////////////////////////	6
	11	////////////////////////////////////	10
	13	////////////////////////////////////	12
	15	////////////////////////////////////	14

XRB+XRLEN

If the user logical information is in its standard location (USRPPN, USRPRT, and USRLOG), this word is passed as zero. If some nonstandard set of locations is being used, then specify the length (in bytes) of that information, here. Thus, when the user logical information is in a nonstandard location, this word must be at least four (for user-assignable PPN and default protection code).

XRB+XRBC

The length of the information (same as the word at XRB+XRLEN).

XRB+XRLOC

If the word at XRB+XRLEN is nonzero, then this word defines the starting location for the user logical information (the default PPN). See Chapter 2 for a description of the order and format of the information created by .ULOG.

Data Returned

FIRQB

The error code (if any).

FIRQB+FQFIL

The previous owner of the device as follows:

- If you own a device already and allocate it, UU.ASS returns your own job number.
- If you seize a device, you can see who you seized it from.
- If the value in FIRQB+FQFIL is zero, then you know that the device was not previously owned.

Errors

BADCNT

This error has two possible causes:

- The length specified at XRB+XRLEN and XRB+XRBC must be 4 + 8n, where n = 0, 1, 2, 3, or 4. If it is not, this error is returned. (Other lengths are not valid user logicals.)
- The value at XRB+XRLOC is odd.

BDNERR	An attempt was made to reallocate a device to a nonexistent job. This error can occur only for a reallocate call.
FIEXST	The logical name specified in <code>FIRQB+FQNAM1</code> already exists and the no-replace flag in <code>FIRQB+FQFIL</code> is set. The logical name is not replaced.
INUSE	For allocating or reallocating a device, the specified device is currently open or has an open file. For assigning a user logical, no space is currently available for storing the information.
NODEVC	The device name specified at <code>FIRQB+FQDEVN</code> is a logical device name for which a physical device is not currently allocated.
NOTAVL	The device specified exists on the system, but the operation failed for one of the following reasons: <ul style="list-style-type: none"> • The device is currently reserved by another job (see description of <code>FIRQB+FQMODE</code>). • Ownership of the device requires <code>DEVICE</code> privilege, which the user does not have. • The device or its controller is disabled. • The device is a keyboard line for a pseudo keyboard only.
PRVIOL	You do not have the required privileges and tried to reallocate a device to a job that is logged in to an account other than your current account.
NOBUFS	No buffers available to initiate the connection to the terminal server.

Example

The following code allocates the user logical name `OUT` to the public disk structure. Assume that the `FIRQB` and `XRB` have been previously cleared to zero. For example:

```

MOVB    #UU.ASS,FIRQB+FQFUN        ; Set function code
MOV     #^ROUT,FIRQB+FQNAM1       ; Set logical name as
MOV     #^R    ,FIRQB+FQNAM1+2    ; two words RAD50
.ULOG

```

Data Passed—List User Logicals

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ASS (= octal 12)	////////////////////////////////	2	
	5	////////////////////////////////	index	4	FQFIL
	7	(must be 0)		6	FQPPN
	11	(must be 200 octal)		10	FQNAM1
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
FQPROT	27	(must be 0)	////////////////////////////////	26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFUN

The function code UU.ASS (octal value = 12).

FIRQB+FQFIL

The index number of the logical name to return. Passing a 1 returns information about the first assigned user logical, passing a 2 returns information about the second assigned user logical, and so on.

Data Returned—List User Logicals

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	project number | programmer number	6	FQPPN
	11	user logical device name in RAD50 format (5 words)	10	FQNAM1
	13		12	
	15		14	
	17		16	
	21		20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real | device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQPPN

The PPN assigned to this user logical, or zero if no PPN was assigned.

FIRQB+FQNAM1

The five words beginning here contain the returned user logical name in RAD 50 format

FIRQB+FQDEV

The physical device name assigned to this user logical. If no device name was assigned, this word and the next word both contain zero.

FIRQB+FQDEVN

Device unit number for assigning a logical name to be associated with a device. The device unit number is passed as a binary value in byte FIRQB+FQDEVN. A nonzero value in byte FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in byte FIRQB+FQDEVN+1 indicates no device unit number.

3.35.2 UU.DAL — Deallocate All Devices and Deassign All User Logicals

Form

```

MOVB      #UU.DAL, FIRQB+FQFUN
.
.
.
(set up FIRQB and XRB)
.
.
.
.ULOG
    
```

Function

The UU.DAL function of .ULOG deallocates all devices and deassigns all user logicals for the calling program.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.DAL (=octal 14)	////////////////////////////////	2	
	5	////////////////////////////////	deassign-only flag	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFUN

The function code UU.DAL (octal value equals 14).

FIRQB+FQFIL

The deassign-only flag. Set this byte to 1 to deassign all user logicals without deallocating devices.

Mne- monic	Octal Offset	XRB	Octal Offset	Mne- monic
	1	length of user logical information	0	XRLEN
	3	length of user logical information	2	XRBC
	5	starting address for user logical info.	4	XRLOC
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	

XRLEN+XRLEN

If the user logical information is in its standard location (USRPPN, USRPRT, and USRLOG), set this word to zero. If some nonstandard set of locations is being used, then specify the length (in bytes) of that information.

XRLEN+XRBC

The length of the information (same as the word at XRLEN+XRLEN).

XRLEN+XRLOC

If the word at XRLEN+XRLEN is nonzero, then this word defines the starting location for the user logical information (the default PPN). See Chapter 2 for a description of the order and format of the information created by .ULOG.

Data Returned

The UU.DAL subfunction of .ULOG does not return any meaningful data.

Errors

BADCNT

This error has two possible causes:

- The length specified at XRLEN+XRLEN and XRLEN+XRBC must be 4+8n, where n = 0, 1, 2, 3, or 4. If it is not, this error is returned. (Other lengths are not valid user logicals.)
- The value at XRLEN+XRLOC is odd.

Example

The following code deallocates all devices and deassigns user logicals for the current job. The user logical information is in its standard location. For example:

```

MOVB      #UU.DAL, FIRQB+FQFUN
CLR       XRB+XRLEN
CLR       XRB+XRBC
CLR       XRB+XRLOC
.ULOG

```

3.35.3 UU.DEA — Deallocate a Device or Deassign a User Logical

Form

```

MOV B      #UU.DEA, FIRQB+FQFUN
.
.
(set up FIRQB)
.
.
.ULOG
  
```

Function

The UU.DEA subfunction of .ULOG deallocates a device from the current job (releases it for use by other jobs) or deassigns a user-logical assignment.

Privileges Required

None

Data Passed for Deallocate Device

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.DEA (=octal 13) ////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	(must be 0)	6	FQPPN
	11	(must be 0)	10	FQNAM1
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	(must be 0)	26	FQPFLG
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit number real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN

The UU.DEA function code (octal value equals 13).

FIRQB+FQDEV

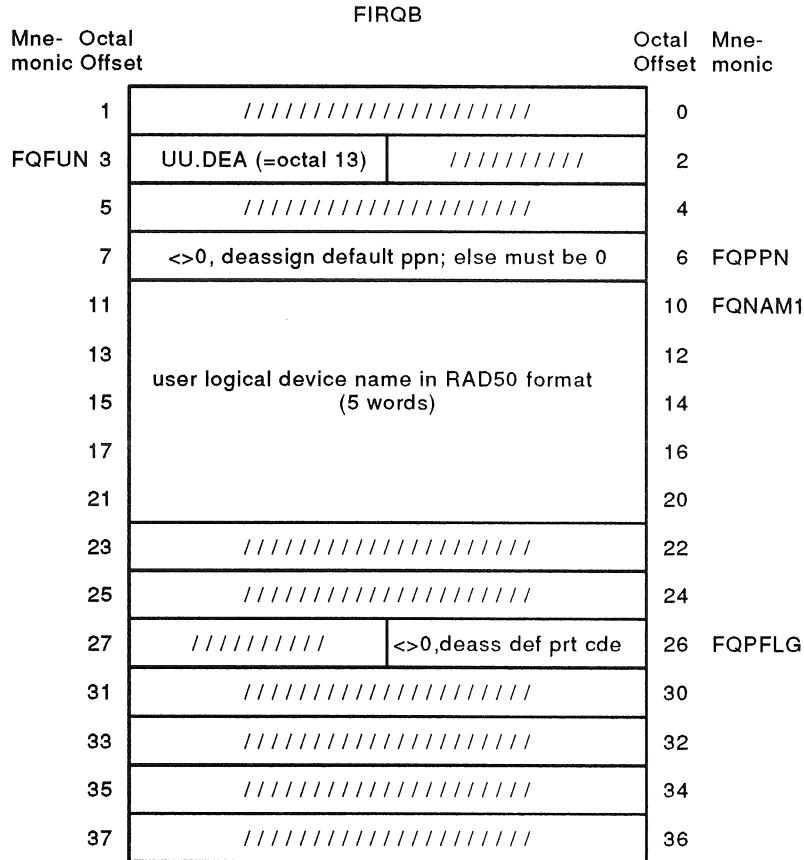
The name of the device to be deallocated; two ASCII characters.

FIRQB+FQDEVN The device unit number is passed in this byte, in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no device unit number.

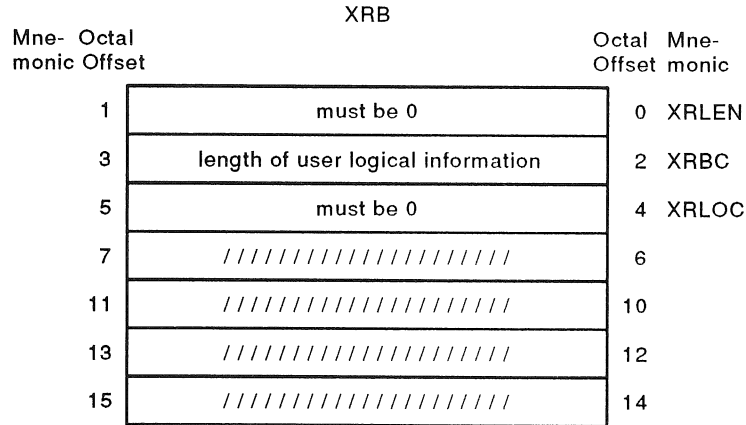
NOTE

The XRB should be cleared to zeros for deallocating a device.

Data Passed for Deassign User Logical



- FIRQB+FQFUN** The UU.DEA function code (octal value equals 13).
- FIRQB+FQPPN** Any nonzero value deassigns any previously assigned default PPN. (In this case, set the word at FIRQB+FQNAM1 to zero.) If deassigning the default protection code, set this word to zero.
- FIRQB+FQNAM1** The logical device name to be deassigned; five words in RAD50 format. If deassigning a default PPN or protection code, set the word at FIRQB+FQNAM1 to zero.
- FIRQB+FQPFLG** Set this byte to nonzero if deassigning a protection code.



XRLEN Must be zero. If the user logical information is in its standard location (USRPPN, USRPRT, and USRLOG), it will be deassigned. If it is in any nonstandard location, UU.DEA cannot deassign the logicals individually. You can clear logical tables in nonstandard locations with UU.DAL.

XRBC The length of the information (same as the word at XRLEN).

XRLOC Must be zero.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.DEA subfunction of .ULOG does not return any meaningful data.

Errors

BADCNT This error has two possible causes:

- The length specified at XRLEN and XRBC must be 4+8n, where n = 0, 1, 2, 3, or 4. If it is not, this error is returned. (Other lengths are not valid user logicals.)
- The value at XRLOC is odd.

NODEVC The device or its type specified at the locations FIRQB+FQDEV and FIRQB+FQDEVN is not part of your system configuration.

Example

The following code deallocates MT0: from the current job:

```

MOVB    #UU.DEA, FIRQB+FQFUN        ; Set function code
CLR     FIRQB+FQNAM1                ; Clear name
MOV     #"MT, FIRQB+FQDEV           ; Set device
MOVB   #0, FIRQB+FQDEVN             ; Set unit number
MOVB   #377, FIRQB+FQDEVN+1        ; Unit number real
.ULOG

```


3.36 .UUO — Execute BASIC-PLUS SYS Call

Form

.UUO

Function

The .UUO directive lets a MACRO program execute the BASIC-PLUS SYS calls to the File Processor (FIP). The *RSTS/E Programming Manual* describes the SYS calls. For the MACRO programmer's convenience, the FIRQB formats for the calls are shown here; however, for detailed descriptions see the *RSTS/E Programming Manual*.

Table 3-10 summarizes the FIP SYS calls; note that some of the calls are handled by directives other than .UUO. (.FSS, for example, handles the file name string scan in MACRO.) The mnemonic subfunction names are provided by the COMMON.MAC prefix file; the decimal values are the BASIC-PLUS FIP call subfunction codes and the .UUO subfunction codes that COMMON.MAC relates to the mnemonics listed.

The rest of this section gives the FIRQB formats for data passed and returned for the .UUO subfunctions; the subfunctions are organized in alphabetical order of the mnemonics provided by COMMON.MAC.

Table 3-10: .UUO Subfunctions — Calls to the File Processor (FIP)

Mnemonic	BASIC-PLUS SYS Call Code (Decimal)	Privileges That Apply	Function
UU.TB3	-29	None	Get monitor tables—Part III
UU.SPL	-28	r/w file	Spooling
UU.DMP	-27	SYSIO	Snap shot dump
UU.FIL	-26	DATES,TUNE SYSIO,r/w	File placement and modification
UU.ATR	-25	r/w acct	Read or write attributes
UU.CCL	-24	INSTAL	Add/delete CCL command
(.FSS)	-23	None	Terminating file name string scan
(.SET)	-22	TUNE	Set special run priority
(.SET/ .CLEAR)	-21	None	Drop/regain temporary privilege
(.SET/ .CLEAR)	-20	TUNE	Lock/unlock job in memory
UU.LOG	-19	SWCTL	Set number of logins
UU.RTS	-18	read file INSTAL	Install run-time system
		INSTAL	Load, remove, or unload run-time system
		INSTAL	Declare default keyboard monitor
		read file INSTAL	Install resident library
		INSTAL	Load, remove, or unload resident library
UU.NAM	-17	write file	Name run-time system
UU.DIE	-16	SHUTUP	System shutdown

(continued on next page)

Table 3-10 (Cont.): .UUO Subfunctions — Calls to the File Processor (FIP)

Mnemonic	BASIC-PLUS SYS Call Code (Decimal)	Privileges That Apply	Function
UU.ACT	-15	write acct	Accounting dump
UU.DAT	-14	DATES	Change system date/time
UU.PRI	-13	TUNE	Change priority/run burst/job size
UU.TB2	-12	None	Get monitor tables—Part II
UU.BCK	-11	DATES	Change file backup statistics
(.FSS)	-10	None	File name string scan
UU.HNG	-9	HWCTL	Hangup a dataset
UU.FCB	-8	None	Get open channel statistics
(internal to BASIC-PLUS)	-7	None	Ctrl/C trap enable
UU.POK	-6	SYSMOD	Poke memory
(.SPEC)	-5	SEND	Broadcast to terminal
(.SPEC)	-4	SYSIO	Force input to terminal
UU.TB1	-3	None	Get monitor tables—Part I
UU.NLG	-2	SWCTL	Disable logins
UU.YLG	-1	SWCTL	Enable logins
UU.PAS	0	write acct	Create user account
UU.DLU	1	write acct	Delete user account
UU.MNT	3	MOUNT	Disk pack status
UU.LIN	4	None	Login
UU.BYE	5	WACNT EXTQA	Logout
UU.ATT	6	write acct DEVICE	Attach Reattach Swap console
UU.DET	7	JOBCTL EXQTA	Detach
UU.CHU	8	write acct JOBCTL HWCTL	Change password/quota Kill job Disable terminal
UU.ERR	9	None	Return error message
UU.ASS	10	DEVICE HWCTL	Allocate/reallocate device †
UU.DEA	11	None	Deallocate device †
UU.DAL	12	None	Deallocate all devices †
UU.ZER	13	DEVICE write acct	Zero a device
UU.RAD	14	write acct	Read or read-and-reset accounting data
UU.DIR	15	DEVICE execute or read file	Directory lookup on index Special mag- netic tape directory lookup
UU.TRM	16	HWCFG	Set terminal characteristics
UU.LOK	17	DEVICE read file	Disk directory lookup on file name Disk wildcard directory lookup
UU.CHE	19	TUNE	Enable/disable disk caching
UU.CNV	20	None	Date and time conversion

†To assign or deassign user logicals, use .ULOG.

(continued on next page)

Table 3-10 (Cont.): .UUO Subfunctions — Calls to the File Processor (FIP)

Mnemonic	BASIC-PLUS SYS Call Code (Decimal)	Privileges That Apply	Function
UU.SLN	21	INSTAL	System logical names
(.MESAG)	22	SEND SYSIO	Message send/receive
UU.SWP	23	r/w files INSTALL	Install, remove, list system files
UU.JOB	24	WACNT JOBCTL EXQTA	Create job
UU.PPN	25	DEVICE	Wildcard PPN lookup
UU.SYS	26	JOBCTL TUNE	Return job status information
UU.PRV	28	None	Set/clear/read current privileges
UU.STL	29	HWCTL	Stall/unstall system
UU.3PP	31	None	Third-party privileges
UU.CHK	32	None	Check access function
UU.ONX	33	DEVICE DATES r/w files	Open next disk file
UU.CFG	34	HWCFG SWCFG HWCTL	Change system characteristics and device defaults

3.36.1 UU.ACT (Accounting Information Dump)

Privileges Required

GACNT or WACNT is required for access to accounting data.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ACT (= -17)	////////////////////////////////	2	
	5	////////////////////////////////////		4	
	7	project number	programmer number	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQPPN Zero in both bytes means the current account.

Data Returned

Except for a possible error in byte 0 of the FIRQB, The UU.ACT subfunction of .UUO does not return any meaningful data.

Errors

NOSUCH The account specified does not exist.

PRVIOL A caller with GACNT privilege specified an account outside the caller's group.

3.36.2 UU.ASS (Allocate/Reallocate Device)

Privileges Required

DEVICE is needed to allocate a restricted device. HWCTL is required to seize a device or reallocate a device to a job in another account.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.ASS (= 12) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	(must be 0) 0,alloc.;<>0,realloc.	10	FQNAM1
	13	////////////////////////////////	12	
	15	DOS or ANS in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	mode	22	FQMODE
	25	////////////////////////////////	24	
	27	must be 0	26	FQPFLG
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0,unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

- FIRQB+FQFUN** The function code ASSFQ (octal value = 24).
- FIRQB+FQNAM1** This byte is set to zero to indicate an assign; if nonzero, it is used as the job number to which the device is to be reassigned. The high byte of this word (FIRQB+11) must be set to zero. If you do not have HWCTL privilege, you can reassign a device only to a job that is logged in to the same account as your current account.
- FIRQB+FQEXT** When the device is magnetic tape, this word can contain either DOS or ANS in RAD50 format, to indicate DOS or ANSI label format for the tape drive. It can also be set to zero to indicate the system default for the drive.

FIRQB+FQMODE	This word contains the mode to use when allocating the device. Valid modes are:										
	<table> <thead> <tr> <th>Mode</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>100001</td> <td>Used to allocate a device that is currently allocated to (but not opened by) another user. This is a snagging allocation, available to users with the HWCTL privilege.</td> </tr> <tr> <td>100002</td> <td>Only used when allocating a host-initiated LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.</td> </tr> <tr> <td>100004</td> <td>Only used when allocating a host-initiated LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.</td> </tr> <tr> <td>0</td> <td>Used when you do not want a snagging allocation and when you want to use the default queueing setting on a host-initiated LAT port.</td> </tr> </tbody> </table>	Mode	Description	100001	Used to allocate a device that is currently allocated to (but not opened by) another user. This is a snagging allocation, available to users with the HWCTL privilege.	100002	Only used when allocating a host-initiated LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.	100004	Only used when allocating a host-initiated LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.	0	Used when you do not want a snagging allocation and when you want to use the default queueing setting on a host-initiated LAT port.
Mode	Description										
100001	Used to allocate a device that is currently allocated to (but not opened by) another user. This is a snagging allocation, available to users with the HWCTL privilege.										
100002	Only used when allocating a host-initiated LAT port and used to tell the LAT driver that the request to initiate the connection <i>should not</i> be queued if the remote port is not available.										
100004	Only used when allocating a host-initiated LAT port and used to tell the LAT driver that the request to initiate the connection <i>should</i> be queued if the remote port is not available.										
0	Used when you do not want a snagging allocation and when you want to use the default queueing setting on a host-initiated LAT port.										
FIRQB+FQDEV	Device name, as two ASCII characters.										
FIRQB+FQDEVN	The device unit number is passed here in binary. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no unit number.										

Data Returned

FIRQB	The error code (if any).
FIRQB+FQFIL	The previous owner of the device as follows: <ul style="list-style-type: none"> • If you own a device already and allocate it, UU.ASS returns your own job number. • If you seize a device, you can see who you seized it from. • If you reallocate the device, you can see who owned it before the reallocation. • If the value in FIRQB+FQFIL is zero, then you know that the device was not previously owned.

Errors

BDNERR	Your program attempted to reallocate a device to a nonexistent job.
INUSE	For a reallocate, the specified device is open or has an open file.
NODEVC	Device name at FIRQB+FQDEV is not a valid device name on this system.
NOTAVL	The device specified exists on the system, but the operation failed for one of the following reasons: <ul style="list-style-type: none"> • The device is currently reserved by another job (see description of FIRQB+FQMODE). • The device or its controller is disabled. • The device is a keyboard line for a pseudo keyboard only. • You do not have DEVICE privilege and the device is restricted.
PRVIOL	You do not have the required privileges and tried to reallocate a device to a job that is logged in to an account other than your current account.
NOBUFS	No buffers available to initiate the connection to the terminal server.

3.36.3 UU.ATR (Read/Write Attributes)

Privileges Required (Read/Write File Attributes)

None

Data Passed (Read/Write File Attributes)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.ATR (= -31)	////////////////////////////////	2	
FQSIZM	5	=0,read; 1-11,write	channel number	4	FQFIL
	7	attribute data (used only for write) number of words written = 1-11, as specified in byte 5 1 attribute per word		6	FQPPN
	11			10	FQNAM1
	13			12	
	15			14	FQEXT
	17			16	FQSIZ
	21			20	FQNAM2
	23			22	FQMODE
	25			24	FQFLAG
	27			26	FQPFLG
	31			30	FQDEV
	33	32	FQDEVN		
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

Data Returned (Read/Write File Attributes)

Other than a possible error in byte 0 of the FIRQB, data is returned on a read only (byte 5 of data passed equals zero).

FIRQB		Mne- Offset
Mne- monic	Octal Offset	Mne- Offset
	////////////////////////////////////	0
	////////// current job no. * 2	2 FQJOB
	////////////////////////////////////	4
1		6 FQPPN
3		10 FQNAM1
5		12
7		14 FQEXT
11	attribute data	16 FQSIZ
13		20 FQNAM2
15	(If file has no attributes, FIRQB+6 and FIRQB+7 = 0)	22 FQMODE
17		24 FQFLAG
21		26 FQPFLG
23		30 FQDEV
25		32 FQDEVN
27		34 FQCLUS
31	name of run-time system in RAD50 format	36
33		
35	(2 words)	
37		

Errors (Read/Write File Attributes)

- BADCNT** Write only. No value greater than 11 can be specified at FIRQB+FQFIL+1.
- BSERR** Attributes can be written only on channels 1 through 15.
- DEVNFS** Device on which file is open must be disk.
- NOROOM** Occurs only on a write. The User File Directory (UFD) of the account is full. Some files must be deleted to free entries for attributes.
- NOTOPN** Channel specified at FIRQB+FQFIL must have file open.
- PRVIOL** Job does not have read/write access to the file open on the channel, or a UFD is open on the channel.

Privileges Required (Read/Write/Delete Account Attributes)

No privileges are required to read attributes 1, 2, and 4 to 191 of your own account. That is, of the Digital-defined attributes you can read all except the password. Of the user-defined attributes (128 to 255) you can read the first 64. To read attribute 3 (password) or attributes 192 to 255, you need GREAD, WREAD, GACNT, or WACNT privilege.

Read or accounting privileges (GREAD, GACNT, WREAD, or WACNT) are required to read accounting data of other accounts. Accounting access (GACNT or WACNT) is required to write or delete accounting data of any account.

Data Passed (Read/Write/Delete Account Attributes)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////		0		
FQFUN	3	UU.ATR (= -31)	////////////////////////////////	2		
FQSIZM	5	attribute type code	subfunction code	4	FQFIL	
	7	project number	programmer number	6	FQPPN	
	11		(see discussion)	10	FQNAM1	
	13	13 bytes of data (only on write)		12		
	15				14	
	17				16	
	21				20	FQNAM2
	23				22	
	25				24	
	27	////////////////////////////////		26		
	31	device name (2 ASCII characters)		30	FQDEV	
	33	<>0, unit no. real	device unit number	32	FQDEVN	
	35	////////////////////////////////		34		
	37	////////////////////////////////		36		

FIRQB+FQFUN The function code UU.ATR (octal value = -31).

FIRQB+FQFIL The subfunction code:

- 1 Read account attributes
- 2 Write account attributes
- 3 Delete account attributes

FIRQB+FQSIZM The attribute type code:

- 0 Look-up by index
- 1 Quotas
- 2 Authorized Privilege Mask
- 3 Password
- 4 Date/time information
- 5 User name information
- 6 Nondisk quotas

FIRQB+FQPPN The PPN of the account accessed. The project number is in the high byte (FQPPN+1), and the programmer number is in the low byte (FQPPN). A value of zero defaults to the caller's PPN.

FIRQB+FQNAM1 The index in a "look-up by index." Look-up by index is specified by using a type code of zero in **FIRQB+FQSIZM** and -1 in **FIRQB+FQFIL**. For programs like **BACKUP**, it is useful to read all the account attributes without having to try each of the 255 possible type codes. The value *n* of the index specifies that you want *n*th attribute type.

FIRQB+FQNAM1+1

The account attributes to be written to one attribute block. See the *RSTS/E Internals and Data Structures Manual* for details about each account attribute. The data is written exactly as passed except for attribute types 2 and 4.

For type 2 (authorized privilege mask), when writing the mask, any attempt to turn on privilege bits are ignored if the caller does not have the corresponding privilege currently in effect. The layout of the 13 bytes are:

- FIRQB+11—reserved
- FIRQB+12 through +21—authorized privilege mask
- FIRQB+22 through +25—reserved

For type 4 (date/time information), the last login fields are left alone unless the fields are currently null. This ensures that any logins to an account leave a trace that cannot be tampered with. The layout of the 13 bytes are:

- FIRQB+11—keyboard of last interactive login
- FIRQB+12,+13—date of last interactive login (RSTS internal format)
- FIRQB+14,+15—time of last interactive login (RSTS internal format)
- FIRQB+16,+17—date of last password change
- FIRQB+20,+21—time of last password change and flags
- FIRQB+22,+23—date of account creation
- FIRQB+24,+25—expiration date (-1 if none)

The flags in FIRQB+14,+15 are:

- Bit 11—no password required ("guest" account)
- Bits 12-15—reserved

The flags in FIRQB+20,+21 are:

- Bit 11—password cannot be looked up ("hashed" password)
- Bit 12—no dial-up logins allowed
- Bit 13—no network logins allowed
- Bit 14—no interactive logins allowed (spawn and batch only)
- Bit 15—captive account

If bit 11 is set, then passwords can be up to 14 characters long and the system stores them in hashed form. The hash uses parts of the date/time attributes; so, altering any bits of bytes FIRQB+16 through FIRQB+23 (except for the flag bits) renders the password useless. The read accounting data directive (UU.RAD) returns two zero words if this bit is set. If bit 11 is clear, then passwords can be up to six characters long and must consist of uppercase letters and numbers; that is, the RAD50 character set.

FIRQB+FQDEV

The device name passed; two ASCII characters. A value of zero indicates "SY", public disk.

FIRQB+FQDEVN

The device unit number passed in binary notation. A nonzero value in the high byte of this word (FIRQB+FQDEVN+1) indicates an explicit device unit number. A zero value in the high byte indicates no unit number.

Data Returned (Read/Write/Delete Account Attributes)

Other than a possible error in byte 0 of the FIRQB, data is returned only on a read subfunction (-1 in FIRQB+FQFIL).

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	//////////	2	FQJOB
	5	attribute type code	4	
	7	project number	6	FQPPN
	11		10	FQNAM1
	13		12	
	15		14	
	17	13 bytes of data	16	
	21		20	
	23		22	
	25		24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQNAM1 The attribute type code. Contains the type code of the attributes just read (same as passed except for lookup by index).

FIRQB+FQNAM1+1 The actual attribute data.

Errors (Read/Write/Delete Account Attributes)

- DEVNFS** The specified device is not a disk.
- EOF** The attribute type not found (read or delete only). The index specified for an indexed look-up call is greater than the number of attributes (read only).
- NODEVC** The specified device does not exist.
- NOROOM** The attribute block did not exist and it cannot be added because the directory is full (write only).
- NOSUCH** The specified account does not exist.
- NOTMNT** The specified disk is not mounted.
- PRVIOL** You do not have sufficient privilege for the operation. The disk is write-locked (write and delete only). Attempt to delete in the Digital-reserved type range (delete only).

Privileges Required (Read Pack Attributes)

DEVICE is required if the device specified is restricted.

Data Passed (Read Pack Attributes)

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ATR (= -31)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code (-4)	4	FQFIL
	7	////////////////////////////////////		6	FQPPN
	11	////////////////////////////////////		10	FQNAM1
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	FQEXT
	17	////////////////////////////////////		16	FQSIZ
	21	////////////////////////////////////		20	FQNAM2
	23	////////////////////////////////////		22	FQMODE
	25	////////////////////////////////////		24	FQFLAG
	27	////////////////////////////////////		26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned (Read Pack Attributes)

This call returns information about mounted disks. It is used to obtain the characteristics of a disk and the drive the disk is mounted in.

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	1st DCN of MFD	10	FQNAM1
	13	Pack Revision Level	12	
	15	Pack Cluster Size	14	FQEXT
	17	Pack Status/Flags	16	FQSIZ
	21	Pack ID in RAD50 format	20	FQNAM2
	23	(in 2 words)	22	FQMODE
	25	Size of disk in DCNs	24	FQFLAG
	27	Device Cluster Size	26	FQPFLG
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

- FIRQB+FQNAM1** The starting device cluster number (DCN) of the MFD.
- FIRQB+12** The pack revision level.
- FIRQB+FQEXT** The pack cluster size.
- FIRQB+FQSIZ** The pack status/flags. The defined bits are:
- Bit 9—Pack is initialized "new files first"
 - Bit 11—Pack is initialized to maintain date of last write
 - Bit 12—Pack is initialized as a read-only pack
 - Bit 14—Pack is initialized as a private/system disk
- All other bits are reserved.
- FIRQB+FQNAM2** The pack ID in RAD50 format. The first three characters are here and the last three characters are in the next word, FIRQB+FQMODE.
- FIRQB+FQFLAG** The size of the disk in DCNs.
- FIRQB+FQPFLG** The device cluster size.

Errors (Return Pack Attributes)

NOTMNT Device specified is not a logically mounted device.
NODEVC Device specified is not valid.

3.36.4 UU.ATT (Attach/Reattach Job/Swap Console)

Privileges Required

DEVICE is required to perform a REATTACH if the terminal is restricted.
 GACNT or WACNT is required to ATTACH to a job outside the caller's account.

Data Passed — Attach

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ATT (= 6)	////////////////////////////////	2	
FQSIZM	5	bit mask	job number to attach	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	password in RAD50 format		10	FQNAM1
	13	(2 words)		12	
	15	or		14	
	17	password in ASCII format		16	
	21	(7 words)		20	
	23			22	
	25			24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQSIZM Bit 0 must be clear for the attach subfunction. Bit 1 is clear for the old password format (RAD50) and set for the new format (ASCII). Bit 2 can be set on an attach to suppress the password check. If clear, the password is checked if you attach to a job in another account. All other bits are reserved.

FIRQB+FQPPN Zero in both bytes means your PPN. You do not need to include a password. If you do not have GACNT or WACNT privilege, you can only specify your own PPN.

FIRQB+FQNAM1 You must include a password if you specify a PPN other than your own unless bit 2 is set in FIRQB+FQSIZM. Note that this use of the call requires GACNT or WACNT privilege.

Data Returned

Other than a possible error in byte 0 of the FIRQB, the attach function of the UU.ATT directive does not return any data.

Errors

BADFUO The system returns this error for one of the following reasons:

- Job executing the call has an open channel.
- Job executing the call is detached.
- Job number at FIRQB+FQFIL is not detached.
- The PPN specified does not match PPN of job to attach.
- Caller does not have GACNT or WACNT privilege, and the job to attach to has a PPN different from that of the caller.
- Password is not valid.

Data Passed — Reattach

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ATT (= 6)	//////////	2	
FQSIZM	5	KB no. to attach to	caller's job number	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

Other than a possible error in byte 0 of the FIRQB, the reattach function of the UU.ATT directive does not return any data.

Errors

BADFUO The system returns this error for one of the following reasons:

- Job number at **FIRQB+FQFIL** is out of range or no such job exists.
- Caller is not detached.
- KB number is out of range.
- KB is currently allocated, opened, or the console keyboard of some job other than the calling job.
- The terminal is restricted and the caller does not have **DEVICE** privilege.

Data Passed — Swap Console

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ATT (= 6)	////////////////////////////////	2	
FQSIZM	5	bit mask	job no. to swap with	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQSIZM Bit 0 must be set for the swap console subfunction. All other bits are reserved.

FIRQB+FQFIL If the calling job is attached, this job must be detached. If the calling job is detached, this job must be attached. Both the calling job and this job must be running under the same PPN.

Data Returned

Other than a possible error in byte 0 of the **FIRQB**, the swap console function of the **UU.ATT** directive does not return any data.

Errors

BADFUO The system returns this error for one of the following reasons:

- Both the calling job and the job specified at **FIRQB+FQFIL** are detached, or neither job is detached.
- The job specified at **FIRQB+FQFIL** has a PPN different from the caller's.
- The value at **FIRQB+FQSIZM** is neither 0 nor 1.

3.36.5 UU.BCK (Change File Statistics)

Privileges Required

DATES is required to change the last access date.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.BCK (= -13)	////////////////////////////////	2	
FQSIZM	5	LSB of last access	channel no. (1-17)	4	FQFIL
	7	LSB of creation date	MSB of last access	6	FQPPN
	11	LSB of creation time	MSB of creation date	10	FQNAM1
	13	////////////////////////////////	MSB of creation time	12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	////////////////////////////////		30	
	33	////////////////////////////////		32	
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

FIRQB+5,6
FIRQB+7,10

The system internal format for dates has the form:
 $[(year - 1970) * 1000] + day-within-year$

FIRQB+11,12

Time is specified in minutes until midnight, where 1440 equals midnight.

NOTE

See the .DATE directive for a discussion of these formats.

Data Returned

Other than a possible error in byte 0 of the FIRQB, the UU.BCK subfunction does not return any meaningful data.

Errors

BADFUO The file open on the channel specified is either not a disk file or is a user file directory (UFD).

PRVIOL The disk is write protected or you do not have write access to the file.

3.36.6 UU.BYE (Logout)

Privileges Required

EXQTA is required to log out without a quota check. WACNT is required to log out without a self-kill.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.BYE (= 5)	////////////////////////////////	2	
	5	////////////////////////////////	type of logout	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

Bits 0 and 1 specify:

Bit	Setting	Meaning
0	Clear	Close I/O channels, deassign devices, remove receivers, and dismount disks mounted /NOSHARE before performing logout.
	Set	Perform logout only; do not close channels, deassign devices, remove receivers, or dismount disks. This call requires WACNT privilege.
1	Clear	Check quotas on all mounted disks before performing logout.
	Set	Perform logout without checking disk quotas. This call requires EXQTA privilege.

If the caller does not have WACNT privilege, RSTS/E forces Bit 0 clear. If the caller does not have EXQTA privilege, RSTS/E forces Bit 1 clear. Bits 2 through 7 are reserved.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
QCFUN	3	////////////////////////////////	2	
	5	logout status (0, -1, or -2)	4	FQFIL
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	///////// quota code	16	FQSIZ
	21	MSB of current usage MSB of current quota	20	FQNAM2
	23	no. of det. jobs all. no. of det. jobs	22	FQMODE
	25	LSB of current disk quota (in blocks)	24	FQFLAG
	27	LSB of current disk usage (in blocks)	26	FQPFLG
	31	disk name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real disk unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL Zero means neither disk quota nor detached job quota is exceeded. If you have WACNT privilege, the system returns control to your program. Otherwise, the system kills your job after performing necessary clean-up functions. Minus one means a quota is exceeded; your job is still logged in. Minus two means a quota is exceeded, but your job is logged out. If you have WACNT privilege, the system returns control to your program. Otherwise, the system kills your job after performing necessary clean-up functions.

FIRQB+FQSIZ Indicates which quota is exceeded. (This value is valid only if FIRQB+FQFIL equals -1 or -2.) Zero means disk quota. One means detached job quota.

FIRQB+FQMODE Returned if detached job quota is exceeded. FIRQB+FQMODE contains the number of detached jobs in the current account. FIRQB+FQMODE+1 contains the number of detached jobs allowed.

FIRQB+FQDEV Returned if disk quota is exceeded.

Errors

No errors are possible with the UU.BYE subfunction.

3.36.7 UU.CCL (Add/Delete CCL Command)

Privileges Required

INSTALL is required to add or delete a CCL command.

Data Passed — Add

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.CCL (= -30)	////////////////////////////////	2	
FQSIZM	5	abbrev. point, chars	must = 0 for add	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format of program to run (2 words)		10	FQNAM1
	13			12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	CCL command one to nine characters padded with NULs (ASCII code 000) to nine characters		16	FQSIZ
	21			20	
	23			22	
	25			24	
FQPROT	27	(must be 0)		26	
	31	device name (2 ASCII chars) must be disk		30	FQDEV
	33	<>0,unit number real	device unit number	32	FQDEVN
	35	line number to start execution		34	FQCLUS
	37	////////////////////////////////		36	

FIRQB+FQSIZ The name you give to the CCL command you are defining; from one to nine characters, padded with nulls.

Example

```

MOV  #UU.CCL, FIRQB+FQFUN      ; FUNCTION CODE ADD/DELETE CCL
CLRB  FIRQB+FQFIL              ; ADD FUNCTION
MOV  #2, FIRQB+FQSIZM         ; ABBREV. POINT IN CHARACTERS
MOV  #195.*256.+1, FIRQB+FQPPN; PPN [195,1]
MOV  ^RTES, FIRQB+FQNAM1      ; FILE NAME IS TEST.TSK
MOV  ^RT, FIRQB+FQNAM1+2      ;
MOV  ^RTSK, FIRQB+FQEXT       ;
MOV  #XR, FIRQB+FQSIZ         ; COMMAND IS "XRUN"
MOV  #UN, FIRQB+FQSIZ+2       ;
CLR  FIRQB+FQSIZ+4            ; PAD COMMAND WITH NULLS
CLR  FIRQB+FQSIZ+6            ;
CLR  FIRQB+FQSIZ+10           ; HIGH BYTE MUST BE ZERO
MOV  #SY, FIRQB+FQDEV         ; DEVICE NAME IS SY
CLRB  FIRQB+FQDEVN            ; UNIT 0
MOV  #-1, FIRQB+FQDEVN+1      ; AND UNIT NUMBER IS REAL
CLR  FIRQB+FQCLUS             ; PROGRAM STARTS AT LINE 0
.UUO                          ; CREATE THE CCL

```

Data Passed — Delete

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CCL (= -30)	//////////	2	
FQSZM	5	abbrev. point, chars	= -2 for delete	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	CCL command one to nine characters padded with NULs (ASCII code 000) to nine characters		16	FQSIZ
	21			20	
	23			22	
	25			24	
	27	//////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.CCL directive does not return any meaningful data.

Errors

- BADNAM** For add only. The CCL command either begins with a number or contains an otherwise unacceptable character.
- INUSE** For add only. The CCL command is already defined.
- NODEVC** For delete only. The CCL command does not exist.

3.36.8 UU.CFG (Set Device/System Default Characteristics)

Privileges Required

HWCFG is required to:

- Declare a device as restricted or unrestricted
- Set magnetic tape default density
- Set line printer characteristics

SWCFG is required to:

- Set magnetic tape label defaults
- Set power fail delay
- Set date/time presentation formats
- Set system flags
- Set dynamic region limit

SWCTL is required to set or return system Answerback.

HWCTL is required to enable/disable a device.

Data Passed (Set DEVn: characteristics)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.CFG (= 42)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code =0	4	FQFIL
	7	parameter switches	par. change flags	6	FQPPN
	11	////////////////////////////////		10	
	13	////////////////////////////////		12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	device name (2 ASCII chars) not a disk		30	FQDEV
	33	377	device unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

FIRQB+FQPPN

Parameter change flags:

Bit	Setting	Meaning
-----	---------	---------

0	Clear	No change in enable/disable status
	Set	Use value in FIRQB+FQPPN+1 to change status
1	Clear	No change in device ownership
	Set	Use value in FIRQB+FQPPN+1 to change ownership
2	Clear	No change in modem control
	Set	Use value in FIRQB+FQPPN+1 to change modem control

All combinations of the bit values are legal.

FIRQB+FQPPN+1

If FIRQB+FQPPN is zero, then this byte should also be zero. If FIRQB+FQPPN is not zero, then the following values are used to alter device parameters:

Bit	Setting	Meaning
-----	---------	---------

0	Clear	Enable device
	Set	Disable device
1	Clear	No privilege needed for device ownership
	Set	DEVICE privilege needed for device ownership
2	Clear	Put device under LOCAL control
	Set	Put device under MODEM control

Data Returned (Set DEVn: characteristics)

Except for a possible error in byte 0 of the FIRQB, the system returns the following:

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
	5	////////////////////////////////////		4	
	7	device parameters	device status flags	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////			

FIRQB+FQPPN

Device status flags indicating:

Bit	Setting	Meaning
0	Clear	Device is enabled and free
	Set	Device is disabled or in use
1	Clear	Device ownership does not require privilege
	Set	Device ownership requires HWCFG privilege
2	Clear	Device is in LOCAL mode
	Set	Device is under MODEM control

Note that Bit 2 is only valid if the device name passed in FIRQB+FQDEV is KB.

FIRQB+FQPPN+1

Valid values are: 0—If bit 0 in FIRQB+FQPPN is clear. 3—The device was disabled by this call and can be enabled by this call. Any even integer—Job number * 2 of the current device owner. Any odd integer (other than 3)—The device was disabled by the monitor and cannot be enabled.

Errors (Set DEVn: characteristics)

- INUSE** An attempt was made to disable a device that was in use by another user or one that had been previously disabled.
- NOTAVL** An attempt was made to enable a device which was not disabled through use of this call.
- PRVIOL** An attempt was made to alter device characteristic of a disk unit.

Data Passed (Set LPn: characteristics)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	UU.CFG (= 42)	////////////////	2	
	5	////////////////	subfunction code =1	4	FQFIL
	7	default form length	default page width	6	FQPPN
	11	set characteristics flag bits mask		10	FQNAM1
	13	clear characteristics flag bits mask		12	
	15	LPTSPC (ASCII value)	0=no chg/1=chg LPTSPC	14	FQEXT
	17	////////////////////		16	
	21	////////////////////		20	
	23	////////////////////		22	
	25	////////////////////		24	
	27	////////////////////		26	
	31	device name (2 ASCII chars) must be "LP"		30	FQDEV
	33	377	device unit number	32	FQDEVN
	35	////////////////////		34	
	37	////////////////////		36	

- FIRQB+FQPPN** Default Page Width; zero indicates no change, nonzero indicates the new value for the default page width.
- FIRQB+FQPPN+1** Default Printer Form Length; zero indicates no change, a nonzero value is the new default printer form length. The maximum value is 377 octal.

FIRQB+FQNAM1	<p>Set characteristics flag bits mask. Zero indicates no change. A nonzero value represents the flag bits to be set in the characteristics flag word. The bit positions currently in use are:</p> <p>Bit 0 Allow <BS> for backspace (LA180)</p> <p>Bit 1 Do not process <BS> as backspace</p> <p>Bit 2 Allow 8-bit characters (LN01)</p> <p>Bit 3 Allow nonprinting characters</p> <p>Bit 4 No fill for <FF></p> <p>Bit 5 Allow <EOT></p> <p>Bit 6 No <CR> required before <LF>,<VT>,<FF> (LP11)</p> <p>Bit 7 Ignore <CR> if next is <LF> (LP11)</p> <p>Bit 8 No <TAB> expanded (LN01)</p> <p>Bit 9 Reserved</p> <p>Bit 10 Reserved</p> <p>Bit 11 Allow lower case (LN01)</p> <p>Note that a value of 3 (set both bits 0 and 1) is illegal. All other combinations are permitted.</p>
FIRQB+FQNAM1+2	<p>Clear characteristics flag bits mask. Zero indicates no change. A nonzero value represents the combination of flag bits to be cleared. See the previous discussion for FIRQB+FQNAM1 for an explanation of the bit meanings.</p>
FIRQB+FQEXT	<p>Change special character flag. Zero indicates no change. One indicates a change to the Lineprinter Special Character (LPTSPC).</p>
FIRQB+FQEXT+1	<p>If FIRQB+FQEXT is equal to one, then this byte contains the new Lineprinter Special Character.</p>
FIRQB+FQDEV	<p>The device name in two ASCII characters; must be LP.</p>
FIRQB+FQDEVN	<p>The line printer unit number on which to perform the operation.</p>

Data Returned (Set LPn: characteristics)

Except for a possible error in byte 0 of the FIRQB, the system returns the following:

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
	5	////////////////////////////////////		4	
	7	case flag	default page width	6	FQPPN
	11	current characteristics flag word		10	FQNAM1
	13	////////////////////////////////////		12	
	15	current special char.	////////////////////////////////	14	FQEXT
	17	////////////////////////////////	current form length	16	FQSIZ
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQPPN Current width of the LP unit specified in FIRQB+FQDEV and FIRQB+FQDEVN.

FIRQB+FQPPN+1 Current value of the case flag.

FIRQB+FQNAM1 Current value of the characteristics flag word.

FIRQB+FQEXT+1 Current value of the special character.

FIRQB+FQSIZ Current value of the default form length.

Errors (Set LPn: characteristics)

BDNERR An attempt was made to set both bits 0 and 1 in the characteristics flag word.

NODEVC An attempt was made to set characteristics of a printer which is not supported by the monitor, or the device name specified in FIRQB+FQDEV was not LP.

Data Passed (Set System Defaults)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CFG (= 42)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code =2	4	FQFIL
	7	powerfail delay in seconds		6	FQPPN
	11	default time format	default date format	10	FQNAM1
	13	////////////////////////////////	default tape label	12	
	15	default tape density		14	FQEXT
	17	dynamic region limit		16	FQSIZ
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	FQDEV
	33	////////////////////////////////////		32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQPPN** Default powerfail delay in seconds. Zero indicates no change. A nonzero value represents the new default powerfail delay. The maximum is 454 (octal) seconds.
- FIRQB+FQNAM1** Default date format. Zero indicates no change. One indicates NUMERIC date format. The ALPHA date format is indicated by 377.
- FIRQB+FQNAM1+1** Default time format. Zero indicates no change. One indicates 24 hour time format. The 12 hour (AM/PM) time format is indicated by 377.
- FIRQB+FQNAM1+2** Default magnetic tape label. Zero indicates no change. One indicates DOS magnetic tape label. The ANSI magnetic tape label is indicated by 377.
- FIRQB+FQEXT** Default magnetic tape density in bits per inch (bpi).
- FIRQB+FQSIZ** Nonprivileged user dynamic region limit. Zero indicates no change, minus one (-1) sets the limit to 0 K words. A value between 1 and 2048 sets the limit to that value in K words. The sum of the dynamic region sizes owned by all nonprivileged users cannot exceed the limit value given here. If a user without INSTAL privilege attempts to create a region whose size, when added to all other nonprivileged region sizes, exceeds this limit, the system returns a NOROOM error message and does not create the region.

Data Returned (Set System Defaults)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
1		////////////////////////////////////		0	
3		////////////////////////////////////		2	
5		////////////////////////////////////		4	
7		seconds to delay on powerfail restarts		6	FQPPN
11		default time format	default date format	10	FQNAM1
13		////////	default tape label	12	
15		default tape density		14	FQEXT
17		dynamic region limit		16	FQSIZ
21		////////////////////////////////////		20	
23		////////////////////////////////////		22	
25		////////////////////////////////////		24	
27		////////////////////////////////////		26	
31		////////////////////////////////////		30	
33		////////////////////////////////////		32	
35		////////////////////////////////////		34	
37		////////////////////////////////////		36	

FIRQB+FQPPN	The number of seconds to delay of powerfail restarts.
FIRQB+FQNAM1	Default date format. One indicates NUMERIC date format. The ALPHA date format is indicated by 377.
FIRQB+FQNAM1+1	Default time format. One indicates 24 hour time format. The 12 hour (AM/PM) time format is indicated by 377.
FIRQB+FQNAM1+2	Default magnetic tape label. One indicates DOS magnetic tape label. The ANSI magnetic tape label is indicated by 377.
FIRQB+FQEXT	Default magnetic tape density in bits per inch (bpi).
FIRQB+FQSIZ	Default region limit in K words.

Errors (Set System Defaults)

FIXERR	An attempt was made to specify a powerfail delay value greater than 454 (octal) seconds.
---------------	--

Data Passed (Load and Remove Monitor Overlay Code)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
QFQUN	3	UU.CFG (= 42)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code =4	4	FQFIL
	7	////////////////////////////////	0 = load, 1 = unload	6	FQPPN
	11	internal overlay name in RAD50 format		10	FQNAM1
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQPPN

Operation flag. Zero indicates load the named overlay code. A one indicates unload the named code.

FIRQB+FQNAM1

Internal overlay name in RAD50 format. These names are subject to change in future releases of RSTS/E. Presently, the following names have been defined:

DIR Handles directory lookups

DLN Handles delete and rename

LIN Handles the UU.ATR SYS() call

PFB Handles several functions used by the DCL command file processor

TRM Handles the set-terminal-characteristics (UU.TRM) SYS() call.

UUO Handles UU.TB1, UU.TB2, UU.TB3, UU.FCB, UU.CNV, UU.SYS, and UU.ERR

FUT Handles UU.FIL SYS() call

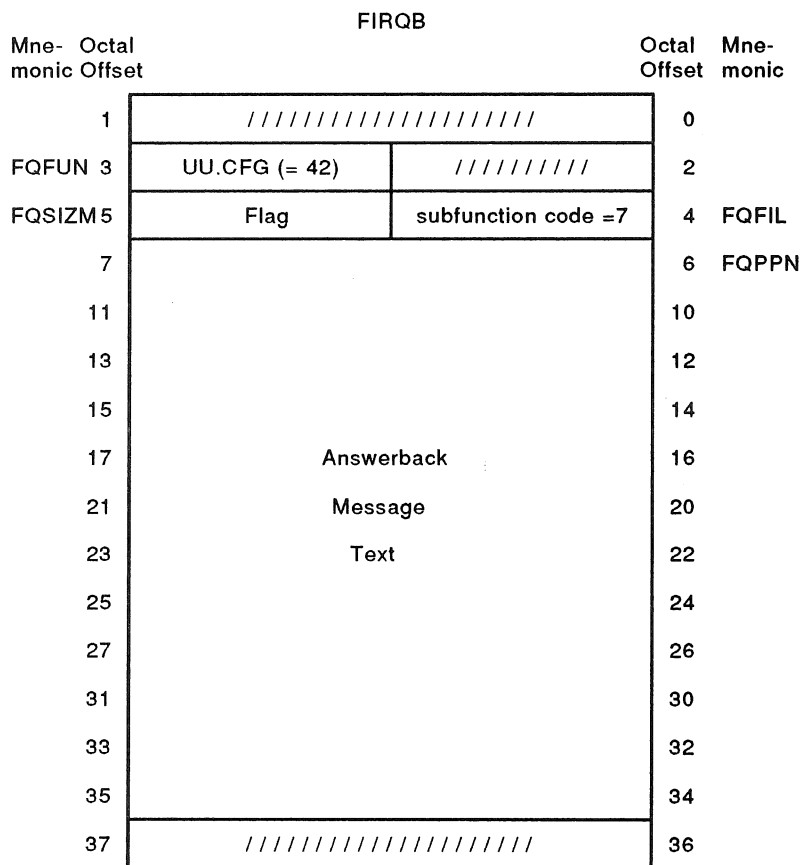
Data Returned (Load and Remove Monitor Overlay Code)

Except for a possible error in byte 0 of the FIRQB, for a load operation, the system returns the amount of XBUF used (in bytes) in FIRQB+FQPPN. The remove monitor overlay code operation does not return any data.

Errors (Load and Remove Monitor Overlay Code)

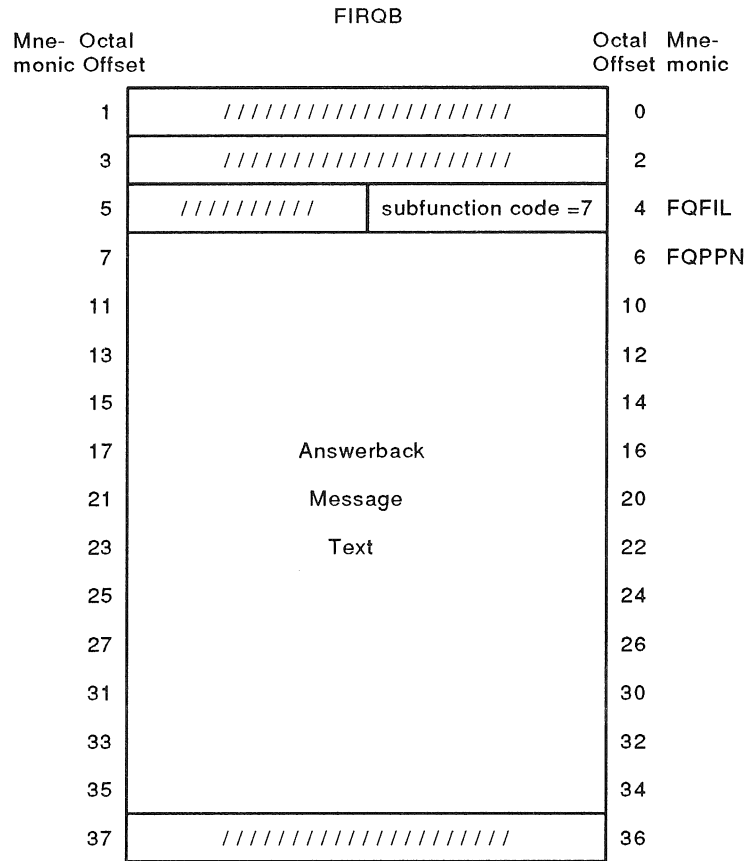
- INUSE The overlay code specified is already loaded. (Load)
- NOBUFS There is not enough XBUF available to load the named overlay code. (Load)
- NODEVC The named overlay code is not loadable. (Load)
- NOSUCH The overlay name is invalid. (either)
- NOTMNT The overlay name is not loaded. (Remove)

Data Passed (Set and Return System Answerback Message)



- FIRQB+FQSIZM Flag= -1 to return the Answerback text
 Flag > 0 to set the Answerback text.
- FIRQB+FQPPN The ASCII string for the Answerback text.

Data Returned



FIRQB+FQPPN

Answerback message text returned if Flag = -1.

Errors

PRVIOL

Current user does not have the SWCTL privilege.

NOTAVL

There is no Answerback text to return.

NOBUFS

There are no buffers available to store the text.

