SYSGEN SC5500
TAPE CONTROLLER
INTERFACE

Applications Manual

SYSGEN, Inc.
47853 Warm Springs Blvd.
Fremont, CA 94539
Phone: (415) 490-6770
Telex: 4990843

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How to Use This Manual

This manual describes the features and operation of the SYSGEN SC5500 Tape Controller Interface for IBM PC, XT, AT, and compatible computers. The interface consists of the SC5500 Tape Controller board and the Software Interface Module containing the SC5500 control commands. The interface module gives the user complete command of tape operations from his system or application program.

The SC5500 Tape Controller interfaces with an industry-standard QIC-36 cartridge or DCAS cassette streaming tape drive. The interface described in this manual is the cartridge tape drive. For information about the cassette interface, please contact SYSGEN Incorporated.

Chapter 1 discusses the features and operation of the SC5500 Tape Controller board, including functions of the read/write registers and the tape controller pulses, jumper selections, and the action of the Programmable Array Logic (PAL). Summary tables are included for easy reference.

Chapter 2 describes the SYSGEN Software Interface Module, including subroutine entry points, command protocols for NEAR CALLS in both ASSEMBLY and C language, and control commands. An alternate set of FAR CALL entry points is provided for users of the LATTICE C Large Memory Model. The chapter includes reference tables on the subroutine entry points and the control commands.

SC5500 Tape Controller specifications, pin assignments for the SC5500 50-pin tape drive interface connector, and error codes are provided in the appendixes.

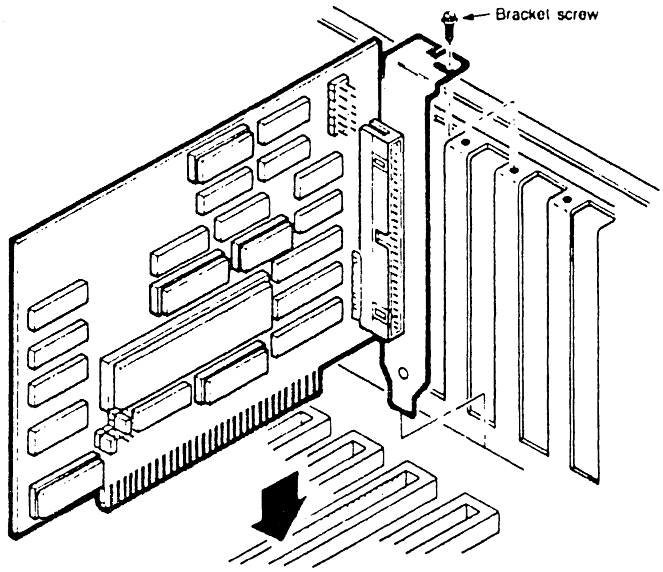
Compliance with FCC Regulations

This equipment generates and uses radio frequency energy and if not installed and used properly; i.e., in strict accordance with the Owner's Manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

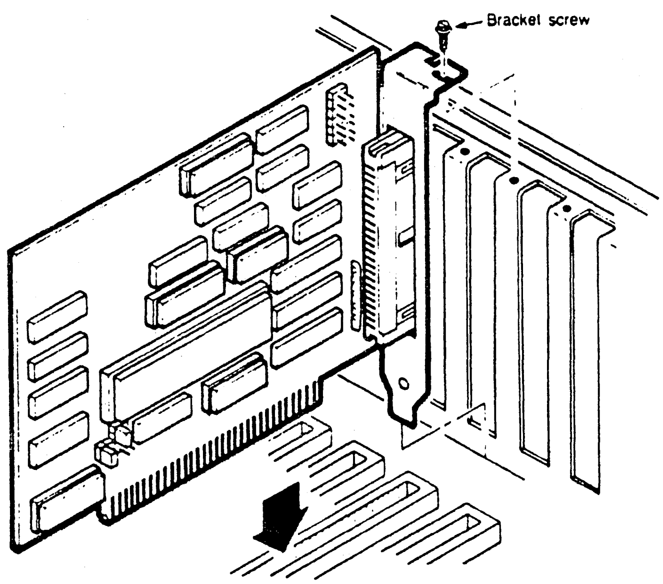
Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to correct the interference.

Contents

Figure 1-1. SC5500 Tape Controller Boards



SC5500 Internal Tape Controller Board



SC5500 External Tape Controller Board

Interface with the tape drive is by means of the SC5500 50-pin internal or external connector. The internal version of this connector interfaces the control board with a tape drive mounted inside the host computer housing. Pin assignments for the 50-pin connector are given in Appendix B. Signal definition is dictated by the tape drive specifications.

