

REFERENCE MANUAL

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4310 SCA MODULE



**SYSTEM TEN** COMPUTER BY **SINGER**

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**SINGER**  
FRIDEN DIVISION

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4310 SCA MODULE



**SYSTEM TEN\*** COMPUTER BY **SINGER**

CONTROL NO. C326PA  
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**SINGER**  
**FRIDEN DIVISION**

2350 WASHINGTON AVE  
SAN LEANDRO, CALIF. 94577

## PREFACE

This document describes the 4310 series Magnetic Data Recording System SCA Module and its use. It will be distributed as an appendix to a general SCA Module users guide to be released early in 1972.

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## INTRODUCTION

This appendix should be used as reference when creating an SCA Module or designing and writing a user application program (UAP) to communicate with a 4310 series Magnetic Data Recording System (MDRS) terminal.

Since 4310 MDRS SCA Module usage is identical to standard SCA Module usage in most respects, the MDRS SCA Module user should understand the material presented in Chapter 2: SCA Data Communications and the SCA Module chapter dealing with the configuration to be used. This appendix covers the differences between the MDRS SCA Module and the standard SCA Module. It covers the following topics:

- . The differences between the standard SCA Module routines and their 4310 SCA Module counterparts.
- . Modifications to the interpartition interface conventions.
- . Line control conventions.
- . Remote device selection.
- . Remote device control.

The following 4300 series and 4310 series manuals may also be of interest to the 4310 MDRS SCA Module user:

<u>PUBLICATION NO.</u>	<u>TITLE</u>
15-151	4301 MDRS Operators Manual
15-146	4310 Series MDRS Communications Operator Instructions
15-147	Super Dup Reference Manual
15-045	Series 4310 Communications Reference Manual

## 4310 SCA MODULE

Two device-specific routines are provided -- a 4310 Read Routine and a 4310 Write Routine. These are designed to be used in place of the standard SCA Read and Write Routines and are compatible with any versions of the standard SCA Handshaking, Initialization, Get-Buffer, and Error Routines. The 4310 Read and Write Routines allow the user to fully utilize the capabilities of a 4310 series MDRS terminal. In this document an SCA Module composed of 4310 Read and/or Write Routines and standard SCA Handshaking, Initialization, Get-Buffer, and Error Routines will be referred to as a "4310 SCA Module".

### 4310 READ ROUTINE

The 4310 Read Routine receives data from the tape drive of the 4310 series MDRS terminal.

Because the 4310 terminal does not generate sequence and length fields in the data block it transmits, the 4310 Read Routine does not include the standard SCA Module Read Routine's sequence and length checks. This removal of sequence and length checking has no effect on UAP design. In all other respects the 4310 Read Routine is identical to the standard Read Routine.

### 4310 WRITE ROUTINE

The 4310 Write Routine transmits data to the tape drive or the line printer of a 4310 series MDRS terminal. It differs from the standard SCA Module Write Routine in three respects:

1. Sequence and Length Fields

Because the 4310 terminal cannot perform sequence and length checking, the logic that generates sequence and length fields has been removed from the 4310 Write Routine. The removal of this logic has no effect on UAP design.

2. Temporary Text Delay

The 4310 Write Routine sends a Temporary Text Delay (TTD) line control sequence (STX ENQ) instead of an IDLE message when no Transmit Buffers are ready for transmission. The 4310 is expected to send a NAK in response to the TTD. When the 4310 Write Routine has sent a TTD (and received a NAK response) one hundred consecutive times without finding a Transmit Buffer ready to transmit, it "gives up": it sends an EOT, posts an R in the Inhibit Switch, and returns to the Handshaking Routine.

This difference does not affect the design of the UAP. The UAP need never be aware that TTDs are being sent until one hundred have been sent and an R has been posted in the Inhibit Switch. The R has the same meaning to a 4310 UAP as to a UAP operating with a standard SCA Module, even though the line control procedures preceding the posting of the R are not the same.

3. Remote Device Selection

The 4310 Write Routine allows the UAP to select the device to which it will transmit (4310 tape drive or line printer). See Remote Device Selection in this appendix for a description of the method by which the UAP requests device selection.

CORE REQUIREMENTS

<u>ROUTINE</u>	<u>CORE REQUIRED</u>
4310 Read Routine	950
4310 Write Routine	1080

CREATING A 4310 MDRS SCA MODULE

To create a 4310 MDRS SCA Module, the user must assemble the 4310 Read Routine or the 4310 Write Routine or both, with the appropriate versions of the standard SCA Module Handshaking, Initialization, Get-Buffer, and Error Routines. The selection of versions of the standard routines is determined by the application as in standard SCA Module use. Once the appropriate routines have been selected, the assembly of the 4310 SCA Module is the same as the assembly of a standard SCA Module.