3.36.9 UU.CHE (Enable/Disable Disk Caching)

Privileges Required

TUNE is required to enable or disable disk caching.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CHE. (= 23)	////////////////////////////////	2	
FQSIZM	5	cache cluster size	subfunction code	4	FQFIL
	7	limit on total number of cache clusters		6	FQPPN
	11	limit on clusters for directory caching		10	FQNAM1
	13	limit on clusters for user data caching		12	
	15	controls sm. buffers	mode for en/disable	14	FQEXT
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQSIZM The number of blocks used in a caching operation.
- FIRQB+FQFIL 0 Enable directory and data caching
 1 Disable all caching
 200 Return current caching parameters
- FIRQB+FQEXT 0 Use current setting
 1 Enable caching as specified in file open mode or UFD setting
 100 Cache all data transfers regardless of the file open mode or UFD setting
 200 Disable all caching
- FIRQB+FQEXT+1 0 Use current setting
 1 Allow use of small buffer pool (ignored)
 200 Do not use small buffer pool
- FIRQB+FQSIZ The new value of the cache replacement time, in seconds. Specify zero for no change.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
FQSIZM5	5	cache cluster size	current cache setting	4	FQFIL
	7	limit on total number of cache clusters		6	FQPPN
	11	limit on clusters for directory caching		10	FQNAM1
	13	limit on clusters for user data caching		12	
	15	controls sm. buffers	mode for en/disable	14	FQEXT
	17	cache age		16	FQSIZ
	21	monitor pool		20	FQNAM2
	23	XBUF pool		22	FQMODE
	25	number of directory tags		24	FQFLAG
	27	number of data tags		26	FQPFLG
	31	number of invalid tags		30	FQDEV
	33	////////////////////////////////		32	
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

FIRQB+FQFIL

Current cache settings and available options:

- 0 All caching disabled.
- 1 Directory caching enabled, data caching is disabled.
- 200 Directory caching disabled, data caching is enabled.
- 201 Directory caching enabled, data caching is enabled.

FIRQB+FQSIZ

The time in seconds that an unused cache can be kept in memory.

FIRQB+FQNAM2

The amount of small buffers used for caching (in units of cache clusters). Always zero.

FIRQB+FQMODE

The amount of XBUF used for caching (in units of cache clusters).

FIRQB+FQFLAG

The number of cache clusters in XBUF used for directory caching.

FIRQB+FQPFLG

The number of cache clusters in XBUF used for data caching.

FIRQB+FQDEV

The number of invalid cache clusters in XBUF.

Errors

INUSE

All of the clusters allotted to the cache are in use.

NOROOM

Not enough XBUF space to enable data caching. System manager must allocate at least 3K words.

NOTAVL

Tried to change cluster size while cached file disk transfer in progress; retry.

PRVIOL

Current user does not have TUNE privilege.

3.36.10 UU.CHK (Check File Access/Privilege Name/Privilege Mask Handling)

The UU.CHK directive performs a variety of privilege checking functions. It takes a subfunction code in FQFIL. The subfunction codes are:

- 0 Check file access rights. You can use this subfunction to check access rights to a file of known protection code and PPN without performing the OPEN function. If a file's access rights need to be checked but the protection code is not known, the most straightforward method is to open the file. You can also use this subfunction to define file-like access rules for objects other than files. For example, the Print/Batch Services programs use this subfunction to control access to jobs.
- 1 Convert privilege name to mask. You can use this subfunction to convert a privilege name to its internal representation or to determine whether a user has a specific privilege.
- 2 Convert privilege mask to name. You can use this subfunction to generate the symbolic form of a privilege mask. It scans the specified privilege mask looking for a bit that is set. If none are found, the error NOSUCH is returned. Otherwise, the first one found is cleared and the privilege name is returned in FIRQB+FQNAM2.

Privileges Required

None

Data Passed - Check File Access Rights

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CHK (= 40)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code=0	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
FQPROT	27	protection code	////////////////////////////////	26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned - Check File Access Rights

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	access flags	4	FQERNO
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQERNO

The bits are set to indicate access rights as follows:

- Bit 0 Owner rights are granted
 - Bit 1 Read access is not allowed
 - Bit 2 Write access is not allowed
 - Bit 5 Execute access is not allowed
 - Bit 6 Accounting rights are granted or the PPN is the same as that of the caller.
 - Bit 7 Accounting rights are granted
- Bits 3, 4, and 8 to 15 are reserved for use by Digital.

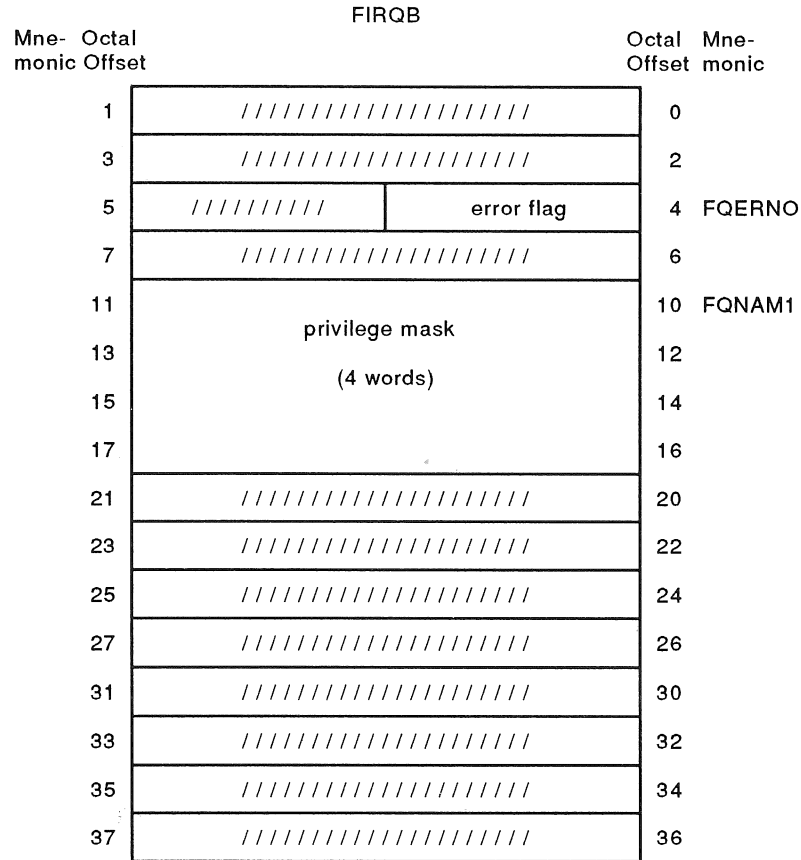
Errors

No errors are possible with this subfunction of UU.CHK.

Data Passed - Convert Privilege Name to Mask

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CHK (= 40)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code =1	4	FQFIL
	7	////////////////////////////////////		6	
	11	privilege name as a 6-character		10	FQNAM1
	13	uppercase ASCII string or "ALL"		12	
	15	padded with NULLs		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned - Convert Privilege Name to Mask



FIRQB+FQERNO

If the passed privilege name was not ALL:

Zero means the current job has the named privilege.

One means the current job does not.

If ALL was passed:

Zero means the current job has all privileges.

One means the current job does not.

FIRQB+FQNAM1

If the passed privilege name was not ALL, the bit corresponding to the named privilege is set. All other bits are clear.

If ALL was passed, all privilege bits that currently have meaning are set. All other bits are clear.

Errors

NOSUCH

The name passed in FIRQB+FQNAM1 is not a valid privilege name.

Data Passed - Convert Privilege Mask to Name

Mne- Octal monic Offset		FIRQB		Octal Mne- Offset monic
1		////////////////////////////////////		0
FQFUN 3		UU.CHK (= 40)	//////////	2
5		//////////	subfunction code =2	4 FQFIL
7		////////////////////////////////////		6
11		privilege mask (4 words)		10 FQNAM1
13				12
15				14
17				16
21		////////////////////////////////////		20
23		////////////////////////////////////		22
25		////////////////////////////////////		24
27		////////////////////////////////////		26
31		////////////////////////////////////		30
33		////////////////////////////////////		32
35		////////////////////////////////////		34
37		////////////////////////////////////		36

Data Returned - Convert Privilege Mask to Name

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	privilege mask (4 words)	10	FQNAM1
	13		12	
	15		14	
	17		16	
	21	6-character uppercase ASCII string padded with NULLs	20	FQNAM2
	23		22	
	25		24	
	27		26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQNAM1

The privilege mask is the same as that passed except that any undefined bits and the bit corresponding to the name in FQNAM2 is turned off. As a result, a subsequent call using the returned mask would return the name of the next privilege. This makes it easy to translate an entire mask by repeated calls to this function.

FIRQB+FQNAM2

The name of the privilege corresponding to the first set bit in the mask.

Errors

NOSUCH

The privilege mask in FIRQB+FQNAM1 is zero or specifies only unassigned privilege bits.

3.36.11 UU.CHU (Set Password, Change Password/Quota/Expiration Date, Disable Terminal, Kill Job)

This directive has five subfunctions:

- Set Long Password
- Change Quotas (updated format), Expiration Date, and Short Password
- Change Quotas (pre-V9.0 format), Expiration Date, and Short Password
- Disable Terminal
- Kill Job

Privileges Required (Set Long Password)

GACNT or WACNT are required to set passwords.

Data Passed (Set Long Password)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////		0		
FQFUN	3	UU.CHU (=10)	////////////////	2		
	5	////////////////	////////////////	4	FQFIL	
	7	project number	programmer number	6	FQPPN	
	11	long password (14 bytes, padded with NULLs)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23				22	
	25		24			
	27	////////////////////		26		
	31	////////////////////		30		
	33	////////////////////		32		
	35	(must be 0)	(must be 377)	34	FQCLUS	
	37	////////////////////		36		

FIRQB+FQNAM1

If the first byte is zero, the password information is deleted (this turns the account into a nonuser account). If password lookup is enabled using CREATE/ACCOUNT or SET PASSWORD then the password must consist of six uppercase letters or numbers. Otherwise, it can contain any character except the question mark (?). The monitor also enforces a minimum password length of six characters.

NOTE

In this subfunction, the PPN is specified in a different place than in the "Change Short Password/Quota" subfunctions where the PPN is specified in FQNAM1.

Privileges Required (Change Short Password, Quotas V9.0 & Higher, or Expiration Date)

GACNT or WACNT are required to set passwords, quotas, or expiration date.

Data Passed (Change Short Password, Quotas for V9.0 & Higher, or Expiration Date)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	UU.CHU (=10)	////////////////	2	
	5	flag byte	detached job quota	4	FQFIL
	7	////////////////////		6	
	11	project number	programmer number	10	FQNAM1
	13	new password in RAD50 format (2 words) (zero if no change)		12	
	15			14	
	17	logged-out quota (LSB)		16	FQSIZ
	21	account expiration date		20	FQBUFL
	23	logged-in quota (LSB)		22	FQMODE
	25	logged-out quota(MSB)	logged-in quota(MSB)	24	FQFLAG
	27	////////////////	=377 to change quota	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	(must be zero)		34	FQCLUS
	37	////////////////////		36	

- FIRQB+FQFIL The number of detached jobs allowed under this account.
- FIRQB+FQFIL+1 Flag byte. Zero means change the disk quotas using the pre-V9.0 format (see the next subfunction). Nonzero means the following:
 - Bit 0 Change logged-out quota
 - Bit 1 Change logged-in quota
 - Bit 2 Reserved
 - Bit 3 Change detached job quota
 - Bit 4 Reserved
 - Bit 5 Reserved
 - Bit 6 Reserved
 - Bit 7 Change disk quotas using updated format
- FIRQB+FQSIZ The LSB of the logged-out quota.

FIRQB+FQBUFL	Zero means no change. Nonzero means this value is the new expiration date.
FIRQB+FQMODE	The LSB of the logged-in quota.
FIRQB+FQFLAG	The MSB of the logged-in quota.
FIRQB+FQFLAG+1	The MSB of the logged-out quota.
FIRQB+FQPFLG	To change disk quota, set this byte to 377.
FIRQB+FQDEV	The device name as two ASCII characters.
FIRQB+FQDEVN	The device unit number, passed as a binary value in byte FIRQB+FQDEVN. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no device unit number.

Privileges Required (Change Short Password, Pre-V9.0 Quotas or Expiration Date)

GACNT or WACNT are required to set passwords, quotas, or expiration date.

Data Passed (Change Short Password, Pre-V9.0 Quotas or Expiration Date)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.CHU (=10)	////////////////////////////////	2	
	5	////////////////////////////////		4	
	7	////////////////////////////////		6	
	11	project number	programmer number	10	FQNAM1
	13	new password in RAD50 format (2 words)		12	
	15	(zero if no change)		14	
	17	number of blocks for quota; 0 = unlimited		16	FQSIZ
	21	account expiration date		20	FQBUFL
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////	=377 to change quota	26	FQPFLG
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	(must be zero)		34	FQCLUS
	37	////////////////////////////////		36	

FIRQB+FQBUFL	Zero means no change. Nonzero means this value is the new expiration date.
FIRQB+FQPFLG	To change disk quota, set this byte to 377.
FIRQB+FQDEV	The device name as two ASCII characters.

FIRQB+FQDEVN The device unit number, passed as a binary value in byte FIRQB+FQDEVN. A nonzero value in FIRQB+FQDEVN+1 indicates an explicit device unit number. A zero value in FIRQB+FQDEVN+1 indicates no device unit number.

Privileges Required (Disable Terminal)

HWCTL is required to disable a terminal.

Data Passed (Disable Terminal)

		FIRQB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CHU (=10)	//////////	2	
	5	//////////	keyboard number	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	(must = 377)	(must = 377)	34	FQCLUS
	37	////////////////////////////////////		36	

Privileges Required (Kill Job)

JOBCTL is required to kill a job.

Data Passed (Kill Job)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.CHU (=10)	////////	2	
	5	////////	job number to kill	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	(must = 377)	(must be zero)	34	FQCLUS
	37	////////////////////////////////////		36	

FIRQB+FQFIL Specify zero to kill current job.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.CHU subfunction does not return any meaningful data.

Errors

BADFUO The system returns this error for one of the following:

- Change password/quota. Device specified is not a disk.
- Kill job. Job number is out of range or the job does not exist.
- Disable terminal. The keyboard number is:
 - Greater than number of keyboards on system
 - A pseudo keyboard
 - Currently opened or allocated by a job

BADNAM For change password/quota. Password is too short, or too long, or contains illegal characters.

NOSUCH For change password/quota. Account not present on disk specified.

NODEV For change password/quota. Device specified is not on the system.

3.36.12 UU.CNV (Date and Time Conversion)

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////////	0	
FQFUN	3	UU.CNV (= 24) //////////////////////////////////	2	
	5	internal form date (see .DATE);0 = current	4	FQFIL
	7	date flag	6	FQPPN
	11	////////////////////////////////////	10	
	13	////////////////////////////////////	12	
	15	////////////////////////////////////	14	
	17	////////////////////////////////////	16	
	21	////////////////////////////////////	20	
	23	internal form time (see .DATE);0 = current	22	FQMODE
	25	time flag	24	FQFLAG
	27	////////////////////////////////////	26	
	31	////////////////////////////////////	30	
	33	////////////////////////////////////	32	
	35	////////////////////////////////////	34	
	37	////////////////////////////////////	36	

- FIRQB+FQFIL** The date to be converted, or zero for the current date.
- FIRQB+FQPPN** Zero means use system default format. A value less than zero means use alphabetic date format. A value greater than zero means use ISO numeric date format.
- FIRQB+FQMODE** The time to be converted, or zero for the current time.
- FIRQB+FQFLAG** Zero means use system default format. A value less than zero means use 12-hour time format. A value greater than zero means use 24-hour time format.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// | job number * 2	2	FQJOB
	5	(same as data passed)	4	FQFIL
	7	(same as data passed)	6	FQPPN
	11	date string (padded at end with NULLs dd-mmm-yy or yy.mm.dd	10	FQNAM1
	13		12	
	15		14	
	17		16	
	21		20	
	23	(same as data passed)	22	FQMODE
	25	(same as data passed)	24	FQFLAG
	27	time string (padded at end with NULLs hh:mm xm or hh:mm	26	FQPFLG
	31		30	
	33		32	
	35		34	
	37	////////////////////////////////	36	

Errors

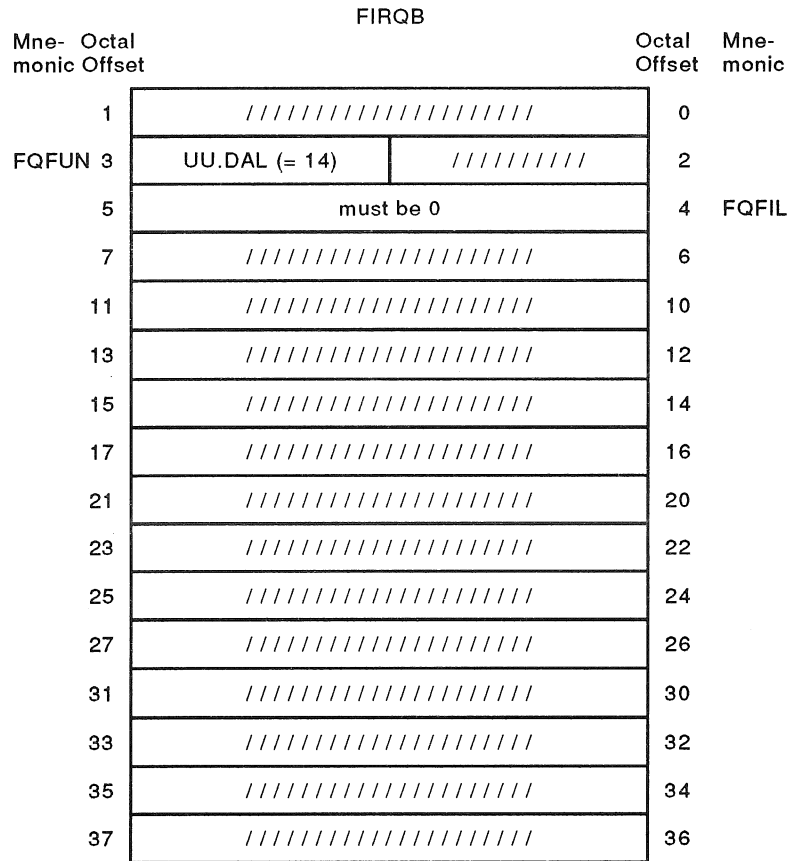
No errors are possible; however, if the date or time passed is illegal, random output is generated.

3.36.13 UU.DAL (Deallocate All Devices and Deassign All User Logicals)

Privileges Required

None

Data Passed



FIRQB+FQFUN The function code UU.DAL (octal value equals 14)

FIRQB+FQFIL The deassign-only flag. Must be zero.

Data Returned

The UU.DAL subfunction does not return any data.

Errors

No errors are possible with the UU.DAL subfunction.

3.36.14 UU.DAT (Change System Date/Time)

Privileges Required

DATES is required to change system date or time.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.DAT (= -16) //////////////////////////////////	2	
	5	new current date	4	FQFIL
	7	new current time	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL The system internal format for date is:
*[(year - 1970) * 1000] + day-within-year*

FIRQB+FQPPN Time is expressed as minutes until midnight, where 1440 equals
 midnight.

NOTE

A value of zero in either of these fields means no change is to be made.
 See the .DATE directive for a discussion of these formats.

Data Returned

The UU.DAT subfunction does not return any data.

Errors

PRVIOL Dates prior to 1-Jan-90 cannot be set.

3.36.15 UU.DEA (Deallocate Device)

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.DEA (= 13)	////////////////////////////////	2	
	5	////////////////////////////////////		4	
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	device name (2 ASCII characters) or 0		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.DEA subfunction does not return any meaningful data.

Errors

NODEV The device or device type in the two words at FIRQB+FQDEV is not on the system.

3.36.16 UU.DET (Detach)

Privileges Required

None required to detach the caller's job (depending on quotas). JOBCTL is required to detach another job. EXQTA is required to suppress the detached job quota check.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.DET (= 7)	////////////////////////////////	2	
	5	////////////////////////////////	close flag & job no.	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL Flag byte as follows: Bits 0-6 equals the job number to detach. If zero, detach calling job. Bit 7 clear means do not close terminal channels or deallocate terminal. Bit 7 set means close all channels on which terminal is open and deallocate terminal, if allocated.

NOTE

If a job running under control of an indirect command file is detached using the UU.DET directive, a new job is created at that terminal, logged in to the same account, and execution of the command file continues with the new job. The detached job retains its job number, while the command file resumes under a different job number.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.DET subfunction does not return any meaningful data.

Errors

BADFUO The current job is already detached.

QUOTA The detached job quota for the account has been reached.

3.36.17 UU.DIE (System Shutdown)

Privileges Required

SHUTUP privilege is required to shut down the system.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.DIE (= -20) //////////////////////////////////	2	
	5	Flag word	4	FQFIL
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQPPN Flag word = 0 means no automatic restart (stop in INIT.SYS).
 Flag word = 1 means automatic restart.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.DIE subfunction does not return any meaningful data.

Errors

- BADFUO One of these conditions has not been met:
- Only one job can be running
 - Logins must be disabled
 - No disks except the system disk can be mounted
 - No files can be open on the system disk

3.36.18 UU.DIR (Directory Lookup)

Privileges Required

If the device is restricted, DEVICE privilege is required to perform directory or disk lookup on the caller's account. File read or execute access (by protection code, GACNT or WACNT privileges) is required to perform disk directory lookup on another account.

Data Passed — Directory Lookup on Index

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.DIR (= 17) //////////////////////////////////	2	
	5	index of file to read	4	FQFIL
	7	project number programmer number	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	marked-for-delete flag	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit number real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL The index for the file to read. If the index is zero, UU.DIR returns the data for the first file in the directory. If the index is *n*, UU.DIR returns the the data for the *n+1*th file in the directory.

On magnetic tape, the index must be zero to rewind the tape before reading the first file. On DECTape, the index must be zero to read the directory blocks from the tape before reading the first file. Subsequent calls, where the index is not zero, read the directory from the BUFF.SYS file.

FIRQB+FQPPN Specifies the PPN to look up. For disks, the PPN defaults to the caller's PPN. For DOS format magnetic tape; a zero in FIRQB+FQPPN means look up files regardless of PPN, a nonzero means only files with that PPN are returned. For ANSI magnetic tape and DECTape, RSTS/E ignores FIRQB+FQPPN.

FIRQB+FQMODE Marked-for-delete flag. Bit 14 set causes UU.DIR to return information about marked-for-delete files.

Data Returned — Directory Lookup on Index

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	////////// | current job no. * 2	2	FQJOB
	5	(same as data passed)	4	FQFIL
	7	project number | programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file size	16	FQSIZ
	21	MSB of file size | protection code	20	FQNAM2
	23	date of last access	22	FQMODE
	25	date of creation	24	FQFLAG
	27	time of creation	26	FQPFLG
	31	(same as data passed)	30	FQDEV
	33	(same as data passed)	32	FQDEVN
	35	file cluster size	34	FQCLUS
	37	USTAT byte | no. entries returned	36	FQNTENT

FIRQB+FQMODE

System internal format for date is:

FIRQB+FQFLAG

$[(\text{year} - 1970) * 1000] + \text{day-within-year}$

FIRQB+FQPFLG

Time is returned as minutes before midnight, where 1440 equals midnight. For look up on DOS format magnetic tape, this field contains the PPN of the file.

NOTE

See the .DATE directive for a discussion of the date and time formats.

FIRQB+FQNTENT+1

The USTAT byte from the UFD Name entry. This byte contains the following internal flag information (for disk only):

Bit Meaning When Set

- 1 File is placed
- 2 Some job has write access now
- 3 File is open in update mode
- 4 File is contiguous; no extend allowed
- 5 No delete or rename allowed
- 7 File is marked for deletion

Errors

BADDIR	The directory structure is invalid. For magnetic tape, this error usually indicates you are reading an ANSI format tape in DOS mode, or a DOS format tape in ANSI mode.
DEVNFS	The device specified is non-file-structured.
NOSUCH	The account specified does not exist on the device or no more files exist on the account.
xxxxxx	The call also returns device-dependent errors such as NOTMNT (disk pack not mounted).

Data Passed — Special Magnetic Tape Directory Lookup

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.DIR (= 17) //////////////////////////////////	2	
	5	index of file to read	4	FQFIL
	7	(= 177777 for magnetic tape lookup)	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit number real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Data Returned — Special Magnetic Tape Directory Lookup

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	//////////	2	FQJOB
	5	(same as data passed)	4	FQFIL
	7	(same as data passed)	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	//////////	20	FQNAM2
	23	date of creation	22	FQMODE
	25	////////////////////////////////	24	
FQPROT	27	project number	26	FQPFLG
	31	(same as data passed)	30	FQDEV
	33	(same as data passed)	32	FQDEVN
	35	////////////////////////////////	34	
	37	//////////	36	FQNTENT
		no. entries returned		

FIRQB+FQMODE System internal format for date is:
 $[(year - 1970) * 1000] + day-within-year$

FIRQB+FQNTENT The number of entries returned: for disk, eight; for tape, six. (Not returned for SYS 17.)

Errors

BADDIR This error usually indicates you are reading an ANSI format tape in DOS mode, or a DOS format tape in ANSI mode.

NOSUCH No more files exist on the tape.

DEVNFS The device specified in the two words at FIRQB+FQDEVN is either non-file-structured or not a magnetic tape.

3.36.19 UU.DLU (Delete User Account)

Privileges Required

GACNT or WACNT is required to delete a user account.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.DLU (= 1)	////////////////////////////////	2	
	5	////////////////////////////////		4	
	7	////////////////////////////////		6	
	11	project number	programmer number	10	FQNAM1
	13	////////////////////////////////		12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.DLU subfunction does not return any meaningful data.

Errors

DEVNFS	Device is not disk or is a disk open in non-file-structured mode.
FIEXST	The account contains files.
INUSE	A user is currently logged in to the system under the account.
NOSUCH	The specified account does not exist.
PRVIOL	Account specified is either [0,0] or [0,1].

Discussion

UU.DLU deletes a user account from a private disk or the public structure. If the error ?Device not available (ERR=8) occurs, you must first delete all files in the account and release the UFD clusters with UU.ZER or the DCL DELETE command.

3.36.20 UU.DMP (Snap Shot Dump)

Privileges Required

SYSIO is required to perform a snap shot dump.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.DMP (= -33) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.DMP subfunction of .UUO does not return any meaningful data.

Errors

- BADFUO** A user without SYSIO privilege attempted to execute this call.
- NOSUCH** The call tried to write data to the file CRASH.SYS, but crash dump was not enabled. This error occurs if RSTS/E tries to allocate a crash dump file during system start-up but could not due to lack of disk space.
- xxxxxx** The call also returns device-dependent errors such as HNGDEV or NOTMNT.

Discussion

UU.DMP writes the current monitor image executing in memory and the contents of the extended buffer pool (XBUF) to the crash dump file [0,1]CRASH.SYS. XBUF contains monitor data structures, including DECnet/E data structures and caching information. You can analyze the contents of the CRASH.SYS file with the ANALYS program (see the *RSTS/E System Manager's Guide*).

3.36.21 UU.ERR (Return Error Messages)

Privileges Required

None

Data Passed

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.ERR (=11)	////////////////////////////////	2	
	5	////////////////////////////////	error number	4	FQERNO
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	KB*2;1's comp=detach	current job no. * 2	2	FQJOB
	5	error message - padded with NULLs to 28. characters (ASCII format)		4	FQERNO
	7			6	
	11			10	
	13			12	
	15			14	
	17			16	
	21			20	
	23			22	
	25			24	
	27			26	
	31			30	
	33			32	
	35	34			
	37	36			

Errors

No errors are possible with the UU.ERR subfunction.

Discussion

UU.ERR extracts error message text from the error message file installed during the current time-sharing session or from the default error message file if an error message file is not currently installed. The text is associated with the value of the ERR variable passed at FIRQB+FQERNO (usually FIRQB+FQFIL). The number in FIRQB+FQFUN of the returned string is two times the number of the keyboard on which the job is running.

3.36.22 UU.FCB (Get Open Channel Statistics: WCB/DDB/FCB)

The WCB is the Window Control Block for the file system. The DDB is the Device Data Block for nondisk devices. The FCB is the File Control Block for the file system. Note that the WCB, DDB, and FCB are internal RSTS/E structures that are subject to change at any time.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.FCB (= -10)	////////////////////////////////	2	
FQSIZM	5	subcode = 0 or 1	WCB,DDB,or FCB ch.no.	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQSIZM

Zero returns WCB or DDB information. One returns FCB information.

Data Returned (for subcode = 0)

For DDB or WCB.

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	////////// | current job no. * 2	2	FQJOB
	5	word 1 of either the WCB or DDB	4	FQFIL
	7	word 2 of either the WCB or DDB	6	FQPPN
	11	word 3 of either the WCB or DDB	10	FQNAM1
	13	word 4 of either the WCB or DDB	12	
	15	word 5 of either the WCB or DDB	14	FQEXT
	17	word 6 of either the WCB or DDB	16	FQSIZ
	21	word 7 of either the WCB or DDB	20	FQBUFL
	23	word 8 of either the WCB or DDB	22	FQMODE
	25	word 9 of either the WCB or DDB	24	FQFLAG
	27	word 10 of either the WCB or DDB	26	FQPFLG
	31	word 11 of either the WCB or DDB	30	FQDEV
	33	word 12 of either the WCB or DDB	32	FQDEVN
	35	word 13 of either the WCB or DDB	34	FQCLUS
	37	word 14 of either the WCB or DDB	36	FQNENT

Data Returned (for subcode = 1)

For FCB.

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	//////////	current job no. * 2	2	FQJOB
FQSIZM	5	users w/file open rr	users w/file open nrr	4	FQFIL
	7	MSB of file size	Status byte	6	FQPPN
	11	LSB of file size		10	FQNAM1
	13	PPN of file		12	
	15	name of file		14	FQEXT
	17			16	FQSIZ
	21	type of file		20	FQBUFL
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	device file is opened on		30	FQDEV
	33	<>0, unit number	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

The number of user who have a file open in a mode other than read regardless.

FIRQB+FQSIZM

The number of user who have a file open in read regardless mode.

FIRQB+FQPPN

This byte contains the following internal flag information:

Bit Meaning When Set

- 1 Placed file
- 2 Some job has write access now
- 3 File is open in update mode
- 4 File is contiguous; no extend allowed
- 5 No delete or rename allowed
- 6 File is a UFD
- 7 File is marked for deletion

Errors

- BADFUO** The subfunction code passed in **FIRQB+FQSIZM** is a value other than zero or one.
- BSERR** The channel number specified at **FIRQB+FQFIL** is outside the range 0 through 17.
- NODEVC** You requested FCB information (**FIRQB+FQSIZM=1**), but the file open on the I/O channel specified at **FIRQB+FQFIL** is not a disk file.
- NOTOPN** The I/O channel specified at **FIRQB+FQFIL** is not open.

Discussion

UU.FCB returns information kept in the **DDB**, **WCB** or **FCB** data structures. Note that these data structures are internal to **RSTS/E** and subject to change at any time.

Specifying 0 in **FIRQB+FQSIZM** returns information kept in the **DDB** or **WCB** data structures.

Specifying 1 in **FIRQB+FQSIZM** returns information kept in the **FCB**, including open counts, status byte, and current file size. **RMS** uses this call to determine file characteristics.

3.36.23 UU.FIL (File Placement and Modification)

Privileges Required

Read access (by protection code, GREAD or WREAD privilege) is required to read file flags. Write access (by protection code, GWRITE, WWRITE, and/or SYSIO privilege) is required to set file flags. DATES is required to change last access date. SYSIO is required to set/clear the no-delete flag (P-bit). TUNE is required to set/clear file caching bits.

To improve performance, use the DCL command LOAD/OVERLAY FILE_UTILITY to move the code for this call into memory. To remove it from memory, use the DCL command UNLOAD/OVERLAY FILE_UTILITY.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	UU.FIL (= -32)	////////	2	
FQSZM	5	function code	channel no.(1-17)	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)		10	FQNAM1
	13			12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17	least significant bits of block number		16	FQSIZ
	21	MSB of block number	placed/cache/seq.flg	20	FQNAM2
	23	new date of last access		22	FQMODE
	25	new date of creation		24	FQFLAG
	27	new time of creation		26	FQPFLG
	31	2-character(ASCII) device name (disk only)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////	subfunction code	34	FQCLUS
	37	////////////////////		36	

FIRQB+FQFIL

You can also place a zero in this byte and specify the file by file specification (device, PPN, file name, and type). The system ignores the values in bytes 6 through 15 and 30 through 33 if you use a nonzero channel number.

FIRQB+FQSIZM	This byte contains the following internal flags: Bit Meaning When Set 0 Set or reset file's placed bit (cannot be used with bit 3). 1 Used with bit 4 to return zero as the device cluster number if file's placed bit is not set. 2 Change file's backup statistics. 3 Change file's run-time system name field. 4 Return file's retrieval information. (Cannot be used with bit 3.) 5 Reset file's contiguous bit. 6 Enable/disable sequential mode caching if file is cached. (Cannot be used with bit 3.) 7 Enable/disable data caching on the file. (Cannot be used with bit 3.)
FIRQB+FQPPN	The programmer number of the file you want to modify.
FIRQB+FQPPN+1	The project number of the file you want to modify.
FIRQB+FQNAM1	The file name, in RAD50 format, of the file you want to modify. If FIRQB+FQFIL is nonzero, UU.FIL ignores these words.
FIRQB+FQEXT	The file type, in RAD50 format, of the file you want to modify. If FIRQB+FQFIL is nonzero, UU.FIL ignores this word.
FIRQB+FQSIZ	If bit 3 of FIRQB+FQSIZM is set, the two words beginning at FIRQB+FQSIZ contain the new run-time system name in RAD50. If bit 4 of FIRQB+FQSIZM is set, the two words beginning at FIRQB+FQSIZ contain the file's retrieval information. The monitor maps the virtual block number (VBN) of the file into the disk DCN.
FIRQB+FQNAM2	This byte contains the following flags: Bit Meaning When Set 1 New value for placed bit if bit 0 of FIRQB+FQSIZM is set. 2 New value for sequential bit if bit 6 of FIRQB+FQSIZM is set. 3 New value for backup bit if bit 2 of FIRQB+FQCLUS is set. 5 New value for P-bit (no delete/rename allowed) if bit 0 of FIRQB+FQCLUS is set. 6 New value for ignore bit if bit 3 of FIRQB+FQCLUS is set. 7 New value for cached bit if bit 7 of FIRQB+FQSIZM is set.
FIRQB+FQMODE	Contains the new date of last access if bit 2 of FIRQB+FQSIZM is set.
FIRQB+FQFLAG	Contains the new date of creation if bit 2 of FIRQB+FQSIZM is set.
FIRQB+FQPFLG	Contains the new time of creation if bit 2 of FIRQB+FQSIZM is set.

FIRQB+FQCLUS

Two subfunction codes currently in use are:

Bit Meaning When Set

- 0 Change the value of the file's P-bit (see FIRQB+FQNAM2).
- 1 Do not return protection violation. If clear, and any of the requested functions cannot be executed, the monitor returns a protection violation error. If set, the monitor changes all valid requested functions and leaves the rest unchanged.
- 2 Change the backup bit.
- 3 Change the ignore bit.
- 4 If file is opened (FQFIL not 0), use DLA in FIRQB+FQMODE if bit 2 of FIRQB+FQSIZM is set.

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	file characteristics	current job no. * 2	2	FQJOB
	5	device cluster number		4	FQFIL
	7	file attribute data (unused words are padded with NULLs)		6	FQPPN
	11			10	
	13			12	
	15			14	
	17			16	
	21			20	
	23			22	
	25			24	
	27			26	
	31			30	
	33	32			
	35	run-time system name in RAD50 format (2 words)		34	FQCLUS
	37			36	

FIRQB+FQFUN

File characteristics:

Bit Meaning When Set

- 1 File is placed.
- 2 File will be cached sequentially, if at all.
- 3 File is set NOBACKUP.
- 4 File is contiguous.
- 5 Current setting of file's P-bit.
- 6 File is set IGNORE.
- 7 File will be cached when open.

Errors

BADFUO File open is not a disk file or is a user file directory.

NOSUCH File or account is not present on disk.

NOTOPN Channel is not open.

PRVIOL File open is not a disk file or job lacks necessary privilege (see **FIRQB+FQCLUS** in data passed).

3.36.24 UU.HNG (Hang Up a Dataset)

Privileges Required

HWCTL is needed to hang up a dataset, except on a keyboard line owned by the calling job.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.HNG (11)	////////////////////////////////	2	
FQSIZM	5	seconds to wait	KB number of line	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQSIZM

Use one of the following values:

- 377 Sets "Data Terminal Ready" to permit a modem connected to a RSTS/E system to dial out. If a connection is not made in 127. seconds, perform an automatic hang-up of the dataset.
- 0 Hang up in two seconds.
- 1-177 Hang up in 1 to 127. seconds.

Data Returned

The UU.HNG subfunction does not return any data.

Errors

BADFUO Illegal KB number or insufficient privileges to hang up a line owned by another job.

3.36.25 UU.JOB (Create Job)

Privileges Required

Set account access is required (GACNT or WACNT privilege) to spawn to another account. EXQTA is required to ignore job quota on spawn. JOBCTL is required to spawn a job even if no logins is set. TUNE is required to specify a priority when creating a job. WACNT is required to spawn a logged-out job.

Data Passed — Logged-out job

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	UU.JOB (= 30)	////////	2	
	5	////////	bit flags	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)		10	FQNAM1
	13			12	
	15	file type in RAD50 format (1 word)		14	FQEXT
	17			16	FQSIZ
	21	10 bytes of information to be placed in created job's core common area		20	
	23			22	
	25			24	
	27			26	
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0,unit number real	device unit number	32	FQDEVN
	35	parameter word (see P.RUN)		34	FQCLUS
	37	////////////////////		36	

FIRQB+FQFIL

The following bit flag is valid for a logged-out job:

Bit Meaning When Set

7 Create a job even if logins are disabled (JOBCTL privilege required). When this bit is not set, the job is created only if logins are enabled. If you do not have JOBCTL privilege, you must clear bit 7.

FIRQB+FQPPN

The project programmer number of the program to run.

FIRQB+FQNAM1

The file name of the program to run, in RAD50 format.

FIRQB+FQEXT

The file type of the program to run, in RAD50 format.

FIRQB+FQDEV

Ten bytes of information to be placed into the created job's core common area. Note that an eleventh byte is appended that contains the job number times 2 of the job that executed the SYS call.

FIRQB+FQDEVN

The device name and unit number of the program to run.

FIRQB+FQCLUS

The parameter word to be passed to the program to run. The parameter word has exactly the same format and functions as the CCL command parameter word. Note that for jobs created under the BASIC-PLUS run-time system, the parameter word equals the program line number to which control is transferred when the job runs.

Data Passed — Logged-in Job to Run a Program

Mne- Octal monic Offset		FIRQB		Octal Mne- Offset monic
1		////////////////////////////////////		0
FQFUN	3	UU.JOB (= 30)	////////////////////////////////	2
FQSIZM	5	KB to attach to	bit flags	4 FQFIL
	7	project number	programmer number	6 FQPPN
	11	file name in RAD50 format (2 words)		10 FQNAM1
	13			12
	15	file type in RAD50 format (1 word)		14 FQEXT
	17	project number	programmer number	16 FQSIZ
	21	run burst	priority	20 FQBUFL
	23	////////////////////////////////	maximum job size	22 FQMODE
	25	////////////////////////////////////		24
	27	////////////////////////////////////		26
	31	device name (2 ASCII characters)		30 FQDEV
	33	<>0,unit number real	device unit number	32 FQDEVN
	35	parameter word (see P.RUN)		34 FQCLUS
	37	////////////////////////////////////		36

NOTE

When you create a logged-in job, the system gives the new job a copy of the core common, the logicals, and the command line recall buffer.

FIRQB+FQFIL	The following bit flags are valid when you create a logged-in job to run a program.
	Bit Meaning When Set
	1 Do not pass the user logicals of the creating account to the new job. (The contents of core common are still passed.)
	2 Create the new job with no privileges.
	3 Create the new job with the authorized privileges of the new job equal to the authorized privileges of the job's account that are also current privileges of the calling job. If Bit 3 is clear, the new job is created with the authorized privileges of the job's account.
	5 Create a job to run under account specified at FIRQB+FQSIZ (GACNT or WACNT privilege required).
	6 Create a logged-in job. You must set this bit. The new job runs under the caller's account unless you also set bit 5.
	7 Create a job even if logins are disabled (JOBCTL privilege required). When this bit is not set, the job is created only if logins are enabled. If you do not have JOBCTL privilege, you must clear bit 7.
	Clear all bits you do not use.
FIRQB+FQSIZM	Bits 0-6 indicate keyboard number to attach to. To specify KB0, set bit 7 to one. A zero byte indicates a detached job.
FIRQB+FQPPN	The PPN of the program to run.
FIRQB+FQNAM1	The file name of the program to run, in RAD50 format.
FIRQB+FQEXT	The file type of the program to run, in RAD50 format.
FIRQB+FQSIZ	Account under which job runs (GACNT or WACNT privilege required; bit 5 at FIRQB+FQFIL must be set). If you do not have the necessary privileges, set both bytes to 0.
FIRQB+FQBUFL	Priority of the new job (requires TUNE privilege). If you specify 0, the system uses the caller's values. Use bit 8 to explicitly specify priority 0. Users without TUNE privilege must set this byte to 0. Note that if you create the job on a pseudo keyboard, the system reduces the priority to the controlling job's priority.
FIRQB+FQBUFL+1	Run burst of the new job (requires TUNE privilege). Use one to explicitly specify priority zero. If you specify 0, the system uses the caller's values. Users without TUNE privilege must set this byte to 0.
FIRQB+FQMODE	Maximum job size of the new job (requires TUNE privilege). If you specify 0, the system uses the caller's values. Users without TUNE privilege must set this byte to 0.
FIRQB+FQDEV	Device name, as two ASCII characters, for the program to run.
FIRQB+FQDEVN	Device unit number for the program to run.
FIRQB+FQCLUS	The parameter word to be passed to the program to run. The parameter word has exactly the same format and functions as the CCL command parameter word. Note that for jobs created under the BASIC-PLUS run-time system, the parameter word equals the program line number to which control is transferred when the job runs.

Data Passed — Logged-in Job to Enter a Keyboard Monitor at P.NEW

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.JOB (= 30)	//////////	2	
FQSIZM	5	KB to attach to	bit flags	4	FQFIL
	7	////////////////////////////////////		6	FQPPN
	11	run-time system name in RAD50 format (2 words)		10	FQNAM1
	13			12	
	15	////////////////////////////////////		14	FQEXT
	17	project number	programmer number	16	FQSIZ
	21	run burst	priority	20	FQBUFL
	23	//////////	maximum job size	22	FQMODE
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

NOTE

When you create a logged-in job, the system gives the new job a copy of the core common, the logicals, and the command line recall buffer.

FIRQB+FQFIL	The following bit flags are valid when you create a logged-in job to enter a keyboard monitor. Bit Meaning When Set
	1 Do not pass the user logicals of the creating account to the new job. (The contents of core common are still passed.)
	2 Create the new job with no privileges.
	3 Create the new job with the authorized privileges of the new job equal to the authorized privileges of the job's account that are also current privileges of the calling job. If Bit 3 is clear, the new job is created with the authorized privileges of the job's account.
	4 Enter keyboard monitor instead of running a program. (You must set this bit.)
	5 Create a job to run under account specified at FIRQB+FQSIZ (GACNT or WACNT privilege required).
	6 Create a logged-in job. (You must set this bit.) The new job runs under the caller's account unless you also set bit 5.
	7 Create a job even if logins are disabled (JOBCTL privilege required). When this bit is not set, the job is created only if logins are enabled. If you do not have JOBCTL privilege, you must clear bit 7.
	Clear all bits you do not use.
FIRQB+FQSIZM	Bits 0-6 indicate keyboard number to attach to. To specify KB0;, set Bit 7 equal to one. The value of zero (detached job) is not allowed.
FIRQB+FQNAM1	The run-time system you specify must be installed and must be a keyboard monitor. Specify zero for the system's default keyboard monitor (DCL).
FIRQB+FQSIZ	Account under which job runs (GACNT or WACNT privilege required; bit 5 at FIRQB+FQFIL must be set). If you do not have the necessary privileges, set both bytes to zero.
FIRQB+FQBUFL	Priority of the new job (requires TUNE privilege). If you specify 0, the system uses the caller's values. Use bit 8 to explicitly specify priority 0. Users without TUNE privilege must set this byte to 0. Note that if you create the job on a pseudo keyboard, the system reduces the priority to the controlling job's priority.
FIRQB+FQBUFL+1	Run burst of the new job (requires TUNE privilege). Use one to explicitly specify priority zero. If you specify 0, the system uses the caller's values. Users without TUNE privilege must set this byte to 0.
FIRQB+FQMODE	Maximum job size of the new job (requires TUNE privilege). If you specify 0, the system uses the caller's values. Users without TUNE privilege must set this byte to 0.
FIRQB+FQDEV	Device name, as two ASCII characters, for the program to run.

Data Returned (all types of jobs)

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// current job no. * 2	2	FQJOB
	5	////////// created job no. * 2	4	FQFIL
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Errors

BADFUO	You specified a keyboard monitor at FIRQB+FQNAM1, but did not supply a keyboard number at FIRQB+FQSIZM.
NOBUFS	You are trying to create a logged-in job, but not enough XBUF is available for temporary storage of your current job's core common.
NODEVC	The keyboard number at FIRQB+FQSIZM is invalid.
NOROOM	Job cannot be created. Probable causes: <ul style="list-style-type: none"> Logins are disabled and bit 7 (value = 200) at FIRQB+FQFIL is clear. The system's job or swap slots are currently full.
NOSUCH	You have the necessary privilege and are trying to create a logged-in job, but the system cannot log the job in. Possible causes are that you specified a nonexistent account or an expired account.
NOTAVL	The keyboard specified at FIRQB+FQSIZM is open, is in use, or is not assigned to the calling job. A user without DEVICE privilege can also get this error if the system manager has restricted the device.

PRVIOL You do not have the required privileges and tried to:

- Create a job when logins were disabled.
- Create a logged-out job.
- Create a job to run under an account other than the current account.
- Create a detached job that would cause you to exceed your detached job quota. (This quota is set by your system manager; its default value is zero.)

Note that when you create a logged-in job, you can also get any error that can occur for the UU.LIN (Login), .RUN, and .RTS directives, because the monitor executes these directives for the new job. If an error occurs, the monitor kills the new job and returns the error to your job instead.

3.36.26 UU.LIN (Login)

Privileges Required

Set account access (GACNT or WACNT) is required to check the password of any account. Also, DEVICE is required if the device is restricted.

Data Passed—Login Function

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.LIN (= 4)	////////////////////////////////	2		
FQSIZM	5	function flag	////////////////////////////////	4		
	7	project number	programmer number	6	FQPPN	
	11	password in RAD50 format (2 words) or password in ASCII format (14 bytes)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23				22	
	25		24			
	27	////////////////////////////////////		26		
	31	////////////////////////////////////		30		
	33	////////////////////////////////////		32		
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

FIRQB+FQSIZM

The function flag bits are:

Bit	Setting	Meaning
0	Clear	Must be clear for the login function.
1	Clear	The monitor assumes the password is six characters in RAD50 format. The password is converted to ASCII before comparison.
	Set	The monitor assumes the password is 14 bytes of ASCII data.
In either case, the password must not contain a question mark (?).		
3	Clear	The monitor performs the password check. No privileges are required.
	Set	The monitor suppresses the password check. However, GACNT or WACNT is required.

FIRQB+FQPPN

PPN for the account being logged into. It must not be in group [0,*].

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	status flags	current job no. * 2	2	FQJOB
	5	total number of jobs under this account		4	FQFIL
	7	detached job no. (2)	detached job no. (1)	6	FQPPN
	11	. . . zero byte marks end of list of detached job numbers. only the first 25. detached job numbers are returned.		10	FQNAM1
	13			12	
	15			14	
	17			16	
	21			20	
	23			22	
	25			24	
	27			26	
	31			30	
	33			32	
	35	34			
	37	36			

FIRQB+FQFUN

On successful return, indicates where the log-in operation has been completed. Values are:

Value	Meaning
-1	Success—the job is logged in to the new account.
-2	Detached job quota exceeded. Job is not logged in and remains in the old account; attach instead to some job from the list starting at offset FQNAM1.
≥0	Total job quota exceeded. Job is not logged in and remains in the old account; the value returned is the actual job quota. If there are any detached jobs, you can attach to one.

Errors

BADDIR	The account does not have all the necessary directory structures.
NOBUFS	No buffers are available to create the necessary internal structures.

- NOSUCH** The monitor returns this error code if:
- The password specified at FIRQB+FQNAM1 does not match the password of the account on the system or contains question marks.
 - The PPN specified at FIRQB+FQPPN does not exist or the project number is zero.
 - System password validation is required for this type of job, and the account is marked "no-lookup," but the "verify system password" function has not yet been successfully executed.
- NOTAVL** The monitor returns this error code if:
- The PPN specified at FIRQB+FQPPN is expired or is marked as "no-interactive."
 - The account is flagged as "no-dial-up" or "no-network" and the job is a dial-up or network job.

Data Passed—Verify Password Function

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.LIN (= 4)	////////////////////////////////	2		
FQSIZM	5	function flag	////////////////////////////////	4		
	7	project number	programmer number	6	FQPPN	
	11	password in RAD50 format (2 words) or password in ASCII format (14 bytes)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23				22	
	25		24			
	27	////////////////////////////////////		26		
	31	device name (2 ASCII characters)		30	FQDEV	
	33	<>0,unit number real	device unit number	32	FQDEVN	
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

FIRQB+FQSIZM	The function flag bits:		
	Bit	Setting	Meaning
	0	Set	The verify password function is performed. The caller supplies the password to verify in FIRQB+FQNAM1.
	1	Clear	The monitor assumes the password is six characters in RAD50 format. The password is converted to ASCII data before verification.
	1	Set	The monitor assumes the password is 14 bytes of ASCII data.
	In either case, the password must not contain any question marks.		
FIRQB+FQPPN	A value of zero means use the caller's PPN.		
FIRQB+FQDEV	Device name of the disk on which to check. You must		
FIRQB+FQDEVN	have DEVICE privilege if the device is restricted.		

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.LIN subfunction does not return any meaningful data.

Errors

BADNAM	Passwords do not match.
DEVNFS	Device specified is not a disk.
NOSUCH	Account specified is a nonuser account (no password data present) or does not exist.
PRVIOL	Caller does not have required privilege.

3.36.26.1 Verify System Password Function

This function verifies the system access password, if any. If there is no system access password, or if the password check has already been performed, the function returns successfully. Otherwise, the monitor compares the password supplied with the system password. A match sets a job flag which is tested by the login function; a mismatch generates the NOSUCH error.

For compatibilty with old programs that perform a password lookup and then login, the login function does not require a system password on accounts where password lookup is allowed.

Data Passed—Verify System Password Function

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.LIN (= 4)	////////////////////////////////	2		
FQSIZM	5	function flag = 6	////////////////////////////////	4		
	7	////////////////////////////////////		6		
	11	password in ASCII format (14 bytes)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23				22	
	25				24	
	27			////////////////////////////////////	26	
	31			////////////////////////////////////	30	
	33			////////////////////////////////////	32	
	35			////////////////////////////////////	34	
	37			////////////////////////////////////	36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.LIN subfunction does not return any meaningful data.

Errors

NOSUCH Password did not match the system password.

3.36.27 UU.LOG (Set Number of Logins)

Privileges Required

SWCTL is required to set the number of logins.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
QFUN	3	UU.LOG (= -23)	////////	2	
	5	////////	no. of allowed jobs	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

A value of zero sets the number of allowed jobs to one. The upper limit for the number of logins is either the system JOB MAX or the number of jobs that can currently be swapped, whichever is lower. If you specify a larger value, the system sets the number of logins to the upper limit. In this case, no error is returned.

Data Returned

		FIRQB			
Mne-	Octal			Octal	Mne-
monic	Offset			Offset	monic
	1	////////////////////////////////////		0	
	3	//////////	current job no. * 2	2	FQJOB
	5	//////////	actual logins set	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Errors

No errors are possible with the UU.LOG subfunction.

3.36.28 UU.LOK (Disk Directory Lookup by File Name/Wildcard Lookup)

Privileges Required

DEVICE is required to do a directory lookup on a restricted device. Read or execute access (by protection code, GREAD or WREAD privilege) is required to lookup another account.

Data Passed — Look Up by File Name

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.LOK (= 21) //////////////////////////////////	2	
	5	(must = 177777)	4	FQFIL
	7	project number programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (disk) (2 ASCII characters)	30	FQDEV
	33	<>0, unit number real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQPPN PPN of the file to look up. Zero in both bytes means the current account is used.

Data Returned — Look Up by File Name

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	//////////	2	FQJOB
	5	(= 177777)	4	FQFIL
	7	project number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file length in 512-byte blocks	16	FQSIZ
	21	MSB of file length	20	FQNAM2
	23	date of last access	22	FQMODE
	25	date of creation	24	FQFLAG
	27	time of creation	26	FQPFLG
	31	device name (disk) (2 ASCII characters)	30	FQDEV
	33	<>0, unit number real	32	FQDEVN
	35	file cluster size	34	FQCLUS
	37	file identification index	36	FQNTENT

FIRQB+FQMODE

System internal format for dates is:

FIRQB+FQFLAG

$[(year - 1970.) * 1000.] + day-within-year$

FIRQB+FQPFLG

Time is in minutes until midnight, where 1440. equals midnight.

See the .DATE directive for a discussion of these formats.

Errors

BADNAM

The file name at FIRQB+FQNAM1 is missing or invalid.

NOSUCH

Device specified at FIRQB+FQDEV is not a disk, or the file specified does not exist on the disk. This error also occurs when a user does not have read or execute access to the specified file.

PAKLCK

The disk is restricted and the account under which the call is executed does not have DEVICE privilege.

Data Passed — Disk Wildcard Directory Lookup

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.LOK (= 21)	////////////////////////////////	2	
	5	index:n means search for n+1 occurrences		4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	wildcard file name in RAD50 format (2 words)		10	FQNAM1
	13			12	
	15	wildcard file type in RAD50 format (1 word)		14	FQEXT
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	marked-for-delete flag		22	FQMODE
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	device name (disk) (2 ASCII characters)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

- FIRQB+FQFIL** The index number, telling the directive to return the first $n+1$ examples. If the value is zero, then the first file matching the wildcard specification is returned; if the value is one, then the second file. This continues until there are no more matching files and the NOSUCH error returns.
- FIRQB+FQPPN** Zero in both bytes means the current account.
- FIRQB+FQNAM1** RAD50 representation of a wildcard file name specification, where a question mark (?) can replace any character in the file name. Used with the file type in **FIRQB+FQEXT** to create a wildcard file specification. You can use .FSS to help construct the wildcard name.
- FIRQB+FQEXT** RAD50 representation of a wildcard file type specification, where a question mark (?) can replace any character in the file type. Used with the file name in **FIRQB+FQNAM1** to create a wildcard file specification.
- FIRQB+FQMODE** Bit 14 set causes the monitor to return information about marked-for-delete files.

Data Returned — Disk Wildcard Directory Lookup

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	//////////	2	FQJOB
	5	(same as data passed)	4	FQFIL
	7	project number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file length	16	FQSZ
	21	MSB of file length	20	FQNAM2
	23	date of last access (disk only)	22	FQMODE
	25	date of creation	24	FQFLAG
	27	time of creation	26	FQPFLG
	31	(same as data passed)	30	FQDEV
	33	(same as data passed)	32	FQDEVN
	35	file cluster size (disk only)	34	FQCLUS
	37	USTAT byte	36	FQNTENT

FIRQB+FQNTENT+1

This byte contains the following internal flag information:

Bit	Meaning When Set
1	File is placed
2	Some job has write access now
3	File is open in update mode
4	File is contiguous; no extend allowed
5	No delete or rename allowed
7	File is marked for deletion

Errors

BADNAM	The file name at FIRQB+FQNAM1 is missing or invalid.
NOSUCH	Device specified is not a disk or no file corresponds to the index given.
PAKLCK	The disk is restricted and the account under which the call is executed does not have DEVICE privilege.

3.36.29 UU.MNT (Disk Pack Status)

Privileges Required

You need HWCFG privilege to declare a mounted disk as restricted or unrestricted. You need SWCTL privilege to load or unload the Storage Allocation Table (SAT) of the specified disk into or out of memory. You need MOUNT privilege to:

- Mount or dismount a shared disk
- Dismount a /NOSHARE disk owned by another job
- Mount a disk /NOSHARE for a job running under another PPN
- Mount a dirty disk

Data Passed

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.MNT (= 3)	//////////	2	
FQSIZM	5	job number	subfunction code	4	FQFIL
	7	////////////////////////////////////		6	
	11	pack identification label in RAD50 format (2 words)		10	FQNAM1
	13			12	
	15	=177777, use logical; =0, use pack ID		14	FQEXT
	17	logical name for disk in RAD50 format (first 2 words)		16	FQSIZ
	21			20	
	23	mode word		22	FQMODE
	25	3rd word of logical name for disk (RAD50)		24	FQFLAG
	27	////////////////////////////////////		26	
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

The subfunction codes are:

Code Meaning

- 0 Mount a disk pack or cartridge
- 2 Dismount a disk pack or cartridge
- 4 Restrict a disk pack or cartridge
- 6 Unrestrict a disk pack or cartridge
- 10 Load the SAT of a disk into memory
- 12 Unload the SAT of a disk from memory
- 14 Reserved for future use
- 16 Return disk drive status information

FIRQB+FQSIZM

Job number of the intended owner. Applies only if bit 11 is set in **FIRQB+FQMODE**. Zero means the caller's job number. If bit 11 in **FIRQB+FQMODE** is clear, this byte should be zero.