REGISTERS AND CONTROL PULSES

The SC5500 write and read registers transfer information between the host computer and the tape controller. Control pulses, triggered by the host computer, reset tape error, generate the single-step clock, and initiate read transfer from tape to computer. Tables 1-1 and 1-2 define the write and read registers, respectively. Table 1-3 defines the computer-triggered control pulses.

Table 1-1. Write Registers

Name	Address	Function
WTTPINTF*	290 hex	Tape interface

Bit map:

7	6	5	4	3	2	1	0

Bit	Name	Function
0	TR0*	Track 0
1	TR1*	Track 1
2	TR2*	Track 2
3	TR3*	Track 3
4	GO*	Go
5	REV*	Reverse
6	EEN*	Erase enable
7	WEN*	Write enable

*Denotes active low level. Single-step mode permits only one DMA operation; dual-step mode permits two concurrent operations.

Table 1-1. Write Registers (Continued)

Name	Address	Function
CONTROL*	292 hex	Control signals

Bit map:

7	6	5	4	3	2	1	0

Bit	Name	Function
0	DMAENO	PCDMA3 enable; active high
1	ENTPWRCNTR	Tape write counter enable; active high
2	FILEMARKEN	File mark enable; active high
3	WRITE	Write enable; active high
4	DMAEN1	PCDMA1 enable; active high
5	TPRDGATE	Tape read gate; active high
6	TPRDSQEN	Tape read sequencer enable; active high
7	ENTPINTF	Tape interface enable; active high

Name	Address	Function
MODE	293 hex	Mode register, interrupt enable

Bit map:

7	6	5	4	3	2	1	0

Bit	Name	Function
0	INTEN	Interrupt enable; active high
1	TPDIAG	Diagnostic mode; active high
2	DUAL/SINGLE	Active how sets single-step mode; active high sets dual-step mode*
3	MODE	Reserved for future application; switching DMARQ selection to PC.
4	CSELSSCLK	Single-step clock enable; active low enables single-step clock, disable TPCLK
5	CNTSEL	Drive select; active low selects 10-mb drive, active high selects 20/45-mb drive
6	RESERVED	
7	RESERVED	

*Denotes active low level. Single-step mode permits only one DMA operation; dual-step mode permits two concurrent operations.

Table 1-2. Read Registers

Name	Address	Function
RDTPINTF*	290 hex	Read tape interface

Bit map:

7	6	5	4				

Bit	Signal	Function
4	UTH*	Upper tape hole
5	LTH*	Lower tape hole
6	CIN*	Cartridge in
7	USF*	Unsafe

Name	Address	Function
RDTPST*	293 hex	Read tape status

Bit map:

7	6	5	4	3	2	1	0

Bit	Signal	Function
0	TPWDA	Writing tape write data; active high
1	TPERRFLG*	Tape error flag; active low latched signal
2	TPRDXFDONE*	Tape read transfer done; active low latched signal
3	FILEMARK	Filemark block; active high latched signal
4	CARCHANGE	Cartridge change; active high
5	INT*	Interrupt; active low
6	DRQ1	Internal DMA request 1; active high
7	DRQ0	Internal DMA request 0; active high

*Denotes active low level.

Table 1-3. Control Pulses

Name	Address (hex)	Mode	Function
RSTERR*	291	Write	Resets tape error
RDSTRXF*	291	Read	Starts read transfer from tape to computer
TPSSCLK*	292	Read	Generates single-step clock when the clock enable (CSELSSCLK*) is low.

*Denotes active low level.

READ OPERATION

The read operation is accomplished in the following steps. (Refer to Tables 1-1 through 1-3):

1. Set the mode register (MODE, active high).
2. Set the tape interface register (WTTPINTF, active low).
3. Set the control register (CONTROL, active low).

   a. Enable the DMA (DMAEN0 and DMAEN1, active high).

   b. Enable the tape read gate (TPRDGATE, active high).

   c. Enable the tape read sequencer (TPRDSQEN, active high).

   d. Enable the read transfer pulse (RDSTRXF*, active low) to start the read operation.

In single-step mode (single operation), DMAEN0 high enables PC DMA signal PCDRQ3 for a read, write, or read-after-write operation. In dual-step mode (two concurrent operations), DMAEN0 high enables PCDRQ3 for a write operation and DMAEN1 high enables PCDRQ1 for a read operation.

