PERKIN-ELMER

HIGH PERFORMANCE MAGNETIC TAPE SYSTEM (HPMTS) 125

Programming Manual

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The Perkin-Elmer Corporation, Computer Systems Division 2 Crescent Place, Oceanport, New Jersey 07757

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PREFACE

This manual provides the information necessary to program the Perkin-Elmer High Performance Magnetic Tape System (HPMTS) 125. The manual is written for the experienced hardware programmer as an aid to writing driver routines.

Chapter 1 gives general details concerning possible configurations, operating controls, and indicators. Chapter 2 contains specific programming information including data formats, instructions, status and command bytes, and programming sequences. Appendix A includes four sample programs and flowcharts.

The following manuals can be used in conjunction with this publication:

MANUAL TITLE	PUBLICATION NUMBER
Extended Selector Channel (ESELCH) Programming Manual	29-529
High Performance Tape Drive (HPTD) Controller Installation and Maintenance Manual	47-028
32-Bit Systems User Documentation Summary	50-003

For further information on the contents of all Perkin-Elmer 32-bit manuals, see the 32-Bit Systems User Documentation Summary.

CHAPTER 1
GENERAL

1.1 INTRODUCTION

This manual describes the functional characteristics and programming aspects of the Perkin-Elmer High Performance Magnetic Tape System (HPMTS) 125, which operates at 125 inches per second (ips) = 3.18 meters per second, in densities of 800, 1600, and 6250 bytes per inch (bpi), nine track format. Sample programs are included in the appendixes of this manual.

1.2 CONFIGURATION

The HPMTS 125 can be used with Perkin-Elmer 32-bit processors and operated with a selector channel (SELCH). Product numbers and part numbers for the configuration of the magnetic tape system are shown in Table 1-1.

TABLE 1-1 HPMTS DESCRIPTION

PRODUCT NUMBER	NAME	PART NUMBER	DESCRIPTION
M64-500	HPTD 125	02-791F01	Tri-density, high speed magnetic tape system; consists of 125 ips transport, formatter, controller, system cabinet, and cables; 115 VAC, 60 Hz.
M64-501	HPTD 125	02-791F02	Same as M64-500, except 230 VAC, 50 Hz.
M64-504	HPTD 125E	02-791F03	Expansion 125 ips transport and cabinet; 115 VAC, 60 Hz.
M64-505	HPTD 125E	02-791F04	Same as M64-504, except 230 VAC, 50 Hz.

1.3 OPERATING CONTROLS AND INDICATORS

The HPMTS 125 may contain either one of two functionally equivalent transports, one provided by the Storage Technology Corporation (STC) or one provided by the TELEX Corporation. Although functionally equivalent, each transport contains a uniquely arranged set of front panel controls and indicators. Figure 1-1 shows the controls and indicators for each transport.

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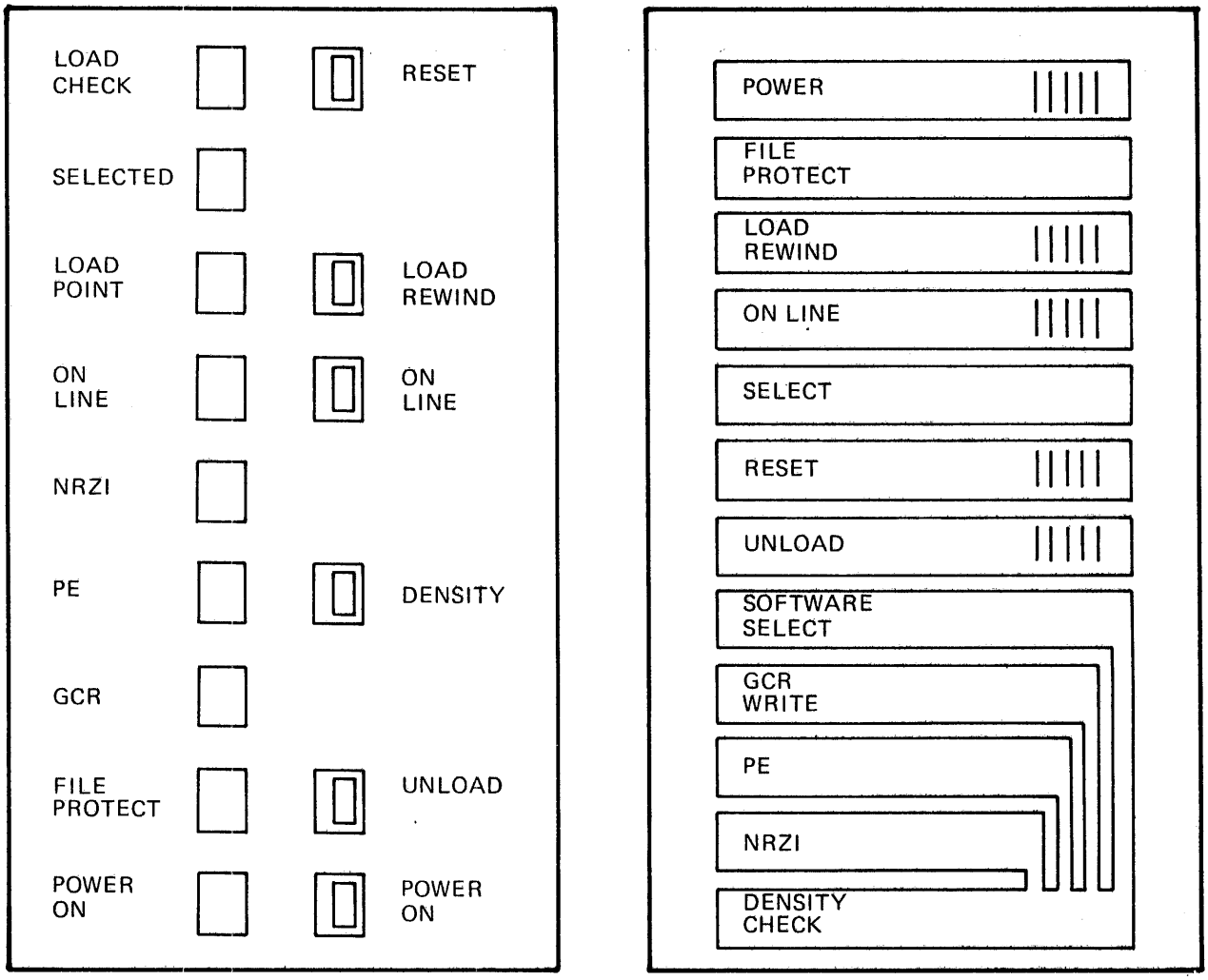


a. TELEX

b. STC

Figure 1-1 HPMTS Controls and Indicators

1.3.1 Description of STC Controls and Indicators

The STC control panel is located on the rightmost side of the magnetic tape system. To the right of the control panel are the easy touch controls indicated by a series of lines. To the left of the control panel are colored lights of green, red, orange, and white that indicate the status of the magnetic tape system. A description of each control and indicator follows.

POWER	This easy touch control is used to supply power to the magnetic tape system. The green indicator lamp is lit when power is on and it remains lit until power is shut down, by another touch of this control.
FILE PROTECT	This red indicator lamp indicates that the magnetic tape that has been mounted and loaded is file protected. This tape may be read but cannot be written to.
LOAD REWIND	The LOAD REWIND control is used to load or rewind a tape. Once a tape has been properly mounted on the STC magnetic tape system, a slight touch to the LOAD REWIND control will cause the tape to thread and load. Once the tape is positioned at the load point (reflector tape on the tape), the orange indicator lamp will be lit. The REWIND control is a momentary action control which is enabled only in the offline mode. The tape will rewind with a touch of this control. On reaching the beginning of tape (BOT) reflector, the rewind action will cease and the load sequence is entered. The BOT tab overshoots the phototab sensor, moves forward, and stops at load point.
ONLINE	The ONLINE control is a momentary action control which is used to put the transport in the ONLINE mode. At a touch of this control, the green status lamp will light and the system can now accept external commands, provided the system is READY and SELECTED.
SELECT	This red indicator lamp is lit to indicate that the drive has been selected by the host processor and is online.

RESET	RESET is a momentary switch which clears all manual commands that have been entered through the control panel. Touching the RESET switch when the transport is ONLINE sets the unit OFFLINE. If a problem occurs during the load operation, this indicator lamp will blink on and off until the system is reset and cleared.
UNLOAD	UNLOAD is a momentary switch that, when depressed, causes the tape to unload. The tape will unload from the load point only.
SOFTWARE SELECT	This switch is nonfunctional.
GCR WRITE	The GCR WRITE indicator lamp is lit when the DENSITY SELECT control has been depressed resulting in the selection of group coded recording (GCR) density mode. When the orange indicator lamp is lit, data is written to and read from the tape at 6250 bytes per inch (bpi).
PE	The PE indicator lamp is lit to indicate that the phase encoded (PE) density mode has been selected through the DENSITY SELECT control. Data is written to and/or read from the tape at 1600 bpi.
NRZI	The NRZI indicator lamp is lit to indicate that nonreturn zero (NRZI) density mode has been selected through the DENSITY SELECT control. Data is written to and/or read from the tape at 800 bpi.
DENSITY SELECT	The DENSITY SELECT control is a momentary switch that is used to select the desired mode of data transfer that is to be read or written. The density of data read should be compatible with the data on the tape. A touch to the DENSITY SELECT control will select GCR density, or 6250 bpi. Two control depressions will select PE or 1600 bpi. Three control depressions will select NRZI or 800 bpi.

1.3.2 Description of TELEX Controls and Indicators

The TELEX control panel is located on the leftmost side of the magnetic tape system. Control keys are indicated in white. Indicator status lamps are the red, white and green lamps adjacent to the control keys.

LOAD CHECK — The red status lamp indicates that a problem has been encountered in the loading of this tape. All action will cease and the lamp will remain lit until the system is RESET.

RESET — This control is used to reset the tape drive system. It clears all status and puts the system in the offline mode.

SELECTED — This white status lamp indicates that the drive has been selected by the host processor and is in use or ready to be used.

LOAD POINT — This white status lamp indicates that the tape is currently at load point (BOT reflector on the tape). Once the tape is moved off load point, the lamp is no longer lit.

LOAD REWIND — This switch has a dual purpose. It is used to load or rewind a tape. Once a tape has been properly mounted on the magnetic tape system, a touch to the LOAD REWIND control will cause the tape to thread and load to the load point. Once the tape is positioned at load point, the white status lamp will be lit.

The REWIND control is a momentary action control which is enabled only in the offline mode. With a depression of the LOAD REWIND control, the tape will rewind at the specified speed. On reading the BOT reflector, the rewind action ceases and the load sequence is automatically entered. The BOT tab overshoots the phototab sensor, moves forward and stops at load point.

ON LINE — The green status lamp is lit once the ON LINE control has been depressed. The transport is in the online mode. The system can now accept external commands provided the system is READY and SELECTED.

ON LINE — This control is used to place the magnetic tape system in the online mode.

DENSITY — The DENSITY control is used to select a desired density for writing to and/or reading from the tape. The density of the data read should be compatible with the density of the tape. Three density modes are available:

NRZI or 800 bpi,

PE or 1600 bpi, or

GCR or 6250 bpi.

NRZI	The NRZI white indicator lamp indicates that NRZI mode or 800 bpi has been selected through the DENSITY control. Data is to be written to and/or read from the tape at 800 bpi.
PE	The PE white indicator lamp indicates that PE density mode has been selected through the DENSITY switch. Data is to be written to and/or read from the tape at 1600 bpi.
GCR	The GCR white indicator lamp indicates that GCR density mode has been selected through the DENSITY switch. Data is written to and/or read from the tape at 6250 bpi.
FILE PROTECT	The FILE PROTECT indicator lamp is lit when the tape currently mounted is file protected. The tape may be read, but cannot be written to.
UNLOAD	The UNLOAD control is a momentary switch which when depressed causes the tape to unload. The tape must be positioned at load point for this action to occur.
POWER ON	The POWER ON white indicator lamp indicates that power has been applied to the magnetic tape system. This lamp remains lit during use until the system is shut down.
POWER ON	The POWER ON control is used to supply power to the magnetic tape system. When the system is not in use, this switch will also shut down power.

1.4 PREVENTIVE MAINTENANCE

It is recommended that the tape heads and capstan be cleaned after every eight hours of operation. Refer to the High Performance Tape Drive (HPTD) Controller Installation and Maintenance Manual for other maintenance guidelines.

1.5 MAGNETIC TAPE LOADING AND UNLOADING

Refer to the High Performance Tape Drive (HPTD) Controller Installation and Maintenance Manual for loading and unloading procedures.

CHAPTER 2
HIGH PERFORMANCE MAGNETIC TAPE SYSTEM (HPMTS) 125 PROGRAMMING

2.1 INTRODUCTION

This chapter describes the instructions for programming the HPMTS 125. Information on data formats, I/O programming instructions, status and command bytes, programming sequence, error recovery, interrupts, initialization, and drive addresses is presented.

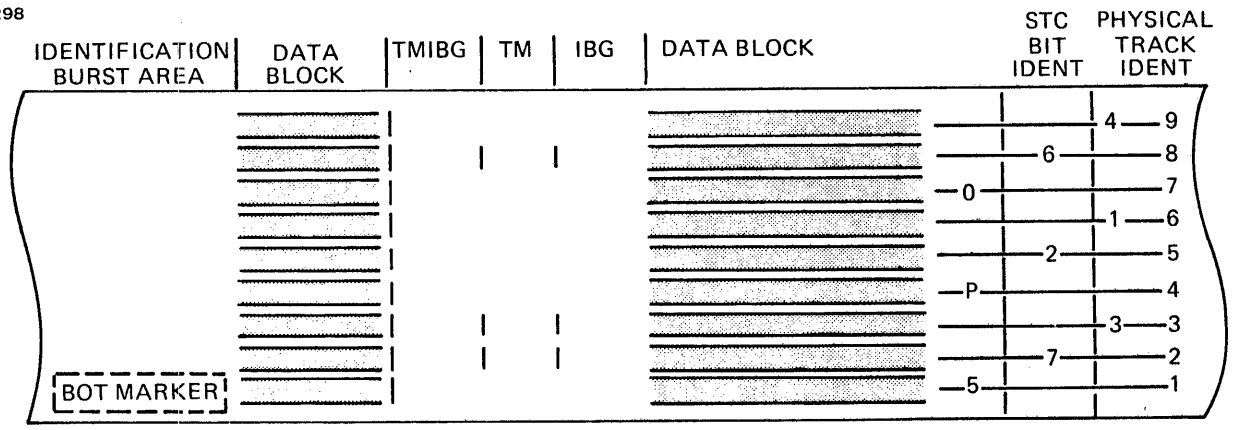
2.2 DATA FORMATS

One of three tape data formats applies, depending on whether the HPMTS 125 is operated in the 800 bpi nonreturn to zero (NRZI), 1600 bpi phase encoded (PE), or 6250 bpi group coded recording (GCR) density mode. Figure 2-1 shows the data format for each of these modes.

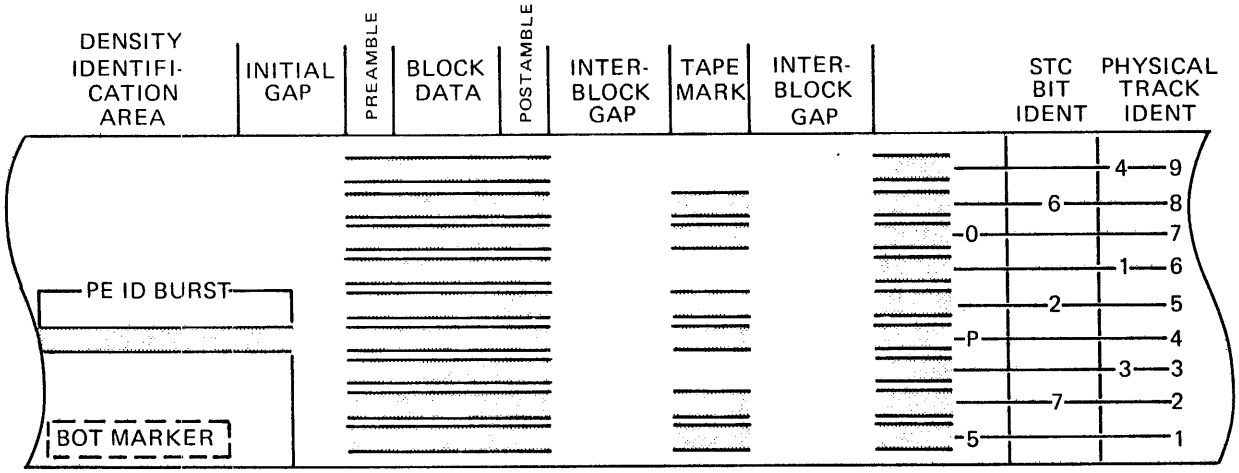
2.3 I/O PROGRAMMING INSTRUCTIONS

The following instructions may be used:

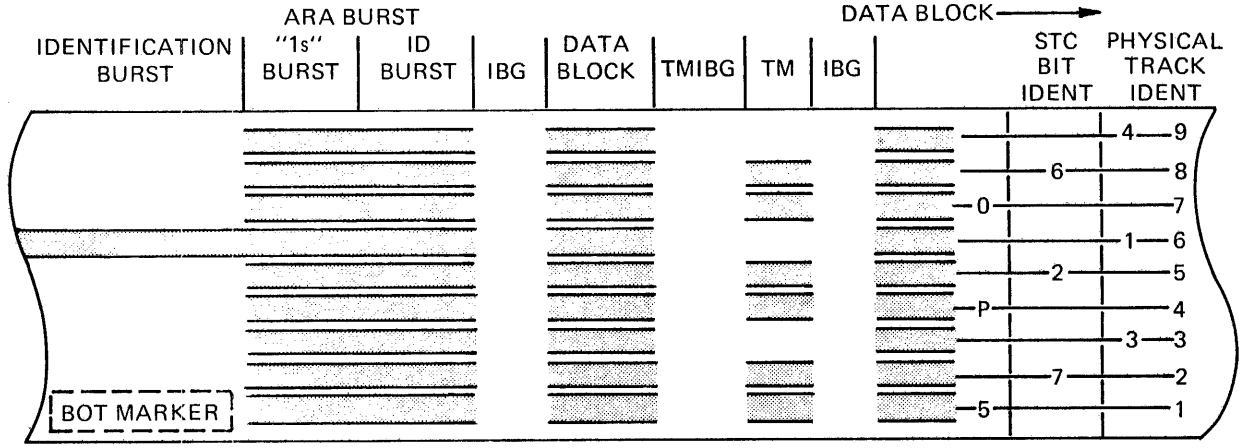
- Output Command (OC or OCR) - This instruction is used to send a command byte to the magnetic tape controller.
- Sense Status (SS or SSR) - This instruction reads the status byte of the magnetic tape controller.
- Write Halfword (WH or WHR) - This instruction is used to output or write a data halfword from the processor to the magnetic tape controller when operating on the MUX bus.
- Read Halfword (RH or RHR) - This instruction is used to input or read a data halfword from the magnetic tape controller to the processor when operating on the MUX bus.
- Autoload (AL) - This instruction is used to read data bytes.



a. Nonreturn to Zero (NRZI) Tape Format



b. Phase Encoded (PE) Tape Format



c. Group Coded Recording (GCR) Tape Format

Figure 2-1 Data Formats

2.4 STATUS AND COMMAND BYTES

Table 2-1 contains the HPMTS 125 status and command byte data.

TABLE 2-1 HPMTS 125 STATUS AND COMMAND BYTES

	BIT NUMBER							
INSTRUCTION	8	9	10	11	12	13	14	15
STATUS	ERR	TERR	EOT	NMTN	BSY	EX	TMS	DU
COMMAND 1	DIS	EN	DENSITY SELECT		BYTE SELECT	COMMAND SELECT		
			DS1	DS0	1	X	X	X
COMMAND 0	COMMAND SELECT				BYTE SELECT	MUX ERROR		
	X	X	X	X	0	X	X	X

2.4.1 Status Byte Description

The Perkin-Elmer system controller returns a status byte to the processor as a result of the sense status instruction. Bit descriptions follow:

ERR — Frror

Set if any dead tracks are set in status halfword. Set if any bit in EMB1 of the status halfword is set.

TERR — Transfer Error

Set by the following transfer errors:

- Overrun - is set during a write operation when transfer request/transfer acknowledge (TREQ/TRAK) responses are not within timing requirements, or a STOP was not sent.

During a read operation when the mag tape controller (MTC) is not accepting data characters at a high enough rate, or if any information remains in the formatter controller unit (FCU) read buffer when the mag tape unit (MTU) is in the interrecord gap (IRG). Bit 8 - ERR.

- Buffer - indicates that an even parity data character was detected on the MTC bus during a read or write operation. Data transmission is not halted for this error.

- FCU offline - is set in diagnostic mode only.

- Write underflow (WUNFLW) - is set during a write operation indicating a STOP was sent to the formatter, but data was either detected at the MTC output buffer or the processor was trying to write data to the MTC without initiating a new command sequence.

- Early read termination - selector channel (SELCH) read operation was terminated too early indicating SELCH read buffer parameters were not set up correctly.

- Even parity byte - an even parity byte was detected during a read operation.

ET — End of Tape Status

Set when tape is positioned at the physical reflector markers: beginning of tape (BOT) or end of tape (EOT).

NMTN — No Motion

Set when the tape motion has stopped and the FCU is in the idle state (ready to accept any valid command). All output commands given when NMTN=0 are ignored.

BSY — Busy

Set when MTC is ready for a SELCH transfer. Reset when MTC is not ready for a SELCH transfer.

EX — Examine

Set when one or more of the high order bits (ERR, TERR, NMTN) have been set. Will interrupt the processor if interrupts are enabled.

TMS — Tape Mark Status

Set when tape is positioned on a tape mark block. Reset at the next motion command or clear.

DU — Device Unavailable

Set when FCU is offline.

NOTES

1. ERR and TERR bits are deferred until NMTN is set (NMTN=1).
2. The status byte reflects the current status of the selected MTU (last MTU addressed).
3. Each MTU has its own individual device address. If an operation on the MTU is in progress, no I/O instruction should address the other MTU or the operation in progress on the first MTU is aborted.

2.4.2 Status Halfwords

When a read halfword has been given to the MTC, a halfword of status consisting of error MUX bytes (EMB) and MTC status will be transferred to the user software. Depending upon which EMB has been requested, the halfword status will be as shown in Tables 2-2 or 2-3 for STC or TELEX drives, respectively. Note that bits 0-8 reflect the EMB from the FCU while bits 9-15 are a combination of FCU status and MTC status. The upper bits were added to help decipher status byte information and FCU status. Bit definitions are listed in Table 2-4.

For a further definition of the status halfword bits, refer to the High Performance Tape Drive (HPTD) Controller Installation and Maintenance Manual.

TABLE 2-2 STORAGE TECHNOLOGY CORPORATION (STC) MAGNETIC TAPE DRIVE STATUS HALFWORD

	ERROR MUX STATUS BITS									UPPER STATUS BITS						
DATA BUS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ERROR MUX BYTE 0 (EMB 0) DEAD TRACKS	D T 7	D T 6	D T 5	D T 4	D T 3	D T 2	D T 1	D T 0	D T P	NRZI	SSC	BLOCK	ODD BYTE	WRITE UNDER FLOW	BUS PARITY	READ OVRN
EMB 1 READ/WRITE ERRORS	WTM CHK	UCE	PART REC	MTE	NOT USED	END DATA CHECK	VEL ERR	DIAG. MODE LTCH	CRC ERR	Same as above						
EMB 2 DIAGNOSTIC AID BITS	D A 7	D A 6	D A 5	D A 4	D A 3	D A 2	D A 1	D A 0	TACH	Same as above						
EMB 3 DRIVE SENSE BYTE 0	EOT STAT	BOT STAT	WRT INHB	FILE PROT	BKWD STAT	HI DEN	RDY STAT	ON-LINE STAT	WRT STAT	Same as above						
EMB 4 CRC-F BYTE	CRC 7	CRC 6	CRC 5	CRC 4	CRC 3	CRC 2	CRC 1	CRC 0	CRC P	Same as above						
EMB 5	Reserved									Same as above						
EMB 6	Reserved															
EMB 7	Reserved															

TABLE 2-3 TELEX MAGNETIC TAPE DRIVE STATUS HALFWORD

	ERROR MUX STATUS BITS									UPPER STATUS BITS						
DATA BUS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EMB 0	EQUIP FAIL TU	EQUIP FAIL FCU	NOISE	FILE MARK ERR	SAGC	MULTI TRACK	VRC	NOT CMPT	0	NRZI	DDSO	BLOCK	ODD BYTE	WRITE UNFLW	BUS PARITY	READ OVRN
EMB 1	CRC	SKEW	LOST BOB	PART REC	POST ERR	PREMB ERR	ENVLP CHECK	LPC	0	Same as above						
EMB 2	DEAD TRACK P	IBG OVFLW	NO DATA	LOOP OUT	ERASE WRITE FAIL	TACH FAIL	VELOC CHECK	ID CHECK	0	Same as above						
EMB 3	DEAD TRACK 7	DEAD TRACK 6	DEAD TRACK 5	DEAD TRACK 4	DEAD TRACK 3	DEAD TRACK 2	DEAD TRACK 1	DEAD TRACK 0	0	Same as above						

TABLE 2-4 BIT DEFINITIONS

MNEMONIC	DEFINITION
BKWD STAT	Backward status
BLOCK	Block status
BOT STAT	Beginning of tape status
CRC	Cyclic redundancy character
CRC ERR	Cyclic redundancy character error
DA	Diagnostic aids
DDS	Data density
DIAG MODE LTCH	Diagnostic mode latch
DT	Dead track
END DATA CHK	End of data check
ENVLP CHECK	Envelope check
EOT STAT	End of tape status
EQUIP FAIL FCU	Equipment fail formatter
EQUIP FAIL TU	Equipment fail tape drive
ERASE/WRITE FAIL	Current erase or write failure
FILE MARK	File mark error
FILE PROT	File protect
HI DEN	High density
IBG OVFLW	Interblock gap overflow
ID CHECK	Identification burst check
LOST BOB	Lost beginning of block
LRC	Longitudinal redundancy check
MTE	Multiple track error
MULTI-TRACK	Multi-track error
NOT COMPT	Not compatible
ODD BYTE	Sets on odd byte boundary
ON LINE STAT	Online status
PART REC	Partial record
POST ERR	Postamble error
PREMB ERR	Preamble error
READ OVRN	Read overrun
RDY STAT	Ready status
SAGC	Set auto gain control
SKEW	Excessive skewing
SSC	Slave status change
TACH	Digital tachometer
TACH FAIL	Tachometer pulses not received
UCE	Uncorrectable error
VEL ERR	Velocity error
VELOC CHECK	Velocity check
VRC	Vertical redundancy check
WRT INHB	Write inhibit
WRT STAT	Write status
WTM CHK	Write tape mark check

2.4.3 Command Byte Descriptions

The MTC has two command bytes selected by bit 12. The MTC responds to program command via an output command (OC) or an output command register (OCR) instruction. According to the bit settings of the density select, command select, and MUX error bits, Table 2-5 lists the commands that can be chosen.

