Addendum To

STAND-ALONE OPERATING SYSTEM User's Manual

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NOTICE

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This addendum, 086-000022-01, updates the Stand-Alone Operating System User's Manual, 093-000062-04. Double bars on the outside margin of each page indicate areas of change from the original manual.

STAND-ALONE OPERATING SYSTEM User's Manual

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This revision of the Stand-Alone Operating System User's Manual, 093-000062-04 and its addendum, 086-000022-01, supersedes 093-000062-03 and constitutes a major revision to the manual. A chapter on CLI commands has been added and the system utility programs are described in greater detail in this revision. Double bars on the outside of each page indicate areas of change from the parent manual, 093-000062-04.

CHAPTER 4 - PROGRAM MODE OF SYSTEM COMMUNICATION

CHAPTER 5 - CONFIGURING SOS UTILITY PROGRAMS

CHAPTER 2

SOS FILES AND DEVICES

SOS files may reside on any SOS device; these devices include magnetic tape units, high speed paper tape reader, high speed paper tape punch, teletypewriter keyboard, etc. In this sense, the terms file and device are interchangeable in the SOS environment. Files are "read from" and "written to", devices are also "read from" and "written to". In the case of magnetic and cassette tapes however, the term file is slightly more encompassing:

> The tape unit or device may contain several files. For example, cassette unit 1 may contain the files CT1:0, CT1:1, CT1:2 and CT1:3.

Cassette and magnetic tape units are the only devices upon which more than one file may reside at the same time. The expression file/device which occurs throughout the remainder of this manual denotes this distinction.

SPECIFYING SOS DEVICES

In a Standard SOS environment, a device is "opened" by passing its fixed SOS Channel Number to the operating system. Under RDOS-SOS, a device is "opened" by passing its filename and an RDOS Channel Number ($0\text{-}76_8$) to the operating system; the system then translates that name into the appropriate SOS Channel Number in order to complete the "open". The RDOS Channel Number that is passed is only assigned to that device for the duration of the "open". The SOS Channel Numbers are always assigned to the same devices however. The list of SOS devices by name and by SOS Channel Number is shown in Table 2-1.

SPECIFYING SOS DEVICES (Continued)

Device Name	Fixed Channel No.	Device Name	Fixed Channel No.
TTI1	5	MT3	23
$PLT	6	MT4	24
TTO1	7	MT5	25
$TTP	10	MT6	26
$CDR	11	MT7	27
$TTO	12	CT0	30
$TTI	13	CT1	31
$LPT	14	CT2	32
$PTR	15	CT3	33
$PTP	16	CT4	34
$TTR	17	CT5	35
MT0	20	CT6	36
MT1	21	CT7	37
MT2	22		

Table 2-1. SOS Devices

The device names are the same as those recognized by RDOS. TTI1 and TTO1 refer to a second Teletype® * which uses device codes 50_8 and 51_8. The other names are self-explanatory. All SOS Utilities recognize devices by the names shown in the table.

LOADING SOS ROUTINES AND DEVICE DRIVERS

In order to select any program in the SOS Libraries for loading, an ENTRY symbol (.ENT) in the desired program must resolve an EXTERNAL (.EXTN or .EXTD) symbol declared in a previously loaded program. Programmers using the SOS or Stand-alone RLDR must use .EXTN. It is the user's responsibility to supply these EXTERNAL declarations to the Relocatable Loader before the SOS Libraries are provided as input to the loader. Each separately assembled program in the SOS Libraries has one or more ENTRY symbols associated with it. Many of these programs also have EXTERNAL declarations which select successive library programs for loading, once they themselves are loaded. For example, the SOS Magnetic Tape Library contains 8 separate programs: a control table and I/O buffer for units 1-7 plus a control table, I/O buffer and

*Teletype is a registered trademark of Teletype Corporation, Skokie, Illinois.

device driver (which controls from 1-8 units) for unit 0. In order to load the necessary programs to support 8 units, only one EXTERNAL declaration need be specified however. That program will then cause the loading of each subsequent program in the library.

The complete set of necessary EXTERNAL declaractions in relocatable binary format is called a trigger. Triggers are produced in two ways:

(1) By assembling a source program of the form:

```
.TITLE    TRIGGER
.EXTN     A,B,C,...
.END
```

where A,B,C,... are the symbols that are ENTRY points in the desired routines in the SOS Libraries.

(2) By using the SYSGEN program to produce the relocatable binary file directly. In the above example, the SYSGEN command line shown below would produce an equivalent file on the high speed punch.

```
(SYSG) TRIGG/T  $PTP/O  A B C ... )
```

Table 2-2 lists the necessary EXTERNAL NORMAL declarations in order to select any SOS Library program for loading.

(This page left blank intentionally)

Physical Characteristics of Cassette and Magnetic Tapes (Continued)

Since consecutive EOF marks always mark the end of the tape to SOS, overwriting or rewriting a file makes any files which used to follow this file inaccessible. For example, if file 3 were overwritten on a tape containing 13 files (files 0-12), files 4 through 12 would become inaccessible and an attempt to reference any file greater than 3 would result in a FILE NON-EXISTENT error.

System commands described in later chapters are used to initialize a tape drive and release a tape drive. The CLI "INIT" command causes a tape on that drive to be rewound and initialized. Full initialization (INIT/F) causes the tape to be rewound and two EOF's to be written. An INIT/F should be performed on all blank (new) magnetic tapes and cassettes before using them. The RELEASE command causes the tape to be rewound and then released from the system.

If a parity error is detected during reading, the system attempts to reread data ten times before issuing a FILE DATA error. If an error is detected after writing, the system will attempt to backspace, erase and rewrite ten times. If the rewrite is unsuccessful after ten times, a FILE DATA error is returned.

Opening Magnetic Tape and Cassette Files

A cassette or magnetic tape file is opened using the .OPEN command (see page 4-8). When performing an .OPEN command under RDOS-SOS, AC0 must contain a byte pointer to the unit name/file number. The string for the pointer has the format:

MTn:dd
where: n is the unit number (0-7) of the magnetic tape unit.
dd is the file number (0-99).

Either a one-digit or two-digit number may be used to reference file numbers 0-9. File number 8 on unit 2 could be referenced as:

MT2:08 or MT2:8
CT2:08 or CT2:8

An example of this would be:

```
            LDA  0,FILE8            ;LINKS THE FILE
            .SYSTM
            .OPEN 3                 ;SPECIFY CHANNEL (0-76 OCTAL)
            error return
            normal return
FILE8:      .+1*2
            .TXT   *MT2:08*         ;FILE
```

Thus, channel number 3 is linked to the file (MT2:8) as specified by the byte pointer. Once the file has been opened, the file is then referenced by channel number 3.

Under Standard SOS, the fixed channel number is given in the .OPEN command (20-27 for magnetic tapes and 30-37 for cassette units). AC0 contains the file number, which in this case can be any positive number from $0\text{-}99_{10}$. For example:

```
            LDA  0, FILE8
            .SYSTM
            .OPEN 22                ;MT2
            error return
            normal return
FILE8:      8.                      ;FILE NUMBER
```

or

SYSTEM CONSOLE BREAKS (Continued)

The SOS Editor treats the CTRL A break somewhat differently. If the break is entered while one of the following Editor commands is in progress:

T, Y, N, E, or P

then the operation is terminated and the program restarts with I/O reset but with the input buffer intact. If this break is entered at some other time while the Editor is executing, it is ignored.

Pressing CTRL and C on a console keyboard causes an immediate transfer to the Core Image Loader program (and is consequently ignored by all non-cassette or magnetic tape utilities). This program issues its prompt message (#) and waits for the user to specify the next program to be loaded. It is very convenient when executing from a master reel (see Chapter 5) to use this feature to swap the utilities in and out of core. All program activity terminates immediately when this break is entered. All appropriately configured SOS utilities except the Editor treat the CTRL C break in this manner.

The SOS Editor ignores this break however. To return to the Core Image Loader from this utility, the "H" command must be issued.

The section on the User Status Table, page 4-30, describes the means available for employing these breaks by user programs.

CORE IMAGE LOADER/WRITER

The core image loader/writer is a utility program that performs two functions: it loads core image files from cassette or magnetic tape into core and produces core image or save files on cassette or magnetic tape from the contents of core. There are two versions of the core image loader/writer -- one for use with cassette drives and another for use with magnetic tape drives. The cassette version works only with cassettes and the magnetic tape version works only with magnetic tape. Both versions when loaded occupy the last 400_8 locations in core.

Installation Procedure

The absolute binary version of the Core Image Loader/Writer, when loaded into core, permits the user to install it on unit 0, file 0 of the appropriate tape. The program types the message

LOAD UNIT 0: STRIKE ANY KEY

at the system console. When a tape reel that is not write protected is mounted on unit 0 and the unit is ready, the user may depress any teletype key. The program then writes the appropriate subset of itself to file 0 of that unit. When this write operation is complete, the message

LOADER INSTALLED

is typed at the system console and the program HALTs. This tape reel is now usable for the Bootstrap Procedure described below. The Installation Procedure may be repeated; depress the CONTINUE switch on the master console and the LOAD UNIT 0: STRIKE ANY KEY message will be issued. A new tape reel may be mounted on unit 0, or the unit assignments changed and the procedure repeated.

Bootstrap Procedure

The core image loader/writer can be bootstrap-loaded from file 0 of the master cassette or magnetic tape reel. The master reel must be installed on cassette or magnetic tape unit 0 and the drive must be rewound manually. This can be done by pressing the REWIND button on the drive unit.

For machines without the Program Load option, deposit the starting address into location 376_8, and deposit 000377 into location 377_8. The starting address is:

060134 - cassette units
060122 - magnetic tape units

Set address switches to 376_8. Press RESET and then START.

Bootstrap Procedure (Continued)

For machines with the Program Load option, set the data switches on the console to 100034 (for cassette units) or 100022 (for magnetic tape units), press RESET then PROGRAM LOAD.

The core image loader/writer is read into page zero initially and then relocates itself to the high end of memory. At the end of the relocation process, the loader outputs a prompt (#) on the teletype. This prompt indicates that the core image loader is ready to accept a command. Whenever the core image loader/writer is resident in core, the core image loader may be restarted by setting the data switches to the address of the last location in memory, pressing RESET, and then pressing START. The core image writer can be started by setting the data switches to the address of the next to last location in core, pressing RESET and then pressing START.

Core Image Loader Operation

Having issued the # prompt on the teletype, the core image loader waits for an operator response of a device number (0-7) and a file number (0-99) separated by a colon. Device 0 need not be specified. For example:

```
#2:7)    (unit 2, file 7)
#4 )     (unit 0, file 4)
```

The indicated cassette or magnetic tape file is loaded from the specified device into memory, starting at the address specified in location 2. If the A key is struck instead of the carriage return after the unit and file entry, the loader will halt after loading is complete. For example:

```
#1:2A
```

causes file 2 of unit 1 to be read into core followed by a HALT.

The Core Image Loader always sets the UST CTRL C break location (USTBR) to point to itself after it loads a program. The loaded program may then ignore, disable, or change this location. (See User Status Table, page 4-20)

If the core image loader encounters a non-recoverable error while trying to load a core image file, it will type

```
*ERR
```

and halt with the cassette or magnetic tape status word in AC0. The following list describes the error conditions assigned to each bit in the status word.

Core Image Loader Operation (Continued)

BIT	MEANING
1	Data late (perhaps due to a long indirect access chain or a faster device preempting the channel.
3	Illegal command
5	Lateral parity error in a word
6	Addressed tape is beyond the EOT marker
8	Addressed tape is at load point
10	Bad tape (e.g., data is found in an interrecord gap)
13	Unit is write locked
14	Odd number of bytes detected in a read or write attempt

If rewinding and substituting a fresh cassette or magnetic tape does not cure an error condition, a hardware malfunction is indicated; run the appropriate diagnostic program.

Core Image Writer Operation

The core image writer operates in a manner similar to that of the core image loader. When the core image writer is started (see page 3-5), it outputs a # prompt and waits for specification of a device number and a file number separated by a colon. Unit 0 need not be specified. After the file has been specified, the core image writer will request specification of the upper core address (NMAX) to be written onto tape. It does this by typing:

NMAX:

on the teletypewriter. The operator must then respond with the highest core address (in octal) whose contents he wants written into the core image cassette or magnetic tape file. Upon detection of a non-recoverable error, the core image writer proceeds in the same way as the core image loader. After completing a successful write, the program types OK and HALTS.

CLI Commands

This section contains definitions and descriptions of each of the CLI commands. The commands are listed in alphabetical order at the bottom of the page and described in that order on pages following.

The following conventions are used to define individual CLI command formats:

All upper case letters represent valid command line elements.

Items in a command line printed in lower case indicate either command information or file names which must be supplied in the command line.

Elements enclosed in modified brackets, { }, are optional. Stacked items indicate alternate choices.

The ellipsis (...) is used to indicate that preceding file types or bracketed material may be repeated if desired.

The comma (,), and right slash (/) are significant and necessary parts of any command line definition in which they are found.

APPEND	-	Concatenate two or more files.
BOOT	-	Invoke a utility program or load any file.
BPUNCH	-	Copy a binary file on $PTP.
COPY	-	Copy a cassette or magnetic tape reel.
DEB	-	Start a program about to be executed in the Debugger.
DUMP	-	Produce a dump format file.
FILCOM	-	Compare two files.
GTOD	-	Get time and date.
INIT	-	Initialize cassette or magnetic tape.
LOAD	-	Reload dumped files.
MKABS	-	Make an absolute binary file from a core image or save file.
MKSAVE	-	Make a save file from an absolute binary file.
PRINT	-	Print an ASCII file on the line printer.
PUNCH	-	Copy an ASCII file on the $PTP.
RELEASE	-	Release cassette or magnetic tape.
SDAY	-	Set today's date.
STOD	-	Set the time.
TYPE	-	Output the contents of an ASCII file on the system console.
XFER	-	Copy a file to another file.

CLI Commands (Continued)

Name: APPEND

Format: APPEND newfilename oldfilename$_1$ [... oldfilename$_n$]

Purpose: To create a new file, consisting of a concatenation of one or more old files in the order in which their names are listed as arguments. The old files are not changed by the command.

Switches: None.

Examples: APPEND MT0:0 CT1:1 CT1:2 CT1:3 CT1:4)

causes creation of the file MT0:0 containing the contents of files CT1:1 CT1:2 CT1:3 CT1:4 in that order.