Read-transfer-done is indicated by an active low latched signal on the tape read transfer done line (TPRDXFDONE) of the status register and also by an active high signal on the interrupt enable line (INTEN) of the mode register. To use the interrupt line to indicate the read done, you must enable INTEN (active high). Any error condition during read is also indicated on the interrupt line. Reset pulse RSTERR*, triggered by the host computer, will clear this interrupt.

WRITE OPERATION

The write operation is accomplished in the following steps. (Refer to Tables 1-1 and 1-2):

1. Set the mode register (MODE, active high).

2. Set the tape interface register (WTTPINTF, active low).

3. Set the control register (CONTROL, active low):

   a. Enable the DMA (DMAEN0 and DMAEN1, active high).

   b. Enable the tape interface (ENTPINTF, active high).

   c. Enable the write signal (WRITE, active high).

   d. Enable the tape write counter signal (ENTPWRCNTR, active high).

In single-step mode (single operation), DMAEN0 high enables PC DMA signal PCDRQ3 for a read, write, or read-after-write operation. In dual-step mode (two concurrent operations), DMAEN0 high enables PCDRQ3 for a write operation and DMAEN1 high enables PCDRQ1 for a read operation.

The write done is indicated by an active high signal on the interrupt enable line (INTEN) of the mode register.

HARD FILE MARK

The hard file mark is written by enabling the FILEMARKEN signal on the Control register (active high) and writing the data FF hexadecimal. The data FF is subsequently converted into a unique Group Code Recording (GCR): 00101,00101. During read operation in dual mode, the GCR is decoded as a hard file mark and FILEMARKEN is enabled on the status line (active high). In dual mode, the GCR is transferred via Channel 3 and the I.D. is transferred via Channel 0.

DIAGNOSTIC OPERATION

In the diagnostic mode, the LSI chip gives the data AA hexidecimal for read operation only. The single-step clock is enabled by an active low signal on the single-step clock enable line (CSELSSCLK) of the mode register. This signal disables the TPCLK signal and stops the 110-nsec clock. The TPCLK signal is re-enabled when the computer triggers the TPSSCLK pulse.

JUMPER FUNCTIONS

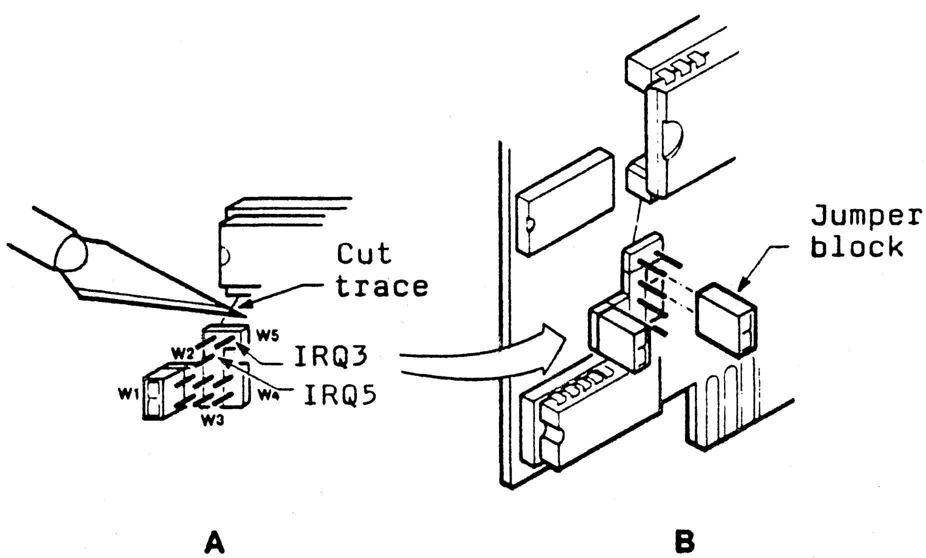
Jumper W1 selects PC address 290. Jumpers W2 through W4 are only used to test the four boards simultaneously. Table 1-4 summarizes the jumper functions.

Jumper W5 currently selects IRQ3* (interrupt channel 3). If you want to make the default IRQ5 (interrupt channel 5), you must change the jumper. On some versions of the board, you must also cut the trace as shown in Figure 1-2. *If your board does not look like figure 1-2, you do not need to cut the trace, just change the jumper.*

Table 1-4. Jumper Functions

Jumper	Function
W1	Selects PC address 290
W2	Selects PC address 2A0
W3	Selects PC address 2B0
W4	Selects PC address 2C0
W5	Selects IRQ3. (See Figure 1-2 to select IRQ5.)

