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TECHNICAL MANUAL FOR INTERVIEW® 4500

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Notice

This Technical Manual applies to the Series A INTERVIEW 4500. This revision, Issue 2, covers Software Versions 10.06 and 10.08. It was produced to incorporate instructions for the Version 10.08 software. There are, basically, two new features in Version 10.08: a CLOCK selection on the Record Control (Parameters 2) menu, and a Tape Utility menu (Parameters 5). Also, Version 10.08 software is compatible with the Program-Only Tape option (see Appendix J), which allows recording up to 100 programs on a single tape.

Atlantic Research Corporation reserves the right to improve this manual or the equipment that it describes without prior notice. Further software releases will not necessarily invalidate this manual.

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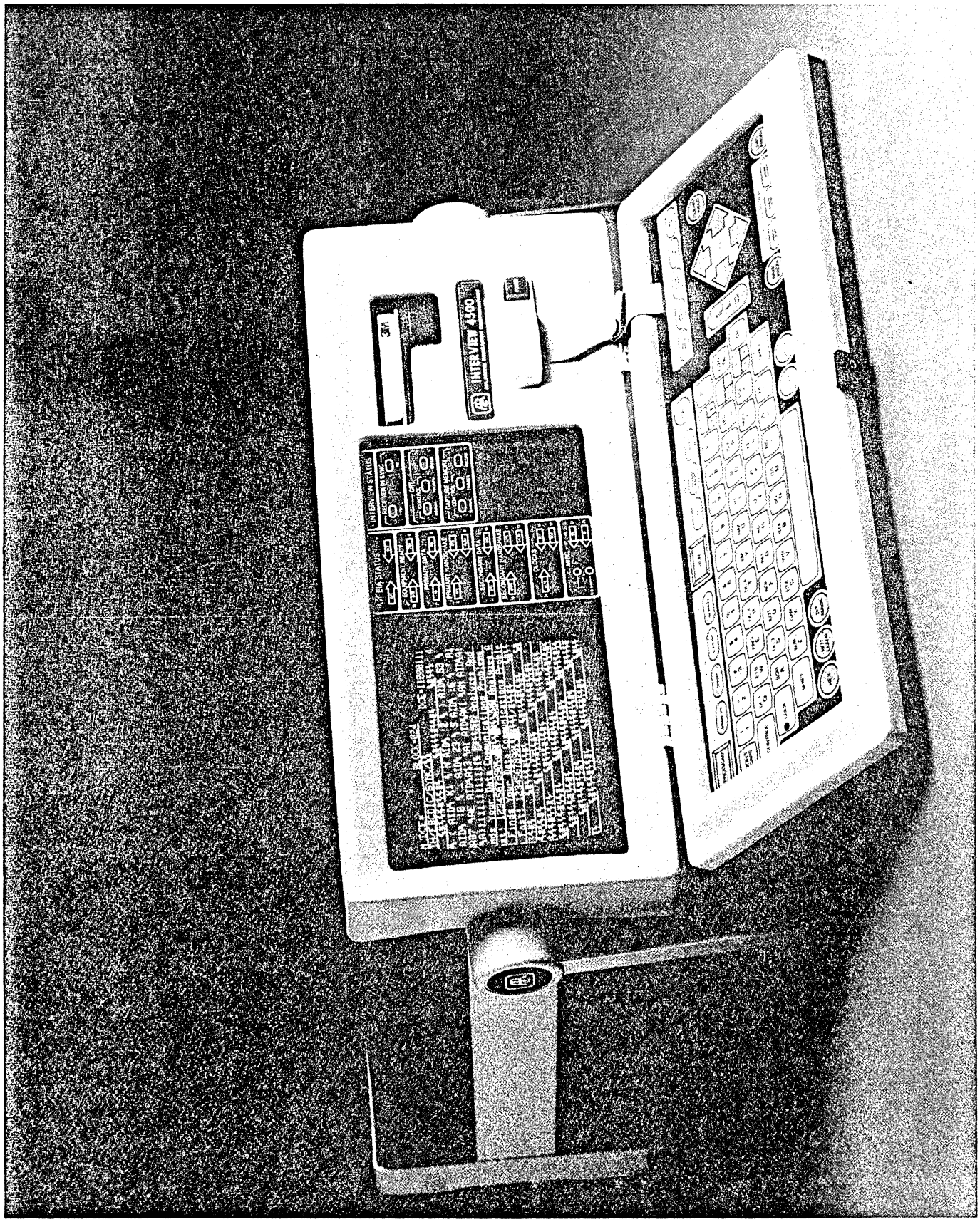

INTERVIEW 4500

1 Introduction: Using This Manual

The INTERVIEW 4500 is a powerful data communications monitor, recorder, and interactive test instrument. Because the unit is completely controlled by menu selections in clear text, it requires no special programming skills or language, which makes it both powerful and simple to use.

The INTERVIEW 4500 can be used for more than trouble-shooting. As a network monitor, it can obtain valuable data to improve system efficiency. As an emulator, it can test new equipment before installation. And as a training device, it can teach new employees the dynamic characteristics of the network and expose them to a variety of system troubles before they start work on the real system.

The more you know about your network and protocol, the more satisfaction you will get from using the INTERVIEW 4500 to its fullest. This manual, then, is only part of the story. Your knowledge of your system and your imagination are the key ingredients of success with the INTERVIEW 4500.

We have organized this technical manual so that you need use only the portions of the manual that you want for the level at which you are using the instrument. There is a thorough subject index at the end of the volume, which you should find convenient as your proficiency with the INTERVIEW 4500 develops.

Many of the illustrations are video prints from the 4500 CRT input. We have used negative images because they give much better reproduction on the printed page.

Section 2, General Description, is descriptive only: it includes no operating instructions or other information essential for operating the instrument. Nevertheless, most readers will find it is very valuable orientation.

Section 3 contains information that is essential if you are using the 4500 for the first time or if you should want to change power source or data source.

Sections 4 and 5, Status Indicators and Keyboard, cover two means of operator interaction with the instrument in detail: These two sections will take on more significance, and you will probably find yourself referring to them in more depth, after you have developed basic operating skills.

Section 6 explains how to power up your unit for monitoring either line data or taped data or for interactive operation. Sections 7 through 10 cover all Run Mode capabilities (with the exception of some specialized features for X.25 and SDLC). You should have a 4500 Training Tape or other tape containing both program and data. Using such a tape, you can use or observe most of the features discussed in Sections 7, 8, and 10. You can ignore

Section 9 for all monitoring purposes, and review it when you are working in the interactive modes.

All the basic parameters that must be selected in order to use the INTERVIEW 4500 can be found on the Parameters 1 menu, explained in Section 11, through 11.2. The remainder of Section 11 is devoted to the Parameters 2 menu, which includes CRT Control and Recording Control.

The triggers are explained in Section 12. Since all measurements, transmitting, and most CRT enhancements are under trigger control, this is an extremely important section.

Section 13, Interactive Testing, adds essential information and instructions for transmitting with the 4500. Other specialized information on this topic may be found in Section 9. You should learn to use the unit as a monitor and to program the triggers before you try interactive operation.

Sections 14 and 15 explain the 4500's recording capabilities: The Capture Memory, which includes a self-documenting tape and optional high-speed memory, is described in Section 14; Section 15 gives instructions for using an ASCII printer.

The 4500 has a number of special features for monitoring and testing systems that use bit-oriented protocols. This information is brought together in Section 16 for your convenience, but the necessary information for operating and programming the 4500 must still be found in other sections of the manual.

Further technical and service information may be found in Section 17 and the Appendixes.

2 General Description

The INTERVIEW 4500 is really four independent instruments in one:

(1) A simple real-time data display that you can control from the keyboard. Selected data can be highlighted or suppressed from the display. You can program more sophisticated CRT control if you wish.

(2) A programmable diagnostic analyzer for network performance measurements. Eight counters and two timers are under program control of 16 nonsequential triggers.

(3) An automatically controlled program and data recorder. Self-documenting integral tapes store the program in a protected area and record data as well as RS-232/V.24 interface lead status. A high-speed memory option is available to augment the tape. There is also a Program-Only Tape option that will store up to 100 programs on a single tape. Programs and data may be printed out on most asynchronous ASCII printers.

(4) An Emulator. When the 4500 transmits, it controls the RS-232/V.24 interface leads to emulate a terminal or CPU transmitting through DTE or DCE.

The 4500 is programmed entirely with self-prompting menus. When you power up the unit, it leads you through all the necessary steps to monitor data in any one of eight codes and six data formats, offering at any point in the process only selections relevant to your previous choices. The same method is used for controlling the CRT, counters and timers, transmitter, RS-232/V.24 interface, and recording.

Figure 2-1 is a simplified block diagram of INTERVIEW 4500 operation. The instrument contains three Z-80 microprocessors. Each microprocessor operates independently and is supported with its own ROM, RAM, and input-output interfaces. Operation has been further simplified by assigning each microprocessor independent tasks: One controls the CRT display and keyboard; the second is actively looking for triggers and handling the real-time statistical performance monitoring operations; and the third controls the tape and the optional high-speed memory.

Although the logical power of the three microprocessors controls the CRT, counters and timers, and data recording, you can override the trigger program from the keyboard without leaving Run Mode, and just as easily restore trigger control.

The 4500 has separate RD and TD receivers for the Capture Memory (tape and RAM option) and for the trigger logic. When the tape or RAM is played back, it sends its data directly to the trigger logic receivers and hence to the CRT buffer and counters and timers.

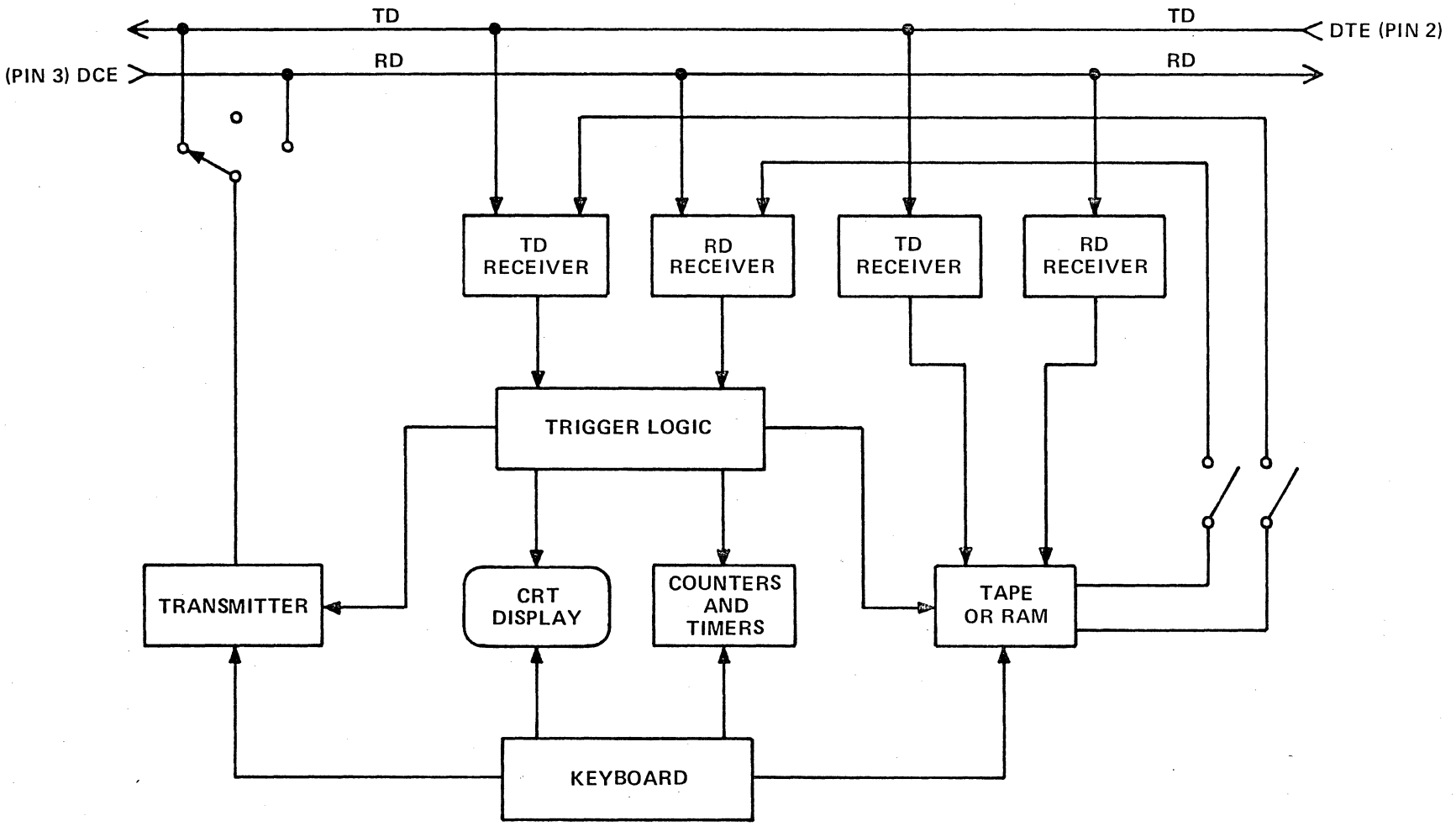

TD
RD
(PIN 3) DCE
TD
RD
DTE (PIN 2)
TD RECEIVER
RD RECEIVER
TD RECEIVER
RD RECEIVER
TRIGGER LOGIC
TRANSMITTER
CRT DISPLAY
COUNTERS AND TIMERS
TAPE OR RAM
KEYBOARD

Figure 2-1

The transmitter sends data only to the line. Both the trigger logic receivers and the Capture Memory receivers receive the 4500's own transmissions only from the line, so the transmissions you see on the 4500's CRT or record in Capture Memory are what is actually sent out on the line.

The transmitter is switched between RD and TD by moving the line data connectors between the EM DCE (TO TERMINAL) connector and the EM DTE (TO MODEM) connector on the rear of the unit. When the data line is connected to the EM DTE connector, the 4500 transmits on TD; when it is connected at the EM DCE connector, it transmits on RD.

There is a separate MONITOR connector, so there will be no possibility of disturbing the data line while the unit is in Monitor Mode.

3 *Before Power-up*

3.1 UNPACKING THE 4500

As each item is unpacked from the carton, inspect it for obvious mechanical damage. Check the pockets in the packing caps for cables, manuals, and so forth. Retain the original packing material for future reshipment, as it has been designed for maximum protection.

Check the received items against the shipping list.

CAUTION: Do not connect the INTERVIEW to power until you have checked the line voltage selector in accordance with Section 3.2.1.

3.2 ELECTRICAL SETTINGS

3.2.1 VOLTAGE SELECTOR

The voltage selector is part of the power connector on the right side of the rear panel of the instrument (see Figures 3-1 and 3-2). Slide the transparent window to the left. The line voltage selector card can be seen at the bottom of the window with the present voltage selection visible--and right side up.

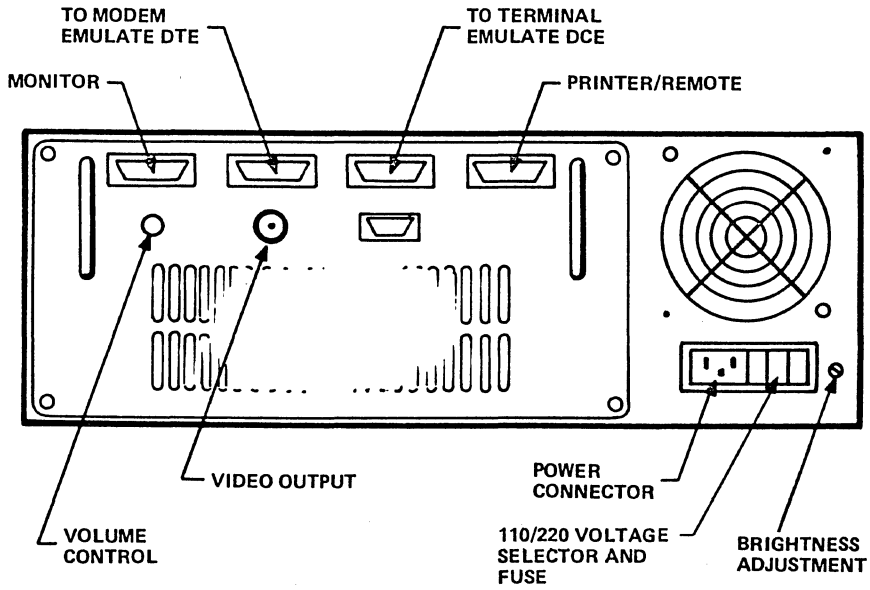


Figure 3-1

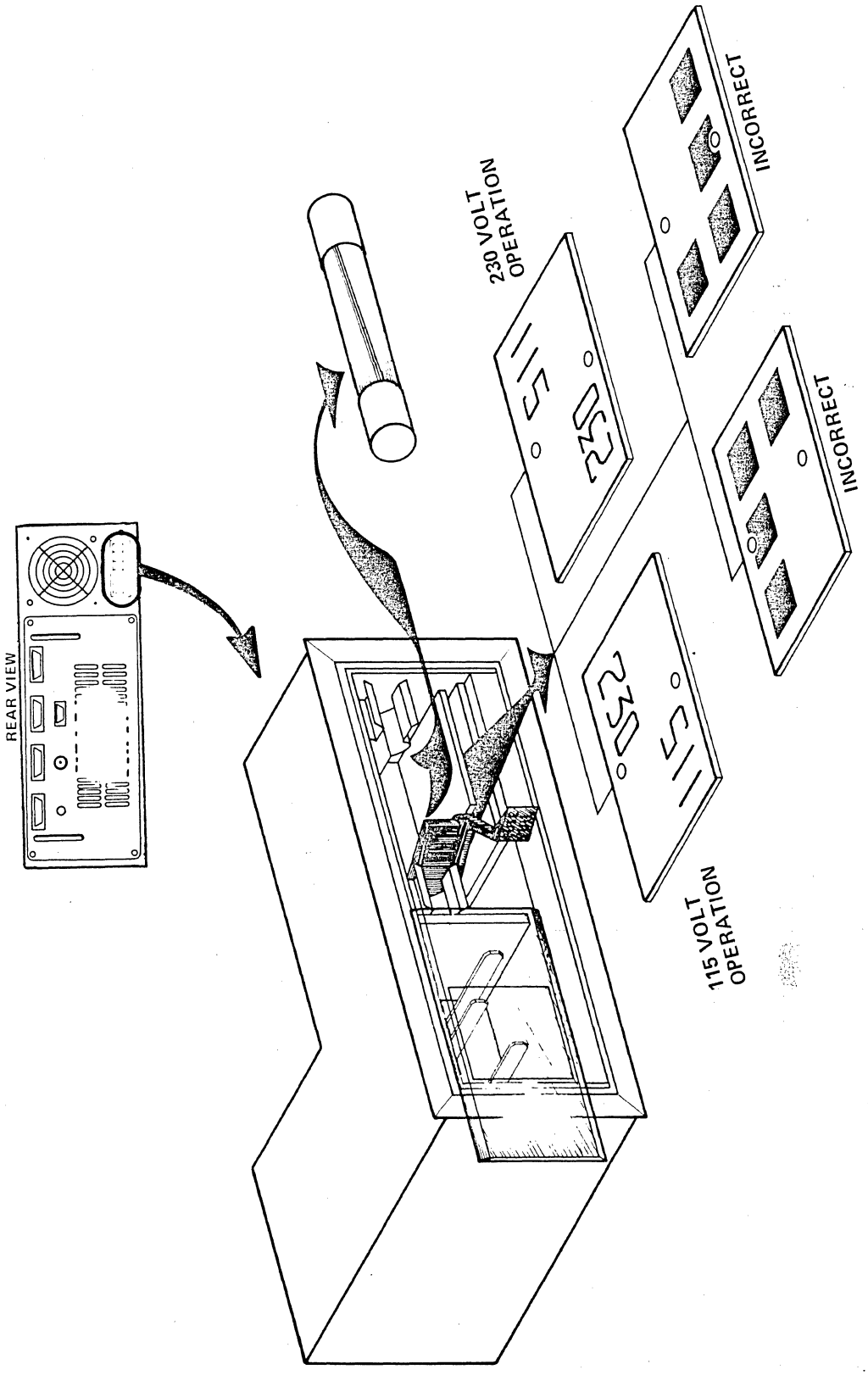


Figure 3-2 Voltage Selector

The INTERVIEW 4500 is designed to operate at 95 to 130 V ac, 50 or 60 Hz when the unit is set for 115 V; or from 190 to 260 V ac, 50 or 60 Hz when it is set for 230 V.

NOTE: The frequency must be selected separately (see Section 3.2.2).

To change the line voltage selection, swing the fuse extractor handle labeled FUSE PULL out toward the left and remove the fuse. The voltage selector card can then be removed and rotated so that the correct line voltage can be read in the window. When the voltage selector card has been seated correctly, rotate the fuse extractor handle to the right and in, and replace the fuse.

3.2.2 POWER FREQUENCY SELECTION

An internal switch gives a choice between 50- and 60-Hz operation. It is factory-set for the customer's environment. If the unit should fail to operate properly, please consult Section 17.3.1 for detailed instructions on this setting.

3.2.3 MIL-188 SELECTION

MIL-188 operation may be chosen on the Parameters 1 menu after power-up (see Section 11.2).

3.3 SETUP

Slide the window on the power connector to the right to expose the connector pins, and connect the power cord to the INTERVIEW.

Rotate the handle to the position shown in Figure 3-3 by pressing inward on the handle pivots while you rotate the handle. Release pressure on the pivots and, if necessary, move the handle until the detents lock in place.

Open the front panel by lifting up the rear edge of the black latch and pulling it forward.

WARNING: Be sure to connect the INTERVIEW only to a properly grounded power source.

Connect the power cord to a third-wire ground power source. The power cord supplied has a third protective ground wire connected to the chassis.

CAUTION: When you power up the instrument (Section 6), be sure that the fan in the rear runs.

3.4 DATA SOURCE CONNECTION

There are three standard RS-232/V.24 data connectors on the rear of the unit (Figure 3-1).

3.4.1 MONITORING LIVE DATA

There is one MONITOR connector. For passive monitoring, connect this connector to the line in both directions using the 5-foot T-cable supplied with the unit, or using your patch system.

3.4.2 INTERACTIVE TESTING

Use the EMULATE DTE (TO MODEM) connector in Emulate DTE Mode to transmit on TD and receive on RD. Use the EMULATE DCE (TO TERMINAL) connector in Emulate DCE Mode to transmit on RD and receive on TD.

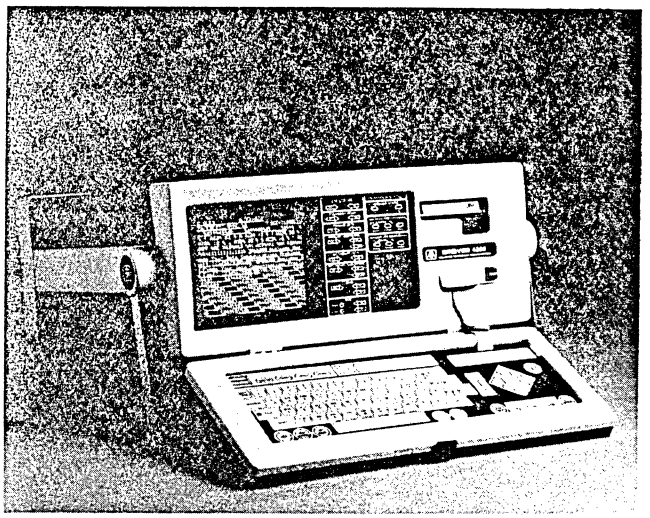


Figure 3-3

3.4.3 MONITORING RECORDED DATA

To use the 4500's integral tape as the data source, see Sections 6, 11.2.5, and 11.2.6. To play back data from the optional high-speed memory (RAM), see Sections 11.2.5 and 11.2.6.

4 Status Indicator Panel

On the front panel of the INTERVIEW 4500 are two groups of Light-Emitting Diode (LED) status indicators. The left side of the status panel, headed EIA STATUS, displays the status of the data and control leads on the RS-232/V.24 interface. On the right side are indicators for the trigger logic, data receivers, CRT, and Capture Memory.

4.1 EIA STATUS

As shown in Figure 4-1, there are specific indicators for 17 RS-232/V.24 data, clock, and control leads. In addition, there is an indicator for Pin 11 and one other, labeled U/A (User-Assigned; see Section 17.3.2) that the user can assign to any lead desired. Thus, the status of any data, clock, or control lead defined by the RS-232/V.24 standard can be observed.

The EIA STATUS display is arranged to identify the source of each signal and to group corresponding signals. In the left-hand column, headed DTE (Data Terminal Equipment), are the indicators for signals from the DTE; in the right-hand column, headed DCE (Data Communication Equipment), the indicators for signals from the DCE.

Below these headings the indicators are grouped logically by function, as shown in Table 4-1.

The EIA status LEDs are ON for input voltages greater than approximately +3 V; that is, for control leads in the ON state or data leads in the space state. When the data source is line,

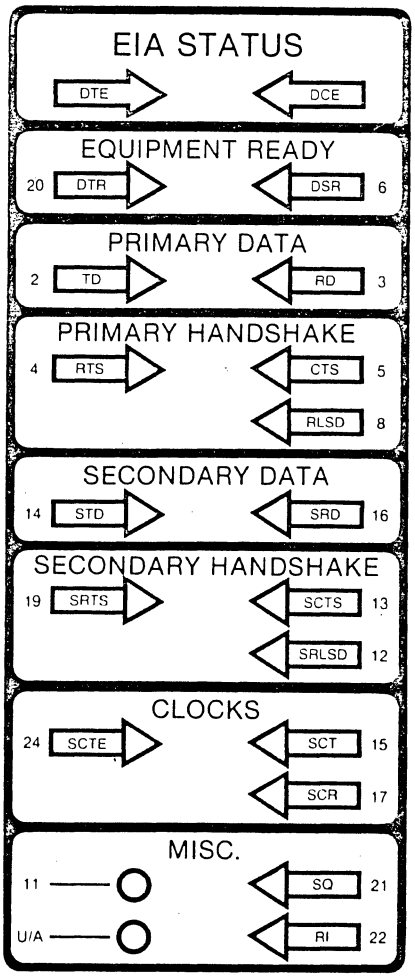


Figure 4-1

TABLE 4-1
EIA STATUS PANEL

DTE	DCE
EQUIPMENT READY Group	
Pin 20, DTR: Data Terminal Ready EIA = CD CCITT = 108.2	Pin 6, DSR: Data Set Ready EIA = CC CCITT = 107
PRIMARY DATA Group	
Pin 2, TD: Transmitted Data EIA = BA CCITT = 103	Pin 3, RD: Received Data EIA = BB CCITT = 104
PRIMARY HANDSHAKE Group	
Pin 4, RTS: Request to Send EIA = CA CCITT = 105	Pin 5, CTS: Clear to Send EIA = CB CCITT = 106
	Pin 8, RLSD: Received Line Signal Detect (Carrier Detect) EIA = CF CCITT = 109
SECONDARY DATA Group	
Pin 14, STD: Secondary Transmitted Data EIA = SBA CCITT = 118	Pin 16, SRD: Secondary Received Data EIA = SBB CCITT = 119
SECONDARY HANDSHAKE Group	
Pin 19, SRTS: Secondary Request to Send EIA = SCA CCITT = 120	Pin 13, SCTS: Secondary Clear to Send EIA = SCB CCITT = 121
	Pin 12, SRLSD: Secondary Received Line Signal Detect EIA = SCF CCITT = 122
CLOCKS Group	
Pin 24, SCTE: Serial Clock Terminal Source EIA = DA CCITT = 113	Pin 15, SCT: Serial Clock Transmit EIA = DB CCITT = 114
	Pin 17, SCR: Serial Clock Receive EIA = DD CCITT = 115

(Continued)

TABLE 4-1 (Continued)
EIA STATUS PANEL

DTE	DCE
MISC. Group	
Pin 11: Originate Mode EIA = CY CCITT = 126/127 Select transmit frequency or select receive frequency; used in BELL 103F-Type Data Sets.	Pin 21, SQ: Signal Quality Detector EIA = CG CCITT = 110 Pin 22, RI: Ring Indicator EIA = CE CCITT = 125
U/A: User Assigned May be connected by the user to any desired control lead (see Section 7.3.2 for strapping instructions). The U/A indicator is then assigned to the strapped pin, and if interface status is recorded, its status will be recorded and displayed during playback.	

they are all active. When the source is tape, and EIA lead status has been recorded, the TD, RD, DTR, DSR, RTS, CTS, RI, RLSD, SCT, SCR, and U/A indicators are active; but if EIA lead status has not been recorded, then only TD, RD, SCT, and SCR are active.

4.2 INTERVIEW STATUS

There are INTERVIEW STATUS indicators for RECEIVERS, the CRT, and the CAPTURE MEMORY--the 4500 tape or high-speed memory (RAM) option. (See Figure 4-2.)

4.2.1 RECEIVER IN SYNC

The RECEIVER IN SYNC indicators, labeled TD for Transmitted Data and RD for Received Data, are ON when their respective trigger logic receivers are "in sync" while monitoring synchronous or bit-oriented protocols. For example, the appropriate indicator is turned on when the synchronization character sequence is encountered in synchronous protocols and remains on until OUTSYNC (see Section 11.2.9) is encountered. It is possible for the receivers to be in synchronization but not updating the data on the CRT because the display has been frozen (see Sections 10 and 12.4.3) or the data is suppressed (see Section 11.4.2).

When asynchronous protocols are being monitored, the RECEIVER IN SYNC indicators are OFF.

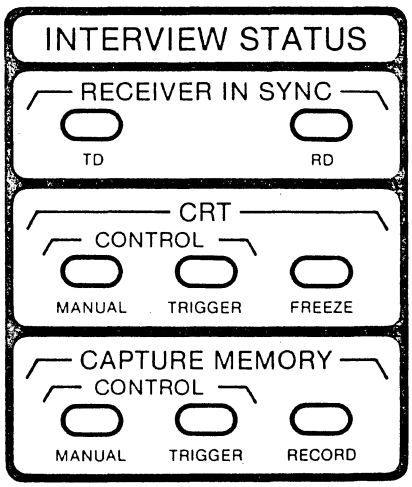


Figure 4-2

NOTE: These indicators do not indicate status of the separate receivers for the tape.

4.2.2 CRT

There are three indicators to display the status of the CRT control logic: TRIGGER, MANUAL, and FREEZE.

(a) Trigger Control. When the trigger LED is ON, the real-time CRT display is stopped (frozen) or started (unfrozen) by triggers (see Section 12.4.3). This is the default condition when Run Mode is entered, even if no triggers have been programmed.

(b) Manual Control. When the MANUAL indicator is ON, the CRT display is under manual control and has been stopped or started using the MANUAL FREEZE or the MANUAL UNFREEZE key. These manual keys override trigger control until the RESUME TRIGGER key is operated. Leaving Run Mode cancels manual control.

(c) Freeze. When the FREEZE LED is ON the real-time CRT display has been stopped (frozen) and no new data is being added to the display. This may be the result of either a manual action or a trigger action as indicated by the MANUAL or TRIGGER CRT control indicator.

4.2.3 CAPTURE MEMORY

If the high-speed random access memory (RAM) is installed in the unit, the CAPTURE MEMORY indicators display status of either TAPE or RAM, whichever is selected on the Parameters 2 menu (Section 11.5.1). Otherwise, tape status is shown. There are three Capture Memory LEDs, which operate in much the same manner as the CRT indicators.

The Capture Memory is separate from and should not be confused with the CRT Display Buffer.

(a) Trigger. The TRIGGER control LED is ON when the Capture Memory is being started and stopped by triggers (see Section 12.4.4). This is the default condition when Run Mode is entered, even if no triggers have been utilized.

(b) Manual. When the MANUAL control indicator is on, the Capture Memory has been started or stopped using the green MANUAL START or MANUAL STOP key and is now under manual control. These manual keys override the trigger controls until the RESUME TRIGGER key is operated. Leaving Run Mode also cancels manual control.

(c) Record. The RECORD indicator is ON when data is being entered in the Capture Memory. This may be the result of a manual action or a trigger action, as indicated by the MANUAL or TRIGGER control indicator, or it may be the result of the initial Record Control condition selected on the Parameters 2 menu (see Section 11.5.2). If no selections have been made on the Record Control (Parameters 2) menu, the default condition of the Capture Memory when the 4500 enters Run Mode is NOT RECORD, and the RECORD indicator is OFF.

NOTE: The RECORD LED does not necessarily indicate that the tape is moving. The cartridge recorder uses a buffered recording technique to make maximum use of the tape by recording at the highest allowable density. The tape only moves when data is being transferred from the buffer to the tape. At low data rates, the tape may remain stationary for several minutes at a time while the buffer is being filled. The RECORD LED indicates that data is being entered into the record buffer.

5 *Keyboard*

5.1 INTRODUCTION

This section is organized by key, rather than by function, because it is intended as a reference source, rather than a procedural instruction. You can use it to gain overall familiarity with the touch-sensitive keyboard, and turn to it whenever you want specific information. A diagram of the factory-built INTERVIEW 4500 keyboard is included as Figure 5-1.

The keyboard of a unit converted to 4500 status from the INTERVIEW 3500 is slightly different. As shown in Figure 5-2, on this keyboard the MESSAGE key is replaced by an ENTER MESSAGE key to the right of the two yellow keys. The ENTER MSG key performs all of the functions of the MESSAGE key.

Key functions are identified by grouping and color. Many keys are valid in several modes, but the colors indicate their primary functions. Red keys are primarily Program Mode keys; green keys, Run Mode. The two rectangular keys are the mode entry keys: Pressing the red rectangular PROGRAM key enables all the other red keys; pressing the green rectangular RUN key enables all green keys as well as certain red keys.

The yellow keys are special-purpose keys that are valid only for certain specific menus. The blue and gray keys are alphanumeric characters; the blue keys are those also used for hexadecimal entries and the most frequently used protocol characters.

A single audible "beep" confirms a proper key action. A displayed message, KEY ERROR, accompanied by a series of "beeps" calls attention to illegal key use.

Keyboard translation tables for the eight codes standard in the INTERVIEW 4500 are included as Appendix A.

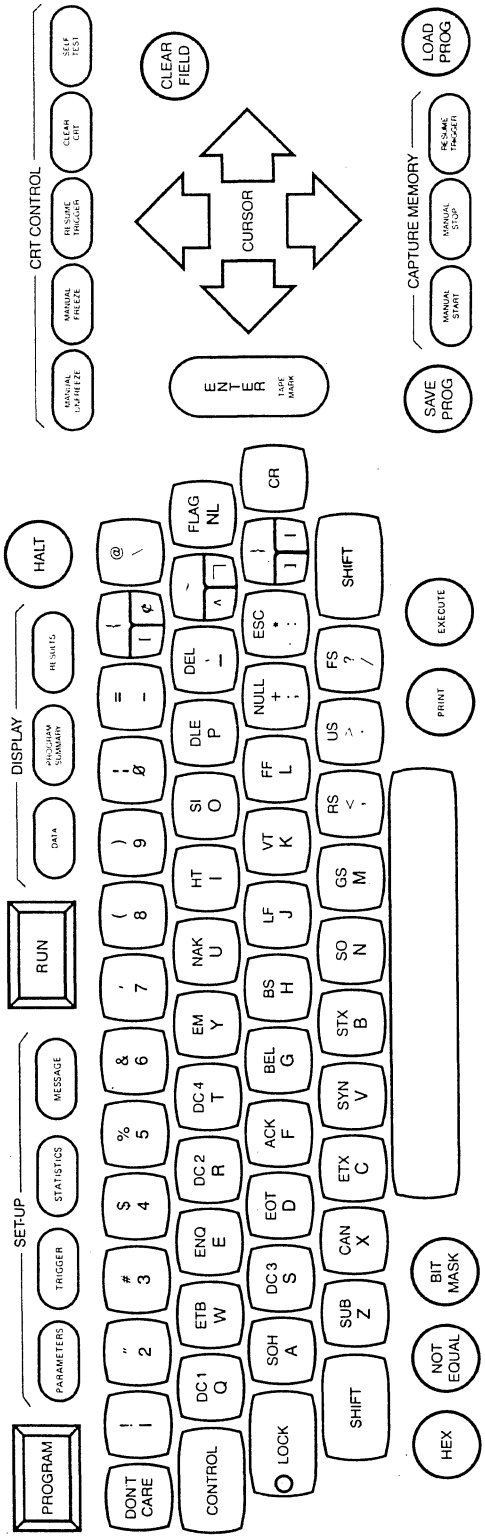


Figure 5-1 Keyboard, factory-built units

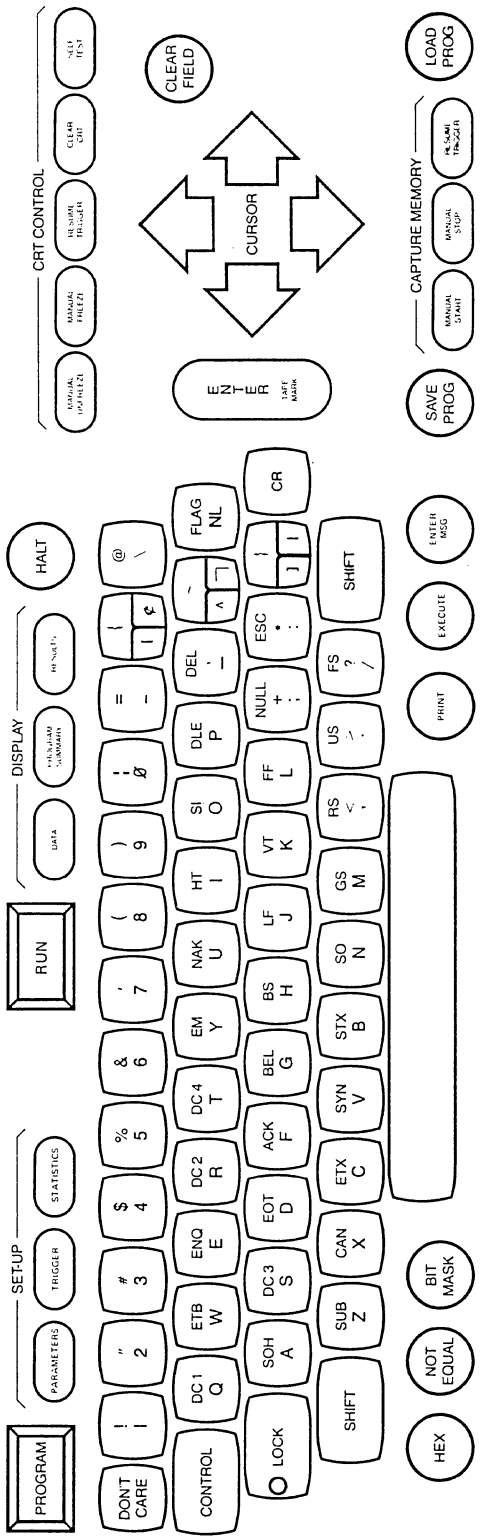


Figure 5-2 Keyboard, converted 3500 units

5.2 RED KEYS: PROGRAM MODE

Key	Program Mode	Run Mode	
		Real Time	Freeze
PROGRAM	Places unit in Program Mode, enables all red program keys, and displays the basic Program Selection menu.		
PARAMETERS	PARAMETERS followed by 1 selects Basic Program menu. PARAMETERS followed by 2 selects CRT and Record Control menu. PARAMETERS followed by 3 selects Printer Control and RAM-Tape Transfer Control menu. PARAMETERS followed by 4 selects Interface Control menu. PARAMETERS followed by 5 selects Tape Utility menu.	Invalid	Invalid
TRIGGER	Selects Trigger Summary for Triggers 0-7. Summary of Triggers 8-F may then be selected by pressing the UP or DOWN cursor arrow. TRIGGER followed by any number from 0 to F, and then C or A, selects the corresponding specific trigger Conditions or Actions menu.	Invalid	Invalid
STATISTICS	Selects Counter and Timer menu.	Invalid	Invalid
MESSAGE (Factory 4500 units only)	Displays Message Summary. Followed by any number from 0 to F, selects corresponding message-entry menu.	With data or frame/packet protocol displayed, enables keyboard buffer. Transfers keyboard buffer to the keyboard transmit buffer and closes keyboard buffer.	Invalid
CLEAR FIELD	Clears any "typed in" entries in current data-entry field.	Clears keyboard buffer. Clears prompt from line 2.	Invalid

(Continued)

5.2 RED KEYS: PROGRAM MODE (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
CLEAR FIELD (Cont)	To clear any displayed menu to its power-up default values, operate CONTROL plus CLEAR FIELD simultaneously.	CONTROL plus CLEAR FIELD clears keyboard buffer and associated transmit buffer.	
	To clear all triggers, use CONTROL plus CLEAR FIELD with Trigger Summary displayed.		
	To clear from cursor location to the end of current data-entry field, operate SHIFT plus CLEAR FIELD simultaneously.	SHIFT plus CLEAR FIELD clears keyboard buffer from cursor location to end.	
CURSOR	When a cursor arrow is held down, after a brief delay the cursor will move continuously until the key is released or until it may no longer logically move in that direction.		
	UP or DOWN arrow moves the cursor up or down to the current selection in first field on the next line, or to first position in field, if choices are to be typed in. (See also ENTER key.)	In tape playback mode, each operation of UP arrow doubles playback speed to max. 9.6 kbps; each operation of DOWN arrow halves speed.	NOTE: When display is frozen, cursor will be at last character of the new data. UP or DOWN arrow moves the cursor up or down to the next line. At top or bottom of CRT window, pulls the next line from the buffer onto the display.
	RIGHT (or LEFT) arrow moves the cursor right (or left) to the next permitted selection or to next field. (See also ENTER key.)	Except for RAM playback, RIGHT and LEFT arrows valid only for keyboard buffer. During RAM playback, LEFT arrow backs playback up by 1 block.	RIGHT (or LEFT) arrow moves the cursor right (or left) to the next character or beginning (or end) of next (or preceding) line.
	Use CONTROL plus CURSOR simultaneously to move cursor directly to last field or selection in cursor arrow direction.	CONTROL plus CURSOR valid only for keyboard buffer.	CONTROL plus CURSOR invalid.

(Continued)

5.2 RED KEYS: PROGRAM MODE (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
ENTER	Always advances the cursor to the next field, whether to the right or down.	If data source is TAPE, ENTER is invalid, except for keyboard buffer entries.	Invalid
	While a Trigger Conditions menu is on the screen, CONTROL plus ENTER displays the Actions menu for the same Trigger; if Actions menu is displayed, then Conditions menu appears.	If data source is LINE, ENTER puts a blinking bright reverse-image marker on the CRT at the current location. This marker can be sensed by triggers.	
	From bit mask entry field, returns cursor to next character in string or in "1 OF" list or in ENHANCE or SUPPRESS list.	If the interface leads are recorded on tape, then the marker (i.e., ENTER key status) is also recorded.	
		When keyboard buffer is open, ENTER transfers keyboard buffer to keyboard transmit buffer without closing keyboard buffer.	
ENTER MSG (Upgraded 3500 units only)	Displays Message Summary menu. Followed by any number from 0 to F, displays corresponding message-entry menu.	With data or frame/packet protocol displayed, enables keyboard buffer. Transfers keyboard buffer to the keyboard transmit buffer and closes keyboard buffer.	Invalid
DON'T CARE	Enters Don't Care character in a string.	Invalid	Invalid
HEX	Latches next two alphanumeric keys (blue keys) to enter one hexadecimal character.	Successive operation places the CRT alternately in and out of hexadecimal display mode. To display only control characters in hexadecimal, operate CONTROL plus HEX.	

(Continued)

5.2 RED KEYS: PROGRAM MODE (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
NOT EQUAL	In a data entry field, NOT EQUAL followed by a character or BIT MASK selects all characters not equal to the character. Applicable to SUPPRESS and ENHANCE (Parameters 2 menu) and STRG and "1 OF" (Trigger Conditions menus).	Invalid	Invalid
BIT MASK	Used to select all characters having same bit(s) at selected bit position(s). Applicable to SUPPRESS and ENHANCE (Parameters 2 menu) and STRG and "1 OF" (Trigger Conditions menus). NOTE: ENTER must be used to return from Bit Mask expansion to the next character in the string or list.	Invalid	Invalid
SAVE PROG	Moves tape to program storage area and stores the current program on tape. An error message is displayed if no tape is inserted or if the RECORD tab is in the "protect" position.	Invalid	Invalid
LOAD PROG	Moves tape to program storage area and loads program from tape. CHECKSUM ERROR is displayed if block cannot be loaded error-free into the 4500.	Invalid	Invalid

(Continued)

5.3 GREEN KEYS: DISPLAY ZONE (see also Table 7-1)

Key	Program Mode	Run Mode	
		Real Time	Freeze
RUN	Sets the unit in Run Mode from any Program Mode display and starts test. Enables all green keys.	Except after the HALT key has been operated, RUN resets all counters and timers, forces the receivers out of synchronization, and restarts the test, but does not move tape to the initial block number or initialize RAM. After HALT, the RUN key restarts the test and forces the receivers out of synchronization without resetting measurements or tape.	
DATA	Invalid	Displays real-time data or frame/packet protocol from the selected source. Restores data display when Program Summary or Results is displayed.	
PROGRAM SUMMARY	Invalid	Displays Trigger Summary. Repeat to see alternate bank. Unit remains in Run Mode. Program, counters, and timers continue.	
RESULTS	Invalid	Displays real-time counters and timers. Unit remains in Run Mode.	
HALT	Invalid	Suspends all Run Mode operation, including counters and timers. Stops Capture Memory playback or recording (whether tape or RAM). Does not fill in the two blank lines in display where the new data has been overwriting the old. To resume Run Mode operation without resetting measurements, press RUN once.	

(Continued)

5.4 GREEN KEYS: CRT CONTROL ZONE (see also Table 7-1)

Key	Program Mode	Run Mode	
		Real Time	Freeze
MANUAL UNFREEZE	Invalid	Starts real-time data display; overrides trigger control of CRT freeze. Turns off the FREEZE status LED; turns on MANUAL LED.	
MANUAL FREEZE	Invalid	Stops real-time data display; overrides trigger control of display.	
		Displays binary pattern of the character (or characters, in dual-line display) at the cursor position in upper right section of CRT.	
		Fills in the two blank lines in the running display where the new data was overwriting the old.	
		Turns on the FREEZE and MANUAL status LEDs. Turns off the TRIGGER status LED.	
		In tape or RAM playback mode, stops playback.	
RESUME TRIGGER	Invalid	Returns the display to trigger control after MANUAL FREEZE or MANUAL UNFREEZE.	
		Turns off MANUAL status LED; turns on TRIGGER status LED. If FREEZE LED comes on, trigger has frozen display.	
CLEAR CRT	Invalid	Clears the CRT screen (and entire 1920-character buffer) of old data momentarily.	
SELF TEST	Invalid	Displays all fonts in code selected on Parameters 1 menu. Operate SELF TEST again to restore previous display mode. Does not affect program operation.	

(Continued)

5.5 GREEN KEYS: CAPTURE MEMORY ZONE

Key	Program Mode	Run Mode	
		Real Time	Freeze
MANUAL START	Invalid	Causes tape or RAM to start recording (or playback): overrides trigger control. Turns on RECORD status LED and MANUAL status LED.	
MANUAL STOP	Invalid	Causes tape or RAM to stop recording (or playback): overrides trigger control. Turns off RECORD status LED; turns on MANUAL status LED.	
RESUME TRIGGER	Invalid	Returns tape or RAM to trigger control after MANUAL START or MANUAL STOP. Turns off MANUAL status LED. If RECORD LED comes ON, a trigger has turned on the tape.	

(Continued)

5.6 YELLOW KEYS: SPECIAL COMMANDS

Key	Program Mode	Run Mode	
		Real Time	Freeze
PRINT	Commands 4500 to output to printer.	Invalid	Commands 4500 to output current display to printer.
EXECUTE	With parameter 5 menu displayed, (Version 10.08 only) starts formatting, duplicating, or retensioning of tape.	Invalid	Invalid
	In units with high-speed memory option: With Parameters 3 menu displayed, transfers data between RAM and Tape.	Invalid	Invalid

(Continued)

5.7 BLUE AND GRAY KEYS: TYPEWRITER AREA

Key	Program Mode	Run Mode	
		Real Time	Freeze
Square Gray and Blue keys	Alphanumeric characters, control characters, special symbols.	When Results are displayed, C followed by 1, 2,..., 8 resets the corresponding counter.	
	Keys that also are used for hexadecimal entry (in conjunction with red HEX key) are blue.	When Results are displayed, T followed by 1 or 2 resets the corresponding timer.	
		When Results are displayed, R resets all counters and timers.	
	Commonly used control characters are blue.	MESSAGE or ENTER MSG enables all alphanumeric and control character keys for keyboard buffer message.	When data is displayed, B moves the CRT window to the beginning of the buffer; E moves the CRT window to the End of the buffer.
			F automatically tabs the cursor to the next Frame-control byte and displays the mnemonic expansion (INFO, RNR, NR, etc.) on line 2.
			P automatically tabs the cursor to the next Packet-type byte and displays the mnemonic expansion (LCN, INFO, RNR, PR, Q, D, M, etc.) on line 2
			CONTROL plus F or CONTROL plus P displays the mnemonic expansion for the character at the current cursor position. NOTE: In this case the logic cannot identify invalid actions.
			On dual-line display, T selects TD, and R selects RD, for all following uses of CONTROL plus F or CONTROL plus P. R cancels preceding T and vice versa.

(Continued)

5.7 BLUE AND GRAY KEYS: TYPEWRITER AREA (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
SHIFT (and LOCK)	Hold SHIFT down (or LOCK it down) while accompanying key, or keys, is operated to give upper-case or special character. SHIFT releases LOCK.	May be used for keyboard buffer entry.	Invalid
	SHIFT plus CLEAR FIELD clears current data field from cursor to end of field.		
CONTROL	Must be held down while accompanying key is operated.	When data is displayed, CONTROL plus HEX alternately displays all control characters in hexadecimal.	Invalid
	Used with an alphanumeric key, gives control character.	May be used for keyboard buffer entry.	
	With red CLEAR FIELD key clears the entire displayed menu to default selections.		
	With CURSOR arrow, moves cursor directly to last position in direction of arrow.		
FLAG (BOP Formats)	CONTROL plus FLAG enters Flag byte for HDLC framing (zero stuffing).	Invalid	Invalid
	(NOTE: The key sequence HEX, 7, E will not be read as a Flag.)		

6 Power-up

Before you power up the INTERVIEW 4500 you should read Section 3 of this Manual.

CAUTION: Whenever you power up the 4500, be sure that the ventilator fan at the rear is running.

6.1 POWER-UP WITHOUT TAPE

6.1.1 Operate the red power switch on the front panel. During the internal diagnostic tests automatically conducted at power-up, the CRT display will be similar to that of Figure 6-1. (Your unit may have a different software version or option numbers.) If the High Speed Memory (RAM) option is installed, these tests may take from several to 30 seconds, depending on which RAM option is present. When the self tests are complete, the display will change to the menu of Figure 6-2. Only the INTERVIEW 4500's default parameters will be resident in the unit.

6.1.2 The red power switch is an alternate-action key; simply press it a second time to power down the 4500.

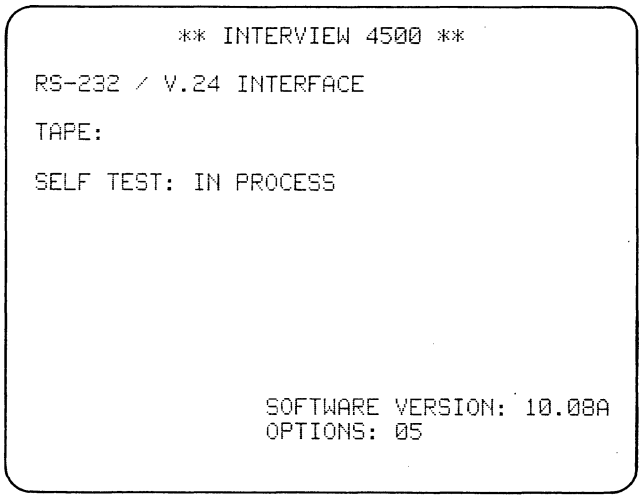


Figure 6-1

6.2 POWER-UP WITH PROGRAM TAPE INSERTED

6.2.1 Select a tape that contains a 4500 program and check that the

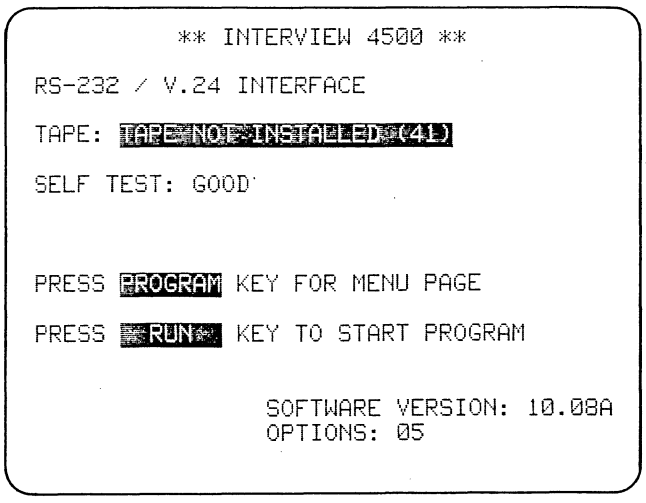


Figure 6-2

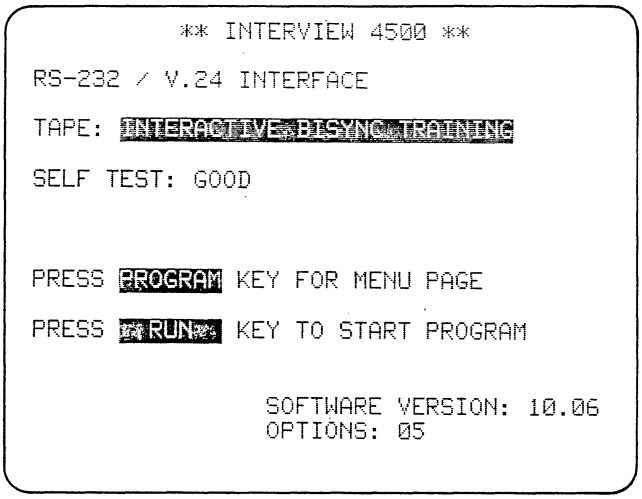


Figure 6-3

RECORD tab on the tape cartridge is not in the record position (the tab should be toward the center of the cartridge). Insert the tape in the drive with the drive wheel to the rear and the transparent window on top. Push it gently in until you feel it lock.