APPEND CT0:0 CT1:2 MT1:0 CT1:1 $PTR)

causes creation of the file CT0:0 containing the files CT1:2, MT1:0, CT1:1 and the paper tape reader.

Note: The same device cannot be used for both input and output files. If it is, an incorrect file number may be written to a block within a tape file. Attempts to reference these files will result in the error message: FILE READ ERROR. Since SOS backs up or spaces forward depending upon the file number read within the last block accessed, attempts to reference other files physically before the incorrectly written file will be erroneous. To recover, manually rewind the tape and bootstrap the CILW. The input file has probably been destroyed.

Name: BOOT

Format: BOOT filename

Purpose: To invoke a utility program or any executable file. To boot a utility program the following are used:

Mnemonics:
- ASM - load the Assembler
- EDIT - load the Text Editor
- FORT - load the FORTRAN IV Compiler
- LFE - load the Library File Editor
- RLDR - load the Relocatable Loader
- SYSG - load SYSGEN
- CLI - load the Command Line Interpreter

Switches:

Local:
- /A - causes the Core Image Loader to HALT instead of starting the program after it is loaded.

Examples:

```
BOOT EDIT )
```

loads and starts the Editor from a master reel.

```
BOOT RLDR/A )
```

loads the Relocatable Loader from a master reel and HALTs.

```
BOOT $TTR )
LOAD $TTR, STRIKE ANY KEY
```

loads an absolute binary tape from the teletypewriter reader.

```
BOOT CT1:2/A )
```

causes file 2 on cassette unit 1 to be loaded and HALTs.

Name: BPUNCH

Format: BPUNCH filename$_1$ [filename$_2$ ...]

Purpose: To punch a given file or files in binary on the high speed punch. The command is the equivalent of a series of XFER commands:

XFER filename$_1$ $PTP;... ;XFER filename$_n$ $PTP)

The files may come from any input device.

Switches: None.

Examples: BPUNCH MT0:0 MT0:1 CT0:3 $PTR)

causes files MT0:0,MT0:1, CT0:3, and $PTR to be punched on the high speed punch.

BPUNCH $PTR)

causes a duplicate of the paper tape in the high speed reader to be punched.

Library File Editor (Continued)

Switches:
Local:
(Continued)

/O - Output library file switch naming the new library file. (Delete, insert, merge, replace, and extract commands.)

/R - Record switch. The logical recordname preceding the switch will be analyzed. (Analyze command.)

/# - Number switch, indicating how many binary records or libraries will be read. (Modifies $PTR or $TTR files only in analyze, insert, merge, and titles commands.)

WARNING: Do not use the $TTP as an output device.

Examples:

```
A $LPT/L $PTR ABC/R CDE/R
```

causes logical records ABC and CDE in a library loaded on the high speed reader to be analyzed with output on the line printer.

```
A $PTR/I $PTP/O ABC DEF
```

causes logical records ABC and DEF to be deleted from the input library file, with the resulting library output on the high speed punch.

```
I $PTP/O $PTR/3
```

causes three relocatable binary records mounted on the high speed reader to be punched as a library file by the high speed punch.

```
I $PTR/I $PTP/O M/A $PTR
```

causes a library to be updated with binaries. If the input library consists of logical records L, M, and N and the update record is Q, Q is inserted after record M. The result is an updated library consisting of records L, M, Q, and N. The new library is punched by the $PTP and the high speed reader is the single input device.

```
M CT1:23/O $PTR/3 $PTR/B/2
```

causes three libraries to be input, then two binaries, forming a new library output as file number 23 on cassette drive 1.

```
R $PTR/I $PTP/O REC1 $PTR
```

causes a library file, input on the high speed reader, to have one of its logical records (REC1) replaced by an update input via the high speed reader. The new library will be punched on the high speed punch.

Examples: (Continued)

T $PTR

causes the titles of all logical records in the library file mounted in the high speed reader to be printed on the teletypewriter printer by default.

X $PTR/I $PTP/O ABC

causes logical record ABC to be extracted from its library file, which is input on the high speed reader. Record ABC is a binary punched on the high speed punch.

Open a File (.OPEN, .EOPEN, or .ROPEN) (Continued)

The format of the .OPEN command is:

```
.SYSTM
.OPEN n                    ;OPEN CHANNEL n
error return
normal return
```

Possible errors resulting from .OPEN commands are:

AC2	Mnemonic	Meaning
0	ERFNO	Illegal channel number.
12	ERDLE	File does not exist.
21	ERUFT	Attempt to use channel already in use.
31	ERSEL	Unit improperly selected.

Get the Number of a Free Channel (.GCHN)

This call enables the user to obtain the number of a channel that is currently unused, if any, so that a file may be opened on this channel via one of the file open calls. .GCHN does not open a file on a free channel; it merely indicates a channel that is free at the moment. RDOS-SOS returns the lowest available channel number in the range 0-76. This command is illegal when running under Standard SOS.

The format of this call is:

```
.SYSTM
.GCHN
error return
normal return
```

Upon a normal return, the information is returned in AC2:

AC2 - Free channel number

One possible error return may occur.

AC2	Mnemonic	Meaning
21	ERUFT	No channels are free.

Close a File (.CLOSE)

After use, files may be closed to insure an orderly ending sequence. The channel number is then available for other I/O. The format of the .CLOSE command is:

```
.SYSTM
.CLOSE n                ;CLOSE CHANNEL n
error return
normal return
```

If the file closed requires trailer (such as the high speed punch) it will be output on the .CLOSE.

Possible errors resulting from a .CLOSE command are:

AC2	Mnemonic	Meaning
0	ERFNO	Illegal number.
15	ERFOP	Attempt to reference a channel not in use.

Close all Files (.RESET)

This command causes all currently open files to be closed. The command also insures that any partially filled buffers are written before the file is closed. The format of the .RESET command is:

```
.SYSTM
.RESET
error return
normal return
```

The error return from this command is never taken.

Read a Line (.RDL)

This command causes an ASCII line, written with even parity, to be read. AC0 must contain a byte pointer to the starting byte address within the user area into which the line will be read. This area should be 133 bytes long.

Reading will terminate normally after transmitting either a carriage return, form feed, or null to the user. Reading will terminate abnormally after transmission of 132 (decimal) characters without detecting a carriage return, form feed, or null as the 133 rd character, upon detection of a parity error, or upon an end-of-file (CTRL Z).

Get Today's Date (.GDAY) (Continued)

```
.SYSTM
.GDAY
error return
normal return
```

No error return is possible.

Set Today's Date (.SDAY)

This command permits the setting of the system calendar to a specific date. The user passes the number of the month in AC1 (January is month number 1), the number of the day within the month in AC0 and the number of the current year--less 1968--in AC2. This is the date that is unconditionally returned to the .GDAY command. It is not incremented when the time of day clock overflows. The format of the .SDAY command is:

```
.SYSTM
.SDAY
error return
normal return
```

One possible error message is:

AC2	Mnemonic	Meaning
41	ERTIM	Illegal day, month, or year.

Note that there is no checking for invalid dates such as 9/31 or 2/30.

Delay the Execution of a Task (.DELAY)

The calling program is suspended for the number of real-time clock pulses indicated by AC1. The real-time clock frequency was specified at load time (see .GHRZ).

The format of this command is:

AC1 - Number of RTC pulses

```
.SYSTM
.DELAY
error return
normal return
```

The error return is never taken. A "JMP ." instruction within the system is executed until this period elapses.

Examine the System Real Time Clock (.GHRZ)

This system call permits the user to examine the Real Time Clock frequency. The frequency is returned in AC0, in the following manner:

AC0	Meaning
0	There is no Real Time Clock in the system.
1	Frequency is 10 HZ.
2	Frequency is 100 HZ.
3	Frequency is 1000 HZ.
4	Frequency is 60 HZ (line frequency)
5	Frequency is 50 HZ (line frequency)

The format of this call is:

```
.SYSTM
.GHRZ
error return
normal return
```

The error return is never taken.

SERVICING USER INTERRUPTS

There are several considerations which must be made by any user wishing to service device interrupt requests. See Appendix A - Adding User Supplied Device Handlers.

Identify a User Interrupt (.IDEF)

In order to introduce to the system those devices (not identified at LOAD time) whose interrupts the system is to recognize, the system call .IDEF must be issued. This adds an entry to the SOS Interrupt Search List (See Appendix A). AC0 contains the device code of the new device. AC1 contains the address of the new device!s DCT. If the device code that is passed is 77_8, then AC1 contains the address to which the system passes control whenever it detects a power-fail interrupt. The format of the command is:

```
.SYSTM
.IDEF
error return
normal return
```

Identify a User Interrupt (Continued)

Possible error messages are:

AC2	Mnemonic	Meaning
36	ERDNM	Illegal device code(>77_8). Device code 77_8 is reserved for power monitor/auto restart option.
45	ERIBS	Interrupt device code in use.

Remove User Interrupt Servicing Program (.IRMV)

To prevent the system's recognition of user interrupts which have been previously identified by the .IDEF command, the .IRMV command must be issued. AC0 contains the user device code which is to be removed from the system's recognition. The format of the .IRMV command is:

```
.SYSTM
.IRMV
error return
normal return
```

One possible error message may be given:

AC2	Mnemonic	Meaning
36	ERDNM	Illegal device code (>77_8).

ERROR MESSAGES

Code	Mnemonic	Meaning	Applicable Commands
0	ERFNO	Illegal channel number.	.OPEN .EOPEN .ROPEN .GTATR .RDL .RDS .WRL .WRS
2	ERICM	Illegal system command.	- - -
3	ERICD	Illegal command for device.	.RDL .RDS .WRL .WRS
6	EREOF	End of file.	.RDL .RDS
7	ERRPR	Attempt to read a read-protected file.	.RDL .RDS
10	ERWPR	Attempt to write a write-protected file.	.WRL .WRS
12	ERDLE	Attempt to reference a non-existent file	.OPEN .EOPEN .ROPEN
15	ERFOP	Attempt to reference a file not opened	.GTATR .CLOSE .RDL .RDS .WRL .WRS

DEVICE RESPONSE TO SOS COMMANDS (Continued)

$PTR

.OPEN	Device is initialized; a prompt message is written and a response is necessary for the program to continue.
.CLOSE	Device is reinitialized.
.RDS	The specified bytes are read into the user area from the device, unedited.
.RDL	The ASCII string is read into the user area from the device. Rubouts and line feeds are ignored.

$PTP

.OPEN	Device is initialized; leader is punched.
.CLOSE	Device is reinitialized after outstanding I/O is complete; trailer is punched.
.WRS	The specified bytes are output to the device, unedited.
.WRL	The ASCII string is output to the device with rubouts inserted after tabs, a line feed after a carriage return, and nulls after a form feed.

MTA (See Chapter 2, SOS Cassette and Magnetic Tape Files.)

.OPEN	Device is initialized; the specified file is located on the tape reel, and the read/write head positioned to the file mark preceding.
.CLOSE	Device is reinitialized. Following write operations, the last partial block is output to the file(padded with nulls if necessary) and two end of files marks are written.
.RDS	The specified bytes are read into the user area from the file, unedited.
.RDL	The ASCII string is read into the user area from the file. Rubouts and line feeds are ignored.
.WRS	The specified bytes are output to the file, unedited.
.WRL	The ASCII string is output to the file.

USER STATUS TABLE

The User Status Table (UST) is a 24 octal word table which records all information pertinent to the execution of an entire program level. This table is located at addresses 0400 through 0423 inclusive and has the following structure:

address	label	contents
400	USTPC	Program counter
401	USTZM	ZMAX
402	USTSS	Start of Symbol Table (SST)
403	USTES	End of Symbol Table (EST)
404	USTNM	NMAX after runtime .MEMIs
405	USTSA	Starting address of program
406	USTDA	Debugger address; -1 if not loaded
407	USTHU	Highest load address
410	USTCS	FORTRAN common area size
411	USTIT	Interrupt address (Control A keyboard character)
412	USTBR	Break address (Control C keyboard character)
413	USTCH	Number of channels and TCBs (unused by SOS)
414	USTCT	Current TCB pointer (unused by SOS)
415	USTAC	Start of active TCB chain (unused by SOS)
416	USTFC	Start of free TCB chain (unused by SOS)
417	USTIN	Initial Start of NREL code (INMAX)
420	USTOD	Overlay directory address (unused by SOS)
421	USTSV	State variable generalized save routine (unused in SOS)
422	USTRV	Revision level (unused by SOS)
423	USTIA	TCB address of interrupt or break procedure (unused by SOS)

Location 400 - USTPC is the program counter.

Location 401 - USTZM points to the first available location in page zero for page zero relocatable code.

Location 402 and 403 - USTSS and USTES point to the start and end of the symbol table respectively. The loader sets 402 and 403 to 0 if the debugger is not loaded.

Location 404 - USTNM contains NMAX. The loader sets the pointer to the first free location for further loading or for allocation of temporary storage at run time.

*Location 12, USTP always points to the start of the UST.

USER STATUS TABLE (Continued)

Location 405 - USTSA points to the program starting address, specified by the .END statement. If no starting address is specified by any loaded program, -1 is stored in 405. If several programs specify starting addresses, USTSA contains the address specified in the last program loaded. (Location 377 contains a JMP @2, which transfers control to a routine in SOS which performs a .SYSI and then branches to the program starting address. Therefore, the user can conveniently restart his program at 377, assuming that he has specified a starting address.)

Location 406 - USTDA points to the starting address of the debugger, or if the debugger is not loaded, 406 contains -1.

Location 407 - USTHU is set to the value of NMAX at the termination of loading. This word is never changed by the operating system during program execution. It is used to reset USTNM whenever a .SYSI is executed.

Location 410 - USTCS contains the size of the FORTRAN unlabeled common area.

Location 411 and 412 - USTIT and USTBR are the interrupt address and break address respectively. Both are initialized to -1. Whenever the location contains 0 or -1, the corresponding interrupt is ignored by the system. To receive control after CTRL A interrupts, USTIT must be changed by the user program to the desired transfer address. The Core Image Loader sets USTBR to the beginning address of the Core Image Loader whenever it loads a save file into core. The user program may then modify USTBR to either point to its own CTRL C break address or to disable CTRL C interrupts. When control is passed to the USTIT address, machine interrupts are enabled; when control is passed to the USTBR address, machine interrupts are disabled.

Location 413-416 - Locations that are used by RDOS and RTOS.