## INTERPARTITION INTERFACE CONVENTIONS

The five areas of Common used by the SCA Module for communication with the UAP remain unchanged in basic physical definition and use. There are, however, minor modifications to the interpretation and use of some of the individual fields within these areas. Only these modifications are discussed here. See Interpartition Interface in Chapter 2 for a complete description of the standard use of fields in Common.

### COMMUNICATIONS CONTROL BLOCK

The definition and use of the CCB is unchanged except that the Inhibit Switch code R has a slightly different meaning. This difference does not change the functional significance of the code R to the UAP. See Temporary Text Delay above for an understanding of the Inhibit Switch code R posted by a 4310 SCA Module.

### PARTITION STATUS BYTE

Three of the possible PSB codes are not applicable when communicating with a 4310 terminal and will not occur. They are:

- E -- length error,
- F -- sequence error,
- T -- transmission interrupt.

All other previously defined PSB codes may occur when communicating with a 4310 MDRS terminal.

### SYSTEM MAILBOX

System Mailbox definition and use during initialization are unchanged.

INTERPARTITION INTERFACE CONVENTIONS

TRANSMIT BUFFERS

Since the 4310 Write Routine does not generate sequence number and length control fields, relative locations 12 - 19 of the Transmit Buffer Prefix have been changed. The definition and use of the Transmit Buffer by the UAP is unchanged.

Standard Transmit Buffer Format:

Buffer Status Byte	To-Address		From-Address		Data Length				Write Flag	Unused			Synchronization Characters (SYNs)			STX or SOH	Sequence Number	Length Control Field		Data	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

See Transmit and Receive Buffers in Chapter 2 for a description of the fields of the standard Transmit Buffer.

4310 Transmit Buffer Format:

Buffer Status Byte	To-Address		From-Address		Data Length				Write Flag	Unused					Synchronization Characters (SYNs)			STX or SOH	Data		
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

(Changed)

Three additional codes may be posted in the Write Flag by the UAP in order to request remote device selection. These codes are covered under Remote Device Selection in this appendix.

The data area of the 4310 Transmit Buffer may contain device control sequences or data or both. When transmitting to the 4310, the number of data characters plus the number of control sequence characters in a single data block may not exceed 200. (Note: If the RECORD LENGTH switch on the 4310 terminal is set at less than 200, then the maximum number of characters that can be sent is correspondingly reduced.)

RECEIVE BUFFERS

Since the 4310 terminal does not send sequence and length control fields, relative locations 15 - 19 of the Receive Buffer prefix have been changed. The definition and use of the Receive Buffer by the UAP is unchanged.

Standard Receive Buffer Format:

Buffer Status Byte	To-Address		From-Address		Data Length				Unused					STX or SOH	Sequence Number	Length Control Field		Data		ETB or ETX	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	

INTERPARTITION INTERFACE CONVENTIONS

See Transmit and Receive Buffers in Chapter 2 for a description of the fields of the standard Receive Buffer.

4310 Receive Buffer Format:

Buffer Status Byte	To-Address			From-Address			Data Length								Unused								STX	Data	ETB or ETX
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20					
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20					

(Changed)

Relative location 19 of the 4310 Receive Buffer will always contain an STX after a data block has been received from the 4310 terminal. The 4310 cannot send an SOH.

IDLE MESSAGE BUFFER

Although the 4310 Write Routine does not send IDLE Messages, the definition of the IDLE Message Buffer must be retained for proper assembly of the 4310 SCA Module. The area defined as the IDLE Message Buffer is available to the UAP for its own use (the SCA Module will not access or modify it), unless Dial-Out Handshaking has been selected, in which case the UAP must use the buffer to pass telephone numbers to the SCA Module.

## LINE CONTROL CONVENTIONS

The line control characters and conventions of the 4310 terminal are discussed in Publication No. 15-045. Only differences which affect UAP design are discussed here.

### SOH -- START OF HEADER

The 4310 terminal cannot send an SOH. If it receives an SOH, it treats it as an STX. Therefore there is no reason for the UAP to request in the Write Flag that a data block be preceded by an SOH instead of an STX.

### ETX -- END OF TEXT

The 4310 terminal sends an ETB (End of Text Block) character after each regular data block. When it has detected end of file on the tape, it sends a null data block (no data characters) terminated by an ETX instead of an ETB. The UAP can recognize this null data block by detecting a zero in the Data Length field of the Receive Buffer Prefix. The UAP should post the buffer available, but it can otherwise ignore the null data block. The 4310 terminal will then send an EOT, and the SCA Module will post a W in the Inhibit Switch. This will indicate end of file to the UAP as in standard SCA Module usage.