6.2.2 Press the red power switch to power up the 4500. After the internal self tests are complete, software version 10.08 displays CHECKING TAPE TYPE while it checks whether a Program-Data or a Program-Only Tape is present.. The 4500 without Option 23 cannot use Program-Only Tapes. If a Program-Data Tape has been inserted, the tape is searched for a test program in its protected location. The program is then automatically loaded and its ID displayed on the power-up menu (Figure 6-3). The unit will automatically go to Run Mode.

If no program is found on the tape, NO PROGRAM FOUND will appear on the TAPE line, and the unit will remain in Program Mode.

CAUTION: Always press the PROGRAM key to stop tape motion before you remove the tape.

To remove the tape, press PROGRAM, then the EJECT button under the tape drive, and pull the tape cartridge out. Removing the tape will not alter the program in the unit. You may modify or replace this program manually.

6.3 THE POWER-UP MENU

6.3.1 If an error is found during the power-up interactive diagnostics among the internal microprocessors, a code indicative of the defective subassembly will be displayed after SELF TEST. A list of self-test error codes is given in Section 17.6.

6.3.2 As Figures 6-2 and 6-3 show, you must choose between two keys at this point: PROGRAM and RUN. Any other key will cause a KEY ERROR response on line 2 of the display and an audible signal. KEY ERROR clears after 3 seconds or when a correct key is operated.

6.3.3 You may abort the power-up RAM tests. This is useful if the unit has the 4-megabyte RAM, because the tests may take up to 30 seconds. The tests should not be aborted if you intend to use the RAM during the session. Press the PROG key after the RAM tests are under way (about 8 seconds). The Program Selection menu will be displayed, and you can proceed as explained in Section 6.4.

6.4 LOADING A TAPED PROGRAM AFTER POWER-UP

6.4.1 With no tape installed, operate the red POWER switch. The power-up display (Figure 6-2) will say, TAPE NOT INSTALLED.

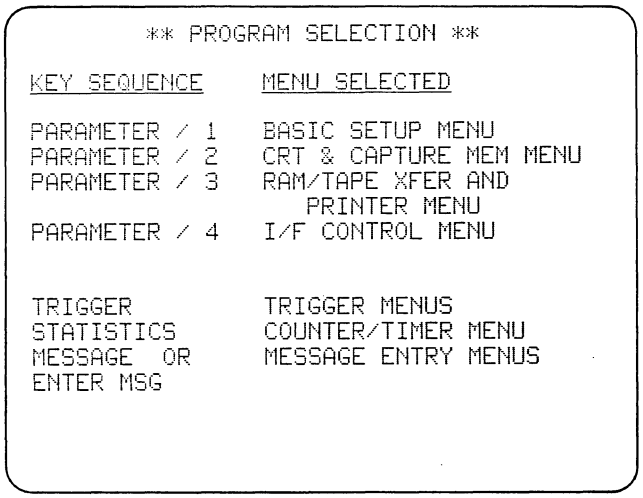


Figure 6-4 (Version 10.06)

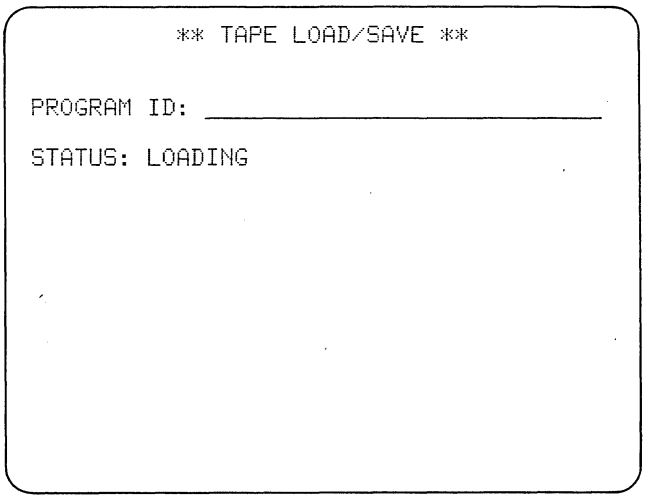


Figure 6-6 (Version 10.06)

6.4.2 Insert the tape as in Section 6.2.1. At this point, only the 4500's default program parameters are set in the unit. You may enter a program in the unit manually as explained in Sections 11, 12, and 13, or you may load a program stored on the tape as explained in Section 6.4.3.

6.4.3 Operate the red PROGRAM key. This places the INTERVIEW 4500 in the Program Mode and displays a Program Selection menu (Figures 6-4 and 6-5).

Press the LOAD PROG key located at the right of the Capture Memory zone. A special TAPE LOAD/SAVE menu will be displayed (Figure 6-6).

(a) Software Version 10.06. While the microprocessor that controls the tape is automatically repositioning the tape to the program area and reading the program, LOADING is displayed on the STATUS line of the CRT display.

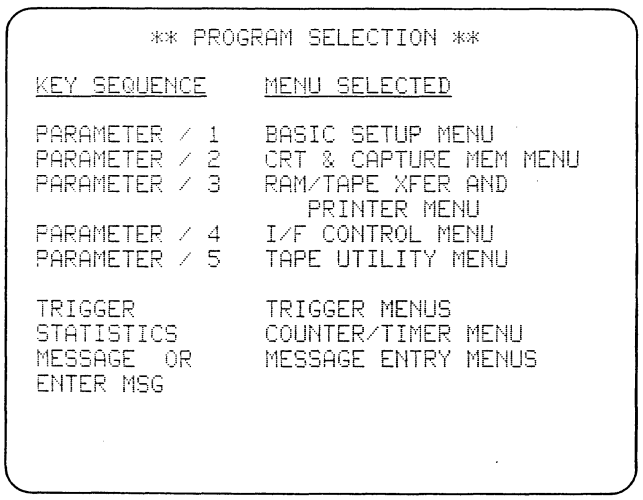


Figure 6-5 (Version 10.08)

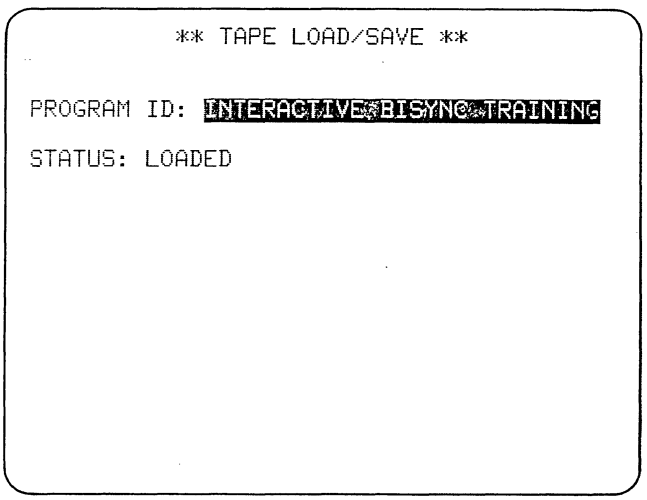


Figure 6-7 (Version 10.06)

When the program has been loaded, the message is replaced by LOADED, and the program ID is displayed (Figure 6-7).

(b) Software Version 10.08. The 10.08 version will first check the tape type, displaying the status message CHECKING TAPE TYPE (Figure 6-8) before LOADING PROGRAM. When the program has been LOADED, the program ID will be displayed, with the message PROGRAM LOADED.

If either 4500 version cannot load a program a status message will be put up. See Appendix D for a list of the messages that may be displayed concerning the Capture Memory.

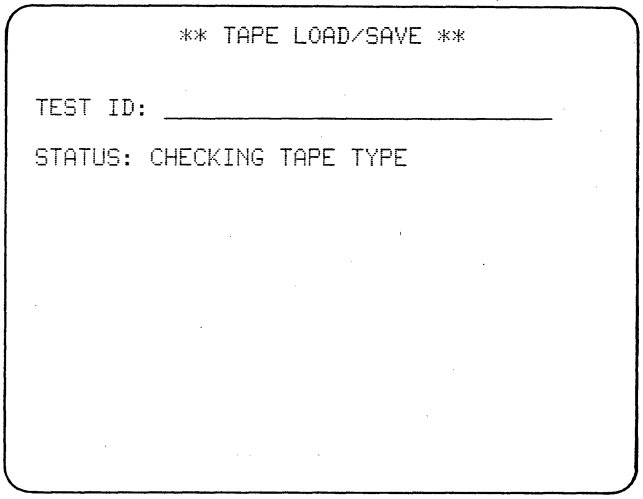


Figure 6-8 (Version 10.08)

7 Using the Keyboard to Get Run Mode Displays

CAUTION: Always press PROGRAM to stop tape motion before you power down the INTERVIEW.

7.1 INTRODUCTION

You can select many aids to data analysis directly in Run Mode, including hexadecimal display, data freeze, and display of the rest of the CRT buffer content (1280 more characters). You can stop and start playback and recording, and reset counters and timers. You may view summaries of the trigger program and break data characters down into their binary patterns. In addition, some special features are available in the X.25 and SDLC modes; these are discussed in Section 16.

7.2 CRT DISPLAY

The INTERVIEW CRT can display 640 characters (16 lines of 40 characters each) from a 1920-character buffer. It can display transmitted or received data or both, in either single-line or dual-line format.

When an appropriate program has been loaded and a data source connected, press the green rectangular RUN key, once. All counters and timers will reset and the trigger program will restart. Playback from or recording by tape or RAM will begin from the block selected on the Parameters 1 or 2 menu.

Line 1 of the screen (Figure 7-1) will display the mode, MON, the SOURCE of the data, and the block number at which the Capture Memory is recording or playing back. On the second line will appear basic parameters from the Parameters 1 menu of the program. If the program includes Prompts, they will be displayed on this line.

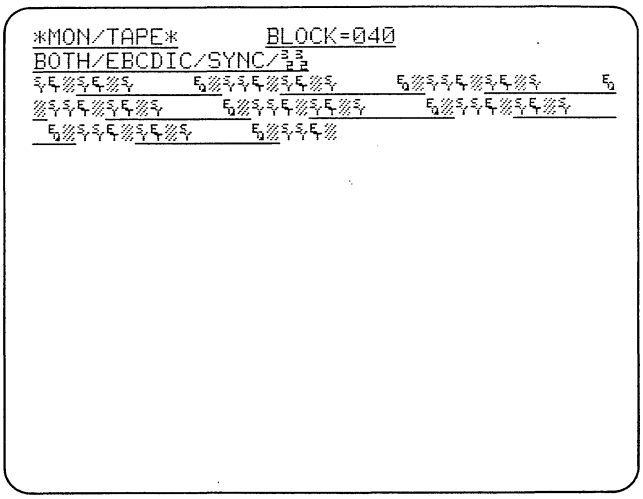


Figure 7-1

For detailed explanations of the data display, see Sections 8 through 10.

The remainder of Section 7 explains the use of the various green Run Mode keys. Program activity during each of the various displays obtained

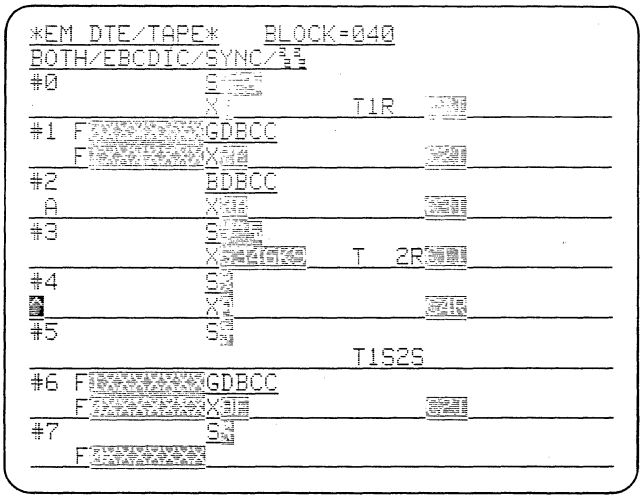


Figure 7-2

with the Run Mode keys is summarized in Table 7-1.

7.3 DISPLAY KEYS

7.3.1 PROGRAM SUMMARY KEY

To review the Trigger Summary (explained in Section 12.5) without leaving Run Mode, press PROGRAM SUMMARY. This will display the summary of the trigger bank that was last displayed in either Program or Run Mode. You may then alternately view the low bank (Triggers 0-7; Figure 7-2) and high-bank (Triggers 8-F; Figure 7-3) summaries by repeating the PROGRAM SUMMARY key. While the Program Summary is displayed, no data is received in the CRT buffer, but the counters and timers receive data, the test continues to run, and recording continues.

Use the DATA key to return data to the screen.

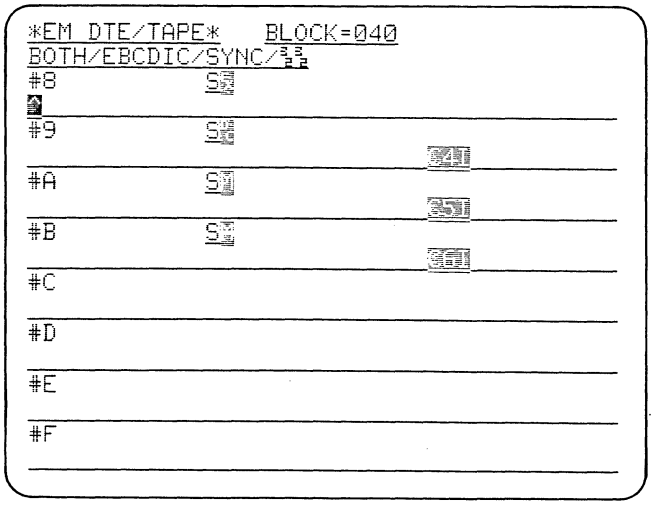


Figure 7-3

7.3.2 RESULTS KEY

To view the real-time counter and timer accumulation, operate the RESULTS key (see Figure 7-4). Whenever a counter or timer is reset by triggers, the preceding accumulation is displayed in the LAST column next to the CURRENT or real-time values.

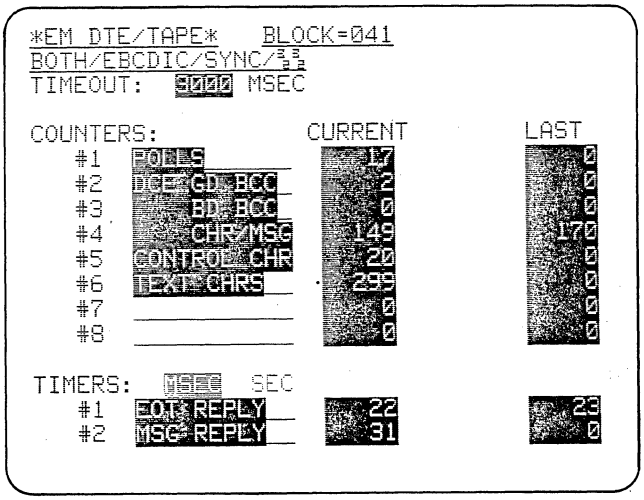


Figure 7-4

The maximum for either counts or time is 65,535. OVerFLOw is displayed to the right of the CURRENT value for any counter or timer that has overflowed this value. OVFLO is also displayed when a counter decrements below zero.

Counters and Timers may be reset manually: While Results are displayed, the C key followed by 1, 2,..., 8 resets the corresponding counter; T followed by 1 or 2 resets the corresponding timer; and R resets all counters and timers. When a counter or timer is reset manually, the LAST value is also reset.

No data is received by the CRT buffer while Results are displayed, but

TABLE 7-1
COUNTERS, TIMERS, AND CAPTURE MEMORY OPERATION IN RUN MODE

			Capture Memory	
Keys	Counters and Timers	Timeout Timer	Data Playback	Recording
RUN				
in Program Mode	Reset	---	Starts	Starts as commanded
in Run Mode	Reset	Stops	Continues	Continues as commanded
in Halt Mode	Continue as commanded	Stops	Continues	Continues as commanded
DATA	Continue as commanded	Continues as commanded	Continues	Continues as commanded
PROGRAM SUMMARY	Continue as commanded	Continues as commanded	Continues	Continues as commanded
RESULTS	Continue as commanded	Continues as commanded	Continues	Continues as commanded
HALT	Stop; do not reset	Stops	Stops	Stops
FREEZE				
Line data	Continue as commanded	Continues as commanded	---	Continues as commanded
Recorded data	Stop; do not reset	Continues as commanded	Stops	---
CLEAR CRT	Continue as commanded	Continues as commanded	Continues	Continues as commanded
SELF TEST	Continue as commanded	Continues as commanded	Continues	Continues as commanded

the program continues--as you can see--and recording continues.

Use the DATA key to return data to the screen.

7.3.3 RUN KEY

To restart the test at any time without leaving Run Mode, press the RUN key. This forces the receivers out of synchronization, resets all counters and timers, and restarts the trigger program. Whether the Capture Memory is recording or playing back data, RUN does not cause the tape to rewind or initialize the RAM.

7.3.4 HALT KEY

HALT suspends all monitor activity and freezes the current data on the screen. Counters and timers stop, but do not reset. Capture Memory playback or recording stops, but the tape does not rewind. The timeout timer is stopped.

If the 4500 is in an Emulate Mode (Section 11.2.4), all of the interface leads are reinitialized and the transmitter is stopped and goes to its normal idle line condition. If the 4500 is in Switched Carrier mode (Section 13.3.1), it will not respond to changes on the RS-232/V.24 interface.

To resume program activity after HALT, press RUN once. All monitor and test activities will simply resume from the point at which they stopped: counters and timers will not reset in this case. If the data source is the 4500 tape or RAM, no data will have been lost (the tape stops); if the source is LINE, all input signals received during the time the INTERVIEW was in the Halt Mode will have been ignored.

7.4 CRT CONTROL KEYS

7.4.1 MANUAL FREEZE KEYS

The MANUAL UNFREEZE, MANUAL FREEZE, and RESUME TRIGGER keys are given a separate section in this manual, namely, Section 10.

7.4.2 CLEAR CRT KEY

Pressing CLEAR CRT clears the screen of data. If real-time data is being displayed, the screen remains clear only momentarily: real-time data flow is automatically resumed.

7.4.3 SELF-TEST KEY

SELF TEST is an alternate-action key that displays the full character font for the code selected on the Parameters 1 menu (see Figure 7-5). The self-test display is also useful for CRT brightness adjustment. Note: In Run Mode, the SELF-TEST key is not related to the internal self tests conducted automatically at power-up (discussed in Section 6).

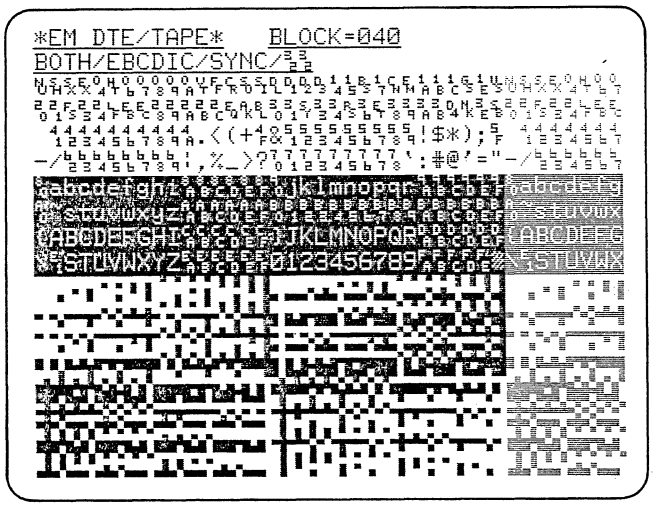


Figure 7-5

7.5 CAPTURE MEMORY KEYS

The three green Capture Memory keys can be used to control both recording and playback. These keys normally control the tape; if the high-speed memory option is installed in the unit, they can also be used to control RAM.

7.5.1 DATA PLAYBACK

When tape or RAM has been selected as SOURCE on the Parameters 1 menu, playback may be stopped and started with

the MANUAL STOP and MANUAL START keys. The block number in the CRT status line will stop incrementing while playback is stopped, and if the source is tape, tape motion will stop. Data will be frozen on the screen (see Section 10).

7.5.2 RECORDING

Recording can be started or stopped at any time with the MANUAL START or MANUAL STOP key. If recording is under trigger control, these keys override the triggers. When recording stops, the block number on the CRT status line will stop incrementing; and if recording is on tape the tape will stop moving.

The only way to return recording to trigger control is to press the RESUME TRIGGER key.

7.6 RUN KEY

By now you can see that the RUN key may have three different actions, depending on what mode the 4500 is in when the RUN key is operated--Program Mode, Run Mode, or Halt Mode. The differences are summarized in Table 7-1.

8 Run Mode: Data Display

Four display modes can be selected on the Parameters 2 menu: (1) Single and (2) Dual Line, and (3) Frame and (4) Packet. Frame and Packet are protocol displays and can be chosen only for X.25 and SDLC formats; they are discussed in Section 16. Single and Dual Line are data displays.

8.1 DATA DISPLAY

Single- or dual-line display is selected in Program Mode on the Parameters 2 menu (see Section 11.4.1).

8.1.1 SINGLE LINE

In single-line display (Figure 8-1), DCE and DTE data are displayed alternately on the same line. They are easily distinguished because DCE data is always underlined (to identify it as originating from the communication line).

8.1.2 DUAL LINE

In dual-line display (Figure 8-2), DTE (TD) data begins on the first data line. DCE (RD) data (always underlined) is shown on alternating lines beginning with the second data line. Time correlation between TD and RD is maintained by a low-intensity L-shaped fill symbol.

In dual-line display the relationship between the Transmit and Receive

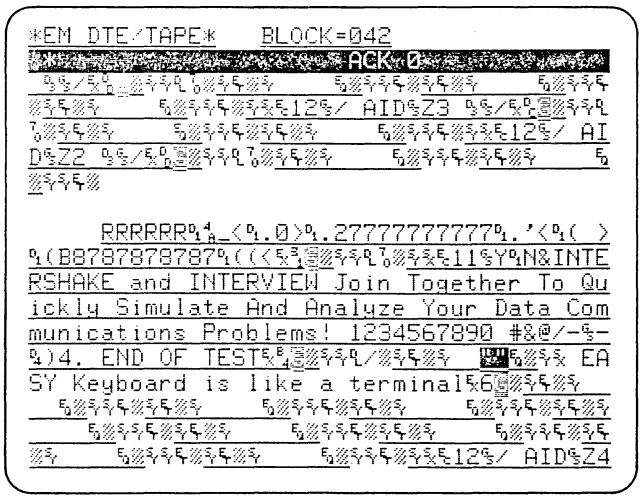


Figure 8-1

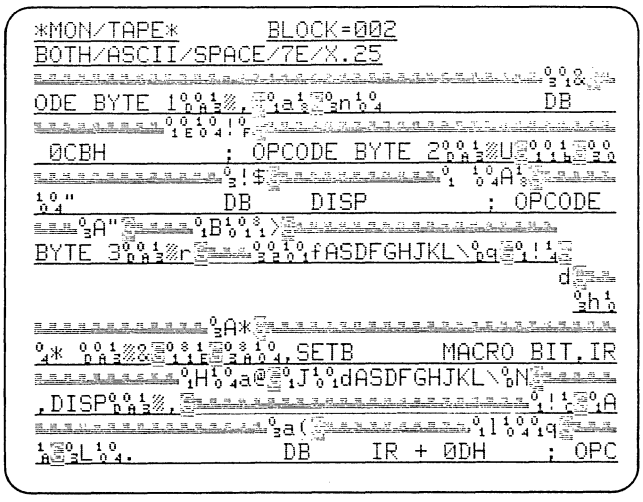


Figure 8-2

data is accurate to within plus or minus 1 character.

8.1.3 HEXADECIMAL DISPLAY

To display all data in hexadecimal, press the red HEX key once (see Figure 8-3); to return to the original text display, press HEX again.

To display only control characters in hexadecimal (see Figure 8-4), hold the CONTROL key down while operating the HEX key. To restore the original text, press CONTROL plus HEX again. For 7E/X.25 and SDLC formats, the

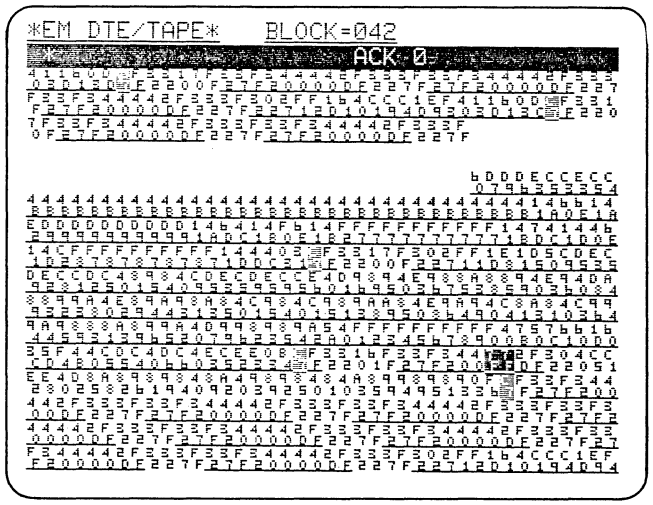


Figure 8-3

default condition is to display protocol characters in hexadecimal, but CONTROL plus HEX still works in the same alternate-action fashion. HEX and CONTROL plus HEX are also effective on the Self Test display.

8.1.4 BLOCK CHECK CHARACTERS

When Received Block Check is ON in the unit (see Section 11.2.10), a Good block check is represented on the display by a low-intensity reverse-image letter G replacing the second block check character. A Bad block check or an Aborted block is shown by replacing the second character with a bright

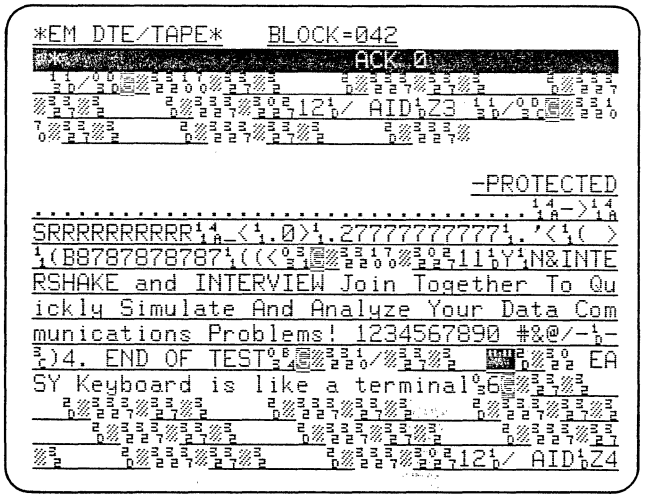


Figure 8-4

reverse-image B or A, respectively. (Figure 8-5 shows a good and a bad block check.)

8.1.5 FLAGS

The Flag byte, $7E_{16}$, used in 7E/X.25 and SDLC protocols is displayed as low-intensity reverse-image 7E to distinguish it from transparent data 7E (see Figure 8-6).

8.1.6 MARKER

In Run Mode, when the data source is not tape, the ENTER key can be used to mark incoming data when it first

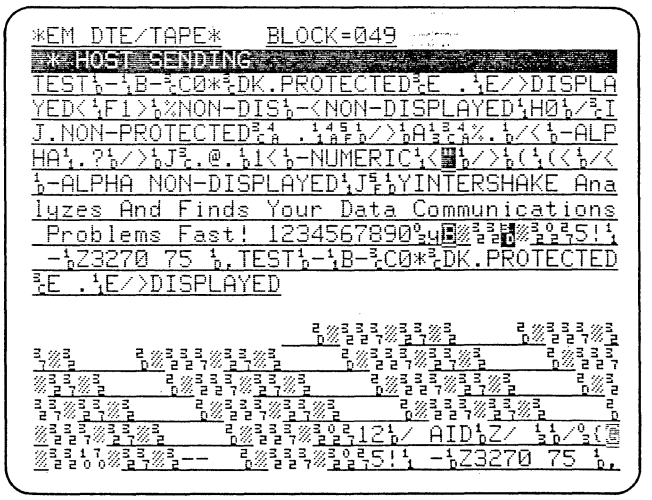


Figure 8-5

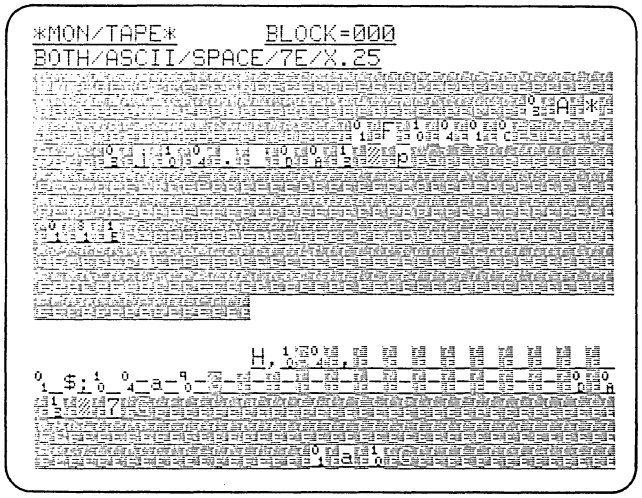


Figure 8-6

appears on the screen: The last character received before ENTER is depressed will appear in blinking bright reverse image. If the display is frozen (MANUAL FREEZE key) while the marked characters are still on the screen, the markers will remain and you will then be able to study the data of interest. The marker may be recorded (see Section 11.5.5), or sensed by triggers (Section 12.3.5). Figure 8-7 shows the marker used as the condition for the 4500 to start transmission.

8.1.7 OTHER HIGHLIGHTS

Other data highlights include reverse, low-intensity, and blink. They are chosen in Program Mode (see Sections 11.4.3 and 12.4.3).

8.2 PLAYBACK FROM CAPTURE MEMORY

When the data source is the Capture Memory, TAPE or RAM is displayed on the first line followed by the block number, which can be seen to increment during playback.

During playback, the data display may be speeded up or slowed. Each operation of the UP cursor arrow doubles the play-back speed to a maximum of 9.6 kbps. Each operation of the DOWN cursor arrow halves the playback speed.

> NOTE: Remember that manually altering playback speed may invalidate the timer readings.

If the data source is RAM, you may "back up" by one block by pressing the left cursor arrow.

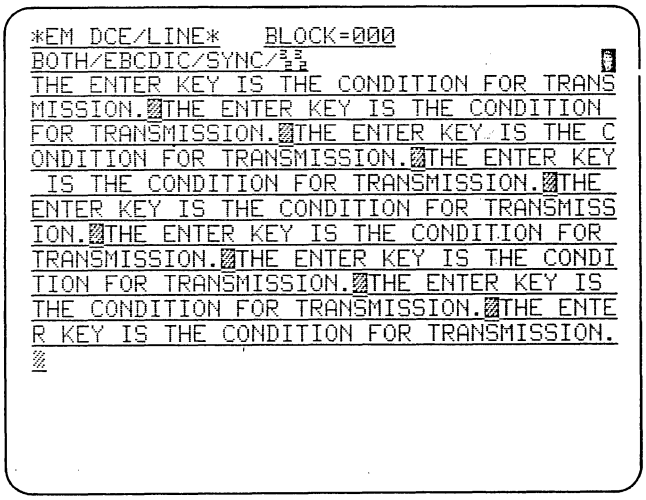


Figure 8-7

9 Run Mode: Interactive Testing

When the 4500 is in either of its interactive modes, Emulate DTE or Emulate DCE (Parameters 1 menu; see Sections 11.2 and 13), the first line of display will always inform you which of these modes the unit is in (Figures 9-1 and 9-2).

Notice that in Emulate DTE Mode (Figure 9-2), data transmitted by the 4500 is always displayed as DTE data with no underline; for Emulate DCE (Figure 9-1), data transmitted by the 4500 is underlined as for received DCE data. In the Emulate Modes, what you see on the screen as transmitted data is always what is actually transmitted on line by the 4500. Thus, the block check characters you see in Figure 9-2 are those actually transmitted by the 4500 (Received Block Check is off), and in Figure 9-1 you see the second block check character replaced by G after the 4500 does a received block check on its own transmitted data and compares it with its transmitted BCC.

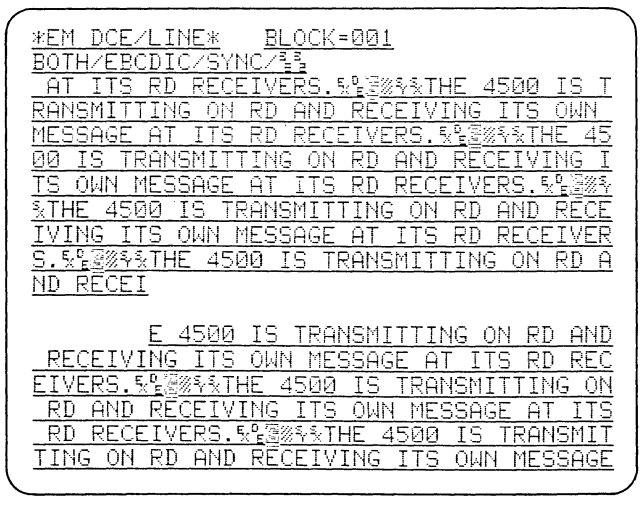


Figure 9-1

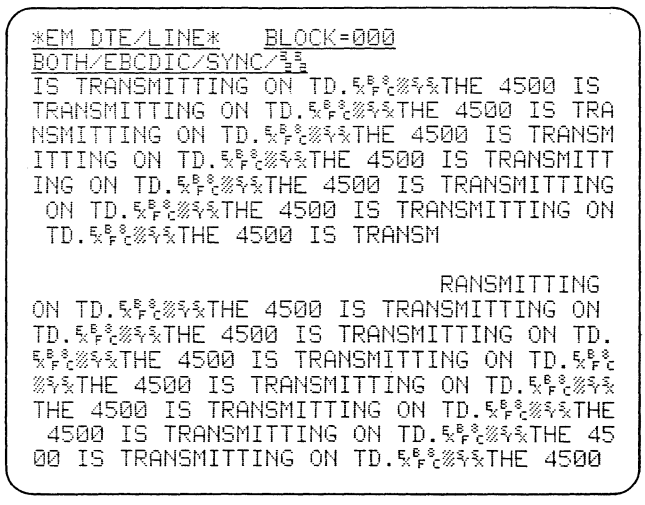


Figure 9-2

In Figures 9-3 and 9-4, you see both transmitted and received data. Always check Line 1 of the display to be sure which data is being transmitted by the 4500. In Figure 9-3 the 4500 is transmitting on TD so transmitted data is not underlined. In Figure 9-4, it is transmitting on RD so the transmitted data is underlined.

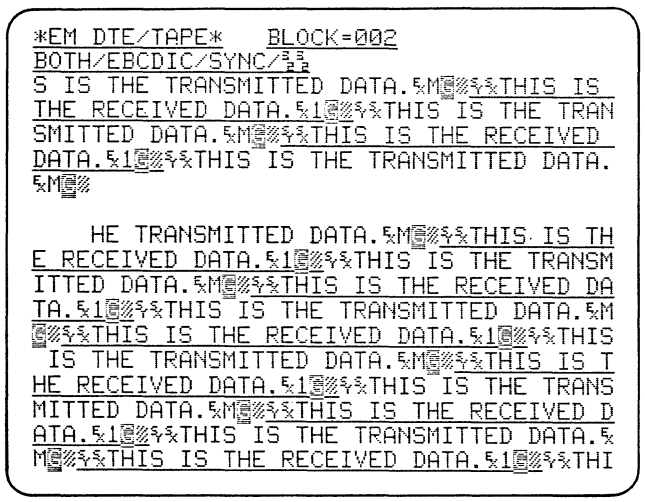


Figure 9-3

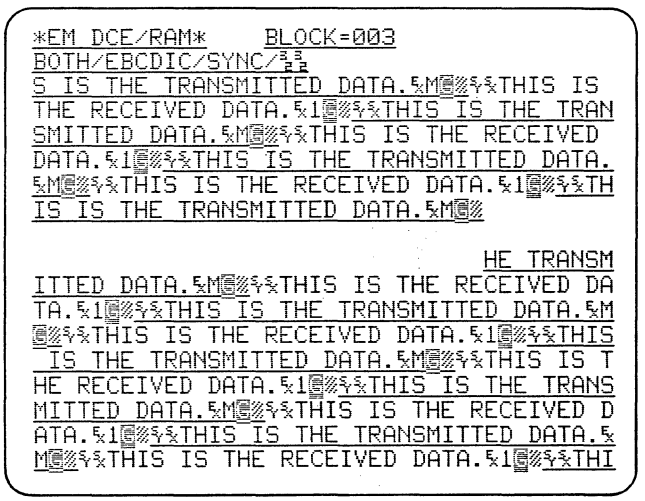


Figure 9-4

10 Run Mode: Manual Freeze

FREEZE, whether manual or under programmed trigger control, means that no new data is being added to the CRT display or buffer. Data already received is "frozen" on the screen and in the buffer. The CRT Freeze indicator on the status panel is ON.

10.1 MANUAL FREEZE CONTROL

10.1.1 MANUAL UNFREEZE KEY

When the display has been frozen by triggers, the MANUAL UNFREEZE key will restore data flow to the CRT. The triggers cannot refreeze the display while it is under manual control.

10.1.2 MANUAL FREEZE KEY

When the display is frozen with the MANUAL FREEZE key, Triggers cannot unfreeze it. A number of very useful special features are available while the CRT is manually frozen.

10.1.3 RESUME TRIGGER KEY

Trigger control of CRT Freeze is the default condition. The MANUAL FREEZE and MANUAL UNFREEZE keys both override trigger control of the CRT. You may manually freeze and unfreeze the display as often as you wish. Trigger control can be restored only by pressing RESUME TRIGGER.

10.1.4 STATUS INDICATORS

The CRT status LEDs on the front panel always indicate whether the display is frozen and whether it is under manual or program (trigger) control (see Section 4.2.2).

10.1.5 PROGRAM ACTIVITY

When the display is frozen, whether manually or under trigger control, data reception (for analysis), counting, and timing continue as programmed or manually commanded, and real-time Results can be viewed just as during real-time data display.

10.2 MANUAL FREEZE DISPLAY

In MANUAL FREEZE, the two blank lines on the screen where the new data was overwriting the old are filled in and a character bit pattern is displayed at the upper right. Notice the difference between the Manual Freeze display (Figure 10-1) and that seen in Trigger Freeze or Halt Mode (Figure 10-2).

10.2.1 CAPTURE MEMORY

If the data source is TAPE or RAM, the block number is displayed on Line 1 of the screen but does not increment, indicating that playback has stopped. If the unit was recording, recording

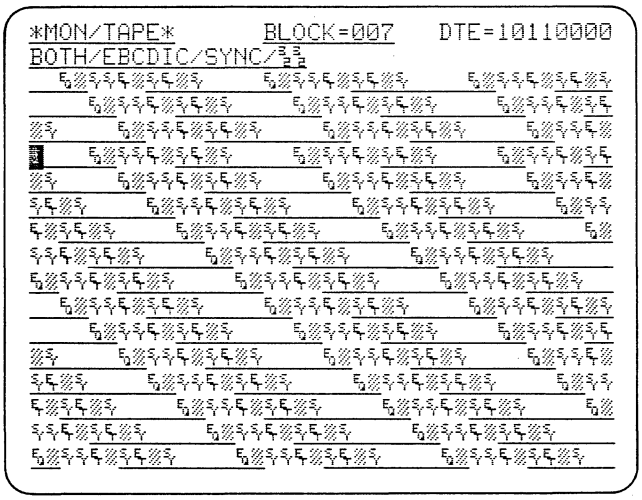


Figure 10-1

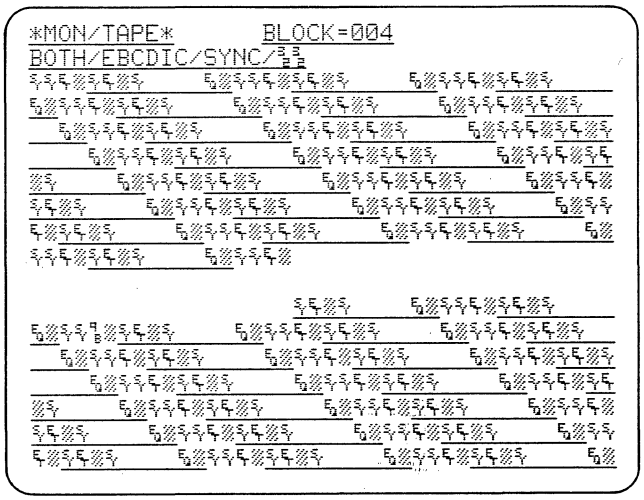


Figure 10-2

continues and the tape or RAM block number on Line 1 continues to increment.

10.2.2 CURSOR

The two blank lines where the new data was overwriting the old when the display was running real time fill in when the display is manually frozen. However, when the display freezes, the cursor is at the latest character of the new data, so it is easy to tell where the new data begins.

From this initial position the cursor will not move into the old data. The cursor forms a boundary between the old and the most recent data: when it is moved to the left or up the old data is transferred to the CRT buffer. The old data can be viewed by scrolling back with the cursor or the B key.

While the CRT is frozen, you can see all of the 1920-byte CRT buffer contents. To display the beginning of the buffer, press the B key. The E key will display the end of the buffer. Intermediate positioning of the CRT window can be accomplished with the up or down cursor arrow. When the cursor reaches the top or bottom of the window, it pulls the next line of data onto the screen.

The right (or left) cursor arrow moves the cursor right (or left) until it "wraps around" to the beginning (or end) of the next (or preceding) line.

10.2.3 BINARY CHARACTER BREAKDOWN

At the right end of the top line (or top two lines in the case of dual-line display), the character (or characters) at the cursor location is broken down into its binary pattern and its source identified as DCE or DTE (Figures 10-3 and 10-1). You can obtain this binary breakdown of any character on the

screen by positioning the cursor on the character.

NOTE: The rightmost bit is the first serial bit received.

10.3 OTHER RUN MODE KEYS

HEX or CONTROL plus HEX can be used just as in real-time monitoring. CLEAR CRT, SELF TEST, PROGRAM SUMMARY, DATA, HALT, and the CAPTURE MEMORY keys also work in Freeze. For bit-oriented protocols (7E/X.25, BSC/X.25, SDLC, and SDLC/NRZI), some special key functions are available in Freeze Mode. These are discussed in Section 16.

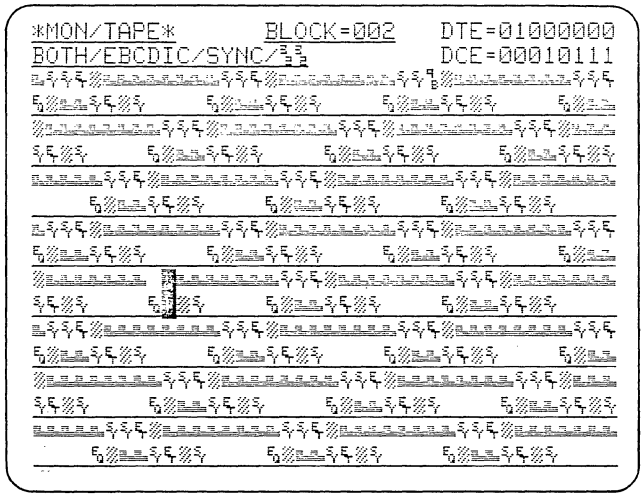


Figure 10-3

11 Basic Program Menus

11.1 ENTERING PARAMETERS

The INTERVIEW 4500's various program menus offer two categories of programming fields: selection fields and data-entry fields. In a selection field, you are offered a choice of entries and the current selection is displayed in low-intensity reverse image. Data-entry fields are displayed in bright reverse image to indicate that you may type in data directly from the keyboard. In Figure 11-1, for instance, the SOURCE line is a selection field, and the space after BLOCK is a data-entry field. The START AT line is actually a selection field containing a data-entry field, since you must choose between BLOCK number and CONT before you enter the block number.

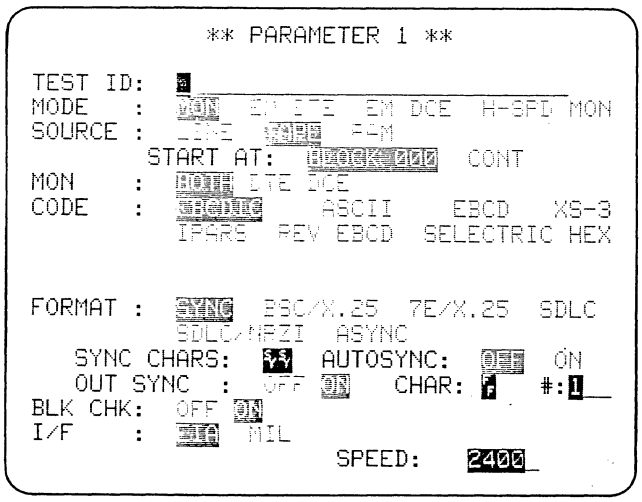


Figure 11-1

Selections are made by positioning the blinking, bright, reverse-image cursor. To move the cursor from one field to the next, without changing prior selections, press the red ENTER key. The cursor will move directly to the default or prior selection in the next field or to the first position in the case of a data-entry field. To move the cursor within a field, use the CURSOR arrows. Once you have made your selection, use ENTER to leave the field. The UP arrow will take you back to the preceding field if you have overshot your mark. See Section 5.2 for a complete description of cursor operation.

To correct a data entry, you may position the cursor on the error and write over it. (Backspacing changes selections but does not alter data entries.) Pressing CLEAR FIELD will clear the current data-entry field. SHIFT plus CLEAR FIELD will clear a data-entry field starting at the cursor position, and CONTROL plus CLEAR FIELD will clear an entire menu to default condition.

11.2 BASIC PROGRAM MENU: PARAMETERS 1

To select all the basic parameters necessary to monitor any variety of data or use any of the 4500's three interactive test modes, press the red PROGRAM key to enter Program Mode; then press the PARAMETERS key followed by

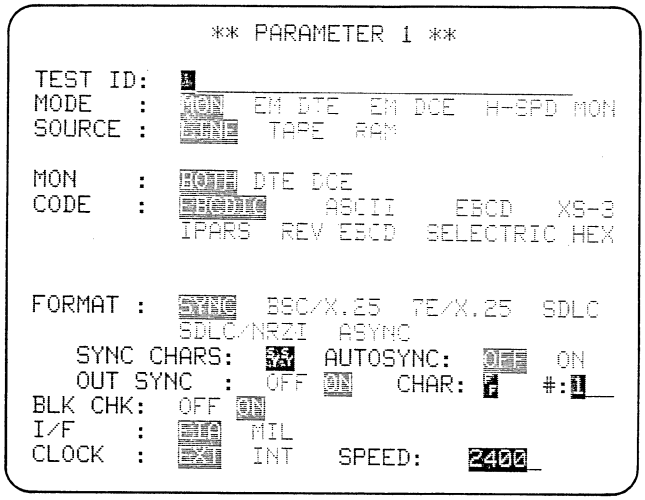


Figure 11-2

numeral 1. The display of Figure 11-2 will appear, but it will vary somewhat, depending on what program is already present. This is because the INTERVIEW 4500's program menus show you only pertinent selections. As you make your selections, some new possibilities may appear while unnecessary choices will be eliminated. You will neither have to make unnecessary decisions nor be allowed to neglect anything essential. Figure 11-2 shows the default menu.

11.2.1 LINE 1

The first line identifies the menu as Parameters 1.

11.2.2 LINE 2

The second line is normally blank. It is reserved for messages to the operator.

11.2.3 TEST ID (LINE 3)

A test identifier of up to 27 characters may be typed onto this line. All alpha, numeric, and control characters are valid in this data-entry field. When a saved program has been loaded from the tape, the ID of that program appears on Line 3. If data is being recorded, it is useful to use this line to identify the system or channel, date, time, and so on, so that this information is saved on the tape along with the program and data.

11.2.4 MODE (LINE 4)

On this line, you choose between MONITOR and two interactive EMULATE modes. If your 4500 has the high-speed memory option (RAM), a fourth choice, H-SPD MON, is also displayed. The following description assumes that for each mode the correct data connection has been made on the rear of the unit.

(a) Monitor. This is the passive mode. In Monitor Mode, the unit will receive data and perform extensive diagnostics on it. The circuit under test will not be interrupted. You may monitor and analyze data from the line or from the 4500's integral tape -- or from RAM if your unit has the high-speed memory option. In this mode, use the MONITOR data connector.

CAUTION: When either of the following two interactive modes is selected, a data line must be broken to enable testing.

(b) Emulate DTE. Make this selection for interactive testing of the DCE. Break the data line from DTE and connect it to the TO MODEM, EMULATE DTE connector on the 4500.

(c) Emulate DCE. This mode is for testing the DTE. Break the data line from DCE and connect it to the TO TERMINAL, EMULATE DCE connector.

(d) High-Speed Monitor. This choice appears only when the high-speed random-access memory (RAM) option is installed. It is intended for use at line data speeds above 19.2 kbps and up to 72 kbps. It cannot be used for tape or RAM playback. Always choose SINGLE-line display on the Parameters 2 menu. Dual-line display may not maintain time correlation between TD and RD at speeds above 19.2 kbps.

In this mode, trigger conditions are limited to looking for two data

conditions in each bank, chosen from Lines 4 through 6 of the Conditions menus: STRING and "1 OF." If a string of over eight characters is used, then only one trigger is valid in that bank.

Only two trigger actions are valid: CPT MEM and ALT BANK.

When full-duplex data is being monitored at 72 kbps, up to two triggers and two 8-character strings or two triggers and one 16-character string are available as conditions.

No received block check calculations are performed, so G, B, and A are not shown on the CRT. In 7E bit-oriented protocol formats, no 7E flags are displayed.

11.2.5 SOURCE (LINE 5)

This selection field determines the source of the data to be monitored or tested.

(a) LINE is the default selection. In Monitor Mode when LINE is selected, the INTERVIEW will monitor data received at one of the line interface connectors on the rear panel.

In Emulate DTE Mode when LINE is selected, the 4500 will transmit on TD and receive on RD. In Emulate DCE Mode, the 4500 will transmit on RD and receive on TD.

(b) TAPE allows data that has been recorded on tape to be displayed. If the interface control leads (see Section 11.5.5) have been recorded, the LEDs on the front panel indicate the status of the leads at the time the data was recorded. The three CAPTURE MEMORY keys on the lower right of the keyboard are now assigned to the TAPE. Selection of TAPE enables a number of other menu selections specific to the TAPE.

(c) RAM appears as a choice on the SOURCE line only if the high-speed random access memory option has been installed in the unit. When you select RAM, the data content of the RAM will be played back. The CAPTURE MEMORY keys on the lower right of the keyboard will now be assigned to the RAM. All the menu choices enabled by TAPE will also be enabled by RAM.

If EM DTE is selected and the SOURCE is TAPE or RAM, then the Capture Memory will play back on the RD lead and the 4500's transmitter, which is controlled by triggers, will be assigned to TD. If EM DCE is selected and the SOURCE is TAPE or RAM, then the Capture Memory will play back on the TD lead and the 4500's transmitter will be assigned to RD.

11.2.6 START AT (LINE 6)

This selection field only appears if the SOURCE selected is either TAPE or RAM (see Figure 11-3). It determines at what tape or RAM block the 4500 will begin to play back data.

> NOTE: Tapes should be preformatted; see Section 14 for a thorough discussion of tape operation and block numbering.

If BLOCK 000 is selected, the tape will rewind when RUN is pressed and start to play from the first block recorded on the tape. This is the default selection. The number of any other block may be entered as the

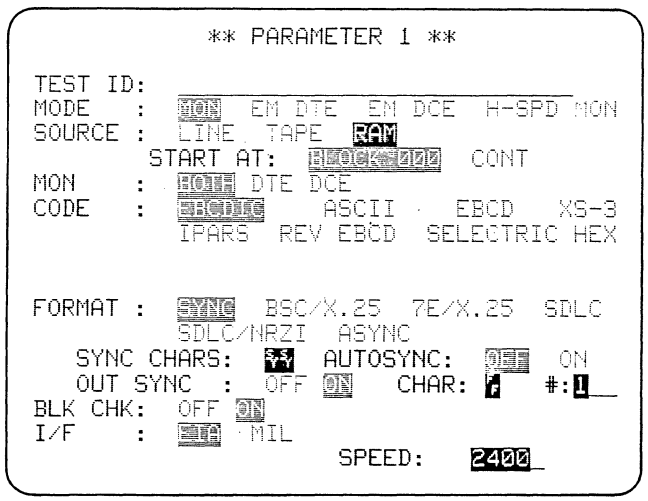


Figure 11-3

starting point. There are generally about 250 blocks on a tape. The RAM has 54 blocks.

CONTINUE allows playback to resume from the block that was being played before leaving the Run Mode. For example, if during playback at Block 015 you decide to change a program menu, you may press PROGRAM, make the desired changes, and select CONTINUE. When you return to Run Mode, playback will automatically continue from Block 015.

The START AT line can be used for RAM in the same fashion as for TAPE.

11.2.7 MONITOR (LINE 7)

You may choose to see the data originating at the Data Terminal Equipment (DTE), the Data Communication Equipment (DCE), or BOTH. The default selection is to display BOTH.

11.2.8 CODE SELECTIONS (LINES 8-11)

(a) Code (Lines 8 and 9). You have a choice of seven codes, namely, EBCDIC, ASCII, EBCD, XS-3, IPARS, REVerse EBCD, SELECTRIC, and HEX. The default code is EBCDIC. In the remaining fields, you will only be shown choices allowed for your CODE selection. Your code choice also determines the default selections for some of the remaining parameters. Tables 11-1 and 11-2 give details of the synchronization character translations and CRC calculations that result from each code choice.

The HEX selection permits the 4500 to be used to monitor codes not included in the menu choices. When HEX is selected the number of information bits, parity, and SYNC characters may

TABLE 11-1
PARAMETERS RESULTING FROM CODE SELECTIONS

	Default			Other Choices	
Code	Info. Bits	Parity	SY1 SY2 (hex)	Info. Bits	Parity
EBCDIC	(8)	(None)	32 32	--	----------
ASCII	7	Odd	16 16*	8	----------
				7	Even, Mark, Space, None
EBCD	(6)	Odd	3D 3D**	--	Even, Mark, Space, None
XS-3	(6)	Odd	35 35	--	----------
IPARS	(6)	(None)	3F 3E	--	----------
Rev. EBCD	(6)	Odd	1A 1A	--	Even, Mark, Space, None
Selectric	(6)	Odd	--	--	Even, Mark, Space, None
HEX	7	Odd	16 16	--	Even, Mark, Space, None
				8	----------
				6,5	Even, Mark, Space, None
Baudot†	(5)	(None)	--	--	----------

* Also applies to space parity and 8-bit ASCII. For even or mark parity ASCII, SY SY defaults to 96 96_{16}.