Location 417 - USTIN contains the address of the start of normally relocatable code (440_8).

Location 420 - Location used by RDOS.

Location 421 - USTSV points to the address of the FORTRAN state variable save routine.

Location 422-423 - Locations that are used by RDOS.

CHAPTER 5

CONFIGURING SOS UTILITY PROGRAMS

The process of configuring a utility program generally consists of the following:

1. Producing a trigger which specifies the desired I/O support.

2. Performing a relocatable load of the trigger, the appropriate SOS libraries, and the relocatable binary (RB) version of the utility program.

These procedures apply to all SOS utilities except the assembler. The assembler program requires an execution pass on the DGC command definitions in order to expand its permanent symbol table appropriately after it had been loaded.

SUPPLIED TAPES

The tapes listed below comprise the SOS package. These tape lists are separated according to those that are supplied to paper tape, cassette or magnetic tape users. For a complete list of type and revision numbers, consult your Software Subscription Release Notice.

SOS Paper Tape System Tapes

Model 3088, Support for Paper Tape only

Name	Tape No.
Relocatable Debug II	089-000031
Relocatable Floating Point Interpreter	089-000046
Relocatable Binary Punch	089-000080
SOS Library File Editor (SLFE.RB)	089-000081
SOS Text Editor (SEDIT.RB)	089-000104
SOS Extended Assembler	089-000106
SOS System Generation (SYSG.RB)	089-000122
SOS Stand-Alone Parameters	090-000498
SOS User Application Parameters	090-000889
RDOS User Parameters (PARU.SR)	090-002935
NOVA®* Basic Instruction Set (NBID.SR)	090-002998
Floating Point Instructions (FPID.SR)	090-002999

*NOVA is a registered trademark of Data General Corporation, Southboro, Massachusetts.

SOS Paper Tape System Tapes (Continued)

Name	Tape No.
Operating Systems Instructions (OSID.SR)	090-003000
ECLIPSE™ * Extended Instructions (NEID.SR)	090-003239
ECLIPSE Floating Point Instructions (NFPID.SR)	090-003240
Binary Loader (BLDR.AB)	091-000004
Tape Duplicator (DUP.AB)	091-000008
Single User Basic (BASIC.AB)	091-000018
Extended Relocatable Loader (RLDR.AB)	091-000038
SOS Library File Editor (SLFE.AB)	091-000057
SOS Extended Assembler (SASM.AB)	091-000069
SOS System Generation (SYSG.AB)	091-000070
SOS Text Editor (SEDIT.AB)	091-000094
Relocatable Math. Library (MATH.LB)	099-000001
Stand-Alone Operating System (SOS.LB)	099-000010
Stand-Alone unmapped NOVA Debug	089-000179
Stand-Alone mapped NOVA debug	089-000180
Stand-Alone unmapped ECLIPSE Debug	089-000181
Stand-Alone mapped ECLIPSE Debug	089-000182

The absolute binary (AB) versions of these programs are preconfigured with conventional paper tape support, viz., high speed paper tape reader and punch, full teletypewriter (keyboard, printer, reader, and punch) and 80 column line printer.

SOS Paper Tape Systems with Cassette/Magnetic Tape Support

Users having cassettes or magnetic tape drives will receive all the tapes supplied to users having paper tape systems as listed above, plus the following:

Model 3229, Cassette/Magnetic Tape Support

Name	Tape No.
SOS CT/MT Relocatable Loader (SRLDR.RB)	089-000120
SOS Command Line Interpreter (SCLI.RB)	089-000121
SOS CT Core Image Loader/Writer (CILWCT.AB)	091-000067
SOS MT Core Image Loader/Writer (CILWMT.AB)	091-000068
SOS Command Line Interpreter (SCLI.AB)	091-000075
SOS CT/MT Relocatable Loader (SRLDR.AB)	091-000076
SOS Cassette Driver Library (SOSCT.LB)	099-000041
SOS Magnetic Tape Driver Library (SOSMT.LB)	099-000042

* ECLIPSE is a trademark of Data General Corporation, Southboro, Massachusetts.

SOS Cassette Systems

Users with cassette systems also receive four cassette reels: 070-000002, 070-000003, 070-000054, and 070-000093. These contain programs in save (SV) or executable format and in relocatable binary (RB) format as follows:

Model 3236C, Cassette Systems

070-000002 (first cassette):

Core Image Loader/Writer (CILWCT.SV)	File 0
CT/MT Relocatable Loader (SRLDR.SV)	File 1
Command Line Interpreter (SCLI.SV)	File 2
Text Editor (SEDIT.SV)	File 3
Extended Assembler (SASM.SV)	File 4

070-000003 (second cassette):

Stand-Alone Operating System Cassette Driver Library (SOSCT.LB)	File 0
Stand-Alone Operating System Magnetic Tape Driver Library (SOSMT.LB)	File 1
Stand-Alone Operating System Library (SOS.LB)	File 2
Command Line Interpreter (SCLI.RB)	File 3
Text Editor (SEDIT.RB)	File 4
Extended Assembler (SASM.RB)	File 5
Relocatable Loader (SRLDR.RB)	File 6
Library File Editor (SLFE.RB)	File 7
System Generation (SYSG.RB)	File 8

070-000054 (third cassette):

Library File Editor (SLFE.SV)	File 0
System Generation (SYSG.SV)	File 1
Relocatable Floating Point Interpreter (RFPI.RB)	File 2
Stand-Alone Unmapped NOVA Debug (SADEB.RB)	File 3
Stand-Alone Mapped NOVA Debug (SAMDEB.RB)	File 4
Stand-Alone Unmapped ECLIPSE Debug (SABDEB.RB)	File 5
Stand-Alone Mapped ECLIPSE Debug (SAADEB.RB)	File 6
Cassette Core-Image Loader/Writer	File 7
Magnetic Tape Core-Image Loader/Writer	File 8

SOS Cassette Systems (Continued)

070-000093 (fourth cassette):

SOS Stand-Alone Parameters (PARA.SR)	File 0
SOS User Application Parameters (PARUA.SR)	File 1
RDOS User Parameters (PARU.SR)	File 2
NOVA Basic Instruction Definitions (NBID.SR)	File 4
NOVA Floating Point Instruction Definitions (FPID.SR)	File 5
RDOS Instruction Definitions (OSID.SR)	File 6
ECLIPSE Extended Instruction Definitions (NEID.SR)	File 7
ECLIPSE Floating Point Instruction Definitions (NFPID.SR)	File 8
Relocatable Math. Library (MATH.LB)	File 9

Procedures for configuring SOS utilities using cassette input files are identical in concept to those using paper tape input files (described later in this chapter). The use of cassettes instead of paper tape makes the configuration procedures easier and quicker, however.

SOS Magnetic Tape Systems

Users with magnetic tape systems receive magnetic tape reel 071-000004, containing files in source file, relocatable binary, and save file formats as indicated in the following list:

Core Image Loader/Writer (CILWMT.SV)	File 0
CT/MT Relocatable Loader (SRLDR.SV)	File 1
Command Line Interpreter (SCLI.SV)	File 2
Text Editor (SEDIT.SV)	File 3
Extended Assembler (SASM.SV)	File 4
Library File Editor (SLFE.SV)	File 5
System Generation (SYSG.SV)	File 6
Magnetic Tape Driver Library (SOSMT.LB)	File 7
Cassette Driver Library (SOSCT.LB)	File 8
Stand-Alone Operating System Library (SOS.LB)	File 9
Command Line Interpreter (SCLI.RB)	File 10
Text Editor (SEDIT.RB)	File 11
Extended Assembler (SASM.RB)	File 12
CT/MT Relocatable Loader (SRLDR.RB)	File 13
Library File Editor (SLFE.RB)	File 14
System Generation (SYSG.RB)	File 15

SOS Magnetic Tape Systems (Continued)

NOVA Basic Instruction Definitions (NBID.SR)	File 16
NOVA Floating Point Instruction Definitions (FPID.SR)	File 17
RDOS Instruction Definitions (OSID.SR)	File 18
RDOS User Parameters (PARU.SR)	File 19
SOS Stand-Alone Parameters (PARA.SR)	File 21
SOS User Application Parameters (PARUA.SR)	File 22
ECLIPSE Extended Instruction Definitions (NEID.SR)	File 23
ECLIPSE Extended Floating Point Instruction Definitions (NFPID.SR)	File 24
Relocatable Math. Library (MATH.LB)	File 25
Relocatable Floating Point Interpreter (RFPI.RB)	File 26
SOS MT Core Image Loader/Writer (CILWMT.AB)	File 27
SOS CT Core Image Loader/Writer (CILWCT.AB)	File 28
Stand-Alone Unmapped NOVA Debug (SADEB.RB)	File 29
Stand-Alone Mapped NOVA Debug (SAMDEB.RB)	File 30
Stand-Alone Unmapped ECLIPSE Debug (SABDEB.RB)	File 31
Stand-Alone Mapped ECLIPSE Debug (SAADEB.RB)	File 32

Procedures for configuring SOS utilities using the magnetic tape master reel and two magnetic tape drives are identical in concept to those using paper tape input files. Paper tape procedures are described in the following two sections. The use of a magnetic tape master reel instead of many paper tape master files adds an extra measure of convenience to the configuration procedures.

PRODUCING A TRIGGER

Triggers are produced by the SYSG program. This program accepts a command line, which contains device driver ENTRY symbols, from the console device. It outputs a relocatable binary file (the trigger) which is comprised of EXTERNAL NORMAL symbols corresponding to the named device drivers. These EXTERNAL NORMALs cause the selection or "triggering" of the desired routines for loading when the trigger precedes the SOS Libraries as input to the relocatable loader.

The first step to produce a trigger is to load and start the SYSG program. This can be done by using the binary loader to load the absolute binary SYSG paper tape (091-000070) or an executable SYSG from cassette (file 1 of cassette 3) or magnetic tape (file 6). SYSG is loaded from cassette or magnetic tape using the appropriate Core Image Loader/Writer (CILWCT.AB or CILWMT.AB).

PRODUCING A TRIGGER (Continued)

When the SYSGEN program is started, it outputs the prompt message:

SYSG

and waits for the user to type a command line. This command line has the following format:

(SYSG) driver$_1$...driver$_n$ .RDSI [.CTB] [.RTC1] output-file/O [ ) [triggername/T])

where:

driver	is an entry symbol in the desired device driver routine. Table 2-2 lists all possible symbols.
.CTB	is the optional Command Table Builder. This symbol must be specified for triggers to be used in configuring the SOS Assembler, the SOS Relocatable Loader, the SYSGEN program, and the SOS FORTRAN IV Compiler.
.RTC1	causes the loading of a 10 Hz Real Time Clock Driver from the SOS Library. This symbol must be specified for the CLI.
output-file	is the name of the file/device to which the user wishes the trigger to be output. This name must be followed by the /O switch.
trigger-name	is the optional title (.TITL) of the trigger. If this name is omitted the trigger will be named SGTRG, by default. If the name is present, it must be followed by the /T switch.

An example of the use of the SYSG program is shown below. This command line causes a trigger to be generated at the high speed paper tape punch to provide support for a small Teletype, high speed reader and punch, Command Table Builder, and cassette units 0 and 1:

(SYSG) .PTRD .PTPD .STTY $PTP/O .RDSI .CTB .CTU1)

PRODUCING A TRIGGER (Continued)

The trigger produced will have the title SGTRG since no trigger title was specified.

After the trigger has been output, the SYSGEN program will again type its prompt (SYSG) and wait for another command. If more than one utility program is to be configured, requiring different triggers, it is most convenient to generate all the necessary triggers before overwriting the SYSGEN program in core.

A discussion of the SYSGEN program, including its associated error messages, is included in Chapter 3.

PROCEDURES FOR CONFIGURING UTILITIES USING PAPER TAPE

Relocatable binary versions of SOS utilities are provided so that users may load each utility with a specific trigger and with a SOS library. The end result of this process will be a set of SOS utilities with only that device support which each user desires. Unwanted drivers are not loaded, and core space that would have been occupied by these drivers is freed for use by the utilities.

Configuring Utilities except the Assembler

The following is a step-by-step description for configuring all SOS Paper Tape Utilities except the assembler. The end result is an absolute binary paper tape of the utility. Before starting the procedure the trigger to be used should be generated on paper tape. Each typed command in this procedure must be terminated by a carriage return.

1. Using the binary loader, load the Extended Relocatable Loader (tape 091-000038).

2. Mount the trigger in the Teletype reader and type 1, or in the high speed paper tape reader and type 2.

3. For paper tape SOS systems, mount the SOS Library (099-000010) in the Teletype reader and type 1 or in the high speed paper tape reader and type 2.

   If the trigger specifies support for cassette or magnetic tape drives, first mount the SOS Cassette Library (099-000041) or the SOS Magnetic Tape Library (099-000042), and type 1 or 2 as appropriate. Then mount the SOS Library (099-000010) and type 1 or 2 as appropriate.

Configuring Utilities except the Assembler (Continued)

4. Mount the relocatable binary version of the program, to be configured, in the Teletype reader and type 1, or in the high speed paper tape reader and type 2.

5. Type 5 and note the value of NMAX output by the relocatable loader on the teletypewriter. This number will be used in Step 11.

6. Mount the relocatable binary punch program (089-000080) on the Teletype reader and type 1, or on the high-speed paper tape reader and type 2.

7. Type 6 and note the value of RBFP output by the relocatable loader on the teletypewriter; this number will be used in Step 9.

8. Type 8 to terminate the loading process.

9. Enter RBFP (from Step 7) into the data switches on the computer console, press RESET and then press START.

10. Type 0H for output on the Teletype punch or 1H for output on the high-speed paper tape punch.

11. Type 1, nmaxP where nmax is the value of NMAX noted in Step 5.

12. Type 377E, to specify a starting address for the program.

Configuring the Assembler

The following is a step by step description for configuring the SOS Assembler. It is similar to the preceding procedures; however before an absolute binary tape is punched, the DGC command definitions are added to the assembler permanent symbol table.

1. Using the binary loader, load the Extended Relocatable Loader (tape 091-000038).

2. Mount the trigger in the Teletype reader and type 1, or in the high-speed paper tape reader and type 2.

3. For paper tape SOS systems, mount the SOS Library (099-000010) in the teletypewriter and type 1 or in the high speed paper tape reader and type 2.