FIRQB+FQNAM1

For mount function: pack ID of pack to mount. Must be supplied unless bit 10 is set in **FQMODE**.

FIRQB+FQMODE

The bits in the mode word are:

Bit Meaning

- 8 Mount Level 1.2 disk with /NOQUOTA
- 10 Mount with lookup of pack ID
- 11 Mount disk for use by single user (/NOSHARE)
- 12 Mount disk read/write, even if disk was initialized as read-only
- 13 Mount disk read-only
- 14 Mount as a private disk (/PRIVATE)
- 15 Must be set if any of the above bits are set

You can set one bit or a combination of bits.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// | current job no. * 2	2	FQJOB
	5	UNTCNT word	4	FQFIL
	7	CSR value	6	FQPPN
	11	Controller number	10	FQNAM1
	13	UNTOPT number	12	
	15	MID value	14	
	17	size of SAT in bytes (first word) or logical name for disk in RAD50 format (2 words)	16	FQSIZ
	21		20	
	23	////////////////////////////////	22	
	25	3rd word of logical name for disk (RAD50)	24	FQFLAG
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL	The internal UNTCNT value for the specified disk, if the subfunction code is 16 in FIRQB+FQFIL of the data passed.
FIRQB+FQPPN	The CSR value for the specified disk, if the subfunction code is 16 in FIRQB+FQFIL of the data passed. The disk does not exist if this value is 0. If a CSR is returned, the specified unit may or may not exist.
FIRQB+FQNAM1	The controller number if the specified disk is a DU type disk, and if the subfunction code is 16 in FIRQB+FQFIL of the data passed. Otherwise, this value is random.
FIRQB+FQNAM1+2	The internal UNTOPT value for the specified disk, if the subfunction code is 16 in FIRQB+FQFIL of the data passed.
FIRQB+FQEXT	The internal drive type identifier for the specified disk, if the subfunction code is 16 in FIRQB+FQFIL of the data passed.
FIRQB+FQSIZ	For subfunction 10, RSTS/E returns the amount of memory in bytes that was used to load the SAT in FIRQB+FQSIZ. For other subfunctions, RSTS/E returns the first two words of the logical name for the disk. The third word of the logical name is in FIRQB+FQFLAG.

Errors

BADFUO	You tried to mount a disk that is already mounted or that resides in a nondismounted drive, or drive specified is the system disk.
BADPAK	Disk directory structure is invalid. For example, the cluster size is larger than 16 or the SAT is unreadable.
DEVNFS	You tried to restrict, unrestricted, or dismount a disk currently open in non-file-structured mode. Or, you tried to load or unload the SAT of a disk currently open in non-file-structured mode.
HNGDEV	You tried to mount a disk that is not write-enabled or you tried to load the SAT of a read-only disk.
INTPAK	The SAT on the disk needs to be rebuilt because the disk was not properly dismounted when it was last used. Before using the disk, use the ONLCLN program to rebuild the SAT.

NOTE

The MOUNT command automatically performs the rebuild operation if it is needed.

Note that when this error occurs, the mount succeeds, but the disk is always mounted read-only with the "dirty" bit set. (You can see if this bit is set by looking at the output of the SHOW DISK command which reports that the disk is "dirty.")

INUSE	You tried to dismount a disk with an open file.
NOBUFS	You tried to load the SAT and there is no memory available.
NODEV	Device type or unit at FIRQB+FQDEV is not on the system.
NOTCLS	You tried to load the SAT more than once.
NOTMNT	You tried to lock, unlock, or dismount a disk that is not mounted. Or, you tried to load or unload the SAT of a disk that is not mounted.
NOTOPN	You tried to unload the SAT of a disk that was not loaded.
PRVIOL	You tried to mount a disk that does not contain the RSTS/E file structure. Use the INITIALIZE command, the online DSKINT program, or the DSKINT initialization option to initialize the disk. You do not have the required privilege to load or unload the SAT.
WRGPAK	You tried to mount a disk with an incorrect pack label.

3.36.30 UU.NAM (Associate a Run-Time System with a File)

Privileges Required

File write access (by protection code or GWRITE, WWRITE, and/or SYSIO privilege) is required to set the run-time system name for a file.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.NAM (= -21)	////////////////////////////////	2	
FQSIZM	5	run-time	channel number	4	FQFIL
	7	system name in RAD50 format		6	FQPPN
	11	////////////////////////////////	(2 words)	10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

Other than a possible error in byte 0 of the FIRQB, the UU.NAM subfunction does not return any meaningful data.

Errors

NOTOPN	Channel is not open.
PRVIOL	File open on channel is not a disk file or the job executing the call does not have write access.

3.36.31 UU.NLG (Disable Further Logins)

Privileges Required

SWCTL is required to disables logins.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////////		0
FQFUN	3	UU.NLG (= -2) //////////////////////////////////		2
	5	////////////////////////////////////		4
	7	////////////////////////////////////		6
	11	////////////////////////////////////		10
	13	////////////////////////////////////		12
	15	////////////////////////////////////		14
	17	////////////////////////////////////		16
	21	////////////////////////////////////		20
	23	////////////////////////////////////		22
	25	////////////////////////////////////		24
	27	////////////////////////////////////		26
	31	////////////////////////////////////		30
	33	////////////////////////////////////		32
	35	////////////////////////////////////		34
	37	////////////////////////////////////		36

Data Returned

The UU.NLG subfunction does not return any meaningful data.

Errors

No errors are possible with the UU.NLG subfunction.

3.36.32 UU.ONX (Open Next Disk File)

This call opens a disk file or a series of disk files matching a wildcard specification. UU.ONX requires an I/O channel to use and grants access to the file.

When you attempt an open next on a closed channel, UU.ONX finds the first file that matches the specification. When you attempt an open next on an open channel, UU.ONX finds the next file that matches the specification. If there are no more files that match the specification, UU.ONX closes the channel.

Privileges Required

DEVICE is required to perform an open next on a restricted disk. File read access (by protection code, or GREAD or WREAD privilege) is required to perform an open next for read access. File write access (by protection code, or GWRITE, WWRITE, and/or SYSIO privilege) is required to perform an open next for write access.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.ONX (= 41) //////////////////////////////////	2	
	5	channel number * 2	4	FQFIL
	7	project number programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	OPEN mode	22	FQMODE
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII chars) must be disk	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQPPN The file owner's PPN. Zero indicates the current account. Wildcards are not permitted in the specification.

FIRQB+FQNAM1 The name of the file in RAD50 format. The name may contain wildcard characters (question marks, ?).

FIRQB+FQEXT	The type of the file in RAD50 format. The type may contain wild-card characters (question marks, ?).		
FIRQB+FQMODE	The OPEN modes currently defined are:		
	Decimal	Octal	Function
	0.	0	Normal read/write
	1.	1	Update
	2.	2	Append
	4.	4	Guarded update (4 + 1)
	8.	10	Special extend (RSTS/E updates file's size and retrieval pointers during extend operations)
	16.	20	Do not update access dates to files; do not grant write access (requires DATES privilege)
	32.	40	Do not grant any access to files (directory lookup only)
	256.	400	User data caching
	2048.	4000	Sequential data caching (with 400)
	4096.	10000	Read normally regardless
	8192.	20000	Open file read-only
	16384.	40000	Include files marked-for-delete
	32768.	100000	Mode bits are real; this must be specified for the other open bits to be tested
FIRQB+FQDEV	The device name; must be a disk. Zero in both bytes indicates "SY", the public disk.		
FIRQB+FQDEVN	The device unit number. A nonzero value in the high byte (FIRQB+FQDEVN+1) indicates an explicit device unit number in the low byte. A zero value in FIRQB+FQDEVN+1 indicates no unit number.		

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	//////////	2	FQJOB
FQSIZM	5	MSB of file size	4	FQFIL
	7	project number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	LSB of file size	16	FQSIZ
	21	last access date	20	FQBUFL
	23	creation date	22	FQMODE
	25	creation time	24	FQFLAG
	27	protection code	26	FQPFLG
	31	device name in two ASCII characters	30	FQDEV
	33	flag byte	32	FQDEVN
	35	file identification index	34	FQCLUS
	37	device description	36	FQNTENT

FIRQB+FQSIZM	For large disk files (greater than 65,535 blocks), this byte contains the MSB of the file's size in 512-byte blocks. This byte is combined with the word at FIRQB+FQSIZ to form a 24-bit field giving the file size.
FIRQB+FQPPN	The PPN under which the file is open.
FIRQB+FQNAM1	The file name; two words of RAD50 data.
FIRQB+FQEXT	The file type; one word of RAD50 data.
FIRQB+FQSIZ	The LSB of the file's size in 512-byte blocks. (See FIRQB+FQSIZM.)
FIRQB+FQBUFL	The date of last access to the file.
FIRQB+FQMODE	The date of creation of the file.
FIRQB+FQFLAG	The time of creation of the file.
FIRQB+FQPFLG	The file cluster size, modulo 256. That is, a file cluster size of 256 is indicated by a value of zero.
FIRQB+FQPROT	The protection code of the file.
FIRQB+FQDEV	The device name, as two ASCII characters.
FIRQB+FQDEVN	The device unit number.
FIRQB+FQCLUS	The file identification index of the file. This word can be used instead of the file name in subsequent opens of the file. The file identification index is provided for compatibility with RSX.

FIRQB+FQNT The description of the device just opened. The low byte contains the device's handler index. The high byte contains a set of status flags to allow for device-independent I/O routines. (See the OPNFQ subfunction of CALFIP.)

Errors

BADFUO The parameters passed in the call are inconsistent with the currently open channel.

DEVNFS You tried to open a device that is not a disk.

HNGDEV Device is hung or write-locked.

NOSUCH No more files match the specification. The channel is closed.

NOTMNT The device is not mounted.

PAKLCK The disk pack is restricted. You need DEVICE privilege to open a restricted disk.

3.36.33 UU.PAS (Create User Account)

Privileges Required

Set account access (GACNT or WACNT) is required to create an account.

Data Passed (Updated Format)

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	UU.PAS (=0)	2	
FQSIZM	5	flags	4	FQFIL
	7	device cluster number for UFD or -1	6	FQPPN
	11	project number	10	FQNAM1
	13	password (2 words in RAD50 format)	12	
	15		14	
	17	LSB of logged-out quota (blocks)	16	FQSIZ
	21	expiration date	20	FQBUFL
	23	LSB of logged-in quota (blocks)	22	FQMODE
	25	MSB logged-out quota	24	FQFLAG
	27	MSB logged-in quota	26	FQFPLG
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit no. real	32	FQDEVN
	35	device unit number	34	FQCLUS
	37	UFD cluster size (0=use pack cluster size)	36	FQNENT
		////////////////////////////////		

- FIRQB+FQFIL** Zero means preextend one cluster. 1-7 means preextend specified number of clusters.
- FIRQB+FQSIZM** Flag byte. Bit 7 set means data passed in the FIRQB is in the updated format. If bit 7 is clear, the data is in the V8.0 format. Other bits are reserved.
- FIRQB+FQPPN** The device cluster number to place UFD. Minus one means place UFD at the midpoint of the disk. If the cluster is not available, the directive uses the next highest available cluster number.
- FIRQB+FQNAM1** The PPN being created.
- FIRQB+12** Optional password in RAD50 format, two words long. This is provided for compatibility. Digital strongly recommends that you use longer passwords for greater security. Specify zero here to create a noninteractive account with no password. The account can be made interactive later by setting a longer password using UU.CHU.
- FIRQB+FQSIZ** The logged-out quota in blocks.

FIRQB+FQFLAG+1 FIRQB+FQSIZ and the MSB are in FIRQB+FQFLAG+1. Use 377 in all three bytes for an unlimited quota. Zero in all three bytes means no blocks can be allocated.

FIRQB+FQBUFL The expiration date in RSTS format: year - 70 + day of year. Minus one means the account does not expire. This is the default.

FIRQB+FQMODE The logged-in quota in blocks. The LSB are in

FIRQB+FQFLAG FIRQB+FQMODE and the MSB are in FIRQB+FQFLAG. Use 377 in all three bytes for an unlimited quota. Zero in all three bytes means no blocks can be allocated.

FIRQB+FQCLUS The UFD cluster size. It must be greater than or equal to the pack cluster size and a power of two from 1-16. Zero means the account uses the pack cluster size.

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// job number * 2	2	FQJOB
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	device cluster number for cluster 0 of UFD	22	FQMODE
	25	device cluster number for cluster 1 of UFD	24	FQFLAG
	27	device cluster number for cluster 2 of UFD	26	FQPFLG
	31	device cluster number for cluster 3 of UFD	30	FQDEV
	33	device cluster number for cluster 4 of UFD	32	FQDEVN
	35	device cluster number for cluster 5 of UFD	34	FQCLUS
	37	device cluster number for cluster 6 of UFD	36	FQNTENT

Data Passed (Pre-V9.0 Format)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	UU.PAS (=0)	////////////////////////////////	2	
FQSIZM	5	flags	preextnd UFD clstrs	4	FQFIL
	7	device cluster number for UFD or -1		6	FQPPN
	11	project number	programmer number	10	FQNAM1
	13	password (2 words in RAD50 format)		12	
	15			14	
	17	number of blocks for quota; 0 = unlimited		16	FQSIZ
	21	expiration date		20	FQBUFL
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	device name (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	UFD cluster size (0=use pack cluster size)		34	FQCLUS
	37	////////////////////////////////		36	

FIRQB+FQFIL Zero means preextend one cluster. 1-7 means preextend specified number of clusters.

FIRQB+FQSIZM Flag byte. Bit 7 set means data passed in the FIRQB is in the updated format. If bit 7 is clear, the data is in the V8.0 format. Other bits are reserved.

FIRQB+FQPPN The device cluster number to place UFD. Minus one means place UFD at the midpoint of the disk. If the cluster is not available, the directive uses the next highest available cluster number.

FIRQB+FQNAM1 The PPN being created.

FIRQB+12 Optional password in RAD50 format, two words long. This is provided for compatibility. Digital strongly recommends that you use longer passwords for greater security. Specify zero here to create a noninteractive account with no password. The account can be made interactive later by setting a longer password using UU.CHU.

FIRQB+FQBUFL The expiration date in RSTS format: year - 70 + day of year. Minus one means the account does not expire. This is the default.

FIRQB+FQCLUS The UFD cluster size. It must be greater than or equal to the pack cluster size and a power of two from 1-16. Zero means the account uses the pack cluster size.

Data Returned

Same as for the updated format.

Errors

ABORT	<p>The account has been entered, and the directory has been preextended. However, the account has not been given a password or quota because an internal consistency check has failed. Submit an SPR if you get this error, and include:</p> <ul style="list-style-type: none">• A copy of the disk.• A snap shot dump. (Use the DUMP/SYSTEM command to copy the contents of memory to CRASH.SYS, then run the ANALYS program to save the information. Submit a listing that contains the ANALYS program's output.) <p>See the <i>RSTS/E System Manager's Guide</i> for more information on ANALYS.</p>
BADCLU	Cluster size is nonzero and is less than the pack cluster size.
BADCNT	<p>The number of clusters specified at FIRQB+FQFIL:</p> <ul style="list-style-type: none">• Is out of range.• When added to the device cluster number specified at FIRQB+FQPPN yields an effective address that is greater than the disk size. (See Appendix B for disk size information.)
DEVNFS	Device is not a disk or the disk is open in non-file-structured mode.
FIEXST	Account specified already exists on device.
NOROOM	The monitor cannot allocate one cluster for the UFD you are creating because the disk is full.
PRVIOL	PPN is [0,0], or either the project number or programmer number is 255.

3.36.34 UU.POK (Poke Memory)

Privileges Required

SYSMOD is required to write into kernel memory.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.POK (= -6) //////////////////////////////////	2	
	5	address of word to be changed	4	FQFIL
	7	new contents of word	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.POK subfunction does not return any meaningful data.

Errors

PRVIOL The job executing the call does not have SYSMOD privilege or the address specified is odd.

3.36.35 UU.PPN (Wildcard PPN Lookup)

Privileges Required

DEVICE is required to perform a lookup on a restricted device.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.PPN (=31) //////////////////////////////////	2	
	5	index: n means search for n+1 occurrence	4	FQFIL
	7	377 or proj. no. 377 or prog. no.	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII chars)- must be disk	30	FQDEV
	33	<>0, unit no. real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL The index. The directive returns the *n*+1th instance. If *n* is zero, the directive returns the lowest PPN that matches the wildcard specification; if *n* is one, it returns the next lowest, and so forth, until there are no matching files.

FIRQB+FQPPN 377 represents a wildcard. Use 377 in both bytes to represent any account, that is, [*,*]. Use zero in both bytes to indicate the current account, that is, [].

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// current job no. * 2	2	FQJOB
	5	////////////////////////////////	4	
	7	project number programmer number	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	(same as data passed)	30	FQDEV
	33	(same as data passed)	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Errors

NOSUCH	Device is not a disk, or no match exists for the specified index.
PAKLCK	The disk is restricted and the caller does not have DEVICE privilege.

3.36.36 UU.PRI (Change Priority/Run Burst/Job Size)

Privileges Required

TUNE is required to change any job's priority, run burst, or size.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.PRI (= -15)	////////////////////////////////	2	
FQSZM	5	<>0, change priority	job no.;377 = caller	4	FQFIL
	7	<>0, change burst	new run priority	6	FQPPN
	11	<>0, change size	new run burst	10	FQNAM1
	13	////////////////////////////////	maximum size	12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQPPN Run priority values range from -200 to 170 in steps of 10. The value -200 suspends the job.
- FIRQB+FQNAM1 The run burst should be a value from 1 to 177. If you use a value outside this range, the monitor sets the run burst to 6.
- FIRQB+FQNAM1+2 The maximum size can range from 1 to 377 (1K-word units). The system uses SWAP MAX if you exceed that value.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.PRI subfunction does not return any meaningful data.

Errors

- BADFUO The job number specified at FIRQB+FQFIL does not exist.

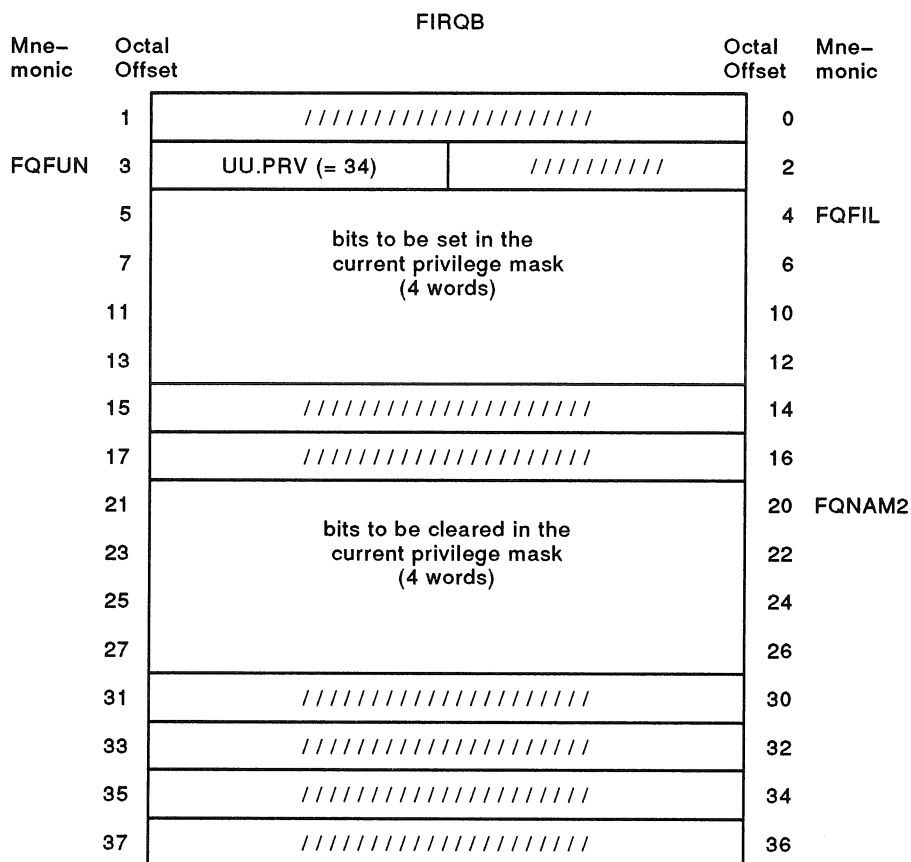
3.36.37 UU.PRIV (Set/Clear/Read Current Privileges)

The UU.PRIV directive lets you read the current privilege mask or selectively set and/or clear bits in it. This function is distinct from the .SET or .CLEAR directives, which apply only when running a privileged program and then update the entire current mask at once.

Privileges Required

None

Data Passed



FIRQB+FQFIL

The bits to be set in the current privilege mask. If you do not want to set any privileges, use four words of zero. Before setting the specified bits, the system performs an AND operation between the bits the caller passes and the caller's authorized privilege mask to prevent the caller from setting unauthorized bits. Note that this applies even for temporary privileges. Thus, a temporarily privileged program can use UU.PRIV to drop any single privilege, but it can regain only those that the caller is authorized to have.

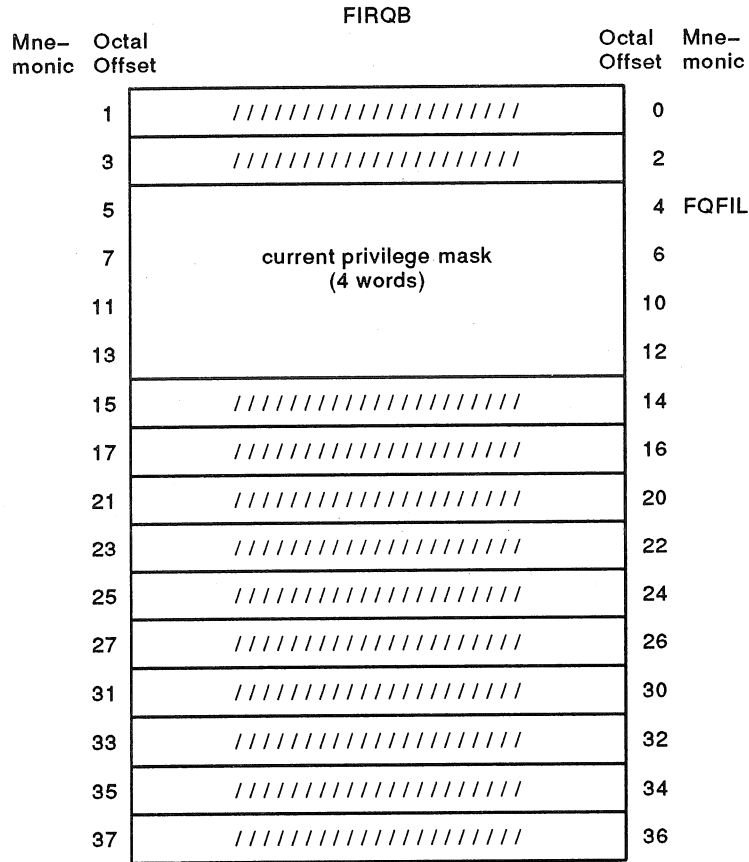
FIRQB+FQNAM2

The bits to be cleared in the current privilege mask. If you do not want to clear any privileges, use four words of zero.

NOTE

If all eight words are zero, no bits are set or cleared. Thus, the job's privileges remain unchanged. This is the way to read your current privileges.

Data Returned



FIRQB+FQFIL The bits set represent the privileges now in effect.

NOTE

A privileged program that wants to find out what privileges the *user* has needs to do a drop temporary privileges function followed by a read privileges function.

Conversely, a privileged program that wants to check whether the *program* has the right privileges should issue the read privileges function while temporary privileges are in effect.

3.36.38 UU.RAD (Read or Read-and-Reset Accounting Data)

Privileges Required

None required to read your own account. Set account access (GACNT or WACNT) is required for all other accounts, or to reset accounting data.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.RAD (= 16)	////////////////////////////////	2	
	5	index number of account		4	FQFIL
	7	0 = read; <>0 = read and reset		6	FQPPN
	11	project number	programmer number	10	FQNAM1
	13	////////////////////////////////	flag	12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	device name (disk) (2 ASCII characters)		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQFIL** The index number of the account to read. If the index is zero, the directive reads the account specified in bytes 7 and 8. If the index is nonzero, the directive searches for an account based either on this index entry or on a wildcard PPN search. The value of the flag in FIRQB+FQNAM1+2 controls which function the directive does.
- FIRQB+FQPPN** The reset flag. If zero, the directive only reads accounting data. If nonzero, the directive reads and resets accounting data. If the caller does have account access privilege, the system performs a read operation only.
- FIRQB+FQNAM1** The programmer number. If this and the project number are zero, the directive uses the current account. A -1 indicates a wildcard.
- FIRQB+FQNAM1+1** The project number. If this and the programmer number are zero, the directive uses the current account. A -1 indicates a wildcard.

FIRQB+FQNAM1+2		Flag byte.	
Bit	Setting	Meaning	
0	Clear	Implies the call returns the number of blocks owned by the account.	
	Set	Implies do not return this data. Note that setting this bit to one can save considerable execution time (for Level 1.1 or older disk structures) if you do not need the disk usage information otherwise returned to the word at FIRQB+FQPPN.	
1	Clear	Means the PPN at FIRQB+FQNAM1 corresponds to a real account, if index value at FIRQB+FQFIL is zero. If index value is not zero, the system uses the index value and ignores any PPN at FIRQB+FQNAM1.	
	Set	Means the PPN at FIRQB+FQNAM1 contains a wildcard (377).	
2	Clear	Means the call returns general accounting information in the pre-V9.0 format.	
	Set	Means return disk quota information in the updated format. Disk quota information is not available in earlier formats.	
3	Clear	Means the call is a read-only lookup on the caller's own PPN if the caller does not have GACNT or WACNT privileges.	
	Set	Means UU.RAD returns a protection violation error if a caller tries to perform a restricted function without having the required privileges.	

Data Returned (Bit 2 Set in FIRQB+FQNAM1+2)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	//////////	current job no. * 2	2	FQJOB
	5	(same as data passed)		4	FQFIL
	7	////////////////////////////////////		6	
	11	PPN of account read		10	FQNAM1
	13	LSB of logged-out quota		12	
	15	LSB of logged-in quota		14	FQEXT
	17	MSB logged-out quota	MSB logged-in quota	16	FQSIZ
	21	MSB current usage	//////////	20	FQBUFL
	23	////////////////////////////////////		22	
	25	LSB of current usage		24	FQFLAG
FQPROT	27	count of open files and logged in jobs		26	FQPFLG
	31	(same as data passed)		30	FQDEV
	33	(same as data passed)		32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQPFLG Count of open files is in bits 0-9. The number of jobs is in bits 10-15.

Data Returned (Bit 2 Clear in FIRQB+FQNAM1+2)

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	//////////	2	FQJOB
	5	(same as data passed)	4	FQFIL
	7	number of blocks owned by account read	6	FQPPN
	11	PPN of account read	10	FQNAM1
	13	password of account read (2 words in RAD50 format) or zeros	12	
	15		14	FQEXT
	17	LSB of CPU time (.1 seconds)	16	FQSIZ
	21	connect time (minutes)	20	FQBUFL
	23	LSB of KCTs	22	
	25	device time (minutes)	24	FQFLAG
FQPROT	27	MSB of CPU time	26	FQPFLG
	31	(same as data passed)	30	FQDEV
	33	(same as data passed)	32	FQDEVN
	35	disk quota in blocks; 0 = unlimited	34	
	37	UFD cluster size	36	

FIRQB+FQPPN

If the byte at FIRQB+FQNAM1+2 in the data passed is 1, this word is zero.

FIRQB+FQNAM1+2

If the caller has GACNT or WACNT privilege and the account allows password look-up, the password is returned as 2 words of RAD50. Otherwise, zeros are returned.

FIRQB+FQSIZ

The LSB of the CPU time in tenths of a second. See the byte at FIRQB+FQPROT for the MSB.

FIRQB+FQMODE

The LSB of the Kilo-Core-Ticks (KCTs). See the byte at FIRQB+FQPFLG for the MSB.

Errors

BADDIR

The account does not have all the necessary directory structures.

BADFUO

Device specified is not a disk.

NOSUCH

The PPN specified does not exist on the disk, or the index specified is greater than the number of accounts on the disk.

PRVIOL

The caller does not have sufficient privilege to perform the indicated function.

3.36.39 UU.RTS (Add/Remove/Run-Time System or Resident Library, or Create Dynamic Region)

Privileges Required

Read access (by protection code, GREAD, WREAD, and/or SYSIO privilege) is required to install a run-time system or resident library. INSTALL is required to install, remove, load, or unload a run-time system or resident library, or create a dynamic region.

Data Passed—Add a Run-Time System

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.RTS (= -22)	////////////////////////////////	2	
	5	////////////////////////////////	flag	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	run-time system name		10	FQNAM1
	13	(2 words of RAD50)		12	
	15	start load address or zero		14	FQEXT
	17	max. user job image size, K words (P.SIZE)		16	FQSIZ
	21	min. user job image size, K words (P.MSIZ)		20	FQBUFL
	23	stay flag	linked-list position	22	FQMODE
	25	flag word (P.FLAG)		24	FQFLAG
FQPROT	27	dfit. exec. file type (P.DEXT), RAD50		26	FQPFLG
	31	device name (disk) where stored		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

- FIRQB+FQFIL** All bits clear implies the values for P.SIZE, P.MSIZ, P.FLAG, and P.DEXT symbols are in the call. Bit 7 set means the system should obtain the values for these symbols from the .RTS file.
- FIRQB+FQPPN** The programmer number of the run-time system to install.
- FIRQB+FQFQPPN+1** The project number of the run-time system to install. If this and FQPPN are both zero, the default PPN is [0,1]
- FIRQB+FQNAM1** The file name of the run-time system to install, in RAD50 format. The file extension must be ".RTS" and the file must be contiguous.

FIRQB+FQEXT	<p>The 1K word section of memory where the run-time system will be loaded. The numbering runs from 0 to $n-1$, where n is the number of 1K word sections of memory in the system.</p> <p>If the value is 0, the monitor picks the load address each time the run-time system is loaded from the disk. (If the /LOCK or /NOREAD_ONLY bits are set, the monitor picks the load address once, as for the value -1.)</p> <p>If the value is -1, the monitor picks the load address once, when the run-time system is first installed, and loads it at that address each time it is used.</p> <p>The monitor takes other values as the specific address to load the run-time system this time.</p>
FIRQB+FQMODE	<p>The position in the linked list of run-time system description blocks at which to place the description block for this run-time system.</p> <p>If the value is 1, the directive places the description block immediately after that of the primary RTS.</p> <p>If the value is nonzero and less than or equal to the number of blocks currently in the list, the call places this new block in that position following the primary RTS block.</p> <p>If the value is zero or a value greater than the number of blocks currently in the list, the call places this new block at the end of the list.</p>
FIRQB+FQMODE+1	<p>All bits clear means the memory occupied by this run-time system can be released when usage count goes to zero. Bit 7 set means the run-time system is permanently resident and is loaded in memory as part of the install.</p>
FIRQB+FQPFLG	<p>The default extension type for the run-time system to be installed, in RAD50 format.</p>
FIRQB+FQDEV	<p>The name of the device (must be a disk) where the run-time system is stored. If you do not specify a name, the default is SY:.</p>
FIRQB+FQDEVN	<p>The unit number of the disk where the run-time system is stored.</p>

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.RTS subfunction does not return any meaningful data.

Errors

BADCNT	<p>The range of memory starting at the load address at FIRQB+FQEXT is not available. See the output of the SHOW MEMORY command to select an available range of memory.</p>
DEVNFS	<p>The device was not a disk, or the disk was mounted NFS.</p>
DTOOOF	<p>The systemwide limit of open files has been reached.</p>
FIEXST	<p>A run-time system with the same name already exists.</p>
NOBUFS	<p>Adding a run-time system description block requires a small buffer and none is currently available.</p>
NOROOM	<p>If loaded at address specified, memory is fragmented and a swapping violation occurs. See the discussion of assigning and allocating memory in the <i>RSTS/E System Installation and Update Guide</i> for guidelines on how to avoid fragmenting memory.</p>
NOSUCH	<p>No file with the name given and a type of .RTS can be found in the account at FIRQB+FQPPN on the device specified.</p>

PRVIOL The file to be added has a bad format. For example, it is not contiguous or has illegal entries in the SIL index.

Data Passed—Remove a Run-Time System

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.RTS (= -22)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code =4	4	FQFIL
	7	////////////////////////////////////		6	
	11	run-time system name		10	FQNAM1
	13	(2 words of RAD50)		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.RTS subfunction does not return any meaningful data.

Errors

- INUSE** This run-time system is currently being loaded into memory or is resident and in use. It cannot be removed until the usage count is zero.
- NOSUCH** The run-time system is not currently defined.
- PRVIOL** The run-time system is the primary run-time system or the system default keyboard monitor and cannot be removed with this call. Use the **DEFAULT** initialization option to change the primary run-time system before starting timesharing. The system default keyboard monitor is always **DCL**.

Data Passed—Unload a Run-Time System

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.RTS (= -22)	2	
	5	////////////////////////////////	4	FQFIL
	7	////////////////////////////////	6	
	11	run-time system name	10	FQNAM1
	13	(2 words of RAD50)	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.RTS subfunction does not return any meaningful data.

Errors

- INUSE** The run-time system is currently being loaded or is resident and in use. It cannot be unloaded until usage count is zero.
- NOSUCH** The run-time system is not currently defined.

Data Passed—Add a Resident Library

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
FQFUN	3	UU.RTS (= -22)	////////	2	
	5	////////	subfunction code=20	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	run-time system name		10	FQNAM1
	13	(2 words of RAD50)		12	
	15	start load address or zero		14	FQEXT
	17	////////////////////		16	
	21	////////////////////		20	
	23	stay flag	////////	22	FQMODE
	25	flag word		24	FQFLAG
FQPROT	27	protection code	<>0, prot.code real	26	FQPFLG
	31	device name (disk) where stored		30	FQDEV
	33	<>0, unit no. real	device unit number	32	FQDEVN
	35	////////////////////		34	
	37	////////////////////		36	

- FIRQB+FQPPN** The programmer number of the resident library to install.
- FIRQB+FQFQPPN+1** The project number of the resident library to install. If this and FQPPN are both zero, the default PPN is [0,1]
- FIRQB+FQNAM1** The file name of the resident library to install, in RAD50 format. The file extension must be ".LIB" and the file must be contiguous.

FIRQB+FQEXT

The 1K word section of memory where the resident library will be loaded. The numbering begins at the first available 1K word section and ends at $n-1$, where n is the total number of 1K word sections of memory in the system.

If the value is 0, the monitor picks the load address each time the resident library is loaded from the disk. The monitor picks the highest available address. Libraries of this kind are called *small floating* libraries. They must be entirely mapped within the virtual address space. They are provided for compatibility with older programs. This value is equivalent to the DCL qualifier /NOADDRESS=RESTRICTED.

If the value is -1, the monitor picks the load address once, when the run-time system is first installed, and loads it at that address each time it is used. The monitor picks the highest available address. This value is equivalent to the DCL qualifier /ADDRESS.

If the value is -2, the monitor picks a new load address each time the library is loaded. Libraries of this kind are called *large floating* libraries and can be larger than the virtual address space. This value is equivalent to the DCL qualifiers /NOADDRESS=UNRESTRICTED or /NOADDRESS.

The monitor takes other values as the specific address to load the resident library specified. Libraries of this kind are called *fixed resident* libraries. These values are equivalent to the DCL qualifier /ADDRESS= n .

If the value is 0 or -2 and the /STAY or read/write bits are set, the monitor picks the load address once, as for the value -1.

FIRQB+FQMODE+1

All bits clear means the resident library can be removed from memory when usage count goes to zero. Bit 7 set means the resident library is permanently resident and is loaded into memory as part of the install process.

FIRQB+FQFLAG

Bit settings indicate resident library characteristics:

Bit	Setting	Meaning
9	Set	The resident library is to be accessed by only one user. That is, the library is not to be shared.
	Clear	The resident library can be shared by more than one user.
10	Set	Read/write access is allowed.
	Clear	Read-only access.
12	Set	Errors occurring within code in the resident library are not to be recorded in the system error log.
	Clear	Errors may be recorded in the system error log.
13	Set	The resident library is immediately removed from memory when its usage count goes to zero.
	Clear	When the usage count for this library goes to zero, the monitor will remove it from memory when the space it takes is needed for something else.

All other bits are reserved and should be zero.

FIRQB+FQPROT

The protection code. If no code is specified, the default is 42.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.RTS subfunction does not return any meaningful data.

Errors

- BADCNT** You did not specify a load address, or the one specified is not available. See the output of the SHOW MEMORY command to find an available range of memory.
- DEVNFS** The device was not a disk, or the disk was mounted NFS.
- DTOOOF** The systemwide limit of open files has been reached.
- FIEXST** A resident library with the specified name already exists.
- NOBUFS** Adding a resident library description block requires a small buffer and none is currently available.
- NOROOM** If loaded at address specified, memory is fragmented and a swapping violation occurs. See the discussion of assigning and allocating memory in the *RSTS/E System Installation and Update Guide* for guidelines on how to avoid fragmenting memory.
- NOSUCH** No file with the name given and a type of .LIB can be found for the given account and device.
- PRVIOL** The file to be added has a bad format. For example, it is not contiguous or has illegal entries in the SIL index.

Data Passed—Remove a Resident Library

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.RTS (= -22)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code=24	4	FQFIL
	7	////////////////////////////////////		6	
	11	resident library name		10	FQNAM1
	13	(2 words of RAD50)		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.RTS subfunction does not return any meaningful data.

Errors

- INUSE** You tried to remove a library that is being loaded into memory or is in use. A resident library cannot be removed while a job is attached to it.
- NOSUCH** You specified a resident library that is not currently defined.

Data Passed—Unload a Resident Library

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.RTS (= -22)	2	
	5	////////////////////////////////	4	FQFIL
	7	////////////////////////////////	6	
	11	resident library name	10	FQNAM1
	13	(2 words of RAD50)	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.RTS subfunction does not return any meaningful data.

Errors

- INUSE** You tried to unload a resident library that is now being loaded or is in use. A library cannot be unloaded while a job is still attached to it.
- NOSUCH** You specified a resident library that is not currently defined.

Data Passed—Create Dynamic Region

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.RTS (= -22)	2	
	5	////////////////////////////////	4	FQFIL
	7	////////////////////////////////	6	
	11	dynamic region name	10	FQNAM1
	13	(2 words of RAD50)	12	
	15	start dynamic region address	14	FQEXT
	17	////////////////////////////////	16	FQSIZ
	21	////////////////////////////////	20	
	23	creation flags	22	FQMODE
	25	region flags	24	FQFLAG
FQPROT	27	protection code	26	FQPFLG
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQNAM1

If zero, the monitor creates an unnamed dynamic region.

FIRQB+FQEXT

The starting address of the dynamic region is K times the value of this word. If zero, the monitor computes the starting address for the dynamic region.

FIRQB+FQSIZ

Bits	Meaning
0-7	Size region requested (maximum of 255) in K words of memory.
14	Set to 1 if the directive can accept a smaller size region than requested when not enough memory exists. Set to 0 if the directive should return an error when there is not enough memory to satisfy the request.
15	Set to 1 to use bits 0-7 for size. Set to 0 to use only bits 0-6 for size.

FIRQB+FQMODE Creation flags. The following bits are currently defined: Bit 7, when set, means attach this job to the named region. Bit 15, when set, means do not delete this region even if all users detach from it; this is the /LOCK bit. All other bits are reserved and should be zero.

You can create a dynamic region with or without a name. However, if the job shares the dynamic region with another job, or if the dynamic region was created with bit 15 of FQMODE set so that it remains in memory, it must have a name in FIRQB+FQNAM1.

Unless you have the TUNE privilege, the size of the region is controlled by the dynamic region limit set for the system. See the UU.CFG directive and the *RSTS/E System Manager's Guide*.

FIRQB+FQFLAG Region flags. The following bit is currently defined: Bit 9, when set, means this region cannot be shared. All other bits are reserved and should be zero.

FIRQB+FQPFLG If nonzero, then the value in FIRQB+FQPROT is real.

FIRQB+FQPROT The protection code of the region.

Data Returned—Create Dynamic Region

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	dynamic region ID	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////// dynamic region size	16	FQSIZ
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQPPN The ID of the created dynamic region. The .PLAS directives use this ID.

FIRQB+FQSIZ The size of the created dynamic region in K words. The value can be in the range 1 to 255.

Errors

BADCNT	You tried to create a region with an illegal size specification or the load address was not valid.
FIEXST	You specified the name of a dynamic region or resident library that already exists.
NOBUFS	A small buffer was not available for the region description block. Also, if attachment was specified, a small buffer was not available for the window descriptor block.
NOROOM	If the dynamic region was loaded at the specified address, memory is fragmented and a swapping violation occurs. If the monitor was choosing the address, there is not enough free memory to create the region.

Data Passed (Create/Delete Virtual Disk)

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.RTS (= -22)	2	
	5	////////////////////////////////	4	FQFIL
	7	dynamic region ID	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	Start Virtual Disk Address	14	FQEXT
	17	Virtual disk size in K words	16	FQSIZ
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFUN	-22 (UU.RTS)
FIRQB+FQFIL	32 (Create/delete virtual disk)
FIRQB+FQEXT	K word address at which to place the virtual disk (from 0 to 2043), or -1 to let RSTS/E select the best-fit address.
FIRQB+FQSIZ	Size of virtual disk to create, in K words (from 1 to 2044), or 0 to delete the current virtual disk. If you specify 0, the address parameter in FQEXT is ignored.

Discussion

This call allocates memory for the virtual disk. Any memory so allocated is not available for other use, nor can it be windowed or mapped using the .PLAS directives. When the virtual disk is deleted, the memory is then made available for other uses.

When the monitor receives a request to create a virtual disk, the memory manager must sometimes "shuffle" things in memory (such as jobs and run-time systems) to make enough contiguous memory space for it. This task may take some time, particularly on very busy systems. Before the virtual disk driver allows the first access to the newly-created virtual disk, it ensures that all the memory that is supposed to be available for the virtual disk has really been allocated. If not, then the virtual disk driver returns a ?Device hung or write locked error to the job requesting the access. If this happens, the requesting job should sleep for a few seconds and then retry the operation, thus giving the memory manager time to do its job.

When a virtual disk is created, it is not automatically initialized as a RSTS/E volume. As in the past, you must still initialize it (using the INITIALIZE command) and mount it (using the MOUNT command) if necessary.

You must have HWCFG and INSTALL privileges to create or delete the virtual disk.

Data Returned

Except for a possible error in byte 0 of the FIRQB, this subfunction does not return any meaningful data.

Errors

When creating:

PRVIOL	User or program did not have the HWCFG privilege.
NOROOM	There was not enough contiguous memory available to create the virtual disk at the requested size.
BADCNT	The specified size or address was invalid, or, if an address was given, the virtual disk would not fit at that address.
NOBUFS	Not enough small buffers were available to build the memory descriptor blocks.
FIEXST	A virtual disk already exists.

When deleting:

PRVIOL	User or program did not have the HWCFG privilege.
INUSE	The virtual disk is mounted, has open files, or is open in non-file-structured mode.
NODEVC	There is no virtual disk to delete.

3.36.40 UU.SLN (System Logical Names)

Privileges Required

INSTAL is required to add, remove, or change system logical names.

Data Passed — Add New Name

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.SLN (= 25)	////////////////////////////////	2		
FQFIL+1	5	no-replace flag	subfunction code= 4	4	FQFIL	
	7	PPN for this name (if 0, none associated)		6	FQPPN	
	11	logical name in RAD50 format (5 words)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23	////////////////////////////////////		22		
	25	////////////////////////////////////		24		
	27	////////////////////////////////////		26		
	31	device name (2 ASCII characters)		30	FQDEV	
	33	must <>0	device unit number	32	FQDEVN	
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

FIRQB+FQFIL

This code adds a new entry to the list of system logical names.

FIRQB+FQFIL+1

Set to 1 to replace an existing system logical with the new information.

FIRQB+FQNAM1

The new logical name, put on the general or disk logical list according to the following conditions (checked in order by the system):

1. If the device name specified at FIRQB+FQDEV is not a disk.
2. If the device name is a disk and you specified a PPN at FIRQB+FQPPN.
3. If the logical name is longer than nine characters.
4. If the device name is a disk and you did not specify a PPN at FIRQB+FQPPN, the system checks to see if the disk is mounted. If the disk is not mounted, the system adds the logical name to the general logical list. If the disk is mounted and currently has no logical name assigned to it, the name is put on the disk logical list and assigned to that disk. All other cases are put on the general logical list.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.SLN subfunction does not return any meaningful data.

Errors

- BADNAM No logical name was given or the name contains invalid characters.
- INUSE The logical name given duplicates one already in use and $FIRQB + FQFIL = 0$.
- NOBUFS An attempt was made to extend the logical name table and there was no room in XBUF.
- NODEVCS The device specification is illegal or is not on the system.

Data Passed — Remove Logical Name

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////////	0	
FQFUN	3	UU.SLN (= 25) //////////////////////////////////	2	
	5	//////////////////////////////// subfunction code= 0	4	FQFIL
	7	////////////////////////////////////	6	
	11	logical name in RAD50 format (5 words)	10	FQNAM1
	13		12	
	15		14	
	17		16	
	21		20	
	23		22	
	25		24	
	27	26		
	31	30		
	33	32		
	35	34		
	37	36		

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.SLN subfunction does not return any meaningful data.

Errors

- BADNAM No logical name was given or the name contains invalid characters.
- NOSUCH The name given is not currently defined as a logical name.

Data Passed — Change Disk Logical Name

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.SLN (= 25)	////////////////////////////////	2		
	5	////////////////////////////////	subfunction code 1	4	FQFIL	
	7	////////////////////////////////////		6		
	11	logical name in RAD50 format (5 words)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21				20	
	23	////////////////////////////////////		22		
	25	////////////////////////////////////		24		
	27	////////////////////////////////////		26		
	31	device name (2 ASCII characters)		30	FQDEV	
	33	must <>0	device unit number	32	FQDEVN	
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

FIRQB+FQFIL This code changes the logical name associated with a disk in the list of disk logical names.

FIRQB+FQNAM1 The disk logical name in RAD50 format. The name can not be more than nine characters.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.SLN subfunction does not return any meaningful data.

Errors

BADNAM No logical name was given, or the name contains invalid characters.

INUSE The logical name given duplicates one already in use.

NOSUCH The disk specified is not on the system.

NODEVC The device specified is illegally formatted or is not a disk.

Data Passed — List Logical Name

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.SLN (= 25)	////////////////////////////////	2	
	5	////////////////////////////////	subfunction code= 2	4	FQFIL
	7	index		6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQPPN

Index. An integer representing the relative position of the specified logical name in the list of system logical names. You can list all logicals by repeated calls with an index value starting at zero and incremented by one each time.

Data Returned

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////////////////		0	
	3	////////////////////////////////		2	
	5	////////////////////////////////		4	
	7	project number	programmer number	6	FQPPN
	11	logical name in RAD50 format (5 words)		10	FQNAM1
	13			12	
	15			14	
	17			16	
	21			20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	device name (2 ASCII characters)		30	FQDEV
	33	must <>0	device unit number	32	FQDEVN
	35	////////	mount flag	34	FQCLUS
	37	////////////////////////////////		36	

FIRQB+FQCLUS The value of this byte is 377 if the indexed logical is a disk and the disk is not mounted.

Errors

NOSUCH Index out of range.

3.36.41 UU.SPL (Spooling)

RSTS/E currently has two spooling packages: the Print/Batch Services (PBS) package and the OPSEER-based package. When you execute the UU.SPL directive, the system first looks at the spooled device name field (FIRQB+FQSIZ). The monitor, by default, routes the request to PBS if it is running and the field is null or LP, or it is BA and the file type is .COM. Otherwise, the monitor routes the request to the OPSEER-based package.

Note that by setting a bit in FQFLAG, you can force the request to be sent to whichever spooling package you want.

For requests routed to PBS, any request parameter that cannot be passed by UU.SPL is assigned a default value.

Privileges Required

File read access (by protection code, or GREAD or WREAD privilege) is required to queue a file. File write access (by protection code, or GWRITE or WWRITE privilege) is also required to queue a file with the delete option flag. DEVICE privilege is required if the file is on a restricted device.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.SPL (= -34) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	project number programmer number	6	FQPPN
	11	wildcard file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	wildcard file type in RAD50 format (1 word)	14	FQEXT
	17	device name to queue to (ASCII); 0 = "LP0"	16	FQSIZ
	21	device unit real flag device unit number	20	FQBUFL
	23	////////////////////////////////	22	FQMODE
	25	flag word	24	FQFLAG
	27	////////////////////////////////	26	
	31	device name where file is (disk)	30	FQDEV
	33	<>0, unit number real device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQSIZ

The requested device name. Permitted values are LP, BA, and zero which translates to "LP0:."

FIRQB+FQBUFL The device unit real flag. If zero, it means use the default print or batch queue. If nonzero, it means use the queue with the same name as the device name.

FIRQB+FQFLAG You can set the following bits for PBS:

Bit Meaning When Set

- | | |
|----|---|
| 2 | Delete after spooling; same as DCL command PRINT/DELETE. |
| 5 | No header; same as DCL command PRINT/NOFLAG_PAGES. (Ignore for batch requests.) |
| 12 | Network Print/Batch request |
| 13 | Route request to OPSER spooler |
| 14 | Route request to PBS |

If both bits 13 and 14 are set, then the request is routed to PBS.

If both bits are clear, then the following rules apply:

- If the spooler device name is "LP" or null, or the device name is "BA" and the file type is .COM, then the request is routed to PBS if it is running; otherwise, it is routed to OPSER.
- If the spooler device name is not "LP" or null, then the request is routed to OPSER.

You can set the following bits for OPSER:

Bit Meaning When Set

- | | |
|---|--|
| 0 | The file is spooled with FORTRAN carriage control; same effect as QUE/TYP:FTN. |
| 1 | Restart file; same effect as QUE/RE. |
| 2 | Delete file after spooling; same effect as QUE/DE. |
| 3 | Binary file; same effect as QUE/BI. |
| 4 | The end; same effect as QUE/END. |
| 5 | No header; same effect as QUE/NH. |

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.SPL subfunction does not return any meaningful data.

Errors

- | | |
|---------------|--|
| DEVNFS | The device specified at FIRQB+FQDEV of the call is not a file-structured device. |
| HNGDEV | This error is caused by a hardware condition. For example, the specified disk could not be accessed. |
| NOBUFS | System buffers are not currently available to store this message. This may be a transient condition; retry the operation. |
| NODEVC | An attempt was made to queue a file to a device that had a unit number greater than seven, or the file to be queued is on an invalid device. |
| NOROOM | The number of messages pending for the queue manager program is at its declared maximum. This may be a transient condition; retry the operation. |
| NOSUCH | The account specified at FIRQB+FQPPN does not exist on the device specified, the file name or type specified at FIRQB+FQNAM1 cannot be found. |

NOTMNT The specified disk device is not mounted.
PAKLCK The specified disk is restricted, and the caller does not have **DEVICE** privilege.
PRVIOL An attempt was made to queue a file to which the user did not have read access or to queue an executable file.

3.36.42 UU.STL (Stall/Unstall System)

Privileges Required

HWCTL is required to stall or unstall a system.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.STL (= 35)	////////////////////////////////	2	
	5	////////////////////////////////	0 or 1	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL Zero means return the system to normal (unstalled) state. One means Stall; suspend all currently active jobs except for the calling job.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.STL subfunction does not return any meaningful data.

Errors

- BADFUO** You specified unstall, but the system is not stalled.
- INUSE** You tried to stall the system, but it is already stalled.

3.36.43 UU.SWP (Add, Remove, and List System Files)

Privileges Required

INSTALL is required to add or remove system files. File read access (by protection code, or GREAD or WREAD privilege) and file write access (by protection code, or GWRITE, WWRITE, and/or SYSIO privilege) is required to add system files. WRTNFS is required to add non-file-structured swap space.

Data Passed — Add System File

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
QCFUN	3	UU.SWP (= 27)	////////////////////////////////	2	
QCSIZM	5	= 1 for add	file to add	4	FQFIL
	7	////////////////////////////////////		6	
	11	for [0,1] file with type of .SYS, file name as 2 words RAD50. If both words = 0, non-file-structured disk.		10	FQNAM1
	13			12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	device name (disk) (2 ASCII characters)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

The possible bit settings are:

Bit	Meaning
0	Swap file 0
1	Swap file 1
2	Illegal (generates an error; slot 2 is always added)
3	Swap file 3
4	Overlay file
5	Error message file

Data Returned

Except for a possible error in byte 0 of the FIRQB, the add option of the UU.SWP subfunction does not return any meaningful data.

Errors

BADFUO	The number specified at FIRQB+FQFIL is either two or is greater than six. The swap file 2 must exist on the system disk and cannot be added during timesharing. System files to be added are defined only by the values 0, 1, 3, 4, and 5.
BADNAM	No file name is specified when an overlay, an error message, or a DECnet/E system file is being added, or the name specified contains nonalphanumeric characters.
DEVNFS	The device specified is not a disk device.
FIEXST	The system file being added is already installed on the system.
INUSE	A swap file is being added to a non-file-structured disk, but the disk is currently mounted (that is, it is being used as a file-structured device).
NODEV	The device specified is a disk but is not on this system.
NOROOM	If an overlay or error file is being added, this error indicates that the file is not long enough. (The overlay file should be at least 128. blocks and the error file at least 16. blocks.) If a swap file is being added to a file-structured device, this error means that the file is not long enough to store even one job.
NOSUCH	A system file is being added to a file-structured disk, but the file with the name specified and with a .SYS file type does not exist in account [0,1].
NOTAVL	A swap file is being added to a non-file-structured disk, but either the disk unit or its controller has been disabled. The system manager must use an initialization option to enable the unit or its controller.
NOTMNT	A system file is being added to a file-structured disk but that disk is not currently mounted. Use the MOUNT command to logically mount the disk before the file is added.
PRVIOL	A system file is being added to a file-structured disk. Either the unit is logically write locked, or the file specified is bad; that is, it is not contiguous or is currently open.

Data Passed — Remove System File

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.SWP (= 27)	////////	2	
FQSIZM	5	= 0 for remove	file to remove	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

The possible bit settings are:

Bit	Meaning
0	Swap file 0
1	Swap file 1
2	Illegal (generates an error; slot 2 is never removed)
3	Swap file 3
4	Overlay file
5	Error message file

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	error code or 0	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	0 or -1	34	FQCLUS
	37	////////////////////////////////	36	

FIRQB_0

Error code or zero.

FIRQB+FQCLUS

Zero means the system file was successfully removed; minus one means the system file was not found and so could not be removed. (If bit 4 = 1, the overlay file is removed.)

Errors

BADFUO

The number specified at **FIRQB+FQFIL** is either two or greater than six. The swap file 2 must exist on the system disk and cannot be removed during time sharing. System files to be removed are defined only by the values 0, 1, 3, 4, and 5.

INUSE

The swap file to be removed can be properly removed but currently contains one or more swapped out jobs. The system locks the file and begins swapping jobs to other files. Retry the call at a later time when the swapped out jobs are no longer in this file.

PRVIOL

A swap file is to be removed but its removal decreases the swap file space below the limit required to store the maximum number of jobs on the system. To remove the swap file, decrease the number of logins currently allowed (by either the **SET LOGINS** command or **SYS** call), wait until the number of logged in jobs falls to the maximum, and try the removal operation again. This error also occurs if you attempt to remove the **DECnet/E** system file when **DECnet/E** is still on.