** Also applies to space parity EBCD. For even or mark parity EBCD, SY SY defaults to 7D $7D_{16}$.

† Baudot is available as an option.

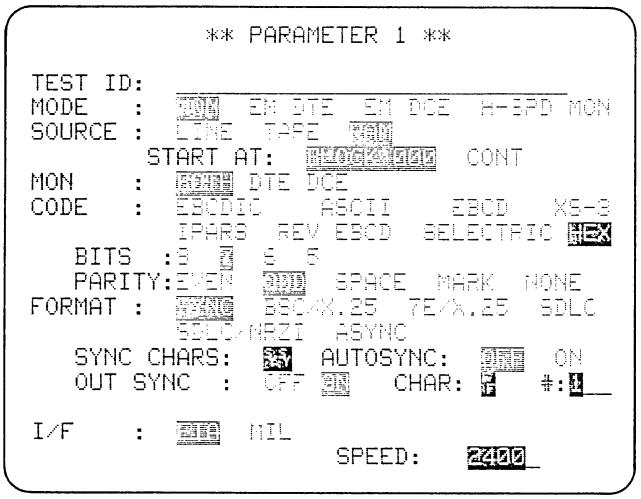


Figure 11-4

be operator-selected. (See Figure 11-4.) All data will be displayed in hexadecimal. Any data entry not made in hexadecimal, that is, entered without the HEX key, will be entered as the ASCII equivalent of the keyboard character.

(b) Bits (Line 10). The BITS field appears for codes having more than one possible number of information bits (Figure 11-5). Only the number of information bits is selected here: parity is not included. For the default CODE (EBCDIC), no selection is available and this field is not visible. For ASCII, the choices are 8 or 7 bits. The choices allowed and the default values for each code are presented in Table 11-1.

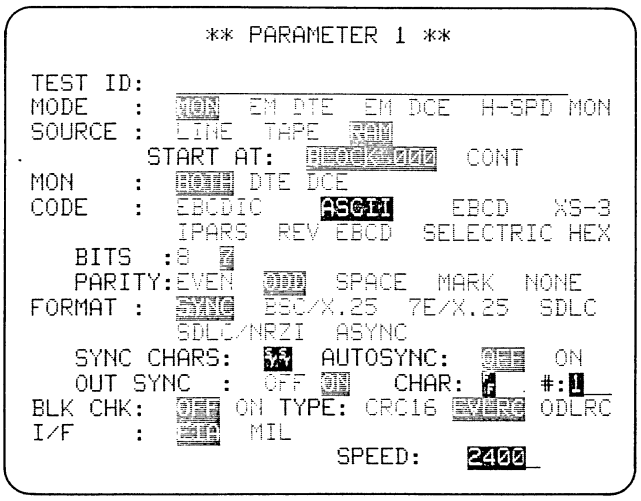


Figure 11-5

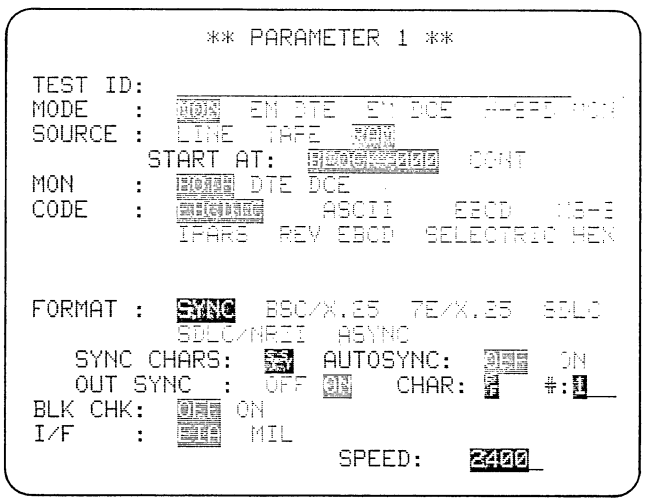


Figure 11-6

(c) Parity (Line 11). When you select a code that uses PARITY, this selection field (Figure 11-5) allows you to choose parity. The parity bit is additional to the data information bits. The parity bit can be tested and counted (Section 12.3.2) and parity errors can be enhanced (Section 11.4.3).

Notice that MARK or SPACE may be selected as the parity bit condition. Violations will then be considered as parity errors.

11.2.9 FORMAT SELECTIONS (LINES 12-15)

(a) Format (Lines 12 and 13). Essentially, the FORMAT selections on Lines 12 and 13 (Figures 11-6 to 11-9)

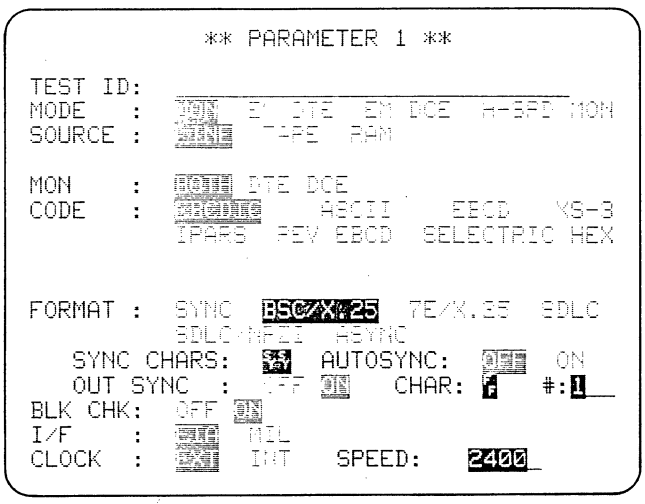


Figure 11-7

TABLE 11-2
INTERVIEW 4500 BLOCK CHECK CALCULATIONS

Code or Format	BCC	BCC Starts	BCC Resets on (Note 1)	Ignores (Strips from Calculations)	BCC Ends with	Aborts (No BCC)
EBCDIC	CRC-16: $X^{16} + X^{15} + X^2 + 1$	First bit after STX or SOH	---	SY	ETX, ETB, or ITB	ENQ (Note 2)
		First bit after DLE STX	---	DLE SY (Note 3)	DLE ETX, DLE ETB, or DLE ITB	DLE ENQ (Note 2)
ASCII	CRC-16: $X^{16} + X^{15} + X^2 + 1$ (Note 4)	First bit after STX or SOH	---	SY	ETX, ETB, or ITB	ENQ (Note 2)
		First bit after DLE STX	---	DLE SY (Note 3)	DLE ETX, DLE ETB, or DLE ITB	DLE ENQ (Note 2)
ASCII	LRC-8 or LRC-7	First bit after STX or SOH	---	SY	ETX, ETB, or ITB	ENQ (Note 2)
IPARS	CRC-6: $X^6 + X^5 + 1$	First bit after SY1 SY2	Next bit after CRC	---	EOM-PB, EOM-I, EOM-C, or EOM-U	---
BSC/X.25 (ASCII or EBCDIC)	CRC-16: $X^{16} + X^{15} + X^2 + 1$	First bit after DLE STX	---	DLE or DLE SY (Note 3)	DLE ETX, DLE ETB, or DLE ITB	DLE ENQ (Note 2)
7E/X.25 (ASCII or EBCDIC)	CRC-CITT: $X^{16} + X^{12} + X^5 + 1$	Address byte (included in calculation)	---	Inserted zeros	FCS (BCC included in calculation)	7 contiguous 1's
SDLC (ASCII or EBCDIC)	CRC-CITT: $X^{16} + X^{12} + X^5 + 1$	Address byte (included in calculation)	---	Inserted zeros	FCS (BCC included in calculation)	7 contiguous 1's
SDLC/NRZI (ASCII or EBCDIC)	CRC-CITT: $X^{16} + X^{12} + X^5 + 1$	Address byte (included in calculation)	---	Inserted zeros	FCS (BCC included in calculation)	7 contiguous 1's

(Continued)

TABLE 11-2 (Continued)

Code or Format	BCC	BCC Starts	BCC Resets on (Note 1)	Ignores (Strips from Calculations)	BCC Ends with	Aborts (No BCC)
EBCD(ASYNC), REV EBCD,or SELECTRIC						
Transmit	LRC (Note 5)	First text char.	EOT (Note 6)	# (bid char) at start of message	ETB	EOT
Receive	LRC (Note 7)	First text char. (Note 8)	EOT (Note 9)	---	ETB	EOT (Note 9)
XS-3	LRC	SOM	---	---	EOM (Not included in BCC)	---

Note 1: Calculations are reset whenever OUTSYNC or AUTOSYNC occurs.
Note 2: The 4500 does not display aborts except for 7E/X.25, SDLC, SDLC/NRZI.
Note 3: When DLE is followed by a non-SY char, the 4500 strips DLE; when DLE is followed by SY, both are stripped; when DLE is followed by DLE, the first DLE is stripped.
Note 4: ASCII CRC is selected on the BCC lines of the Parameters 1 menu.
Note 5: Parity bit of LRC = LRC of all parity bits in transmission.
Note 6: EOT resets LRC.
Note 7: LRC ignores parity bits.
Note 8: The bid character (#) at start of first transmission is not included in calculation, but thereafter all bid characters are included until an EOT is received.
Note 9: An EOT on one side of the line resets the other side of the line also.

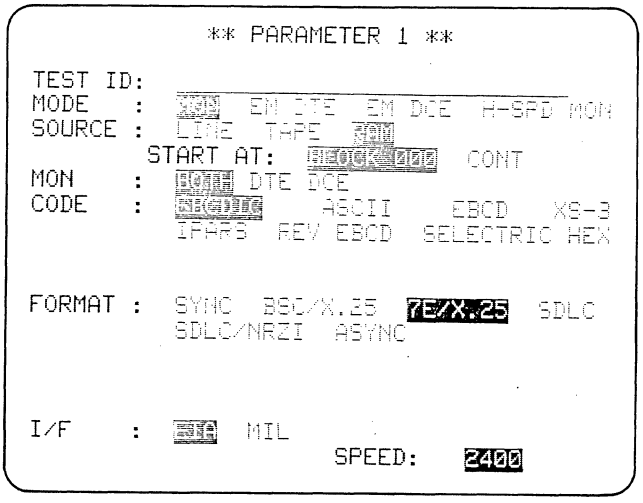


Figure 11-8

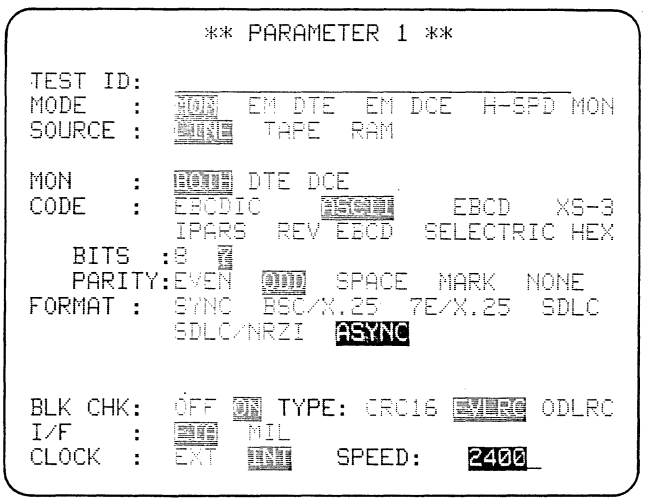


Figure 11-9

program the INTERVIEW correctly for your protocol, and determine what choices are allowed in the following fields. To simplify programming, you are not shown unnecessary choices that could result in an "illegal" setup or could mislead you.

SYNChronous operation is the default FORMAT selection (Figure 11-6). You may accept the standard synchronization pattern in the next field (Line 14), or enter any nonstandard characters you wish. SYNC also permits you to choose OUTSYNC and AUTOSYNC.

Choose BSC/X.25 for BISYNC-framed X.25 (Figure 11-7). You may change the SYNC CHARS if necessary. AUTOSYNC and OUTSYNC will be available. For BSC/X.25, the string search capabilities of the unit are enhanced to ignore inserted DLE and DLE SYN (see Section 16).

7E/X.25 selects Bit-Oriented Protocols with HDLC framing (that is, 7E Flags, zero insertion) and data packet transmission, such as X.25 and BDLC. In these protocols, the synchronization Flag pattern and the conditions for OUTSYNC are always defined, so these selection fields will not appear (Figure 11-8).

SDLC selects IBM's SDLC-SNA; SDLC/NRZI picks SDLC with NonReturn-to-Zero encoding. As for 7E/X.25, synchronization is defined by the protocol so no other format lines are presented.

ASYNC, or asynchronous start-stop data, requires no other selections than the source of clock (Figure 11-9). With EXTernal clock, ASYNC operation is isochronous.

(b) Synchronization Characters (Line 14). The SYNC CHARS data-entry field (see Figures 11-6 and 11-7) determines the synchronization pattern for synchronous data formats. The synchronization characters default to SY SY. In Run Mode, the code chart lookup is automatically performed: the proper SY character for the selected code is transmitted and (or) displayed in hexadecimal. The code chart lookup also obeys the parity selection; for example, the synchronization pattern in odd-parity ASCII is 16 16_{16} but for even-parity ASCII it is automatically converted to 96 96_{16}. (See Table 11-1 for the default values of SY.)

Any other one- or two-character sequence may be entered, using alphanumeric keys, control characters, or hexadecimal. If the characters are entered in hexadecimal, then the selected code chart and parity selection will be ignored and the hexadecimal value entered will be used.

To select a one-character synchronization pattern, position the cursor on the SYNC CHARS line, depress CLEAR FIELD, and enter the desired character.

In Run Mode, the characters that the 4500 uses to find synchronization will not be displayed. Thus if a two-character synchronization pattern is selected, the first two synchronization characters received will not be displayed.

(c) Autosync (Line 14). AUTOSYNC (see Figure 11-7) allows the INTERVIEW to recognize a synchronization pattern at any time even though the receiver logic may "think" it is already in synchronization. AUTOSYNC should only be used with a two-character synchronization pattern. When AUTOSYNC is enabled, the logic constantly tests for the two-character pattern on a bit-by-bit basis. When a match is found, it becomes the new reference point for character framing. AUTOSYNC thus eliminates the need to "bit shift" the data to find synchronization.

NOTE: The two characters may be displayed as "garbage" characters because the number of bits between transmissions may not be an exact multiple of a character, and the extra bits will cause the SYNC characters to be skewed and appear as garbage characters.

NOTE: It is possible to detect the synchronization pattern within a data block. If this happens while AUTOSYNC is enabled, then

the 4500 will resynchronize on this pattern and the rest of the block of data will be shifted.

AUTOSYNC is extremely useful where there is no particular end of message character (OUT SYNC), or where one block of data follows another by less than a full character interval. AUTOSYNC will detect the synchronization pattern even though it is skewed from the previous block and display the following data correctly.

NOTE: If AUTOSYNC is on, the second synchronization character will not be displayed when the synchronization pattern is found.

(d) Outsync (Line 15). OUTSYNC (see Figure 11-7) causes a receiver to go out of synchronization if it finds the entered character in the data stream. Any character may be entered in the CHAR field. The number field (#) allows you to specify how many times the character must occur consecutively (from one to 255 times) before OUTSYNC occurs. Default condition for OUTSYNC is one FF_{16}.

NOTE: A block check character may appear as FF_{16}, and in transparent text there is the possibility that a legitimate data FF_{16} will occur. In such cases, it may be necessary to change the number of OUTSYNC characters or to use a trigger condition to force the 4500 out of synchronization.

11.2.10 RECEIVED BLOCK CHECK (LINE 16)

For details of the rules used for block check calculations in the INTERVIEW 4500, see Table 11-2.

When BLOCK CHECK (Figure 11-9) is ON, the 4500 logic performs the appropriate block check calculation for the code and format chosen above on all received data. When a block check is Good, a low-intensity reverse-image G is displayed at the end of the block; for a Bad block check, a full-intensity reverse-image B is displayed. The default selection is ON.

A second field, TYPE, appears on this line only if ASCII has been selected (see Figure 11-9). The default choice is EVenLRC; CRC-16 and ODdLRC are the other choices.

For 7E/X.25, SDLC, and SDLC/NRZI, Received Block Check is always ON and the Block Check line is absent (Figure 11-8). In addition to G and B for good and bad blocks, a full-intensity reverse-image A indicates an Aborted block.

When Received Block Check is OFF, the block check characters received are displayed. However, no received block check calculations are performed in the unit except for BSC/X.25 FRAME protocol mnemonic display (see Section 16). The 4500 will still transmit block checks if this has been selected on the SET XMIT line of the trigger Conditions menu. Turning received Block Check off enables you to see the actual block check characters sent.

11.2.11 INTERFACE (LINE 17)

EIA is the default selection. In this mode, the unit operates in accordance with the RS-232/V.24 standard. Select MIL to invert the TD and RD data signals for MIL-188 operation.

11.2.12 CLOCK (LINE 18)

This selection field is always displayed in the 4500 (Figure 11-9). If clock is provided on the communication interface (RS-232/V.24 pins 15 and 17 or 24), EXTernal allows the INTERVIEW to use the external clock for the data receivers. The external clock must be a 1 x baud clock with the negative-going transition occurring at the middle of the data bit period.

For cases where such clock is not provided, INTernal selects the INTERVIEW's internal clock logic, which regenerates clock information from the data.

(a) Emulate DCE. When EMulate DCE has been selected on the Parameters 1 menu, selecting INT CLOCK causes the INTERVIEW 4500 to drive pins 15 and 17; if EXT CLOCK is selected, the 4500 loops pin 24 to pins 15 and 17.

(b) Emulate DTE. When EM DTE has been selected on the Parameters 1 menu, selecting INT CLOCK causes the 4500 to put clock on pin 24. EXT CLOCK causes the 4500 to drive pin 24 to mark.

(c) Capture Memory. In software versions before 10.08, the tape always runs off internal clock, even when EXTernal clock is selected. Therefore, to properly record data on tape you must enter the correct speed on Line 18 even when EXTernal CLOCK is selected.

In Version 10.08, clocking for the Capture Memory receivers is selected on the Record Control menu.

11.2.13 SPEED (LINE 18)

SPEED may be entered using up to five digits or four digits and a decimal point. The actual speed generated internally is determined by dividing the speed entered into 57,600. The result is rounded to the nearest integer and becomes the clock divider value. The true internal speed is equal to the clock divider value divided into 57,600.

When INTernal CLOCK has been selected, the correct speed of the system being monitored must be entered here for clock information to be regenerated from the line data.

NOTE: For Version 10.06, even if EXTernal clock has been selected, a speed must be entered for recording on tape.

When the tape or RAM is being replayed, the speed entered determines the speed at which the data will be played back. The maximum speed for tape playback is 9.6 kbps; the maximum for recording data on tape is 19.2 kbps if RS-232/V.24 lead status is not being recorded and 9.6 kbps when RS-232/V.24 status is being recorded.

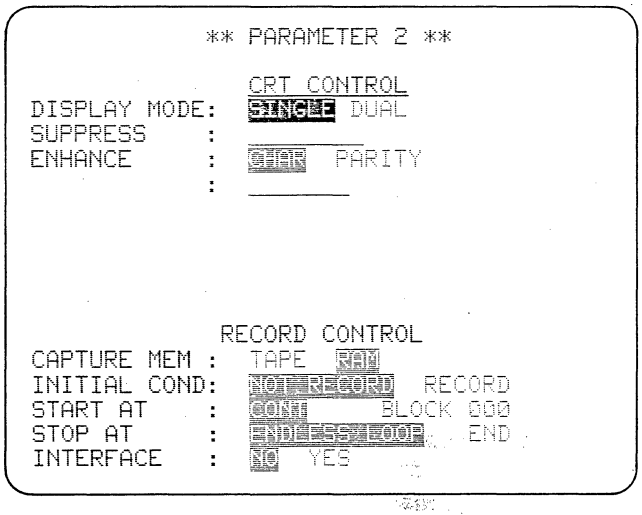


Figure 11-10 (Version 10.06)

11.3 PARAMETERS 2: CRT AND RECORD CONTROL

In Program Mode, press PARAMETERS, then 2, to display the two menus shown in Figure 11-10: CRT CONTROL (Section 11.4) and RECORD CONTROL (Section 11.5).

11.4 CRT CONTROL

11.4.1 DISPLAY MODE (LINE 4)

Four selections may appear here. To display data, you may select either SINGLE line or DUAL line (see Figure 11-10).

(a) Single-Line Display. SINGLE line is the default selection. If BOTH has been selected for MONitor on the Parameters 1 menu, DCE and DTE data are displayed alternately on the same line.

NOTE: Single Line must be used for H-SPD MON Mode.

(b) Dual-Line Display. DUAL line maintains time correlation between DCE and DTE data. Dual-line display is

used for viewing simultaneous FDX data, but it should only be used when required because the single-line display uses the CRT and buffer space more efficiently.

Dual-line display should not be used at data rates above 19.2 kbps. When dual line is used above 19.2 kbps, the unit may miss characters and may not maintain time correlation between TD and RD properly.

See Section 8.1 for descriptions of single-line and dual-line display.

(c) Frame or Packet Protocol Display. FRAME and PACKET appear as DISPLAY MODE selections (Figure 11-11) only when TAPE or RAM has been selected as SOURCE and BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI as FORMAT on the Parameters 1 menu. When you select FRAME or PACKET, data will not be displayed in Run Mode. Instead, you will see a sequential display of frame-control or packet-type mnemonic expansions (see Section 16 for examples and complete descriptions of these displays).

Notice that when FRAME or PACKET is selected, the SUPPRESS and ENHANCE fields disappear and two new fields are shown (see Sections 11.4.4 and 11.4.5).

FRAME. The Run Mode display will show the address, frame type, N(R) and N(S), and P/F bit value. Blocks will be identified as Good, Bad, or Aborted by reverse G, B, or A, respectively.

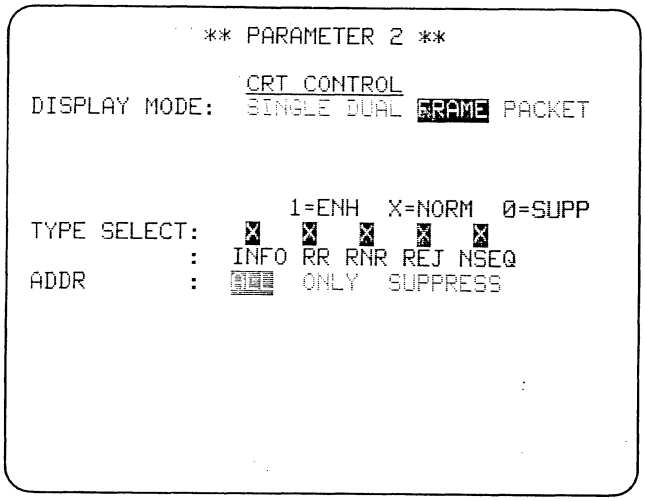


Figure 11-11

PACKET. You may select PACKET only if you have selected BSC/X.25 or 7E/X.25 FORMAT on the Parameters 1 menu. The Run Mode display will then show LCN (Logical Channel Number), packet-type mnemonic, P(R), and P(S). Q, D, and M will be displayed when they are ON. As in the case of the FRAME display, Good, Bad, or Aborted blocks will be identified.

11.4.2 SUPPRESS (LINE 5)

(a) Character List. For SINGLE or DUAL line display mode (see Figure 11-10), you may choose up to eight characters to be suppressed from the CRT display. They will not appear on the CRT or in the CRT buffer, which allows you to obtain a highly condensed, selective display. However, the suppressed characters will be received, considered by the triggers, included in counting and timing where applicable, and recorded if data is being recorded.

The characters to be suppressed can be entered directly from the keyboard and may include--

- Upper- and lower-case alpha characters and numerals
- Control characters
- Hexadecimal entries
- Flag bytes (in 7E/X.25, SDLC, and SDLC/NRZI modes)
- One Bit Mask
- All characters NOT EQUAL to a given character or bit mask.

(b) Flag Byte. The FLAG key must be used for the $7E_{16}$ Flag in X.25 and SDLC protocols. The logic will not read HEX, 7, E as a Flag; in an information frame, this will be interpreted as a data $7E_{16}$.

(c) Bit Mask. With the cursor on the SUPPRESS line, press the red BIT

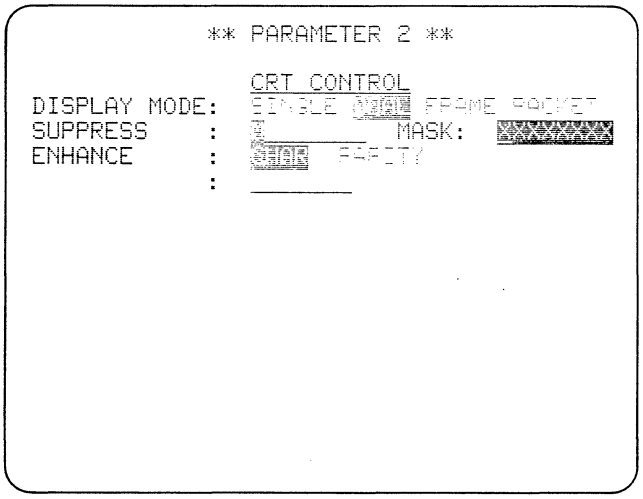


Figure 11-12

MASK key. At the cursor position a low-intensity M will be entered, and at the right end of the line, MASK followed by an eight-place data-entry field will appear (see Figure 11-12). The cursor will be at the first place in the field. Each X in the data-entry field represents one bit of an 8-bit character, with the low-order, first serial bit on the right. X's mean Don't Care. You may replace any of the X's with ones and (or) zeros. If, for instance, you enter 00 for bits 8 and 7, the pattern will now be 00XX XXXX. All characters having 00 for bits 8 and 7 will now be suppressed, as indicated by the low-intensity M in the list of suppressed characters (Figure 11-13). In EBCDIC all control characters have zeros for bits 7 and 8, so if the code selection were EBCDIC, all control characters would now be suppressed from the display.

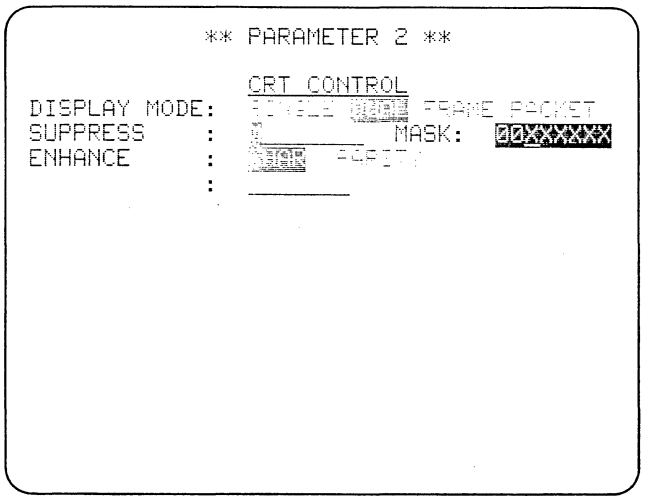


Figure 11-13

NOTE: A low-intensity character in a data-entry field always indicates that the character represents something other than itself.

To return to the SUPPRESS list, use ENTER. To get back to the MASK field, place the cursor on the mask position in the SUPPRESS list and press BIT MASK again.

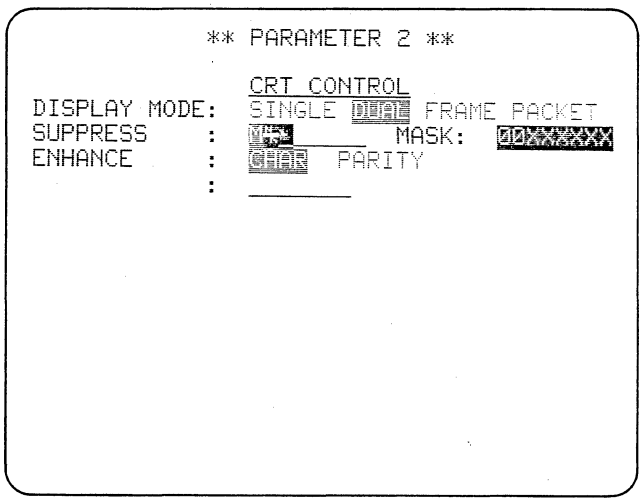


Figure 11-14

Changing the code selection does not affect the number of bits displayed in the mask. If you have selected a code with less than eight information bits, say five, use the five lower-order (rightmost) bits and ignore the three excess higher-order bits.

(d) Not Equal. You may suppress all characters not equal to any given character. To suppress all characters but NAKs for example, press NOT EQUAL, then CONTROL plus NAK. Figure 11-14 shows NK displayed in the SUPPRESS list with a horizontal bar through it to indicate "not equal."

To suppress everything but characters that fit a certain bit mask, press NOT EQUAL, then BIT MASK. All characters that do not fit whatever pattern you then enter for the bit mask will be suppressed, and the low-intensity M in the SUPPRESS list will have a horizontal bar through it.

11.4.3 ENHANCE (LINES 6 AND 7)

Enhanced characters will be displayed in blinking, bright, reverse image. If you select CHAR on the ENHANCE line, you may enter up to eight characters on the next line. Valid characters are the same as for SUPPRESS.

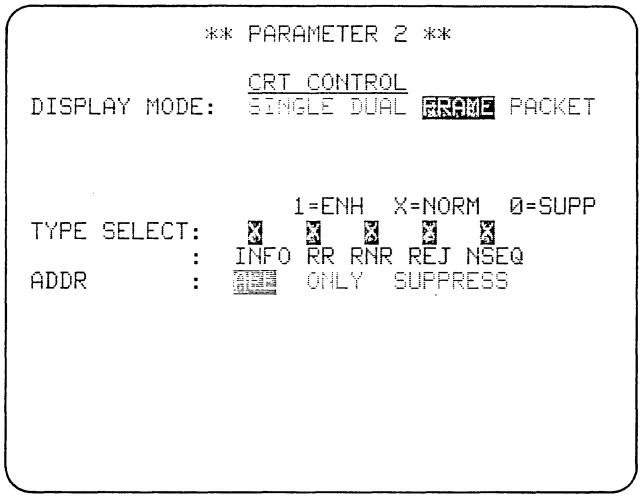


Figure 11-15

If you select ENHANCE PARITY, each character with a parity error will be displayed with a horizontal bar through it.

11.4.4 TYPE SELECT (LINES 8 AND 9)

This is a data entry field that appears upon selection of FRAME or PACKET. If FRAME is selected (Figure 11-15), this field includes INFO, RR, RNR, REJ, and NSEQ. If PACKET is selected (Figure 11-16), the list will be DATA, RR, RNR, REJ, and OTHER. The default condition is normal (X) video display of the expansions of the five selections. Enter 1's for any of the frame or packet types to display the selected frame or

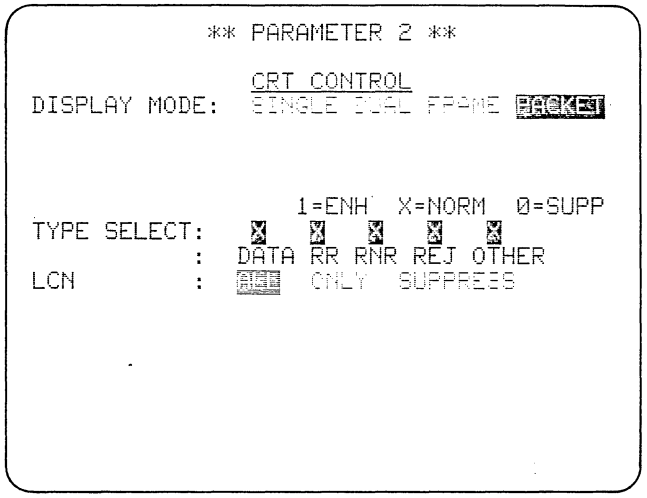


Figure 11-16

packet expansions in low-intensity reverse image. Enter 0's to suppress display of any selections.

11.4.5 ADDR/LCN (LINES 10 AND 11)

This selection also appears only when FRAME (Figure 11-15) or PACKET (Figure 11-16) is selected in the DISPLAY MODE field. There are two fields for this selection. The first line is a data selection field. For the default selection ALL, mnemonic expansions for all traffic are displayed. If you select ONLY, only the traffic for the address or LCN entered on the next line (Figure 11-17) will be displayed.

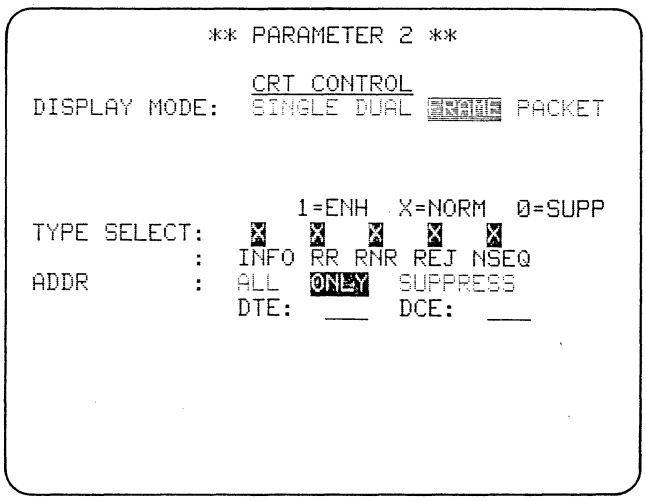


Figure 11-17

SUPPRESS prevents display of mnemonic expansions for the address or LCN entered on the next line.

On the next line, you may select either DTE or DCE or both by entering the address(es) or LCN number(s) in which you are interested. If you have selected FRAME on the DISPLAY MODE line above, enter the hexadecimal frame level address in the DTE or DCE entry field or in both. If you have selected PACKET above, enter the logical channel number, or numbers, in hexadecimal in the DTE or DCE entry field or in both (see Figure 11-18).

11.5 RECORD CONTROL

11.5.1 CAPTURE MEMORY (LINE 13)

This line (Figure 11-19) is present only if the high-speed memory (RAM) option has been installed in the unit. If TAPE is selected, all selections under RECORD CONTROL apply to the 4500's integral tape; if RAM, they apply to the high-speed memory. Block numbering of both tape and RAM is the same.

NOTE: All tapes should be preformatted before use. (See Section 14 for a complete discussion of tape block numbering and tape operation.)

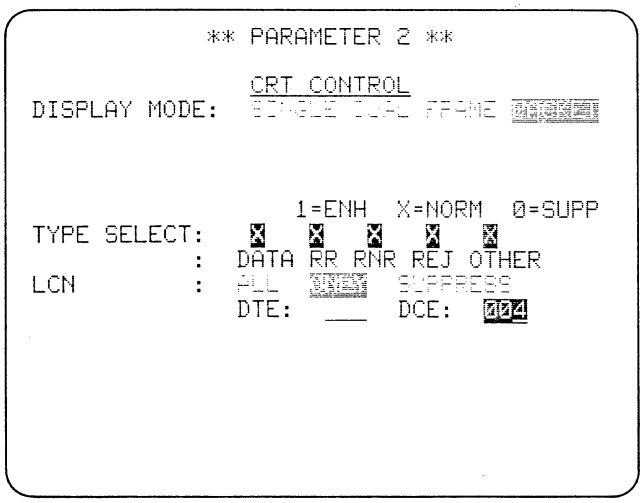


Figure 11-18

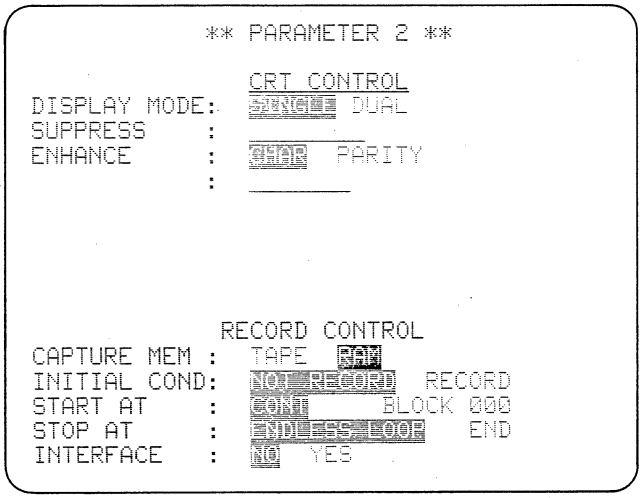


Figure 11-19 (Version 10.06)

11.5.2 INITIAL CONDITION (LINE 14)

This line is entitled INITIAL CONDition because, whether NOT RECORD or RECORD is selected, this condition may be altered by the SET CAPTURE MEMORY selection on a trigger menu.

The default selection is NOT RECORD. If you wish the 4500 to record automatically whenever it enters Run Mode, select RECORD here.

11.5.3 START AT (LINE 15)

START AT selections are analogous to those for playback on the Parameters 1 menu.

Whether recording begins under trigger or manual control, if CONTINUE is selected recording will begin after the last block previously recorded.

When BLOCK=000 is selected, recording begins at the first block, whether or not this entails writing over previously recorded data. You may also choose to start recording at any other specified block by entering the

block number over the 000. Thus you may avoid writing over old data altogether, or you may choose to write over any number of blocks of old data.

11.5.4 STOP AT (LINE 16)

STOP AT offers the choice between beginning again at Block 000 when the tape, or RAM, is full, thus writing over previously recorded data (ENDLESS LOOP), or stopping at the last block (END).

11.5.5 INTERFACE (LINE 17)

This selection is only valid for tape; the RAM will not record interface status. When INTERFACE:YES is selected, the status of six RS-232/V.24 leads (RTS, CTS, DSR, RLSD, DTR, RI), the user-assigned lead--if it has been strapped to an EIA lead--and the ENTER key (marker) is automatically recorded. When the recorded data is played back, the status of these leads is then shown on the EIA indicator panel.

11.5.6 CLOCK (LINE 17)

This selection is only present for Software Version 10.08 (see Figure 11-20). In this version, both tape and RAM will run off either internal or external clock. CLOCK on this menu applies only to the Capture Memory receivers and is completely independent of the Clock selection on the Parameters 1 menu, which is for the data receivers.

For recording off internal clock, be sure to enter the correct SPEED on the Parameters 1 menu.

NOTE: In Software Version 10.06, the tape always runs on internal clock, although the RAM will run off either internal or external clock.

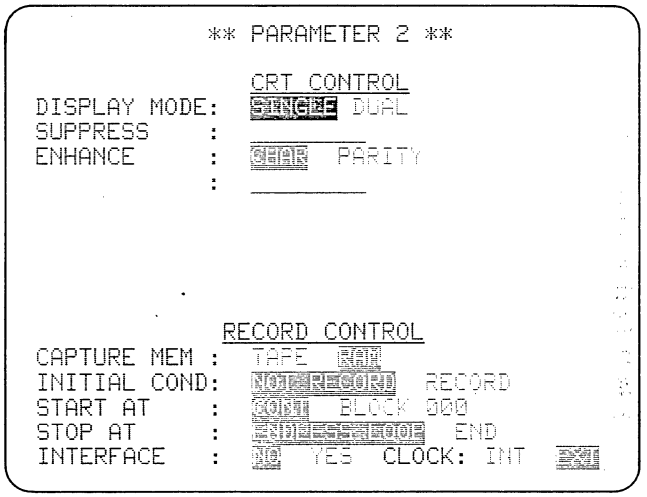


Figure 11-20 (Version 10.08)

12 Triggers

The INTERVIEW 4500 employs the simple, nonsequential programming concept of Triggers: You specify what condition or combination of conditions you wish a trigger to look for, and what action or actions you wish it to take. The triggers in the 4500 are extremely powerful analytic tools not only because of the number of conditions and actions available, but also because there are 16 triggers and they can be linked.

12.1 SELECTING TRIGGER MENUS

The 16 triggers are designated by the hexadecimal numbers 0 through F. There are two menus for each trigger; an Actions menu and a Conditions menu.

To view the trigger Conditions menu of, say, Trigger 0, press the red TRIGGER key, the number 0, and C in succession. This will give the display of Figure 12-1. To view the Trigger Actions menu of Trigger 0, press TRIGGER, 0, and A. The display will appear as in Figure 12-2.

While any trigger Actions menu is displayed, you may see the Conditions menu for that trigger by pressing the CONTROL and ENTER keys simultaneously. While the Conditions menu is displayed, CONTROL plus ENTER returns the Actions menu.

The 16 triggers are divided into two banks of eight, as may be seen from the Trigger Summary. To obtain the Trigger Summary, press the TRIGGER key.

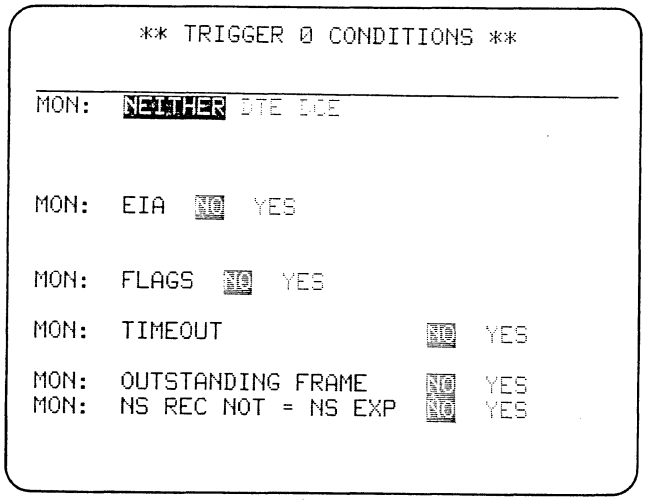


Figure 12-1

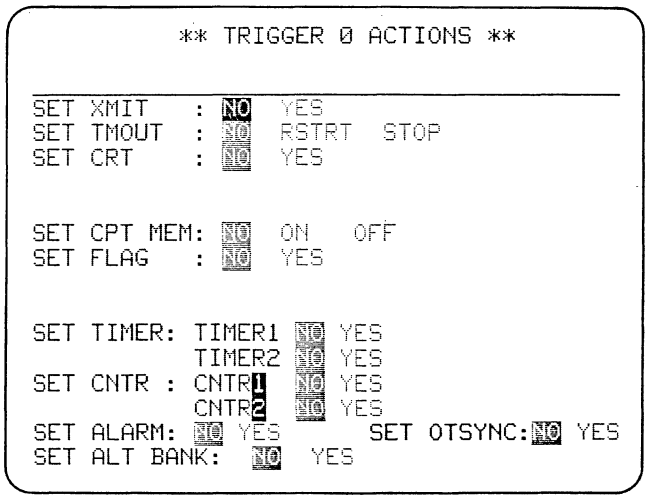


Figure 12-2

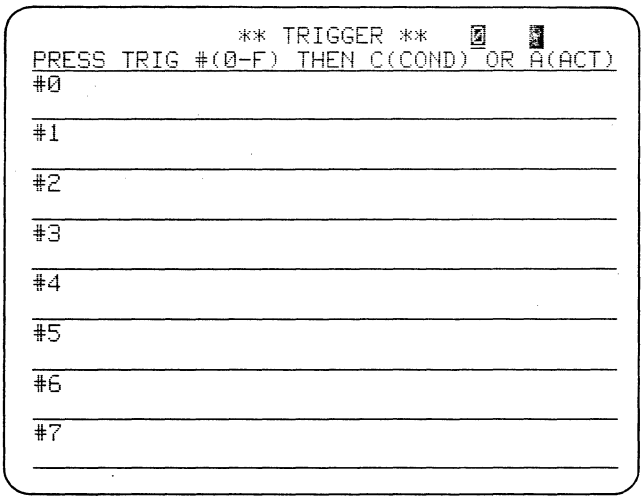


Figure 12-3

This immediately displays the summary of the first bank of eight triggers--Triggers 0 through 7 (see Figure 12-3). Then, to see the second bank of eight, Triggers 8 through F (Figure 12-4), press the UP or DOWN cursor arrow. The UP or DOWN cursor arrow will return the first bank to the screen. (The Trigger Summary will be discussed in Section 12.5, after you have become familiar with trigger Actions and Conditions.)

While either bank of the Trigger Summary is displayed, you may select the Conditions or Actions menu for any trigger. First, enter the trigger number. The number you have selected is always displayed on the first line of the summary after the heading TRIGGER (see Figures 12-3 and 12-4). The default number is the first trigger in the bank. If you select a trigger number that is on the other bank of the summary, the other bank will automatically be displayed. Then you may press the C or the A key to display the desired Conditions or Actions menu. To see the Trigger Summary again, press TRIGGER. The display will return to the summary of the current bank.

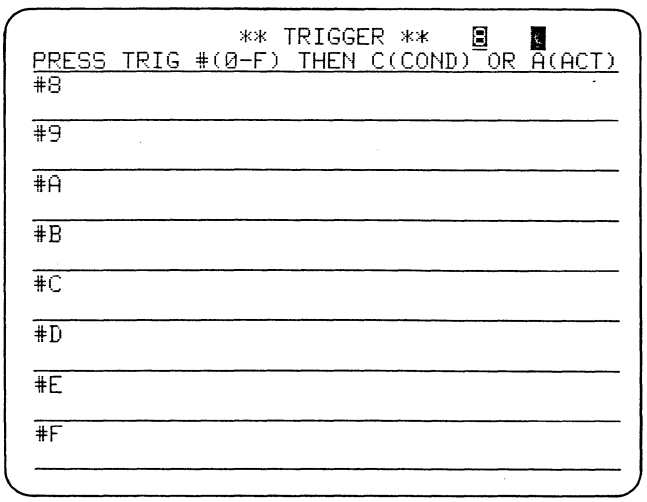


Figure 12-4

12.2 ALTERNATE BANKS

Functionally, as well as on the summary, triggers are grouped in two banks of 0 through 7 and 8 through F. Only one bank of triggers is active at any time, so you can divide a program into two segments. When the 4500 enters Run Mode, the low bank is initially active. Later in this section, you will see how to activate the second, or high, bank by selecting ALT BANK on an Actions menu.

12.3 SELECTING TRIGGER CONDITIONS

Each of the 16 triggers may look for any or all of seven conditions: specific characters or combinations of characters from either the DCE (RD) or DTE (TD), RS-232/V.24 lead status, status of eight internal flags, timeout of a special timer, completion of a transmission by the 4500, outstanding frame, and discrepancies in frame counts. For some Parameters 1 configurations, not all of these selections will be valid, and the invalid choices will not be displayed.

For a trigger to take action, all conditions selected must be true.

Figure 12-5 shows the Trigger 0 Conditions menu for the default Parameters 1 menu; Figure 12-6 shows the same menu for Emulate Mode and 7E/X.25 format. The second and third lines are reserved for a summary of the Trigger 0 actions that have been selected.

Similarly, the Actions menu includes a summary of the Conditions menu selections. After you are thoroughly familiar with the two trigger menus, you should look at the explanations of these two summaries in Sections 12.6 and 12.7.

12.3.1 MONITOR (LINE 4)

If you select NEITHER, data will not be used as a Trigger condition. If you select DTE, then TD (Pin 2) will be monitored for one of the conditions that is now displayed on Line 5 (Figure 12-7). Similarly, when you select DCE, RD (Pin 3) will be monitored for one of the conditions on Line 5. In the Emulate Modes, it is possible to search

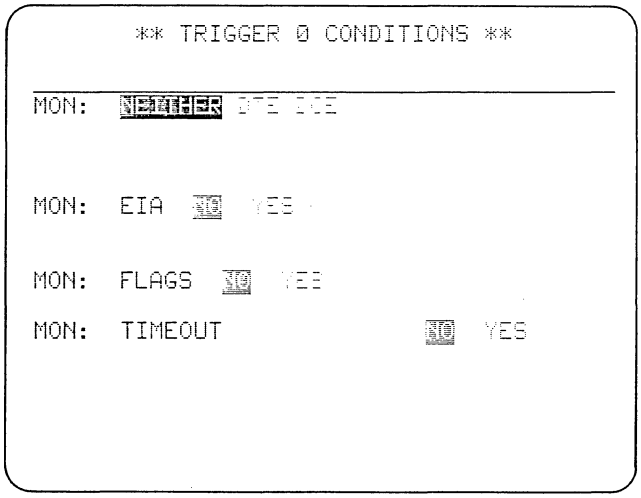


Figure 12-5

for data in your own transmission as well as on the other line.

12.3.2 FOR (LINE 5)

The selection field shown in Figure 12-7 is available on this line when either DTE or DCE has been selected on the preceding line. When the RAM option is installed and H-SPD MON is selected, these are the only trigger conditions that can be used.

(a) String. The default selection is STRG, which allows you to enter a string of up to 16 characters on the following line. The entire, exact

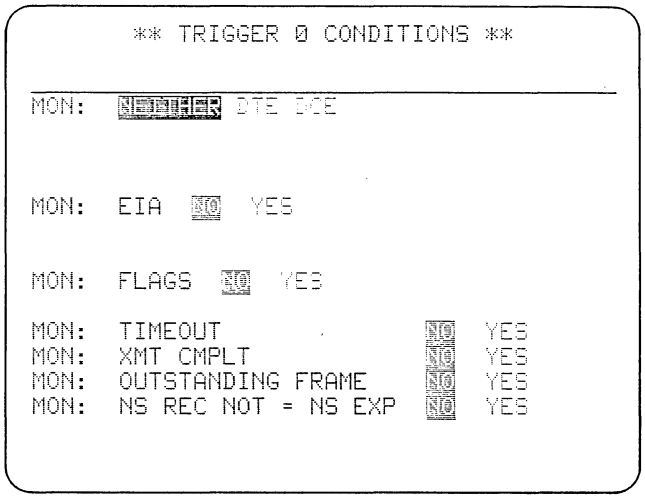


Figure 12-6

sequence of characters entered must be received for the condition to be true.

(b) "One of" Character. When "1 OF" is selected, the trigger looks for any one of the characters in the list of up to 16 characters entered in the next field.

(c) Parity Error. PARER selects PARity ERror as a trigger condition. The logic automatically computes parity in accordance with your selections under CODE on the Parameters 1 menu.

(d) Good or Bad Block Check. GDBCC (GooD Block Check Character) and

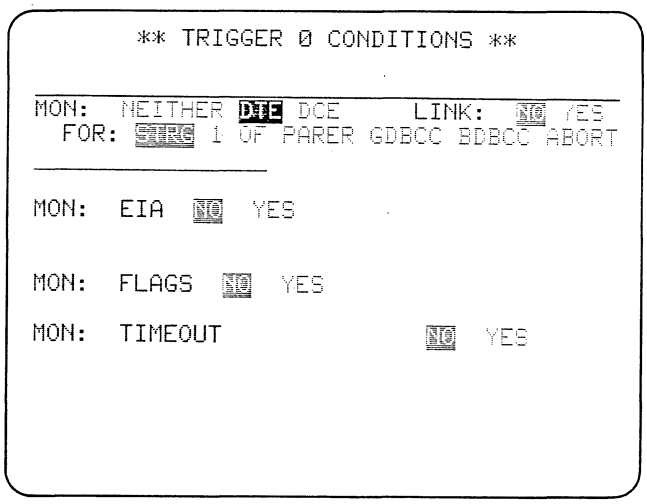


Figure 12-7

BDBCC (BaD Block Check Character) cannot be used as conditions unless Received Block Check is on in the unit (Parameters 1; see Section 11.2.10). Select GDBCC or BDBCC when you want the trigger to take action on receipt of the BCC. The 4500 does the appropriate type of block check calculation for the protocol entered on the Parameters 1 menu and compares it with the received block check characters. (See Table 11-2 for the block check calculations done by the INTERVIEW 4500.)

(e) Aborted Block. When 7E/X.25, SDLC, or SDLC/NRZI has been selected for FORMAT on the Parameters 1 menu, you can choose ABORT as a trigger condition.

In 7E/X.25, seven consecutive 1's always constitute an ABORT. In SDLC or SDLC/NRZI, an ABORT can be received only during a frame, never during idle time. (See Table 11-2 for INTERVIEW 4500 Abort definitions.)

12.3.3 CHARACTER-ENTRY FIELD (LINE 6)

This field appears only if STRG or 1 OF has been selected on Line 5. It is the data-entry line for a character string, if STRG has been selected, or for a character list, if 1 OF has been selected. Up to 16 characters may be entered.

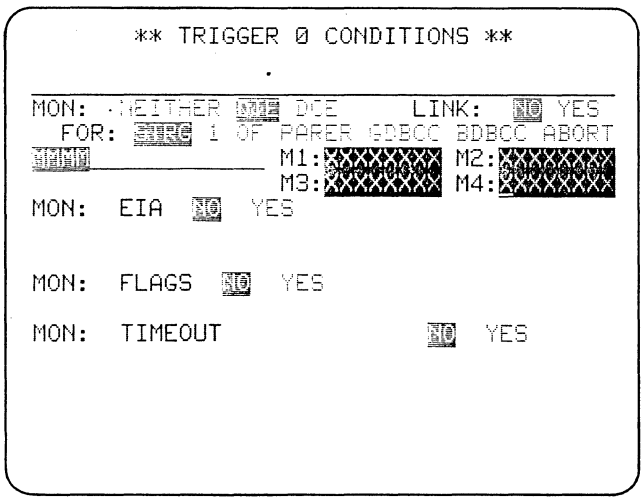


Figure 12-8

(a) String Entry. The 16 characters allowed in the string may include any of the following in any order or number:

- All upper- and lower-case alpha characters and numerals on the keyboard.
- All control character mnemonics on the keyboard.
- Two-digit hexadecimal entries. These are entered by pressing the red HEX key followed by two blue alphanumeric keys in succession. Characters entered in hexadecimal are not translated and parity is not calculated for them.
- Flags. You must use CONTROL plus the FLAG key to enter the $7E_{16}$ Flag byte used in bit-oriented protocols. The logic will not read the key sequence HEX, 7, E as a Flag.
- Not Equal entries (explained in Section 11.4.2). When a character key is preceded by the NOT EQUAL key, all characters not equal to that character will satisfy that position in the string.
- Don't Care entries. The DON'T CARE key permits any character received in that position in the string to satisfy the condition.
- Four Bit Masks (Bit Masks are introduced in Section 11.4.2).

To enter a Bit Mask, use the BIT MASK key at the desired location in the string. Each time you press BIT MASK, a new mask field appears to the right of the string-entry field until you have used the maximum of four masks. The mask fields are numbered M1 through M4, to denote the order in which they appear in the string (Figure 12-8).