Configuring the Assembler (Continued)

If the trigger specifies support for cassette or magnetic tape drives, first mount the SOS Cassette Library (099-000041) or the SOS Magnetic Tape Library (099-000042) and type 1 or 2 as appropriate. Then mount the SOS Library (099-000010) and type 1 or 2 as appropriate.

4. Mount the relocatable binary version of the SOS Extended Assembler (089-000106) in the Teletype reader and type 1, or in the high speed paper tape reader and type 2.

5. Enter 016500_8 in the data switches on the computer console and type 3.

6. Mount the relocatable binary punch program (089-000080) on the Teletype reader and type 1, or on the high-speed paper tape reader and type 2.

7. Type 6 and note the value of RBFP output by the relocatable loader on the teletypewriter; this number will be used in Step 13.

8. Type 8 to terminate the loading process.

9. Press CONTINUE on the computer console to start the assembler.

10. Mount the extended assembler command definitions tape, NBID.SR (090-002998) for NOVA systems, in the Teletype reader and type 0 $TTR/3, or in the high-speed paper tape reader and type 0 $PTR/3. For ECLIPSE systems, also mount NEID.SR (090-003239) and repeat the keyboard commands.

11. Mount the remaining tapes, OSID.SR (090-003000), and FPID.SR (090-002999) for NOVA systems or NFPID.SR (090-003240) for ECLIPSE systems, when they are requested by the prompt message; strike any key on the console when the tapes are mounted.

12. When the assembler halts, examine AC0 and note its contents (NMAX); this value will be used in step 15.

13. Enter RBFP (from step 7) into the data switches on the computer console, press RESET, and then press START.

14. Type 0H for output on the Teletype punch or 1H for output on the high-speed paper tape punch.

Configuring the Assembler (Continued)

15. Type 1, nmaxP where nmax is the value of NMAX noted in step 11.

16. Type 377E to specify a starting address for the program.

PRODUCING A MASTER REEL USING PAPER TAPE INPUT FILES

The following procedure details the necessary steps to configure SOS utility programs and at the same time produce a master cassette or magnetic tape reel. The assumption is made that only one cassette or magnetic tape drive is available and that all programs input to the Relocatable Loader are on paper tape. The high speed paper tape reader is assumed to be the input device for these tapes.

Before starting this procedure, the triggers should have been generated on paper tapes. When the cassette or magnetic tape reel that is required for this procedure has been mounted, the cassette should have its file protect tab in place and the magnetic tape should contain a write permit ring, so that files may be written on them. Each typed command in this procedure must be terminated by a carriage return. The master reel generated on unit 0 need never be removed from that unit during the following procedures.

1. CILW:

   Using the binary loader, load and start the appropriate absolute binary version of the Core Image Loader/Writer (CILWCT.AB for cassette; CILWMT.AB for magnetic tape). When started, this program will output the following message to the console device:

   LOAD UNIT 0: STRIKE ANY KEY

   Place the cassette or magnetic tape reel that is to become the master on unit 0 and depress any key on the console keyboard. This program will write the Core Image Loader/Writer to file 0 of unit 0. When the loader has been successfully written, the message

   LOADER INSTALLED

   is printed at the console and the tape is rewound. This program may be used to install additional loaders at this point. After the program HALTs, the user may change cassette or magnetic tape

reels, and depress the CONTINUE switch on the master console. The message on the preceding page is again printed; the user may repeat this procedure as often as desired.

2. RLDR:

The binary loader remains in high core. Using this loader, load the absolute binary version of the SOS Relocatable Loader (091-000076). This program outputs the prompt message (RLDR) to the console device; respond with the command line:

```
CT0:1/S $PTR/4  (for cassette)
MT0:1/S $PTR/4  (for magnetic tape)
```

If the Teletype reader is used, substitute $TTR for $PTR. As the relocatable loader requests them, mount the following paper tapes in order:

1. The trigger to be used for the Relocatable Loader.
2. The SOS Cassette Library (099-000041) for cassette or the SOS Magnetic Tape Library (099-000042) for magnetic tape.
3. The SOS Library (099-000010).
4. The relocatable binary version of the SOS Relocatable Loader (089-000120).

The loader will produce a core image of the tailored Relocatable Loader on file 1 of the master reel, type OK, and HALT when finished. This version of the loader is now usable for the remaining procedures.

It will typically need to be re-loaded via the CILW, but in this one case it is already present in core. Hence to restart the loader, merely depress the CONTINUE switch on the master console.

3. CLI:

After the Relocatable Loader outputs the prompt message (RLDR) to the console, respond with the command line:

3. CLI: (Continued)

```
CT0:2/S $PTR/4 (for cassette)
MT0:2/S $PTR/4 (for magnetic tape)
```

If the Teletype reader is used, substitute $TTR for $PTR. As the relocatable loader requests them, mount the following paper tapes in order:

1. The trigger to be used for the Command Line Interpreter.
2. The SOS Cassette Library (099-000041) for cassette or the SOS Magnetic Tape Library (099-000042) for magnetic tape.
3. The SOS Library (099-000010).
4. The relocatable binary version of the SOS Command Line Interpreter (089-000121).

The loader will produce a core image or save file version of this utility program on the designated file of the master reel. It will type OK and halt when finished.

4. Restore RLDR:

The Relocatable Loader must be restored to core using the CILW.

For systems with PROGRAM LOAD, first manually rewind unit 0, make the unit ready, depress RESET on the master console. Set data switches 0, 11, and 14 to ones, and depress PROGRAM LOAD.

For systems without PROGRAM LOAD, restart the CILW by setting the address of the last location in core into the data switches on the master console. Depress RESET, then START.

When the CILW is invoked and types its prompt message (#) to the console device, respond with the command line:

```
0:1
```

The user-configured version of the SOS Relocatable Loader will be returned to core.

5. EDIT:

   Repeat step 3, making the following substitutions:

   1. CT0:3/S or MT0:3/S instead of CT0:2 or MT0:2 respectively in the Relocatable Loader command line.

   2. The trigger for the SOS Text Editor instead of the trigger for the CLI.

   3. The relocatable binary version of the SOS Text Editor (089-000104) instead of that of the CLI.

6. Restore RLDR:

   Repeat step 4 to restart the Relocatable Loader.

7. ASM:

   Repeat step 3 making the following substitutions:

   1. CT0:4/S or MT0:4/S instead of CT0:2/S or MT0:2/S respectively in the Relocatable Loader command line.

   2. The trigger for the SOS Assembler instead of the trigger for the CLI.

   3. The relocatable binary version of the SOS Assembler (089-000106) instead of that of the CLI.

8. ASM:

   Depress the CONTINUE switch on the master console to start the assembler.

9. ASM:

   Respond to the assembler prompt message (ASM) with the following command line:

9. ASM: (Continued)

0 $PTR/3 (or "0 $TTR" if the Teletype reader is used)

If the Floating Point Instruction definitions are not desired, respond with:

0 $PTR/2 or 0 $TTR/2.

10. ASM:

Mount each command definition tape as it is requested (by the LOAD {$TTR / $PTR}, STRIKE ANY KEY message) and depress any console key.

One of the two following sets of tapes, in the order given below must be loaded; the first set is for NOVA systems, the second is for ECLIPSE systems.

NOVA systems:	NOVA Basic Instructions, NBID.SR	(090-002998)
	*Floating Point Instructions, FPID.SR	(090-002999)
	Operating System Instructions, OSID.SR	(090-003000)
ECLIPSE systems:	NOVA Basic Instructions, NBID.SR	(090-002998)
	ECLIPSE Extended Instructions, NEID.SR	(090-003239)
	ECLIPSE Floating Point Instructions, NFPID.SR	(090-003240)
	Operating System Instructions, OSID.SR	(090-003000)

*only use if these command definitions are desired for permanent symbols.

PRODUCING A MASTER REEL (Continued)

ASM: (Continued)

The assembler will perform a one pass assembly on these source files and then HALT.

11. ASM:

EXAMINE (using the master console switches) the contents of AC0 and note for use in step 12.

12. CILW:

Start the Core Image Writer by setting the address of the next to last location in core into the data switches on the master console, pressing RESET, and then START. Respond to this program's prompt message (#) with:

0:4

Respond to the next prompt message (NMAX:) with the octal value noted in step 11. The Core Image Writer will rewrite a core image of the assembler to file 4 of the master reel. This copy contains the assemblers permanent symbols in the symbol table. It will type OK and HALT when finished.

13. Restore RLDR:

Repeat step 4 to restart the Relocatable Loader.

14. LFE:

Repeat step 3 making the following substitutions:

1. CT0:5/S or MT0:5/S instead of CT0:2/S or MT0:2/S respectively in the Relocatable Loader command line.

2. The trigger for the SOS Library File Editor (LFE) instead of the trigger for the CLI.

3. The relocatable binary version of the SOS LFE (089-000081) instead of that of the CLI.

PRODUCING A MASTER REEL (Continued)

15. Restore RLDR:

    Repeat step 4 to restart the Relocatable Loader.

16. SYSG:

    Repeat step 3 making the following substitutions:

    1. CT0:6/S or MT0:6/S instead of CT0:2/S or MT0:2/S respectively in the Relocatable Loader command line.

    2. The trigger for the SOS SYSGEN program instead of the trigger for the CLI.

    3. The relocatable binary version of SOS SYSGEN (089-000122) instead of that of the CLI.

    This completes the generation of a master reel.

CONFIGURING A SOS FORTRAN IV COMPILER

The procedures for configuring a FORTRAN IV compiler are identical to the previous procedures. The additional tapes that are required are the relocatable binary version of the FORTRAN IV Compiler (089-000161) and the SOS FORTRAN Interface (089-000041). The input order of the tapes to the appropriate relocatable loader is the following:

1. FORTRAN Compiler trigger (see Producing a Trigger).
2. SOS Cassette Library, SOSCT.LB (099-000041) for cassette systems.
3. SOS Magnetic Tape Library, SOSMT.LB (099-000042) for magnetic tape systems.
4. SOS Library, SOS.LB (099-000010).
5. SOS FORTRAN Interface, SOSFI.RB (089-000041).
6. FORTRAN IV Compiler, FORT.RB (089-000161).

SOS DEVICE HANDLING STRATEGY (Continued)

In general, these variables should be consistent among devices; that is, the first device in the Interrupt Search List should not be interruptible by any other devices, the second device in the list should only be interruptible by the first, and the last one should be interruptible by all other devices. This scheme cannot be rigidly adhered to because many devices share a priority bit in the interrupt mask. It is recommended that as nearly as possible device handlers observe these conventions. There is actually no interdependence between these variables however; if a user does not follow these conventions in adding his device handler, he will merely introduce slight inefficiencies into the processing of interrupts. The procedures for user specification of these device handler variables are discussed later in this appendix.

These considerations broadly summarize the information that must be provided to and used by the system to control Level One devices. To properly support Level Two devices, several additional pieces of information are required by the system:

1. The system must be able to associate the text string identifying the file/device with a physical SOS Channel Number whenever the device is opened. (This applies only to systems which use the RDOS to SOS Interface Program. When that program is not used, then the SOS Channel Number is specified in the ".OPEN" command).

2. The system must be able to map from the SOS Channel Number to a body of information which enables it to recognize the unique properties of the device, start it, stop it, and buffer I/O for it. This body of information is contained in the Device Control Table, DCT.

The DCT also contains much of the information that is used by the system interrupt dispatcher to service both Level One and Level Two devices at interrupt time. A DCT or some subset of it must therefore be provided for every unique device being incorporated into SOS, regardless of the device support level. The word by word layout of the DCT is described starting on page A-10. There are various means available to the user to link the DCT that he supplies into the system. These options are itemized and elaborated upon in the following section.

SOS DEVICE HANDLING STRATEGY (Continued)

The critical system requirements for each device level are summarized below:

Level One Devices:

1. A DCT
2. A position in the SOS Interrupt Search List
3. An interrupt service routine* which performs all necessary interrupt level device functions and returns control appropriately to the system interrupt dispatcher.
4. A device clear routine which is called on all system initializations (.SYSI) and resets (.RESE).
5. All other necessary device control routines. These routines are never entered through the operating system however.

Level Two Devices:

1. A DCT
2. A position in the SOS Interrupt Search List.
3. An interrupt service routine* (see above).
4. A device clear routine (see above).
5. A (physical) SOS Channel Number associated with the DCT. (Inherent in this requirement is a position in the SOS Channel Number Map.)
6. A file/device name associated with the SOS Channel Number. This only applies to devices which are running in an RDOS-SOS environment.
7. The routines to perform the appropriate subset of system commands (.OPEN, .CLOSE, .RDL, .WRL, .RDS and .WRS) meaningful to the device. These routines make partial or full use of the SOS global subroutines.

*Note that in writing an interrupt service routine, the programmer must preserve the contents of AC2 which points to the location of the DCT.