Data Passed — List System File

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.SWP (= 27)	////////////////////////////////	2	
FQSIZM	5	= -1 to list	file to list	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

FIRQB+FQFIL

The possible bit settings are:

Bit	Meaning
0	Swap file 0
1	Swap file 1
2	Swap file 2
3	Swap file 3
4	Overlay file
5	Error message file
6	DECnet/E system file

Data Returned — List System File

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	project number | programmer number	6	FQPPN
	11	file name in RAD50 format (2 words)	10	FQNAM1
	13		12	
	15	file type in RAD50 format (1 word)	14	FQEXT
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	device name (2 ASCII characters)	30	FQDEV
	33	<>0, unit number real | device unit number	32	FQDEVN
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Errors

- BADFUO** The number specified at **FIRQB+FQFIL** is less than zero or greater than six.
- NOSUCH** The number specified at **FIRQB+FQFIL** refers to a file that is not currently installed.

3.36.44 UU.SYS (Return Job Status Information)

Privileges Required

JOBCTL is required to read the status of another job, except a job running on a pseudo keyboard controlled by the caller. TUNE is required to obtain priority or run burst status.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.SYS (= 32)	////////////////////////////////	2	
FQSIZM	5	subcode= 0, 1, or 2	job number or 0	4	FQFIL
	7	////////////////////////////////////		6	
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////////////////////////////////		26	
	31	////////////////////////////////////		30	
	33	////////////////////////////////////		32	
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Data Returned (for subcode = 0)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	calling job no. * 2	2	FQJOB
FQSIZM	5	job's console KB no.	status job no. * 2	4	FQFIL
	7	swap slot location	(ctrlg job no.*2)+1	6	FQPPN
	11	LSB of CPU time, in .1 seconds		10	FQNAM1
	13	job's current connect time, in minutes		12	
	15	LSB of KCTs		14	FQEXT
	17	job's accumulated device time, minutes		16	FQSIZ
	21	MSB of CPU time	MSB of KCTs	20	FQBUFL
	23	job name in RAD50 format (2 words)		22	FQMODE
	25			24	
FQPROT	27	project number	programmer number	26	FQPFLG
	31	job keyboard monitor in RAD50 format (2 words)		30	FQDEV
	33			32	
	35	current run-time system in RAD50 format (2 words)		34	FQCLUS
	37			36	

FIRQB+FQSIZM If this value is negative, the job is detached, and the value is the one's complement of the keyboard number to which the job was previously attached.

FIRQB+FQPPN Returned only if job is attached to a pseudo keyboard.

Data Returned (for subcode = 1)

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////	2	FQJOB
FQSIZM	5	job's console KB no.	4	FQFIL
	7	current flag word	6	FQPPN
	11	curr. info. posting	10	FQNAM1
	13	current JBSTAT word	12	
	15	current JBWAIT word	14	FQEXT
	17	mem. ctrl sub-block	16	FQSIZ
	21	current physical addr., 32-word increments	20	FQBUFL
	23	run burst, in .1 sec	22	FQMODE
	25	value at offset 6	24	FQFLAG
	27	(depends on JBWAIT and JBSTAT)	26	FQPFLG
	31	read or write state	30	FQDEV
	33	pointer to Job Data Block	32	FQDEVN
	35	pointer to second Job Data Block	34	FQCLUS
	37	pointer to first Receiver ID Block	36	FQNTENT

FIRQB+FQSIZM If this value is negative, the job is detached, and the value is the one's complement of the keyboard number to which the job was previously attached.

FIRQB+FQMODE Returned only if the caller has TUNE privilege.

Data Returned (for subcode = 2)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	calling job no. * 2	2	FQJOB
FQSIZM	5	job's console KB no.	status job no. * 2	4	FQFIL
	7	job's current D-space	job's current I-space	6	FQPPN
	11	job's current privilege mask (4 words)		10	FQNAM1
	13			12	
	15			14	FQEXT
	17			16	FQSIZ
	21	job's header size	job's access type	20	FQBUFL
	23	reserved		22	
	25			24	
	27	job's PPN		26	FQPFLG
	31	job's saved privilege mask (4 words)		30	FQDEV
	33			32	
	35			34	
	37			36	

- FIRQB+FQSIZM** If this value is negative, the job is detached, and the value is the one's complement of the keyboard number to which the job was previously attached.
- FIRQB+FQPPN** The monitor returns the job's current I-Space size in **FIRQB+FQPPN** and the job's current D-Space size in **FIRQB+FQPPN+1**.
- FIRQB+FQNAM1** The monitor returns the job's current privilege mask in four words beginning at **FIRQB+FQNAM1**.
- FIRQB+FQBUFL** The monitor returns the job's access type in this byte. The following values are defined:
- | Value | Meaning |
|-------|--------------------|
| 0 | Local |
| 1 | Dial-up |
| 2 | Batch |
| 4 | Network (SET HOST) |
| 6 | Network server |
- All other values are reserved.
- FQBUFL+1** The monitor returns the job's header size in **FIRQB+FQBUFL+1**.
- FIRQB+FQPFLG** The monitor returns the PPN of the job in the word beginning at **FQPFLG**.
- FIRQB+FQDEV** The monitor returns the job's saved privilege mask in the four words beginning at **FIRQB+FQDEV**. This differs from the current privilege mask if the job has temporary privileges.

Errors

BADFUO The job number specified at FIRQB+FQFIL is less than zero or greater than JOB MAX.

PRVIOL The job specified at FIRQB+FQFIL does not exist.

3.36.45 UU.TB1 (Get Monitor Tables, Part I)

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////////		0
FQFUN	3	UU.TB1 (= -3) //////////////////////////////////		2
	5	////////////////////////////////////		4
	7	////////////////////////////////////		6
	11	////////////////////////////////////		10
	13	////////////////////////////////////		12
	15	////////////////////////////////////		14
	17	////////////////////////////////////		16
	21	////////////////////////////////////		20
	23	////////////////////////////////////		22
	25	////////////////////////////////////		24
	27	////////////////////////////////////		26
	31	////////////////////////////////////		30
	33	////////////////////////////////////		32
	35	////////////////////////////////////		34
	37	////////////////////////////////////		36

Data Returned

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
FQSIZM	5	MAXCNT(max. job no.)	CNT.KB-1(max. KB no.)	4	FQFIL
	7	(DEVCNT) address of max. unit no. table		6	FQPPN
	11	(DEVPTR) address of pointers to dev. DDBs		10	FQNAM1
	13	(MEMLST) root link word in 1st mem ctl sblk		12	
	15	(JOBTBL) address of the job table		14	FQEXT
	17	(JBSTAT) address of job status table		16	FQSIZ
	21	(JBWAIT) address of job wait flag table		20	FQBUFL
	23	(UNTCLU) addr of unit owners/pk cl sz tbl		22	FQMODE
	25	(UNTCNT) address of disk status table		24	FQFLAG
	27	(SATCTL) address of free-block table		26	FQPFLG
	31	(JSBTBL) adr of job stat ordered by drv idx		30	FQDEV
	33	(SATCTM) addr of free block count table		32	FQDEVN
	35	current date in system internal format		34	FQCLUS
	37	(UNTOPT) addr of unit option table		36	FQNENT

FIRQB+FQCLUS System internal format for date is:
*[(year - 1970) * 1000.] + day-within-year*

Errors

No errors are possible with UU.TB1.

3.36.46 UU.TB2 (Get Monitor Tables, Part II)

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////		0
FQFUN	3	UU.TB2 (= -14) //////////////////////////////////		2
	5	////////////////////////////////		4
	7	////////////////////////////////		6
	11	////////////////////////////////		10
	13	////////////////////////////////		12
	15	////////////////////////////////		14
	17	////////////////////////////////		16
	21	////////////////////////////////		20
	23	////////////////////////////////		22
	25	////////////////////////////////		24
	27	////////////////////////////////		26
	31	////////////////////////////////		30
	33	////////////////////////////////		32
	35	////////////////////////////////		34
	37	////////////////////////////////		36

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////	0	
	3	////////// current job no. * 2	2	FQJOB
	5	(FREES) addr of free buffer info table	4	FQFIL
	7	(DEVNAM) addr of device name table	6	FQPPN
	11	(CSRTBL) addr of CSR table	10	FQNAM1
	13	(DEVOKB) no. disks in DEVNAM * 2	12	
	15	(TTYHCT) no. hung term errs since startup	14	FQEXT
	17	(JOBcnt) no. jobs now / no. logins allowed	16	FQSIZ
	21	(RTSLST) rt. lnk.word in RTS dsc.blk.list	20	FQBUFL
	23	(ERLCTL) error logging control data	22	FQMODE
	25	(SNDLST) list of eligible msg. rec. jobs	24	FQFLAG
	27	(DSKLOG) disk logical table	26	FQPFLG
	31	(DEVSYN) start of synonym names in DEVNAM	30	FQDEV
	33	(MEMSIZ) physical memory size, K-words*32	32	FQDEVN
	35	(CCLLST)root link word of CCL desc. blks.	34	FQCLUS
	37	(FCBLST) addr of table of roots of FCBs	36	FQNENT

Errors

No errors are possible with UU.TB2.

3.36.47 UU.TB3 (Get Monitor Tables, Part III)

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
FQFUN	3	UU.TB3 (= -29) //////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Data Returned

		FIRQB			
Mne- monic	Octal Offset			Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
	5	(DDCTBL) addr of controller/device table		4	FQFIL
	7	(UCTTBL) addr of unit/controller table		6	FQPPN
	11	(SATEND) addr of disk size table		10	FQNAM1
	13	(UNTLVL) addr of disk structure level table		12	
	15	(MFDPTR) addr of MFD point table		14	FQEXT
	17	(MAGLBL) addr of mag tape labeling default		16	FQSIZ
	21	no. of single LOTS	no. jobs on system	20	FQBUFL
	23	(LOTTBL) local object type table		22	
	25	(EMLCTL) EMT logger control table		24	FQFLAG
	27	hardware configuration word		26	FQPFLG
	31	(UNTERR) address of unit error count table		30	FQDEV
	33	(DEVCLU) addr of unit dev cl sz/cl fac tbl		32	FQDEVN
	35	(NULRTS) address of NULL RTS block		34	FQCLUS
	37	(DSTPTR) address of disk statistics table		36	FQNENT

FIRQB+FQPFLG Flag word bit settings indicate hardware configuration attributes:

Bit	Setting	Meaning
3	Clear	FIS not available
	Set	FIS available
5	Clear	Unibus system
	Set	QBUS system
9	Clear	FPP not available
	Set	FPP available
10	Clear	CIS not available
	Set	CIS available
13	Clear	System does not have I&D Space
	Set	System has I&D Space

FIRQB+FQNENT The Memory Management Unit (MMU) value for the disk statistics table, if unsupported disk statistics are turned on.

Errors

No errors are possible with UU.TB3.

3.36.48 UU.TRM (Set Terminal Characteristics)

Privileges Required

HWCFG is required to set a terminal other than the caller's own, or to set permanent characteristics. A job owns a terminal if the terminal is the job's console terminal, or if the terminal is opened or allocated by the job.

Data Passed (subfunction= 0)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.TRM (= 20)	////////////////////////////////	2	
FQSIZM	5	377(current) or KB no	subfunction code =0	4	FQFIL
	7	200(tab)/377(no tab)	width: 0 or width+1	6	FQPPN
	11	200(lwc out)/377(no)	200(no frm)/377(form)	10	FQNAM1
	13	200(fdplx)/377(local)	200(no XON)/377(XON)	12	
	15	200(no)/377(lwc in)	200(no scp)/377(scp)	14	FQEXT
	17	rcv baud rate	FILL fctr+1;1(noFILL)	16	FQSIZ
	21	xmt baud rate	PARITY;1(no)2(e)3(od)	20	FQBUFL
	23	200(^)/377(no ^)	200(no stl)/377(stl)	22	FQMODE
	25	parameters	////////////////////////////////	24	FQFLAG
FQPROT	27	200(no)/377(esc seq)	PERMANENT flag	26	FQPFLG
	31	200(no esc)/377(esc)	private delimiter	30	FQDEV
	33	RSUM;200(^C)/377(any)	200(no ^R/377(^R)	32	FQDEVN
	35	200(no GAG)/377(GAG)	BRAK;200(nul)/377(^C)	34	FQCLUS
	37	////////////////////////////////////		36	

FIRQB+FQEXT

Setting No Scope automatically sets No Stall. Setting Scope automatically sets Stall.

FIRQB+FQSIZ+1

Receiver baud rate is set as follows:

- 0 No change
- n The internal code to determine the baud rate at which the terminal receives characters. If FIRQB+FQBUFL+1 is zero, this code also determines the transmit (output) baud rate. (Requires HWCTL privilege.) Note that you can set internal codes only for DH11, DZ11/DZV11, and DHU11/DHV11 interface lines as follows:

DH11		DZ11/DZV11		DHU11/DHV11	
Code	Speed	Code	Speed	Code	Speed
1	0	1	0	1	0
2	50	2	50	2	75
3	75	3	75	3	110
4	110	4	110	4	134.5
5	134.5	5	134.5	5	150
6	150	6	150	6	300
7	200	7	300	7	600
8	300	8	600	8	1200
9	600	9	1200	9	1800
10	1200	10	1800	10	2000
11	1800	11	2000	11	2400
12	2400	12	2400	12	4800
13	4800	13	3600	13	Res.
14	9600	14	4800	14	9600
15	EXTA	15	7200	15	19200
16	EXTB	16	9600		

FIRQB+FQBUFL

Parity and 8-bit mode values:

- 1 No parity
- 2 Even parity
- 3 Odd parity
- 4 Enable parity characteristic
- 20 8-bit characteristic off
- 30 8-bit characteristic on

FIRQB+FQBUFL+1

Transmitter baud rate is set as follows:

- 0 Both the receive (input) and transmit (output) speeds are determined by the value n in FIRQB+FQSIZ+1.
- n The internal code to determine the baud rate at which the terminal transmits characters when a split speed setting is used. (HWCTL privilege required.) You can use split speed settings only with the DH11, DHU11, and DHV11 interface lines.

FIRQB+FQFLAG+1 Value=10+DATA+STOP+PARITY
 where:
DATA is 0 for 5-bit characters
 1 for 6-bit characters
 2 for 7-bit characters
 3 for 8-bit characters
STOP is 0 for 1 stop bit per character
 4 for 2 stop bits per character
 or 1.5 bits if DATA = 0
PARITY is 0 for no parity bit
 20 for even parity format
 60 for odd parity format

This byte applies only to interfaces that support DATA/STOP/PARITY features. When this byte is used with these interfaces, it overrides the setting of FIRQB+FQBUFL. In addition, when this byte is used, FIRQB+FQSIZ+1 (receiver baud rate) must be nonzero.

FIRQB+FQPFLG The PERMANENT flag is as follows:
 0 No change
 200 Return permanent characteristics
 377 Set permanent characteristics

FIRQB+FQDEV Determines the use of private delimiters as follows:
 0 No change.
 200 Disable (clear) the private delimiter.
 200+n Set the private delimiter to ASCII code n (in the range 1 to 127). If the character has a special meaning (for example, horizontal tab or the Ctrl/Z combination), the private delimiter usage has higher precedence.

Data Returned (Current Keyboard Characteristics)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////		0	
	3	////////	current job no. * 2	2	FQJOB
FQSZM	5	255(current) or KB no	KB status	4	FQFIL
	7	tab/no tab	width: 0 or width+1	6	FQPPN
	11	lc outpt/no lc outpt	no form/form	10	FQNAM1
	13	full dplx/local echo	no XON/XON	12	
	15	no lc input/lc input	no scope/scope	14	FQEXT
	17	receive baud rate	no fill/fill	16	FQSIZ
	21	transmit baud rate	no parity/even/odd	20	FQBUFL
	23	up arrow/no up arrow	no stall/stall	22	FQMODE
	25	////////	interface for line	24	FQFLAG
FQPROT	27	no esc seq/esc seq	PERMANENT flag	26	FQPFLG
	31	no esc/esc	delimiter/delim x	30	FQDEV
	33	resume CTRL/C or any	CTRL/R,CTRL/T flag	32	FQDEVN
	35	enable/dis broadcast	BREAK=null or CTRL/C	34	FQCLUS
	37	////////	8-bit characteristics	36	FQNTENT

FIRQB+FQFIL

Bit 0 when set means the keyboard is disabled or is a pseudo keyboard that is not in use.

When bits 1-6 are clear, it means no job owns the keyboard. Otherwise, the value in bits 1-6 is equal to the job number times two of the job that owns keyboard.

Bit 7 when set means the modem line is hung up or is a pseudo keyboard that is not in use.

Errors

BADFUO

The system returns this error for one of two possibilities:

- Keyboard number is out of range of valid numbers.
- Current keyboard is specified but is detached.

NOTAVL

The system returns this error if you attempt to set or retrieve information on a terminal that is not available, for example a terminal that has been disabled by INIT.SYS.

PRVIOL You do not have HWCFG privilege and tried to either:

- Read the characteristics of a terminal not opened or assigned to your job.
- Change the characteristics of a terminal other than your job's console terminal (KB:).
- Change the speed setting for your terminal. (FIRQB+FQSIZ+1 or FIRQB+FQBUFL+1 is nonzero.)
- Set the permanent characteristics for a dial-up terminal, pseudo keyboard, or local terminal. (FIRQB+FQPFLG is nonzero.)

Data Passed (Subfunction = 1)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
FQFUN	3	UU.TRM (= 20)	////////////////////////////////	2	
FQSIZM	5	377(current) or KB no	subfunction code=1	4	FQFIL
	7	////////////////////////////////	terminal type code	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
FQFLAG+1	25	clear chars flag	set chars flag	24	FQFLAG
FQPROT	27	input buffer quota	PERMANENT flag	26	FQPFLG
	31	clear control chars	set control chars	30	FQDEV
	33	set terminal capability flags		32	FQDEVN
	35	clear terminal capability flags		34	FQCLUS
	37	////////////////////////////////////		36	

FIRQB+FQPPN

Terminal type codes. The following decimal values are valid; zero causes no change to occur:

Code	Type	Code	Type	Code	Type
0	no change	16	VT131	32	KSR33
1	Unknown	17	VT132	33	ASR35
2	LA36	18	VT220	34	KSR35
3	VT52	19	VT240	35	LN03
4	VT55	20	VT241	36-43	Reserved
5	LA180S	21	VT105	44	LA210
6	VT100	22	VK100	45	LQP03
7	LA120	23	RT02	46	LQP02
8	LA12	24	LA30	47	LA75
9	LA100	25	VT50	48	VT330
10	LA34	26	VT50H	49	VT340
11	LA38	27	VT05	50	VT320
12	LA50	28	VT05B	51	LA324
13	VT101	29	LA30S	52-128	Reserved
14	VT102	30	2741	129-255	Customer definable
15	VT125	31	ASR33		

FIRQB+FQFLAG

The Set characteristics flag is as follows:

0	No change
1	Allow operator messages
2	Allow operator requests
4	Allow line editing
10	Allow command recall
200	Insert edit mode

FIRQB+FQFLAG+1

The Clear characteristics flag is as follows:

0	No change
1	Disable operator messages
2	Disable operator requests
4	Disable line editing
10	Disable command recall
200	Overstrike edit mode

FIRQB+FQPFLG

The PERMANENT flag is as follows:

0	No change
200	Return permanent characteristics
377	Set permanent characteristics

FIRQB+FQPROT

The terminal's input buffer quota is as follows:

- 0 No change
- 6 The maximum number of input buffers. The default value is 6. There are 28 characters per buffer. The /BUFFER_QUOTA qualifier of the SET TERMINAL command sets this characteristic. Users need HWCFG privilege to use this feature.
- 255

NOTE

There is no guarantee that a terminal can allocate its full buffer quota.

Excessive use of this feature to allocate large amounts of buffers to several terminals could create a shortage of small buffers.

FIRQB+FQDEV

Setting control character functions or auto-baud. The bits currently defined are:

- 0 Set Ctrl/C
- 1 Set Ctrl/T
- 2 Set Ctrl/R
- 3 Set Ctrl/X
- 4 Set autobaud

Bits can be combined; that is one or more bits can be set at any time. If no bits are set, then the current setting is unchanged. All other bits are reserved and should be zero.

FIRQB+FQDEV+1

Clearing control character functions or auto-baud. The bits currently defined are:

- 0 Clear Ctrl/C
- 1 Clear Ctrl/T
- 2 Clear Ctrl/R
- 3 Clear Ctrl/X
- 4 Clear autobaud

Bits can be combined; that is one or more bits can be cleared at any time. If no bits are cleared, then the current setting is unchanged. All other bits are reserved and should be zero.

FIRQB+FQDEVN

Set terminal capability flags. The following bits are currently defined:

- 0 Set ANSI escape sequences
- 1 Set advanced video
- 2 Set width to 132 columns
- 3 Set printer port
- 4 Set ReGIS graphics
- 5 Set SIXEL graphics
- 6 Set Katakana character set
- 7 Set selectively erasable characters
- 8 Set dynamically redefinable character sets (DRCS)
- 9 Set user defined keys (UDKs)
- 10 Set local copy
- 11 Set Non-Interactive
- 12 Set Answerback mode

If no bits are set, the current capability status is unchanged. All other bits are reserved and should be zero.

FIRQB+FQCLUS

Clear terminal capability flags. The following bits are currently defined:

- 0 Clear ANSI escape sequences
- 1 Clear advanced video
- 2 Clear 132 column flag
- 3 Clear printer port
- 4 Clear ReGIS graphics
- 5 Clear SIXEL graphics
- 6 Clear Katakana character set
- 7 Clear selectively erasable characters
- 8 Clear dynamically redefinable character set (DRCS)
- 9 Clear user defined keys (UDKs)
- 10 Clear local copy
- 11 Clear Non-Interactive
- 12 Clear Answerback mode

If no bits are set, the current capability status is unchanged. All other bits are reserved and should be zero.

Data Returned (Current Terminal Characteristics)

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////////		0	
	3	////////////////////////////////////		2	
	5	////////////////////////////////////		4	
	7	////////	current terminal type	6	FQPPN
	11	////////////////////////////////////		10	
	13	////////////////////////////////////		12	
	15	////////////////////////////////////		14	
	17	////////////////////////////////////		16	
	21	////////////////////////////////////		20	
	23	////////////////////////////////////		22	
	25	////////////////////////////////////		24	
	27	////////	PERMANENT flag	26	FQPFLG
	31	////////	current ctrl settings	30	FQDEV
	33	current terminal capability flag settings		32	FQDEVN
	35	////////////////////////////////////		34	
	37	////////////////////////////////////		36	

Errors

BADFUO

The system returns this error for one of three possibilities:

- Keyboard number is out of range of valid numbers.
- Current keyboard is specified but is detached.
- The terminal's input buffer quota is out of range.

PRVIOL

You do not have the required privileges and you tried to either:

- Read the characteristics of a terminal not opened or assigned to your job.
- Change the characteristics of a terminal other than your job's console terminal (KB:).
- Change the speed setting for your terminal. (FIRQB+FQSIZ+1 or FIRQB+FQBUFL+1 is nonzero.)
- Set the permanent characteristics for a dial-up terminal, pseudo keyboard, or local terminal. (FIRQB+FQPFLG is nonzero.)
- Change the terminal's input buffer quota.

3.36.49 UU.YLG (Enable Logins)

Privileges Required

SWCTL is required to enable logins.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////		0
FQFUN	3	UU.YLG (= -1) //////////////////////////////////		2
	5	////////////////////////////////		4
	7	////////////////////////////////		6
	11	////////////////////////////////		10
	13	////////////////////////////////		12
	15	////////////////////////////////		14
	17	////////////////////////////////		16
	21	////////////////////////////////		20
	23	////////////////////////////////		22
	25	////////////////////////////////		24
	27	////////////////////////////////		26
	31	////////////////////////////////		30
	33	////////////////////////////////		32
	35	////////////////////////////////		34
	37	////////////////////////////////		36

Data Returned

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////// | current job no. * 2	2	FQJOB
	5	////////// | no. logins allowed	4	FQFIL
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

Errors

No errors are possible with UU.YLG.

3.36.50 UU.ZER (Zero Device)

Privileges Required

DEVICE is required to access a restricted device. Create/rename access (matching PPN, or GWRITE, WWRITE and/or SYSIO privilege) required to zero an account other than caller's. Set account access (GACNT or WACNT privilege) is required to deallocate the UFD when zeroing an account.

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic
	1	////////////////////////////////		0	
FQFUN	3	UU.ZER (= 15)	////////////////////////////////	2	
	5	////////////////////////////////	flag (disk only)	4	FQFIL
	7	project number	programmer number	6	FQPPN
	11	volume ID for label in RAD50 format (2 words)		10	FQNAM1
	13	(ANSI format mag tape only)		12	
	15	////////////////////////////////		14	
	17	////////////////////////////////		16	
	21	////////////////////////////////		20	
	23	////////////////////////////////		22	
	25	////////////////////////////////		24	
	27	////////////////////////////////		26	
	31	device name (disk, magtape, or DECTape)		30	FQDEV
	33	<>0, unit number real	device unit number	32	FQDEVN
	35	////////////////////////////////		34	
	37	////////////////////////////////		36	

FIRQB+FQFIL Zero means delete all files except those write-protected against owner; retain UFD clusters.

Minus one means delete all files regardless of protection code; release UFD clusters (users with GACNT or WACNT privilege only). Users without GACNT or WACNT privileges can use this flag to delete all files regardless of their protection codes, but cannot release UFD clusters.

FIRQB+FQPPN Users without GACNT or WACNT privilege can specify the current account only. Be sure to include the PPN; the system returns an error if both bytes are zero.

Data Returned

Except for a possible error in byte 0 of the FIRQB, the UU.ZER subfunction does not return any meaningful data.

Errors

BADFUO	No PPN was specified.
BADNAM	The specified device is ANSI magnetic tape, and the volume ID is either missing or invalid.
DEVNFS	The specified device does not allow access by file name.
NODEVC	The device specified is not on the system.
NOSUCH	The account specified does not exist on the device specified.
NOTAVL	The device specified exists on the system, but you cannot zero it for one of the following reasons: <ul style="list-style-type: none">• A file is currently open on the device.• The device is currently reserved by another job.• The device or its controller is disabled.
PRVIOL	The unit is write-locked, the unit is restricted and the caller does not have DEVICE privilege, or the caller does not have accounting privileges and FIRQB+FQPPN contains a PPN other than the current account.

3.36.51 UU.3PP (Third-Party Privilege Checking)

The UU.3PP directive enables or disables third-party privilege checking. This directive is for the use of server programs that run as a separate job; for example, spoolers.

Once issued, the directive remains in effect until cancelled by another UU.3PP with zero in FIRQB+FQPPN, or by exit from the calling program. While in effect, every privilege check done by the monitor is made twice: once for the job's PPN and privilege mask, and once for the PPN and privilege mask specified in the call. The function proceeds only when the check passes in both cases.

Privileges Required

None

Data Passed

Mne- monic	Octal Offset	FIRQB		Octal Offset	Mne- monic	
	1	////////////////////////////////////		0		
FQFUN	3	UU.3PP (= 37)	////////////////////////////////	2		
	5	////////////////////////////////////		4		
	7	project number	programmer number	6	FQPPN	
	11	privilege mask (4 words)		10	FQNAM1	
	13				12	
	15				14	
	17				16	
	21	////////////////////////////////////		20		
	23	////////////////////////////////////		22		
	25	////////////////////////////////////		24		
	27	////////////////////////////////////		26		
	31	////////////////////////////////////		30		
	33	////////////////////////////////////		32		
	35	////////////////////////////////////		34		
	37	////////////////////////////////////		36		

FIRQB+FQPPN Specify zero to cancel third-party privilege checking.

Data Returned

None

Errors

NOBUFS No small buffers available.

3.37 .WRITA — Write Data to File or Device (Asynchronously)

Form

.WRITA

Function

The asynchronous write directive (.WRITA) performs the same basic functions as the synchronous write directive (.WRITE): both move data between a device and a user program. The difference lies in the completion of the request. While synchronous write requests stall the job's execution until the request completes, asynchronous write requests do not stall; the program continues to run while the I/O request completes in parallel with program execution. The mechanism that the RSTS operating system uses to notify the user job upon I/O completion is an asynchronous completion routine.

The .WRITA directive writes a specified number of bytes of data from a user buffer (defined in the XRB) to a file or device currently open on a channel. Unless an error occurs, the .WRITA always transfers the number of bytes specified. The number of bytes specified must be less than or equal to the size of the buffer. Table 3-11 gives specific details for each device (see the discussion for the .WRITE directive). For comparison, Table 3-11 also shows the "best guess" buffer sizes returned by the monitor at FIRQB+FQBUFL when the file or device is opened.

When you do I/O to or from a resident library mapped in D-Space, such as a dynamic region, you can use I/O buffer sizes larger than the greatest size that can be mapped into the program's virtual address space. You can get single I/O block sizes up to 65,534 bytes (177776 octal). Note that not all devices can use such large block sizes.

You only need to map the first word of the I/O buffer into the the virtual address space, so the monitor can locate the buffer in the resident library. However, the entire buffer must reside in the resident library; otherwise, the monitor rejects the I/O request. This feature is available only for resident libraries mapped in D-Space.

Privileges Required

EXQTA is required to write in excess of disk quota. TUNE is required for multiple asynchronous I/O requests.

Data Passed

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	completion routine address	4	FQFIL
	7	user-supplied parameter	6	FQPPN
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	
	21	////////////////////////////////	20	
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	////////////////////////////////	26	
	31	////////////////////////////////	30	
	33	////////////////////////////////	32	
	35	////////////////////////////////	34	
	37	////////////////////////////////	36	

FIRQB+FQFIL

The address in the user job where program flow should begin when the asynchronous write completes.

If this value is zero, no AST completion is executed. In this event, it is understood that the user is using some other mechanism to determine whether the I/O successfully completed.

FIRQB+FQPPN

The user job uses this field to communicate information to the AST completion routine. If FIRQB+FQFIL is zero, this value is ignored.

Mne- monic	Octal Offset	XRFB	Octal Offset	Mne- monic
	1	length of output buffer, in bytes	0	XRLEN
	3	number of bytes to be written	2	XRBC
	5	starting address of buffer	4	XRLOC
XRBLKM	7	MSB of block number | channel number * 2	6	XRCI
	11	LSB of block number	10	XRBLK
	13	////////////////////////////////	12	
	15	optional modifier	14	XRMOD

XR B+XRLEN	Length of the output buffer, in bytes. The value of this word must be nonzero.
XR B+XRBC	The number of bytes to be written. The value of this word must be nonzero and less than or equal to the buffer size, as specified at offset XR B+XRLEN. For disk, this must be a multiple of 512.
XR B+XRLOC	Starting address of the output buffer. For disk, flexible diskette, and magnetic tape devices, this address must be on a word (even) boundary. For all other devices, the buffer can begin on an odd address. (See the section "XR B (Transfer Request Block)" in Chapter 2 for more information.)
XR B+XRCI	Channel number times two; defines the channel on which the data is to be written, as previously defined in an open (OPNFQ, CREFQ, CRTFQ, CRBFQ functions of CALFIP).
XR B+XRBLKM	For disk files, this byte contains the most significant bits of the starting block number where the write is to begin. This byte is combined with the word at XR B+XRBLK to form a 24-bit field.
XR B+XRBLK	Starting block number where the write is to begin. Performs the same action as the BLOCK option for disk or the RECORD option for flexible diskette and non-file-structured DECTape (see the <i>RSTS/E Programming Manual</i>). This parameter is ignored if the device is not a random-access device. If the device is random-access, and this field is nonzero, it is interpreted as the block number where the write is to start (1 to n, where n is the length of the file in 512-byte blocks). If zero, the next sequential block is written. For disk devices opened as non-file-structured in cluster mode, this value is the starting device cluster number where the write is to begin.
XR B+XRMOD	Output operation modifier; significant only for line printer, terminal, and DMC/DMR devices. (The monitor informs you with the FLGMOD bit of the flag word whether or not the device accepts modifiers.) This parameter performs the same action as the BASIC-PLUS RECORD modifier for these devices (see the <i>RSTS/E Programming Manual</i>).

Data Returned to Completion Routine

Mne- monic	Octal Offset	FIRQB	Octal Offset	Mne- monic
	1	//////////	0	
	3	//////////	2	FQJOB
	5	////////////////////////////////////	4	
	7	user-supplied parameter	6	FQPPN
	11	////////////////////////////////////	10	
	13	////////////////////////////////////	12	
	15	////////////////////////////////////	14	
	17	////////////////////////////////////	16	
	21	////////////////////////////////////	20	
	23	////////////////////////////////////	22	
	25	////////////////////////////////////	24	
	27	////////////////////////////////////	26	
	31	////////////////////////////////////	30	
	33	////////////////////////////////////	32	
	35	////////////////////////////////////	34	
	37	////////////////////////////////////	36	

Mne- monic	Octal Offset	XRB	Octal Offset	Mne- monic
	1	////////////////////////////////////	0	
	3	number of bytes not written	2	XRBC
	5	////////////////////////////////////	4	
XRBLKM	7	MSB of block number | //////////	6	
	11	block number where write began	10	XRBLK
	13	////////////////////////////////////	12	
	15	////////////////////////////////////	14	

XRBC+XRBC

The number of bytes not written in this .WRITE operation. This value is usually zero.

XRBC+XRBLKM

For disk files, the MSB of the block number of the block just written. (Combined with XRBC+XRBLK to form a 24-bit field.)

XRIB+XRIBLK For random-access devices, this word contains the block number of the block just written. Block numbers range from 1 to n, where n is the length of the file, in 512-byte blocks. They define the order in which the file is written. For disk devices opened as non-file-structured in cluster mode, this is the device cluster number of the cluster just written.

Errors

BADCNT The completion routine address is invalid or odd.

BSERR The specified channel number is illegal; that is, it is not in the range 0 - 36 (since channel is specified as channel * 2), or it is an odd number.

EOF A write was attempted to a block beyond the end of the disk when the disk was opened non-file structured.

INUSE Too much outstanding I/O for the job or the job does not have the TUNE privilege and has asynchronous I/O already outstanding.

NOBUFS No small buffers were available for the request.

NOTOPN No device is currently open on the specified channel.

PRVIOL One of the following occurred:

- The file or device currently open on the specified channel is read-only.
- The open for this file or device did not specify write access. A write was requested that would extend a UFD or a contiguous file.
- A write was attempted that would extend a file in special update mode and block 0 was not locked.
- A write was attempted that would extend an executable file, increasing its size to more than 65,535 blocks.

All other errors are device-dependent. Common errors are:

DATERR Some data error occurred. This error is issued when a parity error occurs, and so forth.

HNGDEV Some hard device I/O error occurred. For example, the specified device is off-line, is physically write-locked, and so forth.

NOROOM No more room is available on the device. For example, the end-of-tape marker has been encountered, no more available disk space, and so forth.

Example

See the description of .READA for an example using .WRITA.

3.38 .WRITE — Write Data to File or Device

Form

.WRITE

Function

The .WRITE directive writes a specified number of bytes of data from a user buffer (defined in the XRB) to a file or device currently open on a channel. Unless an error occurs, the .WRITE always transfers the number of bytes specified. The number of bytes specified must be less than or equal to the size of the buffer. Table 3–11 gives specific details for each device. For comparison, Table 3–11 also shows the best guess buffer sizes returned by the monitor at FIRQB+FQBUFL when the device is opened.

When you do I/O to or from a resident library mapped in D-Space, such as a dynamic region, you can use I/O buffer sizes larger than the greatest size that can be mapped into the program's virtual address space. You can get single I/O block sizes up to 65,534 bytes (177776 octal). Note that not all devices can use such large block sizes.

You only need to map the first word of the I/O buffer into the the virtual address space, so the monitor can locate the buffer in the resident library. However, the entire buffer must reside in the resident library; otherwise, the monitor rejects the I/O request. This feature is available only for resident libraries mapped in D-Space.

Table 3–11: Data Output with .WRITE

Device	Block Size,Bytes (Decimal)	"Best Guess," Bytes (Decimal)	Restrictions on Number of Bytes Written
Byte-Oriented Devices (FLGFRC=1, FLGRND=0)			
Keyboard (Terminal)	N/A	128	None
Pseudo Keyboard	N/A	128	None
Paper Tape Punch	N/A	128	None
Line Printer	N/A	128	None
Block-Sequential Devices (FLGFRC=0, FLGRND=1)			
Magnetic Tape	14 to 32,767	512	14 to 32,767 bytes
DECtape (file-structured)	510	510	Must be < 510 bytes; if < 510, automatically filled with NULLs to 510 bytes.
DMC/DMR	1 to 8000	512	None
Block-Random Devices (FLGFRC=0, FLGRND=0)			
Disk	14 to 32,767	512	Must be multiple of 512 bytes. (Must be 512 if writing UFD.)
Flexible Diskette (RX01 and RX02)	†	512	If not a multiple of block/sector size, zero fill to end of block/sector.

†512 (block mode) or 128 (RX01 or RX02 single-density sector mode) or 256 (RX02 double-density sector mode)

(continued on next page)

Table 3-11 (Cont.): Data Output with .WRITE

Device	Block Size,Bytes (Decimal)	"Best Guess," Bytes (Decimal)	Restrictions on Number of Bytes Written
Block-Random Devices (FLGFRC=0, FLGRND=0)			
DEctape (non-file-structured)	512	512	Must be < 512 bytes; if < 512, automatically filled with NULLs to 512 bytes.

Privileges Required

EXQTA is required to write in excess of disk quota.

Data Passed

Mne- monic	Octal Offset	XR B	Octal Offset	Mne- monic
	1	length of output buffer, in bytes		0 XRLEN
	3	number of bytes to be written		2 XRBC
	5	starting address of buffer		4 XRLOC
XRBLKM	7	MSB of block number	channel number * 2	6 XRCI
	11	LSB of block number		10 XRBLK
	13	////////////////////		12
	15	optional modifier		14 XRMOD

- XRBLKM+XRLEN Length of the output buffer, in bytes. The value of this word must be nonzero.
- XRBLKM+XRBC The number of bytes to be written. The value of this word must be nonzero and less than or equal to the buffer size, as specified at offset XRBLKM+XRLEN. For disk, this must be some multiple of 512.
- XRBLKM+XRLOC Starting address of the output buffer. For disk, flexible diskette, and magnetic tape devices, this address must be on a word (even) boundary. For all other devices, the buffer can begin on an odd address. (See the section "XRBLKM (Transfer Request Block)" in Chapter 2 for more information.)
- XRBLKM+XRCI Channel number times two; defines the channel on which the data is to be written, as previously defined in an open (OPNFQ, CREFQ, CRTFQ, CRBFQ functions of CALFIP).
- XRBLKM+XRBLKM For disk files, this byte contains the MSB of the starting block number where the write is to begin. This byte is combined with the word at XRBLKM+XRBLK to form a 24-bit field.

XRIB+XRBLK

Starting block number where the write is to begin. Performs the same action as the BLOCK option for disk or the RECORD option for flexible diskette and non-file-structured DECTape (see the *RSTS/E Programming Manual*). This parameter is ignored if the device is not a random-access device. If the device is random-access, and this field is nonzero, it is interpreted as the block number where the write is to start (1 to n, where n is the length of the file in 512-byte blocks). If zero, the next sequential block is written. For disk devices opened as non-file-structured in cluster mode, this value is the starting device cluster number where the write is to begin.

XRIB+XRMOD

Output operation modifier; significant only for line printer, terminal, and DMC/DMR devices. (The monitor informs you with the FLGMOD bit of the flag word whether or not the device accepts modifiers.) Except for modifier 20000, which is useful to MACRO programmers only, this parameter performs the same action as the BASIC-PLUS RECORD modifier for these devices (see the *RSTS/E Programming Manual*).

Modifier 20000 provides a no stall option for line printer or terminal output. This modifier causes the monitor to return control to your program if an output stall is to occur on the device. You can determine the number of bytes still to be written by checking the contents of XRIB+XRBC.

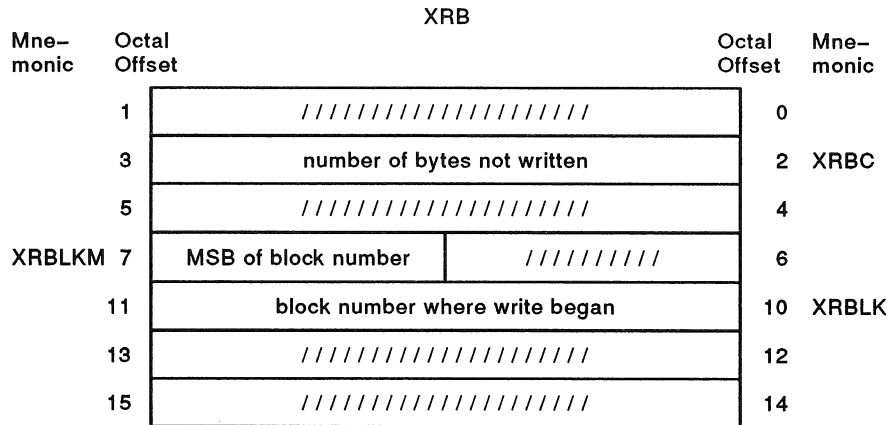
Use this modifier for programs that must perform several different functions with optimal performance, such as a line printer spooler that performs message send/receive and prints files at the same time. When an output stall does occur, the program can perform other processing before trying to write the remaining bytes to the line printer or terminal. You may also find this modifier useful in multiterminal service applications.

When you use the No Stall option on a line printer, you can perform a special test to see whether the line printer is busy without causing your program to stall. To perform the test, write a null character and set modifier bits 2 and 13. When both bits are set, the system returns control to your program instead of stalling it. The value at XRIB+XRBC tells you the status of the line printer:

XRIB+XRBC = 0	The line printer buffers are empty; that is, there are no characters still to print.
XRIB+XRBC <> 0	The line printer buffers still contain one or more characters to print. Repeat the test until the system returns zero at XRIB+XRBC.

For more information on modifier bit 2 for line printers, see Appendix B and the *RSTS/E Programming Manual*. The *RSTS/E Programming Manual* also contains more information on special programming techniques for line printers.

Data Returned



XRBC+XRBC The number of bytes not written in this .WRITE operation. Except for terminals and line printers, this value should be ignored.

XRBC+XRBLKM For disk files, the most significant bits of the block number of the block just written. (Combined with XRBC+XRBLK to form a 24-bit field.)

XRBC+XRBLK For random-access devices, this word contains the block number of the block just written. Block numbers range from 1 to n, where n is the length of the file, in 512-byte blocks. They define the order in which the file is written. For disk devices opened as non-file-structured in cluster mode, this is the device cluster number of the cluster just written.

Errors

BADCNT The first three words of the XRB that describe the output buffer are illegal (an illegal byte count).

BSERR The specified channel number is illegal; that is, it is not in the range 0 - 36 (since channel is specified as channel * 2), or it is an odd number.

EOF A write was attempted to a block beyond the end of the disk when the disk was opened non-file structured.

NOTOPN No device is currently open on the specified channel.

PRVIOL One of the following occurred:

- The file or device currently open on the specified channel is read-only.
- The open for this file or device did not specify write access. A write was requested that would extend a UFD or a contiguous file.
- A write was attempted that would extend a file in special update mode and block 0 was not locked.
- A write was attempted that would extend an executable file, increasing its size to more than 65,535 blocks.

All other errors are device-dependent. Common errors are:

DATERR Some data error occurred. This error is issued when a parity error occurs, and so forth.

HNGDEV Some hard device I/O error occurred. For example, the specified device is off-line, is physically write-locked, and so forth.

NOROOM No more room is available on the device. For example, the end-of-tape marker has been encountered, no more available disk space, and so forth.

Example

The following code writes the contents of a buffer to the file open on channel 5:

```
MOV      #1024., XRB+XRLEN          ;SET BUFFER LENGTH
MOV      #1024., XRB+XRBC          ;SET BYTES TO WRITE
MOV      #BUFFER, XRB+XRLOC        ;SET BUFFER ADDRESS
MOVB     #5*2, XRB+XRCI            ;SET CHANNEL = 5
.WRITE
```


Part III
RSX and RT11 Emulator Directives



RSX Run-Time System Environment

Chapter 1 describes the RSX run-time system as emulating the RSX operating system environment on RSTS/E. This is only partially true; the RSX emulator does not provide a real-time, multiprocessing environment to users of a RSTS/E time-sharing system. However, the RSX emulator does process directives that are identical in form, and similar in objective, to a subset of the RSX-11M-PLUS monitor directives that the *RSX-11M/M-PLUS Executive Reference Manual* describes.

If you use the RSX directives Chapter 5 describes, you must assemble your program with the MAC assembler and link the modules with the Task Builder (TKB). The program can then be run as a user job image under the control of the RSX emulator (which is part of the RSTS/E monitor).

4.1 Advantage: Transportable Code

The RSX emulator directives are useful if you are coding a program to be run under both the RSX-11M-PLUS and RSTS/E operating systems. However, RSTS/E does not emulate all RSX-11M-PLUS executive directives, and the meanings of those that are emulated are fitted to the RSTS/E environment.

To design a program to be run under both operating systems, you need to know how the directives work under RSX-11M-PLUS and under RSTS/E. This manual describes what the directives do under RSTS/E. Some comparison is made here to RSX-11M-PLUS, but you must refer to the *RSX-11M/M-PLUS Executive Reference Manual* for a complete description of how these directives work in the RSX-11M-PLUS environment.

Another benefit of using compatible directives is that you can execute such programs directly on VAX/VMS under the VAX-11 RSX Application Migration Executive (AME), which is similar in function to the RSX emulator. AME emulates most RSX-11M-PLUS executive directives.

4.2 General Services

Besides transportable code, the RSX emulator directives also provide:

- Non-file-structured I/O—The RSX emulator directives handle only non-file-structured I/O (for example, terminal I/O). For this type of I/O, using the directives takes less memory than using RMS. See the *RSTS/E RMS-11 MACRO Programmer's Guide* for a description of the record management service capabilities for MACRO programmers. RMS routines are available to MACRO programmers through resident libraries or through linking to make them part of the user job image. In either case, the RMS routines take space

in the job area. The RSX emulator directives that do I/O take no extra space, since the code to handle the processing is in the monitor.

- **Trap handling**—The RSX emulator includes processing to handle synchronous and asynchronous exceptions. Mainly, the emulator aborts the program when such exceptions occur and prints an error message at the job's terminal. For some directives, you can request that this processing be bypassed and handle such exceptions in your program. For example, you can specify an address to pass control to when a Floating-Point Processor (FPP) exception occurs.

4.3 RSX Directive Emulation Within RSTS/E Monitor

RSX emulation is a standard feature of the RSTS/E monitor. This allows task images to execute without a run-time system, because the monitor handles the RSX emulation directly. As a result, task images may expand to be as large as 64K-32 words; furthermore, a resident library (for example, RMS) may use the address space which would otherwise be taken by the run-time system.

Since RSTS/E jobs are never without a run-time system, the monitor associates the job with a zero-length, run-time system called "...RSX" for the duration of the task's execution. When the task ends, the job exits to its default keyboard monitor.

4.4 System Macro Library

The RSX emulator directives that you code into your program are macro; they must be expanded into executable code at assembly time. The system macro library (LB:RSXMAC.SML) contains the macro expansions for the RSX emulator directives. This library file can be named in the input-file list when the assembly is done. For example:

```
MAC OBJ,OBJ=SRC1, SRC2, LB:RSXMAC.SML/ML
```

However, the MAC assembler searches the library automatically to resolve undefined symbols, so this is not really necessary.

In your code, though, you must use the MACRO-11 `.MCALL` directive to define the directives you use as external macros needed to assemble the source program. The `.MCALL` directive must appear before you call the first such directive. For example:

```
.MCALL ALUN$, QIO$  
.  
.  
.  
ALUN$ 2, TT, 5  
.  
.  
.
```

Alternatively, you can use the `.ENABL MCL` assembler directive to enable automatic macro library search. See the *PDP-11 MACRO-11 Language Reference Manual* for details.

4.5 Directive Processing

At assembly time, MAC expands the RSX directives to code. This creates a Directive Parameter Block (DPB) that defines the action to be taken and the parameters to be used.

Figure 4–1 shows the general form of a DPB.

Figure 4–1: General Form of the Directive Parameter Block

DPB length (in words)	Directive ID Code (DIC)
(Parameters) . .	

The Directive Identification Code (DIC) in the low byte of the first word of the DPB defines the particular function to be performed. The RSX emulator examines the DIC to determine what it is supposed to do. The high byte of the first word of the DPB gives the length of the DPB in words (including the DIC and length byte). The remaining words contain parameters; usually these are values specified by the user in the directive call, expanded through MACRO-11 data definition macros such as `.BYTE`, `.WORD`, `.RAD50`, and so forth.

The directive expansions also include executable code to tell the emulator where the DPB is, an EMT 377 instruction to pass control to the emulator and, optionally, transfer control to an error processing routine specified by the user.

At execution time, RSTS/E pushes either the DPB address or the DPB itself on the stack. The choice depends on the form of the directive. The EMT 377 instruction passes control to the RSTS/E monitor. The monitor recognizes the EMT 377 and passes control to the RSX emulation in the monitor. The RSX emulator examines the DPB and processes the directive. It then pops the DPB address or the entire DPB off the stack and either returns control to the program that executed the directive or, if the directive was an exit of some kind, to whatever location is appropriate to the exit.

When control returns in line, the carry condition code in the program status word (PSW) indicates that the directive executed successfully (carry code = 0) or failed (carry code = 1). The Directive Status Word gives more information on the success or failure of the directive. You can refer to the Directive Status Word in your program with the mnemonic `$DSW`; TKB defines this variable and resolves its location automatically at link time. Other mnemonics are similarly related to the possible values of `$DSW`, so the MACRO programmer can test for error conditions using symbols such as `IS.SUC` for successful completion. See "DSW Return Codes" in Chapter 5 for a listing of the symbols appropriate to each directive.

4.6 Directive Forms (\$, \$C, \$S) and Their Expansions

The library file RSXMAC.SML contains three different expansions for each of the RSX-11M directives (see Chapter 5). The form of the directive name you use determines which expansion to be inserted in your code. Directive names consist of one to four letters, followed by a dollar sign (\$) and, optionally, a C or an S.

Table 4-1 shows an example of the three forms for the ALUN\$ directive (Assign Logical Unit).

Table 4-1: Example of RSX Directive Forms

Form	Your Code	Expansion	Description	
\$ A:	ALUN\$ 5,TT,0	A:	.BYTE 7,4	
	.		.WORD 5	
	.		.ASCII /TT/	
	.		.WORD 0	
	.		.	
	DIR\$ #A,ERR		MOV #A,-(SP)	Push DPB address
	.		EMT 377	Call RSX emulator
	.		BCC .+6	Branch if no error
	.		JSR PC,ERR	Go to ERR on error
	.	DIR\$ #A,ERR	.	(same as above)
\$C	ALUN\$C 5,TT,0,PSECT1,ERR	\$\$\$=.	.PSECT \$DPB\$\$	
	.		.BYTE 7,4	
	.		.WORD 5	
	.		.ASCII /TT/	
	.		.WORD 0	
			.PSECT PSECT1	Reenter PSECT
			MOV #\$\$\$,-(SP)	Push DPB address
			EMT 377	Call RSX emulator
			BCC .+6	Branch if no error
			JSR PC,ERR	Go to ERR on error
\$S	ALUN\$\$S #5,#"TT,#0,ERR		MOV #0,-(SP)	
	.		MOV #"TT,-(SP)	
	.		MOV #5,-(SP)	
	.		MOV (PC)+,-(SP)	
			.BYTE 7,4	Call RSX emulator
			EMT 377	Branch if no error
			BCC .+6	Go to ERR on error
			JSR PC,ERR	

4.6.1 \$ Form (and DIR\$ Directive)

As Table 4-1 shows, the \$ form of an RSX emulator directive generates a DPB inline. The DIR\$ directive expands to code that pushes the address of the DPB on the stack and passes control to the RSX emulator. Use the \$ form/DIR\$ combination when you want to repeatedly execute the same directive. After one directive defines a DPB, as many other DIR\$ directives as need it, can use it. This technique saves memory. Also, you can modify the individual parameters in the DPB when you use the same directive many times with varying parameters.

\$ Form

The \$ form of an RSX emulator directive expands to code that defines the DPB. The expansions consist of MACRO-11 data storage directives (for example, .BYTE, .WORD, .RAD50); they are not executable. Therefore, use the \$ form of an RSX emulator directive only in a data section of your program.

Finally, use parameters that fit the MACRO-11 data storage directive in which they will appear in the expanded code. For example, the ALUN\$ directive expands to the four instructions that follow:

```
ALUN$ 5, TT, 0
```

Expansion:

```
.BYTE 7, 4  
.WORD 5  
.ASCII /TT/  
.WORD 0
```

Although the example uses the two-character second parameter (TT) in a MACRO-11 .ASCII directive, you do not need to specify the enclosing slashes; the expansion does that for you.

Note that the first word of the expansion (the first word of the DPB) consists of two bytes. The 7 in the low byte is the DIC byte for the ALUN\$ directive. The 4 in the high byte indicates that the DPB is 4 words long.

DIR\$ Directive

The general form of the DIR\$ directive is:

```
new DIR$ [adr] [,err]
```

where:

- adr** is the address of the first word of the DPB. As shown in the following expansion, this address must be a valid source address for a MOV instruction. (The *adr* parameter can be omitted. In this case, the entire DPB must be on the stack when the DIR\$ is executed.)
- err** is an optional error address. Control passes to this address if the directive does not execute successfully. If this parameter is omitted, control returns in line with the C-bit set in the program status word (PSW).

For example, the DIR\$ directive expands to the four instructions that follow:

```
DIR$ #DPB, ERROR
```

Expansion:

```
MOV    #DPB, - (SP)  
EMT    377  
BCC    .+6  
JSR    PC, ERROR
```

RSTS/E pushes the address of the DPB on the stack, and the EMT transfers control to the RSX emulator. The emulator processes the directive according to the parameters specified in the DPB, pops the DPB address off the stack, and (for ALUN\$) returns control in line. The BCC instruction branches around the JSR to ERROR if the C-bit is not set (no error occurred).

Other Features of \$ Form/DIR\$ Combination

The \$ form of the RSX emulator directives generates local offsets that you can use to refer to parameters in the DPB.

NOTE

The expansions use the MACRO-11 .NLIST directive so the code that generates these offsets (which is not of interest to your program) does not show up in your assembly listings.

For example, in the ALUN\$ directive, you specify a logical unit number, physical device name, and device unit number:

```
LN5DEF: ALUN$ 5,TT,0
```

When this directive is expanded, it includes code that allows you to refer to the parameters as:

```
LN5DEF+A.LULU      Logical unit number
LN5DEF+A.LUNA      Device name
LN5DEF+A.LUNU      Unit number
```

Chapter 5 lists these offset names under "Local Symbol Definitions" for each directive. The number of bytes defined for each offset is given in parentheses following a description of the area referenced by the offset. For example:

A.LUNU — Logical unit number (2)

(You can also use offset names with the \$C form of directives. However, you cannot use offset names with the \$\$S form because \$\$S generates values that are pushed on the stack.)

The \$ form expansions are also designed so you can use them to simply set up the offset symbols to reference a DPB in another module. If you define the symbol \$\$\$GLB in your program (for example, \$\$\$GLB = 0 will do), the \$ form of any directive generates the symbolic offsets as global symbols and does not generate the DPB itself. For example, suppose another module has the following code:

```
MYMY:: ALUN$ 5,TT,0
```

In the current module, define MYMY as a global symbol, define \$\$\$GLB, specify an ALUN\$, and you will be able to reference MYMY+A.LULU, and so forth.

4.6.2 \$C Form

If you know the DPB parameters at assembly time and need to issue a directive only once, the \$C form saves you the trouble of coding two directives: the \$ form and DIR\$. The \$C form also saves execution time over the \$\$S form, which uses MOV instructions to place the entire DPB on the stack and may save space as well.

The \$C form of the directives expands to code that:

- Defines the DPB in a separate PSECT (called \$DPB\$).
- Returns to a user-specified PSECT. If no PSECT name is given, returns to the blank (unnamed) PSECT.

- Pushes the DPB address on the stack.
- Passes control to the RSX emulator.
- On return, passes control to a user-specified error routine if the directive did not execute successfully. If you did not specify an error routine, no such code is generated.