Figure 1-2. Selecting IRQ5



PROGRAMMABLE ARRAY LOGIC

Table 1-5 describes the action of the Programmable Aray Logic (PAL). By using the combinations shown in the table, you can transfer data in dual mode, single mode, or diagnostic mode. The diagnostic mode is for internal testing only.

Table 1-5. PAL Action

Signal				**Transfer to PC**
WRITE	**SINGLE*/ DUAL**	**DMAEN0**	**DMAEN1**	**SC5500 ------→ PC**
ON	Don't care	ON	OFF	DMARQ0 ------→ PCDRQ3
OFF	Don't care	ON	OFF	DMARQ1 ------→ PCDRQ3
Don't care	DUAL	OFF	ON	DMARQ3 ------→ PCDRQ1
Don't care	SINGLE*	OFF	ON	DMARQ1 ------→ PCDRQ1

*Denotes default. PAL also transfers the tape interrupt to PCINT.

Chapter **2**

Software Interface Module

The Software Interface Module described in this chapter is a highly intelligent PCDOS/MSDOS relocatable object module that the user can incorporate in his system or application program to command the SYSGEN SC5500 Tape Controller. The interface consists of six access subroutines that are callable with ASSEMBLY language, LATTICE® C, and other high-level languages compatible with LATTICE C.

Note:

Microsoft® C Version 2.XX is fully compatible, but not Version 3.XX. Users of Version 3 should consult their user's manual to find out how to achieve compatability.

SUBROUTINES

The Software Interface Module subroutines are summarized in Table 2-1. This table gives the sequence of execution for data and nondata commands. The subroutines can be linked directly into the user's application program or incorporated into a standard DOS device driver.

Table 2-1. Interface Module Subroutines

Subroutine	Function
_DORESET	Initialize controller hardware
_INITCMD	Start a tape command
_GETDAT	Start data transfer, tape to computer memory
_PUTDAT	Start data transfer, computer memory to tape
_POLLCMD	Check for completion of DMA transfer
_WAITCMD	Wait for command to terminate

Command execution is in two or three phases as follows:

Nondata transfer commands (ex., Rewind):

1. _INITCMD
2. _WAITCMD

Data input commands (ex., Read Tape Data):

1. _INITCMD
2. _GETDAT
3. _WAITCMD

Data output commands (ex., Write Tape Data):

1. _INITCMD
2. _PUTDAT
3. _WAITCMD

The subroutines _DORESET and _POLLCMD are supplemental. _DORESET initializes the controller hardware, and _POLLCMD checks for completion of the DMA operation.

CALLING PROTOCOL

All calls included in this section are Intel 8088 microprocessor NEAR CALLS. For users of the LATTICE C Large Memory Model, a special set of FAR CALL entry points is provided in Table 2-2 (see the following section, "Alternate Entry Points").

Note that on entry to all the subroutines, DS must be set to the C data segment DGROUP.

_INITCMD

_INITCMD starts the command execution and returns control to the caller immediately, without waiting for a command to terminate. It must be followed by a call to _GETDAT, _PUTDAT, or _WAITCMD.

An _INITCMD call will only return an ERROR if the controller does not respond properly to the command initiation. In this case the command protocol should be aborted, since the controller cannot continue.

C Language Protocol

The C language NEAR CALL protocol is as follows:

status = _initcmd(cmd_code)

where:

cmd_code = integer specifying the command to execute

status = integer: -1 for ERROR, anything else for OK.

Specific command codes are described under "Command Description" in this chapter.

ASSEMBLY Language Protocol

The ASSEMBLY language NEAR CALL protocol has the following stack arrangement:

Return Address	Stack point
Cmd_code	Stack point + 2

(Only CS, DS, ES, SS and BP registers are unmodified.)

Example of Assembly language usage:

```
PUSH    word ptr cmd_code    ;push parameter onto stack
CALL    _initcmd             ;call routine
ADD     sp,2                 ;remove parameter from stack
                             ;result returned in AX
```

_WAITCMD

This call waits for an ERROR to occur or for the command in progress to terminate before returning control to the caller. If an ERROR is returned, the user should send a Request Sense command to determine the nature of the error. Request Sense is described under "Command Description" in this chapter.

C Language Protocol

The C language NEAR CALL protocol is as follows:

status = _waitcmd()

where **status** is an **integer: -1** for **ERROR and anything** else for OK.