If you have used, for example, Bit Masks 1 and 2 at positions 5 and 8 of a string (as in Figure 12-9), you may decide to change the character at position 1 to a bit mask: Return the cursor to position 1 of the string and press BIT MASK. The character at position 1 will be overwritten with the low-intensity M, the two prior bit

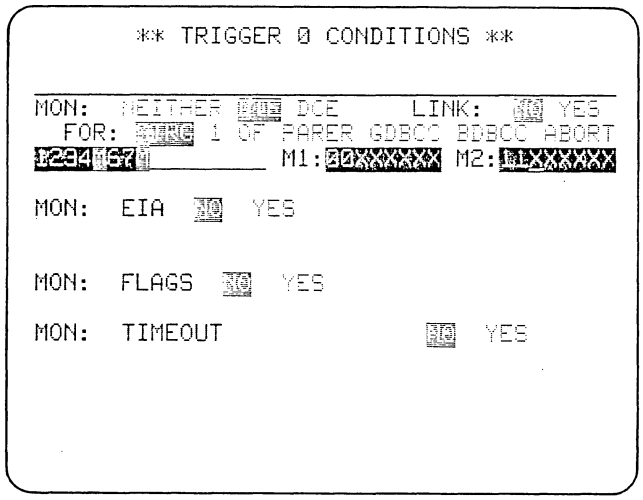


Figure 12-9

masks will be renumbered to 2 and 3, and their menu location shifted to make room for the new Bit Mask 1. The cursor will be at Bit 8 on the new mask. (Compare Figure 12-9 with Figure 12-10.)

In transparent BISYNC protocols, the communications equipment may insert characters in the data: DLE or DLE SYNC, for example. Most testing devices cannot find a string with inserted DLEs. The INTERVIEW 4500, however, does not see inserted DLE and DLE SYNC in string searches if BSC/X.25 has been selected on the Parameters 1 menu, even though it does display and record them.

> NOTE: In BSC/X.25, once the 4500 has seen a DLE STX, it will ignore the first DLE in a sequence. This enables the 4500 to ignore inserted DLE and DLE SYN. In this protocol the end-of-frame sequence is DLE ETX. The 4500 will not detect DLE ETX since it will ignore the DLE. To find an end-of-frame sequence in BSC/X.25, use the string ETX DC DC FF_{16}.

(b) "1 OF" Character Entry. Up to 16 characters may be entered from the same list as for strings. The trigger will take action upon receipt of the first character to match any one in the list. If Don't Care is used, only one character should be entered. If all characters are entered as Not Equal, a match is found on each character that is not any one of the characters entered.

12.3.4 LINK (LINE 4)

Triggers can be linked to increase the length of the string that a trigger will look for and the number of bit masks in a string, and to include BCC or "1 OF" characters in the string.

When you select YES in the LINK field, the following trigger in numerical sequence is linked to the present trigger. If you wish, you may link all eight triggers in a bank in succession, but you cannot link a trigger in one bank to one in another bank. The default selection is LINK:NO.

(a) Bit Masks in Linked Strings. When a trigger is LINKed, 16 more character positions including four more bit masks may be added to the string by entering them on the next trigger. To enter a fifth Bit Mask at the end of a string--whether or not you have filled all 16 positions--select the Conditions menu for the linked trigger; that is, the next trigger in numerical order. Enter a bit mask at the first string position. Fill in the bit mask field and press the ENTER key to return to

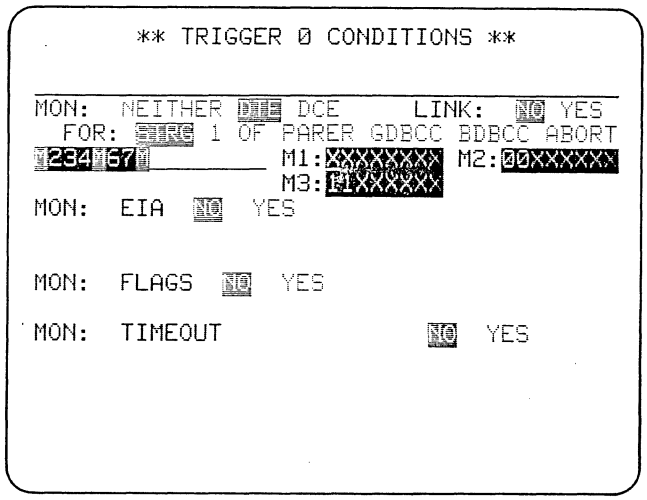


Figure 12-10

the string-entry line on the linked trigger. Complete your string there. The software will ignore any empty positions at the end of the string-entry line of the preceding trigger and add the linked string directly to the last character on the preceding menu. To return to the previous trigger, press TRIGGER followed by its number and C.

(b) Strings of More than 16 Characters. If you wish to enter a string of more than 16 characters, when the string is full simply select LINK and then the next trigger Conditions menu, and use the string capacity of the linked trigger.

(c) "1 OF" Character in Linked String. At any position in a linked string, you can insert a character that is one of a list of characters by linking the next trigger and selecting 1 OF on its Conditions menu. The trigger will look for the first character satisfying the character list at that position in the string. To add any more characters to the string after a "1 OF" character, you must link another trigger.

(d) Block Check Characters in Linked Strings. A good or bad block check character (GDBCC or BDBCC) may be used only as the first character in a linked string. It will be the only string character on the Conditions menu; succeeding characters must be entered on the next linked trigger.

(e) Linked Trigger Actions. When triggers are linked, actions are taken in stepwise, cumulative fashion, as shown in Figure 12-11. If Triggers 0, 1, and 2 are linked, then Trigger 0 actions will occur as soon as Trigger 0 is true; Trigger 1 actions will occur when Triggers 0 and 1 conditions are true, and Trigger 2 actions will occur only when Triggers 0, 1, and 2 conditions are true. Thus you may select actions on any linked trigger, but only those on the last linked trigger will result from the trigger seeing the entire string.

(f) Other Conditions on Linked Triggers. You may include other trigger conditions (EIA status, internal flag status, and so on) on any linked trigger. These other conditions will be tested when the string segment accumulated through that trigger comes true (see Figure 12-11).

12.3.5 EIA (LINE 8)

Select YES in the EIA field if you want a trigger to monitor status of the

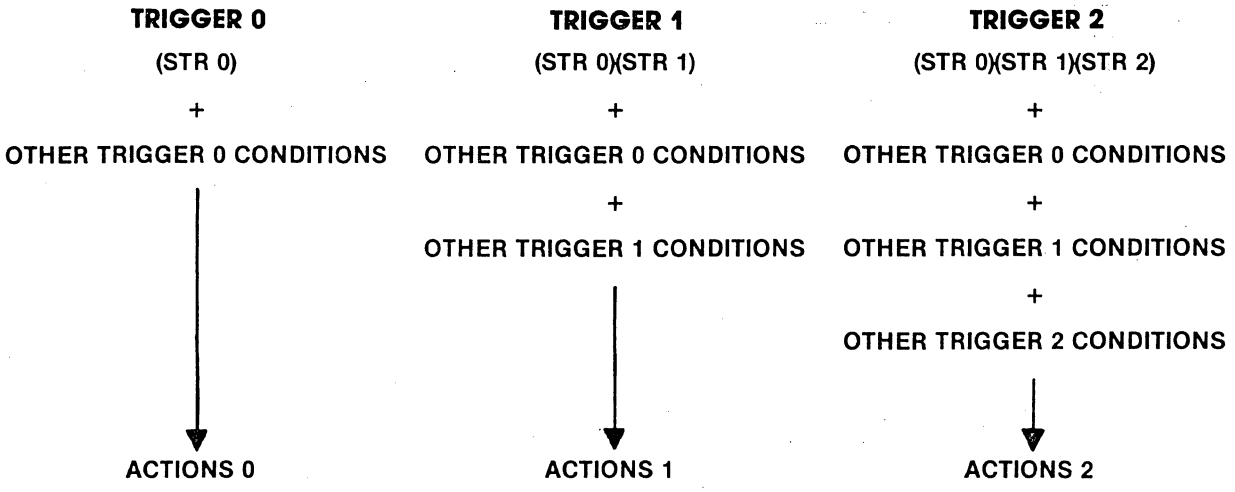


Figure 12-11 Linked Triggers

RS-232/V.24 leads or to look for a Marker (see Figure 12-12). The trigger will look for the specific pattern of ON and OFF voltages--as defined by the RS-232/V.24 standard--and Marker that you select in the next field.

(a) RS-232/V.24 Leads. In Line 10, enter a 1 in the box under a lead to indicate ON; a 0 for OFF. No entry is read as Don't Care. Entry fields are provided for six leads: RTS (Pin 4), CTS (Pin 5), DSR (Pin 6), DTR (Pin 20), RLSD (Pin 8), and RI (Pin 22).

You may monitor a seventh RS-232/V.24 lead by strapping the desired lead and selecting STraP on the menu. See Section 17.3.2 for strapping instructions.

(b) Marker; Manual Program Control. When you select MKR, the trigger will sense the status of the ENTER key. This effectively gives you manual control of trigger actions, for the conditions will not be true until you press (or release) the ENTER key in Run Mode.

12.3.6 FLAGS (LINE 11)

There are eight internal flags in the INTERVIEW 4500 and they all may be monitored by one trigger, or all set by one trigger, or monitored and set by any combination of triggers. All flags are set to 0 when the 4500 enters Run Mode or if the RUN key is pressed when the unit is already in Run Mode. To test internal flags, select YES in the FLAGS field (see Figure 12-13). In the flag mask on the next line, enter a 1 to test for a flag ON, a 0 to test for a flag OFF, or X for Don't Care.

If a FLAG condition is used with a string or character-type condition, then the flag is tested when the entire string has come true. The flag condition is not tested on each character of the string.

12.3.7 TIMEOUT (LINE 13)

When TIMEOUT YES is selected, the trigger looks for the timeout set by another trigger to occur (see Section 12.4.2). The default selection is NO.

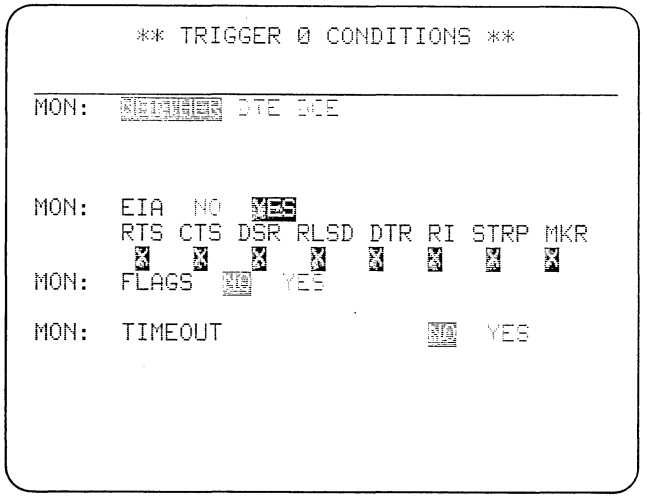


Figure 12-12

12.3.8 TRANSMISSION COMPLETE (LINE 14)

The XMT CMPLT field (Figure 12-14) appears only if you have selected one of the Emulate Modes on the Parameters 1 menu. The default choice is OFF. When YES is selected the trigger looks for the end of a transmission by the 4500. The XMIT CMPLT condition usually should be used with another condition to control when, or how many times, it will be tested.

A transmission is defined as all messages (excluding Prompts) entered in

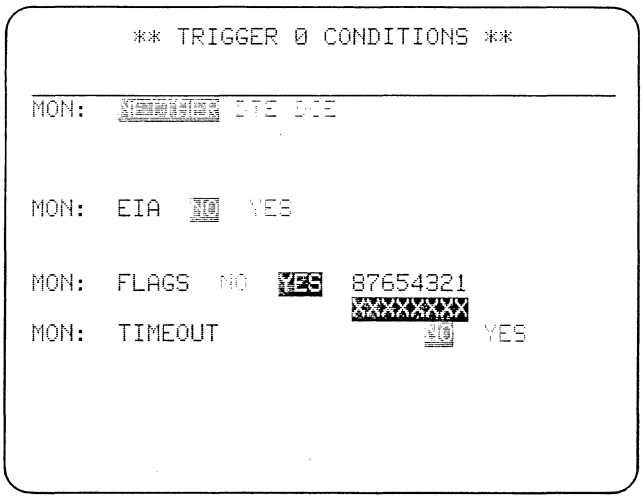


Figure 12-13

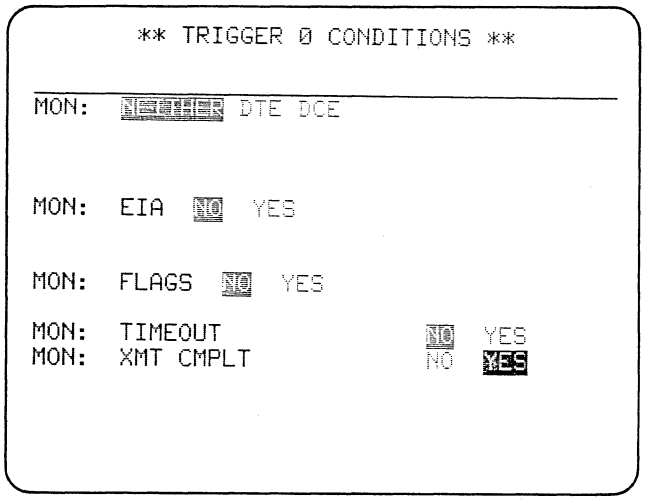


Figure 12-14

the SET XMIT field of a Trigger. End of Transmission usually is the last character in the last message entered in the SET XMIT field if Block Check (Parameters 1) is not on, or the second Block Check Character if Block Check is on. However, in Switched carrier and Multidrop modes (Parameters 4; Section 13.3) a transmission is not considered complete until all of the interface handshaking is complete.

12.3.9 OUTSTANDING FRAME (LINE 15)

This selection (Figure 12-15) only appears if BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI has been selected on the Parameters 1 menu. The default choice is NO. Select YES if you want a trigger action whenever there is an outstanding frame.

When an information frame is transmitted in HDLC or SDLC mode, the internal outstanding frame flag is set until that frame is acknowledged. Once the frame is acknowledged the outstanding frame flag is reset. OUTSTANDING FRAME must be used with another condition that selects WHEN it is to be tested--usually a string search or timeout. For instance, you could set a timeout to start when a frame is transmitted, and set a trigger to resend the frame if there is an outstanding receive frame at timeout.

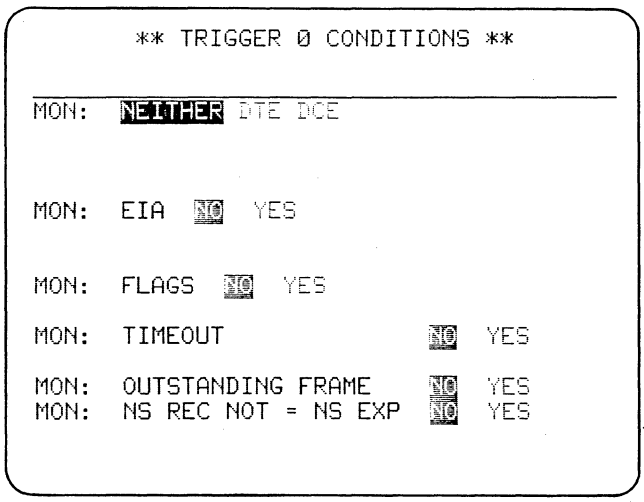


Figure 12-15

12.3.10 NS REC NOT = NS EXP (LINE 16)

This condition (Figure 12-15) appears only for BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI. It is true when the Number Sent Count Received does not equal the Number Sent Count Expected. The default choice is NO.

In X.25 and SDLC modes, the Received NS count is constantly being monitored. The NS count should always increment by 1. If the Received NS count sequence is, for example, 0, 1, 2, 4, 5, then this trigger condition will come true when the frame with NS = 4 is received. This condition can be used to send a REJ frame.

NOTE: A block is not considered received until the entire frame is received with a good BCC. Thus, if the Received NS count sequence is 0, 1, 2, 3, 4, but frame 2 is received with a bad BCC, this condition will come true when frame 3 is received with a good BCC.

12.4 SELECTING TRIGGER ACTIONS

REMINDER: To go to the Actions menu of a trigger while its Conditions menu is displayed, press CONTROL plus ENTER.

Figure 12-16 is a trigger Actions menu as it appears for default parameters; Figure 12-17 shows the same menu with all actions displayed.

Any combination of trigger Actions may be set to take effect when all conditions selected for that trigger are true. More than one trigger has access to the same action. For example, a counter may be used to count characters from DTE on one trigger, and to count characters from DCE on another trigger, to obtain the total number of characters in both directions.

When you select YES for a trigger action, the action criteria are presented. If you then select NO, the criteria you have selected will disappear from the display, but will remain dormant in the unit. When the program is recorded, the dormant choices will also be saved on the tape for future use. These choices will reappear if YES is again selected. They can be cleared, and the entire trigger returned to the default (OFF) state, by CONTROL plus CLEAR FIELD.

At data speeds up to 9600 bps, all trigger actions occur within the next received character time. As the speed is increased up to 72 kbps, the number and complexity of triggers that can be used is reduced. Trigger efficiency is also influenced by the type of data. Trigger timing and sequencing are discussed in detail in Section 12.10.

The second and third lines of each trigger Actions menu are a summary of the selections on the Trigger Conditions menu. This summary will be explained in Section 12.7.

12.4.1 SET TRANSMIT (LINE 4)

When you have selected Monitor Mode on the Parameters 1 menu, you may use SET XMIT to send one PROMPT per trigger. When you have selected one of the Emulate Modes, you will use this line to designate which messages you want the trigger to send, and you also may include one Prompt in the message list. For the default selection, NO, the remainder of this line is blank.

```
** TRIGGER 0 ACTIONS **

SET XMIT    : NO  YES
SET TMOUT   : NO  RSTRT  STOP
SET CRT     : NO  YES

SET CPT MEM: NO  ON   OFF
SET FLAG    : NO  YES

SET TIMER: TIMER1 NO YES
           TIMER2 NO YES
SET CNTR : CNTR1  NO YES
           CNTR2  NO YES
SET ALARM: NO YES        SET OTSYNC:NO YES
SET ALT BANK:  NO  YES
```

Figure 12-16

(a) Message Designation. When YES is selected (see Figure 12-18), two more fields appear on this line. The first is a data-entry field allowing six characters. In this field you may enter the identification characters for up to six messages in the order that they are to be sent. When the trigger conditions come true, the messages entered will be sent in the order entered with the RS-232/V.24 leads controlled in accordance with the message transmission envelope selected on the Parameters 4 menu. If a Prompt is included in the message list, it will be displayed immediately when the trigger is

```
** TRIGGER 0 ACTIONS **

SET XMIT    : NO  YES
SET TMOUT   : NO  RSTRT  STOP
SET CRT     : NO  YES

SET CPT MEM: NO  ON   OFF
SET FLAG    : NO  YES
SET XMT VAR: NO  INC  00
SET RECBUF : NO  RESTART  STOP
SET TIMER: TIMER1 NO YES
           TIMER2 NO YES
SET CNTR : CNTR1  NO YES
           CNTR2  NO YES
SET ALARM: NO YES        SET OTSYNC:NO YES
SET ALT BANK:  NO  YES
```

Figure 12-17

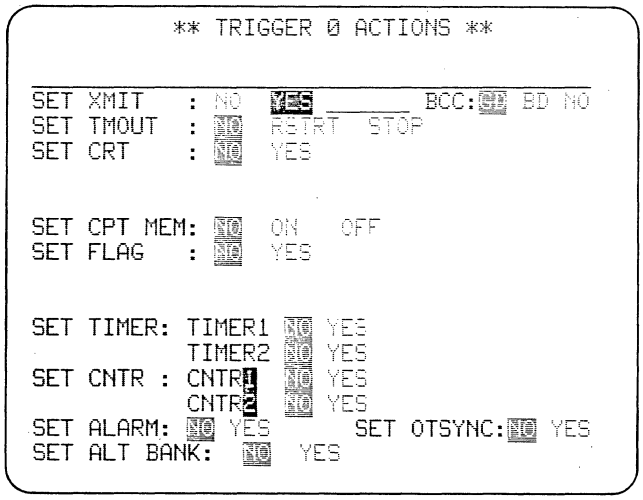


Figure 12-18

true, no matter what its position in the list.

You may transmit up to six of the 16 messages (0-F) you may have entered on the Message-Entry menus (see Section 13.5) by simply entering their hexadecimal identification numbers (0-F) in the order you wish them to be sent.

To transmit the contents of the Receive Buffer (see Section 13.8), enter an R.

If you want to enter a message from the keyboard in Run Mode (see Section 13.7), enter a K.

To send the 4500's standard stored message (see Section 13.9), enter an M. The stored message will automatically be sent.

To send a 1-byte variable that can be incremented or set by triggers (see Section 12.4.6), enter a V.

(b) Prompts. You can use the message designation field to enter a Prompt, or message to the operator, which will appear on the second line of the data display in either Monitor Mode or the Emulate modes.

To enter the text of a Prompt, choose a message-entry menu (see Section 13.5) and select PROMPT; then type in your text. The maximum Prompt message is 40 characters because it must fit on one line of the CRT. If you enter too many characters, the first 40 will be displayed and the overflow dropped. Hexadecimal characters should not be used: the 4500 will display hex characters in their ASCII equivalent regardless of what code has been chosen on the Parameters 1 menu.

To display the Prompt, enter the number of the Message-Entry menu in the Set XMIT field just as though it were a message. One prompt is permitted per trigger; if you enter more than one, only the last one will be displayed. The Prompt will not be transmitted on RD or TD, but will be routed directly to the CRT. You can include a Prompt in a list of messages to be transmitted, and the 4500 will display the Prompt immediately upon trigger true without waiting for the preceding messages in the list to be transmitted.

In Run Mode, the Prompt is cleared from the CRT by pressing the CLEAR FIELD key.

Prompts are very useful in program development because you can use a Prompt to tell you when a trigger is true.

(c) Block Check. The third field on this line enables you to send either a GooD or BaD block check. The default selection is GD. The 4500 will make the proper calculation for your Parameters 1 menu selections and send either a good or bad BCC, respectively, for each end-of-block character sequence detected in any of the messages entered in the preceding field. If there is a PROMPT included in the message list, it will be ignored when the BCC is calculated.

NOTE: No matter how many messages are entered in the SET XMIT field, the number of blocks is determined by the number of end-of-block sequences detected, with a maximum of one BCC calculation per message. For correct operation, the end-of-block sequence must be placed at the end of a message.

If received Block Check is ON in

the unit (Parameters 1 menu; see Section 11.2.10), the second block check character transmitted will be replaced by G or B on the display; if received Block Check is not on, you will see both block check characters as they are actually transmitted.

For 7E/X.25, SDLC, or SDLC/NRZI, the bad BCC will be CRC-16 instead of CCITT; for other formats it will be an inverted good BCC.

If you select NO, then no block check character will be sent.

For 7E/X.25, SDLC, and SDLC/NRZI, the NO selection is replaced by AB (see Figure 12-19). You may send an abort by selecting AB whether or not you have designated any messages on this line. If you have designated any messages to be sent, the transmission will be aborted.

(d) Message Transmission Priorities. When a Transmit action comes true, the action is put into a 16-action buffer. The transmit actions are then taken in the order in which they entered the buffer. Thus, if triggers come true in the order 1, 5, and 2, then the blocks will be sent in that order.

Message blocks transmitted by separate triggers will be transmitted separately with at least one fill character (or 7E Flag) between blocks. In Switched or Multidrop Mode (Section 13), the interface leads will be controlled between blocks. If more than 16 Transmit actions are stacked, an error message will be displayed. (Once the error message is displayed, the PROGRAM key must be pressed to reset the error.)

Be sure to read Section 13 for more information and suggestions for using the 4500 interactively.

12.4.2 SET TIMEOUT (LINE 5)

The INTERVIEW 4500 has a timer dedicated to the timeout function; that is, a timer whose final reading may be used as a trigger condition. Select the duration of the timeout on the Statistics menu (Figure 12-20). The maximum value for a single timeout is 6800 milliseconds. However, it is possible to obtain longer timeouts by using the flags to look for multiple occurrences of the timeout. The maximum is 256 X 6800 msec or approximately 29 minutes.

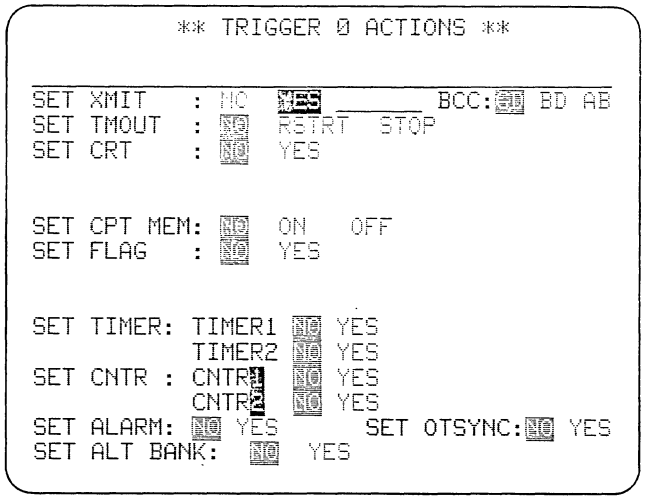


Figure 12-19

RSTRT: When ReSTaRT is selected, the trigger resets the timeout timer to 0 and it begins to increment.

STOP: When STOP is selected, the trigger stops the timer, and the timeout condition will not occur.

The default selection is NO.

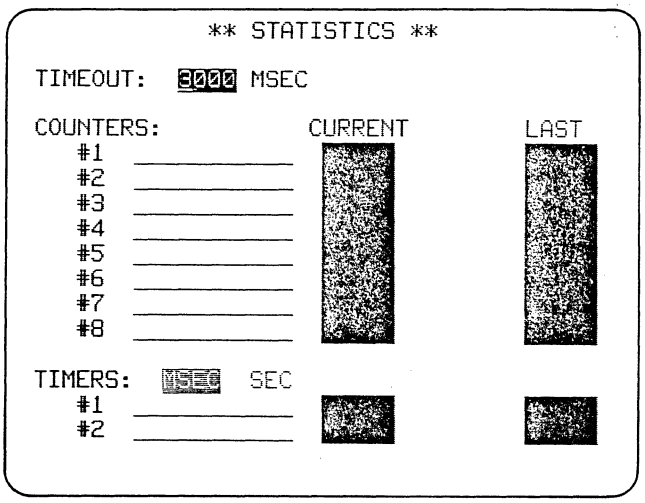


Figure 12-20

12.4.3 SET CRT (LINES 6-8)

Triggers can be used to selectively enhance or display specific data on the CRT. Control of the CRT is independent of the tape or counters or timers. Data withheld from the CRT while it is frozen is still available to be recorded and counted. The 640-character display and the 1920-character display buffer are controlled together.

To turn a CRT action ON (see Figure 12-21), enter a numeral 1 in the corresponding box on Line 7; to turn an action OFF, enter a zero (0). An X means that no action will be taken.

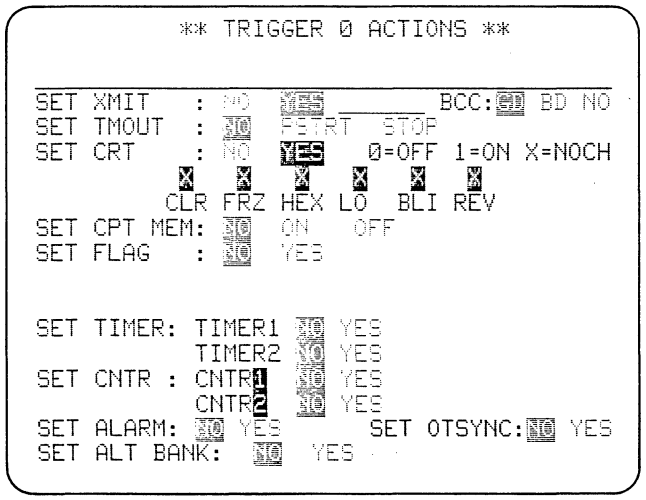


Figure 12-21

CLEAR. When CLR is selected, the trigger clears the entire CRT display and the 1920-character buffer. The process takes 20 milliseconds, during which all received data is lost to the CRT display. CLEAR is automatically reset to OFF when the clearing process is complete, so it is not necessary to use another trigger to turn CLEAR off.

FREEZE. When FRZ is on, no new data is received by the CRT buffer or displayed until freeze is turned off. Freeze may be turned on or off by another trigger or manually. When a trigger freezes the display, the TRIGGER and FREEZE indicators on the status panel go on. If the display has been frozen manually, the MANUAL and FREEZE indicators go on, and trigger control can be restored only by operating the RESUME TRIGGER key in the CRT Control zone of the keyboard.

HEXADECIMAL. When HEX is enabled, all data received after the trigger is true is displayed in hexadecimal. Once data is received in the CRT buffer under trigger control as hexadecimal, it remains in hexadecimal.

LOW INTENSITY. LOw intensity is useful to display data of lesser importance. However, in combination with reverse image, it creates a highlight that is immediately noticeable.

BLINK. BLInk is useful to call attention to small portions of data. In combination with reverse image it gives the most conspicuous highlight. Blink cannot be reset or overridden from the keyboard.

REVERSE IMAGE. Reverse-imaged characters are presented in black on a white background. REVerse image is very effective when used in combination with low intensity, but hard to read if used over a large area of the screen.

12.4.4 SET CAPTURE MEMORY (LINE 9)

This selection starts (ON) and stops (OFF) data recording (or playback). All other recording parameters are controlled from the Parameters 2 menu (Section 11.5).

Whenever the Capture Memory--that is, the tape or the RAM option--is turned ON, the preceding 16 bytes are automatically recorded too. When the tape or RAM is turned OFF, the following 16 bytes are automatically recorded. Therefore when the triggers turn the Capture Memory OFF and then ON within less than 32 characters, the data is recorded continuously without an interruption.

When data is being recorded under trigger control, the panel status LEDs

marked TRIGGER and RECORD are ON. You may override the triggers from the keyboard using the MANUAL START or MANUAL STOP key in the CAPTURE MEMORY zone. RESUME TRIGGER must be used to restore trigger control. The panel status LEDs will show all changes in status.

NOTE: On the Set Flag, Timer, and Counter lines, remember to use the ENTER key to move the cursor to the number and action fields to avoid altering your selections.

12.4.5 SET FLAG (LINE 10)

(a) Specify a Flag Mask. The default selection is NO. When YES is selected (see Figure 12-22), a mask of eight numbered boxes appears. Use the ENTER key to move the cursor to this field. Enter a 1 under the number of any flag, or flags, that you wish turned on; a 0 for any flag, or flags, you wish turned off. X means Don't Care: the trigger will not change the status of this flag. The trigger action will be to set the flags according to the mask you have entered. The initial flag status upon entering Run Mode is all flags OFF.

Flags 6, 7, and 8 cause outputs in pins 11, 9, and 4, respectively, of the 4500's auxiliary connector to change state, following the status of the flags. When the flag is set to 1, the output will be +3.5 volts and when the flag is set to 0, the output will be at ground. The output driver is a 74LS04 and is capable of sinking up to 8 mA. Ground on the connector is on pins 7, 8, 15, and 14.

(b) Increment Flags. INCrement is the alternate choice when YES is selected. Increment can be used to control recursive routines. Each time the trigger conditions are satisfied, the value of the flag mask, considered as a binary number, will increment by one. To reset Flag Increment, use the flag mask action (a).

```
** TRIGGER 0 ACTIONS **

SET XMIT    : NO  YES _____ BCC:ON BD NO
SET TMOUT   : NO  RSTRT  STOP
SET CRT     : NO  YES

SET CPT MEM: NO  ON   OFF    87654321
SET FLAG   : NO  YES  INC    XXXXXXXX

SET TIMER: TIMER1 NO YES
           TIMER2 NO YES
SET CNTR : CNTR1 NO YES
           CNTR2 NO YES
SET ALARM: NO YES      SET OTSYNC:NO YES
SET ALT BANK:  NO  YES
```

Figure 12-22

NOTE: The high-order bit is on the left (Flag 8); the low-order bit on the right (Flag 1).

12.4.6 SET TRANSMIT VARIABLE (LINE 11)

The 4500 has a Variable Counter (Figure 12-23) whose 1-byte output can be included in any transmission by the 4500 (see Section 12.4.1). This counter may be set or incremented on the same trigger as the transmission in which it is to be included. The default selection is NO.

```
** TRIGGER 0 ACTIONS **

SET XMIT    : NO  YES _____ BCC:ON BD NO
SET TMOUT   : NO  RSTRT  STOP
SET CRT     : NO  YES

SET CPT MEM: NO  ON   OFF    87654321
SET FLAG   : NO  YES  INC    XXXXXXXX
SET XMT VAR: NO  INC  00
SET RECBUF : NO  RESTART  STOP
SET TIMER: TIMER1 NO YES
           TIMER2 NO YES
SET CNTR : CNTR1 NO YES
           CNTR2 NO YES
SET ALARM: NO YES      SET OTSYNC:NO YES
SET ALT BANK:  NO  YES
```

Figure 12-23

(a) Increment. To increment the Transmit Variable Counter by 1, select INC.

(b) Set and Reset (Data-Entry Field). To set the Transmit Variable Counter, move the cursor into the data-entry field to the right of the INC selection. Enter a two-digit hexadecimal number (the HEX key need not be used here). To reset the Transmit Variable Counter, enter 00 in the data-entry field.

(c) INC and XMIT on the Same Trigger. If the same trigger is used to increment the Variable Counter and to send the Variable Counter in a message, then the counter will increment once before it is sent. Thus--when the INC and XMIT actions are taken by the same trigger--if the value in the data-entry field is 00, the transmitted count will begin with 01. If you want the transmitted count to begin with 00, set the Counter to FF on another trigger, so the counter will increment to 00 before transmission.

12.4.7 SET RECEIVE BUFFER (LINE 12)

This field (Figure 12-23) appears only when you have chosen one of the Emulate modes on the Parameters 1 menu. The contents of the Receive Buffer can be transmitted (see Section 12.4.1).

The Receive Buffer will hold up to 255 characters from the Receive side of the line. Data transmitted by the 4500 cannot be loaded into the Receive Buffer. RESTART clears the buffer and starts loading it with received data; STOP causes the buffer to stop loading. If a trigger tries to send the Receive Buffer after it has been restarted but before it has been stopped, nothing will be sent.

NOTE: Triggers should not be set to load more than 255 characters in the Receive Buffer. If you attempt to load more than 255 characters in the buffer, only modulo 256 characters will be kept in the buffer; for example, if you try to load 258 characters, only the last two will be kept.

It is usually necessary to enter a message containing synchronization characters in the trigger Xmit field preceding the Receive Buffer because the synchronization characters are not usually included in the Receive Buffer.

The Receive Buffer generally should be used in a controlled test to ensure that only the data in which you are interested satisfies the conditions for loading the buffer. (See also Section 13.8.)

The default choice on this line is NO.

12.4.8 SET TIMER (LINES 13 and 14)

There are two timers, both of which can be controlled by the same trigger. (A separate timeout timer is also available; see Section 12.4.2.) The default selection is NO. When YES is selected for either timer, three more choices appear (Figure 12-24):

(a) ReSTaRT causes the selected timer to reset to 0 and begin counting. Before a timer is reset by a trigger, the current value is transferred to the LAST column on the Results display.

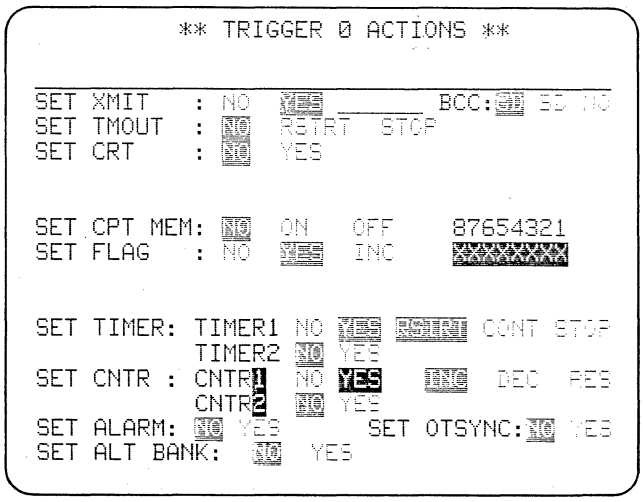


Figure 12-24

(b) CONTinue causes a timer to begin counting by adding to the existing count.

(c) STOP causes the timer to stop. The timer value will be displayed in the CURRENT column of the RESULTS display until the next ReSTaRT or CONTinue takes effect or you intervene manually. (Timers can be reset in Run Mode; see Section 7.3.2.)

The maximum value for each timer is 65,535. When this is exceeded, OVerFLOw appears on the Results display.

Timer resolution is selected on the Statistics menu (Figure 12-20) as seconds or milliseconds. The timers may also be named on the Statistics menu. (See Section 12.8.)

NOTE: When 1 second is used for the count increment and the durations are less than 1 second, a rounding effect occurs, where some shorter periods are missed and others counted. This effect will usually average out for counts above 100. Since the 1-second timebase runs continuously and is not initialized for each measurement, the accuracy of measurements will always be plus or minus 1 second.

NOTE: Remember that in tape playback mode, the timer readings are valid only if the data is played back at the original line speed. Otherwise, a correction must be made: for instance, 2 ms at 4800-bps line speed is equivalent to 1 ms at 9600-bps playback speed.

12.4.9 SET COUNTER (LINES 15 and 16)

There are eight counters available in the 4500. Each trigger can set any two counters, and several triggers can control the same counter. The default selections are Counters 1 and 2, NO. You may select any of the other counters by writing over the default counter number. When YES is selected, three choices appear (Figure 12-24).

INC. The menu defaults to INCrement because this is the most often used selection. Each trigger occurrence adds 1 (one) to the counter.

DEC. When DECrement is selected, each trigger occurrence subtracts 1 (one) from the counter value.

RESET sets the counter to 0 (zero). Whenever a counter is reset by a trigger, the current count is transferred to the LAST column of the Results display.

The maximum count for each counter is 65,535; the minimum is 0. When either limit is passed, OVerFLOw appears on the Results display. Counters may be reset in Run Mode (see Section 7.3.2). They may be named on the Statistics menu (see Section 12.8).

12.4.10 ALARM (LINE 17)

The alarm is a multiple beep each time the trigger comes true. It is useful for calling your attention to the unit, especially when the situation of interest occurs infrequently. For example, the alarm can be set to sound whenever data is frozen on the CRT for analysis.

If you select YES, the alarm is set off when the trigger comes true.

12.4.11 SET OUTSYNC (LINE 17)

When OUTSYNC is selected, the DCE (RD) or DTE (TD) receiver, whichever is selected on the trigger Conditions menu, goes out of synchronization from trigger true until it sees the next synchronization pattern. While the receiver is OUT OF SYNC, no data from that side of the line is presented to the 4500 display or counters or timers. However, the data is still recorded because the 4500 has separate receivers for the Capture Memory.

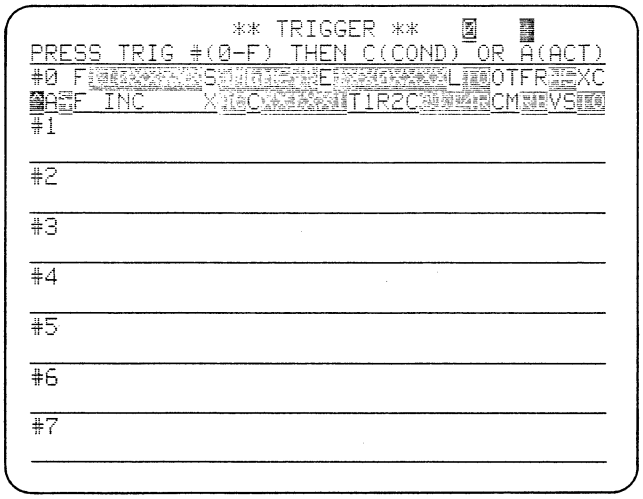


Figure 12-25

This ability is useful when the information after a header group is of no interest, but you need to see data on the other side of the line. In this case, Freeze would not be applicable since it inhibits addition of all data to the display.

When ASYNC has been selected on the Parameters 1 menu, OUTSYNC is deleted from the trigger menus.

12.4.12 ALTERNATE BANK (LINE 18)

As mentioned in Section 12.2, the triggers are grouped into two banks of eight triggers, 0 through 7 (the low bank) and 8 through F (the high bank). When the ALTernate BANK action takes effect, the alternate bank of triggers becomes active and the present bank goes dormant. When the unit enters Run Mode, the low bank (Triggers 0-7) is always active.

When the alternate bank becomes active, it sees everything that is happening at that instant, whether or not the occurrences were initiated by a trigger on the other bank. For example, if a trigger starts a transmission and sets ALT BANK, the alternate bank may see the end of the transmission. Flag status is unchanged by the alternate bank action, so flags are a good means of communication between the two banks.

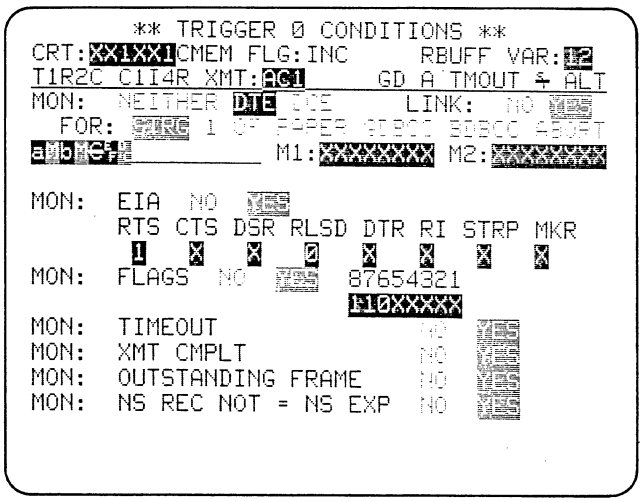


Figure 12-26

12.5 TRIGGER SUMMARY

You may obtain a Trigger Summary display at any time by pressing the red TRIGGER key. Usually, you will immediately see the Summary of the low-bank Triggers. However, if you press TRIGGER while a high-bank Trigger menu is displayed, the high-bank Trigger Summary will appear.

While the low-bank summary is displayed, you can obtain the high-bank summary by pressing the UP or DOWN cursor arrow; the UP or DOWN cursor arrow will then return the low-bank summary.

Figure 12-25 shows the Trigger Summary for the Trigger menus shown in Figures 12-26 and 12-27. The summary for Trigger 0 is identified by #0 at the left; that for Trigger 1 by #1, and so forth. For each trigger, the first line summarizes the Conditions menu and the second line summarizes the Actions menu. Entries appear on the summary only if YES is selected on the menu. The entries on the Summary are not in the same order as they appear on the trigger menu. No Actions will appear on the Trigger Summary unless a Condition has been selected.

The abbreviations used on the Trigger Summary are defined in Tables 12-1a and 12-1b.

12.6 ACTIONS SUMMARY

Figures 12-26 and 12-27 are the Conditions and Actions menus for the same trigger. Lines 2 and 3 of the Conditions menu summarize the Actions menu. Table 12-1b defines the abbreviations used on this summary.

12.7 CONDITIONS SUMMARY

Lines 2 and 3 of Figure 12-27 summarize the Conditions menu shown in Figure 12-26. The abbreviations used are defined in Table 12-1a.

12.8 STATISTICS MENU

The Statistics display (see Figure 12-28) has three uses:

(1) Enter a value for the timeout timer. The timeout timer increments in milliseconds. The data-entry field defaults to 3000 msec, and you may alter the default entry to any value up to 6800.

(2) Enter the descriptive names and (or) functions of the eight counters and two timers. Alphanumeric and control characters are both legal in the name entry fields, but hexadecimal is not permitted.

(3) Select the units in which the timers read. Timers may be set to increment in seconds or milliseconds. The default selection is milliseconds.

To obtain this menu, press the red STATISTICS key while the unit is in Program Mode. In Run Mode, the RESULTS key obtains this same display, but with real-time counter and timer readings displayed (see Section 7.3.2).

12.9 TRIGGER STRING CAPACITY

The maximum string capacity in the 4500, whether or not triggers are

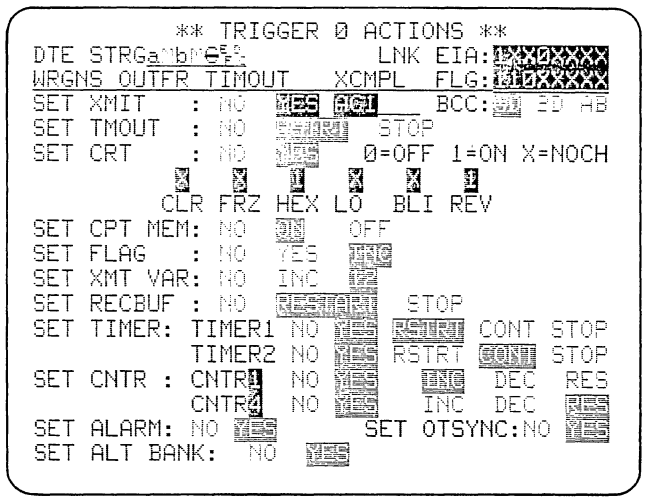


Figure 12-27

linked, is determined by number of string sets: a string set consists of the first eight or the second eight string positions on a trigger or of a single "1 OF" character set. The maximum that may be used simultaneously in the unit is 20 string sets. Therefore, if you use either ten 16-character strings or eight 16-character strings, two 4-character strings, and two "1 OF" character sets, you have used the unit's 20-string set capacity. In

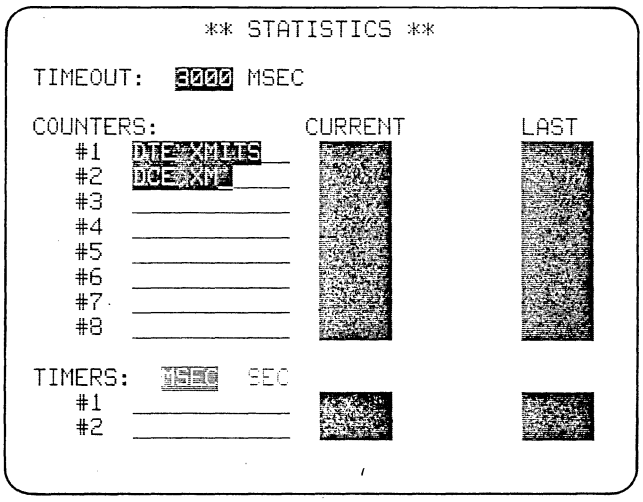


Figure 12-28

TABLE 12-1a
TRIGGER CONDITIONS MNEMONICS

TRIGGER MENU	CONDITIONS SUMMARY	TRIGGER SUMMARY
NEITHER	No entry	No entry
DTE	DTE	No underline
DCE	DCE	Underline
LINK	LNK	L
STRG	STRG_____	S_____
BIT MASK	M (Low intensity)	M
1 OF	1 OF_____	1_____
PARER	PARER	PARER
GDBCC	GDBCC	GDBCC
BDBCC	BDBCC	BDBCC
ABORT	ABORT	ABORT
EIA NO	No entry	No entry
EIA YES	EIA:[ ]	E[ ]
FLAGS NO	No entry	No entry
FLAGS YES	FLG:[ ]	F[ ]
TIMEOUT NO	No entry	No entry
TIMEOUT YES	TIMOUT	TO
OUTSTANDING FRAME NO	No entry	No entry
OUTSTANDING FRAME YES	OUTFR	OTFR
NS REC NOT=NS EXP NO	No entry	No entry
NS REC NOT=NS EXP YES	WRGNS	~~NS~~
XMT CMPLT NO	No entry	No entry
XMT CMPLT YES	XCMPL	XC

TABLE 12-1b
TRIGGER ACTIONS MNEMONICS

TRIGGER MENU	ACTIONS SUMMARY	TRIGGER SUMMARY
XMIT:_____	XMT:_____	X[ ]
BCC: GD	GD	No entry
BCC: BD	BD	No entry
BCC: NO	No entry	No entry
BCC: AB	No entry	No entry
TMOUT: NO	No entry	No entry
RSTRT	TMOUT	TO
STOP	~~TMOUT~~	~~TO~~
CRT: NO	No entry	No entry
CRT: YES	CRT:[ ]	C[ ]
CPT MEM: NO	No entry	No entry
CPT MEM: ON	CMEM	CM
CPT MEM: OFF	~~CMEM~~	~~CM~~
FLAG: NO	No entry	No entry
FLAG: YES	FLG:[ ]	F[ ]
FLAG: INC	FLG: INC	F INC
XMT VAR: NO	No entry	No entry
XMT VAR: INC	VAR: INC	VI
XMT VAR: ____	VAR: ____	VS
RECBUF: NO	No entry	No entry
RECBUF: RESTART	RBUF	RB
RECBUF: STOP	~~RBUF~~	~~RB~~
TIMER_: NO	No entry	No entry
TIMER_: YES	T_	T_
RSTRT	R	R
CONT	C	C
STOP	S	S
CNTR_: NO	No entry	No entry
CNTR_: YES	C_	C_
INC	I	I
DEC	D	D
RES	R	R
ALARM: NO	No entry	No entry
ALARM: YES	A	A
OTSYNC: NO	No entry	No entry
OTSYNC: YES	~~SY~~	~~SY~~
ALT BANK: NO	No entry	No entry
ALT BANK: YES	ALT	^

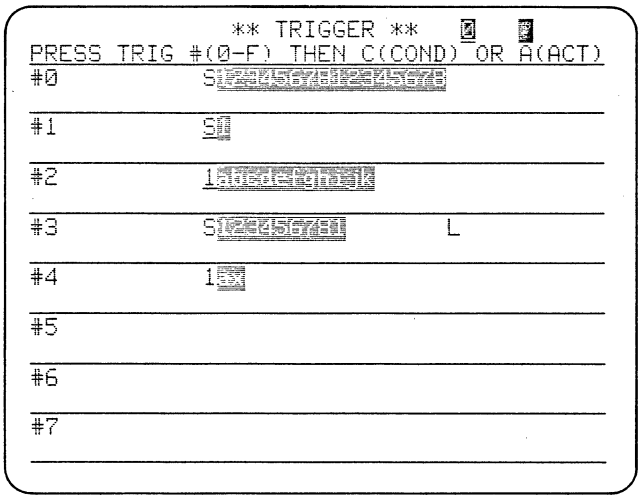


Figure 12-29

Figure 12-29, seven of the possible 20 string sets have been used.

12.10 TRIGGER TIMING AND SEQUENCE

Although all triggers are simultaneously active, there is an order in which they are processed. The order of trigger processing is significant only in special situations (as in Section 12.10.2).

12.10.1 Basically, all triggers are first evaluated in order (0 through 7 or 8 through F) for their conditions to be true; then the trigger actions are taken in order (0 through 7 or 8 through F). This process permits the same internal flag to be sensed and set by the same trigger.

The sequence that occurs after each character is received is as follows:

(1) Evaluate triggers that do not look for data.

(2) Evaluate triggers that look for DTE data.

(3) Evaluate triggers that look for DCE data.

(4) Set all actions applicable for each trigger in order (0 through 7 or 8 through F).

12.10.2 Usually the timing described in Section 12.10.1 is not important. However, under certain circumstances, such as when internal flags are being set and tested, these timing relationships are significant.

Consider the case in which a string on the DTE line sets a flag; another DTE string resets the flag; and that flag in conjunction with a DCE string turns on the tape. Figure 12-30 shows the Trigger Summary for this example. Trigger 1 looks for a string, BC, on the DTE side of the line and turns Flag 1 ON when the string is found. Trigger 2 looks for a string, DE, on the DTE side and turns Flag 1 OFF when the string is found. Trigger 3 looks for Flag 1 to be ON in conjunction with a DCE string of HI and turns ON the tape when this condition is met.

Suppose that the following data is received and shown in dual-line display on the CRT:

DTE -- A B C D E F
DCE -- G H I J K L

Before we consider what the program of Figure 12-30 will do with this data, we must understand how this data may have

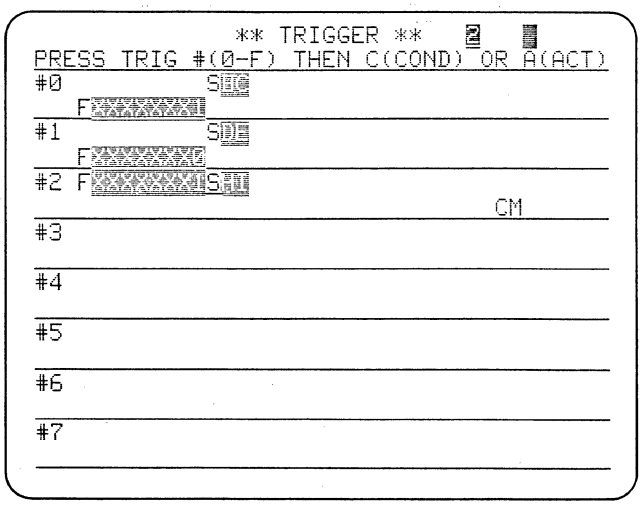


Figure 12-30

been received. First, the time correlation between the DTE and DCE lines on the display is accurate to ±1 character. Second, the display has a resolution, at the very best, of only one character. Thus, the two lines may actually be skewed by half a character or even one bit, but this cannot be shown on the display. Third, the program processes characters within microseconds after they are received. Thus, two characters that appear on the screen to have been received simultaneously may not have been treated that way by the program.

Our sample program is looking for a string of BC on the DTE line and HI on the DCE line. On the display, these characters appear to have been received simultaneously, but actually string BC may have been received (1) before, (2) after, or (3) simultaneously with string HI. We now consider what action would be taken in each of the three cases.

(1) BC String Received before HI String: The Trigger 1 conditions and actions are processed before the Trigger 3 conditions and actions. Thus, when BC is received, Flag 1 is turned ON. When HI is received Flag 1 is already ON and the Trigger 3 conditions are met, so the tape is turned ON.

(2) BC String Received after HI String: Trigger 1 conditions and actions are processed after the Trigger 3 conditions and actions. Thus, when the HI string is received, Flag 1 has not yet been turned ON and the Trigger 3 conditions are not met, so the tape is not turned ON.

(3) BC and HI Strings Received Simultaneously: For this case, we must consider the trigger timing discussed in Section 12.10.1. Remember that all trigger conditions are tested before any of the actions are taken. First, the string BC on the DTE line is checked and found to be true, but no action is taken yet. Next, the string HI on the DCE line is evaluated, but since the Trigger 1 action has not yet been taken, Flag 1 has not been turned ON and the Trigger 3 conditions are not met.