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
 0001 PARU  MACRO REV 03.00                12:08:44 04/09/75
01
02              ;=================================
03              ; RDOS REVISION 04 USER PARAMETERS
04              ;=================================
05
                        .TITL   PARU
07
08
09
10              ;
11              ; UFT ENTRY
12              ;
13
14              ; USER FILE DEFINITION (UFD) OF UFT
15
16        000000 .DUSR UFTFN=0            ;FILE NAME
17        000005 .DUSR UFTEX=5            ;EXTENSION
18        000006 .DUSR UFTAT=6            ;FILE ATTRIBUTES
19        000007 .DUSR UFTLK=7            ;LINK ACCESS ATTRIBUTES
20        000007 .DUSR UFLAD=7            ;LINK ALTERNATE DIRECTORY
21        000010 .DUSR UFTBK=10           ;NUMBER OF LAST BLOCK IN FILE
22        000011 .DUSR UFTBC=11           ;NUMBER OF BYTES IN LAST BLOCK
23        000012 .DUSR UFTAD=12           ;DEVICE ADDRESS OF FIRST BLOCK (0 UNASSIGNED)
24        000013 .DUSR UFTAC=13           ;YEAR-DAY LAST ACCESSED
25        000014 .DUSR UFTYD=14           ;YEAR-DAY CREATED
26        000014 .DUSR UFLAN=14           ;LINK ALIAS NAME
27        000015 .DUSR UFTHM=15           ;HOUR-MINUTE CREATED
28        000016 .DUSR UFTP1=16           ;UFD TEMPORARY
29        000017 .DUSR UFTP2=17           ; "     "
30        000020 .DUSR UFTUC=20           ;USER COUNT
31        000021 .DUSR UFTDL=21           ;DCT LINK
32
33              ; DEVICE CONTROL BLOCK (DCB) OF UFT
34
35        000022 .DUSR UFTDC=22           ;DCT ADDRESS
36        000023 .DUSR UFTUN=23           ;UNIT NUMBER
37        000024 .DUSR UFCA1=24           ;CURRENT BLOCK ADDRESS (HIGH ORDER)
38        000025 .DUSR UFTCA=25           ;CURRENT BLOCK ADDRESS (LOW ORDER)
39        000026 .DUSR UFTCB=26           ;CURRENT BLOCK NUMBER
40        000027 .DUSR UFTST=27           ;FILE STATUS
41        000030 .DUSR UFEA1=30           ;ENTRY'S BLOCK ADDRESS (HIGH ORDER)
42        000031 .DUSR UFTEA=31           ;ENTRY'S BLOCK ADDRESS (LOW ORDER)
43        000032 .DUSR UFNA1=32           ;NEXT BLOCK ADDRESS (HIGH ORDER)
44        000033 .DUSR UFTNA=33           ;NEXT BLOCK ADDRESS (LOW ORDER)
45        000034 .DUSR UFLA1=34           ;LAST BLOCK ADDRESS (HIGH ORDER)
46        000035 .DUSR UFTLA=35           ;LAST BLOCK ADDRESS (LOW ORDER)
47        000036 .DUSR UFTDR=36           ;SYS.DR DCB ADDRESS
48        000037 .DUSR UFFA1=37           ;FIRST ADDRESS (HIGH ORDER)
49        000040 .DUSR UFTFA=40           ;FIRST ADDRESS (LOW ORDER)
50
51              ; DCB EXTENSION
52
53        000041 .DUSR UFTBN=41           ;CURRENT FILE BLOCK NUMBER
54        000042 .DUSR UFTBP=42           ;CURRENT FILE BLOCK BYTE POINTER
55        000043 .DUSR UFTCH=43           ;DEVICE CHARACTERISTICS
56        000044 .DUSR UFTCN=44           ;ACTIVE REQ COUNT
57                                        ;B0 INDICATES Q, 0=DSQ1,1=DSQ2
58
59
60
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
 0002 PARU
01
02        000045 .DUSR UFTEL=UFTCN-UFTFN+1        ;UFT ENTRY LENGTH
03        000022 .DUSR UFDEL=UFTDL-UFTFN+1        ;UFD ENTRY LENGTH
04
05        177764 .DUSR UDBAT=UFTAT-UFTDC ;NEGATIVE DISP. TO ATTRIBUTES
06        177777 .DUSR UDDL=UFTDL-UFTDC ;NEGATIVE DISP. TO FIRST ADDRESS (HIGH ORDER)
07        177770 .DUSR UDBAD=UFTAD-UFTDC ;NEGATIVE DISP. TO FIRST ADDRESS (LOW ORDER)
08        177766 .DUSR UDBBK=UFTBK-UFTDC ;NEGATIVE DISP. TO LAST BLOCK
09        000017 .DUSR UDBBN=UFTBN-UFTDC ;POSITIVE DISP. TO CURRENT BLOCK
10
11
12
13                ;
14                ; FILE ATTRIBUTES
15                ;
16
17        100000 .DUSR ATRP =1B0          ;READ PROTECTED
18        040000 .DUSR ATCHA=1B1          ;CHANGE ATTRIBUTE PROTECTED
19        020000 .DUSR ATSAV=1B2          ;SAVED FILE
20        000400 .DUSR ATNRS=1B7          ;CANNOT BE A RESOLUTION ENTRY
21        000100 .DUSR ATUS1=1B9          ;USER ATTRIBUTE # 1
22        000040 .DUSR ATUS2=1B10         ;USER ATTRIBUTE # 2
23        000002 .DUSR ATPER=1B14         ;PERMANENT FILE
24        000001 .DUSR ATWP =1B15         ;WRITE PROTECTED
25
26                ;
27                ; FILE CHARACTERISTICS
28                ;
29
30        003400 .DUSR ATMSK=7B7          ;TO GET HIGH ORDER PART OF 3330
31                                        ; ADDRESSES OUT OF UFTDL
32        010000 .DUSR ATLNK=1B3          ;LINK ENTRY
33        004000 .DUSR ATPAR=1B4          ;PARTITION ENTRY
34        002000 .DUSR ATDIR=1B5          ;DIRECTORY ENTRY
35        001000 .DUSR ATRES=1B6          ;LINK RESOLUTION (TEMPORARY)
36        000200 .DUSR ATDIO=1B8          ;DIRECT I/O ONLY
37        000010 .DUSR ATCON=1B12         ;CONTIGUOUS FILE
38        000004 .DUSR ATRAN=1B13         ;RANDOM FILE
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
!0003 PARU
01
02                          ; DEFINE THE DEVICE CHARACTERISTICS
03
04        000001 .DUSR    DCCPO=   1B15     ; DEVICE REQUIRING LEADER/TRAILER
05        000001 .DUSR    DCSTO=   1B15     ; USER SPECIFIED TIME OUT CONSTANT (MCA)
06        000002 .DUSR    DCCGN=   1B14     ; GRAPHICAL OUTPUT DEVICE WITHOUT TABBING
07                                          ; HARDWARE
08        000004 .DUSR    DCIDI=   1B13     ; INPUT DEVICE REQUIRING OPERATOR INTERVENTION
09        000010 .DUSR    DCCNF=   1B12     ; OUTPUT DEVICE WITHOUT FORM FEED HARDWARE
10        000020 .DUSR    DCTO=    1B11     ; TELETYPE OUTPUT DEVICE
11        000040 .DUSR    DCKEY=   1B10     ; KEYBOARD DEVICE
12        000100 .DUSR    DCNAF=   1B09     ; OUTPUT DEVICE REQUIRING NULLS AFTER FORM FEEDS
13        000200 .DUSR    DCRAT=   1B08     ; RUBOUTS AFTER TABS REQUIRED
14        000400 .DUSR    DCPCK=   1B07     ; DEVICE REQUIRING PARITY CHECK
15        001000 .DUSR    DCLAC=   1B06     ; REQUIRES LINE FEEDS AFTER CARRIAGE RTN
16        002000 .DUSR    DCSPO=   1B05     ; SPOOLABLE DEVICE
17        004000 .DUSR    DCFWD=   1B04     ; FULL WORD DEVICE (ANYTHING GREATER THAN
18        010000 .DUSR    DCFFO=   1B03     ; FORM FEEDS ON OPEN
19        020000 .DUSR    DCLTU=   1B02     ; CHANGE LOWER CASE ASCII TO UPPER
20        040000 .DUSR    DCC80=   1B01     ; READ 80 COLUMS
21        100000 .DUSR    DCDIO=   1B00     ; SUSPEND PROTOCOL ON TRANSMIT (MCA)
22        100000 .DUSR    DCBDK=   1B00     ; DISK CHARACTERISTIC (SET NON-PARAMETRICALLY)
23                                          ; SET MEANS ITS 3330
24        100000 .DUSR    DCSPC=   1B00     ; SPOOL CONTROL
25                                          ; SET = SPOOLING ENABLED
26                                          ; RESET = SPOOLING DISABLED
27
28
29
30                ;
31                ; DEFINE SWITCHES
32                ;
33
34        100000 .DUSR    A.SW=    1B00
35        040000 .DUSR    B.SW=    1B01
36        020000 .DUSR    C.SW=    1B02
37        010000 .DUSR    D.SW=    1B03
38        004000 .DUSR    E.SW=    1B04
39        002000 .DUSR    F.SW=    1B05
40        001000 .DUSR    G.SW=    1B06
41        000400 .DUSR    H.SW=    1B07
42        000200 .DUSR    I.SW=    1B08
43        000100 .DUSR    J.SW=    1B09
44        000040 .DUSR    K.SW=    1B10
45        000020 .DUSR    L.SW=    1B11
46        000010 .DUSR    M.SW=    1B12
47        000004 .DUSR    N.SW=    1B13
48        000002 .DUSR    O.SW=    1B14
49        000001 .DUSR    P.SW=    1B15
50        100000 .DUSR    Q.SW=    1B00
51        040000 .DUSR    R.SW=    1B01
52        020000 .DUSR    S.SW=    1B02
53        010000 .DUSR    T.SW=    1B03
54        004000 .DUSR    U.SW=    1B04
55        002000 .DUSR    V.SW=    1B05
56        001000 .DUSR    W.SW=    1B06
57        000400 .DUSR    X.SW=    1B07
58        000200 .DUSR    Y.SW=    1B08
59        000100 .DUSR    Z.SW=    1B09
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
!0004 PARU
01
02                ;
03                ; SYSTEM CONSTANTS.
04                ;
05
06        000377 .DUSR SCWPB=255.          ;WORDS PER BLOCK
07        000400 .DUSR SCDBS=256.          ;SIZE OF DISK BLOCK
08        000100 .DUSR SCRRL=64.           ;WORDS PER RANDOM RECORD
09        000204 .DUSR SCLLG=132.          ;MAX LINE LENGTH
10        000030 .DUSR SCAMX=24.           ;MAX ARGUMENT LENGTH IN BYTES
11        000006 .DUSR SCFNL=UFTEX-UFTFN+1 ;FILE NAME LENGTH
12        000005 .DUSR SCEXT=UFTEX-UFTFN ;EXTENSION OFFSET IN NAME AREA
13        000012 .DUSR SCMER=10.           ;MAX ERROR RETRY COUNT
14        000016 .DUSR SCSTR=16            ;SAVE FILE STARTING ADDRESS
15        177760 .DUSR SCTIM=-80.          ;RINGIO 1 MS. LOOP TIME (SN)
16        000000 .DUSR SCPPL=0             ;PRIMARY PARTITON LEVEL
17        000006 .DUSR SCPPA=6             ;PRIMARY PARTITION BASE ADDRESS
18        000000 .DUSR SCSYS=0             ;SYS.DR ADDRESS OFFSET
19        000001 .DUSR SCPSH=1             ;PUSH DIRECTORY OFFSET
20        000004 .DUSR SCPNM=4             ;MAX NUMBER OF PUSH LEVELS
21        000011 .DUSR SCMAP=SCPNM*2+SCPSH ;RELATIVE BASE ADDRESS OF MAP.DR
22        000001 .DUSR SCBPB=1             ;RELATIVE BACKROUND PUSH BASE
23        000005 .DUSR SCFPB=SCBPB+SCPNM ;RELATIVE FOREGROUND PUSH BASE
24        000021 .DUSR SCFZW=SCBPB+(SCPNM*4) ;FRAME SIZE WORD (SKIP DOUBLE WORD PUSH INDICES
25        000022 .DUSR SCNVW=SCFZW+1       ;NUMBER-OF-SYSTEM-OVERLAYS WORD
26        100000 .DUSR SFINT=1B0           ;INTERRUPT FLAG
27        000001 .DUSR SFBRK=1B15          ;BREAK FLAG
28        000066 .DUSR SCNSO=66            ;NUMBER OF SYSTEM OVERLAYS
29
30
31                ; DEFINE SYSTEM BOOTSTRAP CONSTANTS
32
33        000000 .DUSR    SCTBP=0          ; TEXT STRING BYTE POINTER
34        000001 .DUSR    SCINS=1          ;SWITCHED FULL/PARTIAL-OVERLAYS ADDRESS
35        000002 .DUSR    SCPSA=2          ; PROGRAM START ADDRESS
36        000002 .DUSR    SCPAR=SCPSA      ; PARTIAL INIT ADDRESS
37        000003 .DUSR    SCINT=3          ;FULL/PARTIAL-OVERLAYS INIT ADDRESS
38        000004 .DUSR    SCCLI=SCINT+1    ; ADDRESS OF END OF CLI
39        000005 .DUSR    SCZMX=SCCLI+1    ; SQUASHED/UNSQUASHED FLAG
40        000006 .DUSR    SCCPL=SCZMX+1    ; CURRENT PARTITION LEVEL
41        000007 .DUSR    SCPBA=SCCPL+1    ; PARTITION BASE ADDRESS (LOW ORDER)
42        000010 .DUSR    SCOFA=SCPBA+1    ; OVERLAY BASE ADDRESS (LOW ORDER)
43        000011 .DUSR    SCPB1=SCOFA+1    ;PARTITION BASE ADDRESS (HIGH ORDER)
44        000012 .DUSR    SCOF1=SCPB1+1    ;OVERLAY BASE ADDRESS (HIGH ORDER)
45        000013 .DUSR    SCBAS=SCOF1+1    ; BASE OF INFORMATION BLOCK
46        000013 .DUSR    SCSWC=SCBAS      ;SWITCH FOR SCINS ENTRY
47        000020 .DUSR    SCIDV=20         ; INITIAL DEVICE CODE
48
49        000000 .DUSR    SCAUN=0          ; ASCII UNIT NUMBER
50        000001 .DUSR    SCUN=1           ; UNIT (DEVICE CODE)
51        000002 .DUSR    SCGO=2           ; ENTRY TO PASS FILENAME
52        000004 .DUSR    SCNGO=4          ; ENTRY TO ASK FROM CONSOLE
53
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10005 PARU
01
02                ; DEFINE THE SYSTEM ERROR CODES
03
04        000000 .DUSR ERFNO=     0        ; ILLEGAL CHANNEL NUMBER
05        000001 .DUSR ERFNM=     1        ; ILLEGAL FILE NAME
06        000002 .DUSR ERICM=     2        ; ILLEGAL SYSTEM COMMAND
07        000003 .DUSR ERICD=     3        ; ILLEGAL COMMAND FOR DEVICE
08        000004 .DUSR ERSV1=     4        ; NOT A SAVED FILE
09        000005 .DUSR ERWR0=     5        ; ATTEMPT TO WRITE AN EXISTENT FILE
10        000006 .DUSR EREOF=     6        ; END OF FILE
11        000007 .DUSR ERRPR=     7        ; ATTEMPT TO READ A READ PROTECTED FILE
12        000010 .DUSR ERWPR=     10       ; WRITE PROTECTED FILE
13        000011 .DUSR ERCRE=     11       ; ATTEMPT TO CREATE AN EXISTENT FILE
14        000012 .DUSR ERDLE=     12       ; A NON-EXISTENT FILE
15        000013 .DUSR ERDE1=     13       ; ATTEMPT TO ALTER A PERMANENT FILE
16        000014 .DUSR ERCHA=     14       ; ATTRIBUTES PROTECTED
17        000015 .DUSR ERFOP=     15       ; FILE NOT OPENED
18        000016 .DUSR ERFUE=     16       ; FATAL UTILITY ERROR
19        000017 .DUSR   EREXQ=   17       ; EXECUTE CLI.CM (NO ERROR)
20        000020 .DUSR   ERNUL=   20       ; INVISIBLE ERROR CODE
21        000021 .DUSR ERUFT=     21       ; ATTEMPT TO USE A UFT ALREADY IN USE
22        000022 .DUSR ERLLI=     22       ; LINE LIMIT EXCEEDED 0
23        000023 .DUSR ERRTN=     23       ; ATTEMPT TO RESTORE A NON-EXISTENT IMAGE
24        000024 .DUSR ERPAR=     24       ; PARITY ERROR ON READ LINE
25        000025 .DUSR ERCM3=     25       ; TRYING TO PUSH TOO MANY LEVELS
26        000026 .DUSR ERMEM=     26       ; NOT ENUF MEMORY AVAILABLE
27        000027 .DUSR ERSPC=     27       ; OUT OF FILE SPACE
28        000030 .DUSR ERFIL=     30       ; FILE READ ERROR
29        000031 .DUSR ERSEL=     31       ; UNIT NOT PROPERLY SELECTED
30        000032 .DUSR ERADR=     32       ; ILLEGAL STARTING ADDRESS
31        000033 .DUSR ERRD=      33       ; ATTEMPT TO READ INTO SYSTEM AREA
32        000034 .DUSR ERDIO=     34       ; FILE ACCESSIBLE BY DIRECT I/O ONLY
33        000035 .DUSR ERDIR=     35       ; FILES SPECIFIED ON DIFF. DIRECTORIES
34        000036 .DUSR ERDNM=     36       ; DEVICE NOT IN SYSTEM
35        000037 .DUSR EROVN=     37       ; ILLEGAL OVERLAY NUMBER
36        000040 .DUSR EROVA=     40       ; FILE NOT ACCESSIBLE BY DIRECT I/O
37        000041 .DUSR ERTIM=     41       ; USER SET TIME ERROR
38        000042 .DUSR ERNOT=     42       ; OUT OF TCB'S
39        000043 .DUSR ERXMT=     43       ; SIGNAL TO BUSY ADDR
40        000044 .DUSR ERSQF=     44       ; FILE ALREADY SQUASHED ERROR
41        000045 .DUSR ERIBS=     45       ; DEVICE ALREADY IN SYSTEM
42        000046 .DUSR ERICB=     46       ; INSUFFICENT CONTIGUOUS BLOCKS
43        000047 .DUSR ERSIM=     47       ; QTY ERROR
44        000050 .DUSR ERQTS=     50       ; ERROR IN USER TASK QUEUE TABLE
45        000051 .DUSR ERNMD=     51       ; NO MORE DCB'S
46        000052 .DUSR ERIDS=     52       ; ILLEGAL DIRECTORY SPECIFIER
47        000053 .DUSR ERDSN=     53       ; DIRECTORY SPECIFIER NOT KNOWN
48        000054 .DUSR ERD2S=     54       ; DIRECTORY IS TOO SMALL
49        000055 .DUSR ERDDE=     55       ; DIRECTORY DEPTH EXCEEDED
50        000056 .DUSR ERDIU=     56       ; DIRECTORY IN USE
51        000057 .DUSR ERLDE=     57       ; LINK DEPTH EXCEEDED
52        000060 .DUSR ERFIU=     60       ; FILE IS IN USE
53        000061 .DUSR ERTID=     61       ; TASK ID ERROR
54        000062 .DUSR ERCMS=     62       ; COMMON SIZE ERROR
55        000063 .DUSR ERCUS=     63       ; COMMON USAGE ERROR
56        000064 .DUSR ERSCP=     64       ; FILE POSITION ERROR
57        000065 .DUSR ERDCH=     65       ; INSUFFICIENT ROOM IN DATA CHANNEL MAP
58        000066 .DUSR ERDNI=     66       ; DIRECTORY NOT INITIALIZED
59        000067 .DUSR ERNDD=     67       ; NO DEFAULT DIRECTORY
60        000070 .DUSR ERFGE=     70       ; FOREGROUND ALREADYS EXISTS
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
 0006 PARU
01        000071 .DUSR ERMPT=     71       ; ERROR IN PARTITON SET
02        000072 .DUSR EROPD=     72       ; DIRECTORY IN USE BY OTHER PROGRAM
03        000073 .DUSR ERUSZ=     73       ; NO ROOM FOR UFTS ON EXEC/EXFG
04        000074 .DUSR ERMPR=     74       ; ADDR ERROR ON .SYSTM PARAM
05        000075 .DUSR ERNLE=     75       ; NOT A LINK ENTRY
06        000076 .DUSR ERNTE=     76       ; CURRENT BG IS NOT CHECKPOINTABLE
07        000077 .DUSR ERSDE=     77       ; SYS.DR ERROR
08        000100 .DUSR ERMDE=     100      ; MAP.DR ERROR
09        000101 .DUSR ERDTO=     101      ; DEVICE TIME OUT
10        000102 .DUSR ERENA=     102      ; ENTRY NOT ACCESSIBLE VIA LINK
11        000103 .DUSR ERMCA=     103      ; MCA REQUEST OUTSTANDING
12        000104 .DUSR ERSRR=     104      ; INCOMPLETE TRANSMISSION CAUSED BY RECIEVER
13        000105 .DUSR ERSDL=     105      ; SYSTEM DEADLOCK
14        000106 .DUSR ERCLO=     106      ; I/O TERMINATED BY CHANNEL CLOSE
15        000107 .DUSR ERSFA=     107      ; SPOOL FILE(S) ACTIVE
16        000110 .DUSR ERABT=     110      ; TASK NOT FOUND FOR ABORT
17        000111 .DUSR ERDOP=     111      ; DEVICE PREVIOUSLY OPENED
18        000112 .DUSR EROVF=     112      ; SYSTEM STACK OVERFLOW
19        000113 .DUSR ERNMC=     113      ; NO MCA RECEIVE REQUEST OUTSTANDING
20        000114 .DUSR ERNIR=     114      ; NO INIT/RELEASE ON OPENED DEVICE (MAG TAPE)
21        000115 .DUSR ERXMZ=     115      ; .XMT & .IXMT MESSAGES MUST BE NON-ZERO
22        000116 .DUSR ERCANT=    116      ; 'YOU CAN'T DO THAT'
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10007 PARU
01
02                ; DEFINE THE CLI ERROR CODES
03
04        000300 .DUSR    CNEAR=   300      ; NOT ENOUGH ARGUMENTS
05        000301 .DUSR    CILAT=   301      ; ILLEGAL ATTRIBUTE
06        000302 .DUSR    CNDBD=   302      ; NO DEBUG ADDRESS
07        000303 .DUSR    CCLTL=   303      ; COMMAND LINE TOO LONG
08        000304 .DUSR    CNSAD=   304      ; NO STARTING ADDRESS
09        000305 .DUSR    CCKER=   305      ; CHECKSUM ERROR
10        000306 .DUSR    CNSFS=   306      ; NO SOURCE FILE SPECIFIED
11        000307 .DUSR    CNACM=   307      ; NOT A COMMAND
12        000310 .DUSR    CILBK=   310      ; ILLEGAL BLOCK TYPE
13        000311 .DUSR    CSPER=   311      ; NO FILES MATCH SPECIFIER
14        000312 .DUSR    CPHER=   312      ; PHASE ERROR
15        000313 .DUSR    CTMAR=   313      ; TOO MANY ARGUMENTS
16        000314 .DUSR    CTMAD=   314      ; TOO MANY ACTIVE DEVICES
17        000315 .DUSR    CILNA=   315      ; ILLEGAL NUMERIC ARGUMENT
18        000316 .DUSR    CSFUE=   316      ; FATAL SYSTEM UTILITY ERROR
19        000317 .DUSR    CILAR=   317      ; ILLEGAL ARGUMENT
20        000320 .DUSR    CCANT=   320      ; IMPROPER OR MALICIOUS INPUT
21        000321 .DUSR    CTMLI=   321      ; TOO MANY LEVELS OF INDIRECT FILES
22        000322 .DUSR    CSYER=   322      ; SYNTAX ERROR
23        000323 .DUSR    CBKER=   323      ; BRACKET ERROR
24        000324 .DUSR    CPARE=   324      ; PAREN ERROR
25        000325 .DUSR    CCART=   325      ; < WITHOUT > OR > WITHOUT <
26        000326 .DUSR    CCAR1=   326      ; ILLEGAL NESTING OF <> AND ()
27        000327 .DUSR    CINDE=   327      ; ILLEGAL INDIRECT FILENAME
28        000330 .DUSR    CPAR1=   330      ; ILLEGAL NESTING OF () AND []
29
30        000330 .DUSR    CCMAX=   CPAR1    ; MAX CLI ERROR CODE
31        000036 .DUSR    ERML=    30.      ; MAXIMUM ERROR MESSAGE LENGTH
32
33
34
35
36                ; DEFINE THE PANICS
37
38        100001 .DUSR    PNMPE=   @1       ; MAP.DR ERROR
39        100002 .DUSR    PNSDE=   @2       ; SYSTEM DIRECTORY ERROR
40        100003 .DUSR    PNCSO=   @3       ; SYSTEM STACK FAULT
41        100004 .DUSR    PNIDA=   @4       ; INCONSISTENT SYSTEM DATA
42        100005 .DUSR    PNMDD=   @5       ; MASTER DEVICE DATA ERROR
43        100006 .DUSR    PNMDT=   @6       ; MASTER DEVICE TIME OUT
44        100007 .DUSR    PNDPE=   @7       ; MOVING HEAD DISK ERROR
45        100010 .DUSR    PNCUI= @10        ; UNCLEARABLE UNDEFINED INTERRUPT
46        100012 .DUSR    PNCBK= @12        ; INSUFFICENT CONTIGUOUS BLOCKS TO BUILD
47                                          ; PUSH SPACE INDICES
48        100011 .DUSR    PNILL= @11        ; ILLEGAL EXTENDED INSTRUCTION
49        100013 .DUSR    PNPSH= @13        ; RTN BEYOND TOP OF WORLD
50        100014 .DUSR    PNIPB= @14        ; INCONSISTENT OR IMPOSSIBLE CONDITION
51                                          ; RELATED TO DUAL PROCESSORS (IPB)
52        100015 .DUSR    PNITR= @15        ; INT WORLD TRAPPED
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10008 PARU
01
02                ;
03                ; USER STATUS TABLE (UST) TEMPLATE
04                ;
05        000400 .DUSR    UST=    400     ; START OF BACKGROUND USER STATUS AREA
06
07        000012 .DUSR    USTP=12         ;PZERO LOC FOR UST POINTER
08                ; NOTE- USTP MUST CORRESPOND TO PARS PZERO ALLOCATIONS
09
10        000000 .DUSR    USTPC=  0
11        000001 .DUSR    USTZM=  1       ; ZMAX
12        000002 .DUSR    USTSS=  2       ; START OF SYMBOL TABLE
13        000003 .DUSR    USTES=  3       ; END OF SYMBOL TABLE
14        000004 .DUSR    USTNM=  4       ; NMAX
15        000005 .DUSR    USTSA=  5       ; STARTING ADDRESS
16        000006 .DUSR    USTDA=  6       ; DEBUGGER ADDRESS
17        000007 .DUSR    USTHU=  7       ; HIGHEST ADDRESS USED
18        000010 .DUSR    USTCS=  10      ; FORTRAN COMMON AREA SIZE
19        000011 .DUSR    USTIT=  11      ; INTERRUPT ADDRESS
20        000012 .DUSR    USTBR=  12      ; BREAK ADDRESS
21        000013 .DUSR    USTCH=  13      ; # TASKS (LEFT), # CHANS (RIGHT)
22        000014 .DUSR    USTCT=  14      ; CURRENTLY ACTIVE TCB
23        000015 .DUSR    USTAC=  15      ; START OF ACTIVE TCB CHAIN
24        000016 .DUSR    USTFC=  16      ; START OF FREE TCB CHAIN
25        000017 .DUSR    USTIN=  17      ; INITIAL START OF NREL
26        000020 .DUSR    USTOD=  20      ; OVLY DIRECTORY ADDR
27        000021 .DUSR    USTSV=  21      ; FORTRAN STATE VARIABLE SAVE ROUTINE (OR 0)
28        000022 .DUSR    USTRV=  22      ; REVISION
29        000023 .DUSR    USTIA=  23      ; TCB ADDR OF INT OR BREAK PROC
30
31        000023 .DUSR    USTEN=  USTIA   ; LAST ENTRY
32
33        000030 .DUSR    UFPT=   30      ; SAVE SOS
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10009 PARU
01
02                ;
03                ; DEFINE TASK CONTROL BLOCK (TCB) TEMPLATE
04                ;
05
06        000000 .DUSR TPC=       0        ;USER PC + CARRY
07        000001 .DUSR TAC0=      1        ;AC0
08        000002 .DUSR TAC1=      2        ;AC1
09        000003 .DUSR TAC2=      3        ;AC2
10        000004 .DUSR TAC3=      4        ;AC3
11        000005 .DUSR TPRST=     5        ;STATUS BITS (RIGHT BYTE) + PRIORITY (LEFT BYTE)
12        000006 .DUSR TSYS=      6        ;SYSTEM CALL WORD
13        000007 .DUSR TLNK=      7        ;LINK WORD
14        000010 .DUSR TUSP=      10       ;USP
15        000011 .DUSR TELN=      11       ;TCB EXTENTION ADDR
16        000012 .DUSR TID=       12       ;TASK ID
17        000013 .DUSR TTMP=      13       ;SCHEDULER TEMPORARY
18        000014 .DUSR   TKLAD=   14       ;USER KILL PROC ADDR
19        000015 .DUSR   TSP=     15       ;STACK POINTER
20        000016 .DUSR   TFP=     16       ;FRAME POINTER
21        000017 .DUSR   TSL=     17       ;STACK LIMIT
22        000020 .DUSR   TSO=     20       ;OVERFLOW ADDR
23
24        000015 .DUSR TLN=TKLAD-TPC+1    ;LENGTH OF TCB
25                ; DEFINE BIRD TCB AND ALL SINGLE TASK
26        000021 .DUSR TLNB= TSO-TPC+1
27
28                ; DEFINE TASK STATUS BITS
29                ;
30                ; 1B0 = TASK PENDED
31                ; 1B1 = SUSPENDED
32                ; 1B2 = WAITING FOR OVERLAY AREA OR .XMTW/.REC
33                ; 1B3 = WAITING FOR .TRDOP (READ OPERATOR INPUT)
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
!0010 PARU
01                ;
02                ; DEFINE OVERLAY NODE TABLE
03                ;
04
05
06        000000 .DUSR    OVNDS=0           ;DIRECTORY NODE TABLE START
07        000001 .DUSR    OVRES=1           ;CURRENT OVLY+USER COUNT
08        000002 .DUSR    OVDIS=2           ;NUMBER OF OVERLAYS (LEFT BYTE)
09                                          ;SIZE IN BLOCKS (RIGHT BYTE)
10        000003 .DUSR    OVBLK=3           ;STARTING BLOCK
11        000004 .DUSR    OVNAD=4           ;CORE ADDR FOR NODE
12
13
14
15                ; OFFSETS FOR USER TASK QUEUE TABLE
16
17        000000 .DUSR    QPC=     0        ;STARTING PC
18        000001 .DUSR    QNUM=    1        ;NUMBER OF TIMES TO EXEC
19        000002 .DUSR    QTOV=    2        ;OVERLAY
20        000003 .DUSR    QSH=     3        ;STARTING HOUR
21        000004 .DUSR    QSMS=    4        ;STARTING SEC IN HOUR
22        000005 .DUSR    QPRI=    TPRST    ;MUST BE SAME
23        000006 .DUSR    QRR=     6        ;RERUN TIME INC IN SEC
24        000007 .DUSR    QTLNK=   TLNK     ;MUST BE SAME
25        000010 .DUSR    QOCH=    10       ;CHAN OVERLAYS OPEN ON
26        000011 .DUSR    QCOND=   11       ;TYPE OF LOAD
27        000012 .DUSR    QLDST=   12       ;LOAD STATUS
28                                          ; 1B0= LOADING, 1B15= DEQUE REQ REC
29        000013 .DUSR    QTLN=    QLDST-QPC+1
30
31
32
33                ;
34                ; TUNING FILE DISPLACEMENTS:
35                ;
36
37        000000 .DUSR    .TUN=0            ;OFFSET TO NUMBER WORD IN PAIR
38        000001 .DUSR    .TUC=.TUN+1       ;OFFSET TO 1ST COUNT IN PAIR
39        000003 .DUSR    .TUP=.TUC+2       ;OFFSET TO 2ND COUNT OF PAIR
40        000005 .DUSR    .TUNX=.TUP+2      ;LENGTH OF COUNT PAIR
41
42        000001 .DUSR    .TUNSTK=1                 ;NUMBER STACKS IN SYSTEM
43        000002 .DUSR    .TUSTK= .TUNSTK+.TUC-.TUN       ;STACK COUNT
44        000004 .DUSR    .TUPSTK=.TUNSTK+.TUP-.TUN       ;STACK PEND COUNT
45
46        000006 .DUSR    .TUNCEL=.TUNSTK+.TUNX   ;NUMBER CELLS IN SYSTEM
47        000007 .DUSR    .TUCEL= .TUNCEL+.TUC-.TUN       ;CELLS COUNTS
48        000011 .DUSR    .TUPCEL=.TUNCEL+.TUP-.TUN
49
50        000013 .DUSR    .TUNBUF=.TUNCEL+.TUNX   ;BUFFERS, EXCLUDING TUNING BUFFERS
51        000014 .DUSR    .TUBUF= .TUNBUF+.TUC-.TUN       ;COUNTS
52        000016 .DUSR    .TUPBUF=.TUNBUF+.TUP-.TUN
53
54        000020 .DUSR    .TUNOV= .TUNBUF+.TUNX   ;OVERLAYS
55        000021 .DUSR    .TUOV=  .TUNOV+.TUC-.TUN
56        000023 .DUSR    .TUPOV= .TUNOV+.TUP-.TUN
57
58        000025 .DUSR    TULEN=.TUNOV+.TUNX
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10011 PARU
01
02              ; COPYRIGHT (C) DATA GENERAL CORPORATION, 1972, 1973
03              ; ALL RIGHTS RESERVED.
04
05
06              ;SOS USER APPLICATION PARAMETERS (PARUA)
07
08              ;STACK DISPLACEMENTS
09
10        000006 .DUSR    SSEL=    6          ; ENTRY LENGTH
11        000005 .DUSR    SOSEC=   5          ; ENTRY COUNT FOR SOS USER ROUTINES
12        000000 .DUSR    RTR=     0          ; FRAME LAYOUT:
13        000001 .DUSR    T0=      1          ;  RETURN LOCATION
14        000002 .DUSR    T1=      2          ;  TEMPORARIES
15        000003 .DUSR    SAC0=    3          ;  SAVE ACCUMULATORS
16        000004 .DUSR    SAC1=    4
17        000005 .DUSR    SAC2=    5
18        177775 .DUSR    OAC0=    SAC0-SSEL          ; THESE DISPLACEMENTS PERMIT
19        177776 .DUSR    OAC1=    SAC1-SSEL          ; "CALLEE" TO GET AT "CALLER'S"
20        177777 .DUSR    OAC2=    SAC2-SSEL          ;  REGISTERS
21        177772 .DUSR    ORTR=    RTR-SSEL
22        177773 .DUSR    OT0=     T0-SSEL
23        177774 .DUSR    OT1=     T1-SSEL
24
25                                           ; COMMAND TABLE DISPLACEMENTS
26
27        000000 .DUSR    CTBP=    0          ; STRING BYTE POINTER
28        000001 .DUSR    CTSW=    1          ; SWITCH WORD
29        000002 .DUSR    CTNBP=   2          ; NEXT STARTING BYTE POINTER
30        000002 .DUSR    CTEL=    2          ; ENTRY LENGTH
31
32                                           ; COMMAND TABLE SWITCHES
33
34        100000 .DUSR    SW0=     1B0        ;  EACH OF THESE BIT SETTINGS
35        040000 .DUSR    SW1=     1B1        ; MAY BE EQUIVALENCED TO A MEAN-
36        020000 .DUSR    SW2=     1B2        ; INGFUL VALUE IN THE USER APPLI-
37        010000 .DUSR    SW3=     1B3        ; CATION PROGRAM.  THE ARRANGEMENT
38        004000 .DUSR    SW4=     1B4        ; OF THE TRANSLATE TABLE (TRT)
39        002000 .DUSR    SW5=     1B5        ; DETERMINES THE PRECISE MEANING
40        001000 .DUSR    SW6=     1B6        ; OF EACH SWITCH.
41        000400 .DUSR    SW7=     1B7
42        000200 .DUSR    SW8=     1B8
43        000100 .DUSR    SW9=     1B9
44        000040 .DUSR    SW10=    1B10
45        000020 .DUSR    SW11=    1B11
46
47                        .EOT
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
 0012 PARU
01
02                ; COPYRIGHT (C) DATA GENERAL CORPORATION, 1971, 1973
03                ; ALL RIGHTS RESERVED.
04
05
06                ;
07                ;       SOS PARAMETERS
08                ;
09
10                ;               LINKAGE
11
12        006003 .DUSR    SAVE=   JSR @3
13        002004 .DUSR    RTRN=   JMP @4
14        000000 .DUSR    RTLOC=  0
15        000001 .DUSR    AC0=    1
16        000002 .DUSR    AC1=    2
17        000003 .DUSR    TMP=    3
18        000004 .DUSR    SLGT=   TMP+1
19        177775 .DUSR    OAC0=   AC0-SLGT
20        177776 .DUSR    OAC1=   AC1-SLGT
21        177777 .DUSR    OTMP=   TMP-SLGT
22        177774 .DUSR    ORTN=   RTLOC-SLGT
23        000006 .DUSR    NFRAM=  6.
24        000030 .DUSR    SSZ=    NFRAM*SLGT
25
26                ;               PAGE ZERO
27
28        000006 .DUSR    RLOC=   6
29        000007 .DUSR    CMSK=   7
30        000010 .DUSR    CSP=    10
31        000011 .DUSR    CDCT=   11      ; IN SERVICE DCT
32        000013 .DUSR    BDCT=   13      ; BEGINNING OF DCT CHAIN
33        000014 .DUSR    CAC0=   14
34        000015 .DUSR    CAC1=   15
35
36
37                ;               ADDITIONAL UST DEFINITIONS
38
39        000030 .DUSR    USTSP=  30      ; UST SPARE WORD AREA
40        000031 .DUSR    USTS1=  USTSP+1 ; SECOND SPARE
41        000032 .DUSR    USTA0=  USTS1+1
42        000033 .DUSR    USTA1=  USTA0+1
43        000034 .DUSR    USTA2=  USTA1+1
44        000035 .DUSR    USTA3=  USTA2+1
45        000036 .DUSR    USTCY=  USTA3+1
46        000037 .DUSR    USTWA=  USTCY+1
47
48                ;               ADDITIONAL DEVICE CHARACTERISTICS
49
50        100000 .DUSR    DCDIR=  1B0     ; SOS DATA CHANNEL DEVICE
51
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10013 PARU
01
02
03
04              ; DEVICE CONTROL TABLE (DCT) LAYOUT
05
06              ; COMMON TO ALL DEVICES
07
08        000000 .DUSR    DCTCD=  0       ; DEVICE CODE
09        000001 .DUSR    DCTMS=  1       ; MASK OF LOWER PRIORITY DEVICES
10
11                                        ; DEFINE THE MASK BITS
12
13        000001          .DUSR MSTTO=    1B15
14        000002          .DUSR MSTTI=    1B14
15        000004          .DUSR MSPTP=    1B13
16        000010          .DUSR MSLPT=    1B12
17        000040          .DUSR MSCDR=    1B10
18        000010          .DUSR MSPLT=    1B12
19        000040          .DUSR MSMTA=    1B10
20        000020          .DUSR MSPTR=    1B11
21
22        000002 .DUSR    DCTCH=  2       ; DEVICE CHARACTERISTICS
23        000003 .DUSR    DCTLK=  3       ; LINK TO NEXT DCT
24                                        ; (-1 TERMNATES THE CHAIN)
25        000004 .DUSR    DCTIS=  4       ; INTERRUPT SERVICE ROUTINE ADDRESS
26        000005 .DUSR    DCTIL=  5       ; INTERRUPT MACHINE STATE LINK
27
28
29
30        000006 .DUSR    DCTDT=  6       ; COMMAND DISPATCH TABLE ADDRESS WORD
31        000007 .DUSR    DCTST=  7       ; ADDRESS OF DEVICE START ROUTINE
32        000010 .DUSR    DCTSP=  10      ; ADDRESS OF DEVICE STOP ROUTINE
33        000011 .DUSR    DCTFL=  11      ; FLAGS (ACTIVE, ATTACHED, ETC.)
34
35                                        ; DEFINE THE FLAGS
36        000001          .DUSR DCACT=    1B15    ; ACTIVE FLAG
37        000200          .DUSR DCACPT=   1B8     ; ACCEPT CHARACTER FLAG
38        100000          .DUSR DCKMD=    1B0     ; TTY KEYBOARD MODE FLAG
39
```