ASSEMBLY Language Protocol

ASSEMBLY language NEAR CALL protocol has the following stack arrangement:

Return Address	Stack point

(Only CS, DS, ES, SS and BP registers are unmodified.)

Example of Assembly language usage:

```
CALL     _waitcmd          ;call routine
                           ;result returned in AX
```

_GETDAT

If no ERROR condition is detected, _GETDAT starts the DMA data input from tape to computer memory, then returns control to the caller without waiting for the data transfer to complete. The user can call _POLLCMD to check for completion; however, he must terminate _GETDAT properly with _WAITCMD, whether or not he calls _POLLCMD.

This command returns an ERROR only when the controller is unable to continue operation. In this case, the user should abort the command protocol. Any error in the operation will be reported by _WAITCMD or _POLLCMD. The type of error can be determined by initiating a Request Sense command.

C Language Protocol

_GETDAT has the following C language NEAR CALL protocol:

status =_getdat(boff,bseg,nbytes)

where:

boff = unsigned integer with the offset portion of the data buffer address

bseg = unsigned integer with the segment portion of the data buffer address

nbytes = long integer byte count; must be a multiple of 512

status = integer: -1 for ERROR, anything else for OK.

A zero value for bseg has the special meaning that the data buffer is in the segment specified by the DS register (default data segment in C).

ASSEMBLY Language Protocol

The ASSEMBLY language NEAR CALL protocol has the following stack arrangement:

Return Address	Stack point
Buffer Offset	Stack point + 2
Buffer Segment	Stack point + 4
(LSW) Nbytes	Stack point + 6
(MSW) Nbytes	Stack point + 8

(Only CS, DS, ES, SS, and BP registers are unmodified.)

Example of Assembly language usage:

```
PUSH    word ptr nbytes[2]    ;msw of byte count
PUSH    word ptr nbytes[0]    ;lsw of byte count
MOV     ax,seg buffer
PUSH    ax                    ;segment of data buffer
MOV     ax,offset buffer
PUSH    ax                    ;offset of data buffer
CALL    _getdat               ;call routine
ADD     sp,8                  ;remove parameters from stack
                              ;result returned in AX
```

Note:

If the cmd_code specified to the previous _INITCMD is either a Request Sense or Request Statistics command, then 8 bytes will be transferred, regardless of the value of nbytes.

_PUTDAT

If no ERROR condition is detected, _PUTDAT initiates DMA data output from computer memory to tape, then returns control to the caller without waiting for data transfer to complete. The user can call _POLLCMD to check for completion of the data transfer; however, he must terminate _PUTDAT properly with _WAITCMD, whether or not he calls _POLLCMD.

This routine returns an ERROR only when the controller is unable to continue operation. In this case, the user should abort the command protocol. If there is an error in the operation, it will be reported by -WAITCMD or _POLLCMD. The type of error can be recovered by means of a Request Sense command.

C Language Protocol

The C language NEAR CALL protocol for this command is as follows:

status = _putdat(boff,bseg,nbytes)

where:

boff = unsigned integer with the offset portion of the data buffer address

bseg = unsigned integer with the segment portion of the data buffer address

nbyte = long integer byte count; must be a multiple of 512

status = integer: -1 for ERROR, anything else for OK

A zero value for bseg has the special meaning that the data buffer is in the segment specified by the DS register (default data segment in C).

ASSEMBLY Language Protocol

The ASSEMBLY language NEAR CALL protocol has the following stack arrangement:

Return Address	Stack point
Buffer Offset	Stack point + 2
Buffer Segment	Stack point + 4
(LSW) Nbytes	Stack point + 6
(MSW) Nbytes	Stack point + 8

(Only CS, DS, ES, SS, and BP registers are unmodified.)

Example of Assembly language usage:

```
PUSH    word ptr nbytes[2]      ;msw of byte count
PUSH    word ptr nbytes[0]      ;lsw of byte count
MOV     ax,seg buffer
PUSH    ax                      ;segment of data buffer
MOV     ax,offset buffer
PUSH    ax                      ;offset of data buffer
CALL    _putdat                 ;call routine
ADD     sp,8                    ;remove parameters from stack
                                ;result returned in AX
```

_POLLCMD

_POLLCMD checks for completion of DMA transfer and termination of nondata transfer commands. Unlike _WAITCMD, it returns control to the caller immediately to facilitate concurrent operation. This call is for inspection only; _WAITCMD must be called to terminate the command properly. _WAITCMD must be called even if an ERROR is indicated by the polling.