TABLE 2-5 COMMAND BYTE DESCRIPTIONS

COMMAND 1	HEX COMMAND EQUAL	BIT NUMBER 8	9	10	11	12	13	14	15
DISABLE	X'88'	1	0	0	0	1	0	0	0
ENABLE	X'48'	0	1	0	0	1	0	0	0
DISARM	X'C8'	1	1	0	0	1	0	0	0
6250 DENSITY	X'18'	0	0	0	1	1	0	0	0
1600 DENSITY	X'08'	0	0	0	0	1	0	0	0
800 DENSITY	X'28'	0	0	1	0	1	0	0	0
CLEAR	X'09'	0	0	0	0	1	0	0	1
GAPLESS	X'0A'	0	0	0	0	1	0	1	0
ODDBYXFER	X'0B'	0	0	0	0	1	0	1	1
TESTMODE	X'0C'	0	0	0	0	1	1	0	0
BYTEREAD	X'0D'	0	0	0	0	1	1	0	1
COMMAND 0									
WRITE	X'60'	0	1	1	0	0	0	0	0
READ	X'40'	0	1	0	0	0	0	0	0

TABLE 2-5 COMMAND BYTE DESCRIPTIONS (Continued)

COMMAND 1	HEX COMMAND EQUAL	BIT NUMBER 8	9	10	11	12	13	14	15
WRITE END OF FILE	X'C0'	1	1	0	0	0	0	0	0
SKIP FWD BLOCK	X'B0'	1	0	0	1	0	0	0	0
SKIP BKWD BLOCK	X'90'	1	0	0	1	0	0	0	0
SKIP FWD FILE	X'A0'	1	0	1	0	0	0	0	0
SKIP BKWD FILE	X'80'	1	0	0	0	0	0	0	0
ERASE GAP	X'D0'	1	1	0	1	0	0	0	0
CLR DRIVER	X'10'	0	0	0	1	0	0	0	0
READ BKWD	X'50'	0	1	0	1	0	0	0	0
UNLOAD	X'F0'	1	1	1	1	0	0	0	0
REWIND	X'E0'	1	1	1	0	0	0	0	0
NOP0	X'00'	0	0	0	0	0	0	0	0
NOP1	X'01'	0	0	0	0	0	0	0	1
NOP2	X'02'	0	0	0	0	0	0	1	0
NOP3	X'03'	0	0	0	0	0	0	1	1
NOP4	X'04'	0	0	0	0	0	1	0	0
DMS	X'20'	0	0	1	0	0	0	0	0
SNS	X'30'	0	0	0	0	0	0	0	0
LWR	X'70'	0	1	1	1	0	0	0	0

The command bytes perform the following operations:

DISABLE	Allows queueing of interrupts without interrupting the CPU.
ENABLE	Enables interrupts.
DISARM	Interrupts are not generated or queued.
6250 DENSITY	During read or write operations off BOT, the MTC will read or write at 6250 bpi.
1600 DENSITY	During read or write operations off BOT, the MTC will read or write at 1600 bpi.
800 DENSITY	During read or write operations off BOT, the MTC will read or write at 800 bpi.
CLEAR	Initializes the interface and resets the formatter.
GAPLESS	Sets the interface to operate in gapless mode.
ODDBYXFER	Notifies the interface that an odd number of bytes will be written to the tape. This command is used only in the write to tape.
TESTMODE	Puts the interface in the testmode. Used for diagnostic purposes.
BYTEREAD	Puts the interface in the byte mode for the purpose of reading a tape via an autoload instruction.
WRITE	Causes the tape to move in the forward direction and a write to occur.
READ	Causes the tape to move in the forward direction and read the data on the tape, transferring data characters to the interface.
WRITE END OF FILE	The tape drive will write a compatible file mark at the density selected.
SKIP FWD BLOCK	Moves the tape forward a block and stops in the IRG.
SKIP BKWD BLOCK	Moves the tape in reverse a block and stops in the IRG.

SKIP FWD FILE	Moves the tape forward a file and stops in the IRG on the EOT side.
SKIP BKWD FILE	Moves the tape in reverse a file and stops in the IRG on the BOT side.
ERASE GAP	On the STC, moves the tape in the forward direction and erases a 3.6 in. (91.44 mm) nominal (PE or NRZI) or 3.4 in. (86.36 mm) nominal (GCR) section of the tape. Read checks are performed to verify erasure. On the TELEX, moves the tape forward and erases 3.5 in. (88.9 mm) of the tape.
CLR DRIVER	Resets the formatter from any error status.
READ BKWD	Moves the tape in reverse and reads data characters in reverse.
UNLOAD	Rewinds the tape to BOT and performs an unload, rewinding the tape onto the supply reel.
REWIND	Rewinds the tape at rewind speed until BOT is sensed. No other command will be accepted during this action.
NOP	The NOP commands - NOP0, NOP1, NOP2, NOP3 and NOP4 are essentially nonfunctional.
DMS	The interface is transferred from the functional mode to the diagnostic mode. This transfer is accomplished through a RESET input or after a certain diagnostic mode sequence.
SNS	Used to initiate the transfer of the various drive status bytes (DSB).
LWR	Used to test the read and write data circuit paths within the FCU. There is no tape motion or tape unit required.

Bits 13:15 select one of eight 9-bit registers, DSBs, to be multiplexed on the error MUX bus (ERRMX) output lines as shown in Table 2-6.

TABLE 2-6 DRIVE STATUS BYTES

STC				
MUX2	MUX1	MUX0	DSB	DESCRIPTION
0	0	0	0	Dead tracks
0	0	1	1	Read/write errors
0	1	0	2	Diagnostic aids
0	1	1	3	Drive sense byte
1	0	0	4	CRC-P
1	0	1	5	Reserved
1	1	1	6	Reserved
1	1	1	7	Reserved
TELEX				
MUX2	MUX1	MUX0	DSB	DESCRIPTION
	0	0	0	Byte zero
	0	1	1	Byte one
	1	0	2	Byte two
	1	1	3	Byte three

2.5 PROGRAMMING SEQUENCES

The following paragraphs give a number of conventions and comments concerning the magnetic tape system programming. Some or all of the comments may apply, depending on how the magnetic tape system is to be used.

2.5.1 File Mark at BOT

To conform to Perkin-Elmer tape formats, it is necessary to write a file mark when the tape is positioned at BOT. This is accomplished with a write end of file (EOF) command. Once the write EOF operation terminates (NMTN set), the normal write record processing may be executed. Also, the EOF mark may be overwritten if desired by a backspace, write sequence.

2.5.2 Skip File Forward from BOT

Since a skip forward command can be issued while the tape is positioned at the beginning of tape (BOT status set), a general procedure for skipping file marks from BOT is as follows:

1. Command skip file forward, which moves the tape past the first EOF mark, if not overwritten.

2. A read or write command may be issued to process the remaining records of the file.

2.5.3 Error Recovery

Like any magnetic tape device, the HPMTS 125 is subject to errors from dirt on the tape or from oxide worn thin. When writing or reading from magnetic tape, proper error tests and error recovery routines should be used. In general, during the reading operations, if end of medium (EOM) occurs before four characters have been transferred, the EOM indication may be due to dirt or noise on the tape. In this case, the short record should be ignored, and re-read as outlined below. If the ERR status occurs after reading a record of normal length, a read error may have resulted. In this case, it is proper to backspace and re-read the record five times before considering the error unrecoverable. In the case of a write error, it is proper to backspace and attempt to rewrite the record five times before considering it an unrecoverable error.

NOTE

Following an unrecoverable error, either the program should backspace and overwrite the bad record with record gaps and resume, or the write process on that magnetic tape should be aborted.

The procedure for filling a bad record with record gaps is as follows:

1. Write a file mark

2. Backspace

3. Write a file mark

4. Backspace

5. Write

2.5.4 Skip File Forward

The skip file forward operation is achieved by the use of the skip command. That is, once an output command to skip is issued, the tape advances to the next IRG beyond the EOF mark.

2.5.5 Long Records

For normal use, there should be sufficient buffer space in memory to allow reading the longest record on the magnetic tape. In case the program waits for EOM status and ignores the trailing extra data characters, the ERR status results due to data input overflow. The program cannot then distinguish between long records and an actual read error condition. To avoid this ambiguity, it is mandatory that the program read all data characters from the tape, and disregard those characters in the program that do not fit into the buffer space available.

2.5.6 Short Records

If short records are written, a large amount of space may be wasted on the tape by the many IRGs that occur.

2.5.7 EOF Marks

The write end of file mark (WEOF) command causes the tape unit to generate a special hardware character. When reading in the EOF mark, the special character is recognized by the hardware and the EOF bit is set in the status.

File marks are used by the MTC for skip operations. For this reason, extraneous EOFs on a tape should be avoided. If a tape terminates its last file with a file mark, care should be taken in extending that file. The procedure to extend the last file, terminated by a file mark, is:

1. Skip forward the last file mark at end of last file.
2. Backspace one record.
3. Write new record as desired (overwriting the file mark).
4. Write a new file mark at the end.

2.5.8 EOT Status

The EOT status bit is set whenever the magnetic tape sensors detect the reflective markers at the beginning or end of the tape. Once the EOT is encountered, the EOT bit remains set until a clear command is given, system initialization occurs, or a rewind operation is performed. The examine (EX) bit does not set when EOT sets, unlike the other status bits (EOF, ERR, and NMTN). Thus, it is necessary that the programmer test the upper half of the status byte to ascertain the EOT or BOT condition. It is permissable to write beyond the EOT. (Note that care must be taken to insure that the tape length is not exceeded). The EOT bit remains set until one of the previously mentioned operations in this paragraph is performed.

If the processor issued a write or write file mark command to a magnetic tape that does not have a write ring present, (1) the command is ignored, (2) the no motion (NMTN) status bit remains set, and (3) the BUSY (BSY) status bit remains reset.

2.5.9 Read Operation at BOT

The read block and autoload instructions can be used to read from the BOT. If the first record on the tape is an EOF mark, then it is necessary that two read operations must be performed to read the tape. The first read operation moves the tape past the EOF and the second read loads the first data record.

2.5.10 Multitransport Operations

Each transport on a controller can be issued a rewind command and all transports rewound. If Transport 0 is busy (NMTN=0) and Transport 1 is addressed, the operation (if other than rewind) is terminated on Transport 0. The following is a recommended sequence for switching tape transport operations:

1. Wait for NMTN=1 on Transport 0.

2. Issue rewind command to Transport 0.

3. Wait for NMTN=1 on Transport 1.

4. Perform operations on Transport 1.

It is not mandatory that a program adhere to this sequence, but as a general rule, only the rewind command to all transports can allow motion of all transports at the same time.

As a general rule, no transport accepts a command unless NMTN=1. This means that no motion (NMTN=1) must be set on one transport before any other can be used. It is not necessary to write until NMTN is set before ending an operation, but it is necessary to wait for NMTN to set before starting an operation on the same transport or to any other transport.

2.5.11 Data Transfer

Due to the high data transfer rate of the magnetic tape system, the SELCH is the preferred method of implementation; however, MUX bus programming can be used in certain situations.

2.5.12 Programming Modes

The magnetic tape system may be programmed using sense status loops, immediate interrupts, or auto driver channel. The choice of mode depends on the application and the drives involved. See Appendixes for programming examples of various modes.

2.6 INTERRUPTS

The magnetic tape system produces interrupts when the controller is enabled and:

- DU sets,
- BUSY resets,
- NMTN sets,
- TERR sets, and
- ERR sets.

NOTE

The EOM interrupt occurs as described above, and at the end of all normal operations. Another interrupt occurs after EOM (NMTN is set). Only the addressed transport may generate interrupts.

2.7 INITIALIZATION

Processor initialization resets the formatter status lines leaving RDY and ONLINF set.

2.8 TAPE DRIVE ADDRESSES

The MTC will always respond to four sequential addresses. Each address selects a different tape unit as shown in Table 2-7.

TABLE 2-7 TAPE DRIVE ADDRESSES

ADDRESS				TAPE UNIT SELECTED
X'0X'	X'4X'	X'8X'	X'CX'	TU0
X'1X'	X'5X'	X'9X'	X'DX'	TU1
X'2X'	X'6X'	X'AX'	X'EX'	TU2
X'3X'	X'7X'	X'BX'	X'FX'	TU3

X = don't care

2.9 SAMPLE PROGRAMS

Appendix A contains four sample programs with flowcharts to illustrate writes and reads to a magnetic tape for 32-bit processors.

Program 1 uses sense status loops to write a preset data pattern onto the magnetic tape through the MUX bus followed by reads into a memory location.

Program 2 uses sense status loops to write a preset data buffer onto a magnetic tape through the SELCH, followed by reads into a memory location.

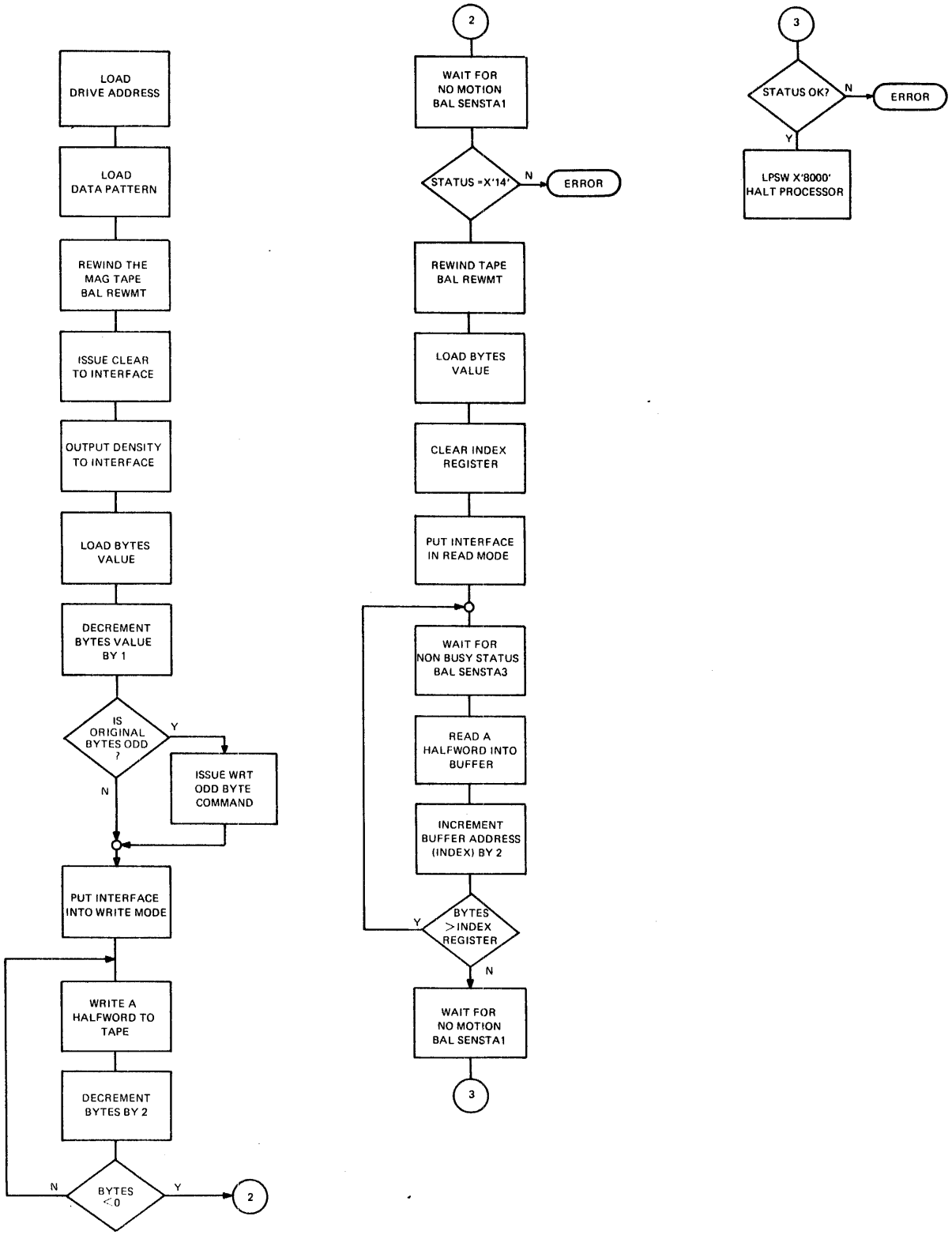
Program 3 uses immediate interrupts to write a preset data pattern onto a magnetic tape through the MUX bus followed by halfword reads into a memory location.

Program 4 uses immediate interrupts to write a preset data buffer onto a magnetic tape through the SELCH followed by reads into a memory location.

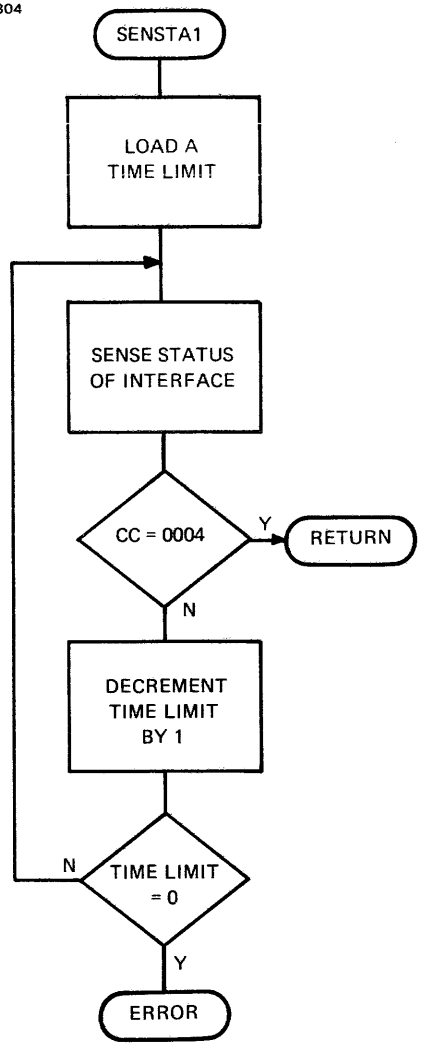
APPENDIX A
SAMPLE PROGRAMS

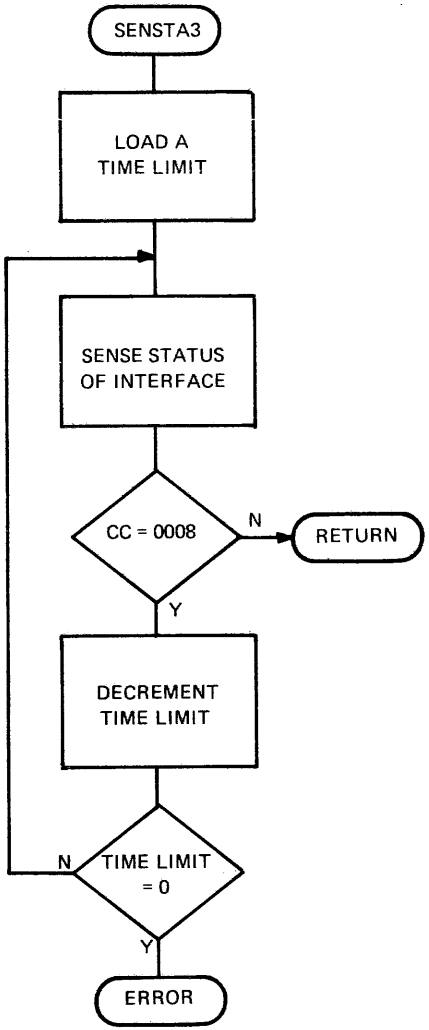
SAMPLE PROGRAM 1: WRITE AND READ TO AND FROM THE TAPE VIA THE MUX BUS UNDER SENSE STATUS CONTROL.

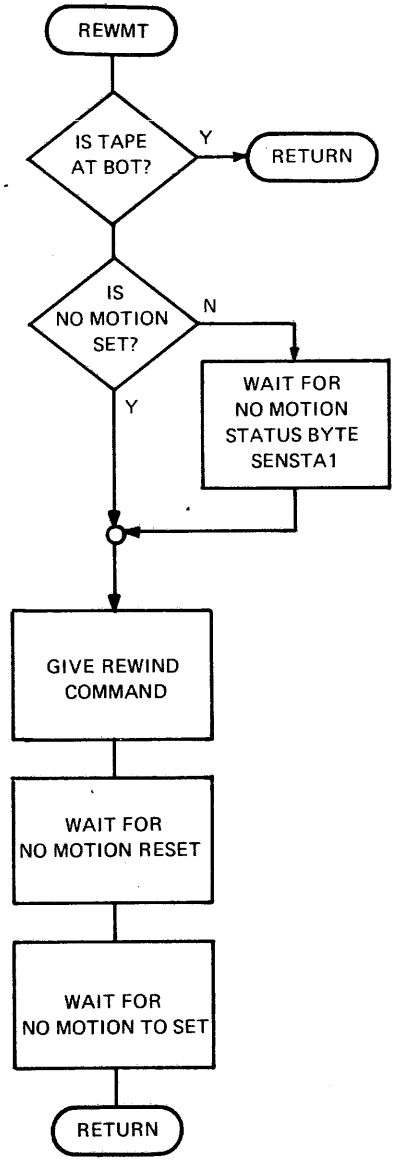
3305

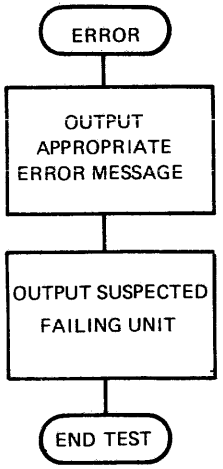


3304


SENSTA1
LOAD A TIME LIMIT
SENSE STATUS OF INTERFACE
CC = 0004
Y
RETURN
N
DECREMENT TIME LIMIT BY 1
N
TIME LIMIT = 0
Y
ERROR


SENSTA3
LOAD A TIME LIMIT
SENSE STATUS OF INTERFACE
CC = 0008
N
RETURN
Y
DECREMENT TIME LIMIT
N
TIME LIMIT = 0
Y
ERROR


REWMT
IS TAPE AT BOT?
Y
RETURN
IS NO MOTION SET?
N
WAIT FOR NO MOTION STATUS BYTE SENSTA1
Y
GIVE REWIND COMMAND
WAIT FOR NO MOTION RESET
WAIT FOR NO MOTION TO SET
RETURN