```
        LICENSED MATERIAL - PROPERTY OF DATA GENERAL CORPORATION
10014 PARU
01
02
03
04                ; COMMON TO DEDICATED DEVICES (I.E. SINGLE USER/SINGLE BUFFER)
05
06        000012 .DUSR    DCTBS=  12        ; BUFFER SIZE ( BYTES )
07        000013 .DUSR    DCTBF=  13        ; BUFFER FIRST ADDRESS (BYTE )
08        000014 .DUSR    DCTBL=  14        ; BUFFER LAST  ADDRESS
09        000015 .DUSR    DCTIP=  15        ; BUFFER INPUT POINTER (BYTE )
10        000016 .DUSR    DCTOP=  16        ; BUFFER OUTPU POINTER
11        000017 .DUSR    DCTCN=  17        ; COUNT OF ACTIVE DATA
12        000020 .DUSR    DCTTO=  20        ; TIMEOUT WORD (ALL INPUT DEVICES)
13        000020 .DUSR    DCTCC=  20        ; COLUMN COUTER (ALLOUTPUT DEVICES)
14        000021 .DUSR    DCTRC=  21        ; RESTART CONSTANT (ALL INPUT DEVICES)
15        000021 .DUSR    DCTLC=  21        ; LINE COUNTER (ALL OUTPUT DEVICES)
16        000022 .DUSR    DCTAT=  22        ; DEVICE ATTRIBUTES
17        000023 .DUSR    DCTFC=  23        ; DEVICE FIXED CHARACTERISTICS
18
19        000000 .DUSR    LCHNO=  0         ; LOWEST LEGAL CHANNEL #
20        000037 .DUSR    HCHNO=  37        ; HIGHEST LEGAL CHANNEL #
21
22                ; MAG TAPE PARAMETERS
23
24        000377 .DUSR    MTBWZ=  377       ; BUFFER WORD SIZE
25        000776 .DUSR    MTBBZ=  MTBWZ*2   ; BUFFER BYTE SIZE
26        000377 .DUSR    CTBWZ=  MTBWZ
27        000776 .DUSR    CTBBZ=  MTBBZ
28
29
30                ;               INTERRUPT FRAME TEMPLATE
31
32        000024 .DUSR    IAC0=   DCTFC+1
33        000025 .DUSR    IAC1=   IAC0+1
34        000026 .DUSR    IAC2=   IAC1+1
35        000027 .DUSR    IAC3=   IAC2+1
36        000030 .DUSR    IPC=    IAC3+1
37        000031 .DUSR    IRLOC=  IPC+1
38        000032 .DUSR    IMSK=   IRLOC+1
39        000007 .DUSR    IFRL=   7         ; INTERRUPT FRAME LENGTH
40
41                        .EOT
```

AC0	000001	12/15	12/19
AC1	000002	12/16	12/20
ATCHA	040000	2/18	
ATCON	000010	2/37	
ATDIO	000200	2/36	
ATDIR	002000	2/34	
ATLNK	010000	2/32	
ATMSK	003400	2/30	
ATNRS	000400	2/20	
ATPAR	004000	2/33	
ATPER	000002	2/23	
ATRAN	000004	2/38	
ATRES	001000	2/35	
ATRP	100000	2/17	
ATSAV	020000	2/19	
ATUS1	000100	2/21	
ATUS2	000040	2/22	
ATWP	000001	2/24	
A.SW	100000	3/34	
BDCT	000013	12/32	
B.SW	040000	3/35	
CAC0	000014	12/33	
CAC1	000015	12/34	
CBKER	000323	7/23	
CCANT	000320	7/20	
CCAR1	000326	7/26	
CCART	000325	7/25	
CCKER	000305	7/09	
CCLTL	000303	7/07	
CCMAX	000330	7/30	
CDCT	000011	12/31	
CILAR	000317	7/19	
CILAT	000301	7/05	
CILBK	000310	7/12	
CILNA	000315	7/17	
CINDE	000327	7/27	
CMSK	000007	12/29	
CNACM	000307	7/11	
CNDBD	000302	7/06	
CNEAR	000300	7/04	
CNSAD	000304	7/08	
CNSFS	000306	7/10	
CPAR1	000330	7/28	7/30
CPARE	000324	7/24	
CPHER	000312	7/14	
CSFUE	000316	7/18	
CSP	000010	12/30	
CSPER	000311	7/13	
CSYER	000322	7/22	
CTBBZ	000776	14/27	
CTBP	000000	11/27	
CTBWZ	000377	14/26	
CTEL	000002	11/30	
CTMAD	000314	7/16	
CTMAR	000313	7/15	
CTMLI	000321	7/21	
CTNBP	000002	11/29	
CTSW	000001	11/28	
C.SW	020000	3/36	