The directive descriptions in Chapter 5 show the form and expansion for the \$ form. To use the \$C form, you must add the C to the directive name and, optionally, add a PSECT name and error address to the parameter list. For example, the ALUN\$C directive expands to the 11 instructions that follow:

```
ALUN$C 5, TT, 0, PART1, ERROR
```

Expansion:

```
.PSECT      $DPB$$
$$$=.
.BYTE      7, 4
.WORD      5
.ASCII     /TT/
.WORD      0
.PSECT     PART1
MOV        #$$$ , -(SP)
EMT        377
BCC        .+6
JSR        PC, ERROR
```

MAC places the DPB in a separate PSECT called \$DPB\$\$\$. The \$\$\$ symbol equates to the address of the DPB, which MAC uses in the MOV instruction that pushes the DPB address on the stack before control passes to the emulator by the EMT instruction. The last two instructions set up the test for error and transfer control to the specified error routine. If you do not specify an error address in the call, MAC does not generate those instructions.

Other Features of \$C Form

The offset mnemonics that MAC generates for the \$ form are also generated for the \$C form. Thus, you can save space by using the \$\$\$ address to form the base address for the offsets. The \$\$\$GLB feature for the \$ form also works for the \$C form of the directives.

4.6.3 \$\$ Form

The \$\$ form is useful if your code is reentrant and the DPB parameters vary. RSTS/E generates the DPB when it executes the directive at run time.

The \$\$ form of the directives expands to code that:

- Generates the DPB at execution time and pushes it on the stack.
- Transfers control to the RSX emulator. The RSX emulator checks the low byte of the first word on the stack to determine if it is a DPB address (even low byte) or a DIC (odd low byte). If the low byte is odd, then the emulator knows that the rest of the DPB is on the stack.
- On return, passes control to a user-specified error routine if the directive did not execute successfully. If no error routine is specified, no such code is generated.

To use the \$\$ form of the directives, add S to the directive names shown in Chapter 5. You can also specify an error address as the last parameter in the line. For example, the ALUN\$\$ directive expands to the eight instructions that follow:

```
ALUN$$ #5,DEV,UN,ERR
```

Expansion:

```
MOV      UN, -(SP)
MOV      DEV, -(SP)
MOV      #5, -(SP)
MOV      (PC)+, -(SP)
.BYTE    7, 4
EMT      377
BCC      +.6
JSR      PC, ERR
```

RSTS/E generates the DPB at run time and pushes it on the stack. Control passes to the RSX emulator, and if control returns with an error (the C-bit is set on return), control transfers to the error routine. If you do not specify an error address in the call, MAC does not generate the last two instructions.

4.7 Using Resident Library Access Directives from FORTRAN

When programming resident library access in FORTRAN, you must create an eight-word, single-precision integer array as the RDB to be supplied from the following routines:

- CALL ATRG (Attach Region directive)
- CALL CRRG (Create Region directive)
- CALL DTRG (Detach Region directive)

See the *PDP-11 FORTRAN IV Language Reference Manual* or the *PDP-11 FORTRAN Lanugage Reference Manual* for information on the creation of arrays.

An RDB array has the following format:

Word	Contents
irdb(1)	Region ID
irdb(2)	Size of the region in 32-word blocks
irdb(3)	Region name—two words in RAD50 format
irdb(4)	
irdb(5)	Name of the partition that contains the region— two words in RAD50 format
irdb(6)	
irdb(7)	Region status word. See the paragraph following this table.
irdb(8)	Region protection code.

You can modify the region status word irdb(7) by setting or clearing the appropriate bits, listed with each directive.

Note that Hollerith text strings can be converted to RAD50 values by calls to the FORTRAN library routine IRAD50.

4.8 First 512. Bytes of Low Segment for RSX

As Chapter 2 notes, the first 512. bytes of virtual address space have special meaning to the monitor. TKB, which links programs assembled or compiled under the RSX run-time system and its derivatives, generates a header for your executable program. When the RSX emulator loads your program, it uses information from this header to load certain values into the low 512. bytes of your program.

Table 4–2 shows the allocation of the first 512. bytes of the low segment for RSX-type programs. Note that all locations are subject to change except for \$DSW, KEY, FIRQB, XRB, and CORCMN.

Table 4–2: First 512. Bytes of Low Segment for RSX

Offset	Mnemonic	Description
0	R.TSKN	Task name in RAD50
2		...
4	R.PRTN	Partition Name in RAD50
6		...
10	R.CDSZ	Task Size (without extension, 32-word blocks)
12	R.ODTV	ODT SST Vector Address
14	R.ODTL	ODT SST Vector Length (low byte only)
16	R.SSTV	Task SST Vector Address
20	R.SSTL	Task SST Vector Length (low byte only)
22	R.FAST	FFP AST Service Address
24	R.CAST	CTRL/C AST Service Address
26	R.TSKF	Task Flags
30	R.PARM	Run Parameter on Entry (from FIRQB+FQNENT)
32	R.CCLF	CCL Entry Flags, Run Size/Extension (XRB+0)
34	R.LDSZ	Load Size of Task in 32-word blocks
36	R.TKSZ	Current Size of Task in 32-word blocks
40	R.LUN	Number of LUNs
42	R.MON1	Monitor RSX Emulation Reserved Word 1
44	R.MON2	Monitor RSX Emulation Reserved Word 2
46	\$DSW	Directive Status Word
50	.FSRPT	FCS Impure Area Pointer
52	\$OTSV	OTS Impure Area Pointer
54	N.OVPT	Auto-Load Impure Area Pointer
56	\$VEXT	Extended Impure Area Pointer
60	CONXTT	(Reserved for Monitor Context Use)
		...
112	FPPTXT	(Reserved for Monitor FPP Context Use)
		...
200	R.LUNS	LUN Table

(continued on next page)

Table 4-2 (Cont.): First 512. Bytes of Low Segment for RSX

Offset	Mnemonic	Description
		...
400	KEY	Keyword
402	FIRQB	FIRQB
		...
442	XRB	XRB
		...
460	CORCMN	Core common area
		...
660	PDMSP	SP saved here on a PM dump
662	PMDXRB	XRB saved here on a PM dump FIRQB also saved on PM dump starting at PMDXRB
		...
722		SP stack space for RSX Emulator
		...
734	USRPPN	User's assignable project, programmer number
736	USRPRT	User's assignable protection code
740	USRLOG	User's logical device table
		...
1000	NSTORG	Stack guard word (must = 0)

RSX Emulator Directives

The RSX emulator directives:

- Perform non-file-structured I/O
- Let you specify your own exception-handler routines
- Control execution of the program
- Return system information to the job
- Provide access to resident libraries

Table 5-1 lists these directives by function. The remaining sections of this chapter present the directives in alphabetical order.

Table 5-1: Summary of the RSX Directives

Name	Description
Non-File-Structured I/O	
ALUN\$	Assigns a logical unit number to a device and unit. The logical unit number then serves to define the device in I/O requests.
GLUN\$	Returns information about a logical unit.
GMCR\$	Returns the command line typed by the user to invoke the program currently running, if it was invoked by a RSTS/E CCL command.
QIO\$ QIOW\$	Open, read from, write to, and close logical units. I/O in RSX-emulation mode is synchronous. That is, it is not asynchronous as in some systems, such as RSX-11M where a user program can request I/O, do other processing, and get an interrupt when the I/O is complete. Thus, under the RSX emulator, QIO\$ (queue input/output) and QIOW\$ (queue input/output and wait) do the same thing. Control returns to the calling program when the I/O is done.
WSIG\$	Provides compatibility with RSX-11M, where some recoverable error conditions require waiting for some significant event to occur before retrying the operation that caused the error. In RSTS/E, such events are transparent to the user program. WSIG\$ simply causes the program to sleep for one second.
WTSE\$	Provides compatibility with RSX-11M, where RSX uses QIO\$ and WTSE\$ together to cause the program to wait until I/O is completed. Since I/O in RSX-emulation mode is synchronous, the WTSE\$ is implemented here as a NOP instruction.

(continued on next page)

Table 5-1 (Cont.): Summary of the RSX Directives

Name	Description
Exception Handling	
ASTX\$	Exits from an FPP exception-handling routine, restoring the DSW, PC, and PSW to the values they had before the exception occurred.
SCCA\$	Defines an address to which control passes when a user at the job's terminal types a CTRL/C combination. The SCCA\$ directive is unique to RSTS/E; it does not exist in the RSX-11M operating system.
SFPA\$	Specifies an address to which control is to pass when an FPP exception occurs. (The FPP is available on all PDP-11 processors that can run RSTS/E, except the PDP-11/35 and 40.)
SSTX\$	Terminates routines that handle synchronous system traps with SVDB\$ or SVTK\$. Required if the program uses supervisor mode libraries. Returns control to where the program left off at the time of the trap. The SSTX\$ directive is unique to RSTS/E; it does not exist in the RSX-11M operating system.
SVDB\$	Specifies a table of synchronous exception addresses that are to override any specified with an SVTK\$ directive. This is a useful capability for a debugging routine, to divert breakpoint traps, for example, to the debugging routine regardless of any SVTK\$ directive in other modules of the job.
SVTK\$	Specifies a table of addresses to which control is to pass when synchronous exceptions occur. The job can handle eight possible exceptions including PDP-11/35 and 40 FIS errors, TRAP instructions, BPT instructions, IOT instructions, and T-bit traps.
Program Execution Control	
ABRT\$	Sets the job's exit status to "Severe Error" and returns control to the job's keyboard monitor.
EXIT\$	Returns control to the job's keyboard monitor (a normal exit).
EXST\$	Sets the job's exit status to the specified value and returns control to the job's keyboard monitor.
EXTK\$	Increases or decreases the amount of memory allocated for execution of the user job image.
EXTM\$	Increases or decreases the amount of memory allocated for execution of the user job image and allows manipulation of the D-Space APRs according to a mask.
SPND\$	Suspends execution of the program until the user types a delimiter on the keyboard (KB:).

(continued on next page)

Table 5-1 (Cont.): Summary of the RSX Directives

Name	Description
System Access Information	
FEADF\$	Defines system feature labels.
FEAT\$	Tests for specified system features.
GPRT\$	Returns partition parameters, which contain general information about the job area and user job image area.
GTIM\$	Returns the current day and time.
GTSK\$	Returns task parameters: run priority, PPN, number of logical units assigned, address of SST vector table (set up the SVTK\$ or SVDB\$), and the system in which the job is running.
TFEA\$	Tests for specified task features.
Resident Libraries Access	
ATRG\$	Attaches the job to a resident library, laying the groundwork for access to the library. If necessary, the resident library is loaded from disk.
CRAW\$	Creates a window of virtual addresses for reference to a library. Optionally, you can map the window to actual locations in a resident library.
CRRG\$	Creates a dynamic region and optionally attaches to it.
DTRG\$	Detaches the job from a resident library.
ELAW\$	Eliminates an address window; it releases the virtual addresses for other use, such as expanding the job image or creating another window.
Fast-map	Relates a created address window to actual memory locations in an attached resident library. Fast-mapping is a simplified, high-speed alternative to MAP\$.
MAP\$	Relates a created address window to actual memory locations in an attached resident library. The user program can then refer to locations in the library using the virtual addresses defined in the window.
MSDS\$	Specifies a 7-bit mask that determines which space each supervisor D-space APR will use.
RDBBK\$	Defines the offsets shown for the RDB areas for the ATRG\$ and DTRG\$ directives and, in addition, generates code to allocate space for the RDB and fills it with values you specify in the call.
RDBDF\$	Assigns literal values to the offsets and status bit mnemonics shown for the RDB areas for the ATRG\$ and DTRG\$ directives.
UMAP\$	Unmaps a window from a library; you can then map the window to another portion of the library or to a different library.
WDBBK\$	Defines the offsets shown for the WDB areas for the CRAW\$, ELAW\$, MAP\$, and UMAP\$ directives and, in addition, generates code to allocate space for the WDB and fills it with values you specify in the call.
WDBDF\$	Assigns literal values to the offsets and status bit mnemonics shown for the WDB areas for the CRAW\$, ELAW\$, MAP\$, and UMAP\$ directives.

5.1 ABRT\$ — Abort

The ABRT\$ directive terminates execution of the calling program. Any open files or devices are reset (that is, closed without the usual clean-up operations). On a RSTS/E system, ABRT\$ acts the same as the EXST\$ directive with a severe error.

Control passes to the job keyboard monitor at the keyboard monitor entry point P.NEW (see Chapter 2). The job keyboard monitor is the default keyboard monitor unless the job has issued the SET JOB/KEYBOARD_MONITOR command or executed the .RTS directive to establish a specific job keyboard monitor (see Chapter 3).

Privileges Required

None

Macro Call

ABRT\$ *name*

RSTS/E ignores the name parameter; the calling program can abort only itself.

Macro Expansion

```
ABRT$      ALPHA
.BYTE      83.,3          ;DIC=83., DPB SIZE = 3 WORDS
.RAD50     /ALPHA/      ;IGNORED IN RSTS/E
```

Local Symbol Definitions

A.BTTN name (4)

DSW Return Codes

IE.SDP DIC or DPB size is invalid. This does not occur unless your program changes the value of the first word of the DPB during execution. Control does not otherwise return inline for the ABRT\$ directive.

5.2 ALUN\$ — Assign Logical Unit Number

The ALUN\$ directive assigns a logical unit number (LUN) to a physical device unit. You can then use the logical unit number in QIO\$ or QIOW\$ directives to do I/O (open, read, write, or close the associated device).

You can specify the device name as any 2-character logical name. The RSX emulator checks the name specified in the call against the user logical names; if a match is found, the monitor assigns the logical unit number to the corresponding physical device. If the device name specified does not match any user logical device names, the monitor performs a similar search for a match with a system-wide logical device name. If there is no match, the emulator checks the monitor's physical device table, and, if a match is found, assigns the logical unit number specified in the call to the actual physical device unit specified. Otherwise, the directive returns an error.

Privileges Required

If the device is restricted, DEVICE is required.

Macro Call

ALUN\$ *lun,dev,unt*

where:

lun is the logical unit number; 1-14.

dev is the device name; two ASCII characters.

unt is the device unit number. Minus one indicates no unit number, as opposed to a unit number of zero. The RSX emulator does not make a distinction between SY (meaning the public disk structure) and SY0 (meaning the disk from which the system was booted). All uses of SY refer to the public structure. TI, TT, and KB all refer to the job's terminal, whereas KBO and TTO both refer to the system console terminal.

Macro Expansion

```
ALUN$      5, TT, 0
.BYTE      7, 4      ;ALUN$ MACRO DIC=7, DPB SIZE=4 WORDS
.WORD      5          ;LOGICAL UNIT NUMBER 5
.ASCII    /TT/      ;DEVICE NAME IS TT (TERMINAL)
.WORD      0          ;DEVICE UNIT NUMBER=0
```

Local Symbol Definitions

A.LULU Logical unit number (2)

A.LUNA Physical device name (2)

A.LUNU Physical device unit number (2)

DSW Return Codes

IS.SUC Successful completion.

IE.IDU Invalid device and/or unit.

IE.ILU Invalid logical unit number.

IE.SDP DIC or DPB size is invalid.

5.3 ASTX\$ — Asynchronous Exception Exit

In the RSTS/E environment, you can use the ASTX\$ directive to terminate a routine that handles an asynchronous FPP exception, only if the program has indicated its intention to handle such traps with an SFPA\$ directive. No other condition in RSTS/E causes an asynchronous exception from which an ASTX\$ exit is useful. The Ctrl/C exception should use the SSTX\$ macro to exit properly (see SCCA\$S).

When you execute an ASTX\$, the stack must be in the state:

SP → (DSW) at the time exception occurred
(PC) at the time exception occurred
(PS) at the time exception occurred
word to which SP pointed before the exception

Your routine must pop the Floating-Point Exception Code (FEC) and Floating-Point Address (FEA) pushed on the stack when the exception occurred (see SFPA\$).

When the ASTX\$ directive executes, the RSX emulator restores the DSW value to the DSW location and loads the PC and PS registers with their appropriate values. Thus, these values pop from the stack, and control returns to the user program at the point where it left off when the exception occurred.

You can change the contents of the PC address in the stack before you execute ASTX\$ so RSTS/E passes control to some point other than where it left off. Use caution because it is hard to debug errors in an asynchronous exception routine.

Privileges Required

None

Macro Call

ASTX\$ [err]

where:

err is the error routine address

Macro Expansion

```
ASTX$$    ERR
MOV       (PC)+,-(SP)    ;PUSH DPB ONTO THE STACK
.BYTE    115.,1         ;DIC = 115., DPB SIZE = 1 WORD
EMT      377            ;TRAP TO RSX EMULATOR
JSR      PC,ERR         ;JUMP TO ERR IF DIRECTIVE UNSUCCESSFUL
```

NOTE

Digital recommends the \$\$ form for this directive for two reasons: first, only a one-word DPB is generated; second, no BCC instruction is generated for the \$\$ form (or the \$C form). Thus, the \$\$ form takes less space than the \$form/DIR\$ combination. In addition, since the one-word DPB requires only one MOV instruction, the \$\$ form takes less space and no more execution time than the \$C form.

Local Symbol Definitions

None

DSW Return Codes

IE.SDP DIC or DPB size invalid. This occurs only if your program changes the first word of the DPB at execution time.

5.4 ATRG\$ — Attach Resident Library

The ATRG\$ directive attaches the job to a resident library. The type of access (read-only or read/write) is specified in the call. If the calling job can access the library in that fashion, the monitor sets up its own internal tables that lay the groundwork for the job to map windows to the library. Note, however, that the resident library does not take up space in the job area (virtual memory) with an attach. Virtual memory is assigned when a window is created (CRAW\$).

NOTE

The job's ability to access the resident library depends upon the protection assigned by the system manager when the resident library was installed. The default protection grants read access to all users and denies write access to all users.

If the attach is successful, a resident library ID is returned to the job. Other directives use this ID to detach the job from the library (DTRG\$) or to map and unmap windows to and from the library (MAP\$ and UMAP\$). Once the monitor attaches the job to a library, you can use the ATRG\$ directive to determine the library ID.

You can attach an unlimited number of resident libraries to a job at any given time, provided the system has enough resources to keep track of the list of attached libraries.

Privileges Required

None

Macro Call

ATRG\$ *adr*

where:

adr specifies the address of an 8-word area defining the library to be attached and the type of access desired. The ATRG\$ directive returns information to this area. Two supplementary directives are available to define (RDBDF\$) or define and fill (RDBBK\$) such an 8-word area, called the resident library definition block (RDB).

Macro Expansion

ATRGS	RDBLK	
.BYTE	57.,2	;DIC = 57., DPB SIZE = 2 WORDS
.WORD	RDBLK	;ADDRESS OF RDB

Data Passed in RDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	resident library name (2 words in RAD50 format)	4	R.GNAM
	7		6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	access flags	14	R.GSTS
	17	////////////////////////////////	16	

adr+R.GNAM is the name of the resident library to which the job is to be attached, as two words of RAD50 data. (The system manager makes resident libraries known to the RSTS/E monitor with the INSTALL/LIBRARY command (see the *RSTS/E System Manager's Guide*). With this command, the system manager defines a file (filename.LIB) as a resident library. The monitor regards "filename" as the resident library's name.)

adr+R.GSTS is the low-order two bits in this word which defines the desired access to the library.

RDBBK\$,
RDBDF\$

adr+R.GSTS are the status bits that are currently defined as follows:

Bit	Definition
0	Read access desired on attach.
1	Write access desired on attach.
3	Delete access desired on attach.
5	Attach to region (forced if unnamed region).
6	Do not mark created region for deletion on last detach.
7	Delete region when all users detach (forced if unnamed region).
14	At least one window was unmapped on a detach.
15	Region was successfully created.

Once RSTS/E attaches a job to a resident library, the access cannot be changed without detaching (DTRG\$) and reattaching. Also, an ATRG\$ with the same resident library name specified at *adr*+R.GNAM returns the assigned resident library ID.

Data Returned to RDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	resident library ID	0	R.GID
	3	size of library, in 32-word blocks	2	R.GSIZ
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	

adr+R.GID is an identifier which must be used in subsequent calls to identify a resident library, rather than the resident library name. Thus, you use this identifier to detach (DTRG\$) and to map and unmap windows (MAP\$ and UMAP\$) to the library.

adr+R.GSIZ is the size of the resident library, in 32-word blocks.

Local Symbol Definition

A.TRBA Resident library definition block address (2)

DSW Return Codes

IS.SUC Successful completion.

IE.UPN Attaching a job to a resident library requires a small buffer; no small buffers are currently available.

IE.PRI The attach did not succeed because the caller's privileges do not allow the access requested. This could happen either because the access code specified is not compatible with the possible access defined when the library was installed by the system manager or because the protection code associated with the resident library file excludes the access requested by the user.

IE.PNS The resident library name specified is not known to the monitor. The system manager must install a resident library before the system can use it.

5.5 CRAW\$ — Create Address Window

You can use the CRAW\$ directive either to create a window (a range of virtual addresses) or to create a window and map it to a range of actual addresses in an attached resident library. You define the range of addresses by naming a base APR, which defines the starting virtual address for the window, and by specifying the size of the window in 32-word blocks. Thus a window always begins on a 4K-word boundary in virtual memory. It may take more than 4K words, depending on the size of the window.

The difference between creating a window and creating and mapping a window is best illustrated by example. By using create without map, you can define one window, which can be mapped to a library or portion of a library and then remapped using MAP\$ to another portion of the same library or another library, as many times as desired. For example, suppose your program takes up 24K words, and you want to access a 24K-word resident library of data values. You can use create without map to set up a 4K-word window in APR 6. You can then map the window to the first 4K words of the library, process the data, map to the next 4K words of the library, and so forth.

If, on the other hand, you had a 4K-word program and still wanted to access a 24K-word library, you could use CRAW\$ to create a 24K-word window and map it to the entire library in APRs 1-6.

A job can create a maximum of 22 windows. A window takes at least one APR, possibly more, depending on the size you specify for the window. Thus, the maximum of 22 assumes 22 4K windows in both user I-Space and D-Space APRs 1 through 7 and eight 4K windows in supervisor I-Space APRs 0 through 7. You can never use user I or D APR 0 to create a window, since the user program takes at least this much space. As mentioned previously, a window cannot overlap the user job image; thus, the size of the user job image determines the lowest base APR that the job can use. If the program (user job image) is 4K words or less, you can use APRs 1 and up (to the limit imposed by the run-time system boundary) to create windows. If the user job image is between 4K words and 8K words, you can use APRs 2 and up to create windows, and so forth.

If the virtual address range overlaps the user job image, the call fails with an error. If the address range overlaps any existing windows, the overlap condition is handled in a number of different ways, depending on the type of windows that overlap:

- If the job has nonseparate I&D Space or a Supervisor window is being created, the new window eliminates all existing windows that it overlaps.
- If the job has separate I- and D-Spaces and the new window request has the same D-Space mapping bit value (WS.UDS) as any overlapping windows, the new window eliminates the old overlapping windows. For example, if a window exists in I-space (WS.UDS=0) and a new window request, also with WS.UDS=0, overlaps it, then the new window eliminates the existing window. The new window also eliminates the existing window if both windows have WS.UDS=1.
- If the new window being created is D-Space only (WS.UDS=1) and it overlaps a window which is currently in both I- and D-Spaces (WS.UDS=0), the new window eliminates *only* the D-Space portion of the existing window, leaving it in I-Space only. The new window then resides in the D-Space concurrently with old window in I-Space. Note that the entire D-Space portion of the existing window is eliminated even if only a portion of it overlaps with the new window.

- Likewise, if an I&D-Space window overlaps an existing D-Space-only window, only the I-Space of the new window gets created and the existing D-Space-only window remains.

Use caution when creating concurrent windows (one in I-Space only and one in D-Space only). The default condition when creating I-Space windows is that the equivalent D-Space accompanies it. The library being mapped through this method must be written as I-only code (such as RMS-11) if the D-Space is to be given to another window. If it is not I-only code, then you will get unpredictable results if its D-Space is given away.

Privileges Required

None

Macro Call

CRAW\$ *adr*

where:

adr is the address of an 8-word area defining the window and the resident library to which the window is to be mapped, if mapping is requested. The CRAW\$ directive also returns information to this area. Two supplementary directives are available to define (WDBDF\$) or define and fill (WDBBK\$) such an area, called the window definition block (WDB).

Macro Expansion

```
CRAW$      WDB
.BYTE      117.,2      ;DIC = 117., DPB SIZE = 2 WORDS
.WORD      WDB        ;ADDRESS OF WDB
```

Data Passed in WDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	base APR (1-7)	0	W.NAPR
	3	//////////	2	
	5	size, in 32-word blocks, of window	4	W.NSIZ
	7	resident library ID (for map)	6	W.NRID
	11	offset, in 32-word blocks (for map)	10	W.NOFF
	13	map length, in 32-word blocks	12	W.NLEN
	15	access flags	14	W.NSTS
	17	//////////	16	

adr+W.NAPR is the base APR of the window, 1-7 that implicitly defines the starting address of the window. This byte cannot be zero, nor can it name an APR already being used to map the user job image (see previous discussion).

adr+W.NSIZ Is the desired size of the window, in 32-word blocks. For example, a value of 128 = 4K words.

adr+W.NRID is the identifier of the resident library to which the window is to be mapped. (This is the value returned at *adr+R.GID* in the RDB for an *ATRG\$* directive.) This word is ignored for calls requesting a create without mapping (bit 7 at *adr+W.NSTS* is zero).

adr+W.NOFF is the offset, in 32-word blocks, from the start of the library where the mapping is to begin. This word is ignored if no mapping is requested (bit 7 at *adr+W.NSTS* is zero.) A value of zero for this word indicates the window is to be mapped beginning at the first byte of the library. A value of one indicates the window is to be mapped beginning at the 33rd word of the library (starting address + 64), and so forth.

adr+W.NLEN is the length, in 32-word blocks, of the area to be mapped (ignored if bit 7 at *adr+W.NSTS* is zero). This value cannot be greater than the length of the window specified at *adr+W.NSIZ*. In addition, this value, combined with the offset specified at *adr+W.NOFF*, cannot indicate an address beyond the end of the library. A value of zero defaults to either the size of the window or the space remaining in the library, whichever is smaller.

adr+W.NSTS is the access-flags word. Two bits of this word define whether the window is to be mapped and whether read-only access or read/write access to the window is desired. Two additional bits define whether the window is to be mapped into supervisor I-Space or User D-Space. If neither *WS.SIS* nor *WS.UDS* are set, then the *CRAW\$* directive uses User I-Space.

WDBDF\$,
WDBBK\$

Mnemonic	Bit	Meaning
<i>WS.64B</i>	8 = 1	The task's permitted alignment boundaries defined as 32 words.
	= 0	The task's permitted alignment boundaries defined as 256 words.
<i>WS.MAP</i>	7 = 1	The window is to be mapped.
	= 0	The window is not to be mapped.
<i>WS.SIS</i>	5 = 1	<i>CRAW\$</i> allocates this window in the supervisor I-Space. Any mapping occurs in the supervisor I-Space APRs only.
	= 0	This window is not a supervisor mode window.
<i>WS.UDS</i>	4 = 1	<i>CRAW\$</i> allocates this window in the User D-Space. Any mapping occurs in User D-Space APRs only.
	= 0	This window is not a data-only window.
<i>WS.WRT</i>	1 = 1	Read/write access is desired.
	= 0	Read-only access is desired.

If neither bit 4 nor bit 5 is set, then user Instruction Space is used. There is a functional correspondence between bits 4 and 5 in the *CRAW\$* mode byte and the region options available in *TKB*. This correspondence is as follows:

TKB Option	CRAW\$ Mode Bit Setting
<i>RESCOM</i> & <i>COMMON</i>	bit 4 set to 1
<i>RESSUP</i> & <i>SUPLIB</i>	bit 5 set to 1
<i>RESLIB</i> & <i>LIBR</i>	neither, bit 4 & 5 set to 0

If bit 4 = 1, the window is created in the D APR space only; no mapping in the I-Space is done. If another window is already created in both the I- and D-Space at this APR, the I-Space window remains as is, but the D-Space window moves to this request. If a CRAW\$ is done with bit 4 set and a second CRAW\$ is done to the same APR with neither bit 4 nor bit 5 set, the resulting mapping is such that the D-Space APR is given to the CRAW with bit 4 set and the I-Space APR is assigned to the region of the second CRAW\$.

It is illegal to CRAW\$ a region with both bits 4 and 5 set. In RSTS/E, supervisor D-Space is always initially mapped the same as user D-Space. See the MSDS\$ directive.

Data Returned in WDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////		0 W.NID
	3	starting virtual address of window		2 W.NBAS
	5	////////////////////		4
	7	////////////////////		6
	11	////////////////////		10
	13	length, in 32-word blocks, mapped		12 W.NLEN
	15	status flags		14 W.NSTS
	17	////////////////////		16

adr+W.NID is the window ID, a value from 1-7. You can use this ID in later MAP\$ calls to map the newly created window. You must use the ID in any ELAW\$ calls to eliminate the window.

adr+W.NBAS is the starting virtual address of the new window.

adr+W.NLEN is the length, in 32-word blocks, actually mapped by the window.

adr+W.NSTS is the status-flags word.

WDBDF\$,
WDBBK\$

Mnemonic	Bit	Meaning
WS.CRW	15 = 1 = 0	The window was created successfully The window was not created
WS.ELW	13 = 1 = 0	An existing window was eliminated because it overlapped the newly created window No existing windows were eliminated by this create
WS.UNM	14 = 1 = 0	An existing window was unmapped because it overlapped the newly created mapping No existing windows were unmapped by this mapping

Local Symbol Definitions

C.RABA Window definition block address (2)

DSW Return Codes

IS.SUC	Successful completion.
IE.ALG	Either the base APR and window length specified were invalid or the offset and mapping length values specified were invalid. For example, an offset indicating a starting address for the mapping that was beyond the end of the library returns this error.
IE.NVR	The library ID specified for mapping does not specify any library currently attached to the job.
IE.PRI	The create was unsuccessful because the requested access is not allowed. At this point, since the library has been attached successfully with some access defined, this error means that the access requested in the CRAW\$ is not allowed by the access requested in the ATRG\$.
IE.WOV	An attempt was made to create more than seven address windows.
IE.UPN	Creating a window requires a small buffer; a small buffer is not currently available.

5.6 CRRG\$ — Create Dynamic Region

The CRRG\$ directive creates dynamic regions similar to those created by UU.RTS. This call operates in a slightly different manner than its counterpart. If an attempt is made to create a region that already exists, CRRG\$ returns with bit 15 in R.GSTS clear. If attachment is specified and the region already exists, the new region is attached to the already existing region.

Privileges Required

INSTAL

Macro Call

CRRG\$ *adr*

where:

adr is the address of an 8-word Region Descriptor Block (RDB). The CRRG\$ directive also returns information to this area.

Macro Expansion

```
CRRG$   RDBLK
.BYTE   55.,2           ;DIC = 55., DPB SIZE = 2 WORDS
.WORD   RDBLK          ;ADDRESS OF RDB
```

Data Passed in RDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	size in 32-word blocks of region to create	2	R.GSIZ
	5	name of region, or 0 for unnamed (2 words)	4	R.GNAM
	7		6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	region status	14	R.GSTS
	17	region protection in RSX format	16	R.GPRO

adr+R.GSTS

are the status bits that are currently defined as follows:

Bit	Definition
0	Read access desired on attach.
1	Write access desired on attach.
3	Delete access desired on attach.
5	Attach to region (forced if unnamed region).
6	Do not mark created region for deletion on last detach.
7	Delete region when all users detach (forced if unnamed region).
14	At least one window was mapped on a detach.
15	Region was successfully created.

adr+R.GPRO

is the region protection code converted from RSX format to RSTS/E format by the following algorithm:

- The system field is ignored
- Delete protection is ignored
- Extend protection is ignored
- Read protection is mapped to RSTS/E read protection
- Write protection is mapped to RSTS/E write protection

Data Returned in RDB

Mne- monic	Octal Offset	Octal Offset	Mne- monic
	1		0 R.GID
	3		2 R.GSIZ
	5		4
	7		6
	11		10
	13		12
	15		14 R.GSTS
	17		16

adr+R.GSTS

is the status-flags word. Bit 15 is clear if the region already exists.

DSW Return Codes

- IS.SUC Successful completion.
- IE.PRI User does not have INSTAL privilege.
- IE.UPN Creation failed, examine FIRQB for details.

5.7 DTRG\$ — Detach Resident Library

The DTRG\$ directive detaches the job from a previously attached resident library. Any windows mapped to the library by the calling job are unmapped and eliminated. If the specified library is a dynamic region marked for deletion when all users detach, the monitor checks if the region is no longer attached by any job. If so, the monitor deletes the region and releases the memory allocated to it.

Privileges Required

None

Macro Call

DTRG\$ *adr*

where:

adr is the address of an 8-word area defining the library to be detached. The DTRG\$ directive also returns information to this area. Two supplementary directives are available to define (RDBDF\$) or define and fill (RDBBK\$) such an 8-word area, called the Resident-Library Definition Block (RDB).

Macro Expansion

```
DTRG$  RDBLK
.BYTE  59.,2      ;DIC = 59., DPB SIZE = 2 WORDS
.WORD  RDBLK      ;ADDRESS OF RDB
```

Data Passed in RDB

Mne- monic	Octal Offset	Octal Offset	Mne- monic
	1		0 R.GID
	3		2
	5		4
	7		6
	11		10
	13		12
	15		14
	17		16

adr+R.GID is the library ID the ATRG\$ directive returns (at the same position in the RDB).

Data Returned in RDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////////////////	0	
	3	////////////////////	2	
	5	////////////////////	4	
	7	////////////////////	6	
	11	////////////////////	10	
	13	////////////////////	12	
	15	status flags	14	R.GSTS
	17	////////////////////	16	

adr+R.GSTS is the status flag, bit 14, that defines if any windows were unmapped as a result of this detach.

Local Symbol Definitions

D.TRBA Resident-Library Definition Block address (2)

DSW Return Codes

IS.SUC Successful completion.

IE.NVR The library ID specified does not identify any library currently attached to the job.

5.8 ELAW\$ — Eliminate Address Window

The ELAW\$ directive eliminates an address window that was created by the job, unmapping the window if necessary. ELAW\$ frees the APRs used by the window and makes them available for creating another window or for expanding the user job image size.

Privileges Required

None

Macro Call

ELAW\$ *adr*

where:

adr is the address of an 8-word area defining the window to be eliminated. The ELAW\$ directive also returns information to this. Two supplementary directives are available to define (WDBDF\$) or define and fill (WDBBK\$) such an area, called the Window Definition Block (WDB).

Macro Expansion

```
ELAW$      WDBADR
.BYTE      119.,2      ;DIC=119., DPB SIZE=2 WORDS
.WORD      WDBADR      ;ADDRESS OF WDB
```

Data Passed in WDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////	0	W.NID
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	////////////////////////////////	14	
	17	////////////////////////////////	16	

adr+W.NID is the ID of the window to be eliminated (returned at the same location in the WDB by the CRAW\$ directive).

Data Returned in WDB

Mne- monic	Octal Offset	Octal Offset	Mne- monic
	1	//////////	0
	3	//////////	2
	5	//////////	4
	7	//////////	6
	11	//////////	10
	13	//////////	12
	15	status flags	14 W.NSTS
	17	//////////	16

adr+W.NSTS is the status-flags word. Two bits in this word give the following information:

WDBDF\$,
WDBBK\$

Mnemonic	Bit	Meaning
WS.ELW	13 = 1	The window was successfully eliminated
	= 0	The window was not eliminated
WS.UNM	14 = 1	The window eliminated was mapped to a resident library and has been unmapped
	=0	The window eliminated was not mapped; no unmapping was done

Local Symbol Definitions

E.LABA Window Definition Block address (2)

DSW Return Codes

IS.SUC Successful completion.

IE.NVW Bad window ID. It is either outside the range 1 to 22 or it does not match any window currently created for this job.

5.9 EXIT\$ — Task Exit

The EXIT\$ directive stops execution of the calling job. Control passes to the job keyboard monitor at the keyboard monitor entry point P.NEW (see Chapter 2). Any devices still open are reset; that is, closed without performing the usual clean-up operations.

NOTE

On exiting from the previously running program, the monitor drops any temporary privileges still in effect.

The job keyboard monitor is the default keyboard monitor unless the job has issued the SET JOB/KEYBOARD_MONITOR command or executed the .RTS directive to establish a specific job keyboard monitor (see Chapter 3).

Privileges Required

None

Macro Call

EXIT\$S [*err*]

where:

err is the error routine address.

Macro Expansion

```
EXIT$S    ERR
MOV       (PC)+, -(SP)    ;PUSH DPB ONTO THE STACK
.BYTE    51., 1          ;DIC = 51., DPB SIZE = 1 WORD
EMT       377            ;TRAP TO THE EMULATOR
JSR       PC, ERR        ;CALL ERROR ROUTINE
```

NOTE

Digital recommends the \$\$S form for this directive for two reasons: first, only a one-word DPB is generated; second, no BCC instruction is generated for the \$\$S form (or the \$\$C form), since control never returns inline unless an error occurs.

Thus, the \$\$S form takes less space than the \$ form/DIR\$ combination. In addition, because the one-word DPB requires only one MOV instruction, the \$\$S form takes less space and no more execution time than the \$\$C form.

Local Symbol Definitions

None

DSW Return Codes

IE.SDP DIC or DPB size is invalid. This occurs only if your program changes the first word of the DPB at execution time.

5.10 EXST\$ — Exit with Status

Like EXIT\$, the EXST\$ directive stops execution of the calling job. On exiting from the previously running program, the monitor drops any temporary privileges still in effect. In addition, EXST\$ sets the job's exit status.

Control passes to the job keyboard monitor at the keyboard monitor entry point P.NEW (see Chapter 2). Any devices still open are reset; that is, closed without performing the usual clean-up operations. The monitor detaches any attached resident libraries, and eliminates any created address windows.

NOTE

The job keyboard monitor is the default keyboard monitor unless the job has issued the SET JOB/KEYBOARD_MONITOR command or executed the .RTS directive to establish a specific job keyboard monitor (see Chapter 3).

Privileges Required

None

Macro Call

EXST\$ *sts*

where:

sts is the status value. DCL copies this data into the \$SEVERITY and \$STATUS variables (see the *RSTS/E Guide To Writing Command Procedures*).

Macro Expansion

```
EXST$      STATS
.BYTE      29.,2          ;DIC=29., DPB SIZE = 2 WORDS
.WORD      STATS         ;EXIT STATUS WORD
```

Local Symbol Definitions

E.XSTS	Exit status word (2)
EX\$WAR	Warning status code
EX\$SUC	Success status code
EX\$ERR	Error status code
EX\$SEV	Severe error status code

DSW Return Codes

No errors are possible with EXST\$.

5.11 EXTK\$ — Extend Task

The EXTK\$ directive lets you increase the amount of memory allocated to the user job image. For compatibility with RSX-11M, the argument specified in the call indicates a positive or negative increment of 32-word blocks. However, the RSTS/E monitor actually allocates space for the user job image in 1K-word units. Thus, the RSX emulator keeps track of the user job image size as a number of 32-word blocks. When an EXTK\$ directive is executed, the emulator checks to see if the extension or reduction needs or frees one or more 1K-word blocks of memory. If so, the emulator directs the monitor to make the new allocation; if not, the current allocation remains.

NOTE

Do not use the .CORE directive (see Chapter 3) before an EXTK\$ directive in the same program. The monitor executes the .CORE directive directly, without the intervention (or knowledge) of the RSX emulator. If a .CORE executes before an EXTK\$, the emulator has incorrect information on the current size of the user job image when it executed the EXTK\$, and it bases the new allocation on the size before the .CORE was executed.

You cannot extend the size beyond the least of the following:

- The job's private maximum size—A private job maximum size can be set by the system manager.
- The system-wide maximum user job image size—Set by the system manager (see SWAP MAX, *RSTS/E System Installation and Update Guide*).
- 32K-32 words—The maximum size allowed by the RSX emulator.

You also cannot extend the size of the image into virtual address space used by an address window created for use with resident libraries (see CRAW\$ directive).

NOTE

If I&D Space is in use, the size applies only to the D-Space of the task. The size of the I-Space is fixed at task load time.

If there is not enough contiguous memory for the extension to be made where the job currently is in memory, the monitor swaps the user job image to disk and then returns it to memory at a location that can accommodate the new size. If no increment is given in the call, the emulator allocates the amount of space the job had initially, based on information built in at link time (with TKB); that is, before any EXTK\$ was executed.

Privileges Required

None

Macro Call

EXTK\$ [*inc*]

where:

inc is the number of 32-word blocks by which the task size is to be extended (positive value for *inc*) or reduced (negative value for *inc*).

Macro Expansion

```
EXTK$      40
.BYTE      89.,3      ;DIC = 89., DPB SIZE = 3 WORDS
.WORD      40         ;EXTEND 40(8) BLOCKS (1K WORDS)
.WORD      0          ;RESERVED WORD
```

Local Symbol Definitions

E.XTIN Extend increment (2)

DSW Return Codes

IE.SUC Successful completion.

IE.UPN The requested increment would have caused the user job image size to exceed that allowed (see previous discussion). The user job image size stays at the current size.

5.12 EXTM\$—Extend Task by Mask

This directive is similar to the EXTK\$ directive. Both directives extend the task's virtual address Data Space. However, when doing I&D-Space tasks, the EXTM\$ directive unmaps the D-Space APRs (only) from libraries and includes them in the memory extension space, if allowed by the APR mask. This leaves the resident library mapped in I-Space only. In tasks built without I&D space (TKB /-ID option), the EXTM\$ directive behaves exactly as the EXTK\$ directive.

During task memory expansion, RSTS/E maps resident libraries with both I&D Space APRs mapped identically; this is done by default. The EXTK\$ directive does not override this mapping. If an attempt is made to extend into an APR used by the library, it will cause an error.

The APR mask provides a method of reserving one or more APRs in the D-Space for resident library use. If, for example, a resident library is built with I-Space using APRs 5, 6, and 7 but all the needed D-Space is contained in APR 7, then by reserving APR 7 for the library, the task can extend its usable D-Space into APRs 5 and 6. The task does this reservation by setting the APR 7 bit in the APR mask word in the EXTM\$ call.

If an EXTM\$ extension of memory requires the use of an APR whose bit is set in the APR mask word, the system returns an error.

The Task Builder has automated the process of constructing the APR mask word for the combination of libraries used in building the task. This data is available to the program at execution time. See the *RSTS/E Task Builder Reference Manual* for details.

NOTE

If I&D Space is not turned on (/ID), then all EXTM\$ requests behave as though they are EXTK\$ requests (that is, the APR mask word is zero).

The lowest bit set above the current task D-Space determines the protection line above which a request will fail. For example, if only bit 3 is set, then APRs 3 through 7 are protected even though bits 4 through 7 are not set.

CAUTION

Take care when using this call to remap D-Space away from a library. If the library is not coded in an I-only manner, the program is likely to behave unpredictably.

Use EXTM\$ to pass information to RSTS/E gathered by the Task Builder about the D-Space that the resident libraries associated with the task need. The task builder makes this link time data available at run time.

If the program includes:

```
.PSECT $TSKP, D
$TSKP::
.PSECT [name of previous .PSECT]
```

then the Task Builder fills the address at \$TSKP with the inclusive OR of all the D-APR masks used by the program. At execution, the value of \$TSKP can be used directly as the mask in the EXTM\$ call by allowing the program to expand to the minimum size allowed for the particular library configuration in use. See the *RSTS/E Task Builder Reference Manual* on building resident libraries for details on the source values filled into \$TSKP.

Privileges Required

None

Macro Call

EXTM\$ [*inc,mask*]

where:

inc is the number of 32-word blocks by which the task size is to be extended (positive value for *inc*) or reduced (negative value for *inc*).

mask is the APR mask word through which the caller passes information about those user D-Space APR registers protected from being expanded into by the task D-Space. This mask specifies which D-Space APRs are still available for resident library (or dynamic region) D-Space mapping.

In the **EXTK\$** directive, this APR mask word is zero; it tells RSTS/E not to expand task D-Space beyond the base APR of the lowest mapped library or dynamic region.

The APR mask word allows the user to control how the task extension is to work. Extension uses fall into three general categories listed in the following table.

APR Mask

Word	Description
0	The EXTM\$ behaves as an EXTK\$ on RSTS/E; that is, extension is only allowed up to the base of the first library APR.
1	The EXTM\$ behaves as an EXTK\$ on RSX-11M/M-PLUS; that is, extension is allowed thru APR7 remapping the D-Space of any libraries. However, extension is not allowed past the beginning of a dynamic region or a window specifically mapped in D-Space.
any other	For all other values, the APR Mask Word acts like a memory protection flag. An EXTM\$ request is not allowed to extend task D-Space into an APR that is above the current task D-Space and that the bit representing the APR is set (see the following list). It also is not allowed to extend past the beginning of a dynamic region or a window specifically mapped in D-Space.
Bit 7	Represents APR 7 <200>
Bit 6	Represents APR 6 <100>
Bit 5	Represents APR 5 <40>
Bit 4	Represents APR 4 <20>
Bit 3	Represents APR 3 <10>
Bit 2	Represents APR 2 <4>
Bit 1	Represents APR 1 <2>
Bit 0	Must be set for EXTM\$ <1>

Macro Expansion

```
EXTK$      40,30
.BYTE     89.,3      ;DIC = 89., DPB SIZE = 3 WORDS
.WORD     40         ;EXTEND 40(8) BLOCKS (1K WORDS)
.WORD     30         ;MASK PROTECTS APRS 6 & 7 D-SPACE FOR LIBRARY
```

Local Symbol Definitions

E.XTIN Extend increment (2)

DSW Return Codes

- IE.SUC Successful completion.
- IE.UPN The requested increment would have caused the user job image size to exceed that allowed (see previous discussion). The user job image size stays at the current size.

5.13 FEADF\$ — Define System Feature Labels

The FEADF\$ macro lets you define the system feature labels.

Privileges Required

None

Macro Call

FEADF\$

This is purely a definition macro and therefore there are no results or errors.

5.14 FEAT\$ — Test for System Feature

The FEAT\$ directive tests for the presence of a specific system software or hardware option, such as floating point hardware or the presence of the commercial instruction set.

Macro Call

FEAT\$ *sym*

where:

sym is the symbol for the specified system feature.

The supported system feature symbols are:

Symbol	Value	Meaning
FE\$EXT	1	22-Bit extended memory support
FE\$PLA	5	PLAS calls supported
FE\$LIB	18.	Supervisor mode library support
FE\$UDS	37.	User data space supported
FE\$FMP	59.	Fast mapping directive supported
HF\$UBM	-1.	Processor has UNIBUS mapping registers
HF\$EIS	-2.	Processor has Extended Instruction Set
HF\$QB	-3.	Processor has a Q-BUS backplane
HF\$DSP	-4.	Processor supports separate I & D spaces
HF\$CIS	-8.	Processor supports Commercial Instruction Set
HF\$FPP	-16.	Processor has NO floating point unit

Macro Expansion

```
FEAT$      FE$FMP
.BYTE      177.,2      ;FEAT$ MACRO DIC, DPB size = 2 words
.WORD      FE$FMP      ;feature identifier
```

Local Symbol Definitions

F.EAF Feature identifier

DSW Return Codes

IS.CLR Successful completion; feature not present (=0)
IS.SET Successful completion; feature present (=2)
IE.ADP Illegal DPB address
IE.SDP Invalid DIC or feature identifier code

NOTE

The full list of RSX-11/M-PLUS feature identifiers is not supported on RSTS/E.

5.15 GLUN\$ — Get LUN Information

The GLUN\$ directive fills a 6-word buffer with information about a physical device unit to which a logical unit (LUN) is assigned.

Privileges Required

None

Macro Call

GLUN\$ *lun,buf*

where:

lun is the logical unit number.

buf is the address of the 6-word buffer to receive the information.

Buffer Format

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	device name (2 ASCII characters)	0	G.LUNA
	3	device unit number	2	G.LUNU
	5	first device characteristics word	4	G.LUCW
	7	second device characteristics word	6	
	11	////////////////////	10	
	13	standard device buffer size	12	

buf+0 is the name of the assigned device; two ASCII characters. This must be a valid physical device name. Exceptions are the logical device names OV and LB, which default to SY if they are not defined, and CL, which defaults to TT.

buf+2 is the unit number of the assigned device. If this word is minus one, it indicates there is no unit number. If this word is zero or a positive number, it is a real unit number.

buf+4 is the first device characteristics. The bit settings are:

Bit	Meaning When Set
0	Record-oriented device
1	Carriage-control device
2	Terminal device
3	Directory device
4	Single-directory device
5	Sequential device
6-15	Reserved

Settings for bits 0-5 are (in octal):

- 01 = Card reader
- 01 = Paper tape reader/punch
- 02 = Line printer
- 03 = Terminal
- 10 = Disk
- 40 = Magtape

buf+6 is the privilege status. If this word is zero, it indicates the job is nonprivileged. If this word is eight, it indicates the job is privileged.

buf+12 is the standard device buffer size to use for input or output on this device.

Macro Expansion

```
GLUN$      7, LUNBUF
.BYTE      5, 3           ;DIC = 5, DPB SIZE = 3 WORDS
.WORD      7             ;LOGICAL UNIT NUMBER 7
.WORD      LUNBUF        ;ADDRESS of 6-WORD BUFFER
```

Local Symbol Definitions

G.LULU Logical unit number (2)

G.LUBA Buffer address (2)

The monitor assigns the following offsets relative to the start of the LUN information buffer:

G.LUNA Device name (2)

G.LUNU Device unit number (1)

G.LUFB Flags byte (not used in RSTS/E) (1)

G.LUCW Four device characteristics words (8)

DSW Return Codes

IS.SUC Successful completion.

IE.ULN Unassigned LUN.

IE.ILU Invalid logical unit number (must be in range 1-14).

IE.SDP DIC or DPB size is invalid.

5.16 GMCR\$ — Get MCR (CCL) Command Line

The GMCR\$ directive transfers an 80-byte CCL command line to the job. The program that processes an installed CCL command must contain code to analyze what you typed to invoke the file. The GMCR\$ directive returns the command line you typed in an 80-byte buffer in the DPB.

If the CCL command line is longer than 80 bytes, the first 79 bytes followed by a hyphen in position 80 is returned on the first call to GMCR\$. A subsequent call returns the remaining portion of the command line. The maximum CCL command line length that can be retrieved via the GMCR\$ call is 127. characters.

This directive has no \$\$ form. Because the DPB receives the CCL command line, the space must be allocated in read/write memory.

Privileges Required

None

Macro Call

GMCR\$

Macro Expansion

```
GMCR$
.BYTE 127.,41. ;DIC = 127., DPB SIZE = 41. WORDS
.BLKW 40. ;80-CHARACTER CCL COMMAND BUFFER
```

Local Symbol Definitions

G.MCRB CCL command buffer (80)

DSW Return Codes

+n	Successful completion. The value n is the number of data bytes transferred (excluding the termination character).
IE.AST	Task was not run as a CCL command or the GMCR\$ directive has already been executed.
IE.SDP	DIC or DPB size is invalid.

5.17 GPRT\$ — Get Partition (Job) Parameters

The GPRT\$ directive fills a 3-word buffer with *partition* parameters. For RSTS/E, a partition corresponds to the job area.

Privileges Required

None

Macro Call

GPRT\$ [*name*],*buf*

where:

name is the partition name. Omit this parameter to get the actual job image size in *buf+2*.

buf is the address of the 3-word buffer where information is to be returned.

Buffer Format

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	virtual base address (always 0 in RSTS/E)	0	G.PRPB
	3	user job image size in 32-word blocks	2	G.PRPS
	5	flags word (always 0 in RSTS/E)	4	G.PRFW

name is the partition name. Omit name to get the actual job image size in *buf+2*.

buf+2 is the partition size (user job image size in RSTS/E), expressed as a multiple of 32 words. If I&D Space is enabled, this reflects only the size of the D-Space of the task. If you give a partition name, the system SWAP MAX is returned, in 32-word units.

buf+4 is the partition flags word. Always returned as zero, since all jobs are system-controlled in RSTS/E. (RSX-11M returns one for a user-controlled partition.)

Macro Expansion

```
GPRT$      , DATBUF
.BYTE      65., 4      ;DIC=65., DPB SIZE = 4
.WORD      0, 0       ;GENERATE 0 WORDS IF NO NAME
.WORD      DATBUF     ;ADDRESS OF 3-WORD BUFFER
```

Local Symbol Definitions

G.PRPN Partition name (4)

G.PRBA Buffer address (2)

The monitor assigns the following offsets relative to the start of the buffer:

G.PRPB Partition virtual base address (2)

G.PRPS Partition size (2)

G.PRF Partition flags word (2)

DSW Return Codes

Successful completion is indicated by carry clear, and the starting address of the partition is returned in the DSW (always zero in RSTS/E). Unsuccessful completion is indicated by carry set and the following code in the DSW:

ID.SDP DIC or DPB size is invalid.

5.18 GTIM\$ — Get Time Parameters

The GTIM\$ directive fills an 8-word buffer with the current day and time of day. All time values are stored as one-word binary integers. The value ranges (in decimal) are shown in the following diagram.

Privileges Required

None

Macro Call

GTIM\$ *buf*

where:

buf is the address of an 8-word buffer.

Buffer Format

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	year (since 1900); such as 78 = 1978	0	G.TIYR
	3	month (1-12); such as 1 = January	2	G.TIMO
	5	day of month (1-31)	4	G.TIDA
	7	hour (0-23); such as 0 = midnight	6	G.TIHR
	11	minute (0-59)	10	G.TIMI
	13	second (0-59)	12	G.TISC
	15	tick of second	14	G.TICT
	17	ticks per second	16	G.TICP

G.TIBA+G.TICT Indicates a tick which is either 1/60th or 1/50th of a second, depending on the clock in use and/or the line frequency. Systems running with the KW11P clock at crystal speeds, rather than at line frequency, or 11/73, 11/83, 11/84, 11/93, or 11/94 systems with 800 Hertz clocks, have a tick of 1/50th of a second. Otherwise, if the system is operating with a 60 Hz power line, a tick is 1/60th of a second.

Macro Expansion

```
GTIM$    DATBUF
.BYTE    61.,2          ;DIC = 61., DPB SIZE = 2 WORDS
.WORD    DATBUF        ;ADDRESS OF 8-WORD BUFFER
```

Local Symbol Definitions

G.TIBA Buffer address (2)

The monitor assigns the following offsets relative to the start of the buffer:

G.TIYR	Year (2)
G.TIMO	Month (2)
G.TIDA	Day (2)
G.TIHR	Hour (2)
G.TIMI	Minute (2)
G.TISC	Second (2)
G.TICT	Clock tick of second (2)
G.TICP	Clock ticks per second (2)

DSW Return Codes

IS.SUC	Successful completion.
IE.SDP	DIC or DPB size is invalid.

5.19 GTSK\$ — Get Task (Job) Parameters

The GTSK\$ directive fills a 16-word buffer with parameters for the task. As with partition in GPRT\$, a task in the RSTS/E environment is equivalent to the job.

Privileges Required

None

Macro Call

GTSK\$ *buf*

where:

buf is the address of the 16-word buffer to receive the parameters.

Buffer Format

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	task name (2 words in RAD50 format)	0	G.TSTN
	3		2	
	5	partition name (2 words in RAD50 format)	4	G.TSPN
	7		6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	run priority (0-255)	14	G.TSPR
G.TSPC	17	project number | programmer number	16	G.TSGC
	21	number of LUNs assigned	20	G.TSNL
	23	////////////////////////////////	22	
	25	////////////////////////////////	24	
	27	address of SST vector table	26	G.TSVA
	31	length of SST vector table in words	30	G.TSVL
	33	size (in bytes) of memory for job image	32	G.TSTS
	35	system where job is running (4 = RSTS/E)	34	G.TSSY

buf+0 is the task name. The name supplied for the TASK = name option at the time the task was built (linked) with TKB; otherwise, the file name of the file being run.

buf+4 is the partition name specified for the PAR = name option at the time the task was built (linked) with TKB. If no such name was specified, the characters "GEN " (GEN followed by three blanks), to indicate the general partition, the default system-controlled partition in RSX-11M.

buf+14 is the run priority; may range from 0 to 255. This is the RSTS/E job priority plus 128.

buf+16 is the programmer number of the user currently running the program.

buf+18 is the project number of the user currently running the program.
buf+20 is the number of logical unit numbers (LUNs) currently assigned.
buf+26 is the address of the SST vector table. If *buf+30* = 0, this word is meaningless.
buf+30 is the length of the SST vector table, in words. If there is no SST vector table, this word is set to 0.
buf+32 is the job size, in bytes. If I&D Space is enabled, this size reflects only the D portion of the task.
buf+34 is the system in which the program/job/task is running:
 0 = RSX-11D
 1 = RSX-11M
 2 = RSX-11S
 3 = IAS
 4 = RSTS/E
 5 = VAX/VMS
 6 = RSX-11M-PLUS
 7 = RT-11
 This value is always 4 on RSTS/E systems.