ERROR
OUTPUT APPROPRIATE ERROR MESSAGE
OUTPUT SUSPECTED FAILING UNIT
END TEST

PROG= *NONE* ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

```
                                    1          SCRAT                                                    SMP10010
                                    2          WIDTH 120                                                SMP10020
                                    3          CROSS                                                    SMP10030
                                    4          TARGT 32                                                 SMP10040
                                    5  * SAMPLE PROGRAM 1                                               SMP10050
                                    6  *                                                                SMP10060
                                    7  *  WRITE TO THE TAPE AND READ FPOM THE TAPE                      SMP10070
                                    8  *  ON THE MULTIPLEXOR BUS USING SENSE STATUS.                    SMP10080
                                    9  *                                                                SMP10090
                                   10  *  REGISTER ASSIGNMENTS                                          SMP10100
          0000 0000                 11  R0         EQU   0                                              SMP10110
          0000 0001                 12  R1         EQU   1                                              SMP10120
          0000 0002                 13  R2         EQU   2                                              SMP10130
          0000 0003                 14  R3         EQU   3                                              SMP10140
          0000 0004                 15  R4         EQU   4                                              SMP10150
          0000 0006                 16  R6         EQU   6                                              SMP10160
          0000 0008                 17  R8         EQU   8                                              SMP10170
          0000 0009                 18  R9         EQU   9                                              SMP10180
          0000 000E                 19  R14        EQU   14                                             SMP10190
          0000 000F                 20  R15        EQU   15                                             SMP10200
                                    21  *                                                                SMP10210
000000I   0085                      22  DRIVADR    DCX   85              DRIVE ADDRESS                  SMP10220
000002I   1234                      23  DATAPAT    DCX   1234            DATA PATTERN                   SMP10230
000004I   00FF                      24  BYTES      DCX   FF              BYTES PER RECORD               SMP10240
000006I   0960                      25  CLEAR      DCX   0960            CLEAR THE INTERFACE            SMP10250
          0000 0007I                26  WRITE      EQU   CLEAR+1         INTERFACE IN WRITE MODE        SMP10260
000008I   0818                      27  DENSITY    DCX   0818,280B       1600, 6250, 800                SMP10270
00000AI   280B
          0000 000BI                28  WRTODDBY   EQU   DENSITY+3       WRITE AN ODD AMOUNT OF BYTES   SMP10280
00000CI   40E0                      29  READ       DCX   40E0            INTERFACE IN READ MODE         SMP10290
          0000 000DI                30  REWIND     EQU   READ+1          REWIND THE TAPE                SMP10300
                                    31  *                                                                SMP10310
                                    32  * START PROGRAM                                                  SMP10320
00000EI   4810 FFEE =000000I        33             LH    R1,DRIVADR      GET DRIVE ADDRESS              SMP10330
000012I   4840 FFEC =000002I        34             LH    R4,DATAPAT      GET DATA PATTERN               SMP10340
000016I   41F0 4000 00F4I           35             BAL   R15,REWMT       REWIND THE TAPE                SMP10350
00001CI   41E0 4000 00A0I           36             BAL   R14,CCLEAR      CLEAR THE INTERFACE            SMP10360
000022I   2432                      37             LIS   R3,2                                           SMP10370
000024I   41E0 4000 00A6I           38             BAL   R14,CDENS       GIVE PROPER DENSITY            SMP10380
00002AI   4860 FFD6 =000004I        39             LH    R6,BYTES        GET BYTES VALUE                SMP10390
00002EI   2761                      40             SIS   R6,1            ADJUST FOR HALFWORD WRITES     SMP10400
000030I   C360 0001                 41             THI   R6,X'0001'      IS IT AN ODD VALUE             SMP10410
000034I   4230 4000 0040I           42             BNZ   SMP1.001        IF ORIGINAL IS NOT, SKIP       SMP10420
00003AI   41E0 4000 00B2I           43             BAL   R14,CWRODBY     ISSUE ODD BYTE COMD            SMP10430
000040I   41E0 4000 00ACI           44  SMP1.001   BAL   R14,CWRITE      GIVE WRITE CMD                 SMP10440
000046I   9814                      45  SMP1.002   WHR   R1,R4           WRITE OUT DATA TO TAPE         SMP10450
000048I   2762                      46             SIS   R6,2            DECREMENT BYTE CNT             SMP10460
00004AI   4380 FFF8 =000046I        47             BNL   SMP1.002        COMPLETE ALL                   SMP10470
00004EI   41E0 4000 00C4I           48             BAL   R14,SENSTA1      WAIT FOR NO MOTION             SMP10480
000054I   C530 0014                 49             CLHI  R3,X'14'        CHECK FOR PROPER STATUS        SMP10490
000058I   4230 4000 0120I           50             BNE   ERROR                                          SMP10500
                                    51  *                                                                SMP10510
00005EI   41E0 4000 00BEI           52             BAL   R14,CREW         REWIND MAGNETIC TAPE           SMP10520
```

```
000064I  41E0 4000 00C4I        53           BAL   R14,SENSTA1        WAIT FOR NO MOTION                    SMP10530
00006AI  4860 FF96 =000004I     54           LH    R6,BYTES           GET BYTES VALUE                       SMP10540
00006EI  2480                   55           LIS   R8,0                                                     SMP10550
000070I  41E0 4000 00B8I        56           BAL   R14,CREAD          PUT INTERFACE IN READ MODE            SMP10560
000076I  41E0 4000 00DAI        57  SMP1.005 BAL   R14,SENSTA3        WAIT FOR NON BUSY                     SMP10570
00007CI  D918 4000 0130I        58           RH    R1,READBUF(R8)     READ INTO MEMORY LOCATION             SMP10580
000082I  2682                   59           AIS   R8,2               INCREMENT LOCATION                    SMP10590
000084I  0568                   60           CLR   R6,R8                                                    SMP10600
000086I  4220 FFEC =000076I     61           BP    SMP1.005           CONTINUE READING                      SMP10610
00008AI  41E0 4000 00C4I        62           BAL   R14,SENSTA1        WAIT FOR NO MOTION                    SMP10620
00008EI  C530 001C              63           CLHI  R3,X'1C'           CHECK FOR PROPER STATUS               SMP10630
000094I  4230 4000 0120I        64           BNE   ERROR                                                    SMP10640
00009AI  4300 4000 0120I        65           B     TSTEND                                                   SMP10650


0000A0I  DE10 FF62 =000006I     67  CCLEAR   OC    R1,CLEAR           CLEAR THE INTERFACE                   SMP10670
0000A4I  030E                   68           BR    R14                RETURN                                SMP10680

0000A6I  DE13 FF5E =000008I     70  CDENS    OC    R1,DENSITY(R3)     PROPER DENSITY                        SMP10700
0000AAI  030E                   71           BR    R14                RETURN                                SMP10710

0000ACI  DE10 FF57 =000007I     73  CWRITE   OC    R1,WRITE           PUT INTERFACE IN WRITE MODE           SMP10730
0000B0I  030E                   74           BR    R14                RETURN                                SMP10740

0000B2I  DE10 FF55 =00000BI     76  CWRODBY  OC    R1,WRTODDBY        ODD BYTE COMMAND FOR ODD BYTE AMOUNTS SMP10760
0000B6I  030E                   77           BR    R14                RETURN                                SMP10770

0000B8I  DE10 FF50 =00000CI     79  CREAD    OC    R1,READ            PUT INTERFACE IN READ MODE            SMP10790
0000BCI  030E                   80           BR    R14                RETURN                                SMP10800

0000BEI  DE10 FF4B =00000DI     82  CREW     OC    R1,REWIND          REWIND TAPE                           SMP10820
0000C2I  030E                   83           BR    R14                RETURN                                SMP10830

0000C4I  F800 007F FFFF         85  SENSTA1  LI    R0,Y'7FFFFF'       TIMELIMIT                             SMP10850
0000CAI  9D13                   86  SENSE1   SSR   R1,R3             GET INTERFACE STATUS                  SMP10860
0000CCI  024E                   87           BOR   R14                RETURN ON NO MOTION                   SMP10870
0000CEI  2701                   88           SIS   R0,1               DECREMENT TIME OUT                    SMP10880
0000D0I  4230 FFF6 =0000CAI     89           BNZ   SENSE1                                                   SMP10890
0000D4I  4300 4000 0120I        90           B     ERROR                                                    SMP10900

0000DAI  F800 007F FFFF         92  SENSTA3  LI    R0,Y'7FFFFF'       TIME LIMIT                            SMP10920
0000E0I  9D13                   93  SENSE3   SSR   R1,R3             GET INTERFACE STATUS                  SMP10930
0000E2I  038E                   94           BNCR  R14                RETURN ON NOT BUSY                    SMP10940
0000E4I  2701                   95           SIS   R0,1               DECREMENT TIME OUT                    SMP10950
0000E6I  4230 FFF6 =0000E0I     96           BNZ   SENSE3                                                   SMP10960
0000EAI  4300 4000 0120I        97           B     ERROR                                                    SMP10970

0000F0I  9D13                   99  SENSTA   SSR   R1,R3             GET INTERFACE STATUS                  SMP10990
0000F2I  030E                  100           BR    R14                RETURN                                SMP11000

0000F4I  41E0 FFF8 =0000F0I    102  REWMT    BAL   R14,SENSTA         CHECK STATUS                          SMP11020
0000F8I  C330 0020             103           THI   R3,X'20'           IS TAPE ALREADY AT BOT                SMP11030
0000FCI  023F                  104           BNZR  R15                RETURN IF SO                          SMP11040
0000FEI  41E0 FFEE =0000F0I    105           BAL   R14,SENSTA                                               SMP11050
```

```
000102I C330 0010              106           THI   R3,X'10'          NOMOTION?                              SMP11060
000106I 4230 4000 0110I        107           BNZ   REW.2                                                     SMP11070
00010CI 41E0 FFB4 =0000C4I     108           BAL   R14,SENSTA1                                              SMP11080
000110I 41E0 FFAA =0000BEI     109 REW.2     BAL   R14,CREW            ISSUE REWIND COMMAND                   SMP11090
000114I 41E0 FFD8 =0000F0I     110 REW.3     BAL   R14,SENSTA                                               SMP11100
000118I 2042                   111           BOS   REW.3              WAIT FOR TAPE TO GO INTO MOTION        SMP11110
00011AI 41E0 FFA6 =0000C4I     112           BAL   R14,SENSTA1        WAIT FOR NO MOTION                     SMP11120
00011EI 030F                   113           BR    R15                RETURN                                 SMP11130

        0000 0120I             115 ERROR     EQU   *                                                       SMP11150
000120I C200 4000 0128I        116 TSTEND    LPSW  WAIT1                                                   SMP11160
000128I 0000 8000              117 WAIT1     DCW   8000                                                    SMP11170
00012CI 0000 0120I             118           DC    A(TSTEND)                                               SMP11180
000130I                        119 READBUF   DS    1024                                                    SMP11190
000530I                        120           END                                                           SMP11200
```

ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

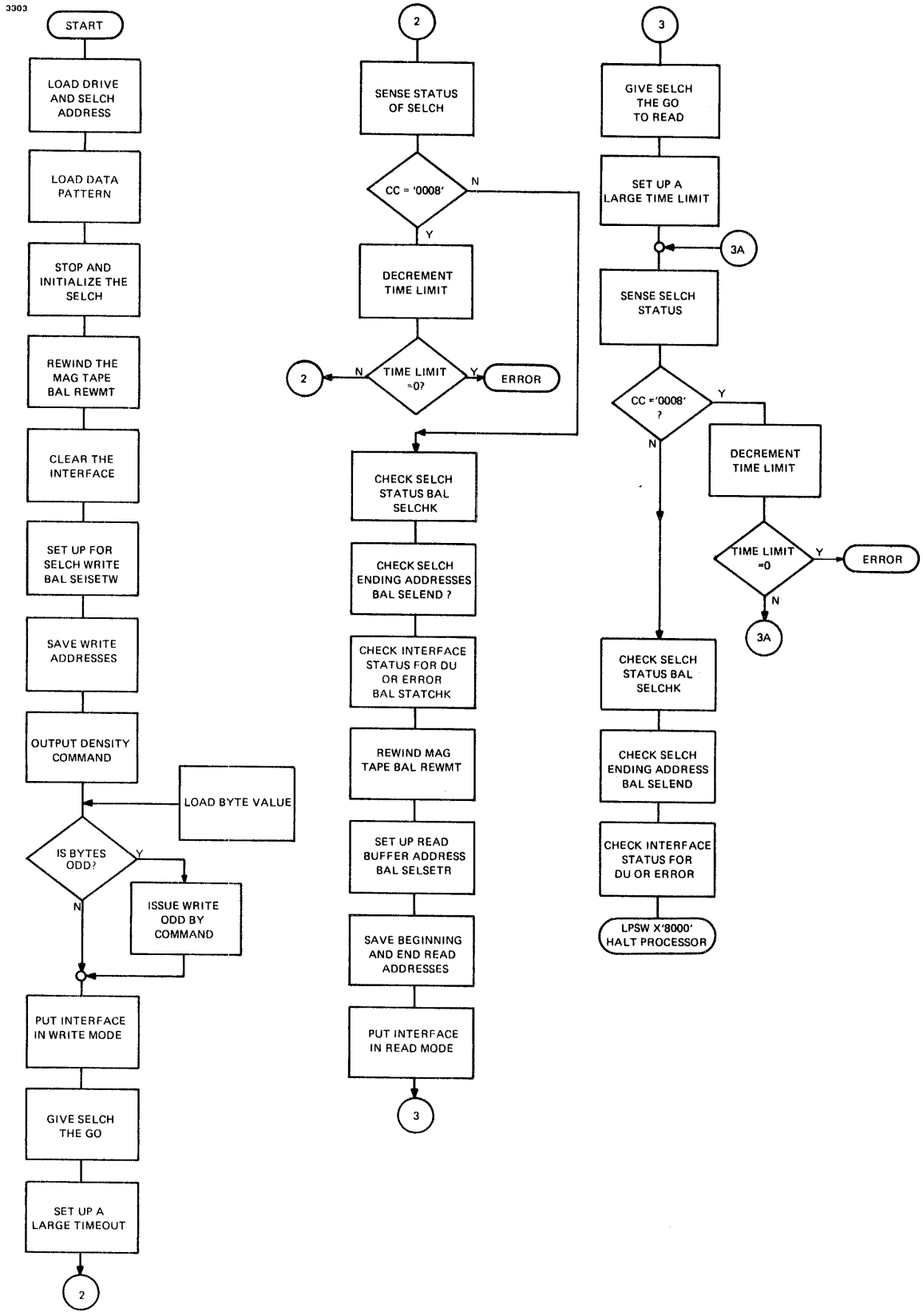
START OPTIONS: T=32,FPLST

NO CAL ERRORS
NO CAL WARNINGS
2 PASSES

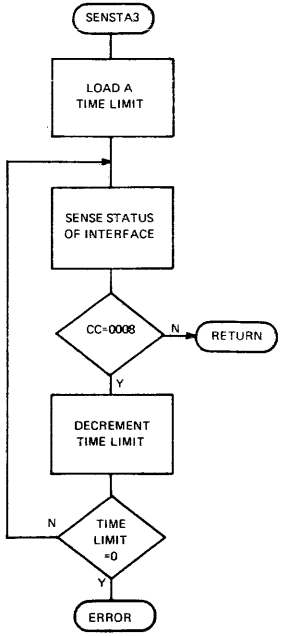
TABLE SPACE USED : 2K

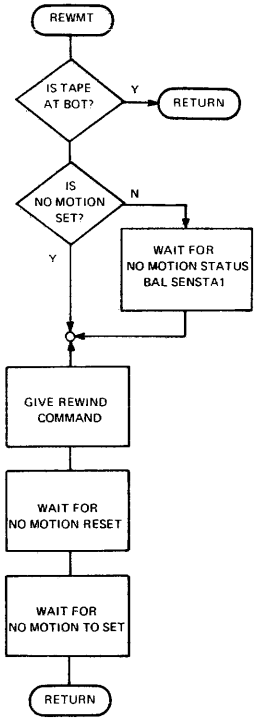
ABSTOP	0000 0000												
ADC	0000 0004												
BYTES	0000 0004I	24*	39	54									
CCLEAR	0000 00A0I	36	67*										
CDENS	0000 00A6I	38	70*										
CLEAR	0000 0006I	25*	26	67									
CREAD	0000 00B8I	56	79*										
CREW	0000 00BEI	52	82*	109									
CWRITE	0000 00ACI	44	73*										
CWRODBY	0000 00B2I	43	76*										
DATAPAT	0000 0002I	23*	34										
DENSITY	0000 0008I	27*	28	70									
DRIVADR	0000 0000I	22*	33										
ERROR	0000 0120I	50	64	90	97	115*							
IMPTOP	0000 0530I	120											
LADC	0000 0002												
PURETOP	0000 0000P	120											
R0	0000 0000	11*	85	88	92	95							
R1	0000 0001	12*	33	45	58	67	70	73	76	79	82	86	93	99
R14	0000 000E	19*	36	38	43	44	48	52	53	56	57	62	68	71
		74	77	80	83	87	94	100	102	105	108	109	110	112
R15	0000 000F	20*	35	104	113								
R2	0000 0002	13*											
R3	0000 0003	14*	37	49	63	70	86	93	99	103	106		
R4	0000 0004	15*	34	45									
R6	0000 0006	16*	39	40	41	46	54	60					
R8	0000 0008	17*	55	58	59	60							
R9	0000 0009	18*											
READ	0000 000CI	29*	30	79									
READBUF	0000 0130I	58	119*										
REW.2	0000 0110I	107	109*										
REW.3	0000 0114I	110*	111										
REWIND	0000 000DI	30*	82										
REWMT	0000 00F4I	35	102*										
SENSE1	0000 00CAI	86*	89										
SENSE3	0000 00E0I	93*	96										
SENSTA	0000 00F0I	99*	102	105	110								
SENSTA1	0000 00C4I	48	53	62	85*	108	112						
SENSTA3	0000 00DAI	57	92*										
SMP1.001	0000 0040I	42	44*										
SMP1.002	0000 0046I	45*	47										
SMP1.005	0000 0076I	57*	61										
TSTEND	0000 0120I	65	116*	118									
WAIT1	0000 0128I	116	117*										
WRITE	0000 0007I	26*	73										
WRTODDBY	0000 000BI	28*	76										

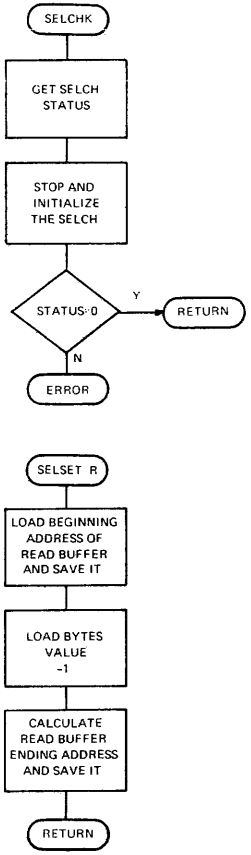
SAMPLE PROGRAM 2: WRITES AND READS TO AND FROM A TAPE USING THE SELCH UNDER SENSE STATUS CONTROL.

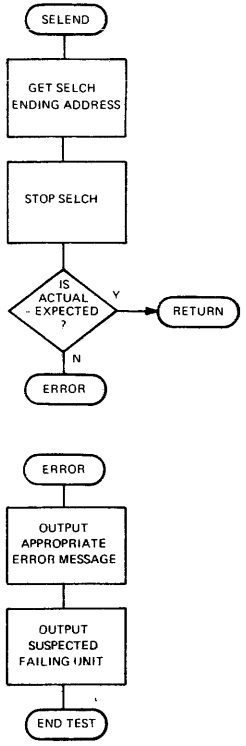


3307

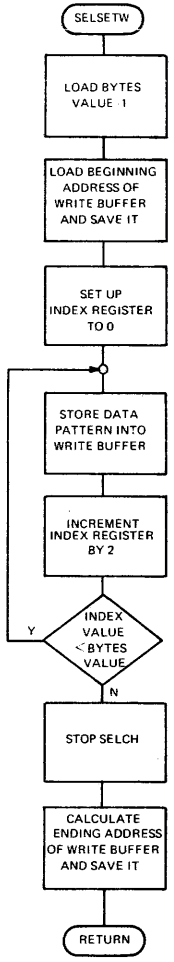

SENSTA3
LOAD A TIME LIMIT
SENSE STATUS OF INTERFACE
CC=0008
N
RETURN
Y
DECREMENT TIME LIMIT
TIME LIMIT =0
N
Y
ERROR

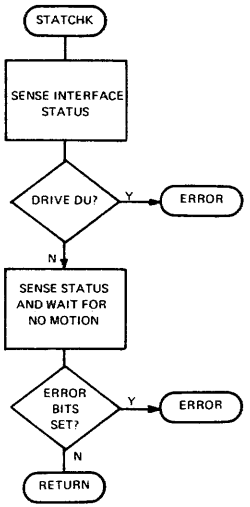

REWMT
IS TAPE AT BOT?
Y
RETURN
IS NO MOTION SET?
N
WAIT FOR NO MOTION STATUS BAL SENSTA1
Y
GIVE REWIND COMMAND
WAIT FOR NO MOTION RESET
WAIT FOR NO MOTION TO SET
RETURN


SELCHK
GET SELCH STATUS
STOP AND INITIALIZE THE SELCH
STATUS=0
Y
RETURN
N
ERROR
SELSET R
LOAD BEGINNING ADDRESS OF READ BUFFER AND SAVE IT
LOAD BYTES VALUE -1
CALCULATE READ BUFFER ENDING ADDRESS AND SAVE IT
RETURN


SELEND
GET SELCH ENDING ADDRESS
STOP SELCH
IS ACTUAL = EXPECTED ?
Y
RETURN
N
ERROR
ERROR
OUTPUT APPROPRIATE ERROR MESSAGE
OUTPUT SUSPECTED FAILING UNIT
END TEST

3306


SELSETW
LOAD BYTES VALUE 1
LOAD BEGINNING ADDRESS OF WRITE BUFFER AND SAVE IT
SET UP INDEX REGISTER TO 0
STORE DATA PATTERN INTO WRITE BUFFER
INCREMENT INDEX REGISTER BY 2
INDEX VALUE < BYTES VALUE
Y
N
STOP SELCH
CALCULATE ENDING ADDRESS OF WRITE BUFFER AND SAVE IT
RETURN


STATCHK
SENSE INTERFACE STATUS
DRIVE DU?
Y
ERROR
N
SENSE STATUS AND WAIT FOR NO MOTION
ERROR BITS SET?
Y
ERROR
N
RETURN

PROG= *NONE* ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

```
                                    1          SCRAT                                                    SMP20010
                                    2          CROSS                                                    SMP20020
                                    3          WIDTH 120                                                SMP20030
                                    4          TARGT 32                                                 SMP20040
                                    5  *                                                                SMP20050
                                    6  * SAMPLE PROGRAM 2                                               SMP20060
                                    7  *  WRITE AND READS TO AND FROM THE TAPE                          SMP20070
                                    8  *  THROUGH THE SELCH USING SENSE STATUS.                         SMP20080
                                    9  *                                                                SMP20090
                                   10  *  REGISTER ASSIGNMENTS                                          SMP20100
          0000 0000                 11  R0         EQU   0                                              SMP20110
          0000 0001                 12  R1         EQU   1                                              SMP20120
          0000 0002                 13  R2         EQU   2                                              SMP20130
          0000 0003                 14  R3         EQU   3                                              SMP20140
          0000 0004                 15  R4         EQU   4                                              SMP20150
          0000 0005                 16  R5         EQU   5                                              SMP20160
          0000 0006                 17  R6         EQU   6                                              SMP20170
          0000 0007                 18  R7         EQU   7                                              SMP20180
          0000 0008                 19  R8         EQU   8                                              SMP20190
          0000 0009                 20  R9         EQU   9                                              SMP20200
          0000 000A                 21  R10        EQU   10                                             SMP20210
          0000 000B                 22  R11        EQU   11                                             SMP20220
          0000 000C                 23  R12        EQU   12                                             SMP20230
          0000 000D                 24  R13        EQU   13                                             SMP20240
          0000 000E                 25  R14        EQU   14                                             SMP20250
          0000 000F                 26  R15        EQU   15                                             SMP20260
000000I   0085                      27  DRIVADR    DCX   85          DRIVE ADDRESS                      SMP20270
000002I   1234                      28  DATAPAT    DCX   1234        DATA PATTERN                       SMP20280
000004I   00F0                      29  SELADR     DCX   F0          SELCH ADDRESS                      SMP20290
000006I   00FF                      30  BYTES      DCX   FF          BYTES PER RECORD                   SMP20300
000008I   000A 5000                 31  BASE       DCY   A5000                                            SMP20310
00000CI   0960                      32  CLEAR      DCX   0960        CLEAR INTERFACE                    SMP20320
          0000 000DI                33  WRITE      EQU   CLEAR+1     INTERFACE INTO WRITE MODE          SMP20330
00000EI   0818                      34  DENSITY    DCX   0818,280B   1600, 6250, 800                    SMP20340
000010I   280B
          0000 0011I                35  WRTODDBY   EQU   DENSITY+3   WRITE AN ODD AMOUNT OF BYTES       SMP20350
000012I   40E0                      36  READ       DCX   40E0        PUT INTERFACE IN READ MODE         SMP20360
          0000 0013I                37  REWIND     EQU   READ+1      REWIND TAPE                        SMP20370
000014I   5474                      38  GO         DCX   5474        SELCH TO GO (WRITE)                SMP20380
          0000 0015I                39  GOREAD     EQU   GO+1        SELCH TO GO READ                   SMP20390
000016I   4C0C                      40  STOP       DCX   4C0C        STOP SELCH                         SMP20400
          0000 0017I                41  STOPS      EQU   STOP+1                                         SMP20410
000018I   4800                      42  EXTD       DCX   4800        EXTENDED ADDRESSES OF SELCH        SMP20420
00001CI   0000 0000                43  STOPADDR   DCY   0           STORAGE LOCATIONS                  SMP20430
000020I   0000 0000                44  WBUF       DCY   0                                              SMP20440
000024I   0000 0000                45  RDBUF      DCY   0                                              SMP20450
000028I   0000 0000                46  ENDBUF     DCY   0                                              SMP20460
                                   47  *                                                                SMP20470
                                   48  * START PROGRAM                                                  SMP20480
                                   49  *                                                                SMP20490
00002CI   4810 FFD0 =000000I       50             LH    R1,DRIVADR    GET DRIVE ADDRESS                  SMP20500
000030I   4820 FFD0 =000004I       51             LH    R2,SELADR     GET SELCH ADRESS                   SMP20510
000034I   4840 FFCA =000002I       52             LH    R4,DATAPAT    GET DATA PATTERN                   SMP20520
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000038I 41E0 4000 012CI          53           BAL   R14,CSTOP          STOP THE SELCH                    SMP20530
00003EI 41E0 4000 012CI          54           BAL   R14,CSTOP          INIT THE SELCH                    SMP20540
000044I 41F0 4000 0246I          55           BAL   R15,REWMT          REWIND THE TAPE                   SMP20550
00004AI 41E0 4000 0108I          56           BAL   R14,CCLEAR         CLEAR THE INTERFACE               SMP20560
000050I 41F0 4000 0172I          57           BAL   R15,SELSETW        SET UP THE WRITE BUFFER           SMP20570
000056I 41E0 4000 0148I          58           BAL   R14,WRBUF                                            SMP20580
00005CI 2432                     59           LIS   R3,2               6250 DENSITY                      SMP20590
00005EI 41E0 4000 011AI          60           BAL   R14,CDENS          GIVE DENSITY COMMAND              SMP20600
000064I 4860 FF9E =000006I       61           LH    R6,BYTES           GET BYTES VALUE                   SMP20610
000068I C360 0001                62           THI   R6,X'0001'         IS IT AN ODD VALUE?               SMP20620
00006CI 4330 4000 0078I          63           BZ    SMP2.002           IF NOT, SKIP                      SMP20630
000072I 41E0 4000 0114I          64           BAL   R14,CWRODBY        ISS ODD BYTE COMMAND              SMP20640
000078I 41E0 4000 010EI          65 SMP2.002  BAL   R14,CWRITE         PUT IN WRITE MODE                 SMP20650
00007EI 41E0 4000 0138I          66           BAL   R14,CGO            GIVE SELCH THE GO                 SMP20660
000084I 5A60 FF80 =000008I       67           A     R6,BASE            A TIME VALUE                      SMP20670
000088I 41E0 4000 0144I          68 SMP2.003  BAL   R14,SENSTA2        SELCH STATUS                      SMP20680
00008EI 4380 4000 00A0I          69           BNC   SMP2.004           WAIT FOR SELCH TO FINISH          SMP20690
000094I 2761                     70           SIS   R6,1                DECREMENT TIMER                   SMP20700
000096I 4230 FFEE =000088I       71           BNZ   SMP2.003           CONTINUE WAIT                     SMP20710
00009AI 4300 4000 0272I          72           B     ERROR                                                SMP20720
0000A0I 41F0 4000 01C0I          73 SMP2.004  BAL   R15,SELCHK         CHECK ENDING STATUS ON SELCH      SMP20730
0000A6I 41F0 4000 01D8I          74           BAL   R15,SELEND         CHECK ENDING ADDR                 SMP20740
0000ACI 41F0 4000 0204I          75           BAL   R15,STATCHK        CHECK INTERFACE STATUS            SMP20750
                                 76 *                                                                    SMP20760
0000B2I 41F0 4000 0246I          77           BAL   R15,REWMT          REWIND MAG TAPE                   SMP20770
0000B8I 41F0 4000 01A8I          78           BAL   R15,SELSETR        SET UP READ ADDRESS               SMP20780
0000BEI 41E0 4000 015AI          79           BAL   R14,REBUF                                            SMP20790
0000C4I 41E0 4000 0120I          80           BAL   R14,CREAD          PUT INTERFACE IN READ MODE        SMP20800
0000CAI 41E0 4000 013EI          81           BAL   R14,CGOREAD                                          SMP20810
0000D0I 4860 FF32 =000006I       82           LH    R6,BYTES                                             SMP20820
0000D4I 5A60 FF30 =000008I       83           A     R6,BASE                                              SMP20830
0000D8I 41E0 4000 0144I          84 SMP2.005  BAL   R14,SENSTA2        CHECK SELCH STATUS                SMP20840
0000DEI 4380 4000 00F0I          85           BNC   SMP2.006                                             SMP20850
0000E4I 2761                     86           SIS   R6,1                DECREMENT TIMER                   SMP20860
0000E6I 4230 FFEE =0000D8I       87           BNZ   SMP2.005                                             SMP20870
0000EAI 4300 4000 0272I          88           B     ERROR              ERROR ROUTINE                     SMP20880
0000F0I 41F0 4000 01C0I          89 SMP2.006  BAL   R15,SELCHK         CHECK SELCH STATUS                SMP20890
0000F6I 41F0 4000 01D8I          90           BAL   R15,SELEND         CHECK ENDING ADDR                 SMP20900
0000FCI 41F0 4000 0204I          91           BAL   R15,STATCHK                                          SMP20910
000102I 4300 4000 0272I          92           B     TSTEND             END SAMPLE PROGRAM                SMP20920


000108I DE10 FF00 =00000CI       94 CCLEAR    OC    R1,CLEAR           CLEAR INTERFACE                   SMP20940
00010CI 030E                     95           BR    R14                RETURN                            SMP20950

00010EI DE10 FEFB =00000DI       97 CWRITE    OC    R1,WRITE           PUT INTERFACE INTO WRITE MODE     SMP20970
000112I 030E                     98           BR    R14                RETURN                            SMP20980

000114I DE10 FEF9 =000011I      100 CWRODBY   OC    R1,WRTODDBY        USED FOR ODD BYTE AMOUNTS         SMP21000
000118I 030E                    101           BR    R14                RETURN                            SMP21010

00011AI DE13 FEF0 =00000EI      103 CDENS     OC    R1,DENSITY(R3)     OUTPUT PROPER DENSITY             SMP21030
00011EI 030E                    104           BR    R14                RETURN                            SMP21040
```