When transmitting data to a 4310 terminal, the UAP must send an ETX before sending an EOT to indicate end of transmission. The ETX can be sent with a null data block after the last regular data block has been sent, or it can be sent with the last regular data block. The UAP requests that an ETX be sent in place of the standard ETB by moving an X to the Write Flag of the Transmit Buffer Prefix before posting the buffer ready. After the ETX has been transmitted, the UAP should request in the Write Flag that an EOT be sent.

Failure to send the ETX prior to sending an EOT will cause the 4310 terminal to indicate an error condition instead of lighting its End of File (EOF) lamp.

## LINE CONTROL CONVENTIONS

TI -- TRANSMISSION INTERRUPT (called RVI -- Reverse Channel Interrupt in Publication No. 15-045)

When the System Ten is receiving data from the 4310 tape drive, the UAP can stop the 4310 tape in order to transmit to the 4310 printer by sending the 4310 terminal a TI. The UAP can request that a TI be sent by moving a 3 to the Read Flag in the CCB. The 4310 will stop transmitting and send an EOT. The UAP can then transmit data to the 4310 printer (if the printer is ready). When the UAP has completed its transmission to the printer (when it has requested in the Write Flag that an EOT be sent and the SCA Module has sent the EOT), the 4310 will continue transmission of its tape file.

The 4310 terminal cannot send a TI.

## REMOTE DEVICE SELECTION

Data sent from the System Ten to the 4310 terminal normally is routed to the 4310 line printer or tape drive or both, depending on the setting of the PRINT/DUAL/WRITE TAPE switch on the terminal. The PRINT setting routes data to the line printer only; the WRITE TAPE setting routes data to the tape drive only; and the DUAL setting routes data to both simultaneously.

The UAP can override the PRINT or WRITE TAPE setting of the switch by requesting device selection. The UAP requests device selection by moving a code 1, 2, or 3 to the Write Flag of the Transmit Buffer of the first data block of the transmission. The Write Flag codes have the following meanings:

<u>CODE</u>	<u>MEANING</u>
1 or 3	Route this data to the line printer, even if the PRINT/DUAL/WRITE TAPE switch is set to WRITE TAPE.
2	Route this data to the tape drive, even if the PRINT/DUAL/WRITE TAPE switch is set to PRINT.

It is not possible to select both the line printer and the magnetic tape drive from the System Ten. However, if the PRINT/DUAL/WRITE TAPE switch is set to DUAL, data will be routed to both the printer and the tape drive, regardless of any device selection requested by the UAP.

Once a device has been selected, all data will be routed to that device until the System Ten sends an EOT to the 4310 terminal.

If the selected device is not ready, the 4310 terminal will send an EOT response. The 4310 Write Routine will post a Q in the Inhibit Switch in the CCB and return to the Handshaking Routine. The following conditions will cause this to happen:

- . An attempt to select the tape drive when the tape drive is not ready or when the 4310 terminal is in the DATA SEND mode.
- . An attempt to select the line printer when it is not in an ON-LINE condition.

## REMOTE DEVICE CONTROL

The System Ten programmer can remotely control vertical positioning of forms in the 4310 line printer by inserting control sequences (device control flags and device control characters) in data blocks sent to the terminal. The forms control functions are performed immediately when transmitting to the 4310 line printer. When transmitting to the tape drive, the control sequences are recorded, as received, on the magnetic tape; the control functions are not actually performed until off-line printing of the data from the tape.

The control sequences used for line printer forms control are the same for remote transmission as for local (off-line) recording. The valid control sequences are shown in figure 6-1.

Each control sequence begins with the flag character \ (reverse slash). The reverse slash always indicates the beginning of a control sequence. Therefore it cannot be used as a data character in a data block that is to be printed.

The 4310 line printer automatically advances forms one line at the end of each data block, and after encountering and printing 132 consecutive data characters (no control sequences) in a data block. However, in either of these cases, if an "after printing" control sequence is imbedded in the data characters of the last line printed, the control function is performed instead of the automatic single-line feed.

The control sequences do not print on the line printer, but they do occupy positions in the 4310 buffer. Therefore they reduce the number of data characters that can be sent to the 4310 in a single data block. Data block size restrictions are discussed under Transmit Buffers in this appendix.

REMOTE DEVICE CONTROL

LINE CONTROL SEQUENCE (INTERNAL SYSTEM TEN REPRESENTATION)	4310 KEYBOARD OR KEYPUNCH * EQUIVALENT	USASCII EQUIVALENT	EXTENDED CHARACTER SET EQUIVALENT	ACTION
\N	0-8-2 - N	LF	J	New Line: space one line immediately.
\K	0-8-2 - K	FF	L	Form Feed: skip to top of next page immediately.
\A	0-8-2 - A	ESC A	[A	Skip to top of form: after printing.
\Q	0-8-2 - Q	ESC Q	[Q	Single Space: after printing.
\R	0-8-2 - R	ESC R	[R	Double Space: after printing.
\S	0-8-2 - S	ESC S	[S	Triple Space: after printing.