Macro Expansion

```

GTSK$   DATBUF
.BYTE   63.,2           ;DIC=63., DPB SIZE = 2 WORDS
.WORD   DATBUF         ;ADDRESS OF 16-WORD BUFFER
  
```

Local Symbol Definitions

G.TSBA Buffer Address

The monitor assigns the following offsets relative to the buffer:

G.TSTN Task name (4)
 G.TSPN Partition name (4)
 G.TSPR Priority (2)
 G.TSGC Programmer number (1)
 G.TSPC Project number (1)
 G.TSNL Number of logical units (2)
 G.TSVA SST vector address (2)
 G.TSVL Length of SST vector table (2)
 G.TSTS Size of space for user job image (2)
 G.TSSY System being run under (2)

DSW Return Codes

IS.SUC Successful completion.
 IE.SDP DIC or DPB size is invalid.

5.20 MAP\$ — Map Address Window

The MAP\$ directive maps a previously created address window to an attached resident library. In other words, MAP\$ relates the virtual address range defined by a CRAW\$ directive to actual locations in memory within a resident library that has been attached to the job by an ATRG\$ directive.

If the window specified is already mapped, it is unmapped from its previous actual memory locations and remapped to the new area. A job may map a maximum of seven address windows at any given time.

Privileges Required

None

Macro Call

MAP\$ *adr*

where:

adr is the address of an 8-word area defining the window to be mapped. The MAP\$ directive also returns information to this area. Two supplementary directives are available to define (WDBDF\$) or define and fill (WDBBK\$) such an area, called the Window Definition Block (WDB).

Macro Expansion

```
MAP$      WDBADR
.BYTE     121., 2          ;DIC=121., DPB SIZE=2 WORDS
```

Data Passed in WDB

Mne- monic	Octal Offset	Octal Offset	Mne- monic
	1	0	W.NID
	3	2	
	5	4	
	7	6	W.NRID
	11	10	W.NOFF
	13	12	W.NLEN
	15	14	W.NSTS
	17	16	

adr+W.NID is the ID of the window to be mapped (returned at the same location in the WDB by the CRAW\$ directive).

adr+W.NRID is the ID of the resident library to which the window is to be mapped (returned at offset R.GID in the RDB by the ATRG\$ or CRRG\$ directive that attached the job to the resident library).

adr+W.NOFF is the offset, in 32-word blocks, from the start of the library where the mapping is to begin. A value of zero for this word indicates that the window is to be mapped beginning at the first byte of the library. A value of one indicates that the window is to be mapped beginning at the 33rd word of the library (starting address +64), and so forth. The offset cannot indicate a starting address past the end of a library.

adr+W.NLEN is the length, in 32-word blocks, to be mapped to the library. This value cannot be greater than the size of the window defined in the CRAW\$ directive with which the window was created. In addition, this value, combined with the offset value at *adr+W.NOFF*, cannot indicate an address beyond the end of the library. A value of zero for this word defaults to the size of the window or the space remaining in the library, whichever is smaller.

adr+W.NSTS is the access flag. When bit 1 (WS.WRT) is set, read/write access is allowed. A separate setting for access in MAP\$ and in ATRG\$ lets you attach to a library read/write and map a portion of the library read-only. You cannot, however, attach to a library read-only and then map to the library read/write.

WDBDF\$,
WDBBK\$

Mnemonic	Bit	Meaning
WS.64B	8 = 1	The task's permitted alignment boundaries defined as 32 words.
	= 0	The task's permitted alignment boundaries defined as 256 words.
WS.WRT	1 = 1	Read/write access is desired
	= 0	Read-only access is desired

Data Returned in WDB

Mne- monic	Octal Offset	Octal Offset	Mne- monic
1	///	0	
3	///	2	
5	///	4	
7	///	6	
11	///	10	
13	length actually mapped	12	W.NLEN
15	status flags	14	W.NSTS
17	///	16	

adr+W.NLEN is the length, in 32-word blocks, mapped by the call.

adr+W.NSTS are the status flags. Bit 14 (WS.UNM) indicates, when set, if the window specified was unmapped before the new map.

Local Symbol Definitions

M.APBA Window Definition Block address (2)

DSW Return Codes

IS.SUC	Successful completion.
IE.ALG	The offset and length specified are inconsistent; either the mapping attempted to go beyond the end of the library, or the length is greater than the created window.
IE.PRI	The mapping did not succeed because user privileges did not allow the access desired.
IE.NVW	Either the resident library ID or the address window ID is incorrect. (That is, the job is not currently attached to the specified resident library, or no address window has been created with the specified window ID.)

5.20.0.1 Fast-Mapping Facility

You may want to use the fast-mapping facility instead of the MAP\$ directive. It enhances performance and is compatible with the fast-mapping facility of RSX-11M-PLUS. The RSTS/E RSX emulator also provides the following features:

- The Task Builder /FM switch.
- The TFEA\$ RSX monitor call can tell a program if fast-mapping is enabled.
- The .SET and .CLEAR monitor calls allow a task to enable and disable fast-mapping.

You can use fast-mapping if your program does not use any IOT instructions except to perform the fast-map operations. To use the fast-mapping facility, set parameters as shown in the following calling sequence, then issue an IOT instruction:

Calling Sequence

R0	parameter 1	see table of APR parameter values
R1	parameter 2	offset field, 32 decimal words from library base
R2	parameter 3	optional length specification (if used, bit 15 in R0 must =1)
IOT		calls the monitor to execute mapping

Returned Data

R0	Status	IS.SUC if successful IE.TIS or IE.ALG if unsuccessful
R2	length mapped	if successful length actually mapped in slivers
R1 & R3		indeterminate

Table of Parameter Values

Space	Base APR	If No Length Given	If Length Given
User-I	0	APR I-0 cannot be changed	
User-I	1	000010	100010
User-I	2	000020	100020
User-I	3	000030	100030
User-I	4	000040	100040
User-I	5	000050	100050
User-I	6	000060	100060

Space	Base APR	If No Length Given	If Length Given
User-I	7	000070	100070
User-D	0	APR D-0 cannot be changed	
User-D	1	000110	100110
User-D	2	000120	100120
User-D	3	000130	100130
User-D	4	000140	100140
User-D	5	000150	100150
User-D	6	000160	100160
User-D	7	000170	100170

The fast-mapping facility has the following requirements:

- The fast-mapping facility can modify only the map field (FQSIZE) and, optionally, the length to the map field (FQBUFL).
- The interface to the fast-mapping facility is designed for speed, not for ease of programming. It may be harder to debug a task using fast-mapping than one using the .PLAS directive. The only validation fast-mapping does is to protect the operating system and its data structures
- The interface uses the IOT instruction. Tasks that use fast-mapping cannot use the IOT instruction for any other purpose.
- The interface uses registers to pass parameters instead of using a FIRQB. This means that the MACRO-11 programmer must be careful about register use when fast-mapping.

Examples

Change the window offset in an I-Space library:

```

MOV    #60,R0           ;I-Space window in APR 6
MOV    #200,R1          ;offset 4K words from the beginning of library
                          ;R2 not used
IOT                    ;do the re-map
TST    R0               ;any errors?
BMI    ERROR            ;if minus yes, otherwise ok

```

Change the D-Space window offset and the actual window length:

```

MOV    #100150,R0       ;D-Space window in APR 5, length to be given
MOV    #400,R1          ;offset 8K words from library base
MOV    #500,R2          ;length to be 10K words (use APR 5,6 &7)
IOT                    ;issue instruction
TST    R0               ;any errors?
BMI    ERROR            ;if minus yes, otherwise ok

```

5.21 MSDS\$—Map Supervisor Mode D-Space

The MSDS\$ directive allows a task to change the mapping of its supervisor mode D-Space APRs. This directive can also provide information about the current mapping of the task's supervisor mode D-Space APRs, or about a library's current mode.

Normally, when supervisor mode library code is executing, the supervisor mode I-Space APRs map supervisor mode instruction space, and the supervisor mode D-Space APRs map the User mode D-Space. However, code that resides in a supervisor mode library may need to use its instruction space as data space for such items as error messages or other text. The Map supervisor Data Space directive allows such code to overmap the supervisor D-Space and the supervisor I-Space on an APR by APR basis. This overmapping can be used with tasks built using separate I-Space and D-Space mapping.

The Map Supervisor D-Space directive allows the task to specify a 7-bit mask that determines which space each supervisor D-Space APR will use. The mask value contains one bit for each APR beginning at APR1. Supervisor mode D-APR0 must overmap user mode D-APR0 at all times and therefore is not included in the mask value.

On the return from the MSDS\$ call, the current supervisor mode D-Space mapping mask is returned along with the high byte (mode bits) of the PSW. If bit 15 of the mask value is set to 1 on the call, no change occurs to supervisor mapping but existing mapping is returned.

The MSDS\$ call is designed to be executed from within the library whose mapping it alters. This allows a library to determine its current mode from the PSW mode bits returned. Further, if the MSDS\$ call is issued from user mode rather than supervisor mode, no mapping change occurs. The call simply returns the mapping data and PSW contents. Note that the MSDS\$ call returns *only* the supervisor mode mapping status. If the library is in user mode, no useful mapping data is returned. Normally, a library in user mode will have its D-Space already mapped to user mode D-Space unless the task builder or the program has taken some overt action to re-map the D-Space.

Digital recommends that you place all required data at the highest addresses in the library. Not only does this remove it from the APR0 restriction in supervisor mode, but also allows the library to make proper use of the EXTM\$ directive (see the *RSTS/E Task Builder Reference Manual*) when used in user mode.

Privileges Required

None

Macro Call

MSDS\$ *mask*

where:

mask is a 7-bit APR mask plus an action flag, formatted as follows:

Bit	Meaning
0-7	Set to 0 on input. Set to PSW high-order byte on return.
8	APR 1 mapping switch. If 1, then supervisor mode D-Space equals supervisor mode I-Space.
9	APR 2 mapping switch. If 1, then supervisor mode D-Space equals supervisor mode I-Space.
10	APR 3 mapping switch. If 1, then supervisor mode D-Space equals supervisor mode I-Space.
11	APR 4 mapping switch. If 1, then supervisor mode D-Space equals supervisor mode I-Space.
12	APR 5 mapping switch. If 1, then supervisor mode D-Space equals User mode D-Space.
13	APR 6 mapping switch. If 1, then supervisor mode D-Space equals supervisor mode I-Space.
14	APR 7 mapping switch. If 1, then supervisor mode D-Space equals supervisor mode I-Space.
15	Action flag. If 0, then set mapping. If 1, then report current supervisor mode D-Space mapping (no changes). If issued from user mode, flag is forced to 1.

Macro Expansion

```
.MACRO MSDS$ mask
.BYTE 201.,2 ;MSDS$ DIC code, DPB size= 2 words
.WORD mask
.ENDM
```

Error codes

IE.SDP DIC or DPB size is invalid

Example

```
;+
; This is sample code that might exist in a supervisor library
; for the purpose of printing error messages.
;-
      TST      (R0)           ;test some piece of user data
      BPL      DATAOK       ;skip next if data ok

      MSDS$$  #100000        ;get current mapping state
      MOV      $DSW,R0       ;
      MOV      R0,-(SP)      ;save for future restoration

      BIS      #400,R0       ;update mask to map APR1 to super I
      MSDS$$  R0             ;change the mapping

      MOV      #MESSAG,R1    ;pointer to error message which is data
      CALL     OUTMSG        ;call a routine in super mode to output
                          ;text data message

      MOV      (SP)+,R0      ;get back the original mapping state
      MSDS$$  R0             ;now back to the original state
      .
      .
      .
;+
; Somewhere in APR 1 of supervisor library:
;
MESSAG: .ASCIZ  /Error in data/
```

5.22 QIO\$ and QIOW\$ — Queue I/O Request (and Wait)

The QIO\$ and QIOW\$ directives do non-file-structured I/O. In the RSX emulation mode environment, QIO\$ and QIOW\$ do the same thing. I/O is synchronous in this environment. That is, you cannot request I/O, do other processing, and get an interrupt when the I/O completes. In RSX emulation mode, control returns to the program only when the I/O is complete.

As non-file-structured implies, the QIO\$ and QIOW\$ directives are useful for I/O on a terminal, card reader, or line printer.

Privileges Required

See discussion

Macro Call

$$\left\{ \begin{array}{l} \text{QIO\$} \\ \text{QIOW\$} \end{array} \right\} \text{ } fnc, lun, [efn], [pri], [isb], [ast][, par]$$

where:

fnc is the I/O function code:

IO.ATT	Attach. In RSTS/E, opens the device specified by the logical unit number (<i>lun</i>).
IO.DET	Detach. In RSTS/E, closes the device specified by the logical unit number (<i>lun</i>).
IO.RAL	For terminals only, performs a read in ODT mode (see .TTDDT in Chapter 3).
IO.RLB IO.RVB	Read. IO.RLB and IO.RVB do the same thing in RSTS/E. The actions performed depend on the device (see the section "Format and Description by Function Code").
IO.WAL	For terminals only, performs a write in binary mode (see RECORD 4096% for terminal output, <i>RSTS/E Programming Manual</i>).
IO.WLB IO.WVB	Write. IO.WLB and IO.WVB do the same thing in RSTS/E. The actions performed depend on the device (see the section "Format and Description by Function Code").

lun is the logical unit number; defines the device for which the I/O operation is to be performed. Must have been previously defined with an ALUN\$ directive.

efn is the event flag. (The RSX emulator ignores this parameter.)

pri is the priority. (The RSX emulator ignores this parameter.)

isb is the I/O status block. Address of a 2-word buffer to which information is returned about the outcome of the I/O operation. The contents vary according to the function code and device, as the following describes.

ast is the asynchronous exception address. (The RSX emulator ignores this parameter.)

par is the parameter list. Of the form <p1,p2[,,,p3]> for RSTS/E users. Form and meaning varies according to function code and device, as the following describes.

Format and Description by Function Code

$$\left\{ \begin{array}{l} \text{QIO\$} \\ \text{QIOW\$} \end{array} \right\} \text{ } \text{IO.ATT}, lun[, , isb]$$

Opens the device specified by the logical unit number (*lun*). Status information is returned to the 2-word buffer at address *isb*. If the device is restricted, this function requires DEVICE privilege.

$$\left\{ \begin{array}{l} \text{QIO\$} \\ \text{QIOW\$} \end{array} \right\} \text{ IO.DET,}lun[,,,isb]$$

Closes the device specified by the logical unit number (*lun*). Status information is returned to the 2-word buffer at address *isb*. This function does not require any privileges.

$$\left\{ \begin{array}{l} \text{QIO\$} \\ \text{QIOW\$} \end{array} \right\} \left\{ \begin{array}{l} \text{IO.RLB} \\ \text{IO.RVB} \end{array} \right\} ,lun,,,[isb],,<stadd,size [,,,block]>$$

For record-oriented devices in the RSX-11M environment (see GLUN\$), IO.RLB and IO.RVB return a record (a line on a terminal, card on a card reader, record on a paper tape reader). The data is read into the buffer whose starting address is defined by *stadd* and whose length in bytes is defined by *size*. The amount of data read never exceeds the buffer size. If the buffer size is smaller than the record, the next IO.RLB or IO.RVB for that *lun* reads another buffer-full. The block parameter is omitted for these devices.

For disk, IO.RLB and IO.RVB fill the buffer whose starting address is defined by *stadd* and whose length in bytes is defined by *size*. The read begins with the device cluster number specified by the block parameter. If *block* is omitted or 0, sequential reads are performed and the next read begins with the next device cluster. The buffer size should be a multiple of the device cluster size for the disk (see Appendix B).

NOTE

Only jobs with the necessary privileges can do non-file-structured disk I/O. RDNFS privilege is required for read-only and WRTNFS privilege is required for read/write non-file-structured disk I/O.

For all devices, the *isb* parameter is the address of a 2-word buffer to which status information on the read is returned. If *isb* is omitted, no such status is returned.

$$\left\{ \begin{array}{l} \text{QIO} \\ \text{QIOW\$} \end{array} \right\} \left\{ \begin{array}{l} \text{IO.WLB} \\ \text{IO.WVB} \end{array} \right\} ,lun,,,[isb],,<stadd, size[,vfc]>$$

For record-oriented devices in the RSX-11M environment (see GLUN\$), IO.WLB and IO.WVB write the contents of the buffer to the device specified by the logical unit number (*lun*). The starting address for the buffer is defined by *stadd*, and the length in bytes is defined by *size*. For record-oriented and carriage-controlled devices, the *vfc* parameter specifies an action to be performed after the buffer contents are written. (The *vfc* parameter is a vertical format control character for terminals and line printers.)

Table 5-2 lists the values for *ufc* and the actions taken. The *ufc* parameter is omitted for non-carriage-controlled devices.

Table 5-2: Vertical Format Control Characters

Octal Value	Character	Meaning
040	blank	Single space—Output a line feed, print the contents of the buffer, and output a carriage return. Normally, printing immediately follows the previously printed line.
060	0	Double space—Output two line feeds, print the contents of the buffer, and output a carriage return. Normally, the buffer contents are printed two lines below the previously printed line.
061	1	Page eject—Output a form feed, print the contents of the buffer, and output a carriage return.
053	+	Overprint—Print the contents of the buffer and output a carriage return. Normally overprints the previous line.
044	\$	Prompting output—Output a line feed and print the contents of the buffer. This mode of output is intended for use with a terminal on which a prompt message is output and input is then read on the same line.
000	null	Internal vertical format—Print the buffer contents without adding vertical format control characters. In this mode, more than one line of guaranteed contiguous output can be printed for each I/O request.

For disk, IO.WLB and IO.WVB write the contents of the buffer to disk, beginning at the device cluster number specified by the *block* parameter. If *block* is omitted, sequential writes are performed. The next write (for sequential writes) begins with the next device cluster. The buffer size must be a multiple of the device cluster size.

NOTE

No job can write to disk in non-file-structured mode while any other user is accessing the disk.

For all devices, the *isb* parameter defines the starting address of a 2-word buffer to which status information on the write is to be returned. If you omit *isb*, no such status information is returned.

Contents of I/O Status Buffer

The general format of the information returned to the 2-word status buffer defined by *isb* is:

(terminal I/O code)	general I/O code
number of bytes read or written	

The first word contains information on the success or failure of the I/O operation requested. As with \$DSW, you can use mnemonic codes to test this word. The Task Builder resolves the mnemonics automatically.

For all devices and operations except terminal reads, you test the low-order byte of the first word to determine the I/O status code. Successful terminal reads provide additional information on what character terminated the line typed at the terminal. For terminal reads, you test the low-order byte first to see if the read was successful (IS.SUC). If it was, you can then test the entire first word to find out if the line was terminated with a carriage return (IS.CR) or an ESC character (IS.ESC), which is called ALTMODE on some terminals.

The second word of the block contains the number of bytes read or written, if the read or write was successful. No information is returned in this word for IO.ATT and IO.DET operations.

The following section describes the I/O return codes. IS.CR and IS.ESC are full-word values; the others are tested by the low-order byte only.

NOTE

The RSX emulator does the requested I/O operation using the non-file-structured OPNFQ subfunction of CALFIP, the CLSFQ subfunction of CALFIP, .READ, and .WRITE. It does not clear the FIRQB or XRB when it returns control to the user program. The codes given in square brackets [] are the RSTS/E errors that are returned to the emulator. You can do further checking in the case of IE.BAD, for example, by checking byte 0 of the FIRQB.

Return Codes

IS.SUC	Successful completion of I/O operation. For terminal reads, you can determine the terminating character of the line by testing the full first word of the I/O status buffer for: IS.CR The terminal line was terminated with a carriage return/line feed combination. (The terminating characters are not included in the character count in the second word. They do appear in the input buffer.) IS.ESC The terminal line was terminated with an ESC (called ALTMODE on some terminals). (The terminating character is not included in the character count in the second word. It does appear in the input buffer.)
IE.BAD	This code is returned by the RSX emulator when an error occurs on the I/O operation that did not fit into any of the error categories diagnosed. To determine the RSTS/E error, examine byte 0 of the FIRQB.
IE.DAA	An open (IO.ATT) was attempted for a device that this job has already opened. The device must be closed (IO.DET) before it can be opened again. [NOTCLS]
IE.DNR	Some hard device I/O error occurred (a read for an off-line device, a write for a physically write-locked device, and so forth). [HNGDEV]
IE.EOF	An end-of-file (EOF) mark, record, or control character (Ctrl/Z for terminals) was recognized on a read operation. [EOF]
IE.EOT	No more room is available on the device for a write operation (end of paper tape, end of magtape, not enough disk space available, and so forth). [NOROOM]
IE.PRI	Privilege violation. A job with insufficient privileges attempted to read or write to disk while the disk was in use. [PRVIOL]
IE.NLN	A close (IO.DET) was attempted for a device that was not open. [NOTOPN]
IE.RSU	Shareable resource in use. The device is not available; it is assigned to another user. [NOTAVL]

IE.VER Unrecoverable error, such as parity error, bad card column, and so forth.
[DATERR]

Macro Expansion

```
QIO$      IO.RVB, 7, , , IOSTAT, , <IOBUFR, 80.>
.BYTE     1, 12.          ;DIC=1, DPB SIZE = 12. WORDS
.WORD     IO.RVB         ;FUNCTION CODE FOR READ
.WORD     7              ;LOGICAL UNIT NUMBER 7
.BYTE     0, 0           ;EFN, PRI IGNORED IN RSTS/E
.WORD     IOSTAT         ;I/O STATUS BUFFER
.WORD     0              ;AST IGNORED IN RSTS/E
.WORD     IOBUFR        ;BUFFER ADDRESS
.WORD     80.            ;BYTE COUNT = 80.
.WORD     0              ;NO VFC NEEDED FOR READ
.WORD     0              ;THIS PARAM. IGNORED IN RSTS/E
.WORD     0              ;THIS PARAM. IGNORED IN RSTS/E
.WORD     0              ;NO BLOCK FOR THIS INVOCATION
```

The expansion for QIOW\$ is the same except that the DIC = 3.

Local Symbol Definitions

Q.IOFN I/O function code (2)
Q.IOLU Logical unit number (2)
Q.IOEF Event flag number (1)
Q.IOPR Priority (1)
Q.IOSB Address of I/O status block (2)
Q.IOAE AST address (2)
Q.IOPL Parameter list (6 words) (12)

DSW Return Codes

IS.SUC Successful completion.
IE.LUN Unassigned logical unit number (*lun*). Use ALUN\$.
IE.ILU Invalid logical unit number (*lun*). Must be in the range 0 to 14.
IE.SDP DIC or DPB size is invalid.

5.23 RDBBK\$ and RDBDF\$—Define and Fill RDBs

Two directives are available for use with resident library definition blocks (RDBs): RDBDF\$ and RDBBK\$.

The RDBDF\$ directive assigns literal values to the offsets and status bit mnemonics shown for the RDB areas for the ATRG\$ and DTRG\$ directives. You can use these mnemonics to reference offsets and bit values in an RDB you have allocated space for in your program.

The RDBBK\$ directive defines these offsets and, in addition, generates code to allocate space for the RDB and fills it with values you specify in the call.

Privileges Required

[Not applicable]

Macro Call

RDBBK\$ *size,libnam,,status,prtcd*e (for read/write access)
or

RDBBK\$ *size,libnam,,status,prtcd*e (for read-only access)

where:

size is the size of the dynamic region to create, if defining a RDB to create a dynamic region.

libnam is the name of the resident library to be attached or the dynamic region to be created.

status is the region status to be placed in the RDB. The following are defined status bits:

- RS.ATT When creating a dynamic region, setting this bit indicates that the user wants the region attached on creation. Note that RSTS/E forces this bit to be set when creating an unnamed dynamic region.
- RS.MDL When creating a dynamic region, setting this bit indicates that the region is automatically removed on the last detach. Note that RSTS/E forces this bit to be set when creating an unnamed dynamic region.
- RS.NDL When creating a dynamic region, setting this bit indicates that the region is not automatically removed on the last detach. Note that RSTS/E forces this bit to be set when creating an unnamed dynamic region.
- RS.RED Map with read-only access to library. (for ATRG\$)
- RS.WRT Map with read/write access to library. (for ATRG\$)

*prtcd*e is the protection code (in RSX format) of the dynamic region to be created.

Macro Expansion

```
RDBBK$ SIZE,DATLIB,,<RS.WRT>,167000
.WORD 0
.WORD SIZE
.RAD50 /DATLIB/
.WORD 0
.WORD 0
.WORD RS.WRT
.WORD 167000
```

(RS.WRT is assigned to a literal value of two, so bit 1 is set in the seventh word of the RDB, requesting read/write access.)

In addition, all the offsets necessary to reference the data returned in the RDB by ATRG\$ or DTRG\$ are generated. For example, you can use the mnemonic RS.UNM to test bit 14 of the word at offset R.GSTS in the RDB after execution of a DTRG\$ directive. RS.UNM is assigned to a literal value of 40000 (octal) by the RDBBK\$ directive.

5.24 SCCA\$\$ — Specify Control/C AST

The SCCA\$\$ directive (actually, a macro) lets you specify an address to which control is to be transferred if the user types a Ctrl/C while the program is executing. Only the \$\$ form is allowed, because no DPB is ever generated. The SCCA\$\$ directive is unique to the RSTS/E environment; no similar directive exists for the RSX-11M operating system.

The SCCA\$\$ expands to code that takes the address specified and stores it in location 24 (part of the first 512 bytes of memory used by the run-time system; see Chapter 4). The RSX run-time system checks this location when a Ctrl/C asynchronous exception occurs, and if it is nonzero, clears the word and transfers control to the location that was specified. If this word is zero, the RSX run-time system falls back to its own processing of Ctrl/C exceptions. Thus, SCCA\$\$ is a one-time operation; you must reset the handler as part of the exception-processing routine, if desired.

Your routine can handle the Ctrl/C in any way it sees fit. The Ctrl/C routine should be exited with the use of the SSTX\$ macro. This will return control back to the point where it left off at the time of the exception. If the task is going to use a library in supervisor mode, the SSTX\$ exit is required.

The trap service routine for SCCA\$\$ may be in either user space or supervisor space. This is determined in bit 0 of the service vector. If bit 0 is set, the service routine is in supervisor space; if bit 0 is clear, the service routine is in user space.

Privileges Required

None

Macro Call

SCCA\$\$ [*arg*]

where:

arg contains the address (usually specified in the form "#addr") to which control passes if the user enters a Ctrl/C combination at the job's terminal. Word 24 is cleared, indicating that the RSX run-time system is to handle such traps.

Macro Expansion

```
SCCA$$    #CTRAP
MOV       #CTRAP, @#24
```

If you omit the address, the expansion is:

```
SCCA$$
CLR       @#24
```

Local Symbol Definitions

None

DSW Return Codes

None. (SCCA\$\$ does not execute an EMT; control does not pass to the RSX emulator when SCCA\$\$ is executed.)

5.25 SFPA\$ — Specify Floating-Point-Processor Exception Address

The SFPA\$ directive tells the RSX emulator one of two things:

- The job wants to handle FPP exceptions itself. The RSX emulator passes control to the address specified in the directive when such an asynchronous exception occurs.

The FPP available on all PDP-11 processors that can run RSTS/E, except the PDP-11/35 and 40. The FPP executes concurrently with the PDP-11 central processor. Thus, an error in the FPP unit occurs asynchronously with the execution of the PDP-11 CPU.

- The job does not want to handle FPP exceptions. The address is omitted in the directive. In this case, if an FPP exception occurs, the RSX emulator aborts the job, and displays the error message ??Reserved instruction trap on the job's terminal (TI:).

If you specify an address in the SFPA\$ directive, control passes to the address when an FPP exception occurs. The stack has the following information:

```
SP ->  FEA
        FEC
        (DSW) at the time the exception occurred
        (PC) at the time the exception occurred
        (PS) at the time the exception occurred
        word to which SP pointed before the exception
```

Your routine can process the exception in any way it sees fit. To exit from the exception-handling routine, pop the FEA and FEC from the stack and issue an ASTX\$ directive.

Privileges Required

None

Macro Call

SFPA\$ [*add*]

where:

add is the address to which control passes when an FPP exception occurs.

Macro Expansion

```
SFPA$    FLTAST
.BYTE    111., 2           ;DIC = 111., DPB SIZE = 2 WORDS
.WORD    FLTAST           ;ADDRESS OF FLOATING POINT AST
```

Local Symbol Definitions

S.FPAE Exception handler entry address (2)

DSW Return Codes

```
IS.SUC    Successful completion.
IE.SDP    DIC or DPB size is invalid.
```

5.26 SPND\$\$ — Suspend

The SPND\$\$ directive instructs the system to suspend the execution of the issuing program. A program can only suspend itself; it cannot suspend any other program. The program is restarted when the user types anything terminated by a RETURN or other delimiter (for example, LINE FEED).

NOTE

RSTS/E implements this directive using the .READ directive to the job's terminal (channel 0). Thus, if you are using special terminal modes (binary input, echo control, and so forth), the SPND\$\$ directive clears these modes.

Because this directive requires only a 1-word DPB, Digital recommends the \$\$ form of the macro. It requires less space and runs with the same speed as the DIR\$ macro.

Privileges Required

None

Macro Call

SPND\$\$ [*err*]

where:

err is the error routine address.

Macro Expansion

```
SPND$$    ERR
MOV      (PC)+, -(SP)    ;PUSH DPB ONTO THE STACK
.BYTE    45., 1         ;SPND$$ MACRO DIC, DPB SIZE=1 WORD
EMT      377            ;TRAP TO THE EMULATOR
BCC      .+6           ;BRANCH IF DIRECTIVE SUCCESSFUL
JSR      PC, ERR       ;OTHERWISE, CALL ROUTINE "ERR"
```

Local Symbol Definitions

None

DSW Return Codes

IS.SPD	Successful completion; that is, the task was suspended.
IE.ADP	Part of the DPB is out of the issuing task's address space.
IE.SDP	DIC or DPB size is invalid.

5.27 SSTX\$ — System Synchronous Trap Exit

You can use the SSTX\$ directive to terminate a routine that handles a synchronous system trap such as BPT and Ctrl/C exceptions, only if the program has indicated its intention to handle such traps with a SVTK\$ or SVDB\$ directive. When the SSTX\$ is issued, control is returned to the point where the program left off at the time of the trap.

If the task also uses supervisor mode libraries, then the SSTX\$ is the required exit from any synchronous trap service routine. There is no equivalent directive in RSX-11/M-PLUS.

If the trap was a memory protection violation, the service routine must remove the additional memory register information from the stack before issuing the SSTX\$ directive.

Privileges Required

None

Macro Call

SSTX\$

Macro Expansion

```
      TST  2(SP)  ;Is this a user or super return?
      BPL  10$    ;Super!
      RTI                ;User
10$:  CSM  #0      ;So, return to supervision mode via Digital Standard.
```

Local Symbol Definitions

None

DSW Return Codes

None. (SSTX\$ does not execute an EMT; control does not pass to the RSX emulator when SSTX\$ is executed.)

NOTE

The SSTX\$ call, when used with supervisor mode, is supported only when the Digital-supplied Supervision Linkage modules are used.

5.28 SVDB\$ — Specify SST Vector Table for Debugging Aid

The SVDB\$ directive, like the SVTK\$ directive, defines a table of addresses to which control is to pass when certain synchronous exceptions occur. When a synchronous exception occurs, the RSX emulator first checks the table defined with SVDB\$ to see if an address has been specified for that trap. If so, control is passed to that address. If not, the emulator then checks the table defined with SVTK\$ (if any).

In other words, the SVDB\$ sets up an SST vector table whose entries, if nonzero, override (but do not destroy) any SST vector table entries defined with SVTK\$. The SVDB\$ directive is useful within a debugging routine that uses BPT instructions (for example, to set breakpoints). With SVDB\$, the debugging routine can divert breakpoint traps to itself, regardless of SVTK\$ directives in other modules of the job.

For example, the Octal Debugging Tool (ODT) object module uses the SVDB\$ directive to divert exceptions to itself, regardless of what may have been requested with SVTK\$ in other modules. This makes it possible to debug without changing your source code; you can link with ODT, use ODT to insert breakpoints, test and debug, and when finished, relink without ODT. Note that it is not necessary to change source code to debug, only to relink: the SVDB\$ directive makes this possible.

NOTE

The ODT object module (the file ODT.OBJ) can be linked to user modules with the RSTS/E Task Builder (TKB) using the /DA switch, as described in the *RSTS/E Task Builder Reference Manual*. ODT.OBJ is different from ODT.BAC, which is a BASIC-PLUS utility in RSTS/E. The commands and syntax for ODT.OBJ are described in the *RSX/IAS ODT Reference Manual*.

To avoid interfering with ODT, do not use the SVDB\$ directive in a user program.

See also Chapter 3, the section "Trap Handling with Supervisor Mode," which is the last section in the chapter.

Privileges Required

None

Macro Call

SVDB\$ [*adr*,*len*]

where:

- adr* is the address of the SST vector table. If *adr* and *len* are both omitted, any SST vector table previously defined with an SVDB\$ directive will be deassigned; that is, the emulator will not check for SVDB\$ addresses. (A previously executed SVTK\$ remains in effect.)
- len* is the length of the SST vector table, in words. You can specify up to eight addresses. If you want to use only the third, you could save space by using a *len* of three, rather than a *len* of eight and filling the last five words of the buffer with zeros. Specifying a length greater than eight has the same effect as a length of eight.

Vector Table Format

A nonzero value for a word is the address to which control passes when that particular exception occurs. A zero value for a word indicates that you have no interest in handling that exception. Should such an exception occur, the emulator checks the vector table assigned by SVTK\$, if any. If there is no SVTK\$ vector table, the emulator aborts the job and displays an error message at the job's terminal.

Octal Offset		Octal Offset
1	odd address or nonexistent memory error	0
3	memory protection violation	2
5	T-bit trap or execution of a BPT instr.	4
7	execution of an IOT instruction	6
11	execution of a reserved instruction	10
13	execution of a non-RSX, non-RSTS EMT instr.	12
15	execution of a TRAP instruction	14
17	PDP-11/40 FPP exception	16

Macro Expansion

```
SVDB$      SSTBL, 3
.BYTE     103., 3      ;DIC=103., DPB SIZE = 3 WORDS
.WORD     SSTBL       ;ADDRESS OF SST TABLE
.WORD     3           ;SST TABLE LENGTH = 3 WORDS
```

Local Symbol Definitions

```
S.VDTA    Table address (2)
S.VDTL    Table length (2)
```

DSW Return Codes

```
IS.SUC    Successful completion.
IE.SDP    DIC or DPB size is invalid.
```


5.29 SVTK\$ — Specify SST Vector Table for Task

The SVTK\$ directive, like the SVDB\$ directive, defines a table of addresses to which control passes when certain synchronous exceptions occur. When a synchronous exception occurs, the RSX emulator first checks to see if a similar table has been defined for this job with an SVDB\$ directive. If so, any nonzero entries in that table override those defined with an SVTK\$ directive.

See also Chapter 3, the section "Trap Handling with Supervisor Mode," which is the last section in in the chapter.

Privileges Required

None

Macro Call

SVTK\$ [*adr*,*len*]

where:

- adr* is the address of the SST vector table. If you omit both *adr* and *len*, any SST vector table previously defined with an SVTK\$ directive is deassigned. (A previously executed SVDB\$ remains in effect.)
- len* is the length of the SST vector table, in words. You can specify up to eight addresses. If you want to use only the first five, you could save space by using a *len* of five, rather than a *len* of eight and filling the last three words of the buffer with zeros. Specifying a length greater than eight has the same effect as a length of eight.

Vector Table Format

A nonzero value for a word is the address to which control passes when that particular trap occurs. A zero value for a word indicates that you have no interest in handling that exception.

Octal Offset		Octal Offset
1	odd address or nonexistent memory error	0
3	memory protection violation	2
5	T-bit trap or execution of a BPT instr.	4
7	execution of an IOT instruction	6
11	execution of a reserved instruction	10
13	execution of a non-RSX, non-RSTS EMT instr.	12
15	execution of a TRAP instruction	14
17	PDP-11/40 FPP exception	16

The contents of the program status register and the program counter (PS and PC) at the time of the exception have been pushed on the stack when the exception-handling routine is entered. Certain other values may have been pushed on the stack. The values depend on the exception. If the exception was a memory protect violation, the stack contains:

(SP) —> Instruction backup register (SR1)
 Virtual PC of the faulting instruction (SR2)
 Memory protect status register (SR0)
 (PC) at time of exception
 (PS) at time of exception

NOTE

The RSX emulator returns zero for SR0 and SR1; SR2 contains the PC at the time of the exception.

If the exception was a TRAP instruction or EMT other than 377, the stack contains:

(SP) —> Instruction operand (low-order byte) times 2, high-order bits cleared
 (PC) at time of exception
 (PS) at time of exception

All items except the (PS) and (PC) must be popped from the stack before the exception-handling routine exits. You can then return control to the point where execution left off with an RTI or RTT instruction.

Macro Expansion

```
SVTK$      SSTBL, 4
.BYTE      105., 3      ;DIC = 105., DPB LENGTH = 3 WORDS
.WORD      SSTBL      ;ADDRESS OF SST TABLE
.WORD      4          ;SET TABLE LENGTH = 4 WORDS
```

Local Symbol Definitions

S.VTTA Table address (2)
 S.VTTL Table length (2)

DSW Return Codes

IS.SUC Successful completion.
 IE.SDP DIC or DPB size is invalid.

5.30 TFEA\$ — Test for Task Feature

The TFEA\$ directive tests for the presence of a task specific software option, such as fast-mapping turned on by the /FM switch in the TKB when the task was built.

Macro Call

TFEA\$ *sym*

where:

sym is the symbol for the specified task feature.

The supported task feature symbols are:

Symbol	Value	Meaning
T2\$DST	15.	AST recognition disabled (IS.SET=disabled)
T4\$DSP	34.	Task was built /ID or has turned I&D on
T4\$FMP	40.	Task has fast mapping turned on

Macro Expansion

```
TFEA$      T4$FMP
.BYTE      177.,2      ;TFEA$ MACRO DIC, DPB size = 2 words
.WORD      T4$FMP      ;feature identifier
```

Local Symbol Definitions

F.TEAF Feature identifier

DSW Return Codes

IS.CLR Successful completion; feature not present (=0)
IS.SET Successful completion; feature present (=2)
IE.ADP Illegal DPB address
IE.SDP Invalid DIC or feature identifier code

NOTE

The full list of RSX-11/M-PLUS feature identifiers is not supported on RSTS/E.

5.31 UMAP\$ — Unmap an Address Window

The UMAP\$ unmaps a specified address window from a resident library. The unmapping does not eliminate the window (created with a CRAW\$ directive) or release the APRs used by the window. The virtual address window can now be remapped to new actual memory locations with the MAP\$ directive.

Privileges Required

None

Macro Call

UMAP\$ *adr*

where:

adr is the address of an 8-word area defining the window to be unmapped. The UMAP\$ directive also returns information to this area. Two supplementary directives are available to define (WDBDF\$) or define and fill (WDBBK\$) such an area, called the window definition block, or WDB.

Macro Expansion

```
UMAP$      WDBADR
.BYTE      123., 2          ;DIC=123., DPB SIZE=2 WORDS
.WORD      WDBADR
```

Data Passed in WDB

Mne- monic	Octal Offset	Octal Offset	Mne- monic
	1	0	W.NID
	3	2	
	5	4	
	7	6	
	11	10	
	13	12	
	15	14	
	17	16	

adr+W.NID is the ID of the window to be unmapped (returned at the same location in the WDB by the CRAW\$ directive).

Data Returned in WDB

Mne- monic	Octal Offset		Octal Offset	Mne- monic
	1	////////////////////////////////	0	
	3	////////////////////////////////	2	
	5	////////////////////////////////	4	
	7	////////////////////////////////	6	
	11	////////////////////////////////	10	
	13	////////////////////////////////	12	
	15	status flag	14	W.NSTS
	17	////////////////////////////////	16	

adr+W.NSTS is the status flag. Bit 14 = 1 (WS.UNM) if the window specified was successfully unmapped.

Local Symbol Definitions

U.MABA Window definition block address (2)

DSW Return Codes

IS.SUC Successful completion.

IE.ITS The window ID specified is either invalid (outside the range 1 to 7) or not currently mapped.

5.32 WDBBK\$ and WDBDF\$—Define and Fill WDBs

Two directives are available for use with Window Definition Blocks (WDBs): WDBDF\$ and WDBBK\$.

The WDBDF\$ directive assigns literal values to the offsets and status bit mnemonics shown for the WDB areas for the CRAW\$, ELAW\$, MAP\$, and UMAP\$ directives. You can use these mnemonics to reference offsets and bit values in a WDB you have allocated space for in your program.

The WDBBK\$ directive defines these offsets and, in addition, generates code to allocate space for the WDB and fills it with values you specify in the call.

Privileges Required

[Not applicable]

Macro Call

WDBBK\$ *apr,siz,rid,off,len,<bit1 ![bit2!bit3]>*

where:

apr is the base APR.

siz is the size of the window.

rid is the resident library ID.

off is the offset into the library, in 32-word blocks.

len is the length to be mapped.

bit... are the mnemonic values for bit settings, separated by exclamation points. The following mnemonics are defined for CRAW\$:

WS.64B Means allow 32 word alignment, rather than requiring 256 word alignment.

WS.MAP Indicates the window is to be mapped

WS.RED Means map with read-only access

WS.SIS Means map in supervisor mode I-Space

WS.UDS Means map in user mode D-Space

WS.WRT Means map with read/write/access

Macro Expansion

```
WDBBK$ 7,128.,0,0,0,<WS.MAP!WS.RED>
.BYTE 0,7
.WORD 0
.WORD 128.
.WORD 0
.WORD 0
.WORD 0
.WORD 0
.WORD WS.MAP!WS.RED
```

When used in a CRAW\$ directive, this WDB creates a window 4K words long (128 by 32-word blocks) in APR 7. The call also specifies an offset and map length of zero and read-only mapping. Note that to use this WDB, you have to supply the resident library ID, which you get from the RDB returned by an ATRG\$ call. To fill in the library ID, move the word at offset R.GID in the RDB to offset W.NRID in the WDB.

The WDBBK\$ directive also defines the offsets and bit settings that the ELAW\$, MAP\$, and UMAP\$ descriptions refer to.

5.33 WSIG\$ — Wait for Significant Event Flag

The WSIG\$ directive is included for compatibility with RSX-11M. In RSX-11M, some recoverable error conditions require waiting for a significant event to happen, at which time a retry of the operation that failed may succeed. On a RSTS/E system, any events that may be termed significant within the RSTS/E monitor are transparent to user jobs. Hence, the WSIG\$ directive in RSTS/E merely causes the calling job to sleep for one second. The job can then retry whatever operation failed previously.

Privileges Required

None

Macro Call

WSIG\$

Macro Expansion

```
WSIG$  
.BYTE      49.,1          ;DIC=49., DPB SIZE=1 WORD
```

Local Symbol Definitions

None

DSW Return Codes

IS.SUC	Successful completion.
IE.SDP	DIC or DPB size is invalid.

5.34 WTSE\$ — Wait for Single Event Flag

The WTSE\$ directive is included for compatibility with RSX-11M, in which some programs are written with a QIO\$ followed by a WTSE\$, to cause the program to wait until the I/O is complete. This has the same effect as a QIOW\$ directive. Since all I/O is synchronous in RSX-emulation mode, QIO\$ performs the same as QIOW\$. Thus, the WTSE\$ directive returns immediately; it performs no operation in RSTS/E.

Privileges Required

None

Macro Call

WTSE\$ *efn*

where:

efn is the event flag number. (The RSX emulator ignores this parameter.)

Macro Expansion

```
WTSE$      0
.BYTE      41.,2          ;DIC=41., DPB SIZE = 2 WORDS
.WORD      0              ;FLAG IGNORED IN RSTS/E
```

Local Symbol Definition

WTSEF Event flag number (2)

DSW Return Codes

IS.SUC Successful completion.
IE.SDP DIC or DPB size is invalid.

RT-11 Run-Time System Environment

The RT-11 run-time system emulates the single-job monitor of the RT-11 operating system on RSTS/E systems. You can use many of the programmed requests available to MACRO programmers on RT-11 systems. In addition, the RT-11 run-time system provides some directives, suited to the RSTS/E environment, that are not available for the RT-11 operating system.

The size limit for programs running under the RT-11 run-time system is 27K words, slightly less than the 28K words allowed by the RT-11 operating system. The run-time system itself takes a 4K-word high segment. It also uses 1K words in the user job image area as a scratch pad. As Chapter 2 notes, run-time systems are usually mapped read-only, so they can be shared by more than one user on a RSTS/E time-sharing system. However, the RT-11 operating system lets you access certain areas within the resident monitor. Thus, to allow a similar capability under RSTS/E, these areas must be located in the user job image area, which is mapped read/write.

If you use the RT-11 directives (see Chapter 7), you must assemble your program with the MACRO assembler and link the modules with the LINK linker. The *RSTS/E RT-11 Utilities Manual* describes how to run MACRO and LINK to assemble and link your program.

6.1 Advantage: Transportable Code

The RT-11 directives are useful if you are coding a program to be run under both the RT-11 and RSTS/E operating systems. RSTS/E emulates the majority of the RT-11 single-job programmed requests. Of those which are not, most are ignored on RSTS/E systems, including the foreground/background (FB) and extended memory (XM) calls. That is, most RT-11 directives do not cause errors on RSTS/E systems (see Chapter 7 for a list of exceptions).

Those RT-11 requests that are emulated are fitted to the RSTS/E environment. For example, under the RT-11 operating system, there are three types of read:

- **.READ**—Initiates a read operation and transfers control back to the user program; the read may or may not be complete.
- **.READW**—Initiates a read operation and transfers control back to the user program only after the read operation is completed.
- **.READC**—Initiates a read operation and transfers control to the user program; then, when the read is complete, transfers control to a user-specified completion routine.

Under RT-11 emulation, all I/O is synchronous; that is, control is returned to the user program only when the I/O is complete. So, `.READ` and `.READW` are implemented the same under RSTS/E as a "read and wait." The `.READC` transfers control to the completion routine when the read operation finishes.

The significance of the differences depends on what you want to do. If you are transporting an existing program from RT-11 to RSTS/E, you can generally be confident that the program works as it should.

If you are developing a program for RSTS/E only, you do not have to be concerned with how the directives work on RT-11. You can choose `.READ` or `.READW`: both work the same. You can also choose `.READC` if, for example, you wanted to code one completion routine to be used after different read operations.

If you are developing a program on RSTS/E to be run under RT-11, or both RSTS/E and RT-11, you need to know how the directives work under RT-11 and under RSTS/E. You can choose between `.READ`, `.READW`, and `.READC` according to what they do on both systems.

Chapters 6 and 7 describe what RT-11 directives are available, as well as what they do under RSTS/E. See the *RT-11 Programmer's Reference Manual* for a complete description of how these directives work in the RT-11 operating system environment.

You can also transport assembled (binary) programs from RT-11 systems to RSTS/E systems, if you keep in mind the limitations of the emulated RT-11 run-time system environment. You must change the run-time system name that RSTS/E maintains in the file directory entry for each runnable file. The easiest way to do this is with the `/RUNTIME_SYSTEM` qualifier in `COPY`. For example:

```
COPY MTO:*. * */RUNTIME_SYSTEM=RT-11
```

This command transfers all files on magnetic tape unit 0 to your account on the public disk structure as files to be run under the RT-11 run-time system.

For binary files that have already been transferred to your system, type:

```
SET FILE file.typ/RUNTIME_SYSTEM=RT-11
```

6.2 General Services

Besides transportable code, the RT-11 emulator provides:

- Simple input/output. The I/O operations under the RT-11 run-time system are simple to code and include file-structured input/output operations.
- Fast program development. The LINK linker executes faster than its RSX emulator counterpart TKB. However, LINK does not provide as many features.

6.3 System Macro Library

The RT-11 emulator directives that you code into your program are macros; MACRO-11 expands them into executable code at assembly time. The macro expansions for the RT-11 emulator directives are contained in the system macro library (\$SYSMAC.SML). You can name this library file in the input-file list when you assemble your program. For example:

```
MACRO OBJ, OBJ=$SYSMAC.SML/M, SRC1, SRC2
```

(MACRO-11 searches the library automatically to resolve undefined symbols, so this is not really necessary.)

However, you must use the MACRO-11 `.MCALL` directive in your code to define the directives you use as external macros needed to assemble the source program. The `.MCALL` must appear before the first directive is called. For example:

```
.MCALL .READ, .DATE, . . . .  
.  
.  
.  
.DATE
```

Alternatively, you can enable automatic macro library search using the `.ENABL MCL` macro directive. See the *PDP-11 MACRO-11 Language Reference Manual* for details.

Note that some RT-11 emulator directives have the same form as general monitor directives (`.DATE`, for example). If you want to use the RT-11 `.DATE`, specify it in an `.MCALL` directive. Then, regardless of whether you assemble with the prefix file `COMMON.MAC`, the `.DATE` is expanded from the system library as a call to the RT-11 run-time system.

If you want the general monitor `.DATE`, do not specify `.DATE` in an `.MCALL` directive. Instead, use the special prefix emulator trap (EMT) instruction (`EMT 377`) immediately before the `.DATE` call, and assemble with `COMMON.MAC`.

NOTE

You must precede all general monitor directives that you use with an `EMT 377`. RT-11 uses EMTs in the range 0 to 100, the same range used by the RSTS/E general monitor directives. To bypass the general monitor calls, the RT-11 run-time system defines a special prefix EMT for the monitor (see Chapter 2), so all EMTs except those preceded by an `EMT 377` are processed by the RT-11 run-time system.

You should not use the general monitor calls `.CHAIN`, `.EXIT`, `.CORE`, `.RTS`, `.FSS`, `.RUN`, or `.CCL` from a program running under control of the RT-11 run-time system. Results from using these directives under RT-11 emulation are unpredictable.

6.4 Directive Processing

It is easier to understand how you specify RT-11 directives and their arguments if you first understand how the directives are expanded at assembly time, and how they are processed by the RT-11 run-time system at execution time.

Generally, the expansions end with an EMT instruction passing control to the RSTS/E monitor. The monitor then passes control to the RT-11 run-time system for processing.

NOTE

The RT-11 run-time system has the PF.EMT bit set in the P.FLAG word in the pseudovector region (see Chapter 2). Thus, the RT-11 run-time system can use all possible values in the low byte of the EMT instruction, just as the RT-11 operating system does. The low-byte of the P.FLAG word is set to 377, which, in combination with the setting of the PF.EMT bit, defines the special prefix EMT 377.

The RT-11 run-time system examines the low byte of the EMT instruction to determine either the action to be performed or the place to look for information that defines the action to be performed.

For example, if the call translates to code ending in an EMT in the range 340 to 357, the RT-11 run-time system determines the action to be performed from the EMT and looks in general register R0 and/or on the stack for other arguments used in the call.

If, on the other hand, the call translates to an EMT 374 instruction, the RT-11 run-time system looks in R0 for a one-byte function code and, if necessary, a one-byte argument. For an EMT 375 instruction, the RT-11 run-time system looks in R0 for the address of an argument block. It then examines the argument block to find the function code defining the action and whatever other arguments it expects, depending on the function.

Table 6-1 summarizes the EMTs that the RT-11 run-time system processes. Unless you want to bypass the directive expansions and load R0 and other arguments yourself, Table 6-1 is important to you because:

- All the directives use general register R0. You must preserve the contents of R0, if necessary, by saving and restoring the contents before and after issuing a directive. Some directives return information to R0; otherwise, the contents of R0 are unpredictable upon completion of a call. All other general registers are preserved as you left them.
- Some of the directives require that you allocate space in your program for arguments. The expansions for such directives fill the argument block you specify in the call with the values you specify as other arguments in the call (see the next section "Call Forms").

If an error occurs when a directive is processed, control returns to the user program with the carry bit set in the PSW and an error code in byte 52 of the low 512. bytes of memory.

Table 6–1: EMT Instructions Recognized by the RT-11 Run-Time System

EMT Low-Byte	Meaning		
EMT 377	Reserved; this is the special prefix EMT. You must code this EMT immediately before any of the general monitor calls in Chapter 3.		
EMT 376	Used internally by the RT-11 run-time system. Never execute this EMT from a user program; the program aborts with an error. The error message displayed is: ?M -OVLY error at user PC nnnnnn."		
EMT 375	Indicates a call that has several arguments: R0 contains the address of the first byte of an argument block. (R0) = <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">address of argument block</td></tr></table>	address of argument block	
address of argument block			
EMT 374	Indicates a call with one argument. R0 contains a function code in the high-order byte and the argument in the low-order byte. (R0) = <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">function code</td><td style="text-align: center;">argument</td></tr></table>	function code	argument
function code	argument		
EMTs 372-373	Ignored by the RT-11 run-time system. Do not use these EMTs; they are reserved for future use by Digital.		
EMTs 360-371	EMTs specific to the RT-11 run-time system under RSTS/E; not available under the RT-11 operating system.		
EMTs 340-357	Indicates a directive that expects arguments either on the stack, in R0, or both.		
EMTs 0-337	Indicates a directive used by Version 1.0 of the RT-11 operating system. These EMTs are also recognized by the RT-11 run-time system.		

6.5 Call Forms

Chapter 7 shows RT-11 directive calls in two basic formats: those with an area argument and those without. The area argument indicates that the call uses an argument block. You must allocate space for the argument block.

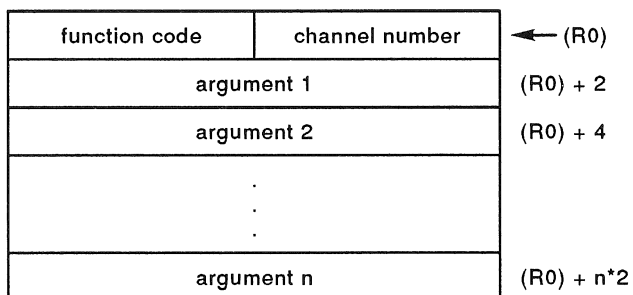
6.5.1 Format for Calls Using Argument Blocks

The previous section describes how directives with an area argument use an argument block. Chapter 7 shows the format for these directives as:

.RTCALL area, arg1, arg2, ..., argn

The area argument is the address of the first byte of the area you have set aside for the argument block. The remaining arguments (arg1, arg2, and so forth) are the values needed for the call. The RT-11 emulator places them in the argument block at execution time.

In general, the argument block format is:



R0 points to location x. The high byte (location x+1) contains the function code defining the action to be performed. The low byte defines a channel number, if one is needed for the call. Remaining arguments, if any, are stored in subsequent words.

Consider the hypothetical directive `.HYPOT`, using four arguments including the area argument:

`.HYPOT area, arg1, arg2, arg3`

If you were to specify all four arguments in the call, at assembly time `MACRO-11` expands the call to a code that:

- Moves the area argument (an address) to R0.
- Moves the function code for `.HYPOT` to the address specified by $(R0)+1$, and, if a channel number is used, moves that channel number to $(R0)$. (The notation (x) means the contents of x — thus the channel number is moved to the address specified by the contents of R0.)
- Moves remaining arguments to subsequent words in the argument block.
- Executes an `EMT 375`.

Thus, all of the arguments for this form should be appropriate as operands in `MOV` instructions. For example:

```
AREA:   .WORD  0,0,0
        .
        .
        .HYPOT #AREA,#4,NUMNUM,#300
```

Under certain conditions, you can leave out arguments in directives using an argument block. If you leave out area, for example, you must load R0 with the address of the argument block yourself, before executing the directive. For example:

```
MOV     #AREA,R0
.HYPOT  ,#4,NUMNUM,#300
```

If you leave out any of the other arguments, the expansion does not load any new values into those positions in the argument block; those words are left untouched. For example:

```
AREA:      .WORD  0,0,0
           .
           .
           .HYPOT #AREA,,NUMNUM,#300
```

The execution of `.HYPOT` uses the value 0, the contents of location `NUMNUM`, and 300 as arguments. Suppose that the following directive is executed next:

```
.HYPOT #AREA,#3,,#200
```

When the directive is executed, the argument block contains the value 3, the contents of location `NUMNUM`, and 200.