C Language Protocol

The C language NEAR CALL protocol is as follows:

status = _pollcmd()

where status is an integer: -1 for ERROR, 0 for not done, and anything else for done.

ASSEMBLY Language Protocol

The ASSEMBLY language NEAR CALL protocol has the following stack arrangement:

Return Address	Stack point

(Only CS, DS, ES, SS, and BP registers are unmodified.)

Example of Assembly language usage:

```
CALL      _pollcmd          ;call routine
                            ;result returned in AX
```

_DORSET

_DORSET initializes the SC5500 Tape Controller hardware. It reports an error only if controller reset fails and the controller is therefore unable to continue operating.

C Language Protocol

This command has the following C language NEAR CALL protocol:

status = _dorset()

where status is an integer: -1 for ERROR and anything else for OK.

ASSEMBLY Language Protocol

The ASSEMBLY language NEAR CALL protocol has the following stack arrangement:

Return Address	Stack point

(Only CS, DS, ES, SS, and BP registers are unmodified.)

Example of Assembly language usage:

```
CALL    _dorset              ;call routine
                             ;result returned in AX
```

ALTERNATE ENTRY POINTS

Table 2-2 lists alternate entry points so that users of the LATTICE C Large Memory Model can invoke the subroutines as FAR CALLS. The corresponding NEAR CALLS are provided for reference.

Table 2-2. Alternate Entry Points

FAR CALLS	NEAR CALLS
_SLRESET	_DORESET
_SLINITC	_INITCMD
_SLGETD	_GETDAT
_SLPUTD	_PUTDAT
_SLPOLLC	_POLLCMD
_SLWAITC	_WAITCMD

COMMAND DESCRIPTION

The SC5500 Tape Controller recognizes the commands summarized in Table 2-3. The data transfer commands -- Tape Data, Write Tape Data, Request Sense, Request Statistics, and Request ID -- have special protocol requirements, which are discussed under "Calling Protocol" in this chapter.

Table 2-3. SC5500 Commands

Command	**Address (hex)**
DESELECT TAPE DRIVE	00H
SELECT TAPE DRIVE	01H
REWIND TAPE TO BOT	21H
ERASE TAPE DATA	22H
RETENSION TAPE	24H
WRITE TAPE DATA	40H
WRITE TAPE FILE MARK	60H
READ TAPE DATA	80H
READ TAPE FILE MARK	A0H
POSITION TO EOT DATA	A3H
REQUEST SENSE BYTES	C0H
REQUEST STATISTICS BYTES	C1H
REQUEST TAPE BLOCK ID	C2H

DESELECT TAPE DRIVE (00H)

After receiving this command, the SC5500 Tape Controller removes the tape drive selection signal. On most tape drives, the drive selection light switches off.

When the drive has been deselected, the tape controller cannot sense tape removal. But it proceeds as if the tape were changed when the drive is reselected with SELECT TAPE DRIVE.

SELECT TAPE DRIVE (01H)

This command causes the SC5500 Tape Controller to activate the drive selection signal. On most tape drives, the drive selection indicator light switches on. The tape drive must be selected before any tape operation can be performed.

REWIND TAPE TO BOT (21H)

Upon receiving this command, the SC5500 Tape Controller positions the tape to the beginning (BOT). When a tape is inserted in the tape drive, a REWIND TAPE TO BOT command must be received before any tape read or write operation can be performed.

ERASE TAPE DATA (22H)

When it receives an ERASE TAPE DATA command, the SC5500 removes all data from the tape by writing an END OF DATA MARK at the beginning of the tape. The data is not actually erased, but the controller has no means of recovering it.

RETENSION TAPE (24H)

The tape controller retensions the tape by repositioning it to the beginning, running it once to the end, and then reversing it to the beginning again. This operation restores even tension over the entire length of the tape. Retensioning is recommended when a tape is first installed in the tape drive.

WRITE TAPE DATA (40H)

This command causes the SC5500 to write data from computer memory to tape in increments of 512-byte blocks. Writing continues as long as the _PUTDAT subroutine is called in succession. Writing terminates when an ERROR occurs or the _WAITCMD subroutine is called. Note that _PUTDAT and _POLLCMD are the only permissable calls prior to termination of this write mode.