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000120I  DE10 FEEE =000012I    106  CREAD    OC    R1,READ            PUT INTERFACE IN READ MODE          SMP21060
000124I  030E                  107               BR    R14                RETURN                          SMP21070

000126I  DE10 FEE9 =000013I    109  CREW     OC    R1,REWIND          REWIND TAPE                         SMP21090
00012AI  030E                  110               BR    R14                RETURN                          SMP21100

00012CI  DE20 FEE6 =000016I    112  CSTOP    OC    R2,STOP            STOP SELCH                          SMP21120
000130I  030E                  113               BR    R14                                                SMP21130

000132I  DE20 FEE1 =000017I    115  CSTOPS   OC    R2,STOPS           INIT SELCH                          SMP21150
000136I  030E                  116               BR    R14                RETURN                          SMP21160

000138I  DE20 FED8 =000014I    118  CGO      OC    R2,GO              GIVE SELCH THE GO                   SMP21180
00013CI  030E                  119               BR    R14                                                SMP21190

00013EI  DE20 FED3 =000015I    121  CGOREAD  OC    R2,GOREAD          GIVE SELCH THE GO FOR READS         SMP21210
000142I  030E                  122               BR    R14                RETURN                          SMP21220

000144I  9D23                  124  SENSTA2  SSR   R2,R3                                                SMP21240
000146I  030E                  125               BR    R14                RETURN                          SMP21250

                               127  * SET UP SELCH WRITE ADDRESSES                                        SMP21270
000148I  DA20 FED5 =000021I    128  WRBUF    WD    R2,WBUF+1                                            SMP21280
00014CI  D820 FED2 =000022I    129               WH    R2,WBUF+2                                          SMP21290
000150I  DA20 FED5 =000029I    130               WD    R2,ENDBUF+1                                        SMP21300
000154I  D820 FED2 =00002AI    131               WH    R2,ENDBUF+2                                        SMP21310
000158I  030E                  132               BR    R14                RETURN                          SMP21320

                               134  * SET UP EXPECTED SELCH READ ADDRESSES                               SMP21340
00015AI  DA20 FEC7 =000025I    135  REBUF    WD    R2,RDBUF+1                                           SMP21350
00015EI  D820 FEC4 =000026I    136               WH    R2,RDBUF+2                                         SMP21360
000162I  DA20 FEC3 =000029I    137               WD    R2,ENDBUF+1                                        SMP21370
000166I  D820 FEC0 =00002AI    138               WH    R2,ENDBUF+2                                        SMP21380
00016AI  030E                  139               BR    R14                RETURN                          SMP21390

00016CI  9B23                  141  REEND    RDR   R2,R3                                                SMP21410
00016EI  992D                  142               RHR   R2,R13                                             SMP21420
000170I  030E                  143               BR    R14                RETURN                          SMP21430

                               145  *                                                                    SMP21450
                               146  * THIS ROUTINE SETS UP THE WRITE ADDRESSES                           SMP21460
                               147  * ON THE SELCH AND SETS UP THE BUFFER THAT                           SMP21470
                               148  * IS TO BE WRITTEN ONTO THE TAPE THROUGH                             SMP21480
                               149  * THE SELCH.                                                         SMP21490
                               150  *                                                                    SMP21500
000172I  4860 FE90 =000006I    151  SELSETW  LH    R6,BYTES           GET BYTES VALUE                     SMP21510
000176I  2761                  152               SIS   R6,1               ADJUST FOR HALFWORD WRITES      SMP21520
000178I  E630 4000 0280I       153               LA    R3,WRTBUF                                          SMP21530
00017EI  5030 FE9E =000020I    154               STA   R3,WBUF                                            SMP21540
000182I  2470                  155               LIS   R7,0               CLEAR INDEX REGISTER            SMP21550
000184I  4830 FE7A =000002I    156               LH    R3,DATAPAT         LOAD DATA PATTERN               SMP21560
000188I  4037 4000 0280I       157  SEL.1    STH   R3,WRTBUF(R7)      FILL WRTBUF                         SMP21570
00018EI  2672                  158               AIS   R7,2               INCREMENT BUFFER ADDRESS        SMP21580
000190I  0576                  159               CLAR  R7,R6                                              SMP21590
000192I  4320 FFF2 =000188I    160               BNP   SEL.1                                              SMP21600
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000196I 41E0 FF92 =00012CI  161          BAL   R14,CSTOP                                  SMP21610
00019AI E630 4000 0280I     162          LA    R3,WRTBUF                                  SMP21620
0001A0I 0A63                163          AR    R6,R3              CALCULATE ENDING ADDR   SMP21630
0001A2I 5060 FE82 =000028I  164          ST    R6,ENDBUF          SAVE IT                 SMP21640
0001A6I 030F                165          BR    R15                RETURN                  SMP21650

                            167  *                                                          SMP21670
                            168  * THIS ROUTINE SETS UP THE SELCH READ ADDRESSES.          SMP21680
                            169  *                                                          SMP21690
0001A8I E650 4000 0680I     170  SELSETR  LA    R5,READBUF         GET START ADDR          SMP21700
0001AEI 5050 FE72 =000024I  171          STA   R5,RDBUF                                   SMP21710
0001B2I 4860 FE50 =000006I  172          LH    R6,BYTES           GET BYTES VALUE         SMP21720
0001B6I 2761                173          SIS   R6,1               ADJUST                  SMP21730
0001B8I 0A56                174          AR    R5,R6              CALCULATE END ADDRESS   SMP21740
0001BAI 5050 FE6A =000028I  175          ST    R5,ENDBUF          SAVE IT                 SMP21750
0001BEI 030F                176          BR    R15                RETURN                  SMP21760

                            178  *                                                          SMP21780
                            179  * THIS ROUTINE IS USED TO CHECK THE SELCH                 SMP21790
                            180  * ENDING STATUS.                                          SMP21800
                            181  *                                                          SMP21810
0001C0I 41E0 FF80 =000144I  182  SELCHK   BAL   R14,SENSTA2        GET SELCH STATUS        SMP21820
0001C4I 41E0 FF64 =00012CI  183          BAL   R14,CSTOP                                  SMP21830
0001C8I 41E0 FF66 =000132I  184          BAL   R14,CSTOPS                                 SMP21840
0001CCI C530 0000           185          CLHI  R3,0               CORRECT STATUS?         SMP21850
0001D0I 033F                186          BER   R15                RETURN IF YES           SMP21860
0001D2I 4300 4000 0272I     187          B     ERROR                                      SMP21870

                            189  *                                                          SMP21890
                            190  * THIS ROUTINE CHECKS THE SELCH ENDING ADDRESSES         SMP21900
                            191  * FOR WRITES AND READS.                                   SMP21910
                            192  *                                                          SMP21920
0001D8I 41E0 4000 0240I     193  SELEND   BAL   R14,CEXTD                                  SMP21930
0001DEI 41E0 FF8A =00016CI  194          BAL   R14,REEND                                  SMP21940
0001E2I 3433                195          EXHR  R3,R3                                      SMP21950
0001E4I 063D                196          OAR   R3,R13                                     SMP21960
0001E6I 5030 FE32 =00001CI  197          STA   R3,STOPADDR                                SMP21970
0001EAI 41E0 FF3E =00012CI  198          BAL   R14,CSTOP          STOP SELCH              SMP21980
0001EEI 41E0 4000 0226I     199          BAL   R14,SENSTA                                 SMP21990
0001F4I 5850 FE24 =00001CI  200          LDA   R5,STOPADDR                                SMP22000
0001F8I 5550 FE2C =000028I  201          CLA   R5,ENDBUF          CORRECT ENDING ADDRESS  SMP22010
0001FCI 033F                202          BER   R15                YES, RETURN             SMP22020
0001FEI 4300 4000 0272I     203          B     ERROR                                      SMP22030

                            205  *                                                          SMP22050
                            206  * THIS ROUTINE CHECKS THE SELCH ENDING STATUS.           SMP22060
                            207  *                                                          SMP22070
000204I 41E0 4000 0226I     208  STATCHK  BAL   R14,SENSTA                                 SMP22080
00020AI C330 0001           209          THI   R3,X'01'           IS DRIVE DU?            SMP22090
00020EI 4230 4000 0272I     210          BNZ   ERROR              YES, TELL USER          SMP22100
000214I 41E0 4000 022AI     211          BAL   R14,SENSTA1         WAIT FOR NO MOTION      SMP22110
00021AI C330 00C0           212          THI   R3,X'C0'           SEE IF ANY ERROR STATUS BITS SET SMP22120
00021EI 4230 4000 0272I     213          BNZ   ERROR1             DETERMINE WHICH ONE     SMP22130
000224I 030F                214          BR    R15                OTHERWISE RETURN        SMP22140
000226I 9D13                215  SENSTA   SSR   R1,R3             GET INTERFACE STATUS    SMP22150
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000228I  030E                    216           BR    R14                 RETURN                                  SMP22160

00022AI  F800 007F FFFF          218  SENSTA1  LI    R0,Y'7FFFFF'        TIME LIMIT                              SMP22180
000230I  9D13                    219  SENSE1   SSR   R1,R3               GET INTERFACE STATUS                    SMP22190
000232I  024E                    220           BOR   R14                 RETURN ON NO MOTION                     SMP22200
000234I  2701                    221           SIS   R0,1                 DECREMENT TIMER                         SMP22210
000236I  4230 FFF6 =000230I      222           BNZ   SENSE1                                                      SMP22220
00023AI  4300 4000 0272I         223           B     ERROR                                                       SMP22230

000240I  DE20 FDD4 =000018I      225  CEXTD    OC    R2,EXTD                                                     SMP22250
000244I  030E                    226           BR    R14                 RETURN                                  SMP22260

000246I  41E0 FFDC =000226I      228  REWMT    BAL   R14,SENSTA                                                  SMP22280
00024AI  C330 0020               229           THI   R3,X'20'            AT BOT ALREADY                          SMP22290
00024EI  023F                    230           BNZR  R15                 RETURN IF YES                           SMP22300
000250I  41E0 FFD2 =000226I      231           BAL   R14,SENSTA                                                  SMP22310
000254I  C330 0010               232           THI   R3,X'10'            NO MOTION SET                           SMP22320
000258I  4230 4000 0262I         233           BNZ   REW.2                                                       SMP22330
00025EI  41E0 FFC8 =00022AI      234           BAL   R14,SENSTA1         WAIT FOR NO MOTION                      SMP22340
000262I  41E0 FEC0 =000126I      235  REW.2    BAL   R14,CREW            REWIND THE TAPE TO BOT                  SMP22350
000266I  41E0 FFBC =000226I      236  REW.3    BAL   R14,SENSTA                                                  SMP22360
00026AI  2042                    237           BOS   REW.3               WAIT FOR TAPE TO GO INTO MOTION         SMP22370
00026CI  41E0 FFBA =00022AI      238           BAL   R14,SENSTA1         WAIT FOR NO MOTION                      SMP22380
000270I  030F                    239           BR    R15                 RETURN                                  SMP22390
                                 240  *                                                                         SMP22400
         0000 0272I              241  ERROR    EQU   *                   APPROPRIATE ERROR MESSAGE AND ERROR     SMP22410
         0000 0272I              242  ERROR1   EQU   *                   INFORMATION IS OUTPUT HERE.             SMP22420
000272I  C200 4000 0278I         243  TSTEND   LPSW  WAIT1               PUT PROCESSOR IN WAIT STATE             SMP22430
000278I  0000 8000               244  WAIT1    DCY   8000                                                      SMP22440
00027CI  0000 0272I              245           DC    A(TSTEND)                                                   SMP22450
000280I                          246  WRTBUF   DS    1024                ALLOCATE ENOUGH SPACE                   SMP22460
000680I                          247  READBUF  DS    1024                                                        SMP22470
000A80I                          248           END                                                               SMP22480
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ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

START OPTIONS: T=32,ERLST

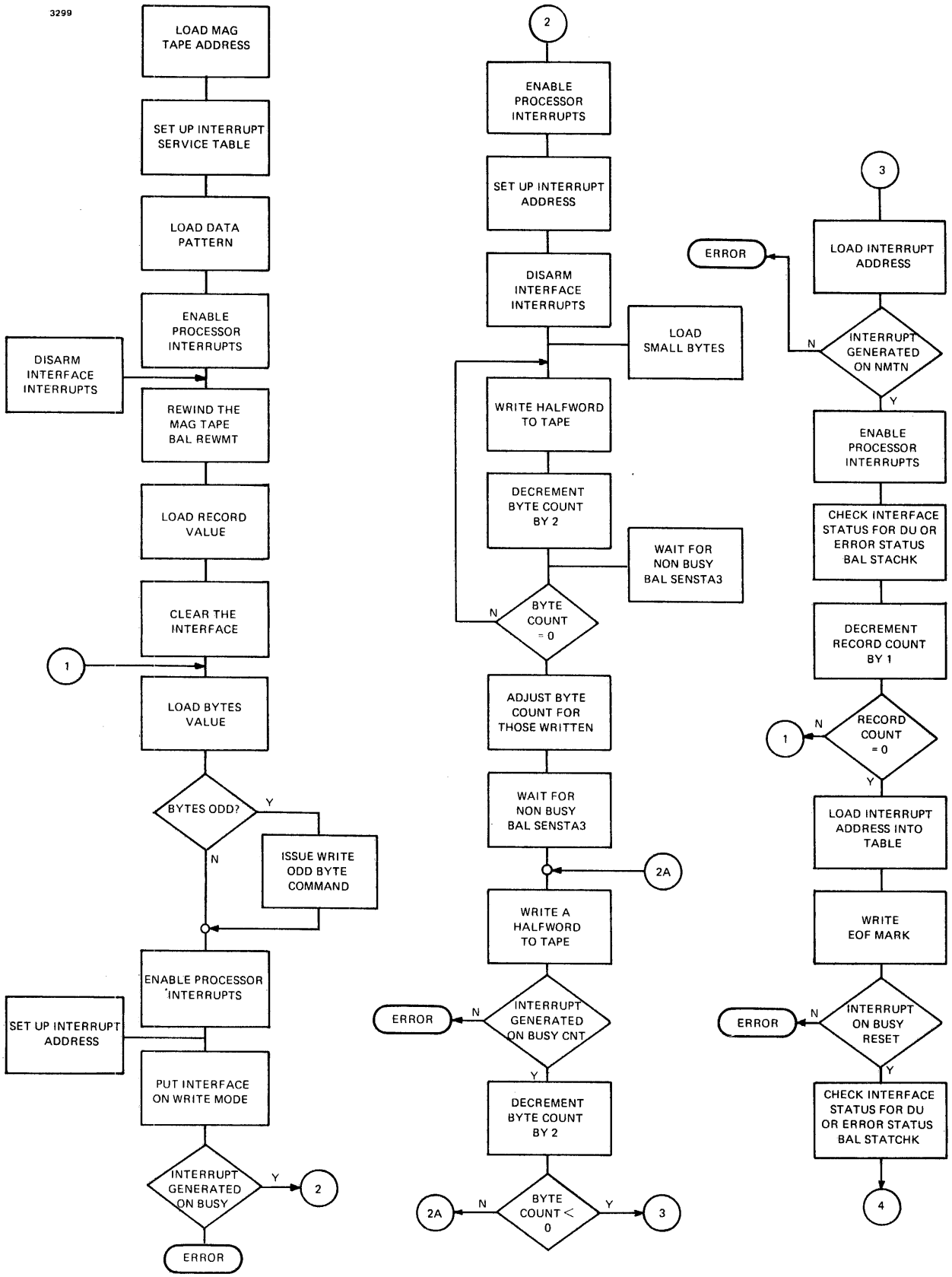
NO CAL ERRORS
NO CAL WARNINGS
2 PASSES

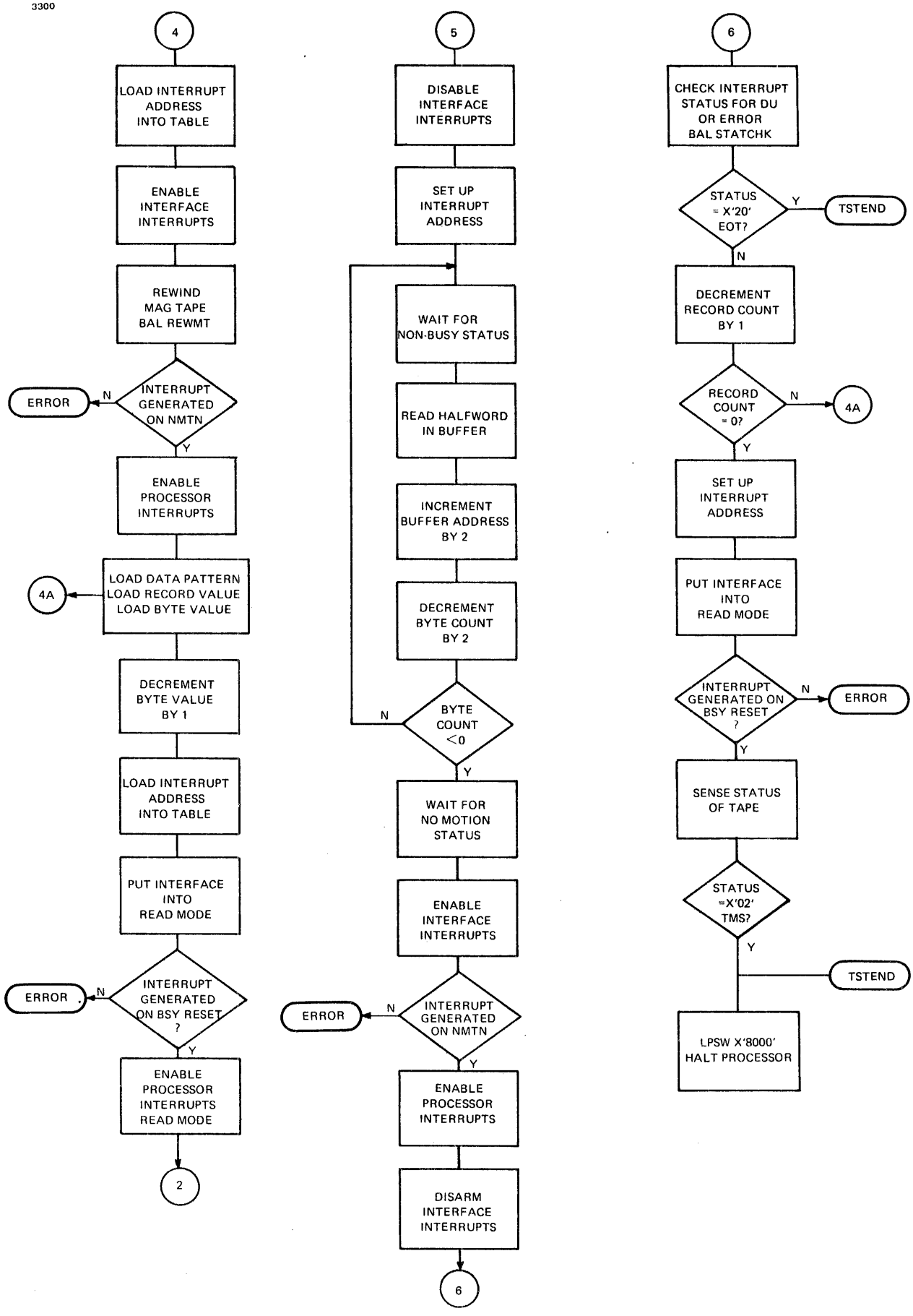
TABLE SPACE USED : 3K

ABSTOP	0000 0000												
ADC	0000 0004												
BASE	0000 0008I	31*	67	83									
BYTES	0000 0006I	30*	61	82	151	172							
CCLEAR	0000 0108I	56	94*										
CDENS	0000 011AI	60	103*										
CEXTD	0000 0240I	193	225*										
CGO	0000 0138I	66	118*										
CGOREAD	0000 013EI	81	121*										
CLEAR	0000 000CI	32*	33	94									
CREAD	0000 0120I	80	106*										
CREW	0000 0126I	109*	235										
CSTOP	0000 012CI	53	54	112*	161	183	198						
CSTOPS	0000 0132I	115*	184										
CWRITE	0000 010EI	65	97*										
CWRODBY	0000 0114I	54	100*										
DATAPAT	0000 0002I	28*	52	156									
DENSITY	0000 000EI	34*	35	103									
DRIVADR	0000 0000I	27*	50										
ENDBUF	0000 0028I	46*	130	131	137	138	164	175	201				
ERROR	0000 0272I	72	88	187	203	210	223	241*					
ERROR1	0000 0272I	213	242*										
EXTD	0000 0018I	42*	225										
GO	0000 0014I	38*	39	118									
GOREAD	0000 0015I	39*	121										
IMPTOP	0000 0A80I	248											
LADC	0000 0002												
PURETOP	0000 0000P	248											
R0	0000 0000	11*	218	221									
R1	0000 0001	12*	50	94	97	100	103	106	109	215	219		
R10	0000 000A	21*											
R11	0000 000B	22*											
R12	0000 000C	23*											
R13	0000 000D	24*	142	196									
R14	0000 000E	25*	53	54	56	58	60	64	65	66	68	79	80	81
		84	95	98	101	104	107	110	113	116	119	122	125	132
		139	143	161	182	183	184	193	194	198	199	208	211	216
		220	226	228	231	234	235	236	238					
R15	0000 000F	26*	55	57	73	74	75	77	78	89	90	91	165	176
		186	202	214	230	239								
R2	0000 0002	13*	51	112	115	118	121	124	128	129	130	131	135	136
		137	138	141	142	225								
R3	0000 0003	14*	59	103	124	141	153	154	156	157	162	163	185	195
		195	196	197	209	212	215	219	229	232				
R4	0000 0004	15*	52											

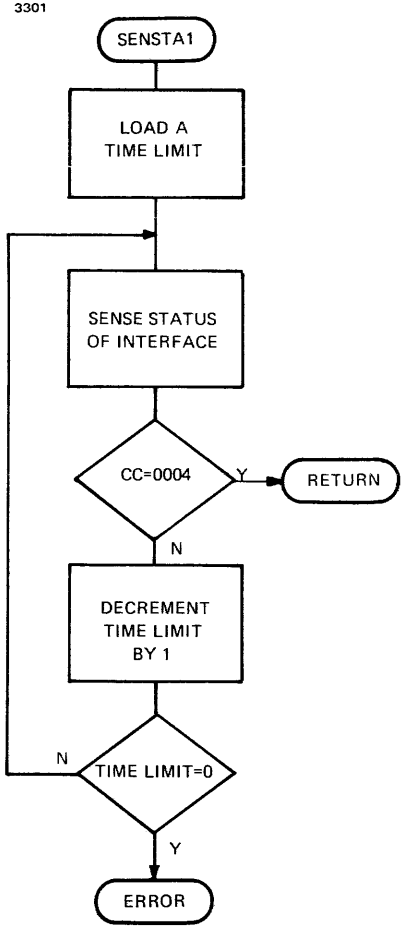
R5	0000 0005	16*	170	171	174	175	200	201						
R6	0000 0006	17*	61	62	67	70	82	83	86	151	152	159	163	164
		172	173	174										
R7	0000 0007	18*	155	157	158	159								
R8	0000 0008	19*												
R9	0000 0009	20*												
RDBUF	0000 0024I	45*	135	136	171									
READ	0000 0012I	36*	37	106										
READBUF	0000 0680I	170	247*											
REBUF	0000 015AI	79	135*											
REEND	0000 016CI	141*	194											
REW.2	0000 0262I	233	235*											
REW.3	0000 0266I	236*	237											
REWIND	0000 0013I	37*	109											
REWMT	0000 0246I	55	77	228*										
SEL.1	0000 0188I	157*	160											
SELADR	0000 0004I	29*	51											
SELCHK	0000 01C0I	73	89	182*										
SELEND	0000 01D8I	74	90	193*										
SELSETR	0000 01A8I	78	170*											
SELSETW	0000 0172I	57	151*											
SENSE1	0000 0230I	219*	222											
SENSTA	0000 0226I	199	208	215*	228	231	236							
SENSTA1	0000 022AI	211	218*	234	238									
SENSTA2	0000 0144I	68	84	124*	182									
SMP2.002	0000 0078I	63	65*											
SMP2.003	0000 0088I	68*	71											
SMP2.004	0000 00A0I	69	73*											
SMP2.005	0000 00D8I	84*	87											
SMP2.006	0000 00F0I	85	89*											
STATCHK	0000 0204I	75	91	208*										
STOP	0000 0016I	40*	41	112										
STOPADDR	0000 001CI	43*	197	200										
STOPS	0000 0017I	41*	115											
TSTEND	0000 0272I	92	243*	245										
WAIT1	0000 0278I	243	244*											
WBUF	0000 0020I	44*	128	129	154									
WRBUF	0000 0148I	58	128*											
WRITE	0000 000DI	33*	97											
WRTBUF	0000 0280I	153	157	162	246*									
WRTODDBY	0000 0011I	35*	100											

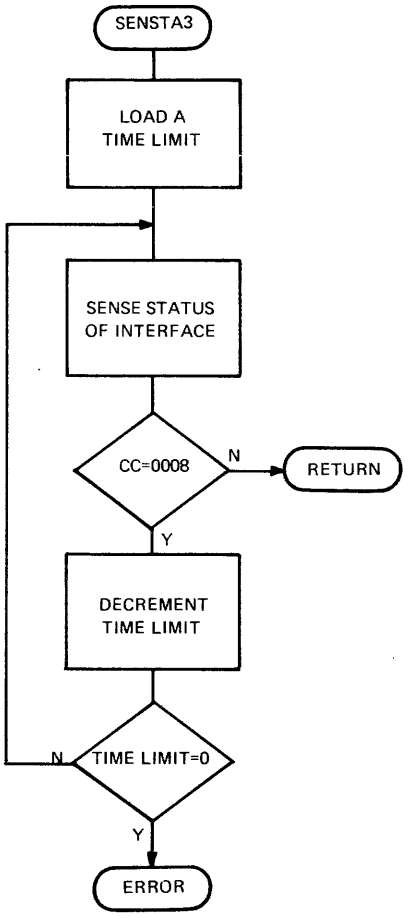
SAMPLE PROGRAM 3: WRITES AND READS TO AND FROM A TAPE VIA A MUX BUS UNDER INTERRUPTS.