6.5.2 Format for Calls Not Using Argument Blocks

For those calls that do not use an argument block, Chapter 7 shows the format as:

```
.RTCALL arg1, arg2, ..., argn
```

These directives expand to code that stores the arguments, if any, in `R0` and/or the stack. (The RT-11 emulator removes any values pushed on the stack before control returns to the user program.)

Again, the arguments should be appropriate as operands in `MOV` instructions. You can omit certain arguments for this form; Chapter 7 indicates these possible omissions with brackets when it describes the directive calls. For example, if the macro call format was as follows, you could leave out the last argument:

```
.HYPOT arg1, arg2[, arg3]
```

6.6 Channel Number and Device Block Arguments

Many RT-11 directives use arguments that define a channel number and device block. A device block is a 4-word area containing the device and file specification. The following general comments apply to these arguments.

6.6.1 Channel Number Arguments

Like the general monitor calls, RT-11 directives which handle I/O use a channel number to refer to a device. Allowable RT-11 channel numbers range from 0 to 15. When you open a file or device using the RT-11 directives `.LOOKUP` or `.ENTER`, you give a channel number in this range. The RT-11 emulator relates the number specified in the call to the first free RSTS/E channel number, with the following considerations:

- The job's terminal (RSTS/E channel 0) is never free for the emulator to relate to an RT-11 channel number. In RT-11, you do I/O to the job's terminal with specific directives, such as `.PRINT` and `.GTLINE`. Thus, since RSTS/E channel numbers range from 0 to 15 but RSTS/E channel 0 is always busy as far as the RT-11 run-time system is concerned, you can open up to 15 channels using any 15 of the 16 possible RT-11 channel numbers (ranging from 0 to 15).

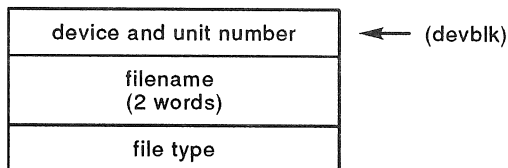
- The RT-11 emulator always attempts to allocate RT-11 channel number 15 to RSTS/E channel 15. Channel 15 is the channel on which the monitor opens the user job image file when RSTS/E executes a .RUN directive (see Chapter 3). The run-time system loads the file and begins its execution. If the program is overlaid, the run-time system keeps channel 15 open. If not, the run-time loads the file and then closes channel 15.

Thus, if your program is not overlaid and you open RT-11 channel 15, the call succeeds (unless you already have channel 15 open). If your program is overlaid, you cannot open channel 15; any attempt to do so results in an error indicating the channel is in use.

Other than channel 15, there is no correspondence between the RT-11 channel number and the RSTS/E channel number. They may or may not be the same.

6.6.2 Device Block Arguments

Several RT-11 directives use a device and file specification. The argument in these cases is an address pointing to the first word of a 4-word device block that you allocate in your program. The format of the device block is 12 RAD50 characters:



You can use any valid RSTS/E device and unit number (0-7) for the first word of the device block. You can also define user logical names up to three characters long. If you need device numbers that have more than one digit (for example, KB27 or TT12), you must use the following steps to form the algorithm:

1. Form the RAD50 representation of unit zero of the device you want. For example:
`BASEKB=^RKBO`
2. Add the decimal value of the unit number wanted. For example, to get the proper representation of KB36:
`KBN36=BASEKB+36.`
3. Use this value as the first word of the device block. For keyboards, there is no file name and type, so you can construct the device block as:

```
DEVBLK:  .WORD  KBN36
         .WORD  0,0,0
```

NOTE

If you assign a logical name with the same RAD50 bit pattern as some device/unit-number that you construct, the logical name takes precedence. The previous example, for instance, forms the RAD50 bit pattern equal to the ASCII characters KCZ. Thus, if you assign the logical name KCZ to the line printer, any call referring to DEVBLK in the previous example would use the line printer not KB36.

6.7 Low 512. Bytes for RT-11 Run-Time System

Table 6–2 summarizes the locations in the low 512. bytes of virtual address space that the RT-11 run-time system uses.

Table 6–2: Locations in First 512. Bytes That RT-11 Uses

Locations	Contents
30,31	Contains the contents of FIRQB+FQNT at the time the .RUN was executed. (See the .RUN description in Chapter 3, and P.RUN description in Chapter 2.)
32,33	Contains the contents of XRB+0 when the run-time system was entered at P.RUN (see Chapter 2).
40,41	Contains the starting address of the job.
42,43	Contains the initial value of the stack pointer. If this value is not set by the user program in an .ASECT or through a LINK option, the LINK linker defaults this word to 1000.
44,45	Contains the Job Status Word (JSW). RSTS/E uses JSW as a flag word for the run-time system. Certain bits are maintained by the RT-11 run-time system exclusively, while others can be set or cleared by the user program. The bits you can set are marked with an asterisk in the following list. Do not use currently unassigned bits for your own purposes; future RT-11 run-time system releases may use them. Bit Meaning
	*15 Core common bit. If set with .ASECT, preserves core common when the user program is executed.
	*14 Lowercase bit. When set, disables automatic conversion of lowercase to uppercase.
	*13 Reenter bit. When set, indicates that you can restart the program from the terminal with the REENTER command.
	*12 Special mode TT bit. When set, indicates that the job is in a special keyboard input mode. See .TTYIN/.TTINR directive descriptions, Chapter 7.
	9 Overlay bit. When set, indicates that the job uses the LINK overlay structure.
	8 CHAIN bit. If set, virtual addresses 500-776 are loaded from the memory image file when the job is started. (These words are normally used to pass parameters between programs.) the RT-11 run-time system sets the bit if you entered the job with the RT-11 .CHAIN directive.
	*6 Inhibit TT wait bit. When set, indicates that the job can accept input from the job's terminal in ODT mode with .TTYIN/.TTINR; that is, one character at a time, as you type the characters rather than one character at a time after you type a whole line.
46,47	Points to the first word of the RT-11 read/write scratch pad area in the user job image area.

(continued on next page)

Table 6–2 (Cont.): Locations in First 512. Bytes That RT11 Uses

Locations	Contents
50,51	Contains the high memory address. The run-time system maintains the highest virtual address the user program can use in this word. It is initially set to the address of the last word of the user program. You can change it with the .SETTOP directive (see Chapter 7) to any address up to the start of the scratch pad area. That is, the maximum value this word can be is the contents of the word at location 46,47 minus 2.
52	Contains the EMT error code. If the directive results in an error, the code number of the error is always returned in byte 52 and the carry bit is set. Always refer to location 52 as a byte, not a word.
54,55	Contains the beginning address of the scratch pad area.

6.8 Scratch Pad Area in User Job Image

The RT-11 run-time system uses part of the user job image space as a scratch pad. Some of the information in this scratch pad is the same as the information in the RT-11 operating system, as the *RT-11 Programmer's Reference Manual* describes. Other information is unique to RSTS/E. For example, you can set a word in this area with a PPN to be used when opening a file. RT-11 does not allow a PPN in its file specification; RSTS/E does.

In any case, the RT-11 emulator adds the scratch pad area to the end (high virtual addresses) of the user job image at execution time. If you do not use RT-11 SIZE command (see the *RSTS/E System User's Guide*), the emulator determines the highest address of the program from the .SAV file, an item which the LINK linker calculates, and rounds the address up to the next multiple of 1024 (1K words) to determine the starting address of the scratch pad. If you use the RT-11 SIZE command, the emulator places the scratch pad in the top 1K words of the address space that SIZE requests.

Thus, the maximum size of MACRO programs running under the RT-11 run-time system is 27K words. Any program larger than this causes the ??Maximum memory exceeded error message when the file is run.

You can determine the start of the scratch pad area from word 54 in the low 512. bytes of memory.

Table 6–3 lists the offsets to locations in the scratch pad area that may be of use to you.

Table 6–3: Offsets to Important Scratch Pad Area Locations

Octal Offset	Mnemonic Offset	Contents
0	PPN	<p>If nonzero, used as a PPN for all of the calls named in this section except .READ and .WRITE. (Note that for .SETFQB, this value is loaded into FIRQB+FQPPN and overrides any PPN resulting from examination of the string by the corresponding .CSISPC directive.)</p> <p>For .READ and .WRITE, this word forms the modifier word (at XRB+XRMOD) in the corresponding RSTS/E .READ or .WRITE directive.</p>
2	PROTEC	<p>If nonzero, this word is the protection code to be used for all of the calls named in this section except .READ and .WRITE. (Note that for .SETFQB, this value is loaded into FIRQB+FQPROT and overrides any protection code resulting from examination of the string by the corresponding .CSISPC directive.)</p> <p>For .READ and .WRITE, this word forms the most significant bits of the block number in the corresponding RSTS/E .READ or .WRITE (at XRB+XRBLKM). This value supplements the block number argument from the RT-11 .READ or .WRITE call.</p>
4	MODE	<p>For RT-11 calls .LOOKUP, .ENTER, and .REOPEN, this word forms the mode word at FIRQB+FQMODE in the corresponding RSTS/E CALFIP call. For .SETFQB, this word is loaded into FIRQB+FQMODE and overrides any /MODE qualifier that the .CSISPC directive finds.</p>
6	CLUSTR	<p>For RT-11 directives that create files, such as .ENTER, this word forms the cluster size (at FIRQB+FQCLUS) for the corresponding RSTS/E CALFIP call. For .SETFQB, this word is loaded into FIRQB+FQCLUS, and overrides any /CLUSTERSIZE qualifier that the .CSISPC directive finds.</p>
10	POSITN	<p>For RT-11 directives that create files, such as .ENTER, this word forms the device cluster number for file placement (at FIRQB+FQNENT) in the corresponding RSTS/E CALFIP call. For .SETFQB, this word is loaded into FIRQB+FQNENT and overrides any /POSITION qualifier that the .CSISPC directive finds.</p>
12	CRMSBS	<p>For RT-11 calls that preallocate space for a file on its creation (.ENTER), this word forms the most significant bits (MSBs) of the file size (at FIRQB+FQSIZM) in the corresponding CALFIP call. For .SETFQB, this byte is loaded into FIRQB+FQSIZM.</p>

(continued on next page)

Table 6-3 (Cont.): Offsets to Important Scratch Pad Area Locations

Octal Offset	Mnemonic Offset	Contents
66	NOCTL	<p>This word is used by the RT-11 run-time system to stop user-entered Ctrl/Cs from interrupting program execution during certain crucial sequences (.SRESET, .HRESET, .LOOKUP, .ENTER, .REOPEN, .CLOSE, and .SAVESTATUS).</p> <p>When set to 177777, user-entered Ctrl/Cs interrupt execution. A zero or positive value inhibits Ctrl/C interrupts. While this word is zero or positive, any user-entered Ctrl/C increments the contents of this word by one.</p> <p>When the emulator reenables Ctrl/Cs, it processes any pending Ctrl/C by either:</p> <ul style="list-style-type: none"> • Passing control to a user routine specified with .SETCC (Chapter 7) • If no .SETCC is in effect, passing control to the job keyboard monitor. If the job keyboard monitor is RT-11, the keyboard monitor commands CONTINUE or CCONTINUE resume execution of the program at the point where the interrupt occurred. Your program can clear this word to inhibit Ctrl/Cs, process them later in whatever manner you see fit, and reenables Ctrl/C interrupts by setting this word to 177777. However, note that the RT-11 emulator clears the word and then reenables interrupts when .SRESET, .HRESET, .LOOKUP, .ENTER, .REOPEN, .CLOSE, or .SAVESTATUS is executed.
276		Emulator version number. The same as the RT-11 operating system version number that the current RT-11 run-time system emulates.
277		Emulator release number. The same as the RT-11 operating system release number that the current RT-11 run-time system emulates.
300		<p>Configuration word. Set for RSTS/E environment, as follows:</p> <p style="padding-left: 40px;">If FP11 floating-point hardware exists, bit 6 is set to one. Bit 9 is always set to one, and all other bits are set to zero. (If your program tests these bits on an RT-11 system, the code also works on RSTS/E.)</p>
370		Extension configuration word. Under RSTS/E, bits 0-3 are always zero, bit 8 is always one (indicating the EIS option is present), and bits 9, 14, and 15 are always zero. (The conditions they indicate on RT-11 systems are not determinable by the RT-11 run-time system under RSTS/E.)
372		SYSGEN options word. This word is always zero on RSTS/E systems.
374		User job image size. This word is always zero on RSTS/E systems.

The first six words in the scratch pad are of special significance; the following general comments apply:

- The directives `.LOOKUP`, `.ENTER`, `.RENAME`, `.REOPEN`, `.DELETE`, and `.SETFQB` examine the first six words, use any values there as described, and clear the first six words before returning control to the user program.
- The directives `.READ` and `.WRITE` examine, use, and clear only the first two words.
- The `.CSIGEN` directive clears the first six words before performing any of the `.LOOKUP` and `.ENTER` calls resulting from its examination of the command string.

RT-11 Emulator Directives

RSTS/E does not emulate some of the RT-11 operating system's single-job monitor calls. RSTS/E ignores the following: .CMKT, .HERR, .LOCK, .QSET, .MRKT, .RELEASE, .SERR, and .UNLOCK. The .CDFN call always returns an error 0 on RSTS/E systems. The following single-job monitor calls are not expanded to include EMTs, and their results on RSTS/E systems are unpredictable: .INTEN, .MFPS, .MTPS, and .SYNCH.

The RT-11 foreground/background (FB) and extended monitor (XM) calls are not supported; they are essentially ignored on RSTS/E systems. They do not return errors.

Table 7-1 lists the directives that are not processed by the RT-11 run-time system on RSTS/E systems.

Table 7-1: RT-11 Calls Not Functional on RSTS/E

Ignored	Return Error 0	Unpredictable
.CMKT	.CDFN	.INTEN
.HERR		.MFPS
.LOCK		.MTPS
.QSET		.SYNCH
.MRKT		
.RELEASE		
.SERR		
.UNLOCK		
All FB calls		
All XM calls		

Table 7-2 lists the directives that are processed by the RT-11 run-time system on RSTS/E systems.

Table 7-2: RT-11 Run-Time System Directives

Mnemonic	EMT	Function Code	Description
..V1.. ..V2..			Lets you assemble directives as they would be expanded under Version 1 or Version 2 of RT-11.
Input/Output and File Operations			
.WRITE .WRITW .WRITC	375	11	Transfers data from a memory buffer to a file or device on an open channel. As with the .READ/W/C directives, .WRITE and .WRITEW operate identically on RSTS/E; .WRITC transfers control to a completion routine after the transfer is complete.
.READ .READW .READC	375	10	Transfers data from a file or device on an open channel to a memory buffer. I/O is synchronous under RT-11 emulation on RSTS/E systems, so for all three reads, control returns to the user program only when the transfer is complete. .READ and .READW are identical on RSTS/E systems. .READC transfers control to a user-specified completion routine when the transfer is complete.
.REOPEN	375	6	Opens a file closed with .SAVESTATUS. Using the .SAVESTATUS/.REOPEN combination is easier than using standard opens and closes; the device, file name and type, and project-programmer number are saved automatically with .SAVESTATUS. You only need to keep track of the address in which you stored the file information to reopen it.
.SAVESTATUS	375	5	Closes a file, keeping the information needed to .REOPEN the file later.
.RENAME	375	4	Changes a file's name on disk or DECTape.
.ENTER	375	2	Creates a file and opens it on a channel.
.LOOKUP	375	1	Opens an already existing file on a channel. .LOOKUP can also be used for non-file-structured I/O operations.
.DELETE	375	0	Deletes a disk or DECTape file.
.CLOSE	374	6	Terminates I/O operations on a channel, performing clean-up operations (positioning tape, and so forth) and releasing the channel for other use.
.PURGE	374	3	Releases a channel without performing the normal clean-up operations. In particular, a file opened with .ENTER and not yet closed is not made a permanent file.
.HRESET	357	-	Closes all open channels, without performing normal clean-up operations. In particular, files opened with .ENTER and not yet closed are not made permanent.

(continued on next page)

Table 7-2 (Cont.): RT-11 Run-Time System Directives

Mnemonic	EMT	Function Code	Description
Input/Output and File Operations			
.SRESET	352	—	Functions the same as .HRESET on RSTS/E.
.PRINT	351	—	Displays an ASCII string on the job's terminal.
.GTLIN	345	—	Accepts a line of input from the job's terminal.
.TTYOUT .TTOUTR	341	—	Transfers one character from R0 to the job's terminal.
.TTYIN .TTINR	340	—	Transfers one character from the job's terminal to R0.
Special Functions Related to I/O			
.SPFUN	375	32	Performs special functions for disk, terminal, magnetic tape, and flexible diskette.
.SCCA	374	35	Causes a Ctrl/Z entered by the user to be passed on to the user program.
.WAIT	374	0	Checks to see if channel is open.
.CLRARB (RSTS/E only)	371	—	Clears the ARB (see Chapter 2).
.CLRFQB (RSTS/E only)	370	—	Clears the FIRQB (see Chapter 2).
.DOFSS (RSTS/E only)	365	—	Analyzes an ASCII string in memory for a RSTS/E file name and returns information as for .FSS (general monitor directive). Use instead of .FSS for programs running under RT-11 run-time system.
.ERRPRT (RSTS/E only)	364	—	Prints text corresponding to RSTS/E error code on the job's terminal.
.SETCC (RSTS/E only)	362	—	Defines an entry point for Ctrl/C traps; allows the user program to handle its own Ctrl/Cs.
.SETFQB (RSTS/E only)	360	—	Sets the FIRQB (see Chapter 2) from information returned by the .CSISPC directive.
.RCTRL0	355	—	Restarts programmed output to job's terminal that was stopped by user-entered Ctrl/C or Ctrl/O.
.CSISPC	345	—	Analyzes an ASCII string (in memory or from the job's terminal) for a standard RT-11 command, and sets up device blocks for later opens.
.CSIGEN	344	—	Analyzes an ASCII string (in memory or from the job's terminal) for a standard RT-11 command, and opens files accordingly.
.FETCH	343	—	Checks to see if device is available on the system.

(continued on next page)

Table 7-2 (Cont.): RT-11 Run-Time System Directives

Mnemonic	EMT	Function Code	Description
Special Functions Related to I/O			
.DSTATUS	342	–	Returns information about a device to an area in the user program.
System/Job Information			
.GVAL	375	34	Returns the contents of a word in the scratch pad area.
.GTIM	375	21	Returns the time of day.
.GTJB	375	20	Returns the current job number.
.DATE	374	12	Returns the current date.
.DATTIM (RSTS/E only)	361	–	Converts date or time from RSTS/E internal format to ASCII string.
.SETTOP	354	–	Sets location 40 (indicating top of user job image area) to the address specified.
Execution Control			
.SFPA	375	30	Sets address to be entered for floating point errors.
.TWAIT	375	4	Timed wait. Suspends job execution for specified number of clock ticks.
.TRPSET	375	3	Sets address to be entered for reserved instruction and odd address errors; normally trapped to kernel mode addresses 4 and 10.
.CHAIN	374	10	Transfers control to another program (file) to be run under the RT-11 run-time system.
.DOCCL (RSTS/E only)	367	–	Examines a string for valid RSTS/E CCL command. If valid, transfers control to new program. Use instead of .CCL (general monitor directive) for programs running under RT-11 run-time system.
.GETCOR (RSTS/E only)	366	–	Expands size of user job image. Use when .CHAIN is used to transfer control to a program larger than the current program. In addition, use instead of .CORE (general monitor directive) for programs running under RT-11 run-time system.
.DORUN (RSTS/E only)	363	–	Transfers control to another program (file) that runs under a non-RT-11 run-time system. Use instead of .RUN (general monitor directive) for programs running under RT-11 run-time system.

(continued on next page)

Table 7-2 (Cont.): RT-11 Run-Time System Directives

Mnemonic	EMT	Function Code	Description
Execution Control			
.EXIT	350	-	Terminates execution of the calling job. Note that you should not use the RSTS/E .RTS or .EXIT directives from a program running under the RT-11 run-time system.

The remaining sections of this chapter describe the directives in detail, in alphabetical order. Note that for all calls, you need only specify the first six characters. For example, the abbreviation .SAVES works as well as .SAVESTATUS.

All the examples in this chapter show Version 2 expansions. Note that Version 1 expansions require different arguments in the calls. See RT-11 system documentation if you need to use Version 1 expansions.

7.1 .CHAIN — Pass Control to Another Program Under RT-11

The .CHAIN directive transfers control to another program without altering the run-time system. The .CHAIN leaves I/O channels from the old program still open for the new program. Thus, you can get around the 27K word limit for programs to be run under the RT-11 run-time system. If the program you are chaining to takes more space than the current program, use the .GETCOR directive to expand the space allocated for the user job image area before executing the .CHAIN.

Virtual addresses 500-507 are expected to contain the device and file name of the program to chain to, in the RT-11 device block format (see Chapter 6). The area from locations 510-777 can be used to pass information between the chained programs. Make sure, though, that the program you are chaining to does not inadvertently destroy the data in locations 510-777 by pushing data on the stack. Note that the linker defaults the initial stack setting to 1000.

An executing program can tell whether it was chained to or run by some other means by examining bit 8 of the Job Status Word (JSW) (see Chapter 6). If bit 8 = 1, the program was invoked with .CHAIN, and locations 500-777 are preserved from the program that issued the .CHAIN. If bit 8 = 0, the program was not entered with an RT-11 .CHAIN.

The .CHAIN directive works only for RT-11-to-RT-11 transfers. If you want to chain to a program to be run under some run-time system other than RT-11, use the .DORUN directive (see Chapter 6). (The description of .DORUN also describes what happens for RT-11 programs receiving control from non-RT-11 programs.)

Privileges Required

Read or execute access to the file.

Macro Call

.CHAIN

Request Format

R0 =

10	0
----	---

Errors

Since .CHAIN is intended to pass control to another program, no errors are returned to the calling program. If the new program cannot be chained to, the .CHAIN is abandoned, and the keyboard monitor is entered. (Control passes to the P.NEW entry point of the RT-11 run-time system, which is the keyboard monitor's entry point for RT-11.)

Example

The following code requests an expansion to 20K words and chains to a sample file named MYFILE.SAV in the user's account:

```
FILE:      .RAD50      /MYFILES/AV/      ;Define text passed in chain
           .
           .
           .
           MOV         #20.,R0            ;Indicate 20.K now needed
           .GETCOR
           CLR         500                ;Default for the device
           MOV         #FILE,502         ;Move
           MOV         #FILE+2,504       ; the
           MOV         #FILE+4,506       ; file name
           .CHAIN                                ;Invoke the new program
```

7.2 .CLOSE — Close a Channel

Use the .CLOSE directive to terminate I/O on a particular channel. The .CLOSE directive:

- Performs whatever action is appropriate to the device (such as updating a disk directory to indicate a new file, repositioning a magnetic tape, and so forth)
- Frees the RT-11 channel number for use with another device
- Frees the RSTS/E channel from its association with the RT-11 channel number (effectively making another channel available).

A .CLOSE on a file opened with .ENTER makes the file permanent; the file is tentative until that time. Note that, unlike the RT-11 operating system, RSTS/E does not deallocate unused space. Thus, if you preallocated space when you opened the file with .ENTER, the file contains all this space after the .CLOSE.

Privileges Required

None

Macro Call

.CLOSE *chanum*

where:

chanum is a channel number in the range 0 to 17 (octal). See Chapter 6 for rules on channel numbers.

R0 Format

(R0) =

6	chanum
---	--------

Errors

No errors are possible with the .CLOSE directive. RSTS/E ignores a .CLOSE for a channel that is not currently open.

Example

The following statement closes channel 5:

```
.CLOSE #5
```

7.3 .CLRFQB — Clear the FIRQB

This directive clears the FIRQB area in the low 512. bytes of virtual memory (see Chapter 2). No data is passed or returned for this directive.

Privileges Required

None

Macro Call

`.CLRFQB`

Note that `.CLRFQB`, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use `.MACRO` to define it. See the following example.

Errors

No errors are possible with the `.CLRFQB` directive.

Example

The following example clears the FIRQB area in the low 512. bytes of virtual memory:

```
.CLRFQB = EMT+370
      .
      .
      .
      .CLRFQB
```

7.4 .CLRXR B — Clear the XRB

This directive clears the XRB area in the low 512. bytes of virtual memory (see Chapter 2). No data is passed or returned with .CLRXR B.

Privileges Required

None

Macro Call

.CLRXR B

Note that .CLRXR B, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

No errors are possible with the .CLRXR B directive.

Example

The following example clears the XRB area in the low 512. bytes of virtual memory:

```
.CLRXR B = EMT+371
      .
      .
      .
      .CLRXR B
```

7.5 .CSIGEN — Examine String for RT Command, Open Files

The .CSIGEN directive examines a string (either in memory or from the job's keyboard) to process a standard RT-11 command string. If the string is to be accepted from the job's keyboard, the .CSIGEN first prints an asterisk (*) prompt on the keyboard and then waits for you to type a line.

If the string is in the correct form, any files or devices open on RT-11 channels 0 - 10 (octal) are closed and then either reopened or left inactive, depending on whether or not a file is given for that slot. For example:

```
          objfile,listfile,crefile=srcfile1,srcfile2,...srcfile6
channel  0          1          2          3          4          10
```

Any valid RSTS/E file specification can appear in the string, including file specifications with PPNs, and logical names. However, the file specifications cannot contain wildcards. Files on the left side of the equal sign are opened with .ENTER, and the files on the right side of the equal sign are opened with .LOOKUP. If the equal sign is missing, RSTS/E assumes an equal sign at the beginning of the string. For example, consider the string:

```
NOW.OBJ,NOW.LST,NOW.CRF=THEN.MAC
```

The file NOW.OBJ would be opened with .ENTER on channel 0; NOW.LST, on channel 1; NOW.CRF, on channel 2. The file THEN.MAC would be opened with .LOOKUP on channel 3. Two more examples are:

```
NOW.OBJ,,NOW.CRF=
```

The file NOW.OBJ would be opened with .ENTER on channel 0 and NOW.CRF on channel 2. Channels 1 and 3-10 would be inactive.

```
LP:
```

The line printer would be opened with .LOOKUP on channel 3.

RSTS/E Options

The file specifications can include any of the standard RSTS/E qualifiers processed by the monitor itself (see the .FSS directive, Chapter 3). These include: /CLUSTER SIZE, /ONLY, /MODE, /PROTECTION, /FILESIZE or /SIZE, and /POSITION. The RT-11 Emulator can handle any of these optional qualifiers that .CSIGEN finds in the command string.

RT-11 Options

The .CSIGEN directive under RSTS/E also does RT-11-type analysis of options. One or more options can appear after any of the file specifications. The general form of an option is:

```
/a:val1:val2:...:valn
```

The slash (/) indicates an option; it must be followed by a one-character option code. (The character does not have to be printable.) The slash-character pair can be followed by one or more values. A colon (:) indicates that a value follows. If given, the colon must be followed by:

- An octal number in the range 0 to 177777.

- A decimal integer in the range -32768. to 32767. (the terminating period must appear).
- From one to three alphanumeric characters, with the first character alphabetic.

The .CSIGEN directive examines any options in the string to ensure that they are in the correct form, reformats them, and pushes them on the stack for the user program to examine. The information pushed on the stack is ordered by channel; if an option is given for the file specification for channel 0 (assuming there is a file specification in the first slot), it is pushed on the stack first, followed by option information for the file specification for channel 1 (if any), and so forth. The last word pushed on the stack is an integer value indicating the total number of options in the string. An option having two values is formatted as two options. The format is:

number of options in string	
value-flag/channel	option code (ASCII)
value (integer or RAD50) or next option	
.	
.	
.	

Bit 15 of a value-flag/channel byte is set to one if the option had an associated value, to zero if it did not. Thus, if bit 15 is set, the next word is the value associated with the option. (The option code itself is in the low byte of this word.) If bit 15 is zero, the next word is the next option (if any). Bits 8 to 14 of a value-flag/channel byte indicate the RT-11 channel number with which the file specification having the option is associated.

Privileges Required

Read or write access to the files specified. DEVICE privilege is required to access a restricted device.

Macro Call

`.CSIGEN devspc,defext,[cstrng][,linbuf]`

where:

- devspc* is ignored on RSTS/E systems.
- defext* is the address of a four-word area containing default file types, in RAD50 format. The format of the area is:

default for files open on channels 3-10
default for file open on channel 0
default for file open on channel 1
default for file open on channel 2

These values are then used when no corresponding file type is given in the examined string. For example, in the MACRO assembler, the first word would contain MAC in RAD50 format; the second, OBJ; the third, LST; and the fourth, CRF.

cstrng is the address of the ASCIZ string to be examined or a #0 if input is to come from the job's terminal. If this argument is not specified, input is automatically taken from the job's terminal.

linbuf is the address where the original string (if accepted from the job's terminal) is to be stored. This area should be 81. bytes long. The string will be terminated with a zero byte, instead of a carriage-return/line-feed combination.

If this argument is omitted, the original string is not kept.

Errors

If an error occurs when input is accepted from the job's terminal, the user gets another try. An error message is printed on the terminal, along with another * prompt, and the directive waits for you to type another line.

If the string being examined is in memory and an error occurs, the carry bit is set, and one of the following error codes is returned in byte 52. The options and option-count are removed from the stack.

Code	Meaning
0	Illegal command (bad separators, illegal file name, command too long, and so forth).
1	A device specification was not recognizable or the device is not available on the system.
2	Unused.
3	An attempt to open a file with .ENTER failed because of a full directory.
4	An input file (to the right of the equal sign) was not found in a .LOOKUP.

Example

The following example includes option switches and shows more clearly how options and values are pushed on the stack:

```
DEFEXT:  .RAD50    /MACOP1OP2OP3/
          .
          .
          .
          .CSIGEN  #0, #DEFEXT, #0
```

Assume that the line typed at the job's terminal is:

```
OUTFIL/M:32.,,ODDFIL=[2,200]HISFIL,DT0:HERFIL/G:NRD:20
```

When control returns to the user program following the .CSIGEN, the file OUTFIL.OP1 on the public structure has been opened with the .ENTER directive on channel 0, and the file ODDFIL.OP3 on channel 3. The file HISFIL.MAC on the public structure, under account [2,200], has been opened with the .LOOKUP directive. (If the calling job did not have the necessary privilege, an error message would have been displayed on the terminal, and another line accepted.) The file HERFIL.MAC on DECTape unit 0 has also been opened with .LOOKUP.

The stack contains:

	Word	Octal Value	Explanation
(SP) →	1	000003	Three options were found in the string. (The G option has two values.)
	2	102107	Last option has a value, and the option is associated with channel 4. The option code is G.
	3	000020	The value of the option is 20 (octal).
	4	102107	Next-to-last option has a value, and the option is associated with channel 4. The option code is G.
	5	055124	Value of option is NRD in RAD50 format.
	6	100115	The first option has a value, and the option is associated with channel 0. The option code is M.
	7	000040	The value of the option is 40 (octal).

7.6 .CSISPC — Examine String for RT Command, Create Devblk

Like .CSIGEN, the .CSISPC directive parses a string (either in memory or from the job's terminal) to see if it is a valid RT-11-type command string. If the string is to be accepted from the job's terminal, .CSISPC first displays an * prompt on the screen and then waits for you to type a line. Instead of closing and opening files, however, .CSISPC simply returns a 39-word block of information about the files named in the string. The user program can later use this information to open the files. See the previous discussion of .CSIGEN for command string format and option processing.

Note that .CSISPC, like .CSIGEN, stores RSTS/E-specific file information (PPN, and so on) within the scratch pad area. Furthermore, you can issue a .SAVSTATUS or .SETFQB referencing the device-block information returned by .CSISPC (although .SAVSTATUS works only for input files to the right of the equal sign when opened with .LOOKUP).

If you use .CSISPC in this way, be sure that you reference addresses in the *outspec* area returned by .CSISPC. If you move the information in the *outspec* area and then refer to the new area in .SAVSTATUS or .SETFQB, the RSTS/E-specific information, such as PPN, is not used. (The emulator keeps a pointer in the impure area relating the PPN and other RSTS/E-specific information to the area returned by .CSISPC.)

Privileges Required

None

Macro Call

.CSISPC outspc, defext, cstrng[, linbuf]

where:

outspc is the address of a 39-word area to contain the file descriptors produced by *.CSISPC*. This area can overlay the space allocated to *cstrng*, if desired. The format of the information returned is:

Offset	Contents	Offset	Contents
0	devblk for channel 0	46	devblk for channel 4
6		54	
10	size	56	devblk for channel 5
12	devblk for channel 1	64	
20		66	devblk for channel 6
22	size	74	
24	devblk for channel 2	76	devblk for channel 7
32		104	
34	size	106	devblk for channel 10
36	devblk for channel 3	114	
44			

Information for the files for channels 0, 1, and 2 is stored in 5-word blocks. The first four words are RAD50 information in the standard RT-11 device block format (see Chapter 6). The last word is the file size indicated by a */FILESIZE* or */SIZE* option, if any was encountered for these files in the string. Since files on the left side of the equal sign are opened with *.ENTER*, they can have a size for preallocation. Information for the files for channels 3 to 10 is stored in 4-word blocks, in the standard RT-11 device block format. If any files are omitted in the string, the corresponding 4- or 5-word block is filled with zeros.

defext is the address of a four-word block containing the RAD50 default file types. (See the discussion of *.CSIGEN* for the format of this area.) These defaults are returned to the *outspc* area if no types are given in the examined string.

cstring is the address of the ASCIZ string to be examined or a #0 if input is to come from the job's terminal. If this argument is not specified, input is automatically taken for the job's terminal. The string must follow the rules for an RT-11 command string, as described for .CSIGEN.

linbuf is the address where the original string (if accepted from the job's terminal) is to be stored. This area should be at least 81 bytes long. The string is terminated with a zero byte instead of a carriage-return/line-feed combination. If this argument is omitted, the original string is not kept.

Errors

If an error occurs when input is accepted from the job's terminal, the user gets another try. An error message is printed on the terminal, along with another * prompt, and the directive waits for you to type another line.

If the string being examined is in memory and an error occurs, the carry bit is set, and one of the following error codes is returned in byte 52. The options and option-count are pushed from the stack.

Code	Meaning
0	Illegal command line (bad separators, illegal file name, command too long, and so forth).
1	A device specification was not recognizable or is not available on the system.

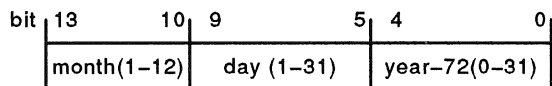
Example

The following code accepts a line of input from the terminal, checks it for RT-11 command format, and stores the resulting device block information in a 39-word area called OUTSPC:

```
DEFEXT: .WORD    0,0,0,0           ;No default file types
OUTSPC: .BLKW   39.              ;Device block area
.
.
.
.CSISPC #OUTSPC,#DEFEXT,#0
```

7.7 .DATE — Return Current Date to R0

The .DATE directive returns the current month, day, and year to R0 in the following format:



The year value in bits 4-0 is the current year minus 72.

Note that this directive gets its date information from the RSTS/E clock. Unlike the RT-11 operating system, you do not set the values returned with the DATE keyboard monitor command.

Privileges Required

None

Macro Call

.DATE

R0 Format

(R0) =

12	0
----	---

Errors

No errors are returned with the .DATE directive.

Example

The following subroutine can be assembled separately and linked to a user program:

```
.TITLE    DATE.MAC
;
;CALLING SEQUENCE:
;
;        JSR        PC,DATE
;
;INPUT:   NONE
;
;OUTPUT:  R0 = DAY (1-31)
;        R1 = MONTH (1-12)
;        R2 = YEAR - 72
;
;        .MCALL    .DATE
```

```

DATE:  .DATE                ;Get the system date
      MOV      R0,R2        ;Copy the date
      BIC      #^C37,R2
      ASR      R0           ;Put month on a byte boundary
      ASR      R0           ;
      MOV      R0,R1        ;Copy the date
      SWAB     R1           ;Put month in the low byte
      BIC      #^C37,R1    ;Isolate the month
      ASR      R0           ;Shift day to a byte boundary
      ASR      R0           ;
      ASR      R0           ;
      BIC      #^C37,R0    ;Isolate the day
      CLC      ;Indicate no error
      RTS      PC
      .END

```

7.8 .DATTIM — Return Date or Time

The .DATTIM directive is available only to RT-11 emulator users under RSTS/E; it is not available under the RT-11 operating system. .DATTIM converts a date or time from the RSTS/E system internal format (as returned by the .DATE directive, see Chapter 3) to an ASCII string suitable for printing. The format of the string is the same as that returned by the BASIC-PLUS DATE\$ and TIME\$ functions. That is, a date is in the form "27-Jun-84"; or, if the system uses the numeric date option, in the form "84.06.27". Similarly, a time is in the form "02:30 PM" or "14:30".

The .DATTIM directive assumes that R0 contains the address of the area to which the string is to be returned. It also expects to find the date or time in RSTS/E system internal format in the XRB. If a date is desired, it should be in XRB+0. If a time is desired, the word at XRB+0 should be cleared and the time stored in XRB+2. Note that these are the locations returned by the RSTS/E .DATE directive.

You can request a specific format for date or time rather than accepting the format selected at system generation. If you set bit 15 of XRB+0 (date) or XRB+2 (time), you request a specific format rather than the default selected at system generation. Bit 15 = 0 indicates the default. If bit 15 = 1, then bit 14 = 0 implies numeric format; bit 14 = 1 indicates alphanumeric format.

Upon return from the call, R0 contains the address of the first byte after the time or date string.

Privileges Required

None

Macro Call

.DATTIM

Note that .DATTIM, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

No errors are possible with the .DATTIM directive.

Example

The following program prints the current date and time at the job's terminal:

```
.MCALL .EXIT, .PRINT
.PRIV = EMT+377 ;Prefix EMT to RSTS/E
.DATTIM = EMT+361 ;Date/time EMT to RT-11
.CSECT
```

```

START:  .PRIV, .DATE          ;Get date from RSTS/E
        MOV      XRB+2, -(SP) ;Save time
        MOV      DATE$, R0    ;Set addr for ret. string
        .DATTIM
        CLRB     (R0)+        ;Clear last byte for ASCIZ
        .PRINT   #DATMSG     ;Print date message
        CLR      XRB          ;Clear date from XRB
        MOV      (SP)+, XRB+2 ;Set time in XRB
        MOV      TIME$, R0    ;Set addr for time string
        .DATTIM
        CLRB     (R0)+        ;Make string ASCIZ
        .PRINT   #TIMMSG     ;Print time message
        .EXIT                ;End program

DATMSG:  .ASCII   /The date is /
DATE$:   .BLKW   12
TIMMSG:  .ASCII   /The time is /
TIME$:   .BLKW   12

.END     START

```

7.9 .DELETE — Delete File from Disk or DECTape

The .DELETE directive deletes a file from a disk or DECTape, deleting it from the device directory and releasing the space for other use. The file description given in the call includes a device, file name, and type. Set the PPN offset to include a PPN for the file, if desired (see Chapter 6). Otherwise, the PPN of the calling job is used.

Note that on RSTS/E systems, unlike the RT-11 operating system, it is possible to delete files which are open; no error is returned.

Privileges Required

Write access to the file being deleted (if disk). DEVICE privilege is required if the device is restricted.

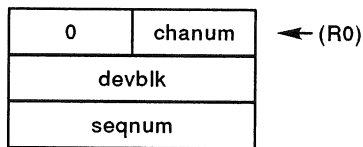
Macro Call

`.DELETE area,chanum,devblk,seqnum`

where:

area is the address of a three-word argument block.
chanum is ignored on RSTS/E systems.
devblk is the address of a four-word device block containing the device and file specification. See Chapter 6 for the format of this area. See also the PPN offset description for specifying a PPN.
seqnum is ignored on RSTS/E systems.

Argument Block Format



Errors

Code Meaning

- 1 The file named cannot be found.
- 2 The device specified is not a disk or DECTape.

Example

The following code deletes the file name FILNAM.TYP in the user's account on disk unit 1:

```
AREA:      .BLKW      3
DEVBLK:    .RAD50     /DK1FILNAMTYP/
.
.
.
.DELETE    #AREA, #1, #DEVBLK
```

7.10 .DOCCL — Do a RSTS/E .CCL

This directive lets a program running under control of the RT-11 run-time system examine a string to see if it is a valid RSTS/E Concise Command Language (CCL) command.

NOTE

.DOCCL must be used by programs running under the RT-11 run-time system, rather than the general monitor .CCL command.

If the string is a valid CCL command, the RT-11 run-time system restores the low 512 bytes of memory to what the monitor expects and issues a general monitor .CCL command. (See Chapter 3 for a description of .CCL.)

The starting address of the string to be examined is passed in R0. The string itself must be in ASCIZ format (terminated with a zero byte).

Privileges Required

Execute access to the program that the CCL command executes.

Macro Call

.DOCCL

Note that .DOCCL, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

The errors returned for .DOCCL are the same (and in the same format) as for .CCL.

Example

The following code executes the CCL command PIP:

```
.DOCCL =   EMT+367
STG:      .ASCIZ   /PIP/
          .
          .
          MOV     #STG,R0
          .DOCCL
```

7.11 .DOFSS — Do a RSTS/E .FSS

The .DOFSS directive examines a string to see if it is a valid RSTS/E file specification. The RT-11 emulator restores the low 512 bytes of memory to what the monitor expects and executes a .FSS directive.

NOTE

You must use .DOFSS rather than .FSS for a program running under the RT-11 run-time system.

The .DOFSS directive assumes that R0 contains the starting address of the string and that the string itself is in ASCIZ format (terminated with a zero byte). See the discussion of .FSS in Chapter 3 for an explanation of how the string is processed. The data returned on completion of .DOFSS is the same as for .FSS.

Note that .DOFSS, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Privileges Required

None

Macro Call

.DOFSS

Errors

The errors for .DOFSS are the same (and in the same format) as for .FSS.

Example

The following code checks the string FILE.NAM to see if it is a valid RSTS/E file specification:

```
.DOFSS =   EMT+365
STG:      .ASCIZ   /FILE.NAM/
          .
          .
          .
          MOV     #STG,R0
          .DOFSS
```

7.12 .DORUN — Chain to Non-RT-11 RTS Program

Use the .DORUN directive to transfer control to programs that run under a non-RT-11 run-time system.

NOTE

The .DORUN directive must be used from programs running under the RT-11 run-time system, rather than the .RUN directive, since RT-11 keeps user logical information in a different area in low-core than the monitor expects.

The .DORUN directive causes the emulator to restore the user logical information to its normal place in the low 512. bytes of memory and translates an RT-11 file specification to the proper form in the FIRQB for a .RUN.

The .DORUN assumes that R0 contains the address of a five-word file definition. The first four words contain a normal RT-11 "device block" specification (see Chapter 6); the last word contains a parameter to be passed to the run-time system at FIRQB+FQNT. If the address passed in R0 points to a device block within an *outspec* area returned by a previous .CSISPC directive, all of the RSTS/E-specific information from the file specification (PPN, and so forth) is loaded into the proper area in the FIRQB. Values in the first six words of the scratch pad area take precedence over the values found in the string examined by .CSISPC.

Privileges Required

Execute access to the specified program.

Macro Call

.DORUN

Note that .DORUN, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

Errors are returned as for a .RUN directive.

Example

The following program uses .CSISPC to scan a user-entered file specification, ensures that the program is entered with a zero parameter passed to the run-time system, and then attempts to execute the file with .DORUN. If an error occurs for either the .CSISPC or the .DORUN, an error message is printed at the job's terminal. The code follows:

```
.SETFQB = EMT+360           ;Define EMT for SETFQB
.DORUN = EMT+363           ;Define EMT for .DORUN

        .CSISPC  OUTSPC,DEFEXT,0 ;Read, scan command string
        BCS      ERROR          ;Command string in error
        MOV      OUTSPC,R0      ;Get devblk for first file
        CLR      4*2(R0)        ;Pass 0 at FIRQB+FQNT
        .DORUN                    ;Try to run the file
ERROR:   .PRINT  #ERRMES        ;An error occurred
        .EXIT

ERRMES:  .ASCIZ  /?Can't run that file/
```


7.13 .DSTATUS — Return Device Status

The .DSTATUS directive returns information about a device to a four-word area defined in the user program.

Privileges Required

None

Macro Call

.DSTATUS *stblk,devnam*

where:

stblk is the address of a four-word area to contain the returned status information.

devnam is the address of one word containing a device and unit number, in RAD50 format. The word can also be a three-character user logical name in RAD50 format.

Information Returned to Statblk

status word (see format)
handler size (= 0 for RSTS/E)
load address (=160000 for RSTS/E)
device size (= 0 for RSTS/E)

Status Word Format

flags	handler index
-------	---------------

The low byte contains the RT-11 handler index for the device:

Octal Value	Device
0	(disk)
1	DT (DECtape)
3	LP (line printer)
4	KB (keyboard)
7	PR (paper tape reader)
10	PP (paper tape punch)
11	MT (magnetic tape)
14	CR (card reader)

The high byte describes the device characteristics. Note that you can combine the device-characteristics flags. For example, a value of 140000 for the entire word would indicate a file-structured, read-only disk. The word values are:

Device Characteristics (Octal Word Value)	Meaning
100000	Device is file-structured
040000	Device is read-only
020000	Device is write-only

Errors

Code	Meaning
-------------	----------------

0	The device named in the <i>devnam</i> argument is not known on the system.
---	--

Example

The following code checks for status information for MT0:

```
STAT:      .BLKW      4
DEVNAM:    .RAD50     /MT0/
           .
           .
           .DSTATUS   #STAT, #DEVNAM
```

7.14 .ENTER — Open File for Output

The `.ENTER` directive creates a new file and associates the file with a channel number. You then use the channel number to refer to the file for other I/O operations.

A RSTS/E "tentative open" is done; that is, the file is not permanent until a `.CLOSE` is executed with the same channel number as specified in the `.ENTER` directive. Then, the tentative file is made permanent, and any already existing file of the same name on the same device is deleted. A `.PURGE`, `.HRESET`, or `.SRESET` directive deletes the tentative file; any already existing file of the same name on the same device is left intact.

You can preallocate space for disk files by setting an argument in the call. Note that you can also set a PPN, protection code, mode, and other RSTS/E parameters applicable to opening a file for output by setting words in the scratch pad area (see Chapter 6).

Privileges Required

Write access to the file.

Macro Call

`.ENTER area,chanum,devblk,len,seqnum`

where:

- area* is the address of a four-word argument block.
- chanum* is a channel number in the range 0 to 17 (octal). See Chapter 6 for rules on channel numbers.
- devblk* is the address of a four-word device-block containing the device and file specifications. See Chapter 6 for the format of this area.
- len* is the file size to be preallocated for the file, in 512-byte blocks (for disk files only). Values can range from 1 to 32767. For large disk files on RSTS/E, you must set the Most Significant Bits (MSB) byte in the scratch pad area (see Chapter 6). RSTS/E ignores a zero or negative value.
- seqnum* is ignored on RSTS/E systems.

Argument Block Format

2	chanum	← (R0)
devblk		
len		
seqnum		

Errors

Code	Meaning
------	---------

- | | |
|---|---|
| 0 | Channel is already in use. |
| 1 | The file cannot be preallocated to the specified size, or the device is full. |

Example

The following code opens the file NEWFIL.SAV on MT0 for output:

```
AREA:      .BLKW      4
DEVBLK:    .RAD50     /MTONEWFILSAV/
           .
           .
           .ENTER     #AREA, #1, #DEVBLK, #0, #0
```

7.15 .ERRPRT — Print RSTS/E Error Message

The .ERRPRT directive prints the RSTS/E error message text corresponding to an error code on the user terminal. The call assumes that the error code is in R0. The text is printed without a carriage-return/line-feed combination.

Privileges Required

None

Macro Call

.ERRPRT

Note that .ERRPRT, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

No errors are possible with the .ERRPRT directive.

Example

```
                .MCALL    .EXIT, .PRINT, .REGDEF
                .REGDEF

.ERRPRT = EMT+364

.CSECT

START:  MOV     256.,R1      ;Number of errors to print
        CLR     R0          ;Start with error zero
10$:    .ERRPRT              ;Print error text
        MOV     R0, -(SP)   ;Save R0
        .PRINT  #CRLF       ;Print a CRLF
        MOV     (SP)+, R0   ;Restore R0
        INC     R0          ;Inc R0 for next message
        SOB    R1, 10$     ;Loop until all are printed
        .EXIT

CRLF:   .BYTE    0
.END    START
```

7.16 .EXIT — Program Exit

The .EXIT directive terminates execution of the calling program. On exiting from the calling job, the RSTS/E monitor drops any temporary privileges still in effect. Then, control passes to the job keyboard monitor at the keyboard monitor entry point (see P.NEW in Chapter 2).

NOTE

The job keyboard monitor is the default keyboard monitor unless the job has issued the SET JOB/KEYBOARD_MONITOR command or has issued a general monitor .RTS directive (see Chapter 3) to specify a job keyboard monitor.

If R0 = 0 when the .EXIT is executed, any channels still open will be released, without the usual clean-up operations. In particular, any temporary files (opened with .ENTER and not yet closed) will be deleted.

NOTE

Programs running under the RT-11 run-time system must use the RT-11 .EXIT directive, not the general monitor .EXIT or .RTS directive.

Privileges Required

None

Macro Call

.EXIT

Errors

No errors are possible with the .EXIT directive.

Example

The following code exits such that files opened with .ENTER and not yet closed will be deleted:

```
SAVOLD:  MOV      #0,R0
          .EXIT
```

7.17 .FETCH — Check Whether Device Exists

On RSTS/E systems, the .FETCH directive checks to see if a specified device exists on the system.

Privileges Required

None

Macro Call

`.FETCH addr,devnam`

where:

addr is ignored on RSTS/E.

devnam is the address of a one-word, RAD50 device name. The format of this word is the same as that described for the first word of a device block (see Chapter 6).

Errors

Code	Meaning
------	---------

0	The device specified does not exist on the system.
---	--

Example

The following code checks to see if LP0 exists on the system:

```
DEVNAM:  .RAD50  /LP0/
          .
          .
          .
          .FETCH  #0, #DEVNAM
```

7.18 .GETCOR — Changes Job Image Size

This directive changes the amount of space currently allocated for the user job image. The RT-11 emulator checks to ensure that the requested expansion will not destroy the scratch pad area, moves the scratch pad area if necessary, and then expands the job image size using the .CORE directive (see Chapter 3). Thus, the same rules concerning size changes for .CORE also apply to .GETCOR.

The .GETCOR directive assumes that the new job image size, in K words, is in R0. If the required expansion is not possible, the carry bit will be set on return from the call. Otherwise, the size change succeeds, and word 44 now points to the new location for the start of the scratch pad area.

NOTE

Programs running under the RT-11 run-time system must use .GETCOR, not the general monitor .CORE directive.

You must use .GETCOR to expand the job image size before you use .CHAIN to transfer control to a program that requires more memory than the current program.

Privileges Required

EXQTA privilege is required to exceed the job's memory limit.

Macro Call

.GETCOR

Note that .GETCOR, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

If the requested change cannot be made, the carry bit is set on return from the call.

Example

The following code uses .GETCOR to expand the user job image area to 24K words before doing a .CHAIN:

```
.GETCOR = EMT+366
      .
      .
      .
      MOV      #24., R0
      .GETCOR
      BCS     ERRTN
      .CHAIN
```


7.19 .GTIM — Return Time-of-Day

The .GTIM directive returns the current time of day to a two-word area defined by the user program. The current time is given in units of 1/60th second since midnight.

Privileges Required

None

Macro Call

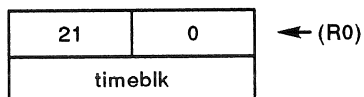
.GTIM area,timblk

where:

area is the address of a two-word argument block.

timblk is the address of a two-word block where the time is to be returned. The first word will contain the Most Significant Bits (MSB) of the current time, and the second word the Least Significant Bits (LSB).

Argument Block Format



Errors

No errors are possible with the .GTIM directive.

Example

The following code returns the current time to a two-word area named TIME:

```
AREA:      .BLKW    2
TIME:      .BLKW    2
           .
           .
           .GTIM
```

7.20 .GTJB — Return Job High Limit

The .GTJB directive on RT-11 systems returns job parameters to an eight-word area in memory. On RSTS/E systems, the only relevant parameter is the job's high memory limit. All other words are set to zero.

Privileges Required

None

Macro Call

.GTJB area,addr

where:

area is the address of a two-word argument block.

addr is the address of an eight-word block to which the job parameters are returned. On RSTS/E systems, only the second word is relevant: it is set to the high memory limit of the user job image. All other words are set to zero.

Argument Block Format

20	0
addr	

Errors

No errors are possible with the .GTJB directive.

Example

The following code stores job information in an area called JOBINF:

```
AREA:      .BLKW      2
JOBINF:    .BLKW      8.
           .
           .
           .
           .GTJB      #AREA, #JOBINF
```

7.21 .GTLIN — Get Line from Job's Terminal

The .GTLIN directive accepts a line of input from either the job's terminal or core common and stores it in a buffer for later examination by the user program. You can also specify an ASCIZ string to be displayed at the terminal before the line is accepted.

.GTLIN reads the line from core common instead of the job's terminal if the program is invoked with a parameter word of 8192. For example, the parameter word normally has this value when a program is run by a CCL command. A second .GTLIN causes the program to exit.

By default, .GTLIN returns a string in uppercase. To obtain lowercase letters, set bit 14 in the Job Status Word (JSW) before you issue the .GTLIN.

Privileges Required

None

Macro Call

.GTLIN *linbuf* [,*prompt*]

where:

linbuf is the address of an area to receive the input line. Up to 81 bytes can be accepted from a terminal, so the buffer should be at least that long. The line is stored in memory and terminated with a zero byte instead of with a carriage-return/line-feed combination.

prompt is the address of a string to be printed on the job's terminal before input is accepted. The string itself must be terminated with a zero byte or a 200 (octal) byte. If the string is terminated with a zero byte, the display ends with a carriage-return/line feed. If terminated with a 200 (octal) byte, the display ends after the prompt string.

Errors

No errors are possible with the .GTLIN request.

Example

The following example prompts the job's terminal and accepts a line of input:

```
PROMPT:  .ASCIZ    /YES OR NO?/  
LINBUF:  .BLKB    81.  
.  
.  
.  
.GTLIN   #LINBUF, #PROMPT
```

7.22 .GVAL — Get Value from Scratch Pad

The .GVAL directive returns the contents of a word in the scratch pad area to R0. You specify an offset from the beginning of the scratch pad.

Privileges Required

None

Macro Call

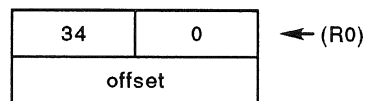
.GVAL area,offset

where:

area is the address of a two-word argument block.

offset is the offset, in bytes, from the beginning of the scratch pad area of the word desired. The offset value must be even. An odd offset causes a trap to kernel mode vector at four.

Argument Block Format



Errors

Code	Meaning
------	---------

0	The offset given is beyond the limits of the scratch pad area.
---	--

Example

The following example returns the contents of the PROTEC offset in the scratch pad area to R0:

```
AREA:      .BLKW      2
           .
           .
           .GVAL      #AREA, #2
```

7.23 .HRESET — Hardware Reset

The `.HRESET` (hardware reset) directive closes all open channels for the program without performing any of the normal clean-up operations (except to disassociate the RT-11 channel numbers from their RSTS/E counterparts). For example, no trailer labels are written to magnetic tape, no form feed is given for the line printer, and so forth. Temporary files (created with `.ENTER` but not yet closed) are deleted.

Privileges Required

None

Macro Call

`.HRESET`

Errors

No errors are possible with the `.HRESET` directive.

Example

```
.HRESET
```

7.24 .LOOKUP — Open File for Input

The .LOOKUP directive opens an existing file and associates it with a channel number; in RSTS/E terms, an OPEN FOR INPUT statement. The channel used is then busy until one of the following directives is executed:

- .CLOSE
- .SAVESTATUS
- .SRESET
- .HRESET
- .PURGE
- .CSIGEN (if the channel number is in the range 0 to 8)

Note that you can set a PPN applicable to a RSTS/E OPEN FOR INPUT statement by setting the appropriate words in the scratch pad area before executing the .LOOKUP (see Chapter 6).

Privileges Required

For disk files, you need read access. If the device is restricted, you need DEVICE privilege. You need RDNFS privilege to access disks in non-file-structured mode.