```
DCACP 000200        13/37
DCACT 000001        13/36
DCBDK 100000         3/22
DCC80 040000         3/20
DCCGN 000002         3/06
DCCNF 000010         3/09
DCCPO 000001         3/04
DCDIO 100000         3/21
DCDIR 100000        12/50
DCFFO 010000         3/18
DCFWD 004000         3/17
DCIDI 000004         3/08
DCKEY 000040         3/11
DCKMD 100000        13/38
DCLAC 001000         3/15
DCLTU 020000         3/19
DCNAF 000100         3/12
DCPCK 000400         3/14
DCRAT 000200         3/13
DCSPC 100000         3/24
DCSPO 002000         3/16
DCSTO 000001         3/05
DCTAT 000022        14/16
DCTBF 000013        14/07
DCTBL 000014        14/08
DCTBS 000012        14/06
DCTCC 000020        14/13
DCTCD 000000        13/08
DCTCH 000002        13/22
DCTCN 000017        14/11
DCTDT 000006        13/30
DCTFC 000023        14/17   14/32
DCTFL 000011        13/33
DCTIL 000005        13/26
DCTIP 000015        14/09
DCTIS 000004        13/25
DCTLC 000021        14/15
DCTLK 000003        13/23
DCTMS 000001        13/09
DCTO  000020         3/10
DCTOP 000016        14/10
DCTRC 000021        14/14
DCTSP 000010        13/32
DCTST 000007        13/31
DCTTO 000020        14/12
D.SW  010000         3/37
ERABT 000110         6/16
ERADR 000032         5/30
ERCAN 000116         6/22
ERCHA 000014         5/16
ERCLO 000106         6/14
ERCM3 000025         5/25
ERCMS 000062         5/54
ERCRE 000011         5/13
ERCUS 000063         5/55
ERD2S 000054         5/48
ERDCH 000065         5/57
ERDDE 000055         5/49
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ERDE1 000013        5/15
ERDIO 000034        5/32
ERDIR 000035        5/33
ERDIU 000056        5/50
ERDLE 000012        5/14
ERDNI 000066        5/58
ERDNM 000036        5/34
ERDOP 000111        6/17
ERDSN 000053        5/47
ERDTO 000101        6/09
ERENA 000102        6/10
EREOF 000006        5/10
EREXQ 000017        5/19
ERFGE 000070        5/60
ERFIL 000030        5/28
ERFIU 000060        5/52
ERFNM 000001        5/05
ERFNO 000000        5/04
ERFOP 000015        5/17
ERFUE 000016        5/18
ERIBS 000045        5/41
ERICB 000046        5/42
ERICD 000003        5/07
ERICM 000002        5/06
ERIDS 000052        5/46
ERLDE 000057        5/51
ERLLI 000022        5/22
ERMCA 000103        6/11
ERMDE 000100        6/08
ERMEM 000026        5/26
ERML  000036        7/31
ERMPR 000074        6/04
ERMPT 000071        6/01
ERNDD 000067        5/59
ERNIR 000114        6/20
ERNLE 000075        6/05
ERNMC 000113        6/19
ERNMD 000051        5/45
ERNOT 000042        5/38
ERNTE 000076        6/06
ERNUL 000020        5/20
EROPD 000072        6/02
EROVA 000040        5/36
EROVF 000112        6/18
EROVN 000037        5/35
ERPAR 000024        5/24
ERQTS 000050        5/44
ERRD  000033        5/31
ERRPR 000007        5/11
ERRTN 000023        5/23
ERSCP 000064        5/56
ERSDE 000077        6/07
ERSDL 000105        6/13
ERSEL 000031        5/29
ERSFA 000107        6/15
ERSIM 000047        5/43
ERSPC 000027        5/27
ERSQF 000044        5/40
```