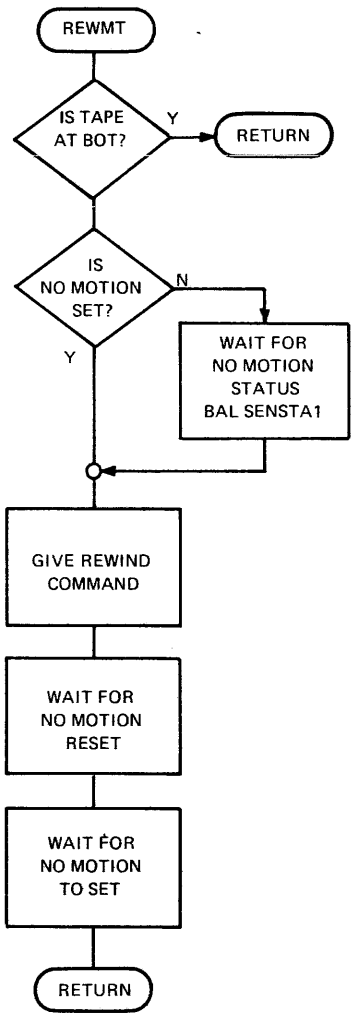


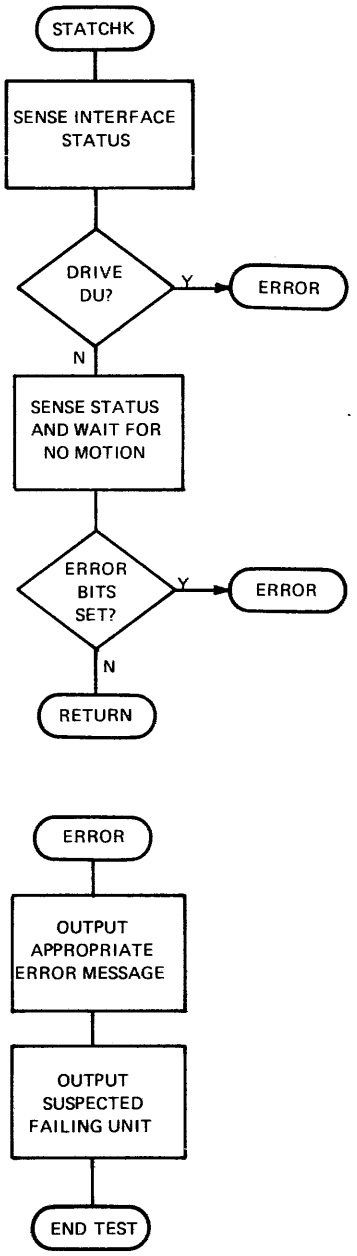

4
LOAD INTERRUPT ADDRESS INTO TABLE
ENABLE INTERFACE INTERRUPTS
REWIND MAG TAPE BAL REWMT
INTERRUPT GENERATED ON NMTN
N
ERROR
Y
ENABLE PROCESSOR INTERRUPTS
4A
LOAD DATA PATTERN LOAD RECORD VALUE LOAD BYTE VALUE
DECREMENT BYTE VALUE BY 1
LOAD INTERRUPT ADDRESS INTO TABLE
PUT INTERFACE INTO READ MODE
INTERRUPT GENERATED ON BSY RESET ?
N
ERROR
Y
ENABLE PROCESSOR INTERRUPTS READ MODE
2
5
DISABLE INTERFACE INTERRUPTS
SET UP INTERRUPT ADDRESS
WAIT FOR NON-BUSY STATUS
READ HALFWORD IN BUFFER
INCREMENT BUFFER ADDRESS BY 2
DECREMENT BYTE COUNT BY 2
BYTE COUNT <0
N
Y
WAIT FOR NO MOTION STATUS
ENABLE INTERFACE INTERRUPTS
INTERRUPT GENERATED ON NMTN
N
ERROR
Y
ENABLE PROCESSOR INTERRUPTS
DISARM INTERFACE INTERRUPTS
6
6
CHECK INTERRUPT STATUS FOR DU OR ERROR BAL STATCHK
STATUS = X'20' EOT?
Y
TSTEND
N
DECREMENT RECORD COUNT BY 1
RECORD COUNT = 0?
N
4A
Y
SET UP INTERRUPT ADDRESS
PUT INTERFACE INTO READ MODE
INTERRUPT GENERATED ON BSY RESET ?
N
ERROR
Y
SENSE STATUS OF TAPE
STATUS =X'02' TMS?
Y
TSTEND
LPSW X'8000' HALT PROCESSOR

3301


SENSTA1
LOAD A TIME LIMIT
SENSE STATUS OF INTERFACE
CC=0004
Y
RETURN
N
DECREMENT TIME LIMIT BY 1
N
TIME LIMIT=0
Y
ERROR


SENSTA3
LOAD A TIME LIMIT
SENSE STATUS OF INTERFACE
CC=0008
N
RETURN
Y
DECREMENT TIME LIMIT
N
TIME LIMIT=0
Y
ERROR


REWMT
IS TAPE AT BOT?
Y
RETURN
IS NO MOTION SET?
N
WAIT FOR NO MOTION STATUS BAL SENSTA1
Y
GIVE REWIND COMMAND
WAIT FOR NO MOTION RESET
WAIT FOR NO MOTION TO SET
RETURN


STATCHK
SENSE INTERFACE STATUS
DRIVE DU?
Y
ERROR
N
SENSE STATUS AND WAIT FOR NO MOTION
ERROR BITS SET?
Y
ERROR
N
RETURN
ERROR
OUTPUT APPROPRIATE ERROR MESSAGE
OUTPUT SUSPECTED FAILING UNIT
END TEST

PROG= *NONE* ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

```
                                    1          SCRAT                                                    SMP30010
                                    2          CROSS                                                    SMP30020
                                    3          WIDTH 120                                                SMP30030
                                    4          TARGT 32                                                 SMP30040
                                    5  *                                                                SMP30050
                                    6  * SAMPLE PROGRAM 3                                              SMP30060
                                    7  *                                                                SMP30070
                                    8  * THIS SAMPLE PROGRAM IS TO ILLUSTRATE                          SMP30080
                                    9  * WRITE AND READS TO THE TAPE VIA A                             SMP30090
                                   10  * MULTIPLEXOR BUS UNDER INTERRUPTS.                              SMP30100
                                   11  *                                                                SMP30110
                                   12  *  REGISTER ASSIGNMENTS                                          SMP30120
          0000 0000                13  R0         EQU   0                                               SMP30130
          0000 0001                14  R1         EQU   1                                               SMP30140
          0000 0002                15  R2         EQU   2                                               SMP30150
          0000 0003                16  R3         EQU   3                                               SMP30160
          0000 0004                17  R4         EQU   4                                               SMP30170
          0000 0005                18  R5         EQU   5                                               SMP30180
          0000 0006                19  R6         EQU   6                                               SMP30190
          0000 0008                20  R8         EQU   8                                               SMP30200
          0000 0009                21  R9         EQU   9                                               SMP30210
          0000 000A                22  R10        EQU   10                                              SMP30220
          0000 000C                23  R12        EQU   12                                              SMP30230
          0000 000D                24  R13        EQU   13                                              SMP30240
          0000 000E                25  R14        EQU   14                                              SMP30250
          0000 000F                26  R15        EQU   15                                              SMP30260
000000I   0085                     27  DRIVADR    DCX   85              DRIVE ADDRESS                   SMP30270
000002I   1234                     28  DATAPAT    DCX   1234            DATA PATTERN                    SMP30280
000004I   00FF                     29  BYTES      DCX   FF              BYTES PER RECORD                SMP30290
000006I   007F                     30  RECORDS    DCX   7F              RECORD VALUE                    SMP30300
000008I   000A 5000                31  BASE       DCX   A5000                                           SMP30310
00000CI   70F0                     32  PSW3       DCX   70F0            ENABLE PROCESSOR INT            SMP30320
00000EI   0000                     33  STATUS     DCX   0000            STORAGE                         SMP30330
000010I   0960                     34  CLEAR      DCX   0960            CLEAR THE INTERFACE             SMP30340
          0000 0011I               35  WRITE      EQU   CLEAR+1         INTERFACE INTO WRITE MODE       SMP30350
000012I   0818                     36  DENSITY    DCX   0818,280B       1600, 6250, 800 DENSITY         SMP30360
000014I   280B
          0000 0015I               37  WRTODDBY   EQU   DENSITY+3       WRITE ODD AMOUNT BYTES          SMP30370
000016I   40E0                     38  READ       DCX   40E0            INTERFACE INTO READ MODE        SMP30380
          0000 0017I               39  REWIND     EQU   READ+1          REWIND THE MAG TAPE             SMP30390
000018I   4888                     40  ENABLE     DCX   4888            ENABLE INTERFACE INTERRUPTS     SMP30400
          0000 0019I               41  DISABLE    EQU   ENABLE+1        DISABLE INTERFACE INTERRUPTS    SMP30410
00001AI   C8C0                     42  DISARM     DCX   C8C0            DISARM INTERFACE INTERRUPTS     SMP30420
          0000 001BI               43  WREOF      EQU   DISARM+1        WRITE END OF FILE MARK          SMP30430
                                   44  *                                                                SMP30440
                                   45  *  START PROGRAM                                                 SMP30450
                                   46  *                                                                SMP30460
00001CI   4810 FFE0 =000000I       47             LH    R1,DRIVADR      GET DRIVE ADDRESS               SMP30470
000020I   08C1                     48             LR    R12,R1          SET UP INTERRUPT ADDRESS TABLE  SMP30480
000022I   91C1                     49             SLHLS R12,1                                           SMP30490
000024I   CAC0 00D0                50             AHI   R12,X'D0'                                       SMP30500
000028I   4840 FFD6 =000002I       51             LH    R4,DATAPAT      GET DATA PATTERN                SMP30510
00002CI   7330 FFDC =00000CI       52             LHL   R3,PSW3         GET PSW 70F0                    SMP30520
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000030I  95E3                    53           EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS              SMP30530
000032I  41E0 4000 02C6I         54           BAL   R14,CDISARM         DISARM ANY INTERRUPTS                    SMP30540
000038I  41F0 4000 032EI         55           BAL   R15,REWMT           REWIND THE TAPE                          SMP30550
00003EI  7360 FFC4 =000006I      56           LHL   R6,RECORDS          GET RECORDS VALUE                        SMP30560
000042I  41F0 4000 0296I         57  SMP3.000 BAL   R14,CCLEAR          CLEAR INTERFACE                          SMP30570
000048I  7380 FFB8 =000004I      58           LHL   R8,BYTES            GET BYTES VALUE                          SMP30580
00004CI  2781                    59           SIS   R8,1                ADJUST FOR HALWORD OUTPUT                SMP30590
00004EI  C380 0001               60           THI   R8,X'0001'          IS BYTES VALUE ODD?                      SMP30600
000052I  4230 4000 005FI         61           BNZ   SMP3.001            NO                                       SMP30610
000058I  41E0 4000 02A2I         62           BAL   R14,CWRODBY         OTHERWISE, ISSUE ODD BYTE COMMAND        SMP30620
                                 63  *                                                                          SMP30630
                                 64  * ENABLE INTERRUPTS AND WAIT FOR THE INTERRUPT                             SMP30640
                                 65  * ON BUSY RESET AFTER WRITE.                                               SMP30650
                                 66  *                                                                          SMP30660
00005EI  0858                    67  SMP3.001 LR    R5,R8                LOAD BYTES INTO TEMP REGISTER            SMP30670
000060I  7330 FFA8 =00000CI      68           LHL   R3,PSW3             PSW 70F0                                 SMP30680
000064I  95E3                    69           EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS              SMP30690
000066I  E630 4000 009AI         70           LA    R3,SMP3.002         INTERRUPT ADDRESS                        SMP30700
00006CI  403C 0000               71           STH   R3,0(R12)                                                  SMP30710
000070I  41E0 4000 02BAI         72           BAL   R14,CENBLE          ENABLE INTERRUPTS                        SMP30720
000076I  2432                    73           LIS   R3,2                INDEX FOR 6250 DENSITY                   SMP30730
000078I  41E0 4000 02A8I         74           BAL   R14,CDENS           OUTPUT DENSITY COMMAND                   SMP30740
00007EI  41E0 4000 029CI         75           BAL   R14,CWRITE          ISSUE WRITE COMMAND                      SMP30750
000084I  C800 7FFF               76           LHI   R0,X'7FFF'          TIMER VALUE                              SMP30760
000088I  41E0 4000 035AI         77           BAL   R14,TIMOUT          WAIT FOR INTERPUPT                       SMP30770
00008EI  E650 4000 0370I         78           LA    R5,SMP3.E00         NO INTERRUPT GENERATED ON COMMAND WRI    SMP30780
000094I  4300 4000 0362I         79           B     ERROR               ERROR ROUTINE                            SMP30790
                                 80  *                                                                          SMP30800
                                 81  * DISARM INTERRUPTS INITIALLY TO VERIFY THAT                               SMP30810
                                 82  * AN INTERRUPT WILL NOT OCCUR ON THE WRITE BUSY,                           SMP30820
                                 83  * THEN ENABLE INTERRUPTS TO VERIFY THAT INTERRUPTS                         SMP30830
                                 84  * WILL OCCUR ON EACH WRITE BUSY RESET.                                     SMP30840
                                 85  *                                                                          SMP30850
00009AI  7330 FF6F =00000CI      86  SMP3.002 LHL   R3,PSW3             PSW 70F0                                 SMP30860
00009EI  95E3                    87           EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS              SMP30870
0000A0I  E630 4000 00EAI         88           LA    R3,SMP3.004         INTERRUPT ADDRESS:                       SMP30880
0000A6I  403C 0000               89           STH   R3,0(R12)           IN INTERRUPT TABLE                       SMP30890
0000AAI  24A4                    90           LIS   R10,4               BYTE NUMBER                              SMP30900
0000ACI  41E0 4000 02C6I         91           BAL   R14,CDISARM         DISARM INTERRUPTS                        SMP30910
0000B2I  9814                    92  SMP3.003 WHR   R1,R4               WRITE TO TAPE(NO INTERRUPTS)             SMP30920
0000B4I  27A2                    93           SIS   R10,2               DECREMENT COUNTER                        SMP30930
0000B6I  2336                    94           BZS   SMP3.0A3            JUMP OUT                                 SMP30940
0000B8I  41E0 4000 02D2I         95           BAL   R14,SENSTA3         WAIT FOR NON BUSY                        SMP30950
0000BEI  4300 FFF0 =0000B2I      96           B     SMP3.003            CONTINUE WRITE                           SMP30960
0000C2I  41E0 4000 02D2I         97  SMP3.0A3 BAL   R14,SENSTA3         WAIT FOR NON BUSY                        SMP30970
0000C8I  41E0 4000 02BAI         98           BAL   R14,CENBLE          ENABLE INTERRUPTS                        SMP30980
0000CEI  2754                    99           SIS   R5,4                ADJUST BYTE COUNT FOR THOSE WRITTEN      SMP30990
0000D0I  9814                   100  SMP3.005 WHR   R1,R4                                                       SMP31000
0000D2I  F800 0000 7FFF         101           LI    R0,Y'7FFF'          TIME VALUE                               SMP31010
0000D8I  41E0 4000 035AI        102           BAL   R14,TIMOUT          WAIT FOR INTERRUPT                       SMP31020
0000DEI  E650 4000 039AI        103           LA    R5,SMP3.E01         NO INTERRUPT GEN ON BSY AFTER WRITE      SMP31030
0000E4I  4300 4000 0362I        104           B     ERROR               ERROR ROUTINE                            SMP31040
                                105  *                                                                          SMP31050
                                106  * EXPECT A NO MOTION INTERRUPT AFTER COMPLETING THE WRITES                 SMP31060
                                107  *                                                                          SMP31070
```

```
0000EAI  7330 FF1E =00000CI     108  SMP3.004 LHL   R3,PSW3             ENABLE PROC INT AND REG SET F          SMP31080
0000EEI  95E3                   109          EPSR  R14,R3                                                     SMP31090
0000F0I  2752                   110          SIS   R5,2                DECREMENT BYTE COUNT                 SMP31100
0000F2I  4380 FFDA =0000D0I     111          BNL   SMP3.005            CONTINUE WRITE OUTPUT                SMP31110
0000F6I  E630 4000 0118I        112          LA    R3,SMP3.009         INTERRUPT ADDRESS                    SMP31120
0000FCI  403C 0000              113          STH   R3,0(R12)           IN INTERRUPT TABLE                   SMP31130
000100I  F800 007F FFFF         114          LI    R0,Y'7FFFFF'                                               SMP31140
000106I  41E0 4000 035AI        115          BAL   R14,TIMOUT          WAIT FOR NMTN INTERRUPT              SMP31150
00010CI  E650 4000 03C6I        116          LA    R5,SMP3.E03         NO INTERRUPT GEN ON MNTN AFTER WRITE  SMP31160
000112I  4300 4000 0362I        117          B     ERROR               ERROR ROUTINE                        SMP31170
                                118  *                                                                       SMP31180
                                119  * CHECK THE INTERFACE STATUS AND THEN WAIT FOR                          SMP31190
                                120  * AN INTERRUPT ON BUSY RESET AFTER WRITE EOF.                          SMP31200
                                121  *                                                                       SMP31210
000118I  7330 FEF0 =00000CI     122  SMP3.009 LHL   R3,PSW3             PSW 70F0                             SMP31220
00011CI  95E3                   123          EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS          SMP31230
00011EI  41F0 4000 02F2I        124          BAL   R15,STATCHK         CHECK STATUS                         SMP31240
000124I  C430 0020              125          NHI   R3,X'20'            IS TAPE AT EOT?                      SMP31250
000128I  4230 4000 0162I        126          BNZ   SMP3.00B            YES, REWIND AND READ                 SMP31260
00012EI  2761                   127          SIS   R6,1                OTHERWISE, DECREMENT RECORD COUNT     SMP31270
000130I  4230 FF0E =000042I     128          BNZ   SMP3.000            AND OUTPUT ANOTHER RECORD            SMP31280
000134I  E630 4000 015CI        129          LA    R3,SMP3.00C         INTERRUPT ADDRESS                    SMP31290
00013AI  403C 0000              130          STH   R3,0(R12)           INTO INTERRUPT TABLE                 SMP31300
00013EI  F800 007F FFFF         131          LI    R0,Y'7FFFFF'        TIME VALUE                           SMP31310
000144I  41E0 4000 02CCI        132          BAL   R14,CWREOF          WRITE AN END OF FILE MARK            SMP31320
00014AI  41E0 4000 035AI        133          BAL   R14,TIMOUT          WAIT FOR INTERRUPT                   SMP31330
000150I  E650 4000 03F2I        134          LA    R5,SMP3.E04         NO INTERRUPT GEN ON WRITE EOF        SMP31340
000156I  4300 4000 0362I        135          B     ERROR               ERROR ROUTINE                        SMP31350
00015CI  41F0 4000 02F2I        136  SMP3.00C BAL   R15,STATCHK         CHECK STATUS                         SMP31360
                                137  *                                                                       SMP31370
                                138  * BEGIN READS HERE.                                                    SMP31380
                                139  * WAIT FOR NO MOTION INTERRUPT AFTER THE REWIND.                       SMP31390
                                140  *                                                                       SMP31400
000162I  7330 FEA6 =00000CI     141  SMP3.00B LHL   R3,PSW3             PSW 70F0                             SMP31410
000166I  95E3                   142          EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS          SMP31420
000168I  E630 4000 0196I        143          LA    R3,SMP3.00D         INTERRUPT ADDRESS                    SMP31430
00016EI  403C 0000              144          STH   R3,0(R12)           INTO INTERRUPT TABLE                 SMP31440
000172I  41E0 4000 02BAI        145          BAL   R14,CENBLE          ENABLE INTERRUPTS                    SMP31450
000178I  F800 007F FFFF         146          LI    R0,Y'7FFFFF'        TIME VALUE                           SMP31460
00017EI  41E0 4000 02B4I        147          BAL   R14,CREW            REWIND TAPE                          SMP31470
000184I  41E0 4000 035AI        148          BAL   R14,TIMOUT          WAIT FOR INTERRUPT  ON NMTN          SMP31480
00018AI  E650 4000 0422I        149          LA    R5,SMP3.E05         NO INTERRUPT GEN ON REWIND           SMP31490
000190I  4300 4000 0362I        150          B     ERROR               ERRO ROUTINE                         SMP31500
                                151  *                                                                       SMP31510
                                152  * PUT THE INTERFACE IN THE READ MODE AND CAUSE                         SMP31520
                                153  * AN INTERRUPT ON BUSY RESET.                                          SMP31530
                                154  *                                                                       SMP31540
000196I  7330 FE72 =00000CI     155  SMP3.00D LHL   R3,PSW3                                                  SMP31550
00019AI  95E3                   156          EPSR  R14,R3              ENABLE INTERRUPTS                    SMP31560
00019CI  7340 FE62 =000002I     157          LHL   R4,DATAPAT                                               SMP31570
0001A0I  7360 FE62 =000006I     158          LHL   R6,RECORDS          GET RECORDS VALUE                    SMP31580
0001A4I  7380 FE5C =000004I     159  SMP3.00E LHL   R8,BYTES            GET BYTES VALUE                      SMP31590
0001A8I  2781                   160          SIS   R8,1                ALLOW FOR HALFWORD TRANSFER          SMP31600
0001AAI  E630 4000 01D4I        161          LA    R3,SMP3.00F                                              SMP31610
0001B0I  403C 0000              162          STH   R3,0(R12)           STORE INTO INTERRUPT TABLE           SMP31620
```

```
0001B4I  0858                    163          LR    R5,R8              LOAD INTO A TEMPORARY REGISTER        SMP31630
0001B6I  F800 0007 FFFF          164          LI    R0,Y'0007FFFF'     TIME VALUE                            SMP31640
0001BCI  41E0 4000 02AEI         165          BAL   R14,CREAD          ISSUE READ COMMAND                    SMP31650
0001C2I  41E0 4000 035AI         166          BAL   R14,TIMOUT         WAIT FOR INTERRUPT                    SMP31660
0001C8I  E650 4000 044CI         167          LA    R5,SMP3.E06        NO INTERRUPT GE ON BUSY AFTER READ    SMP31670
0001CEI  4300 4000 0362I         168          B     ERROR              ERROR ROUTINE                         SMP31680
                                 169  *                                                                     SMP31690
                                 170  * DISABLE INTERRUPTS AND PERFORM THE ACTUAL READS.                    SMP31700
                                 171  *                                                                     SMP31710
0001D4I  7330 FE34 =00000CI      172  SMP3.00F LHL   R3,PSW3                                               SMP31720
0001D8I  95E3                    173          EPSR  R14,R3             ENABLE PROCESSOR INTERRUPTS           SMP31730
0001DAI  41E0 4000 02C0I         174          BAL   R14,CDISBLE        DISABLE INTERRUPTS                    SMP31740
0001E0I  E630 4000 0224I         175          LA    R3,SMP3.00H        INTERRUPT ADDRESS                     SMP31750
0001E6I  403C 0000               176          STH   R3,0(R12)          STORE INTO TABLE                      SMP31760
0001EAI  E690 4000 051CI         177          LA    R9,READBUF         LOAD READBUF ADDRESS                  SMP31770
0001F0I  41E0 4000 02D2I         178  SMP3.00G BAL   R14,SENSTA3       WAIT FOR NON BUSY                     SMP31780
0001F6I  D919 0000               179          RH    R1,0(R9)           READ INTO READBUF                     SMP31790
0001FAI  2692                    180          AIS   R9,2               INCREMENT READBUF ADDRESS             SMP31800
0001FCI  2752                    181          SIS   R5,2               DECREMENT BYTE VALUE                  SMP31810
0001FEI  4380 FFEE =0001F0I      182          BNL   SMP3.00G           CONTINUE TIL FINISHED                 SMP31820
000202I  41E0 4000 0318I         183          BAL   R14,SENSTA1        WAIT FOR NMTN                         SMP31830
000208I  41E0 4000 02BAI         184          BAL   R14,CENBLE         ENABLE INTERRUPTS                     SMP31840
00020EI  C800 7FFF               185          LHI   R0,X'7FFF'         TIMEVALUE                             SMP31850
000212I  41E0 4000 035AI         186          BAL   R14,TIMOUT         WAIT FOR INTERRUPT                    SMP31860
000218I  E650 4000 0480I         187          LA    R5,SMP3.E07        NO INTERRUPT GEN ON NMTN              SMP31870
00021EI  4300 4000 0362I         188          B     ERROR              ERROR ROUTINE                         SMP31880
                                 189  *                                                                     SMP31890
                                 190  * DISARM INTERRUPTS AND CHECK INTERFACE STATUS                        SMP31900
                                 191  *                                                                     SMP31910
000224I  7330 FDE4 =00000CI      192  SMP3.00H LHL   R3,PSW3            PSW 70F0                              SMP31920
000228I  95E3                    193          EPSR  R14,R3             ENABLE PROCESSOR INTERRUPTS           SMP31930
00022AI  41E0 4000 02C6I         194          BAL   R14,CDISARM        DISARM INTERRUPTS                     SMP31940
000230I  41F0 4000 02F2I         195          BAL   R15,STATCHK        CHECK STATUS                          SMP31950
000236I  41E0 4000 02BAI         196          BAL   R14,CENBLE         ENABLE INTERRUPTS                     SMP31960
00023CI  C330 0020               197          THI   R3,X'20'           TAPE AT EOT                           SMP31970
000240I  4230 4000 0362I         198          BNZ   TSTEND             IS YES, END TEST.                     SMP31980
000246I  2761                    199          SIS   R6,1               OTHERWISE, DECREMENT RECORD COUNT     SMP31990
000248I  4230 FF58 =0001A4I      200          BNZ   SMP3.00E           CONTINUE                              SMP32000
                                 201  *                                                                     SMP32010
                                 202  * READ THE EOF MARK AND WAIT FOR INTERRUPT                           SMP32020
                                 203  * ON NMTN                                                            SMP32030
                                 204  *                                                                     SMP32040
00024CI  E630 4000 0274I         205          LA    R3,SMP3.00I        INTERRUPT ADDRESS                     SMP32050
000252I  403C 0000               206          STH   R3,0(R12)                                              SMP32060
000256I  F800 007F FFFF          207          LI    R0,Y'7FFFFF'       TIME VALUE                            SMP32070
00025CI  41E0 4000 02AEI         208          BAL   R14,CREAD          ISSUE READ COMMAND                    SMP32080
000262I  41E0 4000 035AI         209          BAL   R14,TIMOUT         WAIT FOR INTERRUPT                    SMP32090
000268I  E650 4000 04ACI         210          LA    R5,SMP3.E09        NO INTERRUPT GEN ON READ EOF          SMP32100
00026EI  4300 4000 0362I         211          B     ERROR              ERROR ROUTINE                         SMP32110
                                 212  *                                                                     SMP32120
                                 213  * CHECK FOR TMS FROM EOF                                             SMP32130
                                 214  *                                                                     SMP32140
000274I  7330 FD94 =00000CI      215  SMP3.00I LHL   R3,PSW3            ENABLE PROCESSOR INTERRUPTS           SMP32150
000278I  95E3                    216          EPSR  R14,R3                                                 SMP32160
00027AI  41E0 4000 0314I         217          BAL   R14,SENSTA         GET STATUS                            SMP32170
```

```
000280I C330 0002          218          THI  R3,X'02'          EOF STATUS                          SMP32180
000284I 4230 4000 0362I    219          BNZ  TSTEND             ITS OK, END TEST                    SMP32190
00028AI E650 4000 04DAI    220          LA   R5,SMP3.EOA        NO TAPE MARK STATUS ON READ EOF     SMP32200
000290I 4300 4000 0362I    221          B    ERROR              ERROR ROUTINE                       SMP32210



000296I DE10 FD76 =000010I 224 CCLEAR   OC   R1,CLEAR          CLEAR INTERFACE                     SMP32240
00029AI 030E               225          BR   R14               RETURN                              SMP32250

00029CI DE10 FD71 =000011I 227 CWRITE   OC   R1,WRITE                                             SMP32270
0002A0I 030E               228          BR   R14               RETURN                              SMP32280

0002A2I DE10 FD6F =000015I 230 CWRODBY  OC   R1,WRTODDBY                                          SMP32300
0002A6I 030E               231          BR   R14               RETURN                              SMP32310

0002A8I DE13 FD66 =000012I 233 CDENS    OC   R1,DENSITY(R3)    OUTPUT PROPER DENSITY               SMP32330
0002ACI 030E               234          BR   R14               RETURN                              SMP32340

0002AEI DE10 FD64 =000016I 236 CREAD    OC   R1,READ           PUT INTERFACE IN READ MODE          SMP32360
0002B2I 030E               237          BR   R14               RETURN                              SMP32370

0002B4I DE10 FD5F =000017I 239 CREW     OC   R1,REWIND         REWIND TAPE                         SMP32390
0002B8I 030E               240          BR   R14               RETURN                              SMP32400

0002BAI DE10 FD5A =000018I 242 CENBLE   OC   R1,ENABLE                                            SMP32420
0002BEI 030E               243          BR   R14                                                   SMP32430

0002C0I DE10 FD55 =000019I 245 CDISBLE  OC   R1,DISABLE        DISABLE INTERFACE                   SMP32450
0002C4I 030E               246          BR   R14               RETURN                              SMP32460

0002C6I DE10 FD50 =00001AI 248 CDISARM  OC   R1,DISARM         DISARM INTERFACE                    SMP32480
0002CAI 030E               249          BR   R14               RETURN                              SMP32490

0002CCI DE10 FD4B =00001BI 251 CWREOF   OC   R1,WREOF          WRITE END OF FILE                   SMP32510
0002D0I 030E               252          BR   R14               RETURN                              SMP32520

0002D2I F800 007F FFFF     254 SENSTA3  LI   R0,Y'7FFFFF'      TIME LIMIT                          SMP32540
0002D8I 9D13               255 SENSTA3A SSR  R1,R3                                                SMP32550
0002DAI 4030 FD30 =00000EI 256          STH  R3,STATUS                                             SMP32560
0002DEI 038E               257          BNCR R14               RETURN ON NOT BUSY                  SMP32570
0002E0I 2701               258          SIS  R0,1              DECREMENT COUNTER                   SMP32580
0002E2I 4230 FFF2 =0002D8I 259          BNZ  SENSTA3A          WAIT                                SMP32590
0002E6I E650 4000 04FCI    260          LA   R5,SMP3.EOB       TIMED OUT WAITNG FOR BUSY           SMP32600
0002ECI 4300 4000 0362I    261          B    ERROR                                                 SMP32610

0002F2I 41E0 4000 0314I    263 STATCHK  BAL  R14,SENSTA                                           SMP32630
0002F8I C330 0001          264          THI  R3,X'01'          IS DRIVE DU?                        SMP32640
0002FCI 4230 4000 0362I    265          BNZ  ERROR             YES, TELL USER                      SMP32650
000302I 41E0 4000 0318I    266          BAL  R14,SENSTA1       WAIT FOR NO MOTION                  SMP32660
000308I C330 00C0          267          THI  R3,X'C0'          SEE IF ANY ERROR STATUS BITS SET    SMP32670
00030CI 4230 4000 0362I    268          BNZ  ERROR1            DETERMINE WHICH ONE                 SMP32680
000312I 030F               269          BR   R15               OTHERWISE RETURN                    SMP32690
```