Now that all of the conditions have been evaluated, the actions will be taken. The Trigger 1 condition having been met, the Trigger 1 action is taken first, so Flag 1 is now turned ON. Because the Trigger 3 condition has not been met, the Trigger 3 action is not taken, so the tape is not turned ON. In this case, even though Flag 1 has been turned ON, the tape is not, because the flag was not turned ON until after the Trigger 3 condition was tested.

Thus we see that for the same CRT display two different actions may be taken by the program. This is due to the resolution limitations of the CRT. The program is executing within microseconds of receiving each character and with much better resolution than is possible on the CRT.

12.11 TRIGGER USE IN HIGH-SPEED MONITOR MODE

In High-Speed Monitor Mode, the only trigger Conditions that are valid are MON:LINE and its associated selections (Lines 4-6). All of the selections on the FOR line are valid in 7E/X.25, SDLC, and SDLC/NRZI. In SYNC, BSC/X.25, and ASYNC modes, only STRG, 1 OF, and PARER are valid.

Up to 72 kbps, two triggers are available in each bank. If STRG is selected and a string of more than eight characters is used, then only one trigger is available in that bank.

Two trigger Actions are valid in High-Speed Monitor Mode, namely, SET CPT MEM and SET ALT BANK. These actions function in the same way as in other modes.

NOTE: Tape cannot be used above 19.2 kbps. At speeds above 19.2 kbps the tape will not record properly and the tape may run off the reel. Only RAM is valid above 19.2 kbps.

13 Interactive Testing

Interactive testing is selected on Line 4 of the Parameters 1 menu as one of two modes, EMULATE DTE or EMULATE DCE (see Section 11.2.4).

When a data line is connected to one of the Emulate ports on the rear of the 4500, the 4500 assumes control of the RS-232/V.24 interface. There is no need to program the lead activity for each transmission: On the Parameters 4 menu you select, in advance, the sequence of lead activity and the delays you want, and this "envelope" is automatically used each time a message is sent.

The 4500's transmitter is controlled by triggers. You may pre-enter up to 16 messages, for a total of up to 1024 bytes of message content. You can also send a standard stored message, echo received data, and type in messages from the keyboard in Run Mode. You can use the triggers to send messages in any sequence (see Section 12.4.1), or you can obtain manual control through the Marker (ENTER key; see Section 12.3.5).

13.1 THE TRANSMITTER

The 4500's transmitter is switched between RD and TD by moving the data line between the EM DCE (TO TERMINAL) connector and the EM DTE (TO MODEM) connector on the rear of the unit (see Figure 13-1). When the line is connected to the EM DCE connector, the 4500 transmits on RD, receives its own transmissions at its RD receivers, and receives incoming data at its TD receivers. When the data line is connected to the EM DTE connector, the 4500 transmits on TD, receives its own transmissions at its TD receivers, and receives incoming data at its RD receivers.

When you select EMulate DCE on the Parameters 1 menu, the 4500 assumes that it is transmitting on RD, expects to receive its own transmissions at the RD receivers, and expects any other data (whether from the line or from the Capture Memory) to arrive on TD. If you choose Emulate DTE on Parameters 1, the 4500 assumes it is transmitting on TD, expects to receive its own transmissions at the TD receivers, and expects any other data to come in on RD.

Therefore, it is important that you correctly correlate the Emulate mode with the data connections established at the rear of the unit.

Connecting the data line to the MONITOR port disconnects the transmitter and ensures that the 4500 cannot affect the monitored line. This connector should be used when you select a Monitor mode on the Parameters 1 menu.

TABLE 13-1
INTERFACE LEADS CONTROLLED BY THE 4500

RS-232/V.24 LEAD				EM DTE	EM DCE	MONITOR
Pin	Name	EIA	CCITT	Mode	Mode	Mode
2	TD	BA	103	Driven by 4500	GND via 3 kohms	Input to 30-kohm receiver
3	RD	BB	104	GND via 3 kohms	Driven by 4500	Input to 30-kohm receiver
20	DTR	CD	108/2	Driven by 4500	GND via 4.7 kohms	Input to 30-kohm receiver
4	RTS	CA	105	Driven by 4500	GND via 4.7 kohms	Input to 30-kohm receiver
8	RLSD	CF	109	GND via 4.7 kohms	Driven by 4500	Input to 30-kohm receiver
5	CTS	CB	106	GND via 4.7 kohms	Driven by 4500	Input to 30-kohm receiver
22	RI	CE	125	GND via 4.7 kohms	Driven by 4500	Input to 30-kohm receiver
15	SCT	DB	114	GND via 3 kohms	Driven by 4500	Input to 30-kohm receiver
17	SCR	DD	115	GND via 3 kohms	Driven by 4500	Input to 30-kohm receiver
24	SCTE	DA	113	Driven by 4500	GND via 3 kohms	Input to 30-kohm receiver
6	DSR	CC	107	GND via 4.7 kohms	Driven by 4500	Input to 30-kohm receiver

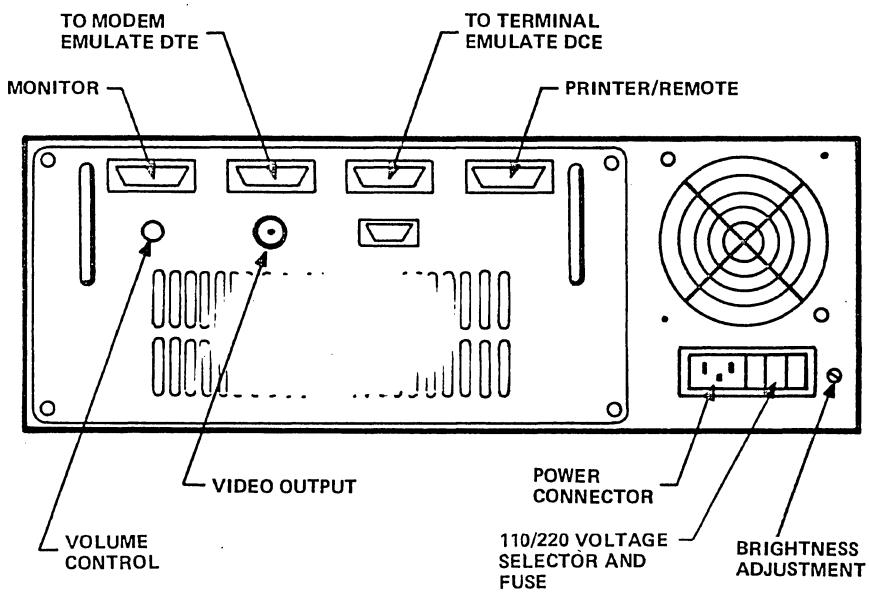


Figure 13-1

13.2 INTERFACE LEAD CONTROL

Table 13-1 gives electrical data on the interface leads controlled by the 4500 that will aid your understanding of this topic.

In order to use either of the 4500's two Emulate modes, you must break the line and connect it to one of the two Emulate connectors on the rear of the unit. In EM DCE mode, if you have used the correct connector for the mode selection, the 4500 will control leads usually controlled by the modem; in EM DTE mode, it will control leads usually controlled by the data terminal equipment.

When you power up the 4500 and plug your equipment into one of the two Emulate connectors, the 4500 will immediately, without waiting for Run Mode, apply an OFF voltage as defined by the RS-232/V.24 standard to each of the leads that it controls in that emulate mode. For EM DCE, these are RI (Pin 22), DSR (Pin 6), RLSD (Pin 8), CTS (Pin 5), SCT (Pin 15), SCR (Pin 17), and RD (Pin 3). For EM DTE, they are DTR (Pin 20), RTS (Pin 4), SCTE (Pin 24), and TD (Pin 2).

NOTE: The terms ON and OFF imply that an RS-232/V.24 lead is driven to either ON or OFF voltage in accordance with the RS-232/V.24 standard. The standard defines a signal as OFF when it is more negative than -3 volts with respect to signal ground. A signal is defined as ON when it is more positive than +3 volts with respect to signal ground. Thus, OFF always implies that the lead is driven to the OFF state and we use the term inactive to mean that a lead is not being driven ON or OFF.

If you make any changes in either the LINE USE or STATIC LEADS field of the Parameters 4 menu, your changes will become effective when the unit enters Run Mode.

13.3 CHOOSING A MESSAGE TRANSMISSION ENVELOPE: PARAMETERS 4

To make up the message transmission envelope, obtain the Parameters 4 menu. This Interface Control menu (see

TABLE 13-2
PARAMETERS 4 MENU SELECTIONS*

	SWITCHED (HDX)		FDX		MULTIDROP	
SELECTIONS	EM DCE (Fig.13-5)	EM DTE (Fig.13-4)	EM DCE (Fig.13-3)	EM DTE (Fig.13-2)	EM DCE (Fig.13-7)	EM DTE (Fig.13-6)
LEAD						
DTR	--	x	--	x	--	x
DSR	x	--	x	--	x	--
RLSD	--	--	x	--	--	--
RI	x	--	x	--	x	--
RTS	--	--	--	x	--	--
CTS	--	--	x	--	--	--
LEAD STATUS EXITING RUN						
MAINTAIN	x	x	x	x	x	x
RESET	x	x	x	x	x	x
DELAY						
T1	--	x	--	--	--	x
T2	x	--	x	--	x	--
T3	--	x	--	--	--	x
T4	--	x	--	--	--	x
T5	x	--	x	--	x	--
T6	x	--	--	--	x	--
T7	x	--	--	--	x	--

*x means that the selection in the first column is displayed; -- means the selection is unavailable.

Figure 13-2) may be seen only in Program Mode. Sections 13.3.1-13.3.4 describe the Parameters 4 menu selections. Section 13.3.5 gives you necessary details of the 4500's operation in the various interface control configurations.

13.3.1 LINE USE (LINE 3)

In conjunction with the Mode selection on the Parameters 1 menu, the LINE USE selection determines what selections will appear on the remainder of the Parameters 4 menu. Table 13-2 summarizes these relationships for your reference as you follow this discussion.

(a) Full-Duplex Operation. The default selection is FDX, for full-duplex or continuous carrier use. Figures 13-2 and 13-3 show the default Parameters 4 menu for Emulate DTE and Emulate DCE modes, respectively. In FDX mode, the active static leads are set to the states assigned them in the Static Leads field. When a trigger transmit action comes true, the 4500 will transmit data immediately, regardless of the status of any of the interface leads.

(b) Switched Operation. For half-duplex use, select SWITCHED. Figures 13-4 and 13-5 show the menus for this selection.

(c) Multidrop Operation. Select MULTIDROP to emulate a drop or a controller on a multidrop network. The menu variations are shown in Figures 13-6 and 13-7.

13.3.2 STATIC LEADS (LINE 4)

In this field, you will be presented with several RS-232/V.24 lead choices

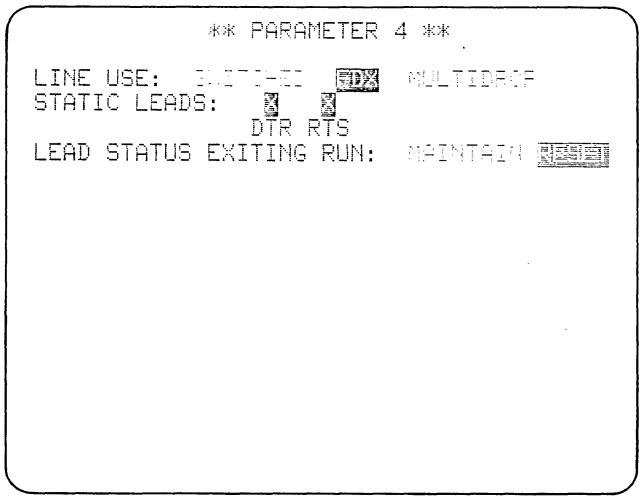


Figure 13-2

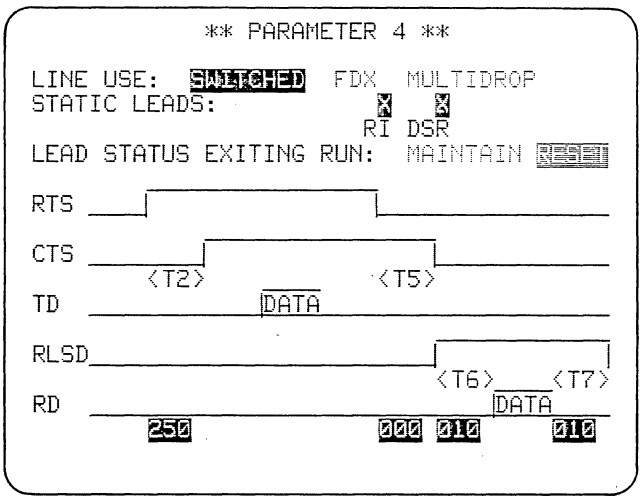


Figure 13-5

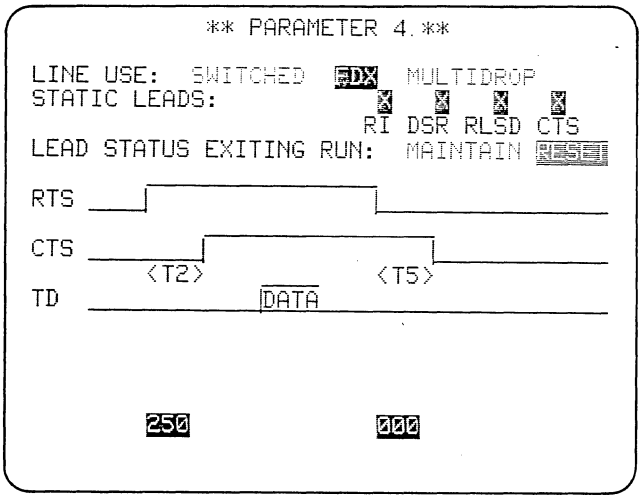


Figure 13-3

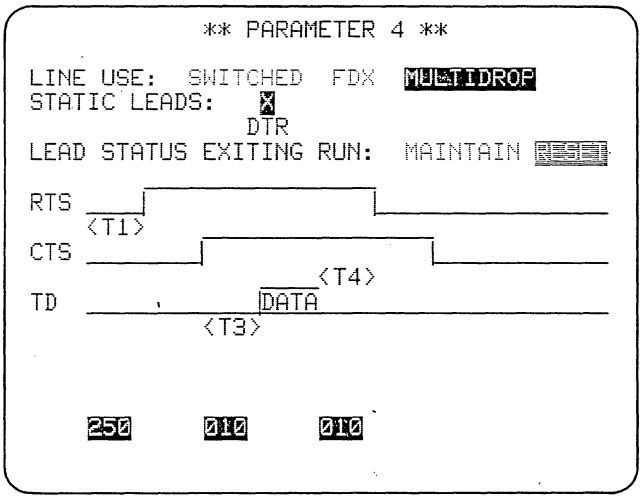


Figure 13-6

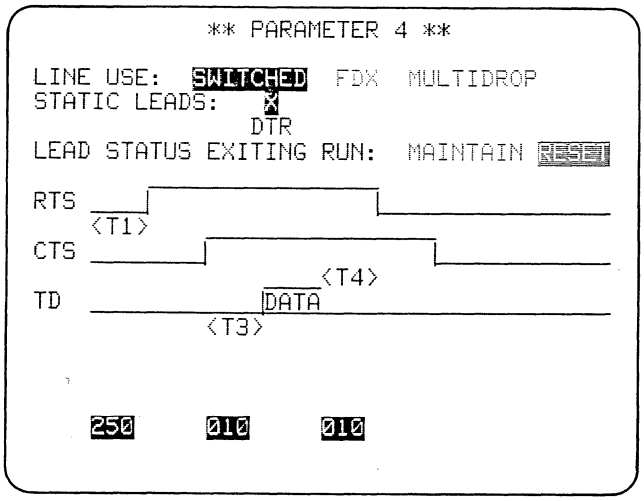


Figure 13-4

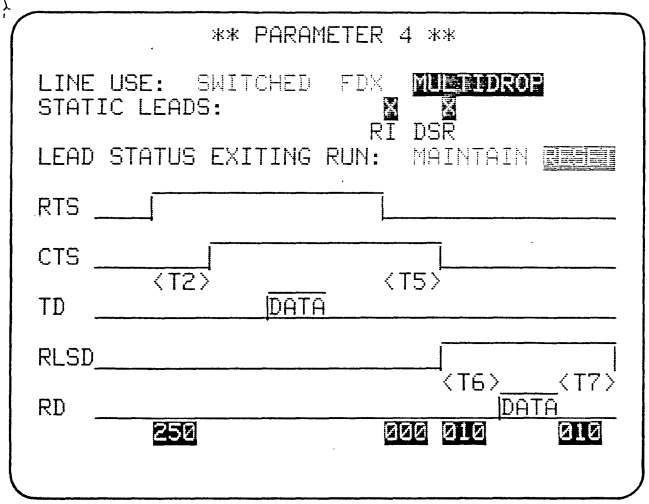


Figure 13-7

depending on your prior selections (see Table 13-2). The static leads will be set to the prescribed state when the 4500 enters Run Mode, and will be maintained in that state until the PROGRAM key is pressed: In other words, these leads are not dynamically controlled in Run Mode.

When the entry in a STATIC LEADS data-entry box is DC (Don't Care), the 4500 will maintain the lead at the OFF voltage. A 0 (zero) in the data-entry box also means OFF voltage level. In FDX mode, there is one case in which the distinction between DC and 0 is significant (see Section 13.3.5).

Enter a 1 (one) in the box for any lead that you want to turn ON.

13.3.3 LEAD STATUS EXITING RUN (LINE 6)

(a) RESET. If you select RESET, then each time the 4500 leaves Run Mode, all active leads will be reset to the OFF voltage state and remain that way until the unit enters Run Mode again.

(b) MAINTAIN. If you have selected MAINTAIN, then none of the active static leads will change in voltage level when the unit leaves Run Mode.

13.3.4 DELAY TIME SELECTION (LINES 7-17)

The graphic shown in the figures is displayed for all interface control modes except EM DTE, FDX. Under each delay time choice allowed by your prior selections (see Table 13-2), there will be a data-entry field.

The seven delay time fields, T1 through T7, are defined as follows:

T1 = Time from trigger true to RTS ON
T2 = RTS ON to CTS ON
T3 = CTS ON to Start Xmit
T4 = End Xmit to RTS OFF
T5 = RTS OFF to CTS OFF
T6 = RLSD ON to Start Xmit
T7 = End Xmit to RLSD OFF

The default entries, in milliseconds, for the delay time fields are as follows:

T1	T2	T3	T4	T5	T6	T7
250	250	010	010	000	010	010

The maximum time that you may enter is 999 milliseconds. When you position the cursor on a delay time entry field, the 4500 displays the appropriate definition at the bottom of the screen.

13.3.5 OPERATION IN THE VARIOUS INTERFACE CONTROL MODES

(a) Full Duplex. FDX, EM DCE is the one case in which there is a distinction between Don't Care (DC) and OFF (0) in the Static Leads field. If the entry for CTS in the Static Leads field is DC, then when the terminal turns RTS on the 4500 will respond with CTS. If you want the 4500 to keep CTS OFF, enter a 0 in the CTS data-entry box; if you want CTS to be continuously ON, enter a 1. Thus if a 0 or 1 is entered in the Static Leads field for CTS, it will not follow RTS after the prescribed delay T2; and when the terminal turns RTS off the 4500 will wait time T4 and turn off CTS.

For 7E/X.25 and the two SDLC formats, in FDX mode the data leads are also involved in Program Mode: For EM DTE, TD idles with $7E_{16}$ flags; for EM DCE, RD idles with $7E_{16}$ flags.

(b) Switched: Emulate DTE. When a trigger comes true to transmit, the 4500 will wait until RLSD is OFF and then start timeout T1. If RLSD is off when the trigger comes true then timeout T1 is started immediately. After T1 milliseconds the 4500 will turn on RTS; it will then wait for CTS. When CTS goes on timeout T3 will start. After T3 milliseconds the 4500 will begin to transmit the message. After the last character has been transmitted timeout T4 will start. After T4 milliseconds the 4500 will turn off RTS and then wait for CTS to go off. At this

point the 4500 considers the transmission complete.

(c) Switched: Emulate DCE. When a trigger comes true to transmit, the 4500 will wait until CTS is off; then turn on RLSD. If CTS is already off, RLSD will be turned on immediately, and timeout T6 will then begin. After T6 milliseconds, the 4500 will begin to transmit the message. After the last character of the message has been transmitted, timeout T7 will start. After T7 milliseconds the 4500 will turn off RLSD. At this point the 4500 considers transmission complete.

The 4500 also monitors RTS. When RTS goes on, timeout T2 starts. After T2 milliseconds the 4500 will turn on CTS; it then waits for RTS to go off. When RTS goes off, timeout T5 starts. After T5 milliseconds the 4500 will turn off CTS.

(d) Multidrop: Emulate DTE. This mode is the same as Switched except that when the trigger comes true, timeout T1 is started immediately. The 4500 does not wait for RLSD to go off before starting timeout T1.

(e) Multidrop: Emulate DCE. This mode is the same as Switched except that when the trigger comes true the 4500 does not wait until it has turned off CTS to turn on RLSD.

13.4 TO DISPLAY MESSAGE-ENTRY MENUS

13.4.1 MESSAGE OR ENTER MSG KEY

When you want to enter a message, first press the MESSAGE key (if you have a factory 4500 unit) or the ENTER MSG key (if your unit is a converted 3500). Either of these keys will display the Message Summary menu.

13.4.2 MESSAGE SUMMARY

The Message Summary menu (see Figure 13-8) is your only entrance to the Message-Entry menus. While the Message Summary is displayed, you may enter any digit from 0 to F to obtain one of the

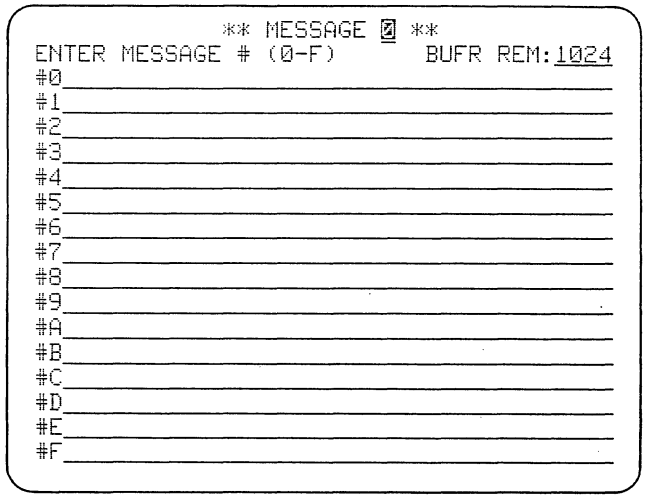


Figure 13-8

16 message-entry menus. (The HEX key is not needed.)

While a Message-Entry menu is displayed you may again view the Message Summary by pressing MESSAGE or ENTER MSG.

On Line 2, the Message Summary always displays the total message buffer space that is currently available (BUFfeR REMaining). For each Message-Entry menu, it tells you the number of characters in the message and also shows the first 28 characters of the message to remind you of what messages are currently available (see Figure 13-9).

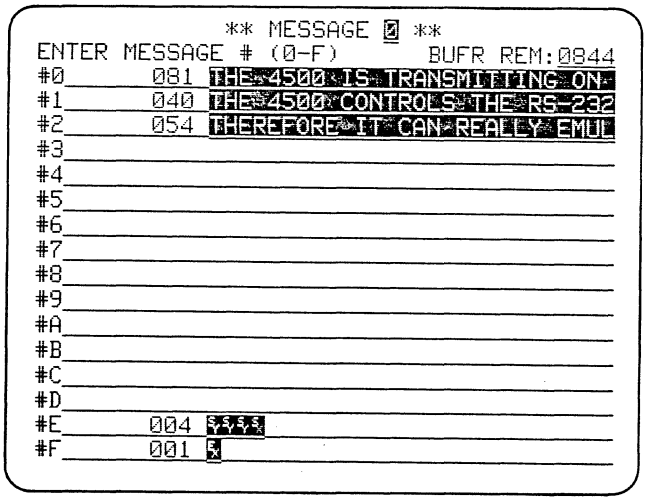


Figure 13-9

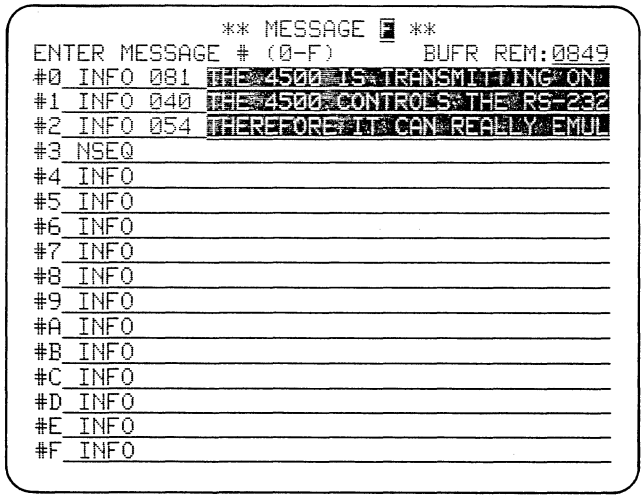


Figure 13-10

For X.25 and SDLC protocols (see Figure 13-10), each message summary line is preceded by the mnemonic for the frame type selected on the message-entry menu.

13.5 MESSAGE-ENTRY MENUS

The sixteen message-entry menus (see Figures 13-11 and 13-12) are identical except for their identification numbers. Figure 13-11 shows a typical message-entry menu for BISYNC protocol; Figure 13-12, the menu as it appears for bit-oriented protocols. The message you type in is automatically entered in the message buffer, but you may alter it at any time simply by changing the Message-Entry menu.

13.5.1 DESTINATION (LINE 3)

The default choice is LINE. When the trigger conditions become true, the message entered on the text lines will be transmitted on the data line chosen in the MODE field of the Parameters 1 menu.

If PROMPT is selected, the text will not be transmitted, but will be displayed as a message to the operator on the second line of the Run Mode display.

13.5.2 BEGIN FRAME (LINE 4)

This field appears only for BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI. The default selection is YES, which enables five more fields, ADDRESS, TYPE, P/F, NR, and NS.

Select NO if the text to be entered is to be a continuation of a frame entered on another message menu. The next five fields will disappear.

13.5.3 ADDRESS (LINE 5)

Enter the address byte as a two-digit hexadecimal character (the HEX key is not needed). Any key except 0 through F (the blue keys) will be rejected with an error message. The address defaults to all 00 if you neglect to enter an address.

13.5.4 TYPE (LINE 6)

Select a mnemonic for frame type. The default selection is INFO. You may also choose from RR, RNR, REJ, and NSEQ. The last field in this line is a

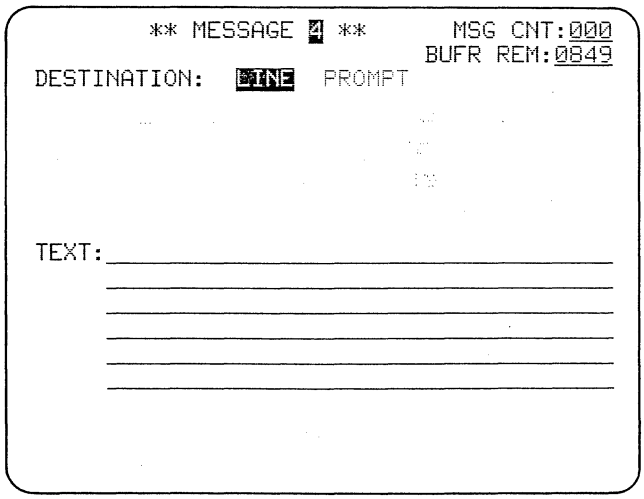


Figure 13-11

data-entry field in which you may select another frame type by entering any two-digit hexadecimal number (HEX key not needed).

13.5.5 P/F (LINE 7)

This line does not appear if NSEQ is selected on Line 6. Select 1 or 0 for the poll/final bit. The P/F bit defaults to 0.

13.5.6 NR (LINE 8)

(a) AUTO is the default selection. If you select AUTO, then the NR sent will be the last good received NR incremented by 1. The received NR is good if it is in sequence and the block had a good block check. The NR count will not be incremented until a good NR is received.

(b) The alternative selection is a data-entry field in which you may enter a numerical value for NR. The number entered will be sent each time. If you select this field but don't enter an NR, the default entry 0 (zero) will be sent. If a specific NR is sent using this selection, then that NR will be the next received NS that is expected.

13.5.7 NS (LINE 9)

(a) The default choice is AUTOmatic. If you select AUTO, then the NS count will always increment one count with each frame sent unless the message is aborted.

(b) If you select LAST good REC NR, then that value is sent. (Good NR is defined by Paragraph (a) of Section 13.5.6.) This can be used to respond to a REJECT.

(c) SKIP. This selection forces NS errors by causing the NS count to increment by 2.

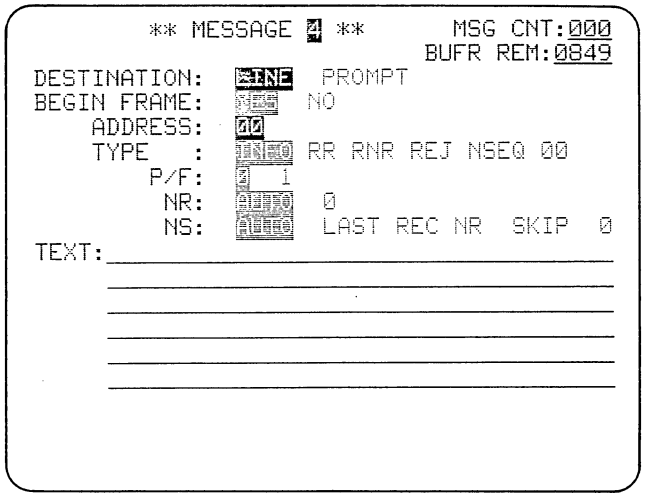


Figure 13-12

(d) If you enter a numerical value for NS, that number will be sent each time. The default value 0 (zero) will be sent if you select this field but do not enter a number. If a specific NS is sent, then the next NS will be that NS plus 1 if AUTO is used.

13.5.8 TEXT (LINES 10 to 15)

In this data-entry field you can type in a message to be transmitted or displayed as an operator prompt. The maximum length for a transmitted message is 210 characters. There are 16 message menus, but the total message buffer space is 1024 bytes, so if you enter a number of messages, not all of them can be of maximum length.

If you have selected PROMPT, however, only 40 characters can be displayed in Run Mode. If you enter more than 40 characters only the first 40 (one line on the CRT) will be displayed.

In the upper right-hand corner of the menu are always displayed the total number of message characters currently entered (MSG CNT) and the total message

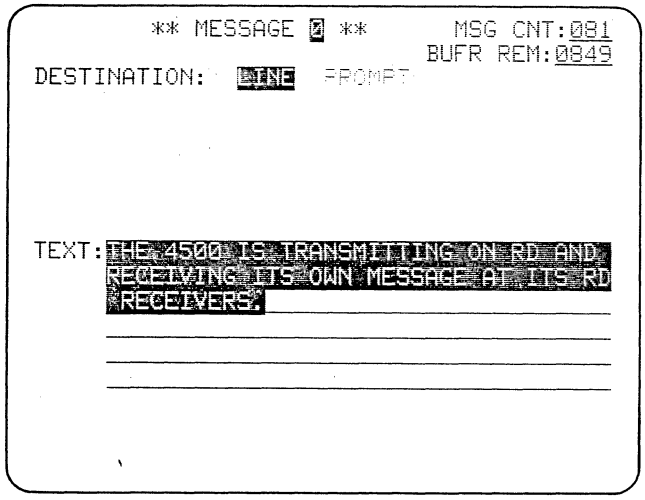


Figure 13-13

buffer (BUFR REM) currently remaining (Figure 13-13).

All alphanumeric characters are valid in the message field. Control characters may be used, but the FLAG key is invalid. Hexadecimal characters may be used in transmitted messages but should not be used in Prompts. If a message character is entered in hexadecimal it is not translated and parity is not calculated. If a Prompt character is entered in hexadecimal, it is displayed as the ASCII equivalent regardless of what code has been chosen.

The packet protocol bytes should be entered in this field, as part of the message text.

Press the MESSAGE or ENTER MSG key to return to the Message Summary and select another message-entry menu.

Messages are transmitted by trigger action, but you can obtain manual control of triggers (see Section 12.3.5).

13.6 FORMATTING MESSAGES

(a) All six messages designated in the SET XMIT field of a trigger Actions menu (except, of course, for Prompts) are always transmitted as one unit in the message envelope that you select on the Parameters 4 menu, and to the 4500, one transmission always consists of all SET XMIT message entries on one trigger.

(b) For bit-oriented protocols--BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI--use the special fields on the message-entry menus for frame control (see Sections 13.5.2 to 13.5.7). Received Block Check is always automatically calculated and displayed for these protocols (see Section 11.2.10). Packet protocol must be entered as message text.

(c) For other protocols, you can enter protocol characters with the message text; or you may use a separate Message-Entry menu to enter each header or trailer and then obtain the message text from any other message-entry menu, the Receive Buffer, Keyboard Buffer, or factory-stored message. If you wish block check calculations to be performed and displayed, always select (1) BLOCK CHECK ON on the Parameters 1 menu (Section 11.2.10) and (2) GooD or BaD BCC on the SET XMIT line of the Trigger Actions menu (Section 12.4.1).

13.7 KEYBOARD BUFFER MESSAGES

In addition to entering messages on the message-entry menus described in Section 13.5, you may type in messages directly from the keyboard in Run Mode. Messages can be entered in the 4500's keyboard buffer only in Run Mode while either data or frame or packet protocol is displayed (not Program Summary or Results). The CRT must not be frozen. The Keyboard Buffer holds 40 characters. Its content must be transferred to a Transmit Buffer before it can be transmitted. Like other messages, the Keyboard Transmit Buffer content is transmitted by triggers (see Section 12.4.1) but you may obtain manual control of the triggers (see Section 13.12).

First enter K, for Keyboard, in the message space on the SET XMIT line of a Trigger Actions menu.

While data is displayed--but not manually frozen--press the MESSAGE key (or the ENTER MSG key on a converted 3500 unit). The second line of the display will clear (see Figure 13-14). Type in the desired message of up to 40 characters. All alphanumeric, hexadecimal, and control characters are legal. The Flag key may not be used. As you type the message, it will be displayed on Line 2 (Figure 13-15). CLEAR FIELD clears the Keyboard Buffer. Just as on the program menus, you can use cursor arrows, CONTROL plus a cursor arrow, or SHIFT plus CLEAR FIELD to make changes in this field.

The Keyboard Buffer message must be transferred to the Keyboard Transmit Buffer before the trigger can send it. This can be done in two ways:

(1) Press MESSAGE, or ENTER MSG, again. The Keyboard Buffer will be cleared and closed to keyboard access and Line 2 of the display will again display status information. Each time the trigger conditions come true, the message will be transmitted.

(2) Press the ENTER key. The message will be transferred to the Keyboard Transmit Buffer but the entry field on Line 2 will remain and you may enter another message in the Keyboard Buffer. Meanwhile, each time the trigger conditions are true the message already in the Transmit Buffer will be sent.

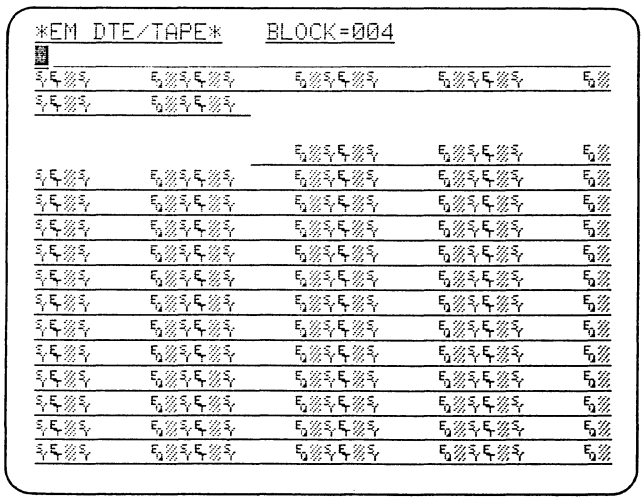


Figure 13-14

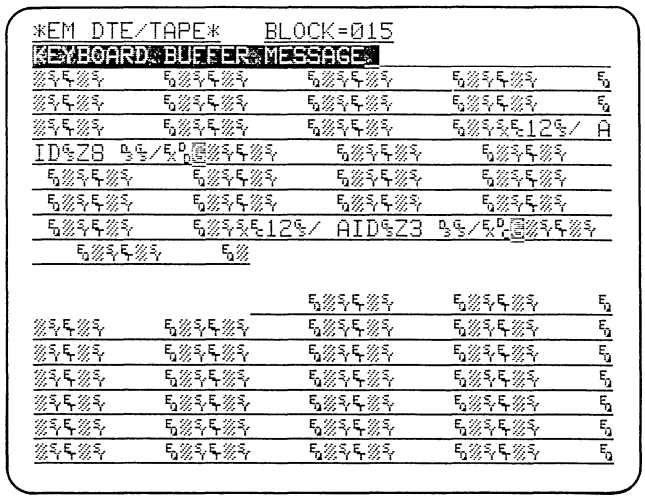


Figure 13-15

To clear the Transmit Buffer, press CONTROL plus CLEAR FIELD while the Keyboard Buffer entry field is displayed. This also clears the Keyboard Buffer.

CAUTION: Be sure to transfer your message to the Keyboard Transmit Buffer before you change the display by pressing MANUAL FREEZE, PROGRAM SUMMARY, or RESULTS. In these cases, you will (1) lose the contents of the Keyboard Buffer, and (2) lose access to the Keyboard Buffer. A message already in the Transmit Buffer will not be affected. HALT, CLEAR CRT, or SELF TEST will not affect either the Keyboard Buffer or the Transmit Buffer.

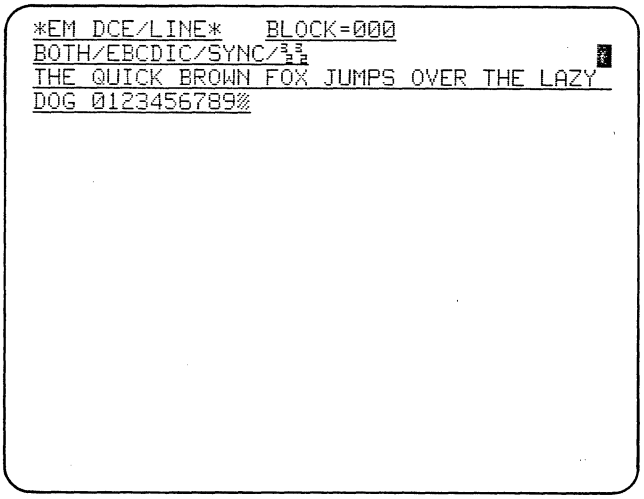
13.8 RECEIVE BUFFER; ECHO

The Receive Buffer can be loaded with up to 255 bytes of data under control of the triggers (see Section 12.4.7). In EM DTE mode, the Receive Buffer loads from the RD line; in EM DCE mode, it loads from the TD line. Data from the transmitter cannot be loaded into the Receive Buffer. To transmit the Receive Buffer contents, enter an R on the SET XMIT line of a trigger Actions menu.

Normally, header and trailer information must be sent along with the Receive Buffer. For instance, you might enter the messages 0, R, and 1 in the SET XMIT field, where 0 is SY SY SY STX and 1 is ETX. Then the text of the message would be the Receive Buffer contents.

13.9 FACTORY-STORED MESSAGE

To transmit the 4500's factory-stored message, enter an M on the SET XMIT line of a trigger Actions menu. The text of the stored message is shown in Figure 13-16. As with the Receive Buffer, any protocol characters must be added from the Message-Entry menus.



Figue 13-16

13.10 LOOPBACK

The INTERVIEW 4500 can transmit to itself. This ability can be put to good use for training purposes.

(1) Be sure that no data lines are connected at the rear of the unit.

(2) When you select Emulate DCE Mode, INT CLOCK will be selected automatically. For EM DTE, be sure to select INT CLOCK.

(3) Select LINE as the SOURCE. Choose the appropriate code and format.

(4) The default Parameters 4 menu is acceptable for this purpose because there will be no switched leads to serve as references for delay times.

(5) Remember that all transmissions are under trigger control, so you must program triggers to transmit. There is no incoming data to trigger on, but you can use internal flags as the Trigger source to start the transmission. Since the initial flag status is always all 0's, you can use Flag OFF as the condition to start transmission. Enter a zero for a flag on a Conditions menu; then set the trigger to transmit your message and turn that flag on. This starts transmission, which provides you with other possible trigger sources (End of Transmission or a DCE string, for example) for further transmissions.

> NOTE: The Receive Buffer cannot be used as it will not load data from the Transmit side of the line.

The display will show the 4500's transmissions as they are received from the line. If the 4500 is in EM DTE mode, you will see TD data (Pin 2); in EM DCE mode, you will see RD (Pin 3) data. The block check characters you see will be the transmitted characters. If Received Block Check is ON, the second block check character will be replaced by G or B (or A) because the 4500 is receiving and checking its own transmissions.

13.11 TAPE PLAYBACK

Taped data (or RAM) may be played back in either EMULATE mode. For example, if a tape contains recorded TD data, select Emulate DCE mode and Tape as the data source. In Run Mode, the status line will identify the mode as EM DCE, the source as TAPE, and the line as BOTH. If you transmit during tape playback, you will see the taped data displayed as TD data, and your transmissions will appear as RD data. Since

you can use the taped TD data to trigger on, this is an excellent tool for developing protocol programs or for protocol training.

13.12 MANUAL TRANSMISSIONS

When the data source is LINE, the keyboard buffer is especially useful for sending messages manually, in the following manner:

(1) Program a trigger to look for the MARKER; that is, select MON EIA:YES MKR on a trigger Conditions menu. Set the trigger to transmit the keyboard message; i.e., select SET XMIT;YES K on the Actions menu.

(2) At any time while real-time data or frame/packet protocol is displayed, you may type a message on the keyboard and enter it in the Transmit Buffer with the MESSAGE or the ENTER MSG key (see Section 13.7).

(3) Transmit the keyboard message by pressing the ENTER key. When any other trigger conditions are satisfied, and any preceding messages called in the same message-entry field have been sent, the keyboard buffer message will be sent. If the message has not been transferred to the Transmit Buffer before the trigger acts, no keyboard message will be sent.

14 Capture Memory: Recording

The INTERVIEW 4500's Capture Memory comprises an integral tape and an optional high-speed Random Access Memory (RAM). You can record data into the RAM just as onto tape, play back data from either tape or RAM, and control the tape or RAM either manually or with triggers. You can also transfer the data content of the RAM to tape or vice versa.

On the tape, you can also save a 4500 program along with the data, and you can make duplicate tapes of the program and data. There is a Program-Only Tape option that enables you to store up to 100 programs on a tape. However, only 4500 units with Option 23 installed can use the Program-Only Tapes. Software Version 10.08 checks the tape in the unit for tape type.

14.1 BLOCK NUMBERING

There are 250 to 260 blocks on a tape. One block contains 2400 characters (1200 from each side of the line) when RS-232/V.24 interface status is not recorded. If interface status is recorded on tape, each block will contain 1600 characters (800 from each side of the line) plus 800 interface samples. The RAM contains 54 blocks of 2400 characters plus a partial block of 1472 characters. The RAM does not record interface status.

14.2 STATUS INDICATORS

The Capture Memory status indicators on the INTERVIEW front panel indicate the status of the tape or RAM, whichever has been selected on the Parameters 2 Record Control menu. When the Capture Memory is recording the RECORD LED is always on. Either the MANUAL or the TRIGGER LED will also be on, to show how the recording process is being controlled.

14.3 CAPTURE MEMORY KEYS

The three green Capture Memory keys control either tape or RAM, depending on which has been selected on the Record Control (or Parameters 1) menu. You can start or stop recording (or data playback) manually using the MANUAL START and MANUAL STOP keys whether or not triggers have been set to control recording. The only way to return the Capture Memory to trigger control, however, is to operate the RESUME TRIGGER key.

14.4 HIGH-SPEED MEMORY OPTION (RAM)

The 4500's optional High-Speed Memory (RAM) will record at data speeds up to 72 kbps. The RAM option also includes

the special high-speed monitoring capability explained in Section 11.2.4(d).

When the RAM option is installed, it will be announced on the power-up display as OPTIONS: 05 after the automatic power-up tests are in progress. Power-up will take up to 30 seconds (depending on the size of the RAM option installed) while the 4500 automatically tests the RAM.

A Series 70 error code displayed on power-up indicates a RAM problem. See Section 17.7 for a discussion of RAM errors and instructions for conducting further self tests of the RAM.

NOTE: Series 70 errors will have no effect on any aspect of 4500 operation except the RAM.

The RAM is a volatile memory, with no power backup. For permanent storage, the RAM content must be transferred to tape (see Section 14.8) or printed (see Section 15) before the 4500 is turned off.

The standard RAM capacity is 128_{16} kbytes (131072_{10} bytes). There are 2400 characters in each block of RAM, which corresponds directly to the block size on the tape. This means that there are 54 and a fraction blocks in RAM: The partial block is at the end of the memory, Block 54.

To play back data from RAM, select SOURCE: RAM on the Parameters 1 menu and enter any speed up to 72 kbps.

During playback, you may "back up" to the preceding block by pressing the LEFT cursor arrow. There is about a 1-second delay before playback resumes from the previous block. If during this delay you press the LEFT cursor arrow several times in rapid succession, the playback will back up by that number of blocks. If you back up from the beginning of memory, the playback will "wrap around" to the end of memory. Until playback actually resumes, FF_{16} will be sent to the CRT buffer.

Another advantage to the 1-second delay is that it gives you time to clear the CRT with the CLEAR CRT key before the playback resumes.

14.5 TAPE

14.5.1 PREFORMATTING TAPES

All new tapes should be formatted prior to use in the 4500, for two reasons. (1) When tapes are exposed to temperature changes or vibration, they may lose their tension. This results in faulty operation. Running a tape through one cycle, forward and reverse, will readjust the tension to its proper value. (2) The 4500 cannot find any block numbers beyond 000 unless the tape has been fully recorded with block numbers.

CAUTION: If there is data on the tape, formatting will erase it.

(a) Software Version 10.06. Power up the unit without a tape so that all menus are in default condition. Be sure no signals are connected at the rear of the unit. The PRIMARY DATA TD and RD indicators in the EIA STATUS indicator zone must be OFF.

Set up the Parameters 1 menu as follows (see Figure 14-1):

FORMAT:	ASYNC
SPEED:	19200

All other fields should be in default condition.

On the RECORD CONTROL section of the Parameters 2 menu (see Figure 14-2), select

CAPTURE MEM:	TAPE
INITIAL COND:	NOT RECORD
START AT:	BLOCK 000
STOP AT:	END

All other menus should be at default condition.

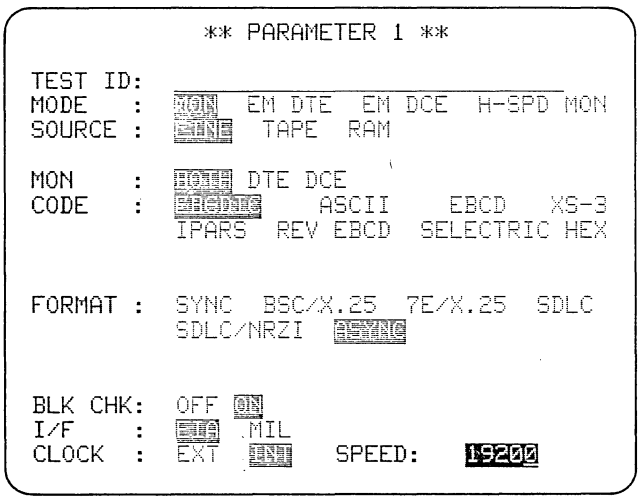


Figure 14-1 (Version 10.06)

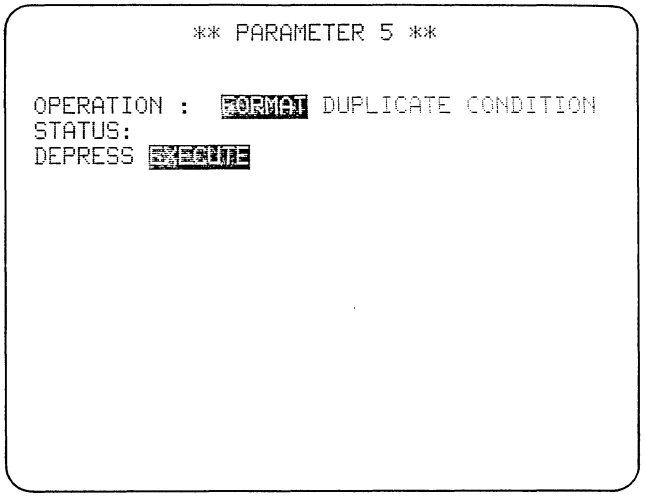


Figure 14-3

Position the tab on the new tape to RECORD, that is, toward the outside of the case, and insert the tape in the 4500. Press the RUN key, and watch the CRT.

When BLOCK 000 appears, press the MANUAL START key in the CAPTURE MEMORY zone. After about 3 minutes the block counter will stop incrementing near 250 and the message TAPE STOPPED @ END will be displayed. The tape is now formatted with all 250 or more blocks.

Press the PROGRAM key to ensure that tape motion has stopped and remove the tape.

(b) Software Version 10.08. Press PARAMETERS and numeral 5 to display the Tape Utility menu (see Figure 14-3). Install the blank tape--or a tape to be reformatted--in the unit with the tab in the RECORD position (toward the outside of the cartridge). Select FORMAT, which is the default OPERATION selection, and press the yellow EXECUTE key.

If the tab on the tape is in the PROTECTED position the tape cannot be formatted, and the status line will display the message TAPE IS WRITE PROTECTED. If the tape is not protected, the message FORMATTING TAPE (Figure 14-4) will blink on the Status line. When formatting is completed, after about 2 1/2 minutes, the STATUS will change to TAPE FORMATTED.

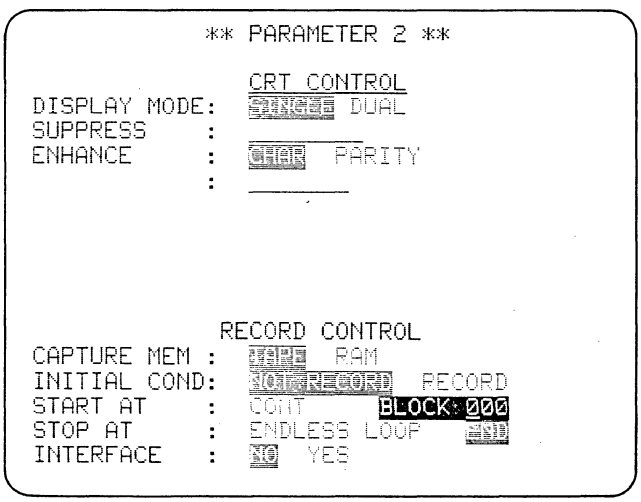


Figure 14-2 (Version 10.06)

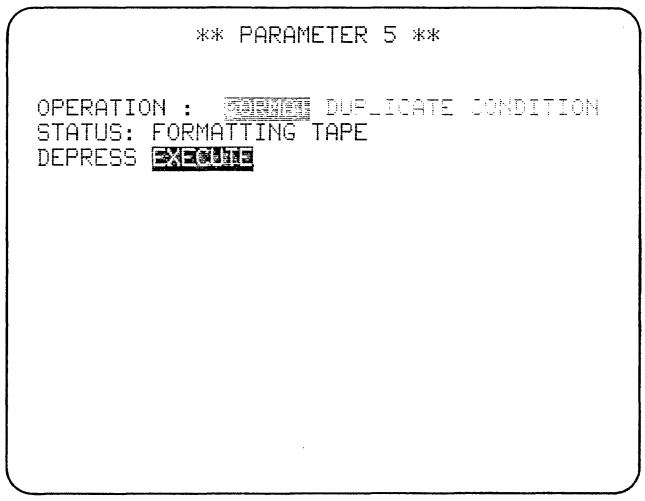


Figure 14-4

14.5.2 RETENSIONING TAPES

If a recorded tape that is to be used for analysis has not been kept in a controlled environment, it should be retensioned before use.

(a) Software Version 10.06. Set up the Parameters 1 menu as follows (see Figure 14-5),

SOURCE:	TAPE
START AT:	BLOCK 100
MONITOR:	BOTH
SPEED:	9600

and select the correct parameters for the data on the tape. Other menus should be in default condition.

Position the tab on the recorded tape to the PROTECTED position (toward the center of the tape) and insert the tape. Press RUN. The tape should move to Block 100; then begin to play back data.

Press PROGRAM, and on the Parameters 1 menu select START AT: BLOCK 000. Return to Run Mode. The tape will move back to Block 000 before it begins to play data.

If the 4500 cannot find Block 100 on a fully recorded tape, playing the tape back from Block 000 through the end may restore the tape to useful condition.

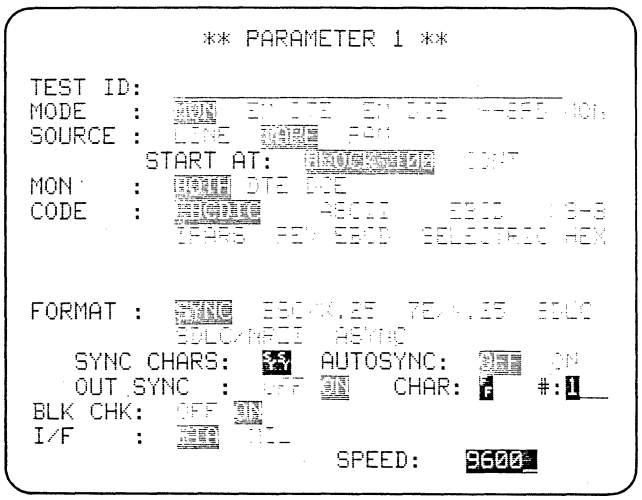


Figure 14-5

(b) Software Version 10.08. Each time you use the Parameters 5 menu to format or duplicate a tape, it is automatically retensioned. You may also retension any tape without affecting its content by selecting CONDITION on the Parameters 5 menu. Insert the tape with the tab in the PROTECTED position and press EXECUTE. The Status line will display CONDITIONING TAPE (Figure 14-6) while the tape is being retensioned; then TAPE CONDITIONED when it is finished.