WRITE TAPE FILE MARK (60H)

After receiving a WRITE TAPE FILE MARK, the tape controller writes a special End-of-File (EOF) mark on the tape. An EOF mark can be used to separate logically related blocks of data, such as text files. This enables the user to skip files with the READ TAPE FILE MARK command (See the READ TAPE FILE MARK description below.)

The user should be sure to write an EOF mark after the last block of data, otherwise the last few blocks might be unreadable.

READ DATA BLOCK (80H)

On receipt of a READ DATA BLOCK command, the SC5500 reads data from the tape into computer memory in increments of 512-byte blocks. Reading continues as long as the _GETDAT subroutine is called in succession. Reading terminates when an ERROR occurs or the _WAITCMD subroutine is called. Note that _GETDAT and _POLLCMD are the only permissible calls prior to termination of this Read Mode.

An EOF ERROR is sometimes generated immediately after the controller reads the last data block before a file mark. However, the last data block is always transferred in its entirety before the ERROR is signaled.

READ TAPE DATA commands received after the controller has reached EOF will generate more EOF ERROR conditions. The only way to pass over a file mark is to send a READ TAPE FILE MARK command.

READ TAPE FILE MARK (A0H)

A READ TAPE FILE MARK permits the tape controller to skip from file to file. After receiving this command, the controller skips over data blocks until it reaches the next EOF mark. Then it passes over the file mark to the first block of data it encounters (beginning of the next file).

POSITION TO EOT DATA (A3H)

This command sends the tape controller to the last recorded block on the tape, which must be an EOT File Mark. Additional data may be written on the tape when the controller is at EOT.

This command must be sent before a WRITE TAPE DATA or WRITE TAPE FILE MARK, unless the previous command was a WRITE TAPE DATA or WRITE TAPE FILE MARK.

The number of File Marks encountered can be obtained from the Block Count returned by a REQUEST SENSE BYTE command. To obtain the File Mark count, the user must clear the Block Count to zero with a REWIND or REQUEST SENSE command before sending the POSITION TO EOT DATA command.

REQUEST SENSE BYTES (C0H)

The REQUEST SENSE BYTES command must be sent immediately after an ERROR occurs. Upon receiving this command, the SC5500 sends eight bytes of sense data to the buffer. The sense data contains the error code and other information, as described below. Error codes are listed in Appendix D.

Immediately after receiving the REQUEST SENSE BYTES command, the tape controller clears the error code and sets the cumulative block count to zero.

A REQUEST SENSE BYTES command can also be sent when no ERROR has occurred. While the error code will be zero, the other fields will contain valid status information.

The sense bytes are arranged as follows:

Error Code	Buffer + 0
MSB Block Count	Buffer + 1
Block Count	Buffer + 2
LSB Block Count	Buffer + 3
Status Bits	Buffer + 4
(reserved)	Buffer + 5
(reserved)	Buffer + 6
(reserved)	Buffer + 7

Status Bits are arranged as follows:

7	6	5	4	3	2	1	0

where Bit 7 is TAPE CHANGED (no read/write possible before rewind), and Bits 6 to 0 are reserved.

Block Count is a cumulative count of blocks that were successfully read or written. This count can be used to determine how many blocks were processed before a given ERROR occurred. Note that during a POSITION TO END OF DATA command, the Block Count reflects the number of file marks encountered, not the number of data blocks.

REQUEST STATISTICS BYTES (C1H)

When the tape controller receives this command, it sends eight bytes of statistics data to the buffer and then clears the count. The statistics data accumulates until the next command is received.

The statistical bytes are arranged as follows:

MSB Reread Count	Buffer + 0
LSB Reread Count	Buffer + 1
MSB Rewrite Count	Buffer + 2
LSB Rewrite Count	Buffer + 3
MSB Overrun Count	Buffer + 4
LSB Overrun Count	Buffer + 5
MSB Underrun Count	Buffer + 6
LSB Underrun Count	Buffer + 7

Reread Count is the total number of read retries in tape read operations.

Rewrite Count is the total number of data block rewrites in response to an ECC error in the read-after-write process during tape write operations.

Overrun Count is the total number of times transmission of data from the tape was halted because the controller did not receive a request for data from the host software.

Underrun Count is the total number of times the tape was stopped and backed up over a blank space because the host software failed to transmit data for a prolonged period of time.