Macro Call

`.LOOKUP area,chanum,devblk,seqnum`

where:

area is the address of a three-word argument block.

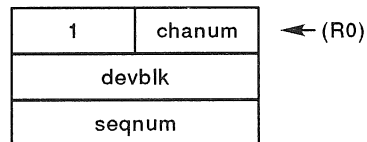
chanum is a channel number in the range 0 to 17 (octal). See Chapter 6 for rules on channel numbers.

devblk is the address of a four-word device block containing the device and file specifications. See Chapter 6 for general rules on the format of device blocks.

The file name portion of the device block is ignored for non-file-structured devices, such as a paper tape. If you want to do non-file-structured I/O on a file-structured device, clear the first word of the file name portion of the device block.

seqnum is ignored on RSTS/E systems.

Argument Block Format



Errors

Code	Meaning
0	Channel already open.
1	The file requested (in the device block) was not found.

Example

```
ERRBYT=42
ARGBLK: .BLKW      5           ;Leave space for arg block
DEVBLK: .RAD50     /DT3/       ;Define device,
      .RAD50       /DATA 001/  ;Filename and type
      .
      .
      .LOOKUP      #ARGBLK,#7,#DEVBLK ;Open on channel 7
      BCC          LDONE         ;File was found
      TSTB         @#ERRBYT      ;Error--test further below
      BNE          NFD           ;File not found
      .PRINT       #CAMSG        ;Print 'Channel Active'
      .EXIT
NFD:  .PRINT       #NMSG         ;PRINT 'File not found'
      .EXIT
CAMSG: .ASCIZ      /Channel active/
NMSG:  .ASCIZ      /File not found/
```

7.25 .PRINT — Display String on Job's Terminal

The .PRINT directive displays a specified ASCII string on the job's terminal. The line can be terminated with or without a carriage-return/line-feed combination. Note that on RSTS/E systems, if the terminal is detached when a .PRINT is issued, the job hibernates. That is, execution of the job is suspended until the terminal is reattached to the job.

Privileges Required

None

Macro Call

.PRINT *stradd*

where:

stradd is the starting address of the string to be printed. The string itself must be terminated with either a zero byte or a byte value of 200. If the string is terminated with a zero byte, the display ends with a carriage-return/line-feed combination. If the string is terminated with a 200 byte, the display ends with the string.

Errors

No errors are possible with the .PRINT directive.

Example

```
S1:      .ASCIZ      /String will have CR-LF following/
S2:      .ASCII      /String will have no CR-LF following/
          .BYTE      200
          .EVEN
          .
          .
          .PRINT     #S1
          .PRINT     #S2
```

7.26 .PURGE — Release Channel

The .PURGE directive can be used to release a channel when it is not desirable to close the file normally. Any temporary file created by a .ENTER is discarded. A .PURGE on a file that was opened with .LOOKUP will cause no action other than to free the channel; any data written to the file will still be there. If the specified channel is not open, the .PURGE is simply ignored; no error is returned.

Privileges Required

None

Macro Call

.PURGE *chanum*

where:

chanum is a channel number in the range 0 to 17 (octal). See Chapter 6 for rules on channel numbers.

R0 Format

(R0) =

3	chanum
---	--------

Errors

No errors are possible with the .PURGE directive.

Example

The following example verifies that channels 0 to 7 are free:

```
.TITLE      .PURGE.MAC
            .MCALL      .PURGE, .EXIT
START:
1$          CLR         R1           ;Start with channel 0
            .PURGE     R1           ;Purge a channel
            INC        R1           ;Bump to next channel
            CMP        R1, #8.      ;Is it at channel 8 yet
            BLO        1$
            .EXIT
            .END          START
```

7.27 .RCTRL0 — Reset Ctrl/O

The .RCTRL0 directive restarts any programmed output to the user's terminal after such output has been stopped by the user-entered Ctrl/O or Ctrl/C.

Terminal service on RSTS/E maintains a "discard all program output" indicator for each terminal on the system. When this indicator is set, the driver ignores any output requests for that terminal. When the indicator is clear, output to the terminal proceeds normally. The .RCTRL0 directive clears this indicator.

The driver sets the indicator when the user enters a Ctrl/C or Ctrl/O combination and reverses it when the user enters a Ctrl/O again.

Thus, when it is important that a message get through to the terminal, use a .RCTRL0 directive before the .PRINT or other request for output to make sure that the message is displayed regardless of any user-entered Ctrl/O or Ctrl/C.

Privileges Required

None

Macro Call

.RCTRL0

Errors

No errors are possible with the .RCTRL0 directive.

Example

The following example forces the message to be displayed on the user's terminal:

```
EOW:      .ASCIZ    /The end of the world is nigh/  
          .  
          .  
          .  
          .RCTRL0  
          .PRINT    #EOW
```

7.28 .READ/.READW/.READC — Read Data

On RSTS/E systems, .READ, .READW, and .READC transfer data from a file or device previously opened on a channel to a user buffer. Once the transfer is complete, control returns to the user program inline, for .READ and .READW, or to a user-specified completion routine, for .READC. You specify the maximum number of words to be transferred; the actual number of words transferred is returned in R0.

Note that you can set a modifier word in the scratch pad area for devices that use this information. See the .READ directive in Chapter 3 for possible values of the modifier word.

Privileges Required

None

Macro Call

$$\left\{ \begin{array}{l} \text{.READ} \\ \text{.READW} \end{array} \right\} \text{ area,chanum,bufadd,wrdcnt,blknum}$$

or

.READC area,chanum,bufadd,wrdcnt,cmptrn,blknum

where:

area is the address of a five-word argument block.

chanum is a channel number in the range 0 to 17 (octal), previously defined in an open (.LOOKUP).

bufadd is the address of a buffer to contain the data to be read.

wrdcnt is the maximum number of words to be read. The actual number of words read may be less than *wrdcnt*; it is never more. The actual number of words transferred is returned in R0.

cmptrn is the address of a completion routine to which control is transferred when the read is complete. (For .READC only.)

blknum is the block number relative to the start of the file where the read is to begin (for files opened with file-structured .LOOKUP). To access large files on RSTS/E systems, you must set the word at offset 2 in the scratch pad area; see Chapter 6. For devices opened with non-file-structured .LOOKUP, *blknum* is the absolute block number or device cluster number where the read is to begin.

For successive reads, your program must increment *blknum*.

Argument Block Format

10	chanum
blknum	
bufadd	
wrdcnt	
cmprtn*	

* (The last word = 0 for .READW, or 1 for .READ.)

Errors

Code Meaning

- 0 Attempt to read past end-of-file (EOF).
- 1 Hard error occurred on channel.
- 2 Channel is not open.

Example

The following code reads data from the device open on channel 7 to a 512. byte user buffer:

```
AREA:     .BLKW     5
BUF:     .BLKW     512.
          .
          .
          .
          .READ     #AREA, #7, #BUF, #512., #0
```

7.29 .RENAME — Rename a File

The .RENAME directive changes the name of a file on disk or DECTape and gives that file the current date in its directory entry. If a file with the new name already exists on the specified device, it is deleted.

Privileges Required

If the device is restricted, you need DEVICE privilege. For disk files, you need create/rename access to the file.

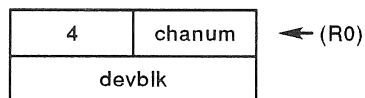
Macro Call

`.RENAME area,chanum,namblk`

where:

area is the address of a two-word argument block.
chanum is ignored on RSTS/E systems.
namblk is the address of an eight-word area containing two four-word device and file descriptor blocks (see Chapter 6). The first four-word block is the old file name and the device where it is stored. The second four-word block is the new file name; the device descriptor must be specified, and must be the same as the device descriptor in the first four-word block. If a PPN is specified in the first six words of the scratch pad, it is used for both the old and the new file. If a protection code is given in the first six words of the scratch pad, it is used for the new file. Other values in the first six words of the scratch pad are ignored.

Argument Block Format



Errors

Code Meaning

- 1 No file with the "old" name was found on the device.
- 2 The device specified is not a disk or DECTape.

Example

The following code renames file OLDFIL.MAC to NEWFIL.MAC:

```
AREA:      .BLKW      2
NAMBLK:    .RAD50     /DT3/
           .RAD50     /OLDFIL/
           .RAD50     /MAC/
           .RAD50     /DT3/
           .RAD50     /NEWFIL/
           .RAD50     /MAC/
           .
           .
           .
           .RENAME   #AREA, #0, #NAMBLK
```

7.30 .REOPEN — Reopen File Closed with .SAVSTATUS

The .REOPEN directive reopens a file that was closed with a .SAVSTATUS directive. You can use a different channel number than was used in the original .LOOKUP and .SAVSTATUS, as long as the new channel is not already open.

The .SAVSTATUS and .REOPEN directives are easier to use than .CLOSE and .LOOKUP, if your program needs to open more than 15 files during its execution. The .SAVSTATUS directive retains the information necessary to reopen a file, including the PPN. Thus, you do not need to reset the PPN offset in the scratch pad area.

Privileges Required

If the device is restricted, you need DEVICE privilege. You need RDNFS privilege to access a non-file-structured disk. You need read access to the file.

Macro Call

`.REOPEN area,chanum,chnblk`

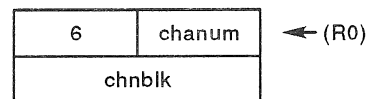
where:

area is the address of a two-word argument block.

chanum is a free channel number in the range 0 to 17 (octal). See Chapter 6 for rules on channel numbers.

chnblk is the address of the five-word block where the channel status information was stored (see .SAVSTATUS).

Argument Block Format



Errors

Code	Meaning
------	---------

0	The specified channel is in use. The .REOPEN has not been done.
---	---

Example

The following code reopens a file closed with .SAVSTATUS using the device block area named SAVBLK:

```
AREA:      .BLKW  2
SAVBLK:    .BLKW  5
           .
           .
           .
           .REOPEN #AREA, #6, #SAVBLK
```

7.31 .SAVESTATUS — Save Status of File for Later .REOPEN

The .SAVESTATUS directive closes a disk or DECTape file, saving all the information needed to reopen the file later in execution of the program (see .REOPEN). The information saved is stored in a five-word area in the user program and includes the PPN for the file. Thus, the .SAVESTATUS/.REOPEN combination is easier to use on RSTS/E systems than .CLOSE/.LOOKUP in this case; you do not have to set the PPN offset in the scratch pad area.

The .SAVESTATUS directive can be used only if the file was opened with .LOOKUP. If the file was opened with .ENTER, a .SAVESTATUS on that channel returns an error.

Privileges Required

None

Macro Call

`.SAVESTATUS area,chanum,chnblk`

where:

area is the address of a two-word argument block.

chanum is a channel number in the range 0 to 17 (octal), previously used in a .LOOKUP directive for disk or DECTape.

chnblk is the address of a five-word area to store the current information for the file. On RSTS/E systems, the first four words of this area are set to the device, file name, and type, in the standard RT-11 device-block format (see Chapter 6). The last word of this area is set to the PPN of the file.

Argument Block Format

5	chanum
chnblk	

Errors

Code	Meaning
------	---------

0	The channel specified is not currently open; that is, a previous .LOOKUP on the channel was never done.
---	---

1	The file was opened with .ENTER, or else the file is not on a disk or DECTape device. The .SAVESTATUS is illegal.
---	---

Example

The following code saves the status of the file open on channel 12 for a later reopen:

```
AREA:      .BLKW  2
SAVBLK:    .BLKW  5
          .
          .
          .
          .SAVEST #AREA, #12., #SAVBLK
```

7.32 .SCCA — Pass Ctrl/Z to User Program

The .SCCA directive lets a user program recognize and process a Ctrl/Z combination entered on the job's terminal. When called with any nonzero value for the *addr* argument, subsequent Ctrl/Zs entered at the job's terminal are translated to an ASCII 3 and passed like any other character to the program when it issues a .TTYIN or .GTLIN. (Normally, a Ctrl/Z causes the RT-11 emulator to exit the running program when a .READ or .TTYIN is done.)

NOTE

The operation of the .SCCA directive is quite different under RSTS/E than under the RT-11 operating system, where it lets a user program trap Ctrl/C combinations.

The .SETCC directive must be used for this function under the RT-11 run-time system under RSTS/E. The intent is to let you code an .SCCA directive to trap the delimiter equivalent in function on the two systems.

On RSTS/E systems, Ctrl/Z is the "type-ahead terminator." You can, for example, type RUN \$MACRO, type the command line for the assembly, enter a Ctrl/Z, and then type RUN \$LINK. You do not have to wait for the assembly to finish before typing the command to link.

On RT-11 systems, Ctrl/C is the "type-ahead terminator." Hence, the .SCCA directive processes the character appropriate to the system on both RSTS/E and RT-11 systems.

Privileges Required

None

Macro Call

.SCCA *area,addr*

where:

area is the address of a two-word argument block.

addr is a switch. Any nonzero value for this argument causes Ctrl/Zs to be passed to the user program, as described previously. A zero value returns Ctrl/Z processing to the emulator.

Argument Block Format

35	0
addr	

Errors

No errors are possible with the .SCCA directive.

Example

The following code causes Ctrl/Zs to be passed to the program:

```
AREA:      .BLKW      2
           .
           .
           .SCCA      #AREA, #1
```

7.33 .SETCC — Process Ctrl/C

The .SETCC directive defines a routine to be entered when the user enters one Ctrl/C on the job's terminal. (Two consecutive Ctrl/Cs still aborts the running program.) The address of the routine to be entered is assumed to be in R0 when the .SETCC is executed.

The .SETCC is only effective until the first Ctrl/C; you must reissue the .SETCC from the trap routine if you want it to remain in effect. You must also reenable Ctrl/O processing with .RCTRL0. Use an RTI instruction to exit from the trap routine. See the discussion of offset 66 in the scratch pad area in Chapter 6 for further information on Ctrl/C processing under the RT-11 run-time system.

Privileges Required

None

Macro Call

.SETCC

Note that .SETCC, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

No errors are possible with the .SETCC directive.

Example

The following code defines a routine to be entered when the user enters a Ctrl/C on the job's terminal:

```
.SETCC = EMT+362
MESSAGE:  .ASCIZ  "You typed a Ctrl/C!"
          .
          .
          .
          MOV    #CTLCL,R0
          .SETCC
          .
          .
          .
CTLCL:   .RCTRL0
          .PRINT #MESSAGE
          MOV    #CTLCL,R0
          .SETCC
          RTI
```

7.34 .SETFQB — Set Up FIRQB

The .SETFQB directive can be used after a .CSISPC; the two calls combined return information to the FIRQB and XRB as if the file specification string had been examined by .FSS.

The call assumes that R0 contains the address of the first word of a device block returned by .CSISPC. As noted in the discussion of .CSISPC, the device-block information must not have been moved; thus, the address in R0 must be the address of the first word of a device block within the "outspc" area returned by the last .CSISPC.

Note that any information in the first six words of the scratch pad area overrides any RSTS/E-specific information returned by the .CSISPC. In addition, the .SETFQB clears the first six words of the scratch pad after using the information.

Privileges Required

None

Macro Call

.SETFQB

Note that .SETFQB, like all RSTS/E-specific directives under RT-11, is not expanded at assembly time. (It is not defined in the SYSMAC.SML file as a directive.) You can code a definition of the directive in a data section of your program or use .MACRO to define it. See the following example.

Errors

No errors are possible with the .SETFQB directive.

Example

The following code returns information to the FIRQB and XRB about the file following the equal sign (=) in an RT command:

```
.SETFQB = EMT+360
      .
      .
      .CSISPC #OUT, #EXT, #CMD
      MOV #OUT+<3*5*2>, R0
      .SETFQB
```

7.35 .SETTOP — Expand to Start of Scratch Pad

On RSTS/E systems, the .SETTOP directive sets the contents of the word at location 50 in the low 512 bytes of memory to the value specified in .SETTOP. The value itself cannot equal or exceed the starting address of the scratch pad area (see Chapter 6). If such a value is specified, .SETTOP simply sets the contents of location 50 to the address of the first word after the starting address of the scratch pad. The value actually set in word 50 is also returned to R0 on completion of the call.

Privileges Required

None

Macro Call

`.SETTOP adrval`

where:

adrval is a value specifying the address to which location 40 is to be changed.

Errors

No errors are possible with the .SETTOP directive.

Example

The following code sets the contents of location 50 to the address of the word after the start of the scratch pad:

```
.SETTOP #-2
```

7.36 .SFPA — Set Floating-Point Error Address

The `.SFPA` directive indicates that you want to handle floating-point errors yourself. You specify the address of a routine to be entered if such errors occur. The `.SFPA` works for errors on both the FIS (floating-point instruction set on the PDP-11/35 and 11/40) and the FPP or FPU (hardware floating-point units compatible with the PDP-11/45 and 11/70 asynchronous unit) and its equivalents. In the case of FPP or FPU hardware, two words have been pushed on the stack: the Floating-Point Exception Code (FEC) at the top of the stack and the Floating Error Address (FEA) one word down. Your routine can process these words in any way it sees fit and should pop them from the stack before issuing an RTI instruction to return control to the program where it left off when the errors occurred.

The `.SFPA` directive works only for one floating-point error trap. You must reexecute the `.SFPA` from your error-processing routine to ensure that successive errors are handled in the same way. You can disable traps to your error routine by issuing the `.SFPA` directive with a zero address argument.

NOTE

You should not use `.SFPA` in a routine called by a FORTRAN program, because programs compiled under FORTRAN have their own FPP/FIS exception handling routines and expect to find the FPU status as they have set it.

Privileges Required

None

Macro Call

`.SFPA area,addr`

where:

area is the address of a two-word argument block.

addr is the address of the routine to be entered when a floating-point error occurs.

Argument Block Format

30	0
addr	

Errors

No errors are possible with the `.SFPA` directive.

Example

The following code defines `ERRTN` as the address of the error routine to be entered when a floating-point error occurs:

```
AREA:      .BLKW      2
           .
           .
           .SFPA      #AREA, #ERRTN
```

7.37 .SPFUN — Special Functions for I/O

The .SPFUN directive handles special functions for disk, terminal, magnetic tape, and flexible diskette.

Privileges Required

None

Macro Call

`.SPFUN area,chanum,func,buf [wcnt] [blk],[crtn]`

where:

- area* is the address of a six-word argument block.
- chanum* is a channel number in the range 0 to 17 (octal), defining the device on which the special function is to be performed. The channel must have been previously opened with .LOOKUP.
- func* is a special function code. To request magnetic tape special functions emulating RT-11's .SPFUN, set this argument to one of the following values:
- 377 Write end-of-file
 - 376 Forward 1 record
 - 375 Backspace 1 record
 - 373 Rewind to load point
 - 372 Offline rewind
- Any other value for this argument is used as the function code (at XRB+XRLEN) in a RSTS/E .SPEC directive (see Chapter 3).
- buf* is used as the value of the word at XRB+XRLOC in a RSTS/E .SPEC directive. It must be set to zero if the *func* argument is 377, 376, 375, 373, or 372.
- wcnt* is used as the value of the word at XRB+XRBC in a RSTS/E .SPEC directive. It is ignored (and can be omitted) if the *func* argument is 377, 376, 375, 373, or 372.
- blk* is used as the value of the word at XRB+XRBLK in a RSTS/E .SPEC directive. It is ignored (and can be omitted) if the *func* argument is 377, 376, 375, 373, or 372.
- crtn* is the address of a completion routine to which control is to be transferred when the operation is complete. If this argument is omitted, control returns to the instruction following the .SPFUN when the operation is completed.

Note that if you are using .SPFUN to do a RSTS/E .SPEC, the RT-11 emulator fills in the RSTS/E channel number and device handler values in the XRB for you.

Argument Block Format

32	chanum
blk	
buf	
wcnt	
func	377
crtn	

Errors

Code	Meaning
0	Tried to read past end-of-file.
1	Hard error occurred on channel.
2	Channel is not open.

Example

The following code rewinds a magnetic tape (open on channel 4):

```
AREA:      .BLKW      6
           .
           .
           .SPFUN    #AREA, #4, #373, #0
```

7.38 .SRESET — Software Reset

On RSTS/E systems, the .SRESET directive does the same thing as a hardware reset (.HRESET). It closes all open channels for the program without performing any of the normal clean-up operations (except to disassociate the RT-11 channel numbers from their RSTS/E counterparts). For example, no trailer labels are written to magnetic tape, no form feed is given for the line printer, and so forth. Tentative files (created with .ENTER but not yet closed) are deleted.

Privileges Required

None

Macro Call

.SRESET

Errors

No errors are possible with the .SRESET directive.

Example

```
.SRESET
```


7.39 .TRPSET — Intercept Traps to 4 and 10

The .TRPSET directive allows the user program to trap to a user routine on errors that normally cause the program to abort execution. Control passes to the address specified in the call when the job tries to execute a reserved instruction (normally trapped to kernel mode address 10) or issues an instruction with an odd address (normally trapped to kernel mode address 4).

The carry bit indicates which error occurred. When control is passed to the error-handling routine, the carry bit is zero if the error was an odd-address error. If the carry bit is one, the error was a reserved-instruction error. An RTI instruction will return control to the user program from the trap routine.

Note that the .TRPSET directive affects only the next error causing such a trap. You must reissue the .TRPSET from your error-handling routine if you want to handle such errors consistently.

Privileges Required

None

Macro Call

.TRPSET area,addr

where:

area is the address of a two-word argument block.
addr is the address to which control is to be passed when a reserved-instruction or odd-address error occurs.

Argument Block Format

3	0
addr	

Errors

No errors are possible with the .TRPSET directive.

Example

The following code defines TRPRTN as the address of the routine to be entered when a reserved-instruction or odd-address error occurs:

```
AREA:      .BLKW      2
           .
           .
           .TRPSET   #AREA, #TRPRTN
           .
           .
TRPRTN:    BCC        ODDADR
           (code for reserved instruction)
           .
ODDADR:    (code for odd address)
```

7.40 .TTYIN/.TTINR — One-Character Read From Terminal

The .TTYIN and .TTINR directives both accept input from the job's terminal and transfer one character to the low byte of R0.

Bits 6 and 12 of the job status word (JSW) affect how the transfer is done.

If bit 12 of the JSW = 0, the .TTYIN/.TTINR waits until a whole line has been typed at the job's terminal and then transfers one character to the low byte of R0. Succeeding .TTYIN/.TTINR requests will then transfer remaining characters, including carriage return and line feed. In addition, the usual monitor processing for terminal input occurs: all characters typed are echoed at the terminal, and Ctrl/U and DELETE delete a line or a character, respectively.

If bit 12 of the JSW = 1, ODT-mode input is done. That is, characters are transferred when they are available, rather than waiting for a whole line to be typed before passing a character to the user program. One .TTYIN/.TTINR transfers one character. Furthermore, characters typed are not echoed at the terminal, and Ctrl/U and DELETE are simply passed on to the user program. (Ctrl/C and Ctrl/O are processed as usual, however. Ctrl/S and Ctrl/Q are processed, if that option was requested for your terminal with TTYSET.) No ALTMODE conversion is done.

If bit 6 = 1, control returns to the user program with the carry bit set if no character can be returned to the program. Note that this should only be used with .TTINR, and only when the program needs to perform other processing while waiting for terminal input. If bit 6 = 0, control does not return to the user program until a character can be passed to the program.

If used, bits 6 and 12 in the JSW must be set by the user program; they are cleared automatically when a program terminates.

NOTE

Single character I/O places heavy demand on RSTS/E system resources and can degrade system performance. These calls are provided only for compatibility with RT-11.

Privileges Required

None

Macro Calls

.TTYIN [*addr*]

or

.TTINR

where:

addr is the address of a location where the character is to be stored, in addition to being stored in R0. If the address is omitted, the character is stored only in R0.

Errors

Code	Meaning
------	---------

0	No character or characters are available in the monitor buffer for terminal I/O (only applies to .TTINR).
---	---

Example

The following code transfers one character from the job's terminal to the low byte of R0:

```
.TTYIN
```

7.41 .TTYOUT/.TTOUTR — Transfer One Character to Job's Terminal

The .TTYOUT and .TTOUTR directives both transfer one character from the low byte of R0 to the job's terminal. Using .TTYOUT or .TTOUTR is slower than using .PRINT because they require more system overhead. Use .PRINT whenever possible.

Note that on RSTS/E systems, if the terminal is detached when a .TTYOUT or .TTOUTR is executed, the job hibernates. That is, execution of the job is suspended until the terminal is reattached to the job.

Privileges Required

None

Macro Call

.TTYOUT [*addr*]

or

.TTOUTR

where:

addr is the address of a memory location containing the character to be printed. The character is loaded into R0 first. When control returns from the call, R0 still contains the character. If you omit this address, RSTS/E prints the character in the low byte of R0 at the job's terminal.

Errors

No errors are possible with the .TTYOUT and the .TTOUTR directives under RSTS/E.

Example

The following example transfers one character from the low byte of R0 to the job's terminal:

```
PROMPT:  .ASCII  /*/  
          .  
          .  
          .  
          MOV    #PROMPT,R0  
          .TTYOUT
```

7.42 .TWAIT — Timed Wait

The `.TWAIT` directive suspends execution of the job for a specified number of clock ticks: a sleep, in RSTS/E terms.

Privileges Required

None

Macro Call

`.TWAIT area,addr`

where:

area is the address of a two-word argument block.

addr is the address of a two-word block specifying the length of time to sleep in units of 1/60th second. The first word contains the high-order bits; the second word contains the low-order bits.

Argument Block Format

24	0
addr	

Errors

No errors are possible with the `.TWAIT` directive.

Example

The following code suspends program execution for 5 seconds:

```
AREA:      .BLKW      2
ADDR:      .BLKW      2
           .
           .
           .
           CLW        #ADDR
           MOV        #300., #ADDR+2
           .TWAIT    #AREA, #ADDR
```

7.43 .WAIT — Check for Channel Open

On RSTS/E systems, the .WAIT directive checks to make sure that the specified channel is open. If not, the call returns with an error.

Privileges Required

None

Macro Call

`.WAIT chanum`

where:

chanum is the channel number to be tested. The number can be in the range 0 to 17 (octal).

R0 Format

R0 =

0	chanum
---	--------

Error

Code	Meaning
------	---------

0	The specified channel is not open.
---	------------------------------------

Example

The following code checks to see if channel 7 is open and branches if it is not:

```
.WAIT      #7.  
BCS      #NOTOPN
```

7.44 .WRITE/.WRITW/.WRITC — Write Data

On RSTS/E systems, .WRITE, .WRITW, and .WRITC transfer data from a user buffer to a file or device previously opened on a channel. After the transfer is complete, control is passed to the user program inline, for .WRITE and .WRITW, or to a user-specified completion routine, for .WRITC. The number of words actually written is returned in R0 when the call completes.

Privileges Required

EXTQA privilege suppresses disk quota checks when extending a disk file.

Macro Call

$$\left\{ \begin{array}{l} .WRITE \\ .WRITW \end{array} \right\} \quad area,chanum,bufadd,wordcnt,blknum$$

or

.WRITC *area,chanum,bufadd,wordcnt,cmprtn,blknum*

where:

<i>area</i>	is the address of a five-word argument block.
<i>chanum</i>	is a channel number in the range 0 to 17 (octal), previously defined in an open (.ENTER or .LOOKUP).
<i>bufadd</i>	is the address of the buffer containing the data to be written.
<i>wordcnt</i>	is the number of words to be written.
<i>cmprtn</i>	is the address of a completion routine to which control is transferred when the write is complete. (For .WRITC only.) For .WRITE and .WRITW, control is returned to the instruction following the directive when the write is complete.
<i>blknum</i>	is the block number relative to the start of the file where the write is to begin. (For files opened with file-structured .ENTER or .LOOKUP.) For devices opened with non-file-structured .ENTER or .LOOKUP, the <i>blknum</i> argument is used as the absolute block number or device cluster number where the write is to begin.

NOTE

To access large files on RSTS/E systems, you must set the word at offset 2 in the scratch pad area (see Chapter 6). To do successive writes, your program must increment *blknum*.

Argument Block Format

11	chanum
blknum	
bufadd	
wrdcnt	
cmprtn*	

* The last word is set to 1 for .WRITE or to 0 for .WRITW.

Errors

Code Meaning

- 0 No more room is available on the device. For example, the end-of-tape (EOT) marker has been encountered, no more available disk space, and so forth.
- 1 Some hard I/O device error occurred. For example, the specified device is offline, is physically write-locked, and so forth.
- 2 The channel specified is not open.

Example

The following code writes a 256-word block to the device open on channel 12:

```
AREA:     .BLKW     5
BUF:     .BLKB     512.
          .
          .
          .
          .WRITE   #AREA, #12., #BUF, #256., #0
```

7.45 `..V1../..V2..` — Use Version 1/Version 2 Expansion

If you have a source program that was coded for Version 1 or Version 2 of the RT-11 operating system and you want to assemble on RSTS/E using the expansions that were used for these versions, you must use either the `..V1..` directive (for Version 1 expansions) or the `..V2..` directive (for Version 2 expansions).

You cannot use both the `..V1..` and `..V2..` directives. You can use directives from more than one version by specifying the `..V1..` directive and simply using the directives from later versions. If the same directive exists in two or three versions, though, you get the expansion from the earliest version.

These directives generate code that defines and sets a variable called `...V1` to either 1 or 2, which the MACRO assembler uses to determine the expansions to use. So, if the `..V1..` or `..V2..` directive is used, it must appear before any other RT-11 directives in your program.

NOTE

All the examples in this chapter show Version 2 expansions. Version 1 expansions require different arguments in the calls. See RT-11 system documentation if you need to use version 1 expansions.

Privileges Required

None

Macro Call

`..V1..`

or

`..V2..`

Appendixes

Full List of Errors

This appendix lists the error messages that you may encounter when using RSTS/E. The question mark (?) and percent sign (%) characters preceding the full error text indicate the error's severity:

- A single question mark precedes nonfatal errors; the command failed but you can continue
- A double question mark precedes severe errors; the command failed and you cannot continue
- A percent sign precedes a warning message; the command may not have performed as you intended but execution continues

Informational messages have neither character; they provide extra detail about the effects of a command.

Table A-1 summarizes the RSTS/E error messages.

Table A-1: RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
BADDIR	1	1	??Bad directory for device
BADNAM	2	2	?Illegal file name
INUSE	3	3	?Account or device in use
NOROOM	4	4	?No room for user on device
NOSUCH	5	5	?Can't find file or account
NODEVC	6	6	?Not a valid device
NOTCLS	7	7	?I/O channel already open
NOTAVL	8	10	?Device not available
NOTOPN	9	11	?I/O channel not open
PRVIOL	10	12	?Protection violation
EOF	11	13	?End of file on device
ABORT	12	14	??Fatal system I/O failure
DATERR	13	15	?Data error on device
HNGDEV	14	16	?Device hung or write locked
HNGTTY	15	17	?Keyboard wait exhausted

(continued on next page)

Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
FIEXST	16	20	?Name or account now exists
DTOOOF	17	21	?Too many open files on unit
BADFUO	18	22	?Illegal SYS () usage
INTLCK	19	23	?Disk block is interlocked
WRGPAK	20	24	?Pack IDs don't match
NOTMNT	21	25	?Disk pack is not mounted
PAKLCK	22	26	?Device is restricted
BADCLU	23	27	?Illegal cluster size
PRIVAT	24	30	?Account does not exist
INTPAK	25	31	%Disk pack needs REBUILDing
BADPAK	26	32	??Disk pack mount error
DETKEY	27	33	?I/O to detached keyboard
CTRLCE	28	34	Programmable ^C trap
SATTBD	29	35	??Corrupted file structure
DEVNFS	30	36	?Device not file-structured
BADCNT	31	37	?Illegal byte count for I/O
NOBUFS	32	40	?No buffer space available
B.4	33	41	??Odd address trap
B.10	34	42	??Reserved instruction trap
B.250	35	43	??Memory management trap
B.STAK	36	44	??SP stack overflow
B.SWAP	37	45	??Disk error during swap
B.PRTY	38	46	??Memory parity failure
MAGSEL	39	47	?Maptape select error
MAGRLE	40	50	?Maptape record length error
NRRTS	41	51	??Non-res run-time system
VCSERR	42	52	?Virtual buffer too large
VCAERR	43	53	?Virtual array not on disk
SIZERR	44	54	?Matrix or array too big
VCOERR	45	55	?Virtual array not yet open
BSERR	46	56	?Illegal I/O channel
LINERR	47	57	?Line too long
FLTERR	48	60	%Floating point error
EXPERR	49	61	%Argument too large in EXP
FMTERR	50	62	%Data format error
FIXERR	51	63	%Integer error
BDNERR	52	64	?Illegal number
LOGERR	53	65	%Illegal argument

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Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
SQRERR	54	66	%Imaginary square roots
SUBERR	55	67	?Subscript out of range
MINVER	56	70	?Can't invert matrix
ODD	57	71	?Out of data
ONBAD	58	72	?ON statement out of range
NEDERR	59	73	?Not enough data in record
IOLERR	60	74	?Integer overflow, FOR loop
DIVBY0	61	75	%Division by 0
NORTS	62	76	?No run-time system
FIELDE	63	77	?FIELD overflows buffer
NORACS	64	100	?Not a random access device
NOTMTA	65	101	?Illegal MAGTAPE() usage
ERRERR	66	102	?Missing special feature
BADSWT	67	103	?Illegal switch usage
EOV	68	104	?End of volume
QUOTA	69	105	?Quota exceeded
	70	106	??Unused ERROR message 70
STMERR	71	107	?Statement not found
EXITTM	72	110	?RETURN without GOSUB
EXITNR	73	111	?FNEND without function call
UNDFNI	74	112	?Undefined function called
COSERR	75	113	?Illegal symbol
TLOPNV	76	114	?Illegal verb
TLNZSP	77	115	?Illegal expression
TLNOIT	78	116	?Illegal mode mixing
TLIFFE	79	117	?Illegal IF statement
TLCONI	80	120	?Illegal conditional clause
TLNOTF	81	121	?illegal function name
TLQDUM	82	122	?Illegal dummy variable
TLMFND	83	123	?Illegal FN redefinition
TLRNNM	84	124	?Illegal line number(s)
MODERR	85	125	?Modifier error
	86	126	?Can't compile statement
OUTOAS	87	127	?Expression too complicated
FUNERR	88	130	?Arguments don't match
TLTMAF	89	131	?Too many arguments
TLINCD	90	132	%Inconsistent function usage
CPNSDF	91	133	?Illegal DEF nesting

(continued on next page)

Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
CPUPFR	92	134	?FOR without NEXT
CPUFNX	93	135	?NEXT without FOR
CPUPDF	94	136	?DEF without FNEND
CPUPED	95	137	?FNEND without DEF
TLJNKY	96	140	?Literal string needed
TLNOFN	97	141	?Too few arguments
SASYNE	98	142	?Syntax error
SAFNOS	99	143	?String is needed
SASNOI	100	144	?Number is needed
TLURTP	101	145	?Data type error
TLXDIM	102	146	?1 or 2 dimensions only
FUCORE	103	147	??Program lost-sorry
RESERR	104	150	?RESUME and no error
DIMED2	105	151	?Redimensioned array
TLIDIM	106	152	%Inconsistent subscript use
NOGOTO	107	153	?ON statement needs GOTO
EOSERR	108	154	?End of statement not seen
TLCNTD	109	155	?What?
TLPRNM	110	156	?Bad line number pair
EDBMCE	111	157	?Not enough available memory
EDEXON	112	160	?Execute only file
NRNERR	113	161	?Please use the RUN command
EDCONE	114	162	?Can't CONTinue
EDARSV	115	163	?File exists-RENAME/REPLACE
PRERRS	116	164	?PRINT-USING format error
UDMERR	117	165	?Matrix or array without DIM
PRNER1	118	166	?Bad number in PRINT-USING
NONOIM	119	167	?Illegal in immediate mode
PRNER2	120	170	?PRINT-USING buffer overflow
BADERR	121	171	?Illegal statement
DISERR	122	172	?Illegal FIELD variable
STPERR	123	173	Stop
DIMERR	124	174	?Matrix dimension error
NOMATH	125	175	?Wrong math package
XCDCOR	126	176	??Maximum memory exceeded
SCAERR	127	177	%SCALE factor interlock
	128	200	?Tape records not ANSI
	129	201	?Tape BOT detected

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Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
	130	202	?Key not changeable
	131	203	?No current record
	132	204	?Record has been deleted
	133	205	?Illegal usage for device
	134	206	?Duplicate key detected
	135	207	?Illegal usage
	136	210	?Illegal or illogical access
	137	211	?Illegal key attributes
	138	212	?File is locked
	139	213	?Invalid file options
	140	214	?Index not initialized
	141	215	?Illegal operation
	142	216	?Illegal record on file
	143	217	?Bad record identifier
	144	220	?Invalid key of reference
	145	221	?Key size too large
	146	222	?Tape not ANSI labeled
	147	223	?RECORD number exceeds max
	148	224	?Bad RECORDSIZE on OPEN
	149	225	?Not at end of file
	150	226	?No primary key specified
	151	227	?Key field beyond record end
	152	230	?Illogical record accessing
	153	231	?Record already exists
	154	232	?Record/bucket locked
	155	233	?Record not found
	156	234	?Size of record invalid
	157	235	?Record on file too big
	158	236	?Primary key out of sequence
	159	237	?Key larger than record
	160	240	?File attributes not matched
	161	241	?Move overflows buffer
	162	242	?Cannot open file
	163	243	?No file name
	164	244	?Terminal fmt file required
	165	245	?Cannot position to EOF
	166	246	?Negative fill or string len
	167	247	?Illegal record format

(continued on next page)

Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
	168	250	?Illegal ALLOW clause
	169	251	??Unused ERROR message 169
	170	252	?Indexed not fully optimized
	171	253	?RRV not fully updated
	172	254	?Record LOCK failed
	173	255	?Invalid RFA field
	174	256	?Unexpired file date
	175	257	?Node name error
	176	260	?Negative TAB not allowed
	177	261	?Too much data in record
	178	262	?OPEN error - file corrupted
	179	263	??Unused ERROR message 179
	180	264	?No support for op in task
	181	265	?Decimal overflow
	182	266	?Network operation rejected
	183	267	?REMAP overflows buffer
	184	270	?Unaligned REMAP variable
	185	271	%RECORDSIZE overflows MAP
	186	272	?Improper error handling
	187	273	?Illegal record lock clause
	188	274	??Unused ERROR message 188
	189	275	??Unused ERROR message 189
	190	276	??Unused ERROR message 190
	191	277	??Unused ERROR message 191
	192	300	??Unused ERROR message 192
	193	301	??Unused ERROR message 193
	194	302	??Unused ERROR message 194
	195	303	??Unused ERROR message 195
	196	304	??Unused ERROR message 196
	197	305	??Unused ERROR message 197
	198	306	??Unused ERROR message 198
	199	307	??Unused ERROR message 199
	200	310	??Unused ERROR message 200
	201	311	??Unused ERROR message 201
	202	312	??Unused ERROR message 202
	203	313	??Unused ERROR message 203
	204	314	??Unused ERROR message 204
	205	315	??Unused ERROR message 205

(continued on next page)

Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
	206	316	??Unused ERROR message 206
	207	317	??Unused ERROR message 207
	208	320	??Unused ERROR message 208
	209	321	??Unused ERROR message 209
	210	322	??Unused ERROR message 210
	211	323	??Unused ERROR message 211
	212	324	??Unused ERROR message 212
	213	325	??Unused ERROR message 213
	214	326	??Unused ERROR message 214
	215	327	??Unused ERROR message 215
	216	330	??Unused ERROR message 216
	217	331	??Unused ERROR message 217
	218	332	??Unused ERROR message 218
	219	333	??Unused ERROR message 219
	220	334	??Unused ERROR message 220
	221	335	??Unused ERROR message 221
	222	336	??Unused ERROR message 222
	223	337	??Unused ERROR message 223
	224	340	??Unused ERROR message 224
	225	341	??Unused ERROR message 225
	226	342	??Unused ERROR message 226
	227	343	?String too long
	228	344	?RECORDTYPES not matched
	229	345	??Unused ERROR message 229
	230	346	?No fields in image
	231	347	?Illegal string image
	232	350	?Null image
	233	351	?Illegal numeric image
	234	352	?Numeric image for string
	235	353	?String image for numeric
	236	354	?TIME limit exceeded
	237	355	?1st arg to SEQ\$ > 2nd
	238	356	?Arrays must be same DIM
	239	357	?Arrays must be square
	240	360	?Cannot change array DIMs
	241	361	?Floating overflow
	242	362	?Floating underflow
	243	363	?CHAIN to nonexistent line

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Table A-1 (Cont.): RSTS/E Errors

ERR.STB Mnemonic	Decimal Value	Octal Value	Full Error Text
	244	364	?Exponentiation error
	245	365	?Illegal exit from DEF*
	246	366	?Error trap needs RESUME
	247	367	?Illegal RESUME to SUBR
	248	370	?Illegal subroutine return
	249	371	?Argument out of bounds
	250	372	?Not implemented
	251	373	?Recursive subroutine call
	252	374	?FILE ACP failure
	253	375	?Directive error
	254	376	??Unused ERROR message 254
	255	377	??Unused ERROR message 255

Device Information

This appendix summarizes MODE and RECORD values and other useful information for:

- Disks
- Flexible diskettes
- Magnetic tape
- Line printers
- Terminals
- Pseudo keyboards

For your convenience, the tables show both decimal and octal values, and list the FIRQB and XRB offsets. All decimal values have a decimal point; values without a decimal point are in octal.

This appendix is a quick reference. See the *RSTS/E Programming Manual* (except where otherwise noted) if you need more detail on any topic.

B.1 Disks

This section summarizes disk MODE values and lists the device cluster size and total size for each disk that RSTS/E supports.

Table B-1 summarizes disk MODE values for file-structured access.

Table B-1: MODE Values for File-Structured Disk Access (FIRQB+FQMODE)

Decimal	Octal	Function
0.	0	Normal read/write
1.	1	Update
2.	2	Append
4.	4	Guarded update (4 + 1)
8.	10	Special extend (RSTS/E updates file's size and retrieval pointers during extend operations)
16.	20	Create contiguous file
32.	40	Create tentative file

(continued on next page)

Table B-1 (Cont.): MODE Values for File-Structured Disk Access (FIRQB+FQMODE)

Decimal	Octal	Function
64.	100	Create contiguous file conditionally
128.	200	No supersede
256.	400	Random data caching (requires TUNE privilege)
512.	1000	Create file and place at beginning of directory (with 2000)
1024.	2000	Create file and place at end of directory
2048.	4000	Sequential data caching (with 400)
4096.	10000	Read normally regardless
8192.	20000	Open file read-only
16384.	40000	Write UFD (requires WRTNFS privilege)

Table B-2 summarizes disk MODE values for non-file-structured access.

Table B-2: MODE Values for Non-File-Structured Disk Access (FIRQB+FQMODE)

Decimal	Octal	Function
0.	0	Access device clusters.
128.	200	Access disk blocks.
512.	1000	Read beyond last writable portion of disk; suppress error logging. (Reserved for use by Digital.)

Table B-3 lists the device cluster size and device size (in 512-byte blocks) for each disk that RSTS/E supports. All values are decimal.

Table B-3: Disk Device Sizes

Disk	Minimum Device Cluster Size	Device Size
RX50	1	800
RK05	1	4800
RK05F	1	4800 per unit; 2 units for each drive
RL01	1	10,220
RL02	1	20,460
RD51	1	21,600
RK06	1	27,104
RK07	1	53,768
RD52	1	60,479
RC25	1	50,902 per unit; 2 units per spindle
RM02	4	131,648
RM03	4	131,648
RD53	4	138,668
RP04	4	171,796

(continued on next page)

Table B-3 (Cont.): Disk Device Sizes

Disk	Minimum Device Cluster Size	Device Size
RP05	4	171,796
RA80	4	237,208
RM80	4	242,575
RD54	8	311,200
RP06	8	340,664
RA60	8	400,175
RM05	8	500,352
RA70	16	547,040
RA81	16	888,012
RA82	32	1,216,640
RA90	64	2,376,128

B.2 Flexible Diskettes

This section summarizes **MODE** and **RECORD** values for **RX01** and **RX02** flexible diskettes. Table B-4 lists **MODE** values for flexible diskettes.

Table B-4: Flexible Diskette MODE Values (FIRQB+FQMODE)

Decimal	Octal	Function
0.	0	Block mode
16384.	40000	Sector mode

Table B-5 lists **RECORD** values for flexible diskettes.

Table B-5: Flexible Diskette RECORD Values (XRB+XRBLK)

Decimal	Octal	Function
8192.	20000	Access logical record 0
16384.	40000	Write deleted data mark
32767.+1.	100000	Perform this I/O operation in block mode

B.3 Magnetic Tape

This section summarizes **MODE** and **CLUSTERSIZE** values for magnetic tape. Table B-6 lists **MODE** values for file-structured magnetic tape.

Table B-6: MODE Values for File-Structured Magnetic Tape (FIRQB+FQMODE)

Decimal	Octal	Function
0.	0	Read file label at current tape position
2.	2	Do not rewind tape when searching for file
16.	20	Write over existing file
32.	40	Rewind tape before searching for file
64.	100	Rewind on CLOSE
128.	200	Open for append
512.	1000	Write new file label without searching
1024.	2000	Use block length field as specified in /FILESIZE in place of record length field in /CLUSTERSIZE. Only meaningful on ANSI tape, when the record length field is zero.
16384.	40000	Search for DOS-formatted file label
24576.	60000	Search for ANSI-formatted file label

Table B-7 lists **CLUSTERSIZE** values for file-structured magnetic tape. The value in **FIRQB+FQCLUS** is the sum of the values chosen from Table B-7. The default value is zero.

NOTE

The **CLUSTERSIZE** option is only effective when processing ANSI-formatted magnetic tape.

Table B-7: CLUSTERSIZE Values for File-Structured Magnetic Tape Files (FIRQB+FQCLUS)

Label Field Name	Decimal	Octal	Label Result
Record format	0.	0	U = undefined. †
	16384.	40000	F = fixed-length.
	32767.+1.	100000	D = variable length.
	-16384.	140000	S = spanned. ‡
Record length (in bytes)	Between 0. and 4095.	Between 0 and 7777	For U, always 0. For F, fixed record length. For D, maximum record length. For S, not used. ‡ If this value is 0% and mode 1024% is used, then the record length field is set equal to the block length value specified in /FILESIZE=.

†RSTS/E undefined record formats cannot be processed directly by most of the other operating systems.

‡RSTS/E does not support ANSI format S records.

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Table B-7 (Cont.): CLUSTERSIZE Values for File-Structured Magnetic Tape Files (FIRQB+FQCLUS)

Label Field Name	Decimal	Octal	Label Result
System Dependent (File characteristics)	0.	0	M = carriage control embedded.
	4096.	10000	A = FORTRAN carriage control.
	8192.	20000	(space) = implied carriage control. When printed, line feed precedes and carriage return follows each record.

MODE values in non-file-structured magnetic tape processing have the form:

$$\text{MODE}(\text{FIRQB}+\text{FQMODE}) = D + P + S$$

where:

D (density)	=	12.(14) for 800 bpi 256.(400) for 1600 bpi, phase-encoded
P (parity)	=	0.(0) for odd 1.(1) for even (800 bpi only)
S (stay)	=	0.(0) to clear MODE value after CLOSE 8192.(20000) to retain MODE value after CLOSE

Note that Digital recommends the use of odd parity. When you use even parity, you cannot write binary data. In addition, many operating systems and tape drives do not support even parity.

For information on magnetic tape special functions, the magnetic tape status word, and the file characteristics word, see the description of .SPEC for magnetic tape (see Chapter 3).

B.4 Line Printers

This section summarizes line printer MODE and RECORD values. Table B-8 lists the MODE values for line printers.

Table B-8: Line Printer MODE Values (FIRQB+FQMODE)

Decimal	Octal	Function
1. to 127.	1 to 177	Sets form length to number of lines per page for software formatting (512., 1000) and automatic page skip (2048., 4000).
128.	200	Changes the character 0 (zero) to O (letter "oh").
256.	400	Truncates lines that are longer than unit was configured for instead of printing the rest of the line on the next physical line on the page.
512.	1000	Enables software formatting. Forms control characters are \geq 200(8).
1024.	2000	Translates lowercase characters to uppercase characters. Applies only to uppercase and lowercase line printers.
2048.	4000	Skips six lines (that is, skips over perforation line) at the bottom of each form.
4096.	10000	Moves paper to top of hardware form.
8192.	20000	Suppresses form feed on CLOSE.

Table B-9 lists the RECORD values for line printers.

Table B-9: Line Printer RECORD Values (XRB+XRMOD)

Decimal	Octal	Function
2.	2	Print over perforation (disables MODE 4000 for this output step).
4.	4	Do not return control to program until output is complete or an error occurs.
8.	10	Clear pending output buffers before buffering characters for the request.
8192.	20000	Return control to program if output stall is to occur. (See the .WRITE directive for more information.)

B.5 Terminals

This section summarizes MODE and RECORD values for terminals. It also includes information about echo control mode and VT100 ANSI-compatible escape sequences.

Table B-10 lists MODE values for terminal input.

Table B-10: Terminal MODE Values (FIRQB+FQMODE)

Decimal	Octal	Function
1.	1	Enable binary input from a terminal
2.	2	Reserved for TECO
4.	4	Suppress automatic CR/LF at right margin
8.	10	Enable echo control (turns off other modes and automatically enables MODE 4)
16.	20	Guard program against Ctrl/C interruption and dial-up line hibernation
32.	40	Enable incoming XON/XOFF processing
64.	100	Reserved
128.	200	Enable use of RUBOUT as a delimiter on video terminals
256.	400	Set escape sequence mode
16384.	40000	Transparent control character mode

Table B-11 lists RECORD values for terminal input.

Table B-11: RECORD Values for Terminal Input (XRB+XRMOD)

Decimal	Octal	Function
256.	400	Force interactive read (always obtain data from the user's terminal, never from a command file)
8192.	20000	Perform conditional input (execute input request without waiting for data to be available).
32767.+1.+K	100000+K	Perform multiterminal service input from assigned keyboard number K.
32767.+1.+ 16384.+S	140000+S	Perform multiterminal service input from any assigned keyboard: S = 0 Wait until input is available from any terminal. The error ?Data error on device may occur due to a race condition with Ctrl/C. 1. < S < 255. 1 < S < 377 Wait up to S seconds for input from any terminal and then return ?Data error on device if no input is available. S = 8192. S = 20000 Request input immediately; return ?Data error on device if no input is pending.

Table B–12 lists RECORD values for terminal output.

Table B–12: RECORD Values for Terminal Output (XRB+XRMOD)

Decimal	Octal	Function
256.	400	Declare echo control field (use with MODE 10).
4096.	10000	Output binary data to terminal.
8192.	20000	Return control to program if output stall is to occur. (See the .WRITE directive for more information.)
16384.	40000	Transparent control character mode.
32767.+1.+K	100000+K	Perform multiterminal service output to assigned keyboard K.

In echo control mode, the system strips the parity bit from all characters. All characters returned to your program have ASCII values in the range 1 to 255. The system does not pass synchronization or editing characters to your program. Delimiters are passed to your program but are never echoed. Table B–13 lists the echo control mode character set.

Table B–13: Echo Control Mode Character Set

Type of Character	ASCII Code (Octal)	Code Returned to User	Comments
Ignored	0		Used as filler for timing
Delimiters	Private	?	Private delimiter.
	3	3	^C (Ctrl/C).
	4	4	^D (Ctrl/D).
	12	12	Line feed.
	14	14	Form feed.
	15	15,12	Carriage return (with line feed appended).
	32	32	^Z (Ctrl/Z); generates error 11(10).
	33	33	If the Escape_Sequence characteristic is not in effect and escape character is received, 33 is returned to user and is treated as a delimiter. If the Escape_Sequence characteristic is in effect, escape character triggers an escape sequence. The escape sequence is returned to user and the whole sequence is considered the delimiter.
	175	33 or 175	If the Alt_Mode characteristic is in effect, 175 is translated to escape (33). If the Alt_Mode characteristic is not in effect, 175 is data.

(continued on next page)

Table B-13 (Cont.): Echo Control Mode Character Set

Type of Character	ASCII Code (Octal)	Code Returned to User	Comments
	176	33 or 176	If the Alt_Mode characteristic is in effect, 176 is translated to escape (33). If the Alt_Mode characteristic is not in effect, 176 is data.
Editing	177	-	RUBOUT (DEL character); on video terminals, generates a backspace followed by the paint character and another backspace; on hard-copy terminals, echoes deleted characters between backslashes (\ \).
	25	-	^U (Ctrl/U); repeatedly simulates RUBOUT until no characters remain in field.
Data	40-137 241-337	40-137 241-337	Normal 64-character graphic set.
	140-176 340-376	100-136 300-336	If the Lowercase=input characteristic is not set, lowercase letters are translated to uppercase.
	140-176 340-376	140-176 340-376	If the Lowercase=input characteristic is set, lowercase letters are returned to user.
Synchro- niza- tion	21	-	XON (Ctrl/Q). Resume suspended output (if the TTSync characteristic is set).
	23	-	XOFF (Ctrl/S). Suspend output (if the TTSync characteristic is set).
Other	1,2,5,6 7,10,11, 13,16-20, 22,24, 26-31, 34-37	-	Echoed as BEL (7) but otherwise ignored.
	21,23	-	If the terminal is set No TTSync, synchronization characters are also echoed as BEL (7) and ignored.

Use `.WRITE` to declare a field. The `.WRITE` must include the value 400 at `XRFB+XRMOD` and the value `N` at `XRFB+XRBC`. `N`, which must be between 1 and the size of the buffer, describes how many bytes in the buffer represent the field declaration:

- `N = 1` The byte contains field size and overflow handling information. The field size must be in the range 1 to 177. Adding 200 to the field size specifies keypunch overflow handling instead of normal overflow handling.
- `N = 2` The first byte contains field size and overflow handling as described for `N = 1`. The second byte contains the ASCII value of the paint character. If this byte is 0 or `N = 1`, a space is the paint character.
- `N > 2` The first (`N-2`) bytes contain a prompt to display on the terminal before the field. Byte (`N-1`) is the field size declaration as described for `N = 1`. The last byte is the paint character as described for `N = 2`.

B.6 Pseudo Keyboards

This section summarizes `MODE` and `RECORD` values for pseudo keyboards. It also lists errors your program can receive on a pseudo keyboard output request.

Table B-14 lists `MODE` values for pseudo keyboards.

Table B-14: Pseudo Keyboard MODE Values (FIRQB+FQMODE)

Decimal	Octal	Function
0.	0	System kills controlled job when the pseudo keyboard is closed
1.	1	System detaches controlled job when the pseudo keyboard is closed

Table B-15 lists `RECORD` values for pseudo keyboards.

Table B-15: RECORD Option Bit Values for Pseudo Keyboard Output (XRFB+XRMOD)

Bit	Decimal	Octal	Result
0	1.	1	If set, the system does not check job status before sending data to the pseudo keyboard.
1	2.	2	If set, the system tests whether pseudo keyboard is waiting for a system command (<code>Ctrl/C</code> state) or is waiting for program input (<code>KB wait</code> state).
2	4.	4	If set, the system does not send data to the pseudo keyboard but instead returns control to the controlling job.
3	8.	10	If set, and there are no small buffers for keyboard input, the system waits until small buffers are available. However, your program receives the <code>NOROOM</code> error if the output buffer chain is full.
4	16.	20	If set, the system kills the job currently running at the pseudo keyboard.

Table B–16 lists errors that your program can receive on a pseudo keyboard output request.

Table B–16: Possible Errors on Pseudo Keyboard Output Request

Error	Meaning
INUSE	Job at pseudo keyboard is not ready for input
NOROOM	No buffer space is available
NOSUCH	No controlled job exists at pseudo keyboard
CTRLCE	Job at pseudo keyboard is not in Ctrl/C state

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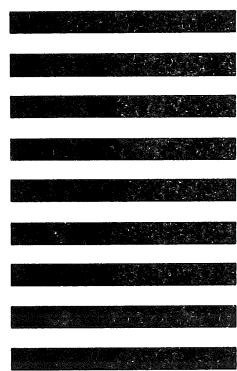
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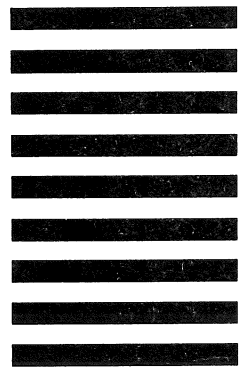
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