14.6 DATA RECORDING

14.6.1 GENERAL

(a) Menu Selections. When LINE has been selected for the data source on the Parameters 1 menu, both received and transmitted data may be recorded on the tape. The only other menu requirements to enable recording are the proper CLOCK and SPEED selections

With clock provided via the RS-232 interface, EXT CLOCK permits recording whether or not data is displayed on the CRT, and whether the data is SYNC or BOP or isochronous (ASYNC with external clock). When clock is not supplied via the RS-232 interface, INT CLOCK and the correct data SPEED must be selected.

> NOTE: The 4500 will not record off external clock if clock is not being received from both DTE and DCE. This could occur, for instance, when a modem is set for New Sync. In this case, INTernal CLOCK and the correct data speed must be selected.

(b) Clock, Software Version 10.06. The Tape always runs off INTernal clock, whether EXT or INT is selected. Thus, for tape, the correct data SPEED must always be entered on the Parameters 1 menu.

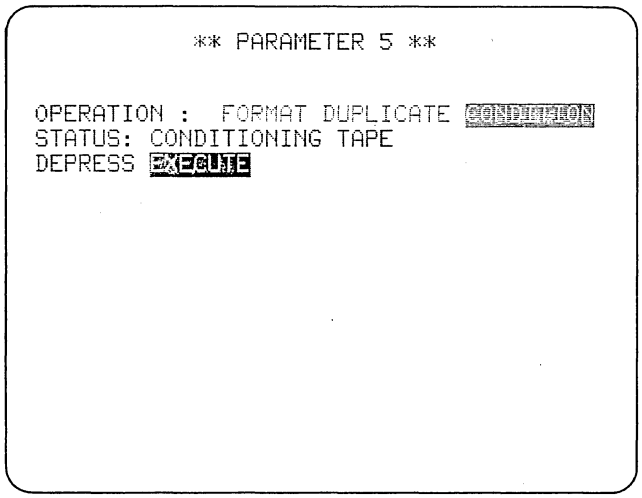


Figure 14-6

RAM will run off EXTernal or INTernal clock, as selected on the Parameters 1 menu.

(c) Clock, Software Version 10.08. There is a special CLOCK selection field on the Parameters 2 Record Control menu (see Figure 14-7), which applies only to the Capture Memory data receivers. Clock for the logic-CRT receivers is selected on the Parameters 1 menu. EXTernal clocking may be used when clock is being supplied on the interface. If you select INTernal clock, be sure to enter the correct data speed on the Parameters 1 menu.

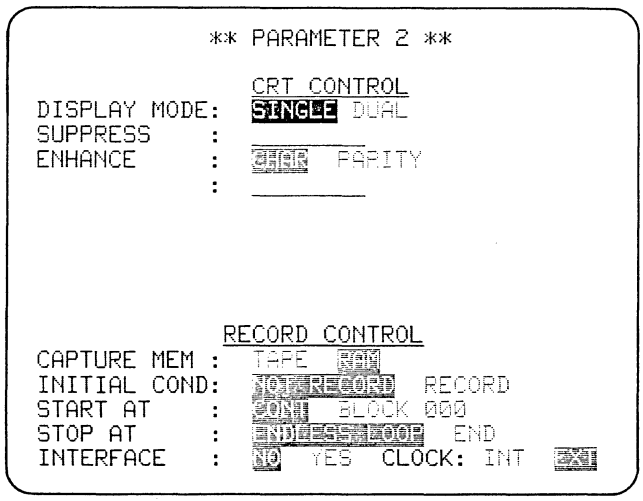


Figure 14-7

(d) Speed. To record using internal clock, be sure to enter the correct data speed on the Parameters 1 menu. For Software Version 10.06, a speed must always be entered to record on tape. Maximum speed for recording on tape is 19.2 kbps (9.6 kbps if EIA interface leads are recorded). The RAM can record at up to 72 kbps, but external clock must be used above 19.2 kbps.

(e) Interface Status. RS-232/V.24 interface lead status can be recorded only on tape and only if programmed on the Record Control Menu (Parameters 2; see Section 11.5).

(f) Run Mode. When data is being recorded, the RECORD indicator on the status panel goes ON and the Capture Memory block number on Line 1 of the display increments for each block received.

When the tape or RAM is turned on, the preceding 16 received characters (128 bits) are automatically recorded too. When it is turned OFF, the following 16 characters (128 bits) are automatically recorded. Therefore, when the Capture Memory is turned off and then on within less than 32 characters, the data is recorded without interruption. (See Figure 14-8.)

If the PROGRAM key is operated while the tape is recording data, the tape controller automatically records at least one full block of nulls (00_{16}).

14.6.2 SPECIAL TAPE CONSIDERATIONS

CAUTION: Always press the red PROGRAM key to stop tape motion before you power down the unit or remove the tape.

If the tab on the tape is in the PROTECTED position, recording will not take place.

The tape must be inserted before Run Mode is selected.

If the tape has not been preformatted, block numbers are assigned as the data is recorded: then only the portion of tape that has been recorded will contain block numbers. The logic cannot find a block number unless the entire tape has been recorded or formatted.

Because the tape is double buffered, incoming data is not immediately recorded, but when recording is finished, all data in the buffer is recorded.

14.6.3 MANUAL CONTROL

To manually record line data into the Capture Memory select Tape or RAM on the Record Control menu (if the RAM option is installed). Then, only two keys are required.

(1) To record on tape, remember to position the tab on the tape to RECORD position (toward the outside edge of the cartridge).

(2) Enter Run Mode; operate the MANUAL START key in the CAPTURE MEMORY zone of the keyboard.

(3) The RECORD and MANUAL indicators on the status panel will go on and the block number on the first line of the display will increment as each block is recorded.

(4) To stop recording, press MANUAL STOP (CAPTURE MEMORY zone).

NOTE: RS-232/V.24 interface status will not be recorded on tape unless INTERFACE is first selected on the Parameters 2 Record Control menu.

14.6.4 AUTOMATIC CONTROL: PARAMETERS 2 MENU

Data recording may be initiated and stopped automatically upon entering and leaving Run Mode by selecting INITIAL COND: RECORD on the Parameters 2 menu (see Section 11.5).

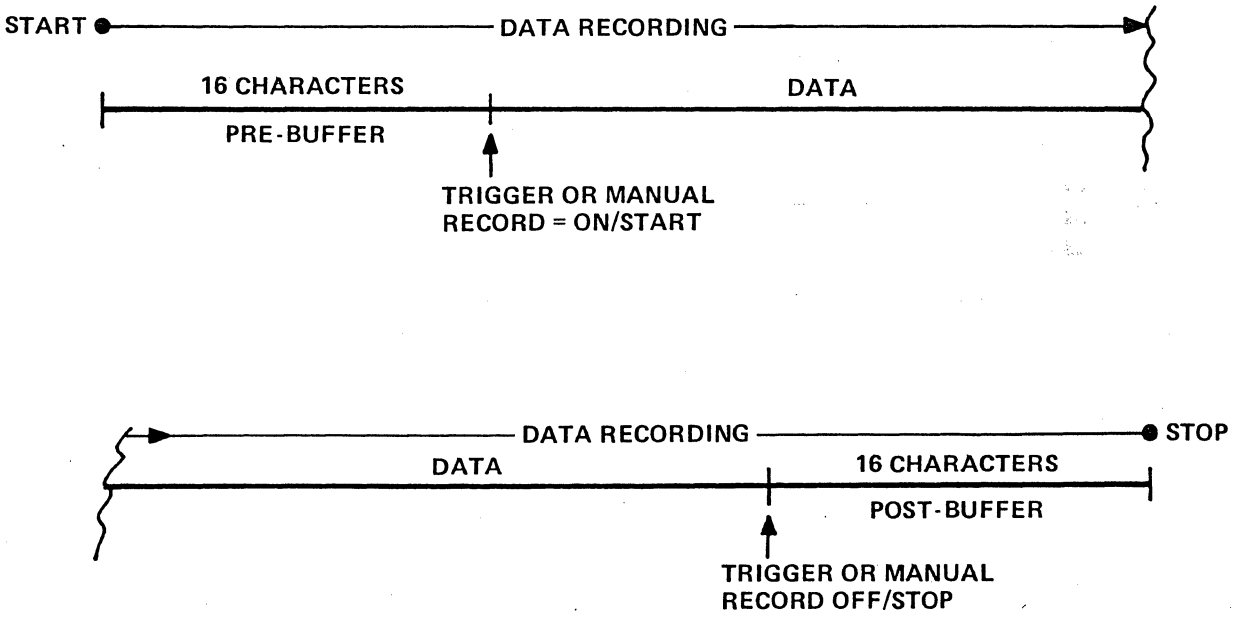


Figure 14-8

14.6.5 TRIGGER CONTROL

Recording may be started and stopped under trigger control. Check the Record Control selections on the Parameters 2 menu, as the trigger actions will be superimposed on these basic instructions.

The TRIGGER indicator in the CAPTURE MEMORY zone of the front panel will be ON. The RECORD indicator will flash ON and OFF to indicate the actual status of the recording process as the triggers control it.

14.6.6 MANUAL OVERRIDE

Control by the Parameters 2 menu or triggers may be overridden by the MANUAL START or MANUAL STOP key (CAPTURE MEMORY group). The MANUAL status LED in the CAPTURE MEMORY zone of the front panel will go ON. To return the tape or RAM to trigger control, press RESUME TRIGGER (CAPTURE MEMORY group). The MANUAL LED will go OFF and the TRIGGER indicator will go ON.

14.7 ERROR MESSAGES

The 4500 can display a number of error messages concerning tape and RAM operation. These messages and their probable causes are included in Appendix D.

14.8 RAM-TAPE DATA TRANSFER

You may transfer part or all of the content of RAM to the tape, or vice versa, using the RAM-Tape Xfer Control section of the Parameters 3 menu (Figure 14-9). This section of the menu will not appear unless the High-Speed Memory option (RAM) is installed in the unit. Recorded programs cannot be transferred, since the RAM does not store programs.

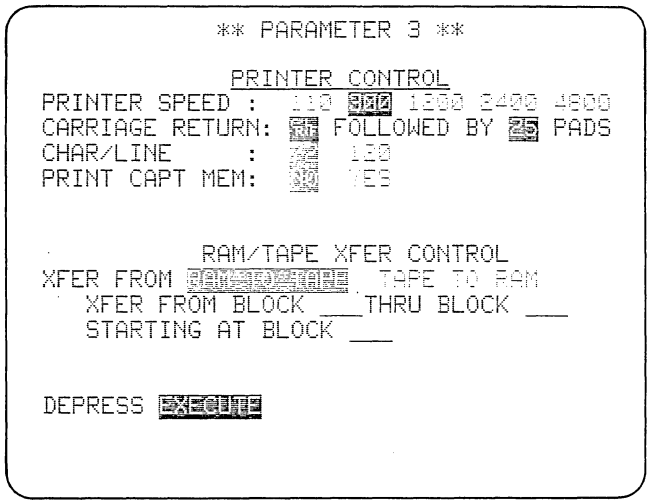


Figure 14-9

The block lengths and numbering of tape and RAM correspond, but there are only 54 and a fraction blocks of RAM as opposed to approximately 250 on tape.

(1) If you wish to transfer data to the tape, remember to position the tab on the cartridge to the RECORD position.

CAUTION: The transfer logic does not check tape type and it will record over any Program-Data or Program-Only tape.

(2) Display the Parameters 3 menu.

(3) Select the direction of transfer, RAM TO TAPE or TAPE TO RAM. The default direction is RAM TO TAPE.

(4) Enter the block number from which you wish transfer to begin (XFER FROM BLOCK ___) and then the block number at which you wish it to stop.

NOTE: All block numbers must be entered as three-digit numbers.

(5) Enter the block number at which you wish recording to begin (STARTING AT BLOCK ___).

(6) To execute these instructions, press the yellow EXECUTE key while the Parameters 3 menu is still displayed. The tape will move to the selected block before transfer begins.

If the RAM has been told to go to a block number beyond the end of memory, the following message will appear:

MEMORY BLOCK NOT FOUND - MAX BLK # = 54

This can occur in Ram-to-Tape transfer if the "XFER FROM" block number is too large, or in Tape-to-RAM transfer if the "STARTING AT" block is too large.

You can verify that the transfer is in progress by watching the number of blocks increment on Line 2 in the message XFER IN PROCESS: XXX BLOCKS TRANSFERRED. The time required for transfer is determined by the time it takes the tape to reposition itself and record or play back the data.

Transfer is followed by one of three messages on Line 2:

XFER COMPLETE: XXX BLOCKS TRANSFERRED

END OF MEMORY: XXX BLOCKS TRANSFERRED

TAPE STOPPED @ END: XXX BLOCKS TRANSFERRED

If interface lead status has been recorded on the tape, the status information will be stripped out during the tape-to-RAM transfer. Thus it will take about 70 blocks of tape containing interface status to fill the RAM.

The transfer will not proceed beyond the last block of the destination, whether tape or RAM. If end of tape is found before the transfer is complete, the 4500 will display the message TAPE STOPPED @ END.

```
          ** PARAMETER 3 **

            PRINTER CONTROL
PRINTER SPEED :  110 300 1200 2400 4800
CARRIAGE RETURN: 13 FOLLOWED BY 25 PADS
CHAR/LINE     :  72  120
PRINT CAPT MEM:  NO  YES


          RAM/TAPE XFER CONTROL
XFER FROM RAM TO TAPE  TAPE TO RAM
   XFER FROM BLOCK 002 THRU BLOCK 001
   STARTING AT BLOCK 000


DEPRESS EXECUTE
```

Figure 14-10

You may transfer from any block of RAM to any preceding block. The transfer will proceed to the end of the memory and then wrap around to Block 000. If, for instance, you transfer Blocks 002 through 001 of RAM (see Figure 14-10) to tape, the tape will record 54 full blocks of data and the 55th block will contain nulls (see Figure 14-11) because the 55th block of RAM (Block 054) is a partial block.

A transfer from the tape to RAM will wrap around also.

If you do not enter block numbers on the Parameters 3 menu, the 4500 will look for Block number SPACE. A message BLOCK NOT FOUND will be displayed.

```
*MON/TAPE*        BLOCK=054
BOTH/EBCDIC/SYNC/
 arrow to back up by one block during pl
ayback.:Press the LEFT cursor arro
w to back up by one block during playbac
k.:Press the LEFT cursor arrow to
b
                                        arrow to back up by one block
 during playback.:Press the LEFT c
ursor arrow to back up by one block duri
ng playback.:Press the LEFT cursor
```

Figure 14-11

If you transfer any portion of RAM that has not been recorded, "garbage" characters may appear on the tape (for example, nulls, self test data, or old data).

NOTE: If the data in RAM has been transferred from a tape containing interface samples, the RAM will be filled out with nulls.

14.9 RECORDING A PROGRAM ON TAPE

The 4500's tape can save a program as well as data. The High-Speed Memory does not record programs. The Program-Only Tape option will record up to 100 programs on a tape. If your unit has this option (Option 23), see Appendix J for program-recording instructions.

CAUTION: Always verify that the program on the tape is no longer of interest before you save a program on it. The tape must be checked before the program is developed in the 4500 to avoid the possibility of writing over the new program with whatever may be on the tape.

14.9.1 TAPE CHECK

Use the following procedure to ascertain that, if the tape contains a program, it is no longer of interest:

(1) Insert the new tape with the tab in the protected position. Operate PROGRAM; and LOAD PROGram: the TAPE LOAD/SAVE menu will be displayed. When the tape has been searched, the name of any resident program or NO PROGRAM FOUND or PROGRAM VERSION NOT SUPPORTED will be displayed on the PROGRAM ID line.

(2) Remove the tape cartridge.

14.9.2 SAVING A PROGRAM

(1) Develop the desired program in the 4500.

(2) Position the tab on the tape cartridge to RECORD (toward the outside of the case) and insert it in the 4500.

(3) Operate PROGRAM, which displays the Program Selection menu; then press the SAVE PROGram key. During the transfer the TAPE LOAD/SAVE menu with the PROGRAM ID and STATUS: SAVING is displayed. When the program has been transferred the menu announces SAVED (Figure 14-12). Version 10.08 will check for tape type and will also verify the program after it has been saved.

(4) Verify that the program has indeed been transferred to the tape as follows:

a. Operate LOAD PROGRAM. The Tape Load/Save menu should show the program ID.

b. If the tape is faulty, the message CHECKSUM ERROR will be displayed. In this case, the original program in the 4500 will not be disturbed. Repeat SAVE PROG and then LOAD PROG. If the error message

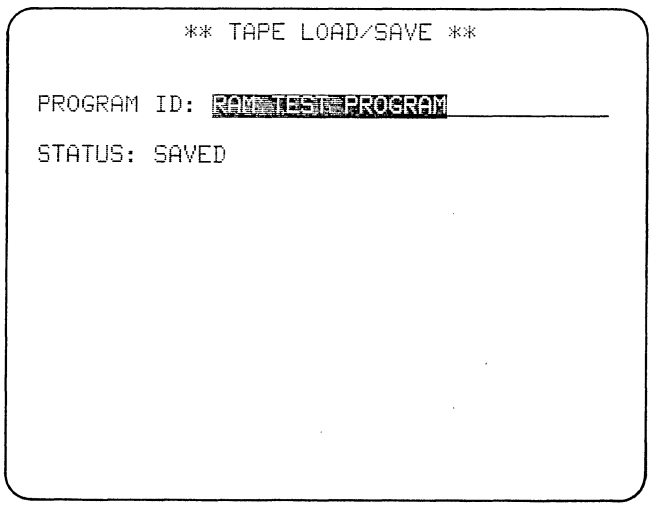


Figure 14-12 (Version 10.06)

repeats, the tape head may need cleaning, or the tape may be defective and need to be discarded.

c. Verify the Parameters 1 and Parameters 2 menus, all the Trigger menus, and the Statistics display.

(5) Remove the tape and position the tab toward the center of the case to protect the tape.

(6) Fill out a label with the program title and parameters. Prefold the label on the perforated line before peeling it off the backing; then attach it to the cartridge.

14.10 DUPLICATION OF TAPES

Program-Data tapes can be duplicated by both Versions 10.06 and 10.08, but the procedures are different. Program-Only tapes cannot be duplicated unless the unit has Option 23 (see procedure in Appendix J).

14.10.1 SOFTWARE VERSION 10.06

In Version 10.06, duplication of a Program-Data tape requires two separate operations: (1) duplication of the program; (2) duplication of the data.

(a) PROGRAMS. To duplicate programs, simply repeat the SAVE PROGRAM procedure of Section 14.9 as many times as necessary. Be sure to go through the verification procedure for each duplicated tape before you remove it and insert the next tape. This also insures that the correct program is available in the unit for saving on the next new tape.

(b) DATA. Duplication of data tapes requires two 4500 units and the RS-232/V.24 T-cable supplied with the unit.

(1) One 4500 is used to play the source tape. Connect the T-cable from the EM DCE and EM DTE connectors on the source 4500 to the MONITOR connector on the recording 4500. This cable carries the signals to be recorded from the source to the recording 4500.

(2) Starting with all menus at default condition, fill out the Parameters 1 menu of the source 4500 to play back the taped data as follows: Select EM DTE or EM DCE mode and select TAPE as the data source. Enter a speed; 9600 bps is recommended. Code and Format selections should be appropriate for the taped data.

(3) All menus on the recording 4500 should be at default condition. On the Parameters 1 menu of the recording 4500 select LINE data source and MONitor BOTH; then, select the same basic parameters as programmed in the source 4500.

(4) Set up the Parameters 2 menu of the recording 4500 as follows:

```
INITIAL COND:   NOT RECORD
START AT    :   BLOCK 000
STOP AT     :   END
```

(5) If RS-232 lead status was recorded with the taped data, the source unit will automatically output lead status in the playback. If you wish lead status to be recorded on the new tape, select INTERFACE: YES on the Parameters 2 menu of the recording unit.

(6) Position the tab on the source tape to the protected position and insert the tape in the source unit.

(7) Position the tab on the new tape to RECORD position and insert it in the recording unit.

(8) Press RUN on the recording unit. Then press RUN on the source unit to start tape playback, and observe the CRT of the source unit.

(9a) As soon as you see data displayed on the source unit, press the MANUAL START key in the CAPTURE MEMORY zone of the recording unit.

(9b) (Alternate Procedure) The recording 4500 can be synchronized by using a trigger to start the tape recording at the first non-FF character (for synchronous data), or the first Flag, non-Flag sequence (for 7E/X.25 or SDLC), or any other specific data string on the source tape.

Press the RUN key on the recording 4500. When BLOCK 000 is displayed on the recording CRT, operate the RUN key on the source unit.

(10) The RECORD LED on the recording unit will come on and the BLOCK number will increment. Recording will continue to the end of the tape--Block number 250 to 260. The CRT of the source 4500 will display data from only one side of the line--TD data if it is in EM DCE mode, or RD data if it is in EM DTE mode. The recording unit, however, will display all data, because it is receiving both RD and TD data at its MONITOR input.

At 9600 bps, recording takes approximately 3.5 minutes.

Verification of the recorded tape can be accomplished by visual observation during playback. However, an easier method is to use triggers to count data specifics such as STX, ENQ, EOT on both the source tape and the new tape. There may be minor discrepancies in the two sets of counts because of the slight differences in the exact locations at which the counts are examined.

Some tapes may contain more blocks than others because of variation in tape length.

14.10.2 SOFTWARE VERSION 10.08

CAUTION: If the unit used for duplicating has the High-Speed Memory option (OPT 05), its data content will be overwritten during the tape duplication process.

(a) FORMATTING AND CONDITIONING. The 4500 will copy the formatting of the source Program-Data tape during duplication and pad out any empty blocks at the end of the destination tape. The destination tape will be retensioned automatically during the duplication process.

(b) PROCEDURE. On the Parameters 5 menu, select DUPLICATE. Set the tab on the SOURCE tape (that is, the tape you want to copy) to the inside, or PROTECTED, position; set the tab on the DESTINATION tape (that is, the new tape) to the outside, or RECORD, position. Install the source tape. Press the EXECUTE key. The message DUPLICATING TAPE will appear on the Status line (Figure 14-13).

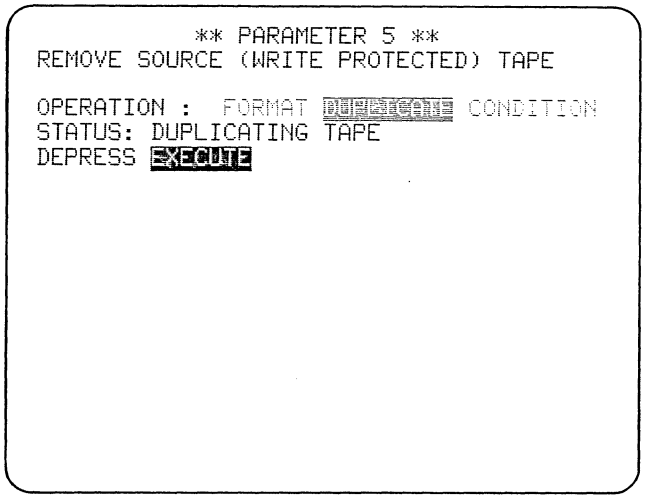


Figure 14-13

If there is no tape in the drive when you press EXECUTE, the 4500 will use Line 2 (see Figure 14-14) to ask you to

INSERT SOURCE (WRITE PROTECTED) TAPE.

If the tape in the unit has the tab in the RECORD position, the 4500 will assume it is not the source tape and ask you to

REMOVE DESTINATION (WRITE ENABLED) TAPE

and then, once you have removed the tape, to

INSERT SOURCE (WRITE PROTECTED) TAPE.

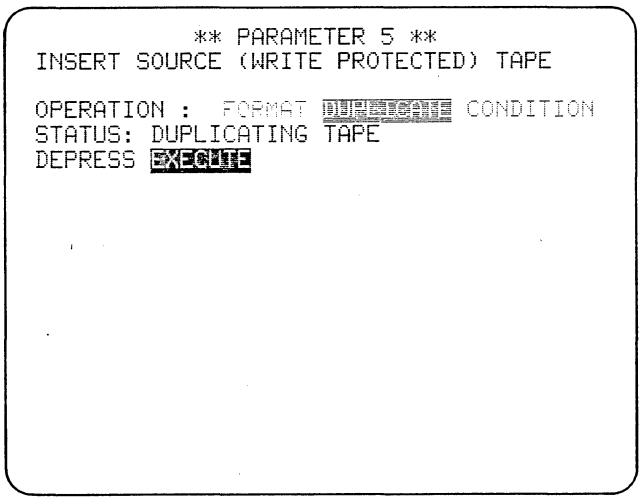


Figure 14-14

In either case, when the source tape is inserted, the 4500 will read it. When it has copied as much as it can from the source tape, it will ask you to

REMOVE SOURCE (WRITE PROTECTED) TAPE

and then to

INSERT DESTINATION (WRITE ENABLED) TAPE

After all the temporarily stored data has been transferred to the destination tape, you will be asked to insert the source tape again.

Thus, the 4500 will guide you through the number of tape swaps necessary to copy the entire tape on the destination tape. If your 4500 has the High-Speed Memory (RAM) option, it will automatically use it to store the content of the source tape, and a maximum of 5 tape exchanges will be required. Without RAM, up to 101 tape exchanges may be required.

When the process has been completed, TAPE DUPLICATED will appear on the Status line.

15 Printer Control

The 4500 will control most asynchronous ASCII printers. You may print not only static displays--all program menus except the summaries, frozen data displays and frozen frame or packet protocol displays, and Results--but also any data or frame or packet protocol as it is being played back from tape or RAM.

15.1 INTERCONNECTION

There is a separate female RS-232/V.24-type PRINTER/REMOTE interface connector on the rear of the INTERVIEW 4500 for connection to a printer (see Figure 15-1). The 4500 transmits to the printer on Pin 3 (RD). The 4500 also outputs an ON voltage (+12 V) on Pins 5 (CTS), 6 (DSR), and 8 (RLSD). The 4500 monitors Pin 20 (DTR). When DTR goes OFF the 4500 stops transmitting on Pin 3. When DTR goes back on, the 4500 resumes transmitting.

15.2 PRINTER CONTROL MENU

The Parameters 3 Printer Control menu (Figure 15-2) must be filled out before you attempt to print any display.

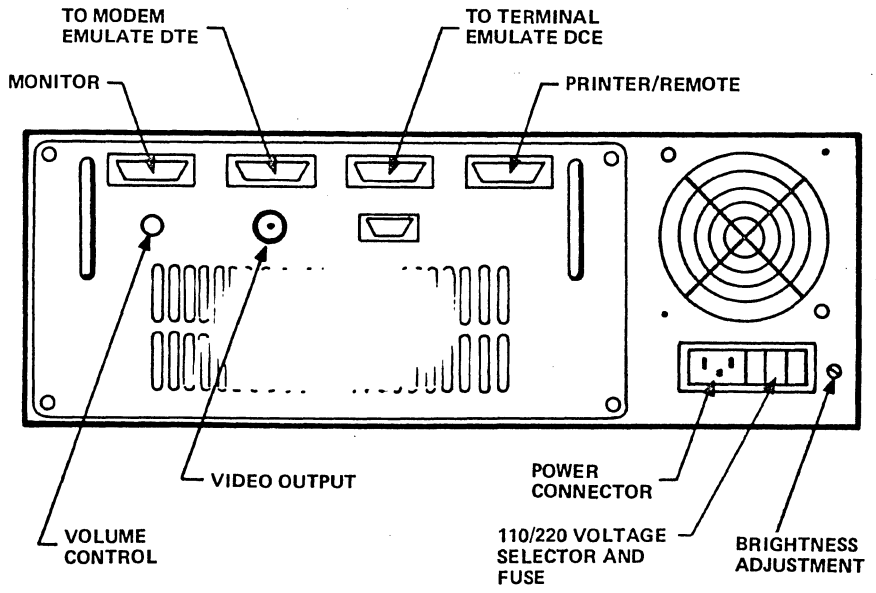


Figure 15-1 Rear Panel of INTERVIEW 4500

```
          ** PARAMETER 3 **

              PRINTER CONTROL
PRINTER SPEED :  110  300  1200  2400  4800
CARRIAGE RETURN:  13  FOLLOWED BY  25  PADS
CHAR/LINE     :   72   120


            RAM/TAPE XFER CONTROL
XFER FROM  RAM TO TAPE   TAPE TO RAM
   XFER FROM BLOCK ___THRU BLOCK ___
   STARTING AT BLOCK ___

DEPRESS  EXECUTE
```

Figure 15-2

15.2.1 PRINTER SPEED

In this selection field, you set the 4500 to match the speed of your printer. The selections are 110, 300, 1200, 2400, and 4800 baud. The default value is 300.

15.2.2 CARRIAGE RETURN

In the first data-entry field on this line, insert the carriage-return character or characters appropriate for your printer. The default characters are the ASCII control characters CR LF.

```
          ** PARAMETER 3 **

              PRINTER CONTROL
PRINTER SPEED :  110  300  1200  2400  4800
CARRIAGE RETURN:  13  FOLLOWED BY  25  PADS
CHAR/LINE     :   72   120
PRINT CAPT MEM:  NO   YES


            RAM/TAPE XFER CONTROL
XFER FROM  RAM TO TAPE   TAPE TO RAM
   XFER FROM BLOCK ___THRU BLOCK ___
   STARTING AT BLOCK ___

DEPRESS  EXECUTE
```

Figure 15-3

In the second field, insert the number of pad characters that must follow the carriage return instruction in order to give the printer time to perform the carriage return.

15.2.3 CHARACTERS PER LINE

Select the number of printed characters per line. The choices are 72 (the default value) and 120. If your printer's line length is 72 characters or less, choose 72. If your printer's line length is greater than 72 and less than 120, choose 120. The 4500 will not output more than 120 characters per line.

```
** TRIGGER 0 CONDITIONS **

MON:    DTE
  LINK:  YES
  FOR:  STRG    a :M  c =M  4E:DC
 M1:  XXXXXXXX
 M2:  XXXXXXXX
MON:  EIA  YES
    1   X   X   X   X   X   X   X
MON:  FLAGS  YES
    0XXXXXXX
MON:  TIMEOUT              YES
```

Figure 15-4

15.2.4 PRINT CAPTURE MEMORY

This field (Figure 15-3) does not appear unless TAPE or RAM has been selected as data source on the Parameters 1 menu. The default selection is NO. If you select YES, then the content of either tape or RAM, whichever was selected on the Parameters 1 menu, will be printed when the unit enters Run Mode.

15.3 PRINTOUT PROCEDURES

15.3.1 STATIC DISPLAYS

To obtain a printout of any allowed static display, fill out the Parameters

3 menu, display the material to be printed, and press the yellow PRINT key. The display will automatically be printed out.

The legal static displays are program menus, frozen data and frame or packet protocol displays, and the Results display. The Trigger and Message Summaries, Program Summary, and Self Test display cannot be printed. Data displays cannot be printed from Halt Mode.

You may print groups of menus as follows:

(1) Display the Program Selections menu (press the PROGRAM key) to print the entire program in the unit.

(2) Press PARAMETERS, then PRINT, to print the Parameters 1, 2, and 4 menus.

(3) Display the Trigger Summary to print all trigger Conditions and Actions menus.

(4) Display the Message Summary to print all message menus.

15.3.2 CAPTURE MEMORY PLAYBACK

To print the data content of either Tape or RAM, select TAPE or RAM as source on the Parameters 1 menu, and CAPTURE MEMORY: YES on the Parameters 3 menu. Press the RUN key, and the data will automatically be printed out as it is played back from the block selected on Parameters 1. The tape or RAM playback speed selected on Parameters 1 will be overridden by the Printer Speed selected on Parameters 3.

15.4 PRINTED FORMAT

15.4.1 PROGRAM MENUS

Most program menus can be adequately represented by 70 character-per-line

```
** TRIGGER 0 ACTIONS **

SET XMIT   :  YES   ACl
 BCC:  GD
SET TMOUT  :  RSTRT
SET CRT    :  YES
    0   0   X   X   X   X
SET CPT MEM:  NO
SET FLAG   :  INC
SET TIMER: TIMER1  YES   CONT
           TIMER2  NO
SET CNTR : CNTR  3   YES   INC
           CNTR  2   NO
SET ALARM:  NO
SET OTSYNC:  NO
SET ALT BANK:  YES
```

Figure 15-5

printouts. The printout will correspond 1:1 with most characters on the display. However, each character in a data-entry field is allotted three positions on the printout. This prevents control characters from being read by the printer and allows special characters such as hexadecimal or bit masks to be represented with standard alphanumeric characters. The symbols used for these and other characters are defined in Table 15-1.

Figures 15-4 and 15-5 are printouts of the trigger menus shown in Figures 15-6 and 15-7. Figure 15-8 shows

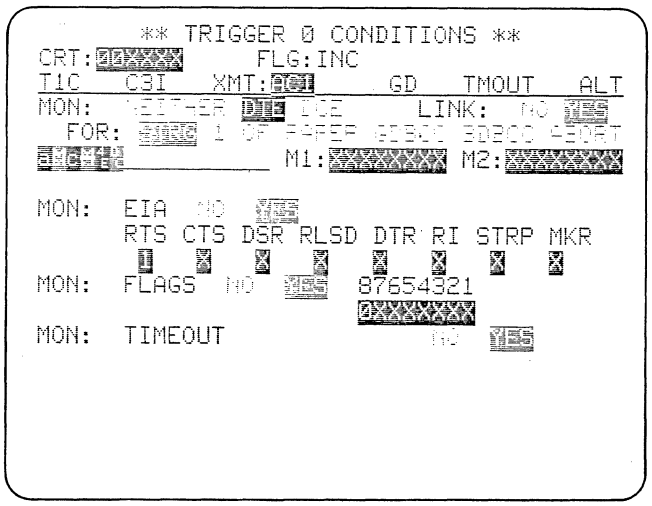


Figure 15-6

TABLE 15-1
SPECIAL CHARACTER REPRESENTATIONS ON PRINTOUTS

CRT Display	Printout
Normal characters	Character is preceded by and followed by a space.
Reverse-image and special characters: 7E (Flag), Bit Mask, G or B (BCC), A (Abort), DC (Don't Care)	Character representation (one or two printed characters) is preceded by a colon.
Don't Care	:DC (upper case)
Not Equal (bar through character)	- (dash) precedes character. = (equal sign) replaces the colon preceding special characters.
Control characters	Lower-case mnemonic (displayed as a space followed by two lower-case printed characters)
Hexadecimal characters	Displayed as a space followed by two printed characters

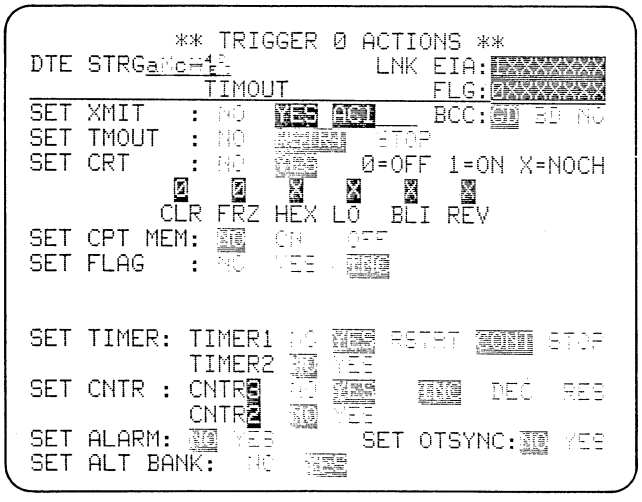


Figure 15-7

how each text-entry line on a Message-Entry menu will be printed on two lines on a 70-char/line printout.

Although control characters can be entered in the Test ID field on the Parameters 1 menu, a control character in that field will be printed out as a space.

15.4.2 MANUAL DATA FREEZE

(a) Status Lines. The status information on Lines 1 and 2 will be

```
** MESSAGE 0 **

DESTINATION:  LINE
BEGIN FRAME:  YES
  ADDRESS:  00
  TYPE   :  INFO
   P/F:  0
   NR:  AUTO
   NS:  AUTO
TEXT:   1 2 3 4 6 7 8 9 0 - [ ® q w e r t y u i o
 p _  © a s d f g h j k l ; :
       ] x c v b n m , . / ! " # $ % & ' ( ) ¶ =
 § @  Q W E R T Y U I O P ° ™
        A S D F G H J K L + * †
```

Figure 15-8

printed, but the binary character breakdown shown at the right of these lines will not be printed (compare Figures 15-9 and 15-10).

(b) Data Lines. Data is printed without any enhancements, and only the new data--up to the cursor position--is printed. In single-line mode, the printout does not distinguish between TD and RD data. The frozen single-line data display shown in Figure 15-9 looks like Figure 15-10 when it is printed out at 120 characters per line.

When DUAL-line display has been selected on the Parameters 2 menu, all data is printed in dual-line format (compare Figures 15-11 and 15-12). A line of TD data is followed by a line of RD data and then a line feed. Thus, the data line following a blank line is always TD data. Dots replace the L-shaped fill symbols (three dots for each character time).

The 4500 automatically converts all data to ASCII before it is sent to the printer interface. All characters for which there is no ASCII equivalent are sent to the printer as hexadecimal.

Each data character is allotted three spaces on the printout to accommodate control characters and hexadecimal. If you select 70 characters per line, therefore, the printout will show only 20 characters per line and will not correlate directly with the CRT

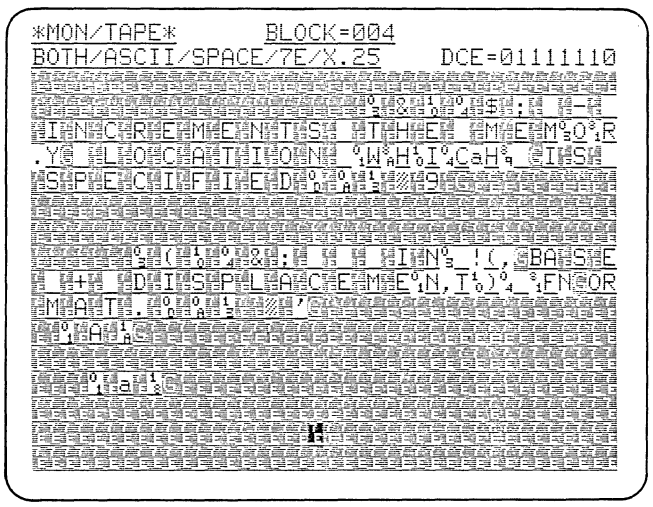


Figure 15-9

```
*MON/TAPE*       BLOCK=004
BOTH/ASCII/SPACE/7E/X.25

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E ex:7E & :7E dl:7E et:7E $ :7E ; :7E sp:7E - :7E sp

:7E I :7E N :7E C :7E K :7E E :7E M :7E E :7E N :7E T :7E S :7E sp:7E T :7E H :7E E :7E sp:7E M :7E E :7E M  ex O  sh R

 .  Y :G  sp:7E L :7E O :7E C :7E A :7E T :7E I :7E O :7E N :7E sp sh W  lf H  dl I  et C  a  H  ht sp:G  I :7E S :7E sp

:7E S :7E P :7E E :7E C :7E I :7E F :7E I :7E E :7E D :7E cr:7E lf:7E d3:7E pd:7E 9 :7E:G :7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E ex:7E ( :7E dl:7E et:7E & :7E ; :7E sp:7E sp:7E sp:7E I :7E N  ex sp !  (  , :G  B  A :7E S :7E E

:7E sp:7E + :7E sp:7E D :7E I :7E S :7E P :7E L :7E A :7E C :7E E :7E M :7E E  sh N  ,  T  dl )  et sp sh F  N :G  O  R

:7E M :7E A :7E T :7E . :7E cr:7E lf:7E d3:7E:7E pd:7E ' :G :7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E sh:7E A :7E sb:G :7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E sh:7E a :7E cn:G :7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E

:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E:7E
```

Figure 15-10

```
*MON/TAPE*       BLOCK=001
BOTH/ASCII/SPACE/7E/X.25

..................................... 03 A  " :G ..................................... 01 @  10 04 a  " :G ..............
 sp ;  sp -  sp E  X  P  E  C  T  S  sp A  sp B  I  T  sp I  N  D  E  X  sp (  7  sp -  sp 0  )  sp I  N  sp '  B  I  T

.................................................................................... 03 a  sp:G ............
 '  0D 0A 13 pd m :G  01 01 16:G  01 !  14:G  03 $  10 04 &  sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp ;  sp -  sp

.................. 01 b  10 04 81 U :G ..................................................... "
 E  X  P  E  C  T  S  sp I  X  sp 0  R  sp I  Y  sp I  N  sp '  I  R  '  0D 0A 13 pd 81:G  01 A  12:G
```

Figure 15-11

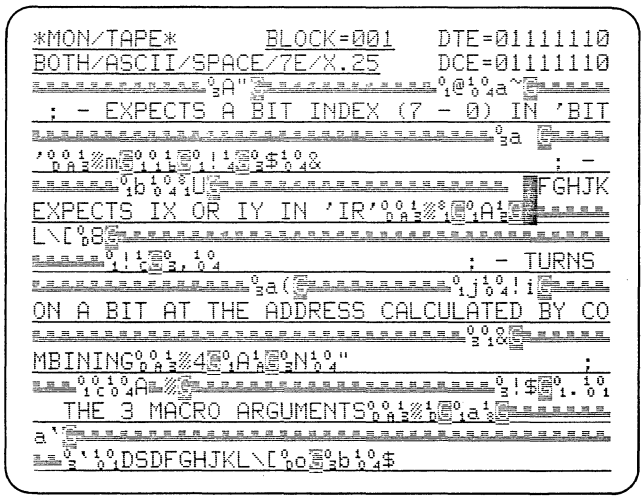


Figure 15-12

display. (See Figure 15-13.) If you select 120 characters per line (Figure 15-11), the printout will correspond line for line with the CRT display.

15.4.3 FROZEN FRAME OR PACKET PROTOCOL DISPLAY

With the exception of a few hexadecimal characters, printouts of the frame or packet protocol display correlate character for character with the CRT display. Figure 15-14 is the printout of the display in Figure 15-15.

```
*MON/TAPE*        BLOCK=001
BOTH/ASCII/SPACE/7E/X.25

..................................... 03 A  " :G .............
 sp ;  sp -  sp E  X  P  E  C  T  S  sp A  sp B  I  T  sp I
   ........................ 01 @  10 04 a  ™ :G ...............
    N  D  E  X  sp (  7  sp -  sp 0  )  sp I  N  sp '  B  I  T

.............................................................
 '  0D 0A 13 pd m :G  01 01 16:G  01 !  14:G  03 $  10 04 &
   ..................................... 03 a  sp:G .............
    sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp ;  sp -  sp

................... 01 b  10 04 81 U :G ......................
 E  X  P  E  C  T  S  sp I  X  sp O  R  sp I  Y  sp I  N  sp
   .............................................................
    '  I  R  '  0D 0A 13 pd 81:G  01 A  12:G  03 F  10 04 (  sp

.............................................................
 sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp sp ;  sp -  sp E
   ..................... 03 81 . :G ...........................
    X  P  E  C  T  S  sp A  N  sp 8  sp B  I  T  sp D  I  S  P

 01 84 10 04 !  G :G .....................................
 L  A  C  E  M  E  N  T  sp I  N  sp '  D  I  S  P  '  0D 0A
   ......... ™
    13 pd e :G
```

Figure 15-13

```
*MON/TAPE*        BLOCK=004
BOTH/ASCII/SPACE/7E/X.25/PACKET

          DTE                              DCE
LCN  TYPE  R S    QDM        LCN  TYPE  R S    QDM
004 *RR    0          G      004  DATA  5 7        G
004 *RR    1          G      004  DATA  5 0        G
004 *RR    2          G      004  DATA  5 1        G
001 *RR    4          G      001  DATA  3 3        G
004 *RR    3          G      004  DATA  5 2        G
004 *RR    4          G      004  DATA  5 3        G
001 *DATA  4 3        G
004 *RR    5          G      004  DATA  5 4        G
004 *RR    6          G      004  DATA  5 5        G
                             004 *DATA  5 6        B
004  RR    7          G      004 *DATA  5 7        G
004  RR    0          G      004 *DATA  5 6        G
001  RR    5          G      004 *DATA  5 7        G
                             001 *DATA  4 4        G
```

Figure 15-14

15.4.4 CAPTURE MEMORY PLAYBACK

Data can be played back directly to the printer when the tape or RAM is selected as source. The printout will use three character spaces for each data character. Since there are 40 characters per line on the CRT, you should select 120 if you want a line of the printout to correlate with a line of the CRT display.

Taped data may be played back to both CRT and printer simultaneously. If SINGLE or DUAL line has been selected on the Parameters 2 menu, the data will be printed in the same manner as for static data display (see Section 15.4.2). The two status lines will be repeated at the top of the form; that is, after every 40 printed lines of single-line data (at 120 characters per line).

15.4.5 FRAME AND PACKET FORMAT

If FRAME or PACKET is selected, both the status lines and the column headings seen at the top of the CRT display will be repeated on the printout at the top of the form; that is, after every 58 printed lines of protocol.

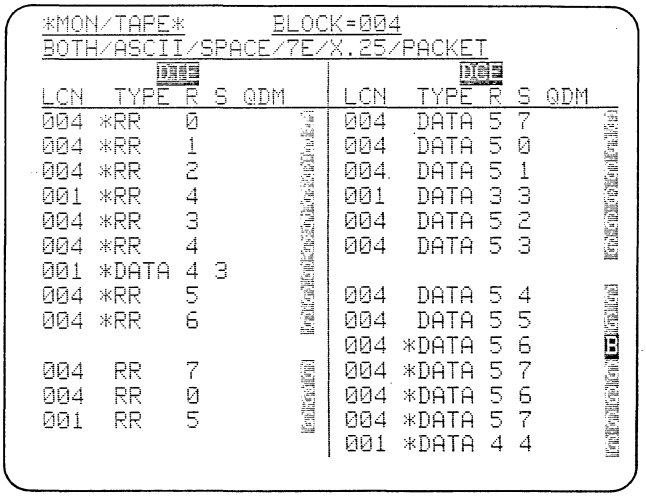


Figure 15-15

16 Bit-Oriented Protocols

This section compiles information needed to operate the INTERVIEW 4500 with bit-oriented protocols. The 4500 has a number of features designed specifically for these protocols.

There are three basic selections for 7E-framed protocols in the Parameters 1 FORMAT field (see Figure 16-1): 7E/X.25; SDLC; and SDLC/NRZI. In addition, BISYNC framing can be obtained by selecting BSC/X.25.

No matter which format you intend to use, select the correct CODE for your data and, if applicable, the number of information BITS and PARITY also. For BSC/X.25, the synchronization characters default according to the code selected but you may enter any synchronization characters by writing over the SY SY.

For BSC/X.25, OUTSYNC should be changed to at least two FFs, because if the 4500 goes out of synchronization on an FF in the frame check sequence, it may confuse the automatic frame or packet locator.

Table 16-1 lists the frame-level mnemonics that the 4500 will display for these selections. The X.25 set includes LAP B and also applies to X.75. Table 16-2 gives the packet-level mnemonics that are available for 7E/X.25 and BSC/X.25.

16.1 DUAL-LINE DISPLAY

The DUAL selection for DISPLAY MODE on the Parameters 2 menu selects dual-line

```
            ** PARAMETER 1 **

TEST ID:
MODE    :  MON  EM DTE  EM DCE  H-SPD MON
SOURCE  :  LINE  TAPE  RAM
         START AT:  BLOCK 000  CONT
MON     :  BOTH  DTE  DCE
CODE    :  EBCDIC    ASCII     EBCD   XS-3
           IPARS  REV EBCD  SELECTRIC HEX
  BITS  :8  7
  PARITY:EVEN  ODD  SPACE  MARK  NONE
FORMAT  :  SYNC  BSC/X.25  7E/X.25  SDLC
           SDLC/NRZI  ASYNC
  SYNC CHARS:  SY  AUTOSYNC:  OFF  ON
  OUT SYNC  :  OFF  ON   CHAR:  F   #:1
BLK CHK:  OFF  ON
I/F     :  RS  MIL
                      SPEED:  9600
```

Figure 16-1

TABLE 16-1
FRAME-CONTROL MNEMONICS

Bit Pattern								SDLC or SDLC NRZI		7E/X.25 or BSC/X.25	
8	7	6	5	4	3	2	1	Mnemonic	Definition	Mnemonic	Definition
	N(R)		P		N(S)		0	INFO	INFOrmation	INFO	INFOrmation
	N(R)		P/F	0	0	0	1	RR	Receiver Ready	RR	Receiver Ready
	N(R)		P/F	0	1	0	1	RNR	Receiver Not Ready	RNR	Receiver Not Ready
	N(R)		P/F	1	0	0	1	REJ	REJect	REJ	REJect
	N(R)		P/F	1	1	0	1	SREJ	Selective REJect	SREJ	Selective REject
0	0	0	P/F	0	0	1	1	NSI	Non-Sequenced Information	---	---
0	0	0	P/F	0	1	1	1	SIM/RQI	Set Initialization Mode/ReQuest Initialization	---	---
0	0	0	F	1	1	1	1	SARM/ROL	Set Asynchronous Response Mode/ Request OnLine	DM/SARM	Disconnect Mode/ Set Asynchronous Response Mode
0	0	1	P/F	0	0	1	1	NSP	Non-Sequenced Poll	---	---
0	0	1	P	1	1	1	1	---	---	SABM	Set Asynchronous Balance Mode
0	1	0	P	0	0	1	1	DISC/RQD	DISConnect/ReQuest Disconnect	DISC	DISConnect
0	1	0	P/F	0	1	1	1	RGA	Remote Go-Ahead	---	---
0	1	1	F	0	0	1	1	NSA	Non-Sequenced Acknowledge	UA	Unnumbered Acknowledge
1	0	0	F	0	1	1	1	CMDR	CoMmanD Reject	FRMR	FRaMe Reject
1	0	0	F	0	0	1	1	SNRM	Set Normal Response Mode	---	---
1	0	1	P/F	1	1	1	1	XID	eXchange station ID	---	---
1	1	0	P/F	0	1	1	1	CFGR	ConFiGuRe	---	---
1	1	1	P/F	0	0	1	1	TEST	link TEST	---	---
1	1	1	F	1	1	1	1	BCN	BeaCoN	---	---
All other patterns									UNKNOWN		UNKNOWN

TABLE 16-2
PACKET-TYPE MNEMONICS

Octet 3								Display (XXX=HEX 000-FFF)	Mnemonic	Definition
8	7	6	5	4	3	2	1			
0	0	0	0	1	0	1	1	LCN = XXX	CALL	CALL
0	0	0	0	1	1	1	1	LCN = XXX	CALL ACC	CALL ACCept
0	0	0	1	0	0	1	1	LCN = XXX	CLEAR	CLEAR
0	0	0	1	0	1	1	1	LCN = XXX	CLEAR C	CLEAR Confirm
P(R)			M		P(S)		0	LCN = XXX	DATA	DATA
1	1	1	1	0	0	0	1	LCN = XXX	DIAG	DIAGnostic
0	0	1	0	0	0	1	1	LCN = XXX	INT	INTerrupt
0	0	1	0	0	1	1	1	LCN = XXX	INT CONF	INTerrupt CONFirm
P(R)			0	0	0	0	1	LCN = XXX	RR	Receiver Ready
P(R)			0	0	1	0	1	LCN = XXX	RNR	Receiver Not Ready
P(R)			0	1	0	0	1	LCN = XXX	REJ	REJect
0	0	0	1	1	0	1	1	LCN = XXX	RESET	RESET
0	0	0	1	1	1	1	1	LCN = XXX	RESET C	RESET Confirm
1	1	1	1	1	0	1	1	LCN = XXX	RSTRT	ReSTaRT
1	1	1	1	1	1	1	1	LCN = XXX	RSTRT C	ReSTaRT Confirm
P(R)			0	1	1	0	1	LCN = XXX	SREJ	Selective REJect
All other									UNKNOWN	

display with L-shaped fill symbols inserted in the data to maintain time correlation between TD and RD (see Figure 16-2).

16.2 BLOCK CHECK

The INTERVIEW 4500 will do block check calculations on both received and transmitted data. You may transmit data with either good or bad BCCs. For any of the three 7E-framed formats, you may also transmit aborts. The transmitted block check is chosen in the XMIT field of a Trigger Actions menu (Figure 16-3).

The rules the 4500 uses for block check calculations may be found in Table 11-2.

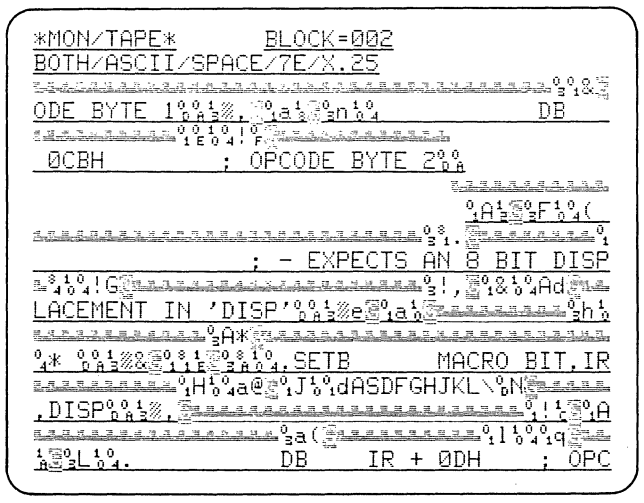


Figure 16-2

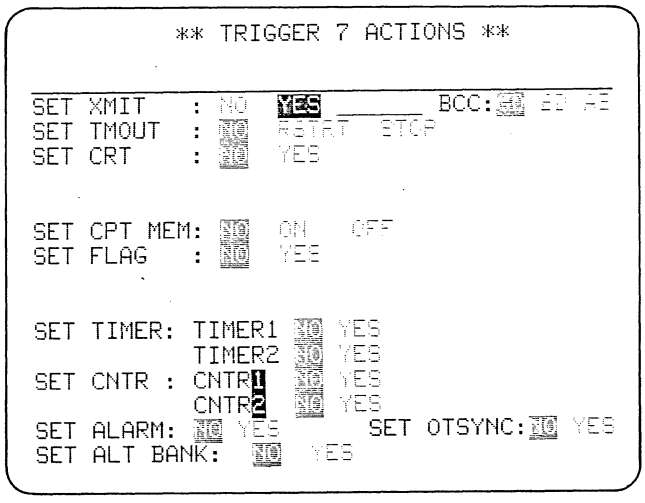


Figure 16-3

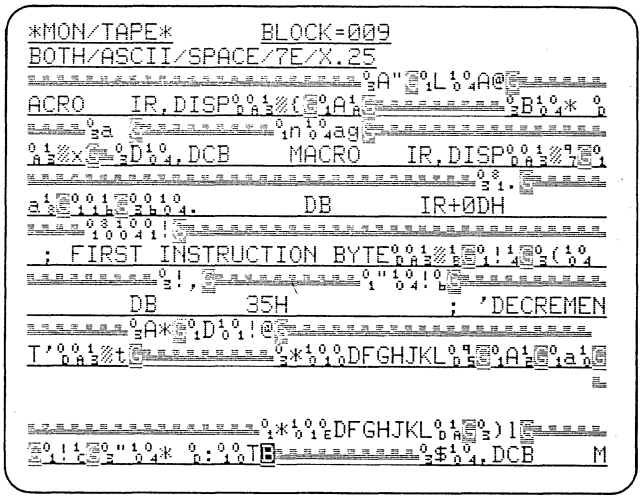


Figure 16-4

16.2.1 FOR 7E-FRAMED DATA

For the Parameters 1 selections 7E/X.25, SDLC, and SDLC/NRZI, Received Block Check is always ON in the INTERVIEW 4500: block check calculations are done for all received data; and the BLK CHK selection line on the Parameters 1 menu is absent.