\* - is equivalent to the multi-punch 11-7-8 on the keypunch machine.

Figure 6-1. System Ten 4310 Device Control Sequences.

Although data received from the 4310 terminal may contain device control sequences, the 4310 SCA Module cannot recognize them. They may, however, have meaning to the UAP.

Column 1 of figure 6-1 shows the internal System Ten representation of the control sequences. However, if the Extended Character Set feature on the terminal is enabled, they will appear in System Ten memory as shown under Extended Character Set Equivalent in the figure. If the Extended Character Set feature on the terminal is enabled, a 200-character block beginning with the control sequence \N will be a 199-character block beginning with the character J after it has been transmitted from the terminal to System Ten memory.

If control sequences are to be transmitted from the terminal to the System Ten, it is recommended that the Extended Character Set feature be disabled in order to facilitate the recognition of the control sequences by the UAP. When transmitting from the System Ten to the 4310 terminal, the Extended Character Set feature has no effect.



## REMOTE DEVICE CONTROL

Figure 6-2 shows sample data blocks containing data to be printed on a 4310 terminal line printer and control sequences to format the data. Figure 6-3 shows the data as it will print on the 4310 line printer.

The data blocks shown in figure 6-2 are moved to the Data area (positions 20 - 219) of the Transmit Buffer and then are transmitted as in standard SCA Module usage. They can be transmitted directly to the 4310 line printer, or they can be transmitted to the 4310 tape drive and then later printed off-line from the tape. The printout will be the same in either case.

REMOTE DEVICE CONTROL

① WAREHOUSE 1 ORDER PREPARATION LIST										② PAGE 0099 ORDER NO. 767202 : SHEET 1 OF 1										09/21/71																																																	
③ FLOOR AISLE BIN PART NO. ORDERED FILLED										④ -----										⑤																																																	
⑥ 3 B 11 98-972										⑦ 10										342 43-466										⑧ 100										399																													
92-980										⑨ F 287 76-412										23										⑩ 201 49-001										1										⑪ R																			
2 B 34 97-760										⑫ 54										D 216 02-743										⑬ 32										119 19																													
-642										⑭ 5										F 3 27-307										⑮ 150										⑯ 1										C 57 62-901										29									
G 10 33-333										⑰ 47										*** END OF ORDER ***										⑱ MOVE TO TRUCK LOADING DOCK										NO. 3																													

Figure 6-2. Data blocks containing Data and Control Sequences for Printing on a 4310 Terminal.

① WAREHOUSE 1 ORDER PREPARATION LIST										PAGE 0099																			
② ORDER NO. 767202 : SHEET 1 OF 1										09/21/71																			
③ FLOOR AISLE BIN PART NO. ORDERED FILLED										④ -----																			
⑤ 3 B 11 98-972										10																			
										⑦ 342 43-466										100									
										⑧ 399 92-980										8									
										⑨ F 287 76-412										23									
										⑩ 201 49-001										1									
⑪ 2 B 34 97-760										⑫ 54																			
										⑬ D 216 02-743										32									
										⑭ 119 19-642										5									
										⑮ F 3 27-307										150									
⑯ 1 C 57 62-901										29																			
										⑰ G 10 33-333										47									
										⑱ *** END OF ORDER ***										Block 4									
										MOVE TO TRUCK LOADING DOCK NO. 3																			

Figure 6-3. Printout of Data Blocks shown in Figure 6-2.

# REMOTE DEVICE CONTROL

Notes: Figures 6-2 and 6-3

- |       |        |   |  |
|-------|--------|---|--|
| 1     |        | - | No device control action is requested at the beginning of the first data block. It is assumed that the paper is already positioned at top of form.   |
| 2-3   | \N\N   | - | Double space immediately.  |
| 4     | \N     | - | Single space immediately.  |
| 5     |        |   | The 4310 hardware will automatically cause single spacing at the end of the data block.  |
| 6     | \N     | - | Single space immediately. This action plus the action described by Note 5 will result in effective double spacing. Note 11 describes an alternate method of requesting double spacing between data blocks. |
| 7-10  | \N\N   | - | Double space immediately.  |
| 11    | \^R    | - | Double space instead of performing the automatic single spacing described in Note 5.   |
| 12-15 | \N\N   | - | Double space immediately.  |
| 16    | \^R    | - | Same as Note 11, except that the control sequence <u>precedes</u> the data to be printed.  |
| 17    | \N\N\N | - | Triple space immediately.  |
| 18    | \N\N   | - | Double space immediately.  |
| 19    | \^A    | - | Skip to the top of the next form instead of performing automatic single spacing.   |

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