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000314I 9D13                    271 SENSTA   SSR   R1,R3              GET INTERFACE STATUS                    SMP32710
000316I 030E                    272          BR    R14                RETURN                                  SMP32720

000318I F800 007F FFFF          274 SENSTA1  LI    R0,X'7FFFFF'       TIME LIMIT                              SMP32740
00031EI 9D13                    275 SENSE1   SSR   R1,R3              GET INTERFACE STATUS                    SMP32750
000320I 024E                    276          BOR   R14                RETURN ON NO MOTION                     SMP32760
000322I 2701                    277          SIS   R0,1               DECREMENT TIMER                         SMP32770
000324I 4230 FFF6 =00031EI      278          BNZ   SENSE1                                                     SMP32780
000328I 4300 4000 0362I         279          B     ERROR                                                      SMP32790

00032EI 41E0 FFE2 =000314I      281 REWMT    BAL   R14,SENSTA                                               SMP32810
000332I C330 0020               282          THI   R3,X'20'            AT BOT ALREADY                          SMP32820
000336I 023F                    283          BNZR  R15                RETURN IF YES                           SMP32830
000338I 41E0 FFD8 =000314I      284          BAL   R14,SENSTA                                                 SMP32840
00033CI C330 0010               285          THI   R3,X'10'           NO MOTION SET                           SMP32850
000340I 4230 4000 034AI         286          BNZ   REW.2                                                      SMP32860
000346I 41E0 FFCE =000318I      287          BAL   R14,SENSTA1        WAIT FOR NO MOTION                      SMP32870
00034AI 41E0 FF66 =0002B4I      288 REW.2    BAL   R14,CREW            REWIND THE TAPE TO BOT                  SMP32880
00034EI 41E0 FFC2 =000314I      289 REW.3    BAL   R14,SENSTA                                                 SMP32890
000352I 2042                    290          BOS   REW.3              WAIT FOR TAPE TO GO INTO MOTION         SMP32900
000354I 41E0 FFC0 =000318I      291          BAL   R14,SENSTA1        WAIT FOR NO MOTION                      SMP32910
000358I 030F                    292          BR    R15                RETURN                                  SMP32920
                                293 *                                                                         SMP32930
00035AI 2701                    294 TIMOUT   SIS   R0,1               DECREMENT TIME VALUE                    SMP32940
00035CI 4230 FFFA =00035AI      295          BNZ   TIMOUT                                                     SMP32950
000360I 030E                    296          BR    R14                RETURN TO ERROR MESSAGE                 SMP32960
                                297 *                                                                         SMP32970
        0000 0362I              298 ERROR    EQU   *                  OUTPUT APPROPRIATE ENGLISH LANGUAGE     SMP32980
        0000 0362I              299 ERROR1   EQU   *                  ERROR MESSAGE AND INFO HERE.            SMP32990
000362I C200 4000 0368I         300 TSTEND   LPSW  WAIT1              PUT PROCESSOR IN WAIT STATE             SMP33000
000368I 0000 8000               301 WAIT1    DCX   8000                                                     SMP33010
00036CI 0000 0362I              302          DC    A(TSTEND)                                                  SMP33020
000370I 4E4F 2049 4E54 4552     303 SMP3.E00 DC    C'NO INTERRUPT GENERATED ON COMMAND WRITE',X'0D0A'         SMP33030
000378I 5255 5054 2047 454E
000380I 4552 4154 4544 204F
000388I 4E20 434F 4D4D 414E
000390I 4420 5752 4954 4520
000398I 0D0A
00039AI 4E4F 2049 4E54 4552     304 SMP3.E01 DC    C'NO INTERRUPT GENERATED ON BUSY AFTER WRITE'              SMP33040
0003A2I 5255 5054 2047 454E
0003AAI 4552 4154 4544 204F
0003B2I 4E20 4255 5359 2041
0003BAI 4654 4552 2057 5249
0003C2I 5445
0003C4I 0D0A                    305          DCX   0D0A                                                      SMP33050
0003C6I 4E4F 2049 4E54 4552     306 SMP3.E03 DC    C'NO INTERRUPT GENERATE ON NMTN AFTER WRITE'               SMP33060
0003CEI 5255 5054 2047 454E
0003D6I 4552 4154 4520 4F4E
0003DEI 204E 4D54 4E20 4146
0003E6I 5445 5220 5752 4954
0003EEI 4520
0003F0I 0D0A                    307          DCX   0D0A                                                      SMP33070
0003F2I 4E4F 2049 4E54 4552     308 SMP3.E04 DC    C'NO INTERRUPT GENERATED ON BUSY AFTER WRITE EOF'          SMP33080
0003FAI 5255 5054 2047 454E
000402I 4552 4154 4544 204F
```

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00040AI  4E20 4255 5359 2041
000412I  4654 4552 2057 5249
00041AI  5445 2045 4F46
000420I  0D0A                    309            DCX   0D0A                                                    SMP33090
000422I  4E4F 2049 4E54 4552     310  SMP3.E05  DC    C'NO INTERRUPT GENERATED ON COMMAND REWIND',X'0D0A'      SMP33100
00042AI  5255 5054 2047 454E
000432I  4552 4154 4544 204F
00043AI  4E20 434F 4D4D 414E
000442I  4420 5245 5749 4E44
00044AI  0D0A
00044CI  4E4F 2049 4E54 4552     311  SMP3.E06  DC    C'NO INTERRUPT GENERATED ON BUSY AFTER COMMAND READ'    SMP33110
000454I  5255 5054 2047 454E
00045CI  4552 4154 4544 204F
000464I  4E20 4255 5359 2041
00046CI  4654 4552 2043 4F4D
000474I  4D41 4E44 2052 4541
00047CI  4420
00047EI  0D0A                    312            DCX   0D0A                                                    SMP33120
000480I  4E4F 2049 4E54 4552     313  SMP3.E07  DC    C'NO INTERRUPT GENERATED ON NMTN AFTER READ',X'0D0A'    SMP33130
000488I  5255 5054 2047 454E
000490I  4552 4154 4544 204F
000498I  4E20 4E4D 544E 2041
0004A0I  4654 4552 2052 4541
0004A8I  4420
0004AAI  0D0A
0004ACI  4E4F 2049 4E54 4552     314  SMP3.E09  DC    C'NO INTERRUPT GENERATED ON BSY AFTER READ EOF',X'0D0A' SMP33140
0004B4I  5255 5054 2047 454E
0004BCI  4552 4154 4544 204F
0004C4I  4E20 4253 5920 4146
0004CCI  5445 5220 5245 4144
0004D4I  2045 4F46
0004D8I  0D0A
0004DAI  4E4F 2022 544D 5322     315  SMP3.E0A  DC    C'NO "TMS" AFTER READ END OF FILE',X'0D0A'              SMP33150
0004E2I  2041 4654 4552 2052
0004EAI  4541 4420 454E 4420
0004F2I  4F46 2046 494C 4520
0004FAI  0D0A
0004FCI  5449 4D45 4420 4F55     316  SMP3.E0B  DC    C'TIMED OUT WAITNG FOR NON BUSY',X'0D0A'                SMP33160
000504I  5420 5741 4954 4E47
00050CI  2046 4F52 204E 4F4E
000514I  2042 5553 5920
00051AI  0D0A
00051CI                          317  READBUF   DS    1024                                                    SMP33170
00091CI                          318            END                                                           SMP33180
```

ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

START OPTIONS: T=32,ERLST

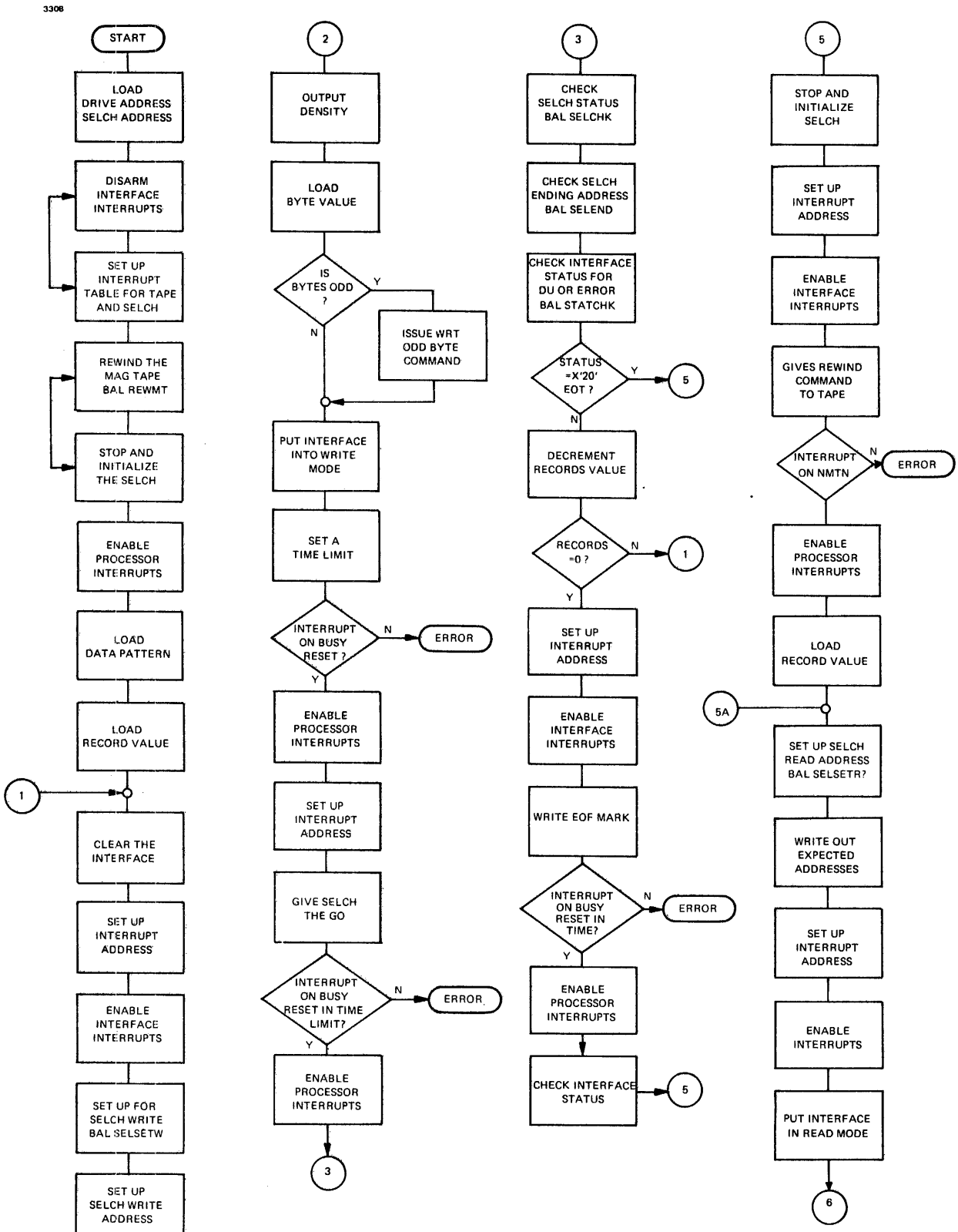
NO CAL ERRORS
NO CAL WARNINGS
2 PASSES

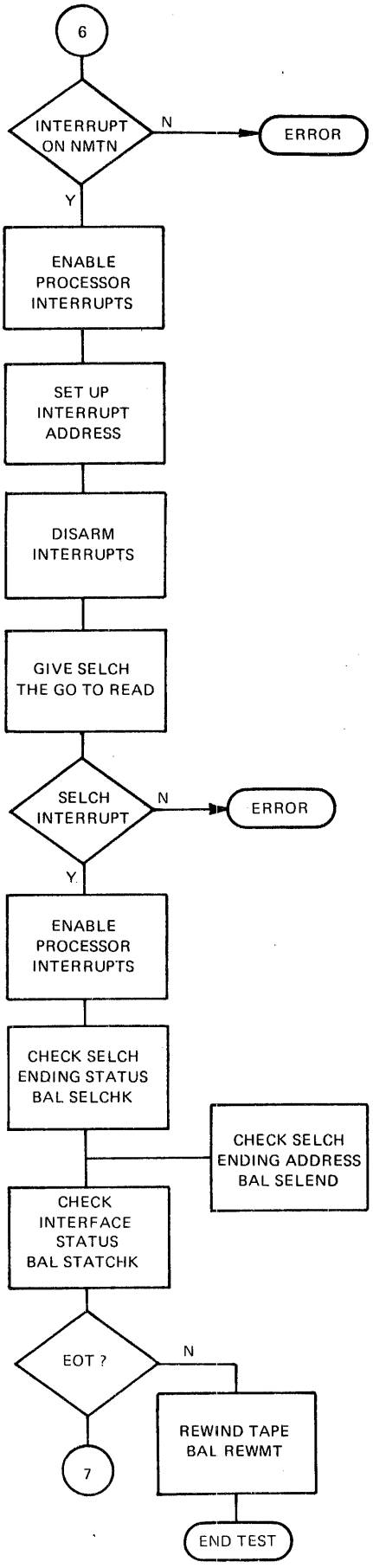
TABLE SPACE USED : 3K

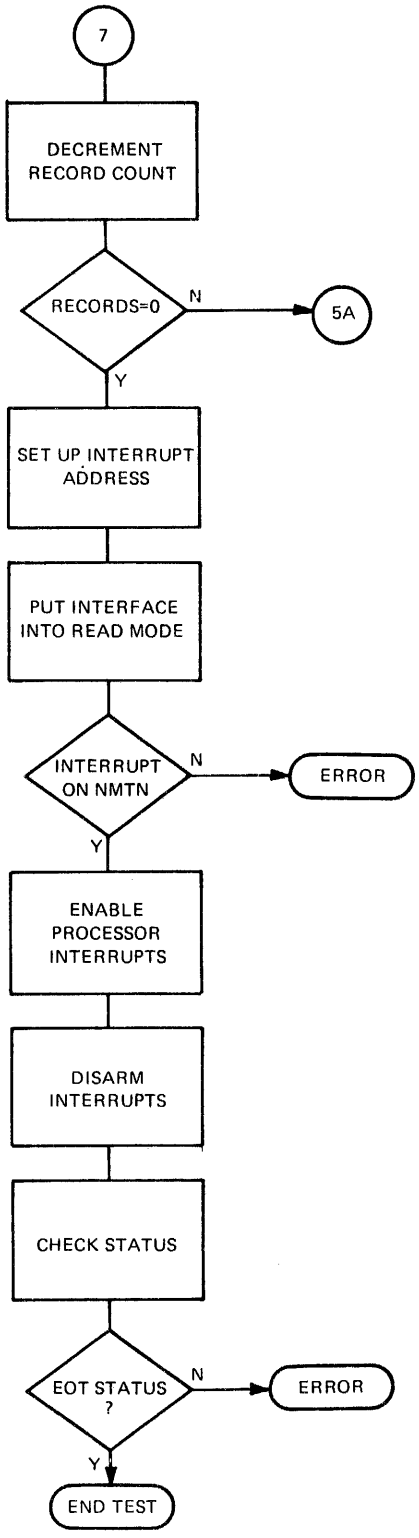
ABSTOP	0000 0000	
ADC	0000 0004	
BASE	0000 0008I	31*
BYTES	0000 0004I	29* 58 159
CCLEAR	0000 0296I	57 224*
CDENS	0000 02A8I	74 233*
CDISARM	0000 02C6I	54 91 194 248*
CDISBLE	0000 02C0I	174 245*
CENBLE	0000 02BAI	72 98 145 184 196 242*
CLEAR	0000 0010I	34* 35 224
CREAD	0000 02AEI	165 208 236*
CREW	0000 02B4I	147 239* 288
CWREOF	0000 02CCI	132 251*
CWRITE	0000 029CI	75 227*
CWRODBY	0000 02A2I	62 230*
DATAPAT	0000 0002I	28* 51 157
DENSITY	0000 0012I	36* 37 233
DISABLE	0000 0019I	41* 245
DISARM	0000 001AI	42* 43 248
DRIVADR	0000 0000I	27* 47
ENABLE	0000 0018I	40* 41 242
ERROR	0000 0362I	79 104 117 135 150 168 188 211 221 261 265 279 298*
ERROR1	0000 0362I	268 299*
IMPTOP	0000 091CI	318
LADC	0000 0002	
PSW3	0000 000CI	32* 52 68 86 108 122 141 155 172 192 215
PURETOP	0000 0000P	318
R0	0000 0000	13* 76 101 114 131 146 164 185 207 254 258 274 277 294
R1	0000 0001	14* 47 48 92 100 179 224 227 230 233 236 239 242 245 248 251 255 271 275
R10	0000 000A	22* 90 93
R12	0000 000C	23* 48 49 50 71 89 113 130 144 162 176 206
R13	0000 000D	24*
R14	0000 000E	25* 53 54 57 62 69 72 74 75 77 87 91 95 97 98 102 109 115 123 132 133 142 145 147 148 156 165 166 173 174 178 183 184 186 193 194 196 208 209 216 217 225 228 231 234 237 240 243 246 249 252 257 263 266 272 276 281 284 287 288 289 291 296
R15	0000 000F	26* 55 124 136 195 269 283 292
R2	0000 0002	15*
R3	0000 0003	16* 52 53 68 69 70 71 73 86 87 88 89 108 109 112 113 122 123 125 129 130 141 142 143 144 155 156 161 162 172 173 175 176 192 193 197 205 206 215 216 218 233 255 256 264 267 271 275 282 285