```
ERSRR 000104        6/12
ERSV1 000004        5/08
ERTID 000061        5/53
ERTIM 000041        5/37
ERUFT 000021        5/21
ERUSZ 000073        6/03
ERWPR 000010        5/12
ERWR0 000005        5/09
ERXMT 000043        5/39
ERXMZ 000115        6/21
E.SW  004000        3/38
F.SW  002000        3/39
G.SW  001000        3/40
HCHNO 000037       14/20
H.SW  000400        3/41
IAC0  000024       14/32   14/33
IAC1  000025       14/33   14/34
IAC2  000026       14/34   14/35
IAC3  000027       14/35   14/36
IFRL  000007       14/39
IMSK  000032       14/38
IPC   000030       14/36   14/37
IRLOC 000031       14/37   14/38
I.SW  000200        3/42
JMP   000000       12/13
JSR   004000       12/12
J.SW  000100        3/43
K.SW  000040        3/44
LCHNO 000000       14/19
L.SW  000020        3/45
MSCDR 000040       13/17
MSLPT 000010       13/16
MSMTA 000040       13/19
MSPLT 000010       13/18
MSPTP 000004       13/15
MSPTR 000020       13/20
MSTTI 000002       13/14
MSTTO 000001       13/13
MTBBZ 000776       14/25   14/27
MTBWZ 000377       14/24   14/25   14/26
M.SW  000010        3/46
NFRAM 000006       12/23   12/24
N.SW  000004        3/47
OAC0  177775       11/18   12/19
OAC1  177776       11/19   12/20
OAC2  177777       11/20
ORTN  177774       12/22
ORTR  177772       11/21
OT0   177773       11/22
OT1   177774       11/23
OTMP  177777       12/21
OVBLK 000003       10/10
OVDIS 000002       10/08
OVNAD 000004       10/11
OVNDS 000000       10/06
OVRES 000001       10/07
O.SW  000002        3/48
PNCBK 100012        7/46
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PNCSO  100003          7/40
PNCUI  100010          7/45
PNDPE  100007          7/44
PNIDA  100004          7/41
PNILL  100011          7/48
PNIPB  100014          7/50
PNITR  100015          7/52
PNMDD  100005          7/42
PNMDT  100006          7/43
PNMPE  100001          7/38
PNPSH  100013          7/49
PNSDE  100002          7/39
P.SW   000001          3/49
QCOND  000011         10/26
QLDST  000012         10/27    10/29
QNUM   000001         10/18
QOCH   000010         10/25
QPC    000000         10/17    10/29
QPRI   000005         10/22
QRR    000006         10/23
QSH    000003         10/20
QSMS   000004         10/21
QTLN   000013         10/29
QTLNK  000007         10/24
QTOV   000002         10/19
Q.SW   100000          3/50
RLOC   000006         12/28
RTLOC  000000         12/14    12/22
RTR    000000         11/12    11/21
RTRN   002004         12/13
R.SW   040000          3/51
SAC0   000003         11/15    11/18
SAC1   000004         11/16    11/19
SAC2   000005         11/17    11/20
SAVE   006003         12/12
SCAMX  000030          4/10
SCAUN  000000          4/49
SCBAS  000013          4/45     4/46
SCBPB  000001          4/22     4/23     4/24
SCCLI  000004          4/38     4/39
SCCPL  000006          4/40     4/41
SCDBS  000400          4/07
SCEXT  000005          4/12
SCFNL  000006          4/11
SCFPB  000005          4/23
SCFZW  000021          4/24     4/25
SCGO   000002          4/51
SCIDV  000020          4/47
SCINS  000001          4/34
SCINT  000003          4/37     4/38
SCLLG  000204          4/09
SCMAP  000011          4/21
SCMER  000012          4/13
SCNGO  000004          4/52
SCNSO  000066          4/28
SCNVW  000022          4/25
SCOF1  000012          4/44     4/45
SCOFA  000010          4/42     4/43
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SCPAR 000002          4/36
SCPB1 000011          4/43     4/44
SCPBA 000007          4/41     4/42
SCPNM 000004          4/20     4/21     4/23     4/24
SCPPA 000006          4/17
SCPPL 000000          4/16
SCPSA 000002          4/35     4/36
SCPSH 000001          4/19     4/21
SCRRL 000100          4/08
SCSTR 000016          4/14
SCSWC 000013          4/46
SCSYS 000000          4/18
SCTBP 000000          4/33
SCTIM 177660          4/15
SCUN  000001          4/50
SCWPB 000377          4/06
SCZMX 000005          4/39     4/40
SFBRK 000001          4/27
SFINT 100000          4/26
SLGT  000004         12/18    12/19    12/20    12/21    12/22    12/24
SOSEC 000005         11/11
SSEL  000006         11/10    11/18    11/19    11/20    11/21    11/22    11/23
SSZ   000030         12/24
SW0   100000         11/34
SW1   040000         11/35
SW10  000040         11/44
SW11  000020         11/45
SW2   020000         11/36
SW3   010000         11/37
SW4   004000         11/38
SW5   002000         11/39
SW6   001000         11/40
SW7   000400         11/41
SW8   000200         11/42
SW9   000100         11/43
S.SW  020000          3/52
T0    000001         11/13    11/22
T1    000002         11/14    11/23
TAC0  000001          9/07
TAC1  000002          9/08
TAC2  000003          9/09
TAC3  000004          9/10
TELN  000011          9/15
TFP   000016          9/20
TID   000012          9/16
TKLAD 000014          9/18     9/24
TLN   000015          9/24
TLNB  000021          9/26
TLNK  000007          9/13    10/24
TMP   000003         12/17    12/18    12/21
TPC   000000          9/06     9/24     9/26
TPRST 000005          9/11    10/22
TSL   000017          9/21
TSO   000020          9/22     9/26
TSP   000015          9/19
TSYS  000006          9/12
TTMP  000013          9/17
TULEN 000025         10/58
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TUSP  000010        9/14
T.SW  010000        3/53
UDBAD 177770        2/07
UDBAT 177764        2/05
UDBBK 177766        2/08
UDBBN 000017        2/09
UDDL  177777        2/06
UFCA1 000024        1/37
UFDEL 000022        2/03
UFEA1 000030        1/41
UFFA1 000037        1/48
UFLA1 000034        1/45
UFLAD 000007        1/20
UFLAN 000014        1/26
UFNA1 000032        1/43
UFPT  000030        8/33
UFTAC 000013        1/24
UFTAD 000012        1/23    2/07
UFTAT 000006        1/18    2/05
UFTBC 000011        1/22
UFTBK 000010        1/21    2/08
UFTBN 000041        1/53    2/09
UFTBP 000042        1/54
UFTCA 000025        1/38
UFTCB 000026        1/39
UFTCH 000043        1/55
UFTCN 000044        1/56    2/02
UFTDC 000022        1/35    2/05    2/06    2/07    2/08    2/09
UFTDL 000021        1/31    2/03    2/06
UFTDR 000036        1/47
UFTEA 000031        1/42
UFTEL 000045        2/02
UFTEX 000005        1/17    4/11    4/12
UFTFA 000040        1/49
UFTFN 000000        1/16    2/02    2/03    4/11    4/12
UFTHM 000015        1/27
UFTLA 000035        1/46
UFTLK 000007        1/19
UFTNA 000033        1/44
UFTP1 000016        1/28
UFTP2 000017        1/29
UFTST 000027        1/40
UFTUC 000020        1/30
UFTUN 000023        1/36
UFTYD 000014        1/25
UST   000400        8/05
USTA0 000032       12/41   12/42
USTA1 000033       12/42   12/43
USTA2 000034       12/43   12/44
USTA3 000035       12/44   12/45
USTAC 000015        8/23
USTBR 000012        8/20
USTCH 000013        8/21
USTCS 000010        8/18
USTCT 000014        8/22
USTCY 000036       12/45   12/46
USTDA 000006        8/16
USTEN 000023        8/31
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USTES 000003         8/13
USTFC 000016         8/24
USTHU 000007         8/17
USTIA 000023         8/29    8/31
USTIN 000017         8/25
USTIT 000011         8/19
USTNM 000004         8/14
USTOD 000020         8/26
USTP  000012         8/07
USTPC 000000         8/10
USTRV 000022         8/28
USTS1 000031        12/40   12/41
USTSA 000005         8/15
USTSP 000030        12/39   12/40
USTSS 000002         8/12
USTSV 000021         8/27
USTWA 000037        12/46
USTZM 000001         8/11
U.SW  004000         3/54
V.SW  002000         3/55
W.SW  001000         3/56
X.SW  000400         3/57
Y.SW  000200         3/58
Z.SW  000100         3/59
.TUBU 000014        10/51
.TUC  000001        10/38   10/39   10/43   10/47   10/51   10/55
.TUCE 000007        10/47
.TUN  000000        10/37   10/38   10/43   10/44   10/47   10/48   10/51
                    10/52   10/55   10/56
.TUNB 000013        10/50   10/51   10/52   10/54
.TUNC 000006        10/46   10/47   10/48   10/50
.TUNO 000020        10/54   10/55   10/56   10/58
.TUNS 000001        10/42   10/43   10/44   10/46
.TUNX 000005        10/40   10/46   10/50   10/54   10/58
.TUOV 000021        10/55
.TUP  000003        10/39   10/40   10/44   10/48   10/52   10/56
.TUPB 000016        10/52
.TUPC 000011        10/48
.TUPO 000023        10/56
.TUPS 000004        10/44
.TUST 000002        10/43
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