In Run Mode, the second character of a Good Block Check, whether received or transmitted, is always replaced with a low-intensity reverse-image letter G; a Bad BCC or an Aborted block is shown by a bright reverse-image B or A, respectively (see Figure 16-4).

The block check polynomial is CRC-CITT, $X_{16} + X_{12} + X_5 + 1$. The block check starts with the address byte and stops at the end of the frame check sequence. Stuffed zeros are ignored. No block check is calculated following seven consecutive 1's (aborted frame).

16.2.2 FOR BISYNC-FRAMED DATA

For the Parameters 1 selection BSC/X.25, or BISYNC-framed HDLC, the software defaults to Received Block Check ON, but you may select OFF on the Parameters 1 menu.

The block check polynomial is CRC-16, $X_{16} + X_{15} + X_2 + 1$. Block check starts with DLE STX and stops with DLE ETX. The calculation ignores DLE whenever it is followed by any character except SY. When DLE is followed by SY, both are ignored. No Block Check is calculated following DLE ENQ (abort).

When Block Check is ON, a Good BCC is shown by replacing the second block check character with a low-intensity reverse-image G; Bad BCC by a bright reverse-image B.

When Block Check is OFF, no received data block check calculations are done and both block check characters actually received or transmitted by the 4500 are displayed. Block check calculations may still be transmitted (selected on the SET XMIT line of a Trigger Actions menu), but the G and B symbols will not be displayed.

16.3 FLAG BYTES, $7E_{16}$

In Run Mode, 7E Flag bytes are always displayed in low-intensity reverse image (Figure 16-5) to distinguish them from transparent data 7E.

To enter the Flag byte on a program menu always use, simultaneously, CONTROL plus the special FLAG key at the right of the alphanumeric key area. The 4500's logic will not read the key

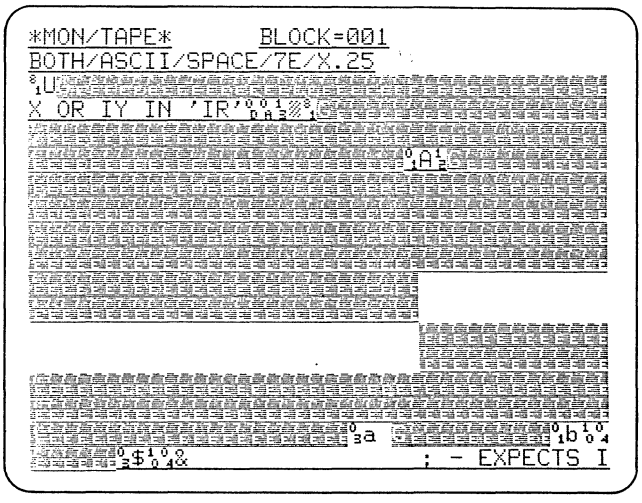


Figure 16-5

sequence HEX 7 E as a Flag. The Flag will appear on the menu as a low-intensity $7E_{16}$.

Idle Flags may be suppressed from the display on the Parameters 2 menu (compare Figure 16-4 with 16-5).

16.4 HEXADECIMAL DISPLAY

For BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI, CONTROL plus HEX is on when the unit enters Run Mode (Figure 16-5). All control characters for the data code selected on Parameters 1 are displayed in hexadecimal. You may alternately override this to see the mnemonics for these characters by repeating CONTROL plus the HEX key (Figure 16-6). The HEX key alone will alternately display all data in hexadecimal just as it does for other formats.

16.5 FRAME AND PACKET LOCATORS

The 4500 has both automatic and manual frame and packet locators. When BSC/X.25 or 7E/X.25 has been selected on the Parameters 1 menu, both frame and packet locators can be used. You may choose automatically or manually any frame-control byte or packet-type octet

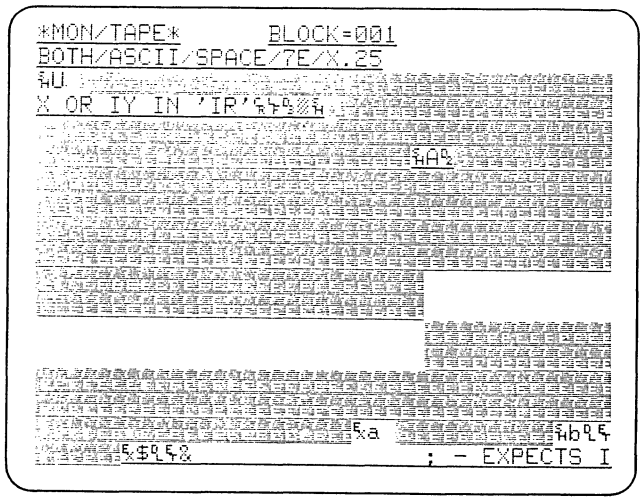


Figure 16-6

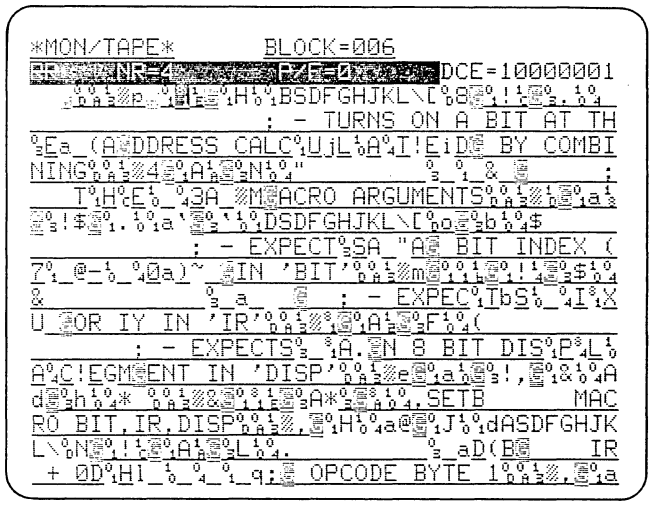


Figure 16-7

on the CRT screen and display a mnemonic expansion of it. The frame locators are also valid for SDLC and SDLC/NRZI. The mnemonics displayed are given in Tables 16-1 and 16-2.

16.5.1 AUTOMATIC LOCATORS

With the data display manually frozen, press the B key to display the beginning of the CRT buffer. Then press the F key once to automatically tab the cursor to the next frame-control byte (see Figure 16-7). The mnemonics for the control frame type, the sequence number (or numbers), and the P/F bit value will be displayed on the second line. The binary breakdown of the control byte at the cursor location will be displayed at the upper right.

Notice that the binary expansion is given with the first bit sent (low-order bit) at the far right and the highest-order bit to the left. In dealing with bit-oriented protocols it is important to remember that there are considerable discrepancies in the literature regarding the order in which the bits are presented on paper, as well as how they are numbered.

To find the next packet-type octet (Octet 3), press the P key; the cursor

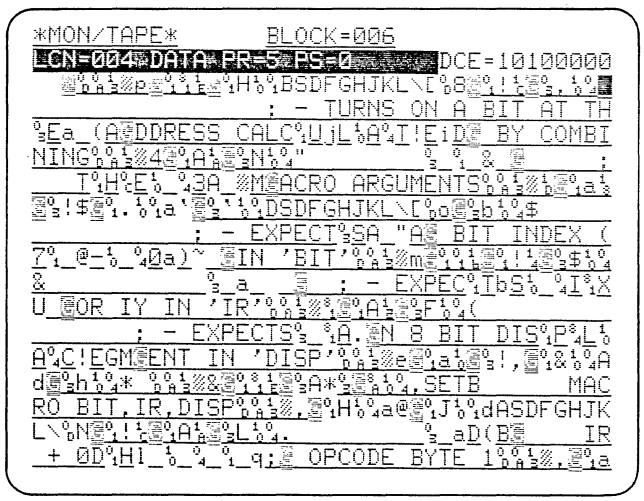


Figure 16-8

will tab to the byte (Figure 16-8). On the second line the 4500 will display the logical channel number and the sequence count modulus. For modulo 8, the packet sequence numbers, P(S) and P(R), will be given, and if the Q, D, or M bit is 1, the letter symbol will be displayed.

Within an information frame, alternate use of the F and P keys moves the cursor between the frame-control byte and the packet-type octet of that frame until one of the two keys is operated twice consecutively.

To return to any byte you have already seen, you may use the UP cursor arrow to reposition the cursor; then use the F or P key again.

NOTE: No CRT enhancements should be programmed on either triggers or the Parameters 2 menu when the automatic frame or packet locator is being used. This is because the automatic locators use the automatic CRT enhancements in the BOP modes for reference to find the control bytes. Also, all leading bytes (Address, Control, Octets 1-3) must be in the display buffer for complete expansion. Therefore, if triggers have been programmed to freeze and unfreeze data, or if any data is suppressed, use of F and P may not produce correct information in the mnemonic expansion line.

16.5.2 MANUAL LOCATORS

You may obtain a mnemonic expansion for any character on the frozen data screen by using the cursor arrows to position the cursor at the desired byte; then pressing CONTROL plus F or CONTROL plus P. Remember, though, that in this case the logic cannot distinguish between a genuine frame-control byte or packet-type octet and the numerous invalid possibilities.

16.5.3 DUAL-LINE DISPLAY

In dual-line display, of course, the frame-control byte or packet-type octet expansion only applies to one of the two cursor characters, but this is easily identified because the single binary breakdown at the upper right of the display is labeled as DTE or DCE. (See Figure 16-9.)

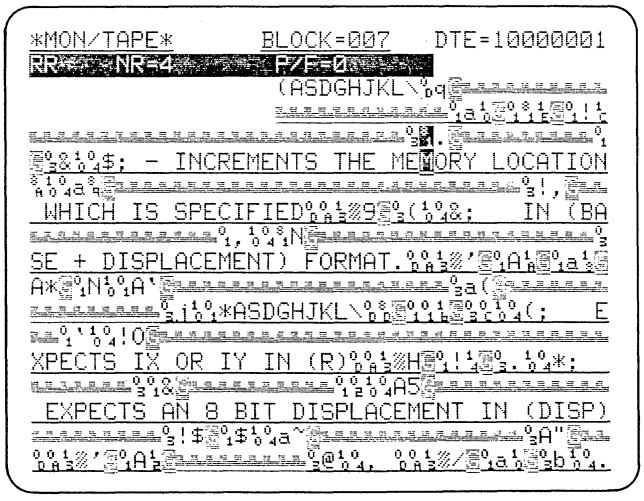


Figure 16-9

In dual-line mode, you may also select the lead to which you wish CONTROL plus F or P to apply. Pressing T before CONTROL plus F or P selects TD; R selects RD. Either lead selection remains in effect until you cancel it by selecting the other lead. The PROGRAM key cancels both T and R.

16.6 PROTOCOL MNEMONIC DISPLAY

When FRAME or PACKET is selected on the Parameters 2 CRT Control menu (see Section 11.4)--and if the data source is TAPE or RAM--you will see a sequential display of only frame (level 2) or packet (level 3) protocol in Run Mode.

In either case, the protocol is listed in two columns (see Figures 16-10 and 16-11), with DTE on the left and DCE on the right. As new data is received, the display scrolls up, so the oldest received frames or packets are at the top of the screen. If multiple frames or packets are received on one side of the line, then spaces are inserted on the other side to maintain time correlation between TD and RD. If a frame or packet has been suppressed on the Parameters 2 menu, a space is shown in its place.

MON/TAPE BLOCK=004
BOTH/ASCII/SPACE/7E/X.25/FRAME

DTE					DCE				
ADDR	TYPE	R	S	P/F	ADDR	TYPE	R	S	P/F
03	RR	4		0	03	*INFO	3	3	0
01	*INFO	4	3	0	01	RR	4		0
03	RR	5		0	03	*INFO	4	4	0
01	*INFO	5	4	0	01	RR	5		0
03	RR	6		0	03	*INFO	5	5	0
01	*INFO	6	5	0	01	RR	6		0
03	RR	7		0	03	*INFO	6	6	0
01	*INFO	7	6	0	01	RR	7		0
03	RR	0		0	03	*INFO	7	7	0
01	*INFO	0	7	0	03	INFO	7	0	0
03	*RR	1		0	01	RR	0		0
01	*INFO	1	0	0	01	RR	1		0
03	RR	2		0	03	*INFO	1	1	0
01	*INFO	2	1	0	01	RR	2		0

Figure 16-10

MON/TAPE BLOCK=005
BOTH/ASCII/SPACE/7E/X.25/PACKET

DTE					DCE				
LCN	TYPE	R	S	QDM	LCN	TYPE	R	S	QDM
004	*RR	4			004	DATA	5	3	
001	*DATA	4	3						
004	*RR	5			004	DATA	5	4	
004	*RR	6			004	DATA	5	5	
					004	*DATA	5	6	
004	RR	7			004	*DATA	5	7	
004	RR	0			004	*DATA	5	6	
001	RR	5			004	*DATA	5	7	
004	RR	1			001	*DATA	4	4	
004	RR	2			004	*DATA	5	0	
001	DATA	5	4		004	*DATA	5	1	
004	*RR	3			004	DATA	5	2	
004	*RR	4			004	DATA	5	3	
001	*RR	6			001	DATA	5	5	

Figure 16-11

If two frames or packets are received at about the same time, they are displayed on the same line. An asterisk precedes the control-type mnemonic of the frame or packet that was received first.

The mnemonics displayed are listed in Tables 16-1 and 16-2.

16.6.1 FRAME DISPLAY

In the frame display, the address, control type, N(R) and N(S) counts, P/F bit status, and frame check are shown.

16.6.2 PACKET DISPLAY

LCN, packet type, P(R) and P(S) counts, Q, D, and M bit status, and frame check are displayed.

In some nonsequenced packet types there are additional bytes of interest. In these cases, since there are no P(R) or P(S) counts, the space reserved for P(R) and P(S) is used to display the additional causing characters in hexadecimal. For CALL and INTERRUPT packets, one additional byte is displayed (Octet 4), and for CLEAR, RESET, RESTART, and DIAGNOSTIC packets, two extra bytes (Octets 4 and 5; see

```
*MON/TAPE*          BLOCK=047
BOTH/ASCII/SPACE/7E/X.25/PACKET
          DTE                          DCE
LCN  TYPE  R S QDM      LCN  TYPE  R S QDM
004   RR   7            004 *DATA 5 6
004   RR   0            004 *DATA 5 7
004 *RR    1            004  DATA 5 0
004 *RR    2            004  DATA 5 1
004 *RR    3            004  DATA 5 2
004 *RR    4            004  DATA 5 3
001 *CLEAR %%           001  CLEAR C
004 *RR    5            004  DATA 5 4
004 *RR    6            004  DATA 5 5
004 *RR    7            004  DATA 5 6
004 *RR    0            004  DATA 5 7
004 *RR    1            004  DATA 5 0
004 *RR    2            004  DATA 5 1
004 *RR    3            004  DATA 5 2
```

Figure 16-12

Figure 16-12) are shown. Figure 16-13 shows a display for modulo 128.

16.6.3 DISPLAY CONTROL AND HIGHLIGHTS

You can display specific frame or packet types in low-intensity reverse image, or suppress them from the CRT; You can also selectively display or suppress all DCE and DTE traffic for specific addresses or logical channels. (This is done on the Parameters 2 CRT Control menu; see Section 11.4.)

```
*EM DTE/RAM*        BLOCK=015
BOTH/ASCII/ODD/7E/X.25/PACKET
          DTE                          DCE
LCN  TYPE  R S QDM      LCN  TYPE  R S QDM
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
001   RR   7            001 *DATA 6 7
```

Figure 16-13

16.6.4 PLAYBACK SPEED

Just as for data display, you can speed up or slow down the playback with the UP or DOWN cursor arrow. You may freeze and unfreeze the protocol display with the CRT CONTROL keys; then scroll through the buffer using the UP and DOWN cursor arrows; or go to the beginning or the end of the buffer using the B or the E key.

The trigger program will continue to run while protocol is displayed. Counters and timers can still be read. However, no CRT enhancements other than Clear CRT and Freeze should be programmed.

```
        ** MESSAGE 0 **          MSG CNT:000
                                 BUFR REM:0977
DESTINATION:  LINE  PROMPT
BEGIN FRAME:  YES   NO
    ADDRESS:  00
       TYPE :  INFO RR RNR REJ NSEQ 00
        P/F:   0   1
         NR:   AUTO  0
         NS:   AUTO  LAST REC NR  SKIP  0
TEXT:_____________________________________
     _____________________________________
     _____________________________________
     _____________________________________
     _____________________________________
     _____________________________________
```

Figure 16-14

16.7 FRAMING TRANSMISSIONS

For the 4500's three 7E-framed formats, transmissions are framed by filling out special fields on the message-entry menus (see Figure 16-14, for example). Notice that you may force Send frame count errors by selecting SKIP and that you have the option of starting a new frame or continuing one that you started on another message-entry menu. See Section 13.5 for detailed instructions.

For BISYNC framing (BSC/X.25), enter the leading and trailing protocol characters as part of the message (Figure 16-15), or on separate message-entry menus (Figure 16-16), just as for BISYNC format.

For all four formats, enter level 3 or higher protocol on the text-entry lines.

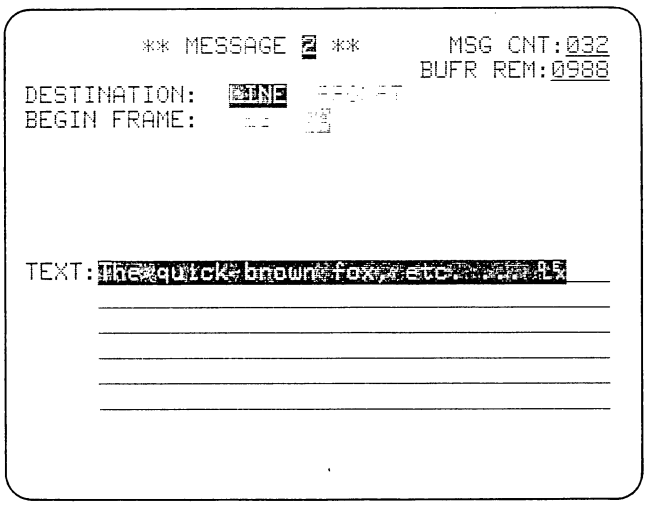


Figure 16-15

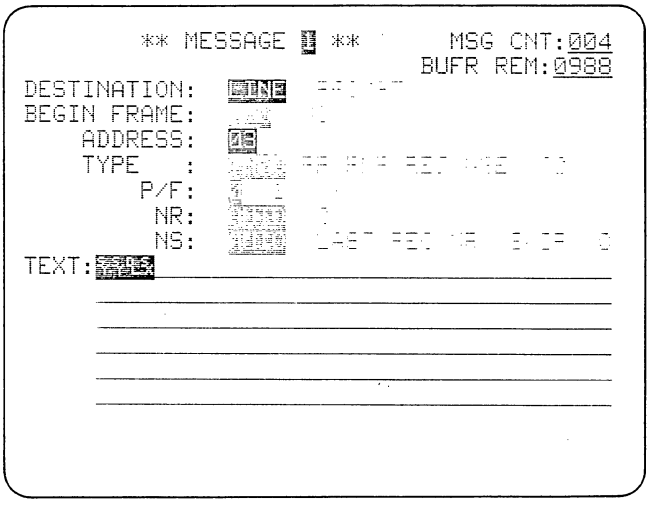


Figure 16-16

17 Maintenance and Service

The INTERVIEW 4500 requires a minimum of maintenance and adjustment to assure satisfactory, trouble-free operation.

Procedures suitable to be performed by the operator are described in Sections 17.1 and 17.2.

Setting the internal switches or strapping the user-assigned status indicator on the Line Interface Module (Section 17.3) and maintenance of the Tape Drive mechanism (Section 17.5) should be performed only under supervision of qualified service personnel. The same holds true for troubleshooting (Section 17.6).

With the exception of the user adjustments described in Sections 17.2 and 17.3, all electrical adjustments are preset at the factory and should require readjustment only after extended periods of operation. The adjustments described in Sections 17.8 and 17.9 should only be performed if there is good reason to believe they are required, and they should be attempted only by qualified service personnel.

17.1 GENERAL CLEANING

The exterior surfaces may be cleaned with a soft damp cloth. Accumulations of dirt or fingerprints may be removed from the case or keyboard using a cloth dampened with a mild detergent. Do not use abrasive or solvent-type cleaners, which may damage the plastic surfaces.

17.2 VOLUME AND BRIGHTNESS ADJUSTMENTS

This section covers adjustments that the operator may make to suit his particular operating environment or preferences. The speaker volume and CRT

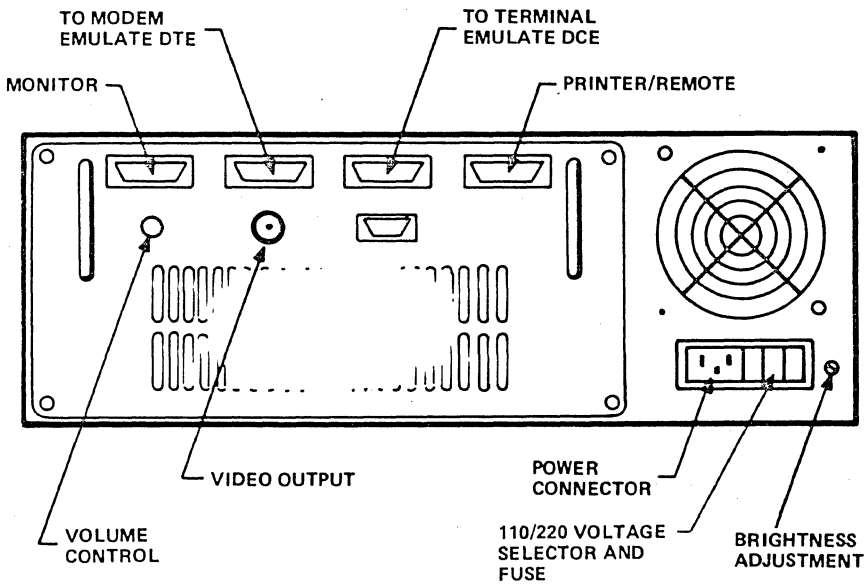


Figure 17-1 Rear panel of INTERVIEW 4500.

brightness controls are on the rear panel (see Figure 17-1).

17.2.1 VOLUME

Volume may be adjusted to suit the user's needs or preferences, depending on the background noise level at the work site. The volume control is mounted on the rear panel and has a knob for easy adjustment. This control adjusts the volume of the key confirmation and error tones and the trigger alarm. Rotating the volume control fully counterclockwise will silence the speaker.

17.2.2 BRIGHTNESS

The CRT brightness adjustment has been preset at the factory for the optimum display brightness. If it becomes necessary to adjust the brightness, follow this procedure:

(1) Allow the CRT to warm up for at least 5 minutes.

(2) Depress the RUN key, and then the SELF TEST key. The display should appear as in Figure 17-2. (The CODE selection is unimportant for this purpose.)

(3) The brightness control is located on the rear panel (see Figure 17-1) next to the power connector-fuse holder. A small screwdriver is needed to turn it.

Observing the display, increase the brightness until defocusing occurs. This will be most noticeable in the area of high-intensity reverse-image characters and along the edge between this area and the low-intensity area to the right of it (the area circled in Figure 17-2). The edge of the high-intensity reverse area will appear to bleed into the low-intensity reverse area.

(4) Now back the brightness adjustment down just to the point that

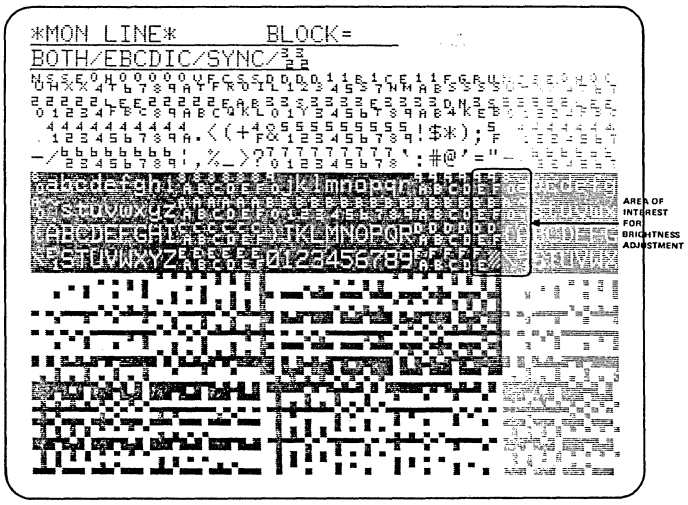


Figure 17-2 Self Test display showing area of interest for brightness adjustment.

the defocusing or bleeding is eliminated. This is the maximum usable brightness setting. A higher setting will degrade the clarity of the display. If a lower setting is desired for a low ambient light environment, be careful not to reduce the brightness to the point that the low-intensity characters are illegible.

17.3 INTERNAL SWITCHES AND STRAPPING

17.3.1 SWITCH S1

The settings of internal switch S1, located on the Line Interface Module, should be checked before the unit is operated. Disconnect the 4500's power cord. Loosen the four captive fasteners on the rear panel of the unit (Figure 17-1); pull out the panel and its attached board (Board A), sliding it in parallel with the top cover.

Check the settings on the switch S1 located near the front of Board A (see Figure 17-3):

S1-1, OFF
S1-2, OFF
S1-3, OFF
S1-4, OFF
S1-5, OFF
S1-6, OFF
S1-7, OFF
S1-8, OFF for 60-Hz power frequency
ON for 50-Hz power frequency

NOTE: Switches S1-1 through S1-7 must be OFF for proper operation. Their only use is for testing by the factory.

Check to see that the other PC boards are correctly seated in their connectors and card guides, and then install the line interface module, as follows: With the component side of the board on top, slide the board squarely and gently into its card guides until the edge connector seats. If it does not seat easily, do not force the board in head on, but use alternate pressure on the handles at the right and left edges of the board. When the board is engaged in its card guides and properly seated in the connector, tighten the captive screws.

NOTE: Changing the power frequency setting (Switch S1-8) sometimes necessitates adjustment of the CRT vertical hold (see Section 17.8).

Table 17-1
Line Interface Module Strapping for User-Assigned EIA Status Indicator

Pin No.	Connect TP 14 (Common) to
9	TP 1
10	TP 2
11	TP 3
12	TP 4
13	TP 5
14	TP 6
16	TP 7
18	TP 8
19	TP 9
21	TP 10
23	TP 11
24	TP 12
25	TP 13

17.3.2 STRAPPING THE USER-ASSIGNED EIA INDICATOR

The User-Assigned EIA status indicator (see Section 4.1) can be strapped to any one of 13 RS-232/V.24 pins using test points on the Line Interface Module (Board A). Remove the Line Interface Module as explained in Section 17.3.1.

Locations of the test points are shown in Figure 17-3; Table 17-1 correlates test point numbers with RS-232/V.24 pin numbers. Wire-wrap TP 14 to the desired test point using 28- or 30-gage insulated wire.

CAUTION: Never connect TP 14 to more than one other test point.

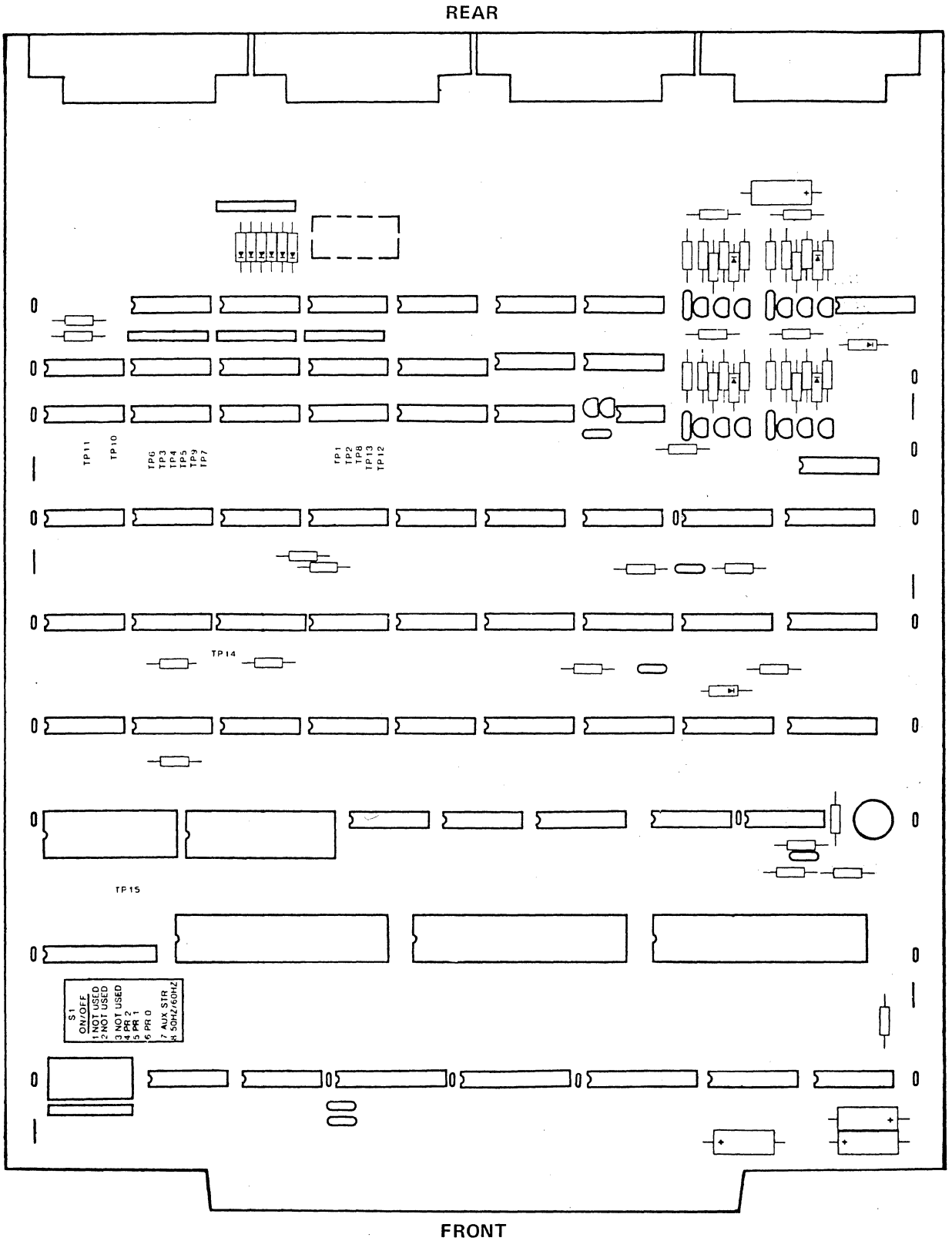


Figure 17-3 Line Interface Module, Board A.

17.4 REMOVING TOP (AND/OR BOTTOM) COVER

Refer to Figure 17-4 as you read the following procedure.

WARNING: Removal of the top or bottom cover of the INTERVIEW 4500 whether or not the power cord is connected may expose personnel to dangerous high voltages and high-vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove either cover or attempt any kind of repair.

17.4.1 TOP COVER

(1) Always disconnect the power cord before removing either cover.

(2) The two screws securing the top cover to the chassis are located adjacent to the handle detent mechanisms on either side of the front of the unit. Remove these two screws.

CAUTION: Raising the cover more than 1/2 inch during removal or replacement may cause the bezel to deform or crack. The proper procedure requires no force.

(3) Gently slide the top cover toward the front of the instrument (about 1/4 inch of movement) until it stops.

(4) Slightly raise the rear of the top cover, just enough so the edges clear the rear bezel and, holding it in this position, slide the cover to the rear (about 1/2 inch of movement) until it frees itself from the front bezel.

(5) Lift the cover off the instrument. To replace the cover, reverse the procedure, sliding the cover into the front bezel first.

17.4.2 BOTTOM COVER

To remove the bottom cover, turn the unit upside down and follow the same procedure as for the top cover.

17.5 PREVENTIVE OR ROUTINE MAINTENANCE OF TAPE DRIVE

The tape head and capstan should be cleaned at least every 8 hours of tape motion. Owing to the recording technique, however, the tape is not continuously in motion when recording or playing back. In normal use at low data rates, monthly cleaning should be adequate. On the other hand, if the tape is used 24 hours a day at high data rates, daily cleaning may be necessary. Frequent visual inspection of the tape head is recommended under any operating conditions. The tape head can easily be seen through the cartridge window when the cartridge is removed. If inspection reveals any accumulation of oxide or dirt, the tape head should be cleaned. At the same time, the tachometer disk (in some units only) and tape hole sensors should also be cleaned.

17.5.1 GENERAL CLEANING

Any accumulation of dust or dirt may be removed from the interior of the cartridge compartment by careful use of vacuum or low-pressure compressed air. Use care not to damage internal components or blow dirt into the sensitive areas of the tape drive.

17.5.2 TAPE HEAD CLEANING

Although the tape head can be cleaned by reaching through the cartridge window, it is recommended that the top cover and tape drive cover be removed for access to the tape head, capstan, tachometer disk (in certain units only), and tape hole sensor. To remove the top cover, refer to Section 17.4.

Remove the tape drive cover (see Figure 17-5) by carefully lifting it upward to disengage the friction retainers from the holes in the cover. Use care not to break the retainer posts.

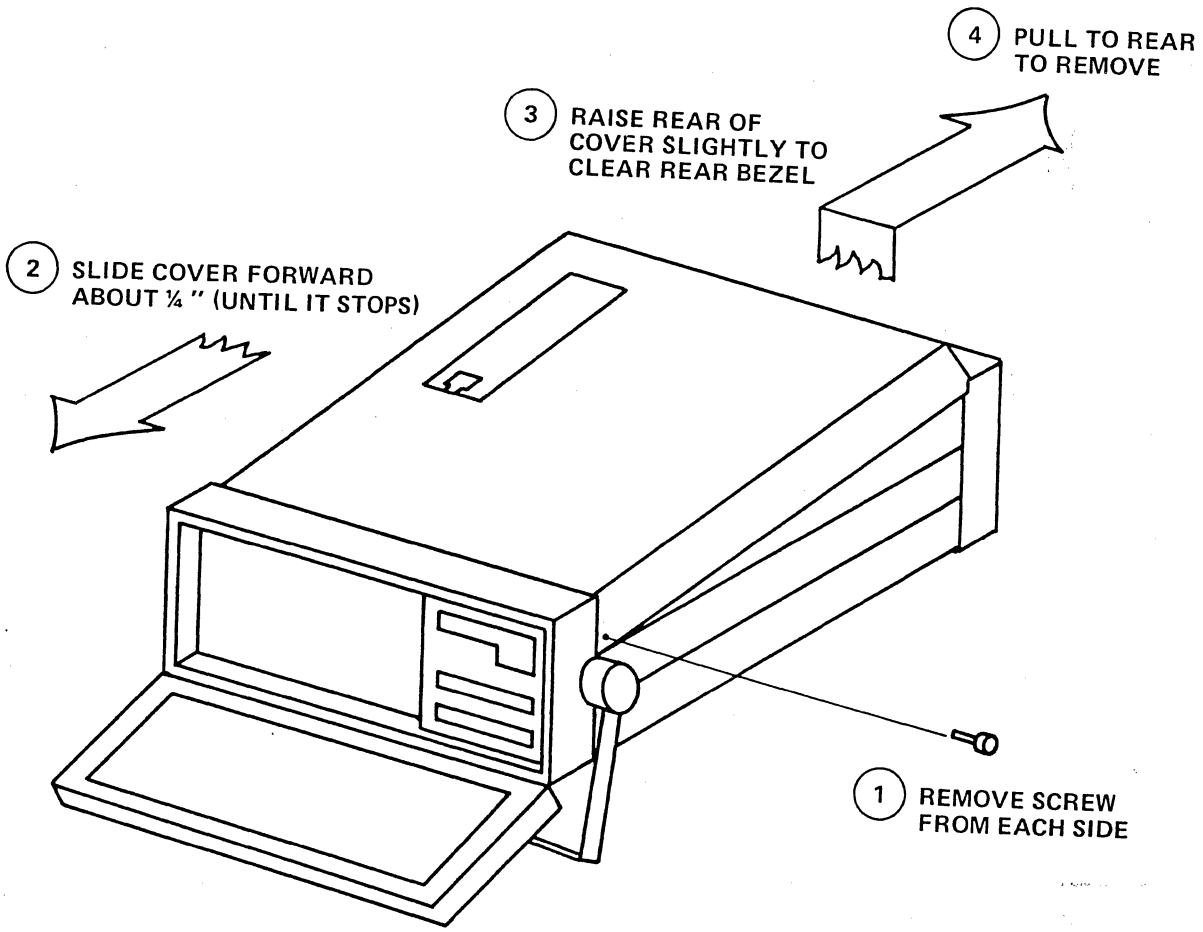


Figure 17-4 Removing the top cover of the INTERVIEW 4500. To remove the bottom cover, follow the same procedure with the unit turned upside down. To replace a cover, reverse the procedure, sliding the cover into the front bezel first.

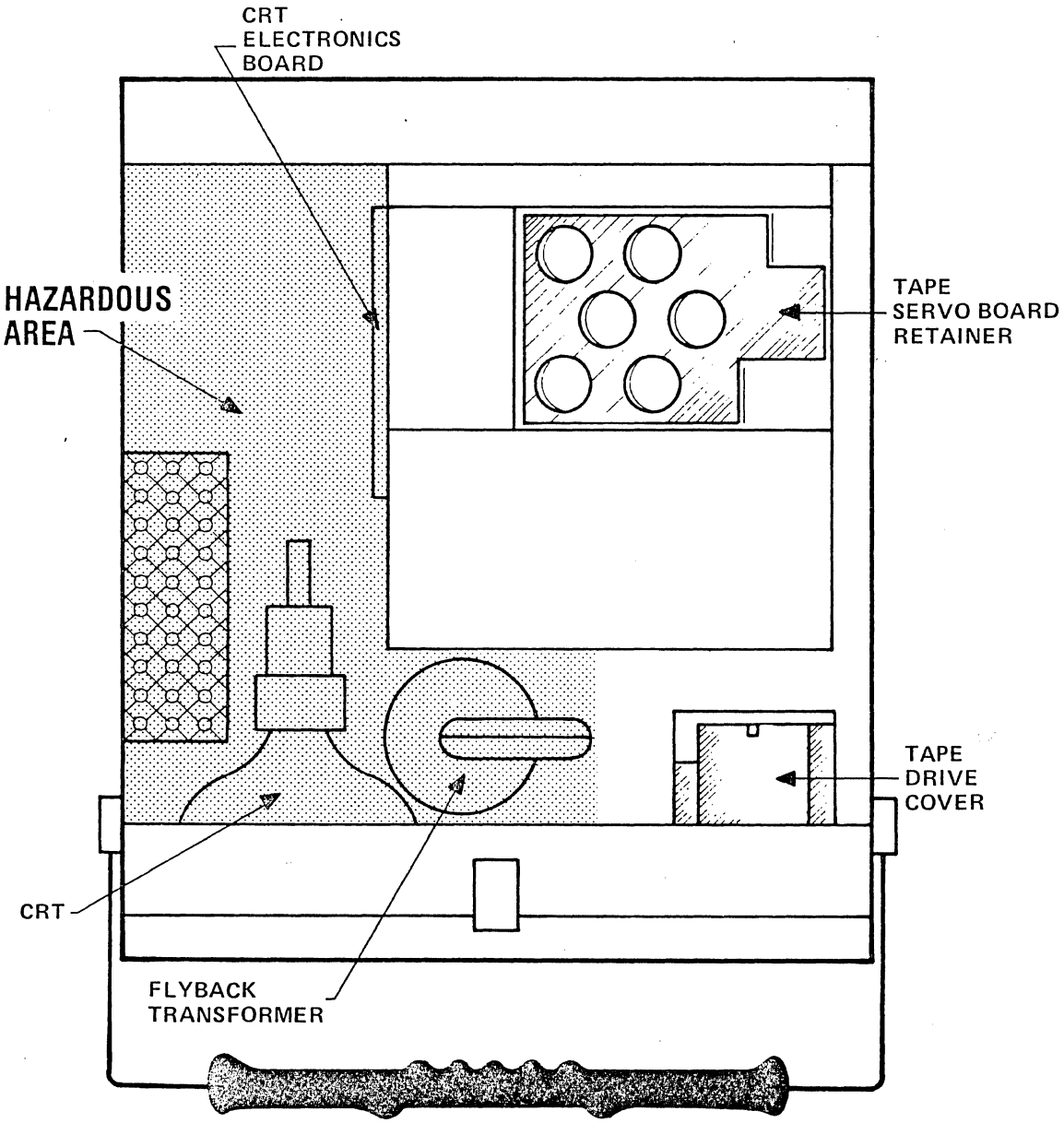


Figure 17-5 INTERVIEW 4500 with top cover removed. Tape Servo Board is under the Tape Servo Board Retainer.

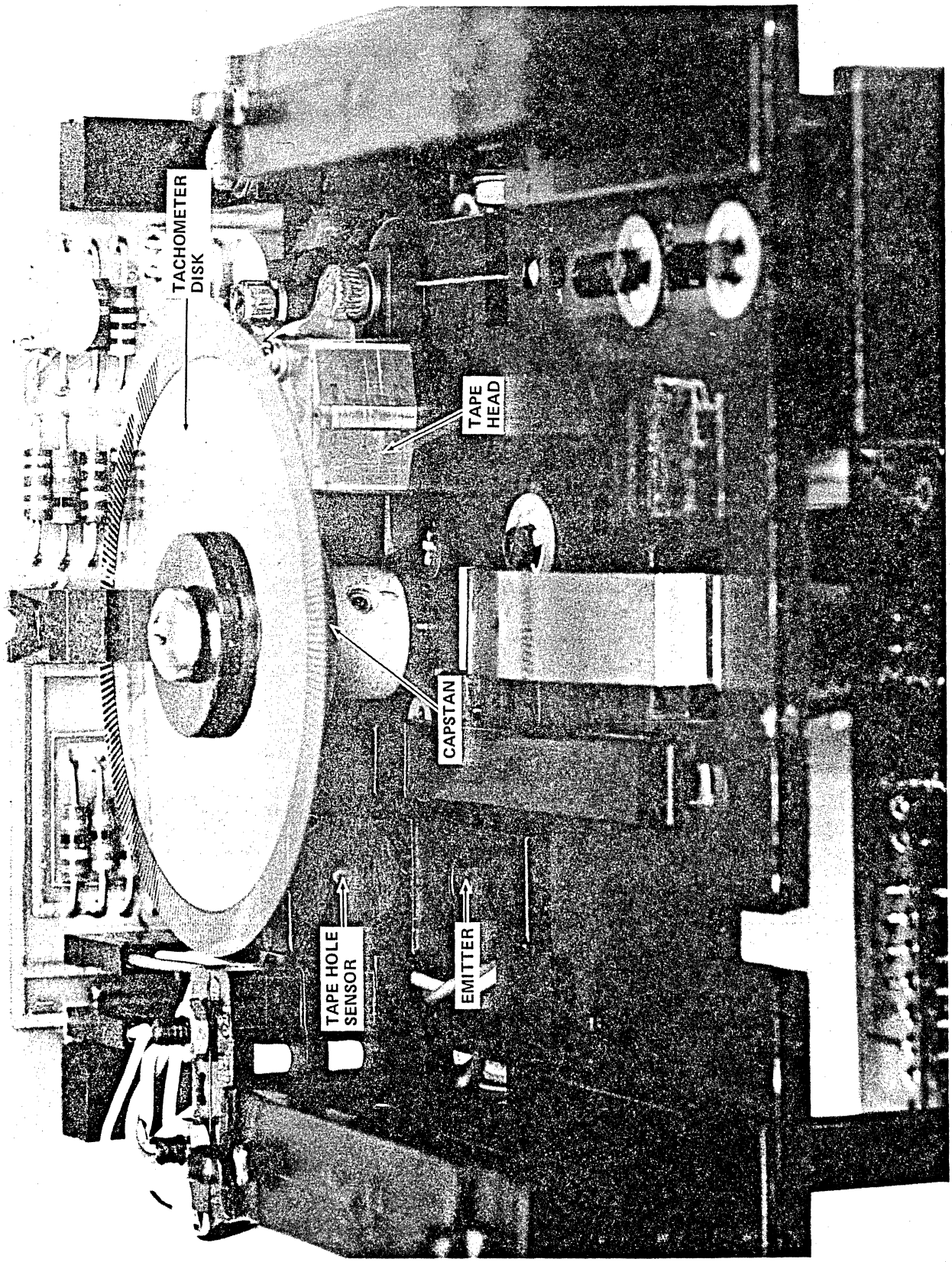


Figure 17-6 Tape Drive, viewed from the top.

CAUTION: Do not touch the tachometer disk.

Clean the tape head and capstan (the rubber drive wheel under the tachometer disk; see Figure 17-6) with a cotton swab moistened with isopropyl alcohol or Miller-Stephenson Magnetic Tape Head Cleaner. Other solvents may damage the tape head or capstan.

CAUTION: Do not use rubbing alcohol, acetone, lacquer or paint thinners, or aerosol sprays.

Do not use an excessive amount of solvent and do not allow the solvent to reach the capstan bearings since this will destroy their lubrication.

CAUTION: Under no circumstances should the tape head mounting be moved since this will affect the operation of the recorder.

17.5.3 TACHOMETER CLEANING

CAUTION: Either of two types of tachometer disks may be installed in the 4500. The newer type is metal. It is labeled on the tape drive cover with a warning not to touch the tachometer disk. Do not attempt to clean these tachometer disks and do not touch or bend the disk while cleaning the head or other parts of the drive.

If your tape drive has no warning label, the tachometer disk (see Figure 17-6) should be visually inspected when the tape head is cleaned or at least once a month. If the disk shows any dust, dirt, or fingerprints, it should be cleaned with a soft moist cloth.

17.5.4 TAPE HOLE SENSOR CLEANING

Visual inspection of the tape hole sensor (see Figure 17-6) should be performed when the tape head is cleaned or at least once a month. Remove any accumulation of dirt or dust on the lenses of both the emitter and the sensor using a soft brush or cotton swab.

17.6 TROUBLESHOOTING: SELF-TEST ERROR CODES

CAUTION: There is no need to remove the top cover to check or exchange any of the boards referred to in this section.

Table 17-2 lists the source and probable cause of each error code that may appear on the power-up display of the 4500. All the logic boards referred to in the table are accessible through the rear of the unit (as described in Section 17.3). Correct installation of the boards is shown in Figure 17-7.

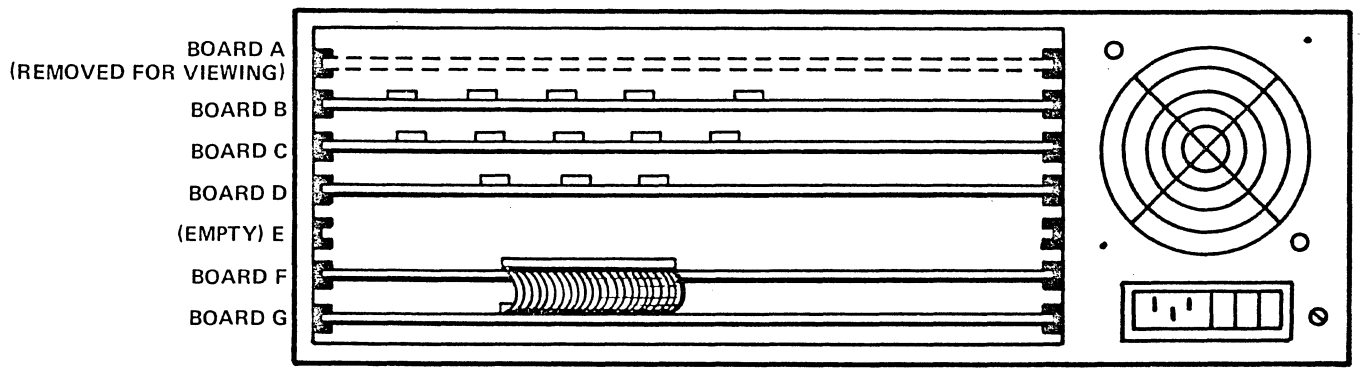


Figure 17-7

TABLE 17-2
SELF-TEST ERROR CODES

Code	Board	Possible Causes	Action
32	C	Defective processor RAM	Exchange board; return for service.
34	C	Incorrect ROM installed	Check for correct revision of all ROMs, board C.
		ROM missing	Check all ROMs, board C. Order correct revision level.
		Defective ROM	Exchange ROM; return for service.
40	D	Board not seated in connector or in wrong slot	Check that all boards are in correct slot and properly seated.
		Board defective	Exchange board; return for service.
42	D	Defective processor RAM	Exchange board; return for service.
44	D	Incorrect ROM installed	Check for correct revision of all ROMs, board D.
		ROM missing	Check all ROMs, board D. Order correct revision level.
		Defective ROM	Exchange ROM; return for service.
48	D	Incorrect software	Check for correct revision of all ROMs, boards C and D.
		Board defective	Exchange; return for service.
60	F	Board not seated in connector or in wrong slot	Check that all boards are in correct slot and properly seated.
		Board defective	Exchange board; return for service.
		Connector between Boards F and G not tight or Board G not properly seated.	Check ribbon connector between the boards; check that Board G is seated tightly.
62	F	Defective processor RAM	Exchange board; return for service.
64	F	Incorrect ROM installed	Check for correct revision of all ROMs, board F.
		ROM missing	Check all ROMs, board F. Order correct revision level.
		Defective ROM	Exchange ROM; return for service.
68	F	Incorrect software	Check for correct revision of all ROMs on boards C and F.
		Board defective	Exchange board; return for service.
72	G	Defect in optional High-Speed Memory (data-storage RAM)	See Section 17.7 for RAM self-test procedure.
NO CIM SYNC			
	D	Board D not properly seated in connector.	Board has been unable to complete minimum initialization necessary to perform power-up tests. Must be corrected before any further testing is possible.
		Defective, incorrect, or incomplete set of ROMs. Board D defective.	

17.6.1 EXCHANGES

When an error code and subsequent check indicate that a PC logic board is defective, the best way to confirm the diagnosis is to insert another board of the same revision level, either a spare or one from another INTERVIEW 4500. If this corrects the problem, the defective board can be returned to Atlantic Research Corporation for service.

> NOTE: Do not return any unit or components to Atlantic Research Corporation without prior authorization.

When the probable cause is a defective or missing ROM, check first that all ROMs on the board are of the correct revision level. Then substitute ROMs known to be of the correct revision level using spares or borrowing from another unit. (Check with the factory if you are in doubt about the correct revision level.)

> *CAUTION: Remove and install ROMs carefully to avoid bending the pins.*

If you can identify the defective ROM, order the replacement; if necessary, return the board for service.

17.6.2 CRT DISPLAY

Board B is the CRT Driver Board. If the CRT display does not come up, connect a video monitor to the video output on the rear of the unit. If you obtain a display on the auxiliary monitor, the fault is probably in the CRT or its immediate area; if no display appears, replace Board B with another of the correct revision level. If this solves the problem, return the defective board for service.

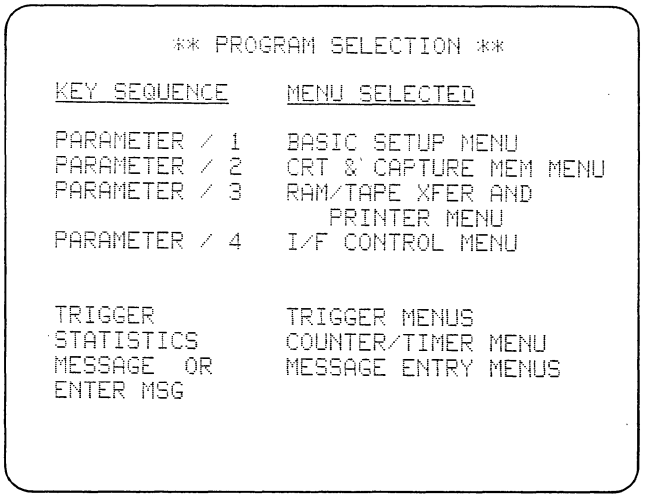


Figure 17-8

17.7 HIGH-SPEED MEMORY OPTION SELF TESTS

During Power-up the 4500 writes data into the RAM and verifies it. A Series 70 error code on the power-up display indicates that a RAM error has been found. To localize the source of the error, conduct the following self tests.

17.7.1 SELF TEST PROCEDURE

(a) Manually Controlled Test. Press Program to display the Program Selection menu (Figure 17-8); then press the green SELF TEST key. This displays the HS RAM TEST menu shown in Figure 17-9 and starts the self tests.