REQUEST TAPE BLOCK ID (C2H)

When the tape controller receives this command, it sends to the buffer four bytes of Tape Block ID and the first four bytes of Block Data from the last successfully processed tape block. These eight bytes are arranged as follows:

Track Address	Buffer + 0
Control Block Address	Buffer + 1
Block Address	Buffer + 2
LSB Block Address	Buffer + 3
Data Byte 0	Buffer + 4
Data Byte 1	Buffer + 5
Data Byte 2	Buffer + 6
Data Byte 3	Buffer + 7

The Track Address is 0 for the first track, 1 for the second track, and so on.

The Control Nibble is 0 for a Data Block and 1 for a File Mark or End of Data Mark.

The 20-bit Block Address is 0 for the first block on the tape, 1 for the second block, and so on. Each block on the tape (data or control block) has a unique block address.

For control blocks (File or End of Data Mark), Data Byte 0 specifies the total number of tracks on the tape drive. Data Byte 1 is a 3 for a File Mark and a 2 for an End of Data Mark.

Detailed descriptions of these bytes can be found in any QIC-24 reference document.

Appendix **A**

SC5500 Specifications

The specifications given in this appendix are for operation of an industry-standard QIC-36 cartridge tape drive with the SC5500 Tape Controller. For information about a DCAS cassette tape drive interface, contact SYSGEN Incorporated.

Tape Interface:	QIC-36
Tape Track:	9
Capacity:	60 MB
Tape Used:	600A (3M^{R} Data Cartridge)
Tape Length:	600 ft
Tape Speed:	90 ips
Transfer Rate at Streaming:	5 mb/min
Recording Density, bpi:	8000
Recording Density, ftpi:	10000
Recording Method:	GCR
Recording Format:	QIC-24
Tape Block Size:	512 bytes
Power Drawn from +5V:	1.0 Amp
Temperature:	Conforms to IBM PC, XT, and AT standards.
Dimensions:	Conforms to IBM PC, XT, and AT short slot standards
Tape Interface Connector:	50-pin 3M 3596 male connector (internal or external)

Appendix **B**

Interface Pin Assignments

Table B-1 gives the SC5500 50-pin connector pin assignments for a QIC-36 cartridge tape drive interface. For information about the DCAS cassette tape drive interface, contact SYSGEN Incorporated.

Note:

All odd-numbered pins are GND except 15, 17, 19, and 21.

Table B-1. 50-Pin Connector Pin Assignments

Pin number	Signal
JT-2	GO_
JT-4	REV_
JT-6	TR3_
JT-8	TR2_
JT-10	TR1_
JT-12	TR0_
JT-14	RST_
JT-15 JT-16 JT-17	Not connected
JT-20	Not connected
JT-22	DS0_
JT-24	HC_
JT-26	RDP
JT-28	UTH_
JT-30	LTH_
JT-32	Not connected
JT-34	CIN_
JT-36	USF_
JT-38	Not connected
JT-40	WDA_
JT-42	WDA+
JT-44	Not connected
JT-46	Not connected
JT-48	WEN_
JT-50	EEN_

Appendix **C**

SC5500 Error Codes

Table C-1 lists the error codes returned by Request Sense.

Table C-1. SC5500 Error Codes

Error	Code (hex)	Description
Undefined command	20	An undefined command code was specified.
Escessive rewrite	40	More than 16 retries failed in attempt to write a single data block.
Tape write protected	41	A write operation was attempted on a read-only tape.
Tape not inserted	42	Cartridge not installed.
Tape full	43	Read or write operation failed because the end of tape was reached before the operation completed.
Mission block detected	44	Operation failed because next block is missing, according to sequence number of blocks being read. This error can occur even in a tape positioning command.

Table C-1. SC5500 Error Codes (Continued)

Error	Code (hex)	Description
Missing BOT/EOT hole detected	45	Controller failed to detect expected BOT and EOT hole.
End of data	46	Normal end of tape reached; tape is positioned for appending.
EOF Mark detected	48	Next block on tape is a file mark, which can be passed only with a Read Tape File Mark command. Use Request Sense to determine number of data blocks actually transferred.
Parity error during command	49	SCSI bus parity error was detected during execution of the command.
Tape change dtected	4A	The operation can't be performed unitl rewind/erase/retention is done.
Controller failure	4B	Controller rejected command and is in unknown state. Call _DORESET, then rewind tape.
Timeout error	4C	Controller found abnormal length of blank tape or did not respond within expected time. (In the latter case, the tape changed flag will be set.) Note that an entirely blank tape immediately following a file mark will usually return error 46h, not 4Ch.
Unrecognized control block	4F	Control block other than a Tape File Mark or EOT Data Mark was read. Tape may have been written by a different type of controller.