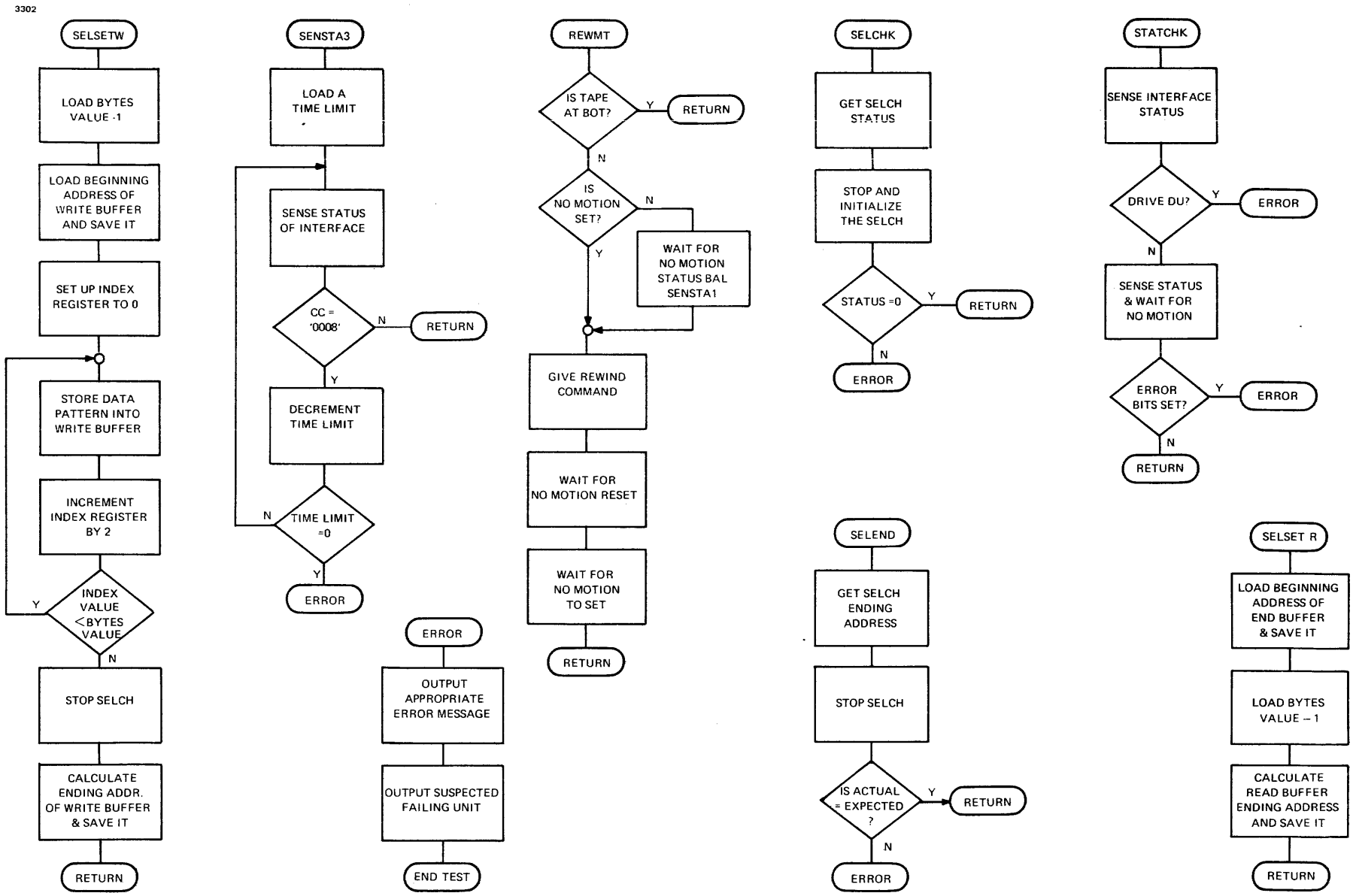
R4	0000 0004	17*	51	92	100	157								
R5	0000 0005	18*	67	78	99	103	110	116	134	149	163	167	181	187
		210	220	260										
R6	0000 0006	19*	55	127	158	199								
R8	0000 0008	20*	58	59	60	67	159	160	163					
R9	0000 0009	21*	177	179	180									
READ	0000 0016I	38*	39	236										
READBUF	0000 051CI	177	317*											
RECORDS	0000 0006I	30*	56	158										
REW.2	0000 034AI	286	288*											
REW.3	0000 034EI	289*	290											
REWIND	0000 0017I	39*	239											
REWMT	0000 032EI	55	281*											
SENSE1	0000 031EI	275*	278											
SENSTA	0000 0314I	217	263	271*	281	284	289							
SENSTA1	0000 0318I	183	266	274*	287	291								
SENSTA3	0000 02D2I	95	97	178	254*									
SENSTA3A	0000 02D8I	255*	259											
SMP3.000	0000 0042I	57*	128											
SMP3.001	0000 005EI	61	67*											
SMP3.002	0000 009AI	70	86*											
SMP3.003	0000 00B2I	92*	96											
SMP3.004	0000 00EAI	88	108*											
SMP3.005	0000 00D0I	100*	111											
SMP3.009	0000 0118I	112	122*											
SMP3.00B	0000 0162I	126	141*											
SMP3.00C	0000 015CI	129	136*											
SMP3.00D	0000 0196I	143	155*											
SMP3.00E	0000 01A4I	159*	200											
SMP3.00F	0000 01D4I	161	172*											
SMP3.00G	0000 01F0I	178*	182											
SMP3.00H	0000 0224I	175	192*											
SMP3.00I	0000 0274I	205	215*											
SMP3.0A3	0000 00C2I	94	97*											
SMP3.E00	0000 0370I	78	303*											
SMP3.E01	0000 039AI	103	304*											
SMP3.E03	0000 03C6I	116	306*											
SMP3.E04	0000 03F2I	134	308*											
SMP3.E05	0000 0422I	149	310*											
SMP3.E06	0000 044CI	167	311*											
SMP3.E07	0000 0480I	187	313*											
SMP3.E09	0000 04ACI	210	314*											
SMP3.E0A	0000 04DAI	220	315*											
SMP3.E0B	0000 04FCI	260	316*											
STATCHK	0000 02F2I	124	136	195	263*									
STATUS	0000 000EI	33*	256											
TIMOUT	0000 035AI	77	102	115	133	148	166	186	209	294*	295			
TSTEND	0000 0362I	198	219	300*	302									
WAIT1	0000 0368I	300	301*											
WREOF	0000 001BI	43*	251											
WRITE	0000 0011I	35*	227											
WRTODDBY	0000 0015I	37*	230											

SAMPLE PROGRAM 4: WRITES AND READS TO AND FROM THE TAPE THROUGH THE SELCH.




6
INTERRUPT ON NMTN
N
ERROR
Y
ENABLE PROCESSOR INTERRUPTS
SET UP INTERRUPT ADDRESS
DISARM INTERRUPTS
GIVE SELCH THE GO TO READ
SELCH INTERRUPT
N
ERROR
Y
ENABLE PROCESSOR INTERRUPTS
CHECK SELCH ENDING STATUS BAL SELCHK
CHECK SELCH ENDING ADDRESS BAL SELEND
CHECK INTERFACE STATUS BAL STATCHK
EOT ?
N
REWIND TAPE BAL REWMT
7
END TEST


7
DECREMENT RECORD COUNT
RECORDS=0
N
5A
Y
SET UP INTERRUPT ADDRESS
PUT INTERFACE INTO READ MODE
INTERRUPT ON NMTN
N
ERROR
Y
ENABLE PROCESSOR INTERRUPTS
DISARM INTERRUPTS
CHECK STATUS
EOT STATUS ?
N
ERROR
Y
END TEST


3302
SELSETW
LOAD BYTES VALUE -1
LOAD BEGINNING ADDRESS OF WRITE BUFFER AND SAVE IT
SET UP INDEX REGISTER TO 0
STORE DATA PATTERN INTO WRITE BUFFER
INCREMENT INDEX REGISTER BY 2
INDEX VALUE <BYTES VALUE
Y
N
STOP SELCH
CALCULATE ENDING ADDR. OF WRITE BUFFER & SAVE IT
RETURN
SENSTA3
LOAD A TIME LIMIT
SENSE STATUS OF INTERFACE
CC = '0008'
N
RETURN
Y
DECREMENT TIME LIMIT
TIME LIMIT =0
N
Y
ERROR
ERROR
OUTPUT APPROPRIATE ERROR MESSAGE
OUTPUT SUSPECTED FAILING UNIT
END TEST
REWMT
IS TAPE AT BOT?
Y
RETURN
N
IS NO MOTION SET?
N
WAIT FOR NO MOTION STATUS BAL SENSTA1
Y
GIVE REWIND COMMAND
WAIT FOR NO MOTION RESET
WAIT FOR NO MOTION TO SET
RETURN
SELCHK
GET SELCH STATUS
STOP AND INITIALIZE THE SELCH
STATUS =0
Y
RETURN
N
ERROR
SELEND
GET SELCH ENDING ADDRESS
STOP SELCH
IS ACTUAL = EXPECTED ?
Y
RETURN
N
ERROR
STATCHK
SENSE INTERFACE STATUS
DRIVE DU?
Y
ERROR
N
SENSE STATUS & WAIT FOR NO MOTION
ERROR BITS SET?
Y
ERROR
N
RETURN
SELSET R
LOAD BEGINNING ADDRESS OF END BUFFER & SAVE IT
LOAD BYTES VALUE – 1
CALCULATE READ BUFFER ENDING ADDRESS AND SAVE IT
RETURN

PROG= *NONE* ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

```
                                    1          SCRAT                                                                SMP40010
                                    2          CROSS                                                                SMP40020
                                    3          WIDTH 120                                                            SMP40030
                                    4          TARGT 32                                                             SMP40040
                                    5  *                                                                            SMP40050
                                    6  * SAMPLE PROGRAM 4                                                          SMP40060
                                    7  *                                                                            SMP40070
                                    8  * THIS IS A SAMPLE PROGRAM TO ILLUSTRATE                                    SMP40080
                                    9  * WRITE AND READS TO AND FROM A TAPE USING                                  SMP40090
                                   10  * THE SELCH UNDER INTERRUPTS.                                               SMP40100
                                   11  *                                                                           SMP40110
                                   12  *  REGISTER ASSIGNMENTS                                                     SMP40120
            0000 0000              13  R0         EQU   0                                                          SMP40130
            0000 0001              14  R1         EQU   1                                                          SMP40140
            0000 0002              15  R2         EQU   2                                                          SMP40150
            0000 0003              16  R3         EQU   3                                                          SMP40160
            0000 0004              17  R4         EQU   4                                                          SMP40170
            0000 0005              18  R5         EQU   5                                                          SMP40180
            0000 0006              19  R6         EQU   6                                                          SMP40190
            0000 0007              20  R7         EQU   7                                                          SMP40200
            0000 0008              21  R8         EQU   8                                                          SMP40210
            0000 0009              22  R9         EQU   9                                                          SMP40220
            0000 000A              23  R10        EQU   10                                                         SMP40230
            0000 000B              24  R11        EQU   11                                                         SMP40240
            0000 000C              25  R12        EQU   12                                                         SMP40250
            0000 000D              26  R13        EQU   13                                                         SMP40260
            0000 000E              27  R14        EQU   14                                                         SMP40270
            0000 000F              28  R15        EQU   15                                                         SMP40280
000000I     0085                   29  DRIVADR    DCX   85          DRIVE ADDRESS                                  SMP40290
000002I     1234                   30  DATAPAT    DCX   1234        DATA PATTERN                                   SMP40300
000004I     00F0                   31  SELADR     DCX   F0          SELCH ADDRESS                                  SMP40310
000006I     00FF                   32  BYTES      DCX   FF          BYTES PER RECORD                               SMP40320
000008I     007F                   33  RECORDS    DCX   7F          RECORD VALUE                                   SMP40330
00000AI     70F0                   34  PSW3       DCX   70F0        ENABLED PROCESSOR INTERRUPTS                   SMP40340
00000CI     000A 5000              35  BASE       DCY   A5000       A NUMBER                                       SMP40350
000010I     0960                   36  CLEAR      DCX   0960        CLEAR INTERFACE                                SMP40360
            0000 0011I             37  WRITE      EQU   CLEAR+1     INTERFACE INTO WRITE MODE                      SMP40370
000012I     0818                   38  DENSITY    DCX   0818,280B   1600, 6250, 800                                SMP40380
000014I     280B
            0000 0015I             39  WRTODDBY   EQU   DENSITY+3   WRITE AN ODD AMOUNT BYTES                      SMP40390
000016I     40E0                   40  READ       DCX   40E0        INTERFACE INTO READ MODE                       SMP40400
            0000 0017I             41  REWIND     EQU   READ+1      REWIND MAG TAPE COMMAND                        SMP40410
000018I     C848                   42  DISARM     DCX   C848        DISARM INTERFACE INTERRUPTS                    SMP40420
            0000 0019I             43  ENABLE     EQU   DISARM+1    ENABLE INTERFACE INTERRUPTS                    SMP40430
00001AI     88C0                   44  DISABLE    DCX   88C0        DISABLE INTERFACE INTERRUPTS                   SMP40440
            0000 001BI             45  WREOF      EQU   DISABLE+1   WRITE AN END OF FILE MARK                      SMP40450
00001CI     5474                   46  GO         DCX   5474        SELCH GO(WRITE)                                SMP40460
            0000 001DI             47  GOREAD     EQU   GO+1        SELCH GO(READ)                                 SMP40470
00001EI     4C0C                   48  STOP       DCX   4C0C        SELCH STOP                                     SMP40480
            0000 001FI             49  STOPS      EQU   STOP+1      INIT SELCH                                     SMP40490
000020I     4800                   50  EXTD       DCX   4800        GET EXTENDED ADDRESS SELCH                     SMP40500
000024I     0000 0000              51  STOPADDR   DCY   0           STORAGE LOCATIONS                              SMP40510
000028I     0000 0000              52  WBUF       DCY   0                                                          SMP40520
```

```
00002CI  0000 0000                53  RDBUF    DCY   0                                                    SMP40530
000030I  0000 0000                54  ENDBUF   DCY   0                                                    SMP40540
000034I  4810 FFC8 =000000I       55           LH    R1,DRIVADR          GET DRIVE ADDRESS                SMP40550
000038I  08C1                     56           LR    R12,R1              LOAD DRIVE ADDR                  SMP40560
00003AI  91C1                     57           SLHLS R12,1                                                SMP40570
00003CI  CAC0 00D0                58           AHI   R12,X'D0'           SET UP INTERRUPT LOCATION        SMP40580
000040I  4820 FFC0 =000004I       59           LH    R2,SELADR           GET SELCH ADDRESS                SMP40590
000044I  08D2                     60           LR    R13,R2              LOAD SELCH ADR INTO R13          SMP40600
000046I  91D1                     61           SLHLS R13,1               DOUBLE ADDRESS                   SMP40610
000048I  CAD0 00D0                62           AHI   R13,X'D0'           SET UP FOR INT ADDRESSES         SMP40620
00004CI  41E0 4000 02CCI          63           BAL   R14,CDISARM         DISARM INTERRUPTS                SMP40630
000052I  41E0 4000 02D2I          64           BAL   R14,CSTOP           STOP SELCH                       SMP40640
000058I  41E0 4000 02D2I          65           BAL   R14,CSTOP           INIT SELCH                       SMP40650
00005EI  41F0 4000 03F0I          66           BAL   R15,REWMT           REWIND TAPE                      SMP40660
000064I  7330 FFA2 =00000AI       67           LHL   R3,PSW3             PSW 70F0                         SMP40670
000068I  95E3                     68           EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS      SMP40680
00006AI  4840 FF94 =000002I       69           LH    R4,DATAPAT          LOAD DATA PATTERN                SMP40690
00006EI  4860 FF96 =000008I       70           LH    R6,RECORDS          GET RECORDS VALUE                SMP40700
000072I  41E0 4000 0296I          71  SMPL4    BAL   R14,CCLEAR          CLEAR INTERFACE                  SMP40710
000078I  E630 4000 00CAI          72           LA    R3,SMP4.001         INTERRUPT ADDRESS                SMP40720
00007EI  403C 0000                73           STH   R3,0(R12)           INTO INTERRUPT TABLE             SMP40730
000082I  41E0 4000 02C0I          74           BAL   R14,CENBLE          ENABLE INTERRUPTS                SMP40740
000088I  41F0 4000 0318I          75           BAL   R15,SELSETW                                          SMP40750
00008EI  41E0 4000 02EEI          76           BAL   R14,WRBUF           SET UP WRITE SELCH ADDRESSES     SMP40760
000094I  41E0 4000 02A8I          77           BAL   R14,CDENS           OUTPUT DENSITY COMMAND           SMP40770
00009AI  7380 FF68 =000006I       78           LHL   R8,BYTES            GET BYTES VALUE                  SMP40780
00009EI  C380 0001                79           THI   R8,X'0001'          IS IT ODD?                       SMP40790
0000A2I  4330 4000 00AEI          80           BZ    SMP4.000            SKIP OVER IF NOT                 SMP40800
0000A8I  41E0 4000 02A2I          81           BAL   R14,CWRODBY         WRITE ODD BYTE COMMAND           SMP40810
0000AEI  41E0 4000 029CI          82  SMP4.000 BAL   R14,CWRITE          ISSUE WRITE COMMAND              SMP40820
0000B4I  C800 7FFF                83           LHI   R0,X'7FFF'          TIME VALUE                       SMP40830
0000B8I  41E0 4000 03C8I          84           BAL   R14,TIMOUT                                           SMP40840
0000BEI  E650 4000 0430I          85           LA    R5,SMP4.E00         NO INTERRUPT GENERATED ON BSY AFTER W SMP40850
0000C4I  4300 4000 041CI          86           B     ERROR               ERROR ROUTINE                    SMP40860
                                  87  *                                                                    SMP40870
                                  88  * WAIT FOR AN INTERRUPT FROM THE SELCH HERE                         SMP40880
                                  89  *                                                                    SMP40890
0000CAI  7330 FF3C =00000AI       90  SMP4.001 LHL   R3,PSW3             GET PSW 70F0                     SMP40900
0000CEI  95E3                     91           EPSR  R14,3               ENABLE PROCESSOR INTERRUPTS      SMP40910
0000D0I  41E0 4000 02CCI          92           BAL   R14,CDISARM         DISARM ANY INTERRUPTS            SMP40920
0000D6I  E630 4000 00FCI          93           LA    R3,SMP4.005         INTERRUPT ADDRESS                SMP40930
0000DCI  403D 0000                94           STH   R3,0(R13)           INTO TABLE FOR SELCH INTERRUPT   SMP40940
0000E0I  41E0 4000 02DEI          95           BAL   R14,CGO             GIVE SELCH THE GO                SMP40950
0000E6I  C800 7FFF                96           LHI   R0,X'7FFF'          TIME VALUE                       SMP40960
0000EAI  41E0 4000 03C8I          97           BAL   R14,TIMOUT          WAIT FOR INTERRUPT               SMP40970
0000F0I  E650 4000 045CI          98           LA    R5,SMP4.E01         NO INTERRUPT GEN                 SMP40980
0000F6I  4300 4000 041CI          99           B     ERROR               ERROR ROUTINE                    SMP40990
                                 100  *                                                                    SMP41000
                                 101  * CHECK SELCH STATUS, ADDRESS AND INTERFACE STATUS                  SMP41010
                                 102  *                                                                    SMP41020
0000FCI  7330 FF0A =00000AI      103  SMP4.005 LHL   R3,PSW3             PSW 70F0                         SMP41030
000100I  95E3                    104           EPSR  R14,R3              ENABLE PROCESSOR INTERRUPTS      SMP41040
000102I  41F0 4000 0362I         105           BAL   R15,SELCHK          CHECK SELCH ENDING STATUS        SMP41050
000108I  41F0 4000 037AI         106           BAL   R15,SELEND          CHECK SELCH ENDING ADDRESS       SMP41060
00010EI  41F0 4000 03A6I         107           BAL   R15,STATCHK         CHECK INTERFACE STATUS           SMP41070
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000114I C330 0020           108          THI   R3,X'20'          IS TAPE AT EOT?                          SMP41080
000118I 4230 4000 016CI     109          BNZ   SMP4.008          REWIND AND READ                          SMP41090
00011EI 2761                110  SMP4.006 SIS   R6,1             DECREMENT RECORD COUNT                   SMP41100
000120I 4230 FF4E =000072I  111          BNZ   SMPL4             CONTINUE WRITE OUTPUT                    SMP41110
                            112  *                                                                        SMP41120
                            113  * WAIT FOR AN INTERRUPT ON BUSY RESET AFTER WRITE EOF                    SMP41130
                            114  *                                                                        SMP41140
000124I E630 4000 0150I     115          LA    R3,SMP4.007       INTERRUPT ADDRESS                        SMP41150
00012AI 403C 0000           116          STH   R3,0(R12)         INTO TABLE                               SMP41160
00012EI C800 007F           117          LHI   R0,X'7F'          TIME VALUE                               SMP41170
000132I 41E0 4000 02C0I     118          BAL   R14,CENBLE        ENABLE INTERRUPTS                        SMP41180
000138I 41E0 4000 02BAI     119          BAL   R14,CWREOF        WRITE AN END OF FILE MARK                SMP41190
00013EI 41E0 4000 03C8I     120          BAL   R14,TIMOUT        WAIT FOR INTERRUPT                       SMP41200
000144I E650 4000 047CI     121          LA    R5,SMP4.E02       NO INTERPT GEN ON WRITE EOF              SMP41210
00014AI 4300 4000 041CI     122          B     ERROR             ERROR ROUTINE                            SMP41220
000150I 7330 FEB6 =00000AI  123  SMP4.007 LHL   R3,PSW3          PSW 70F0                                 SMP41230
000154I 95E3                124          EPSR  R14,R3            ENABLE PROCESSOR INTERRUPTS              SMP41240
000156I 41E0 4000 03D0I     125          BAL   R14,SENSTA        GET STATUS                               SMP41250
00015CI C330 0020           126          THI   R3,X'20'          IS TAPE AT EOT?                          SMP41260
000160I 4230 4000 016CI     127          BNZ   SMP4.008                                                   SMP41270
000166I 41F0 4000 03A6I     128          BAL   R15,STATCHK       CHECK INTERFACE STATUS                   SMP41280
                            129  *                                                                        SMP41290
                            130  * WAIT FOR AN INTERRUPT ON NMTN AFTER REWIND                            SMP41300
                            131  *                                                                        SMP41310
00016CI 41E0 4000 02D2I     132  SMP4.008 BAL   R14,CSTOP         STOP SELCH                               SMP41320
000172I 41E0 4000 02D2I     133          BAL   R14,CSTOP         INIT SELCH                               SMP41330
000178I E630 4000 01A0I     134          LA    R3,SMP4.009       INTERRUPT ADDRESS                        SMP41340
00017EI 403C 0000           135          STH   R3,0(R12)         INTO INTERRUPT TABLE                     SMP41350
000182I 41E0 4000 02C0I     136          BAL   R14,CENBLE        ENABLE INTERRUPTS                        SMP41360
000188I 41E0 4000 02B4I     137          BAL   R14,CREW          REWIND TAPE                              SMP41370
00018EI 41E0 4000 03C8I     138          BAL   R14,TIMOUT        WAIT FOR INTERRUPT                       SMP41380
000194I E650 4000 04A2I     139          LA    R5,SMP4.E03       NO INTERRUPT GEN ON NMTN AFTER REW       SMP41390
00019AI 4300 4000 041CI     140          B     ERROR             ERROR ROUTINE                            SMP41400
                            141  *                                                                        SMP41410
                            142  *                                                                        SMP41420
                            143  * EXPECT AN INTERRUPT ON BUSY RESET AFTER READ                           SMP41430
                            144  *                                                                        SMP41440
0001A0I 7330 FE66 =00000AI  145  SMP4.009 LHL   R3,PSW3          PSW 70F0                                 SMP41450
0001A4I 95E3                146          EPSR  R14,R3            ENABLE PROCESSOR INTERRUPTS              SMP41460
0001A6I 7360 FE5E =000008I  147          LHL   R6,RECORDS        RECORD VALUE                             SMP41470
0001AAI 41F0 4000 034AI     148  SMP4.019 BAL   R15,SELSETR      SET UP READ BUFFER                       SMP41480
0001B0I 41E0 4000 0300I     149          BAL   R14,REBUF         SET UP READ ADDRESSES                    SMP41490
0001B6I E630 4000 01E2I     150          LA    R3,SMP4.00A       INTERRUPT ADDRESS                        SMP41500
0001BCI 403C 0000           151          STH   R3,0(R12)         STORE INTO TABLE                         SMP41510
0001C0I 7300 FE42 =000006I  152          LHL   R0,BYTES          LOAD A TIMVAL                            SMP41520
0001C4I 41E0 4000 02C0I     153          BAL   R14,CENBLE        ENBLE INTERRUPTS                         SMP41530
0001CAI 41E0 4000 02AEI     154          BAL   R14,CREAD         PUT INTERFACE IN READ MODE               SMP41540
0001D0I 41E0 4000 03C8I     155          BAL   R14,TIMOUT        WAIT FOR INTERRUPT                       SMP41550
0001D6I E650 4000 04D0I     156          LA    R5,SMP4.E04       NO INTERRUPT GEN ON C READ               SMP41560
0001DCI 4300 4000 041CI     157          B     ERROR             ERROR ROUTINE                            SMP41570
                            158  *                                                                        SMP41580
                            159  * WAIT FOR AN INTERRUPT FROM THE SELCH                                   SMP41590
                            160  *                                                                        SMP41600
0001E2I 7330 FE24 =00000AI  161  SMP4.00A LHL   R3,PSW3          PSW 70F0                                 SMP41610
0001E6I 95E3                162          EPSR  R14,R3            ENABLE INTERRUPTS                        SMP41620
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0001E8I  E630 4000 0214I      163          LA    R3,SMP4.00B       INTERRUPT ADDRESS                          SMP41630
0001EEI  403D 0000            164          STH   R3,0(R13)         INTO TABLE FOR SELCH INTERRUPT             SMP41640
0001F2I  41E0 4000 02CCI      165          BAL   R14,CDISARM       DISARM INTERRUPTS                          SMP41650
0001F8I  41E0 4000 02E4I      166          BAL   R14,CGOREAD                                                  SMP41660
0001FEI  C800 7FFF            167          LHI   R0,X'7FFF'        TIME OUT VALUE                             SMP41670
000202I  41E0 4000 03C8I      168          BAL   R14,TIMOUT        WAIT FOR INTERRUPT                         SMP41680
000208I  E650 4000 04FCI      169          LA    R5,SMP4.E05       NO INTERRUPT GEN ON BSY AFTER READ         SMP41690
00020EI  4300 4000 041CI      170          B     ERROR             ERROR ROUTINE                              SMP41700
                              171  *                                                                          SMP41710
                              172  * CHECK SELCH STATUS, ADDRESS, AND INTERFACE STATUS                        SMP41720
                              173  *                                                                          SMP41730
000214I  7330 FDF2 =00000AI   174  SMP4.00B LHL   R3,PSW3          PSW 70F0                                   SMP41740
000218I  95E3                 175          EPSR  R14,R3            ENABLE PROCESSOR INTERRUPTS                SMP41750
00021AI  41F0 4000 0362I      176          BAL   R15,SELCHK        CHECK SELCH ENDING STATUS                  SMP41760
000220I  41F0 4000 037AI      177          BAL   R15,SELEND        CHECK SELCH ENDING ADDRESS                 SMP41770
000226I  41F0 4000 03A6I      178          BAL   R15,STATCHK       CHECK INTERFACE STATUS                     SMP41780
00022CI  C430 0020            179          NHI   R3,X'20'          IS TAPE AT EOT?                            SMP41790
000230I  4330 4000 0242I      180          BZ    SMP4.01B                                                     SMP41800
000236I  41F0 4000 03F0I      181          BAL   R15,REWMT         REWIND TAPE                                SMP41810
00023CI  4300 4000 041CI      182          B     TSTEND            END SAMPLE TEST 4                          SMP41820
                              183  *                                                                          SMP41830
000242I  2761                 184  SMP4.01B SIS   R6,1             DECREMENT RECORDS                          SMP41840
000244I  4230 FF62 =0001AAI   185          BNZ   SMP4.019          CONTINUE RECORDS                           SMP41850
                              186  *                                                                          SMP41860
                              187  * CHECK FOR TMS STATUS                                                    SMP41870
                              188  *                                                                          SMP41880
000248I  E630 4000 0274I      189          LA    R3,SMP4.00C       INTERRUPT ADDRESS                          SMP41890
00024EI  403C 0000            190          STH   R3,0(R12)         INTO TABLE                                 SMP41900
000252I  41E0 4000 02C0I      191          BAL   R14,CENBLE        ENABLE INTERRUPTS                          SMP41910
000258I  C800 00FF            192          LHI   R0,X'FF'          TIME VALUE                                 SMP41920
00025CI  41E0 4000 02AEI      193          BAL   R14,CREAD         ISSUE READ COMMAND                         SMP41930
000262I  41E0 4000 03C8I      194          BAL   R14,TIMOUT        WAIT FOR INTERRUPT                         SMP41940
000268I  E650 4000 052CI      195          LA    R5,SMP4.E06       NO INTERRUPT GEN ON READ EOF               SMP41950
00026EI  4300 4000 041CI      196          B     ERROR             ERROR ROUTINE                              SMP41960
                              197  *                                                                          SMP41970
000274I  7330 FD92 =00000AI   198  SMP4.00C LHL   R3,PSW3          PSW 70F0                                   SMP41980
000278I  95E3                 199          EPSR  R14,R3            ENABLE PROCESSOR INTERRUPTS                SMP41990
00027AI  41E0 4000 02CCI      200          BAL   R14,CDISARM                                                  SMP42000
000280I  41E0 4000 03D0I      201          BAL   R14,SENSTA        GET STATUS                                 SMP42010
000286I  C330 0002            202          THI   R3,X'02'          EOF STATUS?                                SMP42020
00028AI  4230 4000 041CI      203          BNZ   TSTEND                                                       SMP42030
000290I  E650 4000 055CI      204          LA    R5,SMP4.E07       NO TAPE MARK STATUS                        SMP42040

000296I  DE10 FD76 =000010I   206  CCLEAR   OC    R1,CLEAR          CLEAR INTERFACE                            SMP42060
00029AI  030E                 207          BR    R14               RETURN                                     SMP42070

00029CI  DE10 FD71 =000011I   209  CWRITE   OC    R1,WRITE          PUT INTERFACE INTO WRITE MODE              SMP42090
0002A0I  030E                 210          BR    R14               RETURN                                     SMP42100

0002A2I  DE10 FD6F =000015I   212  CWRODBY  OC    R1,WRTODDBY       PUT OUT ODD AMOUNT BYTES                   SMP42120
0002A6I  030E                 213          BR    R14               RETURN                                     SMP42130

0002A8I  DE13 FD66 =000012I   215  CDENS    OC    R1,DENSITY(R3)    OUTPUT PROPER DENSITY                      SMP42150
0002ACI  030E                 216          BR    R14               RETURN                                     SMP42160
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0002AEI  DE10 FD64 =000016I    218  CREAD    OC    R1,READ          PUT INTERFACE IN READ MODE          SMP42180
0002B2I  030E                  219               BR    R14              RETURN                              SMP42190

0002B4I  DE10 FD5F =000017I    221  CREW     OC    R1,REWIND        REWIND TAPE                         SMP42210
0002B8I  030E                  222               BR    R14              RETURN                              SMP42220

0002BAI  DE10 FD5D =00001BI    224  CWREOF   OC    R1,WREOF         WRITE EOF MARK                      SMP42240
0002BEI  030E                  225               BR    R14              RETURN                              SMP42250

0002C0I  DE10 FD55 =000019I    227  CENBLE   OC    R1,ENABLE        ENABLE INTERFACE INTERRUPTS         SMP42270
0002C4I  030E                  228               BR    R14              RETURN                              SMP42280

0002C6I  DE10 FD50 =00001AI    230  CDISBLE  OC    R1,DISABLE       DISABLE PROCESSOR INTERRUPTS        SMP42300
0002CAI  030E                  231               BR    R14              RETURN                              SMP42310

0002CCI  DE10 FD48 =000018I    233  CDISARM  OC    R1,DISARM        DISARM INTERFACE INTERRUPTS         SMP42330
0002D0I  030E                  234               BR    R14              RETURN                              SMP42340

0002D2I  DE20 FD48 =00001EI    236  CSTOP    OC    R2,STOP          STOP SELCH                          SMP42360
0002D6I  030E                  237               BR    R14                                                  SMP42370

0002D8I  DE20 FD43 =00001FI    239  CSTOPS   OC    R2,STOPS         INIT SELCH                          SMP42390
0002DCI  030E                  240               BR    R14              RETURN                              SMP42400

0002DEI  DE20 FD3A =00001CI    242  CGO      OC    R2,GO            GIVE SELCH THE GO                   SMP42420
0002E2I  030E                  243               BR    R14                                                  SMP42430

0002E4I  DE20 FD35 =00001DI    245  CGOREAD  OC    R2,GOREAD        GIVE THE SELCH THE GO TO READ       SMP42450
0002E8I  030E                  246               BR    R14              RETURN                              SMP42460

0002EAI  9D23                  248  SENSTA2  SSR   R2,R3             SENSE SELCH STATUS                  SMP42480
0002ECI  030E                  249               BR    R14              RETURN                              SMP42490
0002EEI  DA20 FD37 =000029I    250  WRBUF    WD    R2,WBUF+1        SET UP EXPECTED SELCH ADDRESS       SMP42500
0002F2I  D820 FD34 =00002AI    251               WH    R2,WBUF+2                                            SMP42510
0002F6I  DA20 FD37 =000031I    252               WD    R2,ENDBUF+1                                          SMP42520
0002FAI  D820 FD34 =000032I    253               WH    R2,ENDBUF+2                                          SMP42530
0002FEI  030E                  254               BR    R14              RETURN                              SMP42540

000300I  DA20 FD29 =00002DI    256  REBUF    WD    R2,RDBUF+1       SET UP EXPECTED SELCH READ ADDRS    SMP42560
000304I  D820 FD26 =00002EI    257               WH    R2,RDBUF+2                                           SMP42570
000308I  DA20 FD25 =000031I    258               WD    R2,ENDBUF+1                                          SMP42580
00030CI  D820 FD22 =000032I    259               WH    R2,ENDBUF+2                                          SMP42590
000310I  030E                  260               BR    R14              RETURN                              SMP42600

000312I  9B23                  262  REEND    RDR   R2,R3                                                    SMP42620
000314I  992D                  263               RHR   R2,R13                                                 SMP42630
000316I  030E                  264               BR    R14              RETURN                              SMP42640

                               266  * THIS ROUTINE SETS UP THE SELCH WRTBUF AND                             SMP42660
                               267  * SELCH ADDRESSES FOR THE WRITE                                         SMP42670
                               268  * THE DESIRED DATA PATTERN IS STORED INTO A                             SMP42680
                               269  * BUFFER AND THE BUFFER IS WRITTEN ONTO THE                             SMP42690
                               270  * TAPE VIA THE SELCH.                                                   SMP42700
                               271  *                                                                       SMP42710
000318I  4880 FCEA =000006I    272  SELSETW  LH    R8,BYTES         GET BYTES VALUE                     SMP42720
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00031CI  2781                    273           SIS   R8,1                ADJUST FOR HALFWORD WRITES                SMP42730
00031EI  E630 4000 0584I         274           LA    R3,WRTBUF                                                     SMP42740
000324I  5030 FD00 =000028I      275           STA   R3,WBUF                                                       SMP42750
000328I  2470                    276           LIS   R7,0                CLEAR INDEX REGISTER                      SMP42760
00032AI  4037 4000 0584I         277  SEL.1    STH   R3,WRTBUF(R7)       FILL WRTBUF                               SMP42770
000330I  2672                    278           AIS   R7,2                INCREMENT BUFFER ADDRESS                  SMP42780
000332I  0578                    279           CLAR  R7,R8                                                         SMP42790
000334I  4320 FFF2 =00032AI      280           BNP   SEL.1                                                         SMP42800
000338I  41E0 FF96 =0002D2I      281           BAL   R14,CSTOP                                                     SMP42810
00033CI  E630 4000 0584I         282           LA    R3,WRTBUF                                                     SMP42820
000342I  0A83                    283           AR    R8,R3               CALCULATE ENDING ADDR                     SMP42830
000344I  5080 FCE8 =000030I      284           ST    R8,ENDBUF           SAVE IT                                   SMP42840
000348I  030F                    285           BR    R15                 RETURN                                    SMP42850

                                 287  *                                                                            SMP42870
                                 288  * THIS ROUTINE SETS UP THE READBUF ADDRESSES                                 SMP42880
                                 289  * ACCORDING TO THE AMOUNT OF BYTES WRITTEN.                                  SMP42890
                                 290  *                                                                            SMP42900
00034AI  E650 4000 0984I         291  SELSETR  LA    R5,READBUF          GET START ADDR                            SMP42910
000350I  5050 FCD8 =00002CI      292           STA   R5,RDBUF                                                      SMP42920
000354I  4860 FCAE =000006I      293           LH    R6,BYTES            GET BYTES VALUE                           SMP42930
000358I  2761                    294           SIS   R6,1                ADJUST                                    SMP42940
00035AI  0A56                    295           AR    R5,R6               CALCULATE END ADDRESS                     SMP42950
00035CI  5050 FCD0 =000030I      296           ST    R5,ENDBUF           SAVE IT                                   SMP42960
000360I  030F                    297           BR    R15                 RETURN                                    SMP42970

                                 299  *                                                                            SMP42990
                                 300  * THIS ROUTINE CHECKS THAT THE SELCH STATUS IS                               SMP43000
                                 301  * OK UPON COMPLETION OF READ OR WRITE.                                       SMP43010
                                 302  *                                                                            SMP43020
000362I  41E0 FF84 =0002EAI      303  SELCHK   BAL   R14,SENSTA2          GET SELCH STATUS                          SMP43030
000366I  41E0 FF68 =0002D2I      304           BAL   R14,CSTOP                                                     SMP43040
00036AI  41E0 FF6A =0002D8I      305           BAL   R14,CSTOPS                                                    SMP43050
00036EI  C530 0000               306           CLHI  R3,0                CORRECT STATUS?                           SMP43060
000372I  033F                    307           BER   R15                 RETURN IF YES                             SMP43070
000374I  4300 4000 041CI         308           B     ERROR               A PRECISE ENGLISH ERROR MESSAGE HERE      SMP43080

                                 310  *                                                                            SMP43100
                                 311  * THIS ROUTINE CHECKS THE SELCH ENDING ADDRESSES                            SMP43110
                                 312  * AGAINST WHAT WAS EXPECTED.                                                 SMP43120
                                 313  *                                                                            SMP43130
00037AI  41E0 4000 03EAI         314  SELEND   BAL   R14,CEXTD                                                    SMP43140
000380I  41E0 FF8E =000312I      315           BAL   R14,REEND                                                     SMP43150
000384I  3433                    316           EXHR  R3,R3                                                         SMP43160
000386I  063D                    317           OAR   R3,R13                                                        SMP43170
000388I  5030 FC98 =000024I      318           STA   R3,STOPADDR                                                   SMP43180
00038CI  41E0 FF42 =0002D2I      319           BAL   R14,CSTOP           STOP SELCH                                SMP43190
000390I  41E0 4000 03D0I         320           BAL   R14,SENSTA                                                    SMP43200
000396I  5850 FC8A =000024I      321           LDA   R5,STOPADDR                                                   SMP43210
00039AI  5550 FC92 =000030I      322           CLA   R5,ENDBUF           CORRECT ENDING ADDRESS                    SMP43220
00039EI  033F                    323           BER   R15                 YES, RETURN                               SMP43230
0003A0I  4300 4000 041CI         324           B     ERROR               AN ERROR MESSAGE HERE                     SMP43240

                                 326  *                                                                            SMP43260
                                 327  * THIS ROUTINE CHECKS THE INTERFACE STATUS FOR                              SMP43270
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                                    328  * CORRECTNESS.                                                                  SMP43280
                                    329  *                                                                              SMP43290
0003A6I  41E0 4000 03D0I            330  STATCHK  BAL   R14,SENSTA                                                     SMP43300
0003ACI  C330 0001                  331           THI   R3,X'01'          IS DRIVE DU?                                SMP43310
0003B0I  4230 4000 041CI            332           BNZ   ERROR             YES, TELL USER                              SMP43320
0003B6I  41E0 4000 03D4I            333           BAL   R14,SENSTA1       WAIT FOR NO MOTION                          SMP43330
0003BCI  C330 00C0                  334           THI   R3,X'C0'          SEE IF ANY ERROR STATUS BITS SET            SMP43340
0003C0I  4230 4000 041CI            335           BNZ   ERROR1            DETERMINE WHICH ONE                         SMP43350
0003C6I  030F                       336           BR    R15               OTHERWISE RETURN                            SMP43360

0003C8I  2701                       338  TIMOUT   SIS   R0,1             DECREMENT TIMVAL                            SMP43380
0003CAI  4230 FFFA =0003C8I         339           BNZ   TIMOUT            WAIT FOR INTERRUPT                          SMP43390
0003CEI  030E                       340           BR    R14               RETURN TO ERROR IF NO INTERRUPT             SMP43400

0003D0I  9D13                       342  SENSTA   SSR   R1,R3             GET INTERFACE STATUS                        SMP43420
0003D2I  030E                       343           BR    R14               RETURN                                      SMP43430

0003D4I  F800 007F FFFF             345  SENSTA1  LI    R0,Y'7FFFFF'      TIME LIMIT                                  SMP43450
0003DAI  9D13                       346  SENSE1   SSR   R1,R3             GET INTERFACE STATUS                        SMP43460
0003DCI  024E                       347           BOR   R14               RETURN ON NO MOTION                         SMP43470
0003DEI  2701                       348           SIS   R0,1              DECREMENT TIMER                             SMP43480
0003E0I  4230 FFF6 =0003DAI         349           BNZ   SENSE1                                                        SMP43490
0003E4I  4300 4000 041CI            350           B     ERROR                                                         SMP43500

0003EAI  DE20 FC32 =000020I         352  CEXTD    QC    R2,EXTD                                                       SMP43520
0003EEI  030E                       353           BR    R14               RETURN                                      SMP43530

                                    355  *                                                                           SMP43550
                                    356  * THIS ROUTINE IS USED TO REWIND THE MAG TAPE                               SMP43560
                                    357  * FIRST, NMTN  SHOULD RESET AND THEN SET AGAIN.                             SMP43570
                                    358  *                                                                           SMP43580
0003F0I  41E0 FFDC =0003D0I         359  REWMT    BAL   R14,SENSTA                                                    SMP43590
0003F4I  C330 0020                  360           THI   R3,X'20'          AT BOT ALREADY                              SMP43600
0003F8I  023F                       361           BNZR  R15               RETURN IF YES                               SMP43610
0003FAI  41E0 FFD2 =0003D0I         362           BAL   R14,SENSTA                                                    SMP43620
0003FEI  C330 0010                  363           THI   R3,X'10'          NO MOTION SET                               SMP43630
000402I  4230 4000 040CI            364           BNZ   REW.2                                                         SMP43640
000408I  41E0 FFC8 =0003D4I         365           BAL   R14,SENSTA1       WAIT FOR NO MOTION                          SMP43650
00040CI  41E0 FEA4 =0002B4I         366  REW.2    BAL   R14,CREW           REWIND THE TAPE TO BOT                      SMP43660
000410I  41E0 FFBC =0003D0I         367  REW.3    BAL   R14,SENSTA                                                    SMP43670
000414I  2042                       368           BOS   REW.3             WAIT FOR TAPE TO GO INTO MOTION             SMP43680
000416I  41E0 FFBA =0003D4I         369           BAL   R14,SENSTA1       WAIT FOR NO MOTION                          SMP43690
00041AI  030F                       370           BR    R15               RETURN                                      SMP43700
                                    371  *                                                                           SMP43710
         0000 041CI                 372  ERROR    EQU   *                 THE APPROPRIATE ERROR MESSAGE AND           SMP43720
                                    373  *                               NECESSARY INFORMATION TO AID THE            SMP43730
                                    374  *                               USER IN DIAGNOSING THE PROBLEM              SMP43740
                                    375  *                               IS OUTPUT HERE.                             SMP43750
         0000 041CI                 376  ERROR1   EQU   *                 SOME DIAGNOSING IS NECESSARY HERE           SMP43760
                                    377  *                               TO IDENTIFY THE INCORRECT STATUS BIT        SMP43770
                                    378  *                               THAT IS SET.                                SMP43780
00041CI  41E0 FEAC =0002CCI         379  TSTEND   BAL   R14,CDISARM       DISARM ANY PENDING INTERRUPTS               SMP43790
000420I  C200 4000 0428I            380           LPSW  WAIT1             PUT PROCESSOR IN WAIT STATE                 SMP43800
000428I  0000 8000                  381  WAIT1    DCY   8000                                                          SMP43810
00042CI  0000 041CI                 382           DC    A(TSTEND)                                                     SMP43820
```

```
000430I 4E4F 2049 4E54 4552   384 SMP4.E00 DC    C'NO INTERRUPT GENERATED ON BUSY AFTER WRITE'          SMP43840
000438I 5255 5054 2047 454E
000440I 4552 4154 4544 204F
000448I 4E20 4255 5359 2041
000450I 4654 4552 2057 5249
000458I 5445
00045AI 0D0A                  385           DCX   0D0A                                                  SMP43850
00045CI 4E4F 2049 4E54 4552   386 SMP4.E01 DC    C'NO INTERRUPT GENERATED ON NMTN',X'0D0A'              SMP43860
000464I 5255 5054 2047 454E
00046CI 4552 4154 4544 204F
000474I 4E20 4E4D 544E
00047AI 0D0A
00047CI 4E4F 2049 4E54 4552   387 SMP4.E02 DC    C'NO INTERRUPT GENERATED ON WRITE EOF',X'0D0A'         SMP43870
000484I 5255 5054 2047 454E
00048CI 4552 4154 4544 204F
000494I 4E20 5752 4954 4520
00049CI 454F 4620
0004A0I 0D0A
0004A2I 4E4F 2049 4E54 4552   388 SMP4.E03 DC    C'NO INTERRUPT GENERATED ON NMTN AFTER REWIND'         SMP43880
0004AAI 5255 5054 2047 454E
0004B2I 4552 4154 4544 204F
0004BAI 4E20 4E4D 544E 2041
0004C2I 4654 4552 2052 4557
0004CAI 494E 4420
0004CEI 0D0A                  389           DCX   0D0A                                                  SMP43890
0004D0I 4E4F 2049 4E54 4552   390 SMP4.E04 DC    C'NO INTERRUPT GENERATED ON BUSY AFTER READ'          SMP43900
0004D8I 5255 5054 2047 454E
0004E0I 4552 4154 4544 204F
0004E8I 4E20 4255 5359 2041
0004F0I 4654 4552 2052 4541
0004F8I 4420
0004FAI 0D0A                  391           DCX   0D0A                                                  SMP43910
0004FCI 4E4F 2049 4E54 4552   392 SMP4.E05 DC    C'NO INTERRUPT GENERATED ON BUSY AFTER READ EOF'      SMP43920
000504I 5255 5054 2047 454E
00050CI 4552 4154 4544 204F
000514I 4E20 4255 5359 2041
00051CI 4654 4552 2052 4541
000524I 4420 454F 4620
00052AI 0D0A                  393           DCX   0D0A                                                  SMP43930
00052CI 4E4F 2049 4E54 4552   394 SMP4.E06 DC    C'NO INTERRUPT GENERATED ON BUSY AFTER READ EOF'      SMP43940
000534I 5255 5054 2047 454E
00053CI 4552 4154 4544 204F
000544I 4E20 4255 5359 2041
00054CI 4654 4552 2052 4541
000554I 4420 454F 4620
00055AI 0D0A                  395           DCX   0D0A                                                  SMP43950
00055CI 494E 434F 5252 4543   396 SMP4.E07 DC    C'INCORRECT STATUS - NO TAPE MARK STATUS',X'0D0A'      SMP43960
000564I 5420 5354 4154 5553
00056CI 202D 204E 4F20 5441
000574I 5045 204D 4152 4B20
00057CI 5354 4154 5553
000582I 0D0A
000584I                       397 WRTBUF   DS    1024              ALLOCATE ENOUGH SPACE               SMP43970
000984I                       398 READBUF  DS    1024                                                  SMP43980
000D84I                       399           END                                                         SMP43990
```

ASSEMBLED BY CAL 03-066R08-00 (32-BIT)

START OPTIONS: T=32,ERLST

NO CAL ERRORS
NO CAL WARNINGS
2 PASSES

TABLE SPACE USED : 4K

ABSTOP	0000 0000												
ADC	0000 0004												
BASE	0000 000CI	35*											
BYTES	0000 0006I	32*	78	152	272	293							
CCLEAR	0000 0296I	71	206*										
CDENS	0000 02A8I	77	215*										
CDISARM	0000 02CCI	63	92	165	200	233*	379						
CDISBLE	0000 02C6I	230*											
CENBLE	0000 02C0I	74	118	136	153	191	227*						
CEXTD	0000 03EAI	314	352*										
CGO	0000 02DEI	95	242*										
CGOREAD	0000 02E4I	166	245*										
CLEAR	0000 0010I	36*	37	206									
CREAD	0000 02AEI	154	193	218*									
CREW	0000 02B4I	137	221*	366									
CSTOP	0000 02D2I	64	65	132	133	236*	281	304	319				
CSTOPS	0000 02D8I	239*	305										
CWREOF	0000 02BAI	119	224*										
CWRITE	0000 029CI	82	209*										
CWRODBY	0000 02A2I	81	212*										
DATAPAT	0000 0002I	30*	69										
DENSEITY	0000 0012I	38*	39	215									
DISABLE	0000 001AI	44*	45	230									
DISARM	0000 0018I	42*	43	233									
DRIVADR	0000 0000I	29*	55										
ENABLE	0000 0019I	43*	227										
ENDBUF	0000 0030I	54*	252	253	258	259	284	296	322				
ERROR	0000 041CI	86	99	122	140	157	170	196	308	324	332	350	372*
ERROR1	0000 041CI	335	376*										
EXTD	0000 0020I	50*	352										
GO	0000 001CI	46*	47	242									
GOREAD	0000 001DI	47*	245										
IMPTOP	0000 0D84I	399											
LADC	0000 0002												
PSW3	0000 000AI	34*	67	90	103	123	145	161	174	198			
PURETOP	0000 0000P	399											
R0	0000 0000	13*	83	96	117	152	167	192	338	345	348		
R1	0000 0001	14*	55	56	206	209	212	215	218	221	224	227	230
		342	346										
R10	0000 000A	23*											
R11	0000 000B	24*											
R12	0000 000C	25*	56	57	58	73	116	135	151	190			
R13	0000 000D	26*	60	61	62	94	164	263	317				
R14	0000 000E	27*	63	64	65	68	71	74	76	77	81	82	84
		92	95	97	104	118	119	120	124	125	132	133	136

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		138 146 149 153 154 155 162 165 166 168 175 191 193
		194 199 200 201 207 210 213 216 219 222 225 228 231
		234 237 240 243 246 249 254 260 264 281 303 304 305
		314 315 319 320 330 333 340 343 347 353 359 362 365
		366 367 369 379
R15	0000 000F	28* 66 75 105 106 107 128 148 176 177 178 181 285
		297 307 323 336 361 370
R2	0000 0002	15* 59 60 236 239 242 245 248 250 251 252 253 256
		257 258 259 262 263 352
R3	0000 0003	16* 67 68 72 73 90 93 94 103 104 108 115 116
		123 124 126 134 135 145 146 150 151 161 162 163 164
		174 175 179 189 190 198 199 202 215 248 262 274 275
		277 282 283 306 316 316 317 318 331 334 342 346 360
		363
R4	0000 0004	17* 69
R5	0000 0005	18* 85 98 121 139 156 169 195 204 291 292 295 296
		321 322
R6	0000 0006	19* 70 110 147 184 293 294 295
R7	0000 0007	20* 276 277 278 279
R8	0000 0008	21* 78 79 272 273 279 283 284
R9	0000 0009	22*
RDBUF	0000 002CI	53* 256 257 292
READ	0000 0016I	40* 41 218
READBUF	0000 0984I	291 398*
REBUF	0000 0300I	149 256*
RECORDS	0000 0008I	33* 70 147
REEND	0000 0312I	262* 315
REW.2	0000 040CI	364 366*
REW.3	0000 0410I	367* 368
REWIND	0000 0017I	41* 221
REWMT	0000 03F0I	66 181 359*
SEL.1	0000 032AI	277* 280
SELADR	0000 0004I	31* 59
SELCHK	0000 0362I	105 176 303*
SELEND	0000 037AI	106 177 314*
SELSETR	0000 034AI	148 291*
SELSETW	0000 0318I	75 272*
SENSE1	0000 03DAI	346* 349
SENSTA	0000 03D0I	125 201 320 330 342* 359 362 367
SENSTA1	0000 03D4I	333 345* 365 369
SENSTA2	0000 02EAI	248* 303
SMP4.000	0000 00AEI	80 82*
SMP4.001	0000 00CAI	72 90*
SMP4.005	0000 00FCI	93 103*
SMP4.006	0000 011EI	110*
SMP4.007	0000 0150I	115 123*
SMP4.008	0000 016CI	109 127 132*
SMP4.009	0000 01A0I	134 145*
SMP4.00A	0000 01E2I	150 161*
SMP4.00B	0000 0214I	163 174*
SMP4.00C	0000 0274I	189 198*
SMP4.019	0000 01AAI	148* 185
SMP4.01B	0000 0242I	180 184*
SMP4.E00	0000 0430I	85 384*
SMP4.E01	0000 045CI	98 386*

SMP4.E02	0000 047CI	121	387*							
SMP4.E03	0000 04A2I	139	388*							
SMP4.E04	0000 04D0I	156	390*							
SMP4.E05	0000 04FCI	169	392*							
SMP4.E06	0000 052CI	195	394*							
SMP4.E07	0000 055CI	204	396*							
SMPL4	0000 0072I	71*	111							
STATCHK	0000 03A6I	107	128	178	330*					
STOP	0000 001EI	48*	49	236						
STOPADDR	0000 0024I	51*	318	321						
STOPS	0000 001FI	49*	239							
TIMOUT	0000 03C8I	84	97	120	138	155	168	194	338*	339
TSTEND	0000 041CI	182	203	379*	382					
WAIT1	0000 0428I	380	381*							
WBUF	0000 0028I	52*	250	251	275					
WRBUF	0000 02EEI	76	250*							
WREOF	0000 001BI	45*	224							
WRITE	0000 0011I	37*	209							
WRTBUF	0000 0584I	274	277	282	397*					
WRTODDBY	0000 0015I	39*	212							

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