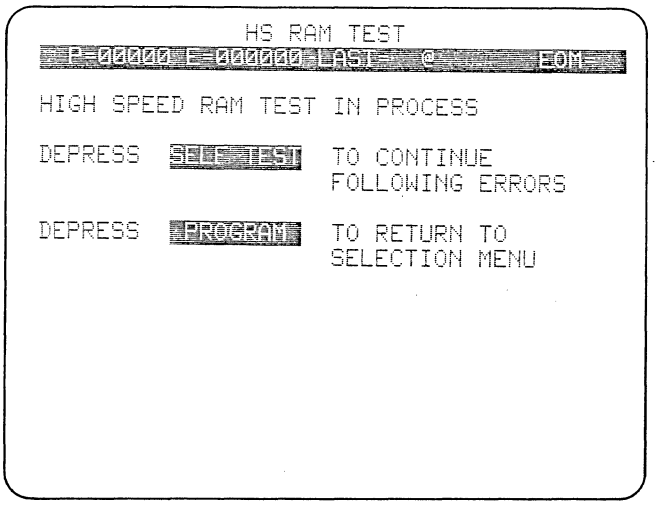


Figure 17-9

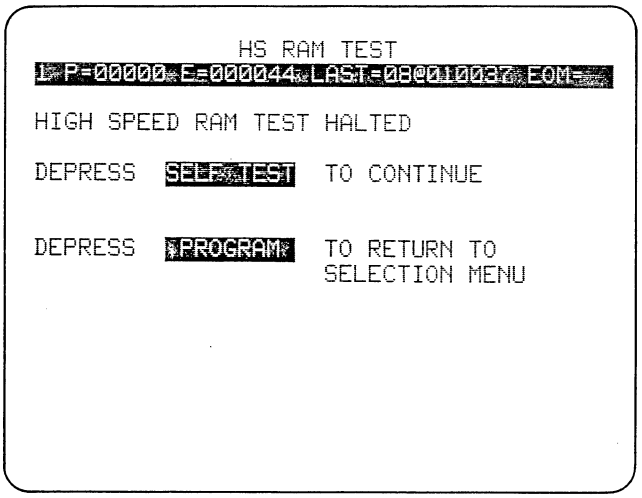


Figure 17-10

RAM test status is shown on the second line of this menu.

When the logic finds a RAM error, it halts the test and replaces the message HIGH SPEED RAM TEST IN PROCESS with HIGH SPEED RAM TEST HALTED (see Figure 17-10). This allows you to record the status information for the last error found before the test is continued. Press SELF TEST again to continue the test.

The memory board contains two types of logic: Mode 1 logic and Mode 2 logic. Each test pass consists of four steps: Mode 1 write and read; and Mode 2 write and read.

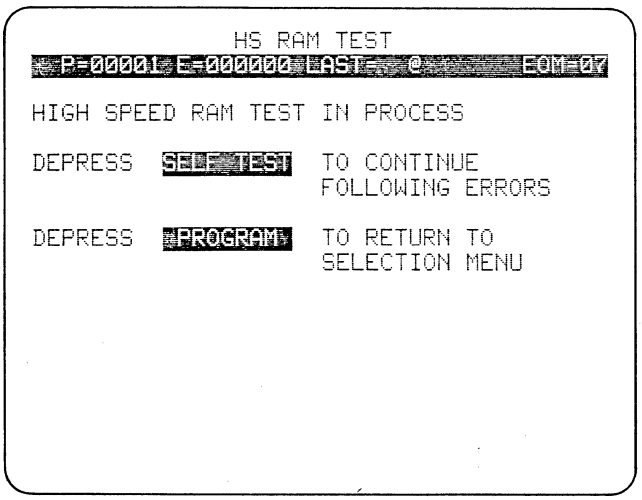


Figure 17-11

(b) Free-Running Test. If you press the SELF TEST key a second time before the test halts on an error, the test will run continuously until you press the PROGRAM key, unless it encounters an EOM or a page select error.

The following sections explain the information given on the test status line in detail.

17.7.2 MODE

When an error is found, the logic mode in which it was found is put up in the first character position of the status line. In Figure 17-9, this position is vacant because no errors have been found; in Figure 17-10, the error was found in Mode 1.

17.7.3 PASS COUNT

The Pass Count is a decimal number. Each time the test logic makes one pass (Mode 1 and Mode 2) through the memory, the Pass Count (P) increments (compare Figure 17-9 with Figure 17-11). Each pass takes about 12 seconds. This count is cumulative until the test is reinitialized by pressing the PROGRAM and SELF TEST keys again.

17.7.4 ERROR COUNT

The Error Count is a decimal number that increments each time an error is found until the test is initialized (Figure 17-10).

17.7.5 ADDRESS OF THE LAST ERROR FOUND

The specific address of the last error found is given by LAST = ww @ xxyyyy.

The first two digits after LAST, ww, are the hexadecimal value of the bit mask formed by the column addresses in which errors have been found. Figure 17-12 shows the column numbers of the chips on the memory board (Board G). Column 1 is the low-order bit; column 8, the highest-order bit in the mask. An error in a column is represented by a 1 in its position in the mask. A

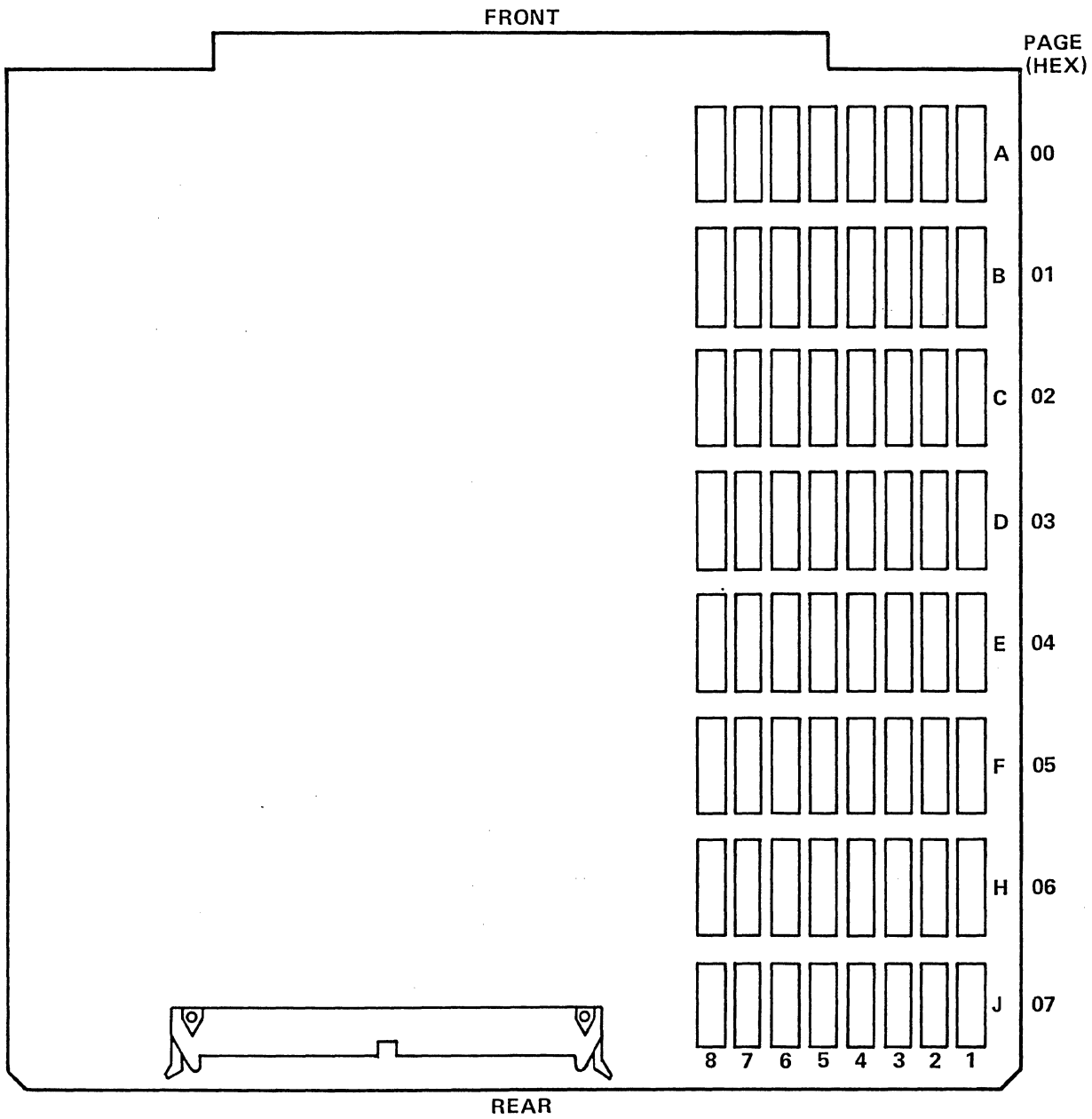


Figure 17-12 Diagram of Board G showing RAM addressing.

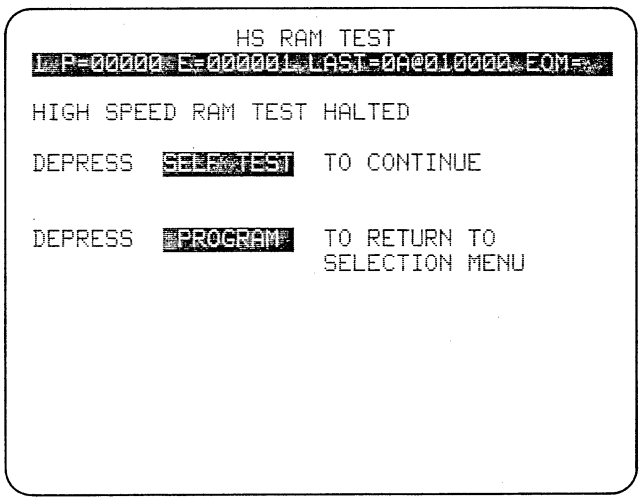


Figure 17-13

value for ww of $0A_{16}$, as shown in Figure 17-13, represents the binary number 0000 1010. This indicates that errors were found in columns 2 and 4 of Board G. (The logic arrives at the error mask by taking the exclusive OR of Data Written and Data Read in either Mode 1 or Mode 2.)

The hexadecimal page address is given by the first two digits after the @ sign, xx. This value can range from 00 through 07_{16}, which corresponds to Rows A, B, C, D, E, F, G, and H, respectively, on Board G (see Figure 17-12).

The hexadecimal bit address within the page is given by yyyy. The range for this value is 0000 to $3FFF_{16}$. It changes each time the logic finds an error, and thus shows how many errors there are at any particular page and column location.

Using this column and row information, it is possible to locate the specific RAM chip at fault.

17.7.6 END OF MEMORY FOUND

After each pass, the last page of memory found will be displayed in hexadecimal at the far right (EOM, or End of Memory; Figure 17-11). The only valid EOM value is 07_{16} (Figure 17-12) because there are eight pages in the 4500's 128K memory option.

During normal operation, End of Memory is detected by logic on Board G. This logic is tested during both the write and read test cycles. If the End of Memory values detected within one pass are inconsistent the following message appears on the RAM status line:

WRITE PASS EOM = XX :
READ PASS EOM = YY

The values XX and YY are in hexadecimal and may range from 00_{16} to $1F_{16}$.

To record or play back from any block other than 000, the 4500 uses Page Address Select Logic. This logic is also tested during the self tests. If a malfunction is found, the following message appears:

BOARD G MODE 1 PAGE ADDRESS SELECT ERROR

17.7.7 COUNTER OVERFLOW

When the Pass or Error Counter has overflowed, the equal sign (=) in the status line is replaced by a pound sign (#).

17.8 CRT ADJUSTMENTS

CRT adjustments should only be performed if there is good reason to believe they are required. In order to make the adjustments, the INTERVIEW must be operated with the top cover removed and the adjustments must be performed in an area that exposes service personnel to dangerous high voltages and the hazards of the high-vacuum CRT. Also, while the covers are removed there is great danger of overheating the 4500 with the possibility of permanent damage. Thus, the following procedures should be performed only by thoroughly qualified personnel in strict accordance with these instructions.

17.8.1 EQUIPMENT

The equipment required is (1) one

screwdriver and (2) one clip lead.

WARNING: Removal of either cover of the INTERVIEW 4500 with or without the power cord connected may expose personnel to dangerous high voltages and high vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove the top cover or attempt any kind of repair.

17.8.2 REMOVING THE TOP COVER

CRT adjustments can be done more precisely if the 4500 is first allowed to warm up for 5 to 10 minutes with the cover in place. A longer warmup period should be allowed if the unit has been stored or transported at temperatures substantially below or above normal operating temperature.

Remove the top cover in accordance with the instructions in Section 17.4.

CAUTION: Operation of the INTERVIEW with the top cover removed exposes the unit to the possibility of damage due to overheating. Keep operating time to a minimum while the cover is off.

17.8.3 BACKGROUND BRIGHTNESS ADJUSTMENT

(1) With the top cover removed, power up the INTERVIEW 4500.

(2) Using the brightness control on the rear panel (see Figure 17-1), adjust the CRT brightness to a minimum so that no data is visible.

(3) With a screwdriver, adjust BRIGHTNESS on the CRT Electronics Board (see Figures 17-5 and 17-14) clockwise until you see the CRT raster pattern.

(4) Back down the adjustment (counterclockwise) until the raster just disappears. Then readjust the rear panel brightness control as explained in Section 17.2.2.

17.8.4 VERTICAL HOLD

After the frequency setting on the Line Interface Module (see Section 17.3.1) has been changed from 60 to 50 Hz or vice versa, the CRT display may roll.

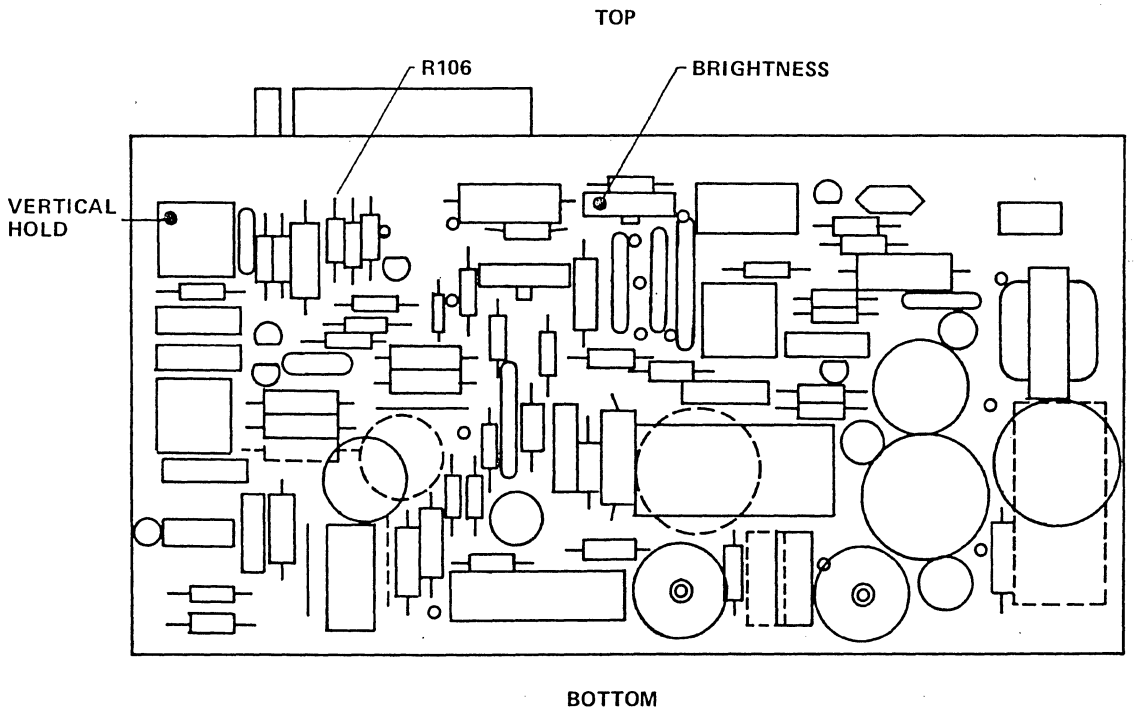


Figure 17-14 Diagram of CRT Electronics Board. For location of this board in the unit, see Figure 17-5.

(1) Set the switch S1-8 on the Line Interface Module to the power line frequency desired: OFF for 60 Hz or ON for 50 Hz (see Section 17.3.1).

(2) With a clip lead, connect the bottom end of R106 on the CRT Electronics Board (see Figure 17-14) to ground.

(3) Operate the red PROGRAM key.

(4) With a screwdriver, turn the Vertical Hold adjustment on the upper, rear corner of the CRT Electronics Board (see Figure 17-14) until the display rolls UP very slowly.

(5) Disconnect R106 from ground. The display should lock and stand still.

If no further adjustments are to be made, disconnect the power immediately and replace the cover.

17.8.5 OTHER ADJUSTMENTS

A qualified electronics technician may make other standard adjustments to the CRT, such as display rotation, centering, height, width, or linearity. If the need arises, contact Atlantic Research Corporation for further information.

17.9 CALIBRATION OF TAPE DRIVE

Calibrations should only be performed if there is good reason to believe that they are required. In order to make the adjustments the INTERVIEW must be operated with top and bottom covers removed. This exposes the service personnel to dangerous high voltages and the hazards of the high vacuum CRT. Also, while the covers are removed, there is great danger of overheating with the possibility of permanent damage. Thus, the following procedures should be performed only by thoroughly qualified personnel in strict accordance with these instructions.

17.9.1 EQUIPMENT

The equipment required is (1) a frequency counter; (2) an oscilloscope; (3) a new blank tape cartridge; and (4) a tape cartridge with recorded data (training tape).

17.9.2 REMOVING THE COVERS

Remove the top and bottom covers in accordance with the procedure in Section 17.4 (Figure 17-4).

CAUTION: Operation of the INTERVIEW with top and (or) bottom covers removed exposes the unit to the possibility of damage due to overheating. Keep operating time to a minimum while the covers are off.

17.9.3 TAPE SPEED ADJUSTMENT

(1) Remove the top cover and the Tape Servo Board Retainer (see Figure 17-5).

(2) Insert a new blank tape in the drive.

(3) Connect the frequency counter common ground to the chassis.

(4) Connect the frequency counter input to TP 5 on the Tape Servo Board (see Figures 17-5 and 17-15a or 17-15b).

NOTE: The Tape Servo Board in your unit may be similar to either Figure 17-15a or 17-15b.

(5) Power up the unit. Press PROGRAM; then PARAMETERS and numeral 1. On the Parameters 1 menu now displayed,

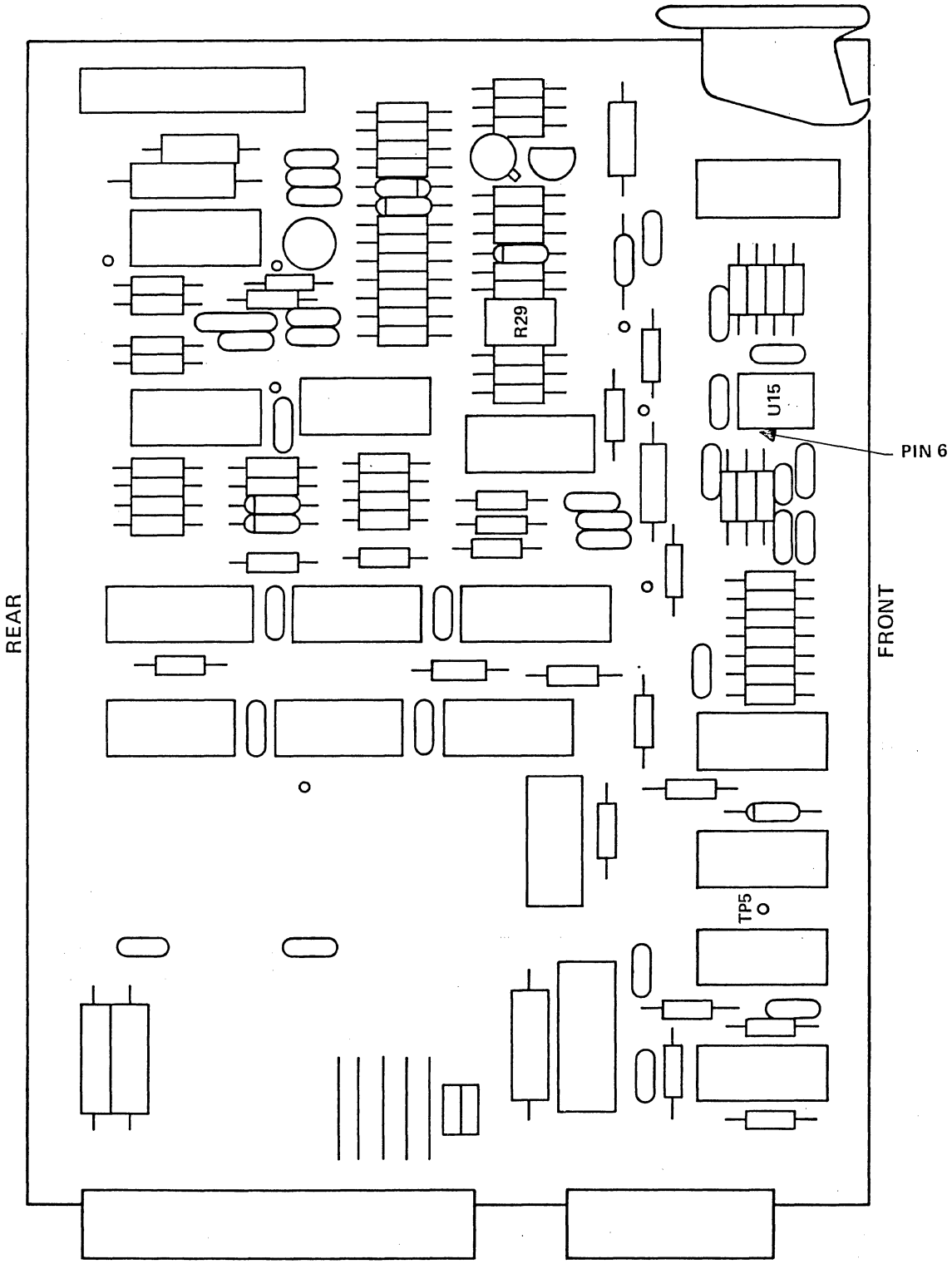


Figure 17-15a Diagram of Tape Servo Board.

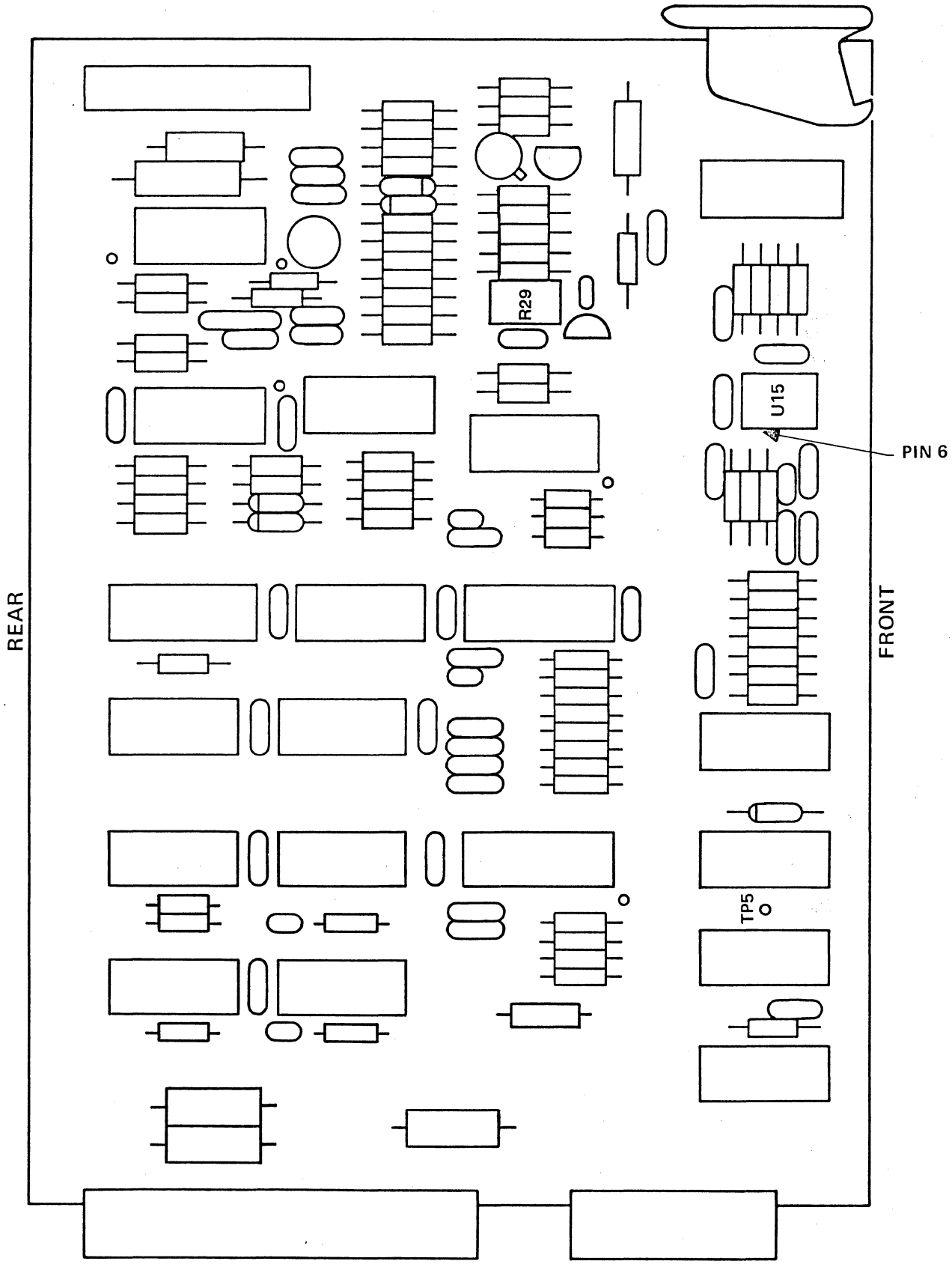


Figure 17-15b Diagram of alternate Tape Servo Board.

select TAPE on the SOURCE line. The menu should appear as in Figure 17-16.

(6) Press the RUN key once. The tape should rewind and then run continuously forward. If the tape starts and stops, it has been recorded and cannot be used for this purpose. A new tape must be used to set tape speed.

(7) The frequency counter should indicate 7900 ±150 Hz. This measurement must be made while the tape is moving continuously forward. If the tape reaches the end and reverses before the reading is obtained, operate the PROGRAM key and then the RUN key to rewind and restart the tape.

NOTE: The tape should not be adjusted while rewinding.

(8) If necessary, use a screwdriver to adjust R29 on the Tape Servo Board (Figure 17-15a or 17-15b) to obtain a reading of 7900 ±150 Hz. The frequency will vary somewhat over the length of the tape, but should remain within the ±150 Hz tolerance. The tape speed is set at the factory to be as close as possible to 7900 Hz at the beginning of the tape after the counter reading has stabilized.

(9) After adjustment, press PROGRAM and RUN again to rewind the tape and recheck the reading over the length of the tape.

(10) Press PROGRAM and then power down the unit immediately to prevent overheating.

17.9.4 READ GAIN ADJUSTMENT

(1) Remove both covers (as described in Section 17.4) and the Tape Servo Board Retainer (Figure 17-5).

(2) Clean the tape head before performing this adjustment (refer to Section 17.5.2).

```
** PARAMETER 1 **

TEST ID:
MODE   : MON  EM DTE  EM DCE  H-SPD MON
SOURCE : LINE  TAPE  RAM
       START AT:  BLOCK 0000  CONT
MON    : BOTH DTE DCE
CODE   : PRODTC     ASCII    EBCD   XS-3
         IPARS  REV EBCD  SELECTRIC HEX

FORMAT : SYNC  BSC/X.25  7E/X.25  SDLC
         SDLC/NRZI  ASYNC
   SYNC CHARS:  AUTOSYNC:  OFF  ON
   OUT SYNC  : OFF ON   CHAR:    #:1
BLK CHK: OFF ON
I/F    : EIA  MIL
                    SPEED:  2400
```

Figure 17-16

(3) Connect the oscilloscope common ground to the chassis. Connect the oscilloscope input to Pin 6 of U15 on the Tape Servo Board (see Figure 17-15a or 17-15b).

(4) Power-up the unit. Press PROGRAM; then PARAMETERS and (numeral) 1.

(5) Select TAPE on the SOURCE line; then use the ENTER key to get to the SPEED line and enter (numerals) 9600. The menu should look like Figure 17-17.

(6) Select a tape that is fully recorded with data (training tape). Make the proper code and format selections for the taped data on the Parameters 1 menu. Do not load the training tape program.

```
** PARAMETER 1 **

TEST ID:
MODE   : MON  EM DTE  EM DCE  H-SPD MON
SOURCE : LINE  TAPE  RAM
       START AT:  BLOCK 0000  CONT
MON    : BOTH DTE DCE
CODE   : PRODTC     ASCII    EBCD   XS-3
         IPARS  REV EBCD  SELECTRIC HEX

FORMAT : SYNC  BSC/X.25  7E/X.25  SDLC
         SDLC/NRZI  ASYNC
   SYNC CHARS:  AUTOSYNC:  OFF  ON
   OUT SYNC  : OFF ON   CHAR:    #:1
BLK CHK: OFF ON
I/F    : EIA  MIL
                    SPEED:  9600
```

Figure 17-17

(7) Insert the tape in the drive and press the RUN key. While data is being read from the tape, the waveform at Pin 6 of U15 should be 8 +0/-1 V peak-to-peak.

(8) If necessary, use a screwdriver to adjust R3 on the Read-Write Board (see Figure 17-18) to obtain the correct waveform. The Read-Write Board is located on the bottom of the tape drive and is accessible through the chassis from the bottom of the unit (see Figure 17-19a).

(9) Press PROGRAM and then power down the INTERVIEW immediately.

17.9.5 TAPE HOLE SENSOR ADJUSTMENT

(1) Power up the unit.

(2) Install any tape in the drive.

(3) Press the PROGRAM, then the LOAD PROG key to position the tape.

(4) Power down the INTERVIEW.

(5) Remove the tape. Looking at the cartridge from the rear, lift the tape head door and locate the load point hole in the tape by pushing the roller toward the door. Position the hole directly over the mirror.

(6) Do not install the tape now.

(7) Remove the top and bottom covers as explained in Section 17.4.

(8) Clean the tape hole sensor before performing this adjustment (refer to Section 17.5.4).

(9) Determine which of three possible tape status-drive boards has been installed in your unit. The Tape Status-Drive Board is located on the rear of the tape drive. Compare the top of the board, behind the tachometer disk, with Figures 17-20a and 17-20c. If your board has 555 timer U4, you will refer to Figure 17-20a or 17-20b and the procedure of paragraph (12a). If the board has unijunction transistor Q1, you will refer to Figure 17-20c and the procedure in paragraph (12b). Now go to paragraph (10).

(10) Connect the oscilloscope common ground to the chassis. Connect the oscilloscope input to TP 1 on the Tape Status-Drive Board. TP 1 is accessible through cutouts in the bottom and side of the INTERVIEW chassis. This test point may be in either of two locations (see Figures 17-19a and 17-19b).

(11) Power up the unit. After the internal self tests are finished, reinstall the tape in the drive. Monitor TP 1 on the oscilloscope while you rotate the tape capstan-tachometer disk back and forth by hand until you obtain a waveform; continue until a maximum peak-to-peak waveform is obtained.

(12a) If the board in your unit has U4 (Figures 17-20a and 17-20b), adjust R11 (see Figures 17-19a and 17-19b) for a minimum output of 1.3 V peak to peak. Then continue the adjustment to maximize the peak-to-peak voltage while keeping the dc offset voltage at less than 6 V. Go immediately to Step 13.

(12b) If the board in your unit has Q1 (Figure 17-20c), adjust R11 (Figure 17-19a) for 1.2 V peak to peak. The maximum allowable voltage is 1.3 V peak to peak and the dc offset voltage must be less than 5 V. Go immediately to Step 13.

(13) Immediately power down the unit to prevent overheating.

(14) Remove the tape. Move the tape by hand until the hole is no longer over the mirror. If the hole is left over the mirror, the 4500 will not detect the presence of the tape.

17.9.6 COVER REPLACEMENT

Be sure to replace the Tape Servo Board Retainer and Tape Drive Cover before you replace the top cover of the unit. Replace the top and bottom covers in accordance with Section 17.4.

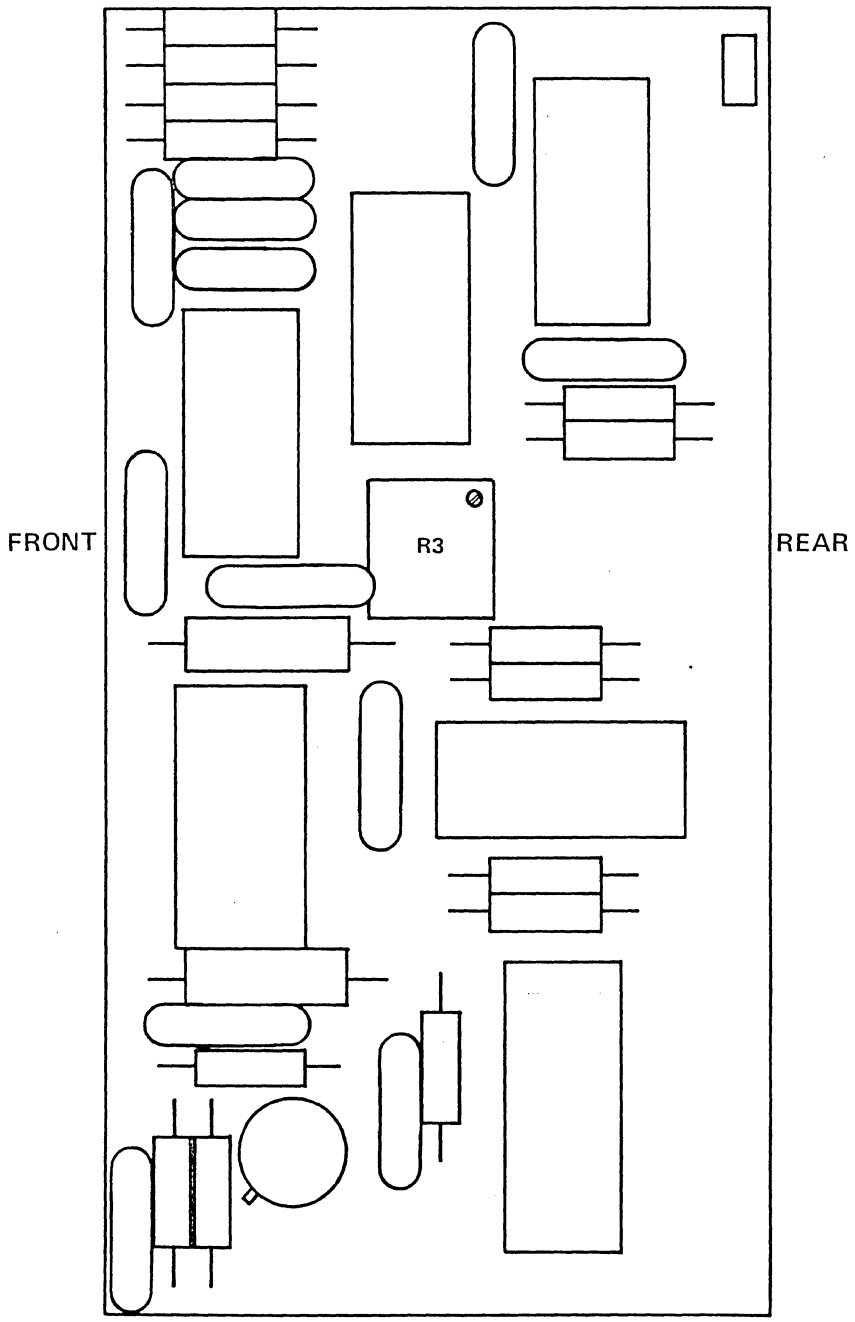


Figure 17-18 Diagram of Read-Write Board viewed through the chassis from under side of unit (see also Figures 17-19a and 17-19b).

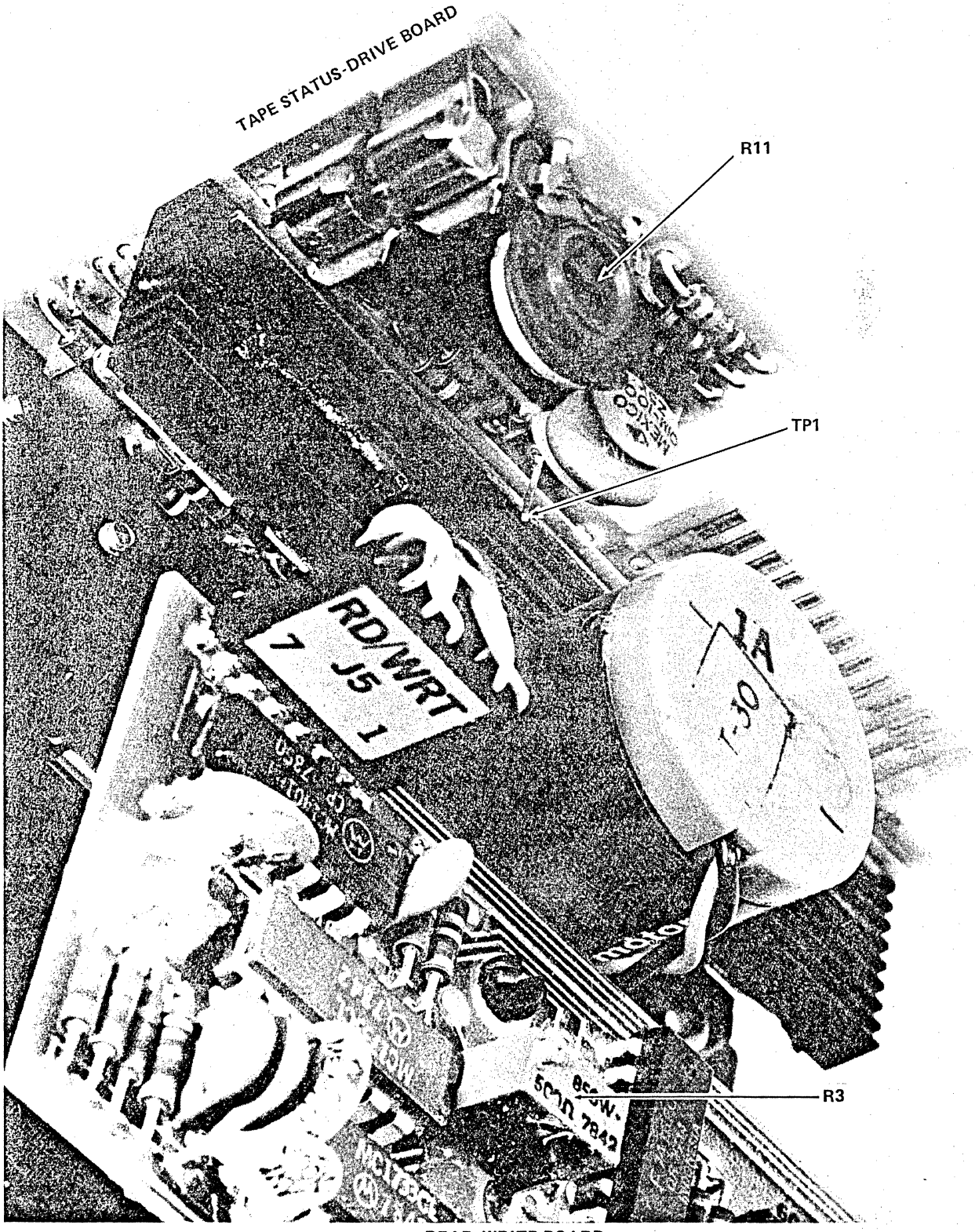


Figure 17-19a Tape Status-Drive Board seen through chassis from front and side of unit; cf. Figures 17-20a, 17-20b, and 17-20c.

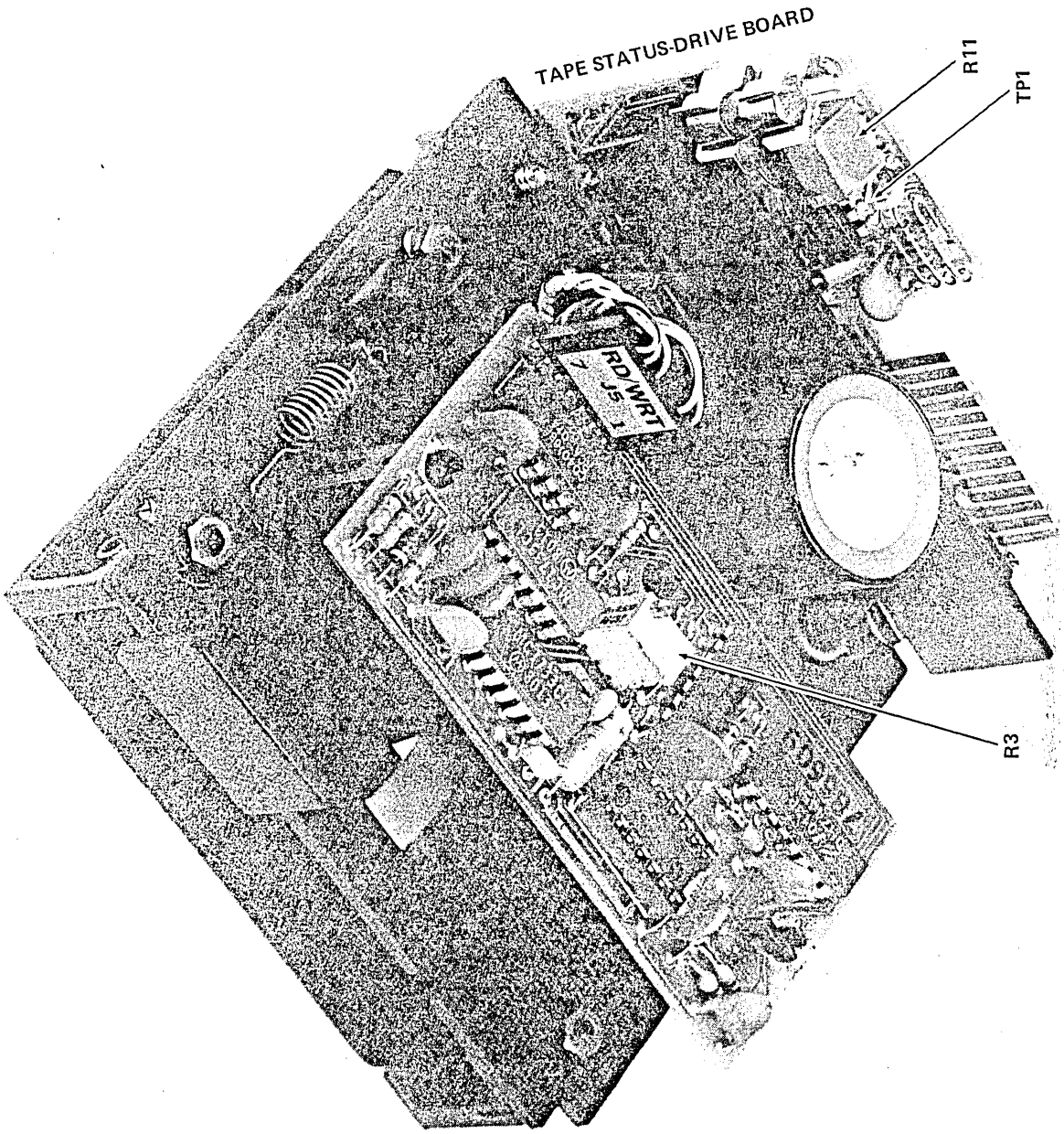


Figure 17-19b Alternate Tape Status-Drive Board showing different location of TP1.

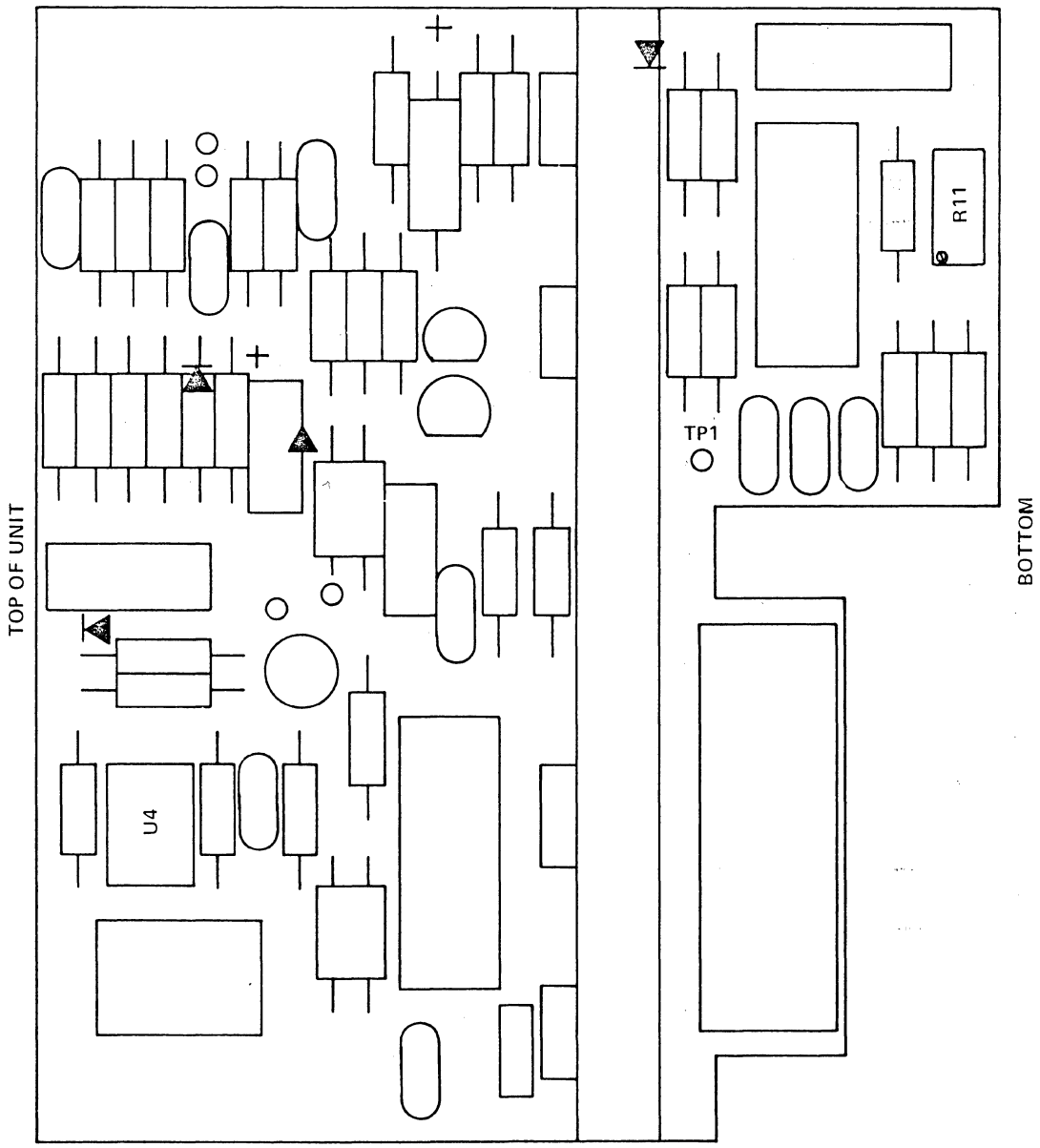


Figure 17-20a Tape Status-Drive Board with 555 timer U4.

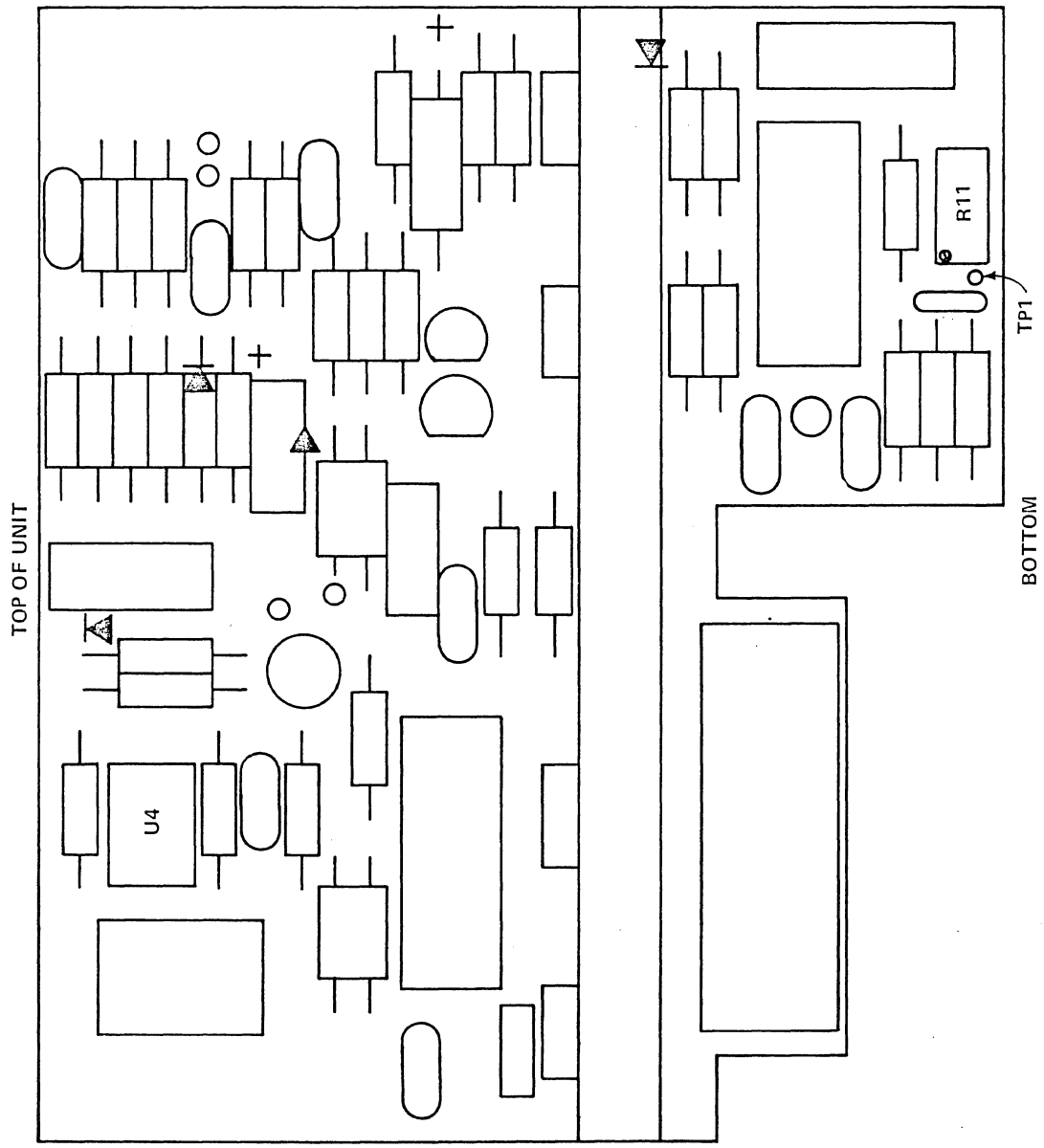


Figure 17-20b Alternate Tape Status-Drive Board with 555 timer U4.

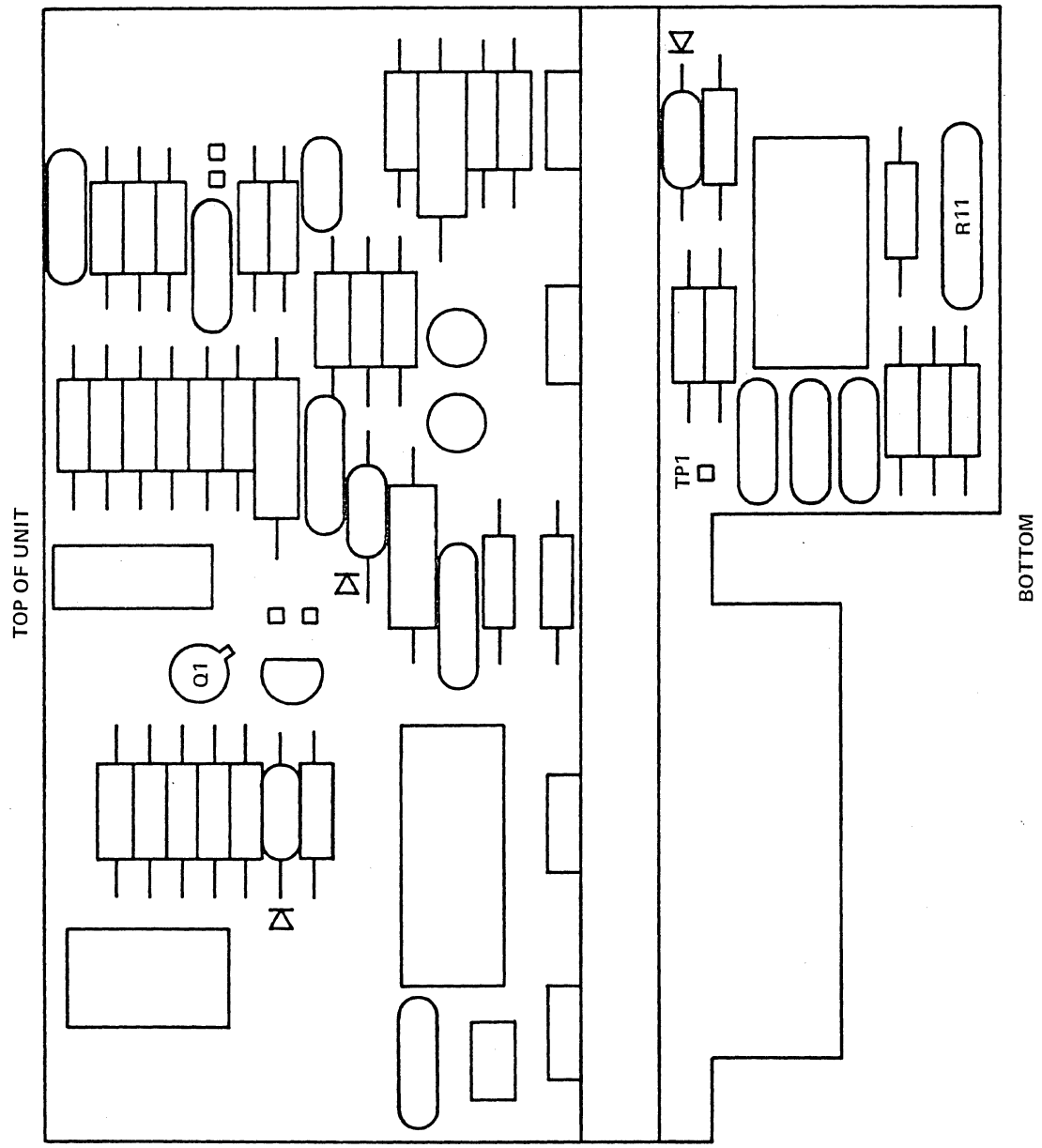


Figure 17-20c Tape Status-Drive Board with unijunction transistor Q1.

Appendix A
Keyboard Translation Tables

EBCDIC

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	81	A	C1	SOH	01
B	b	82	B	C2	STX	02
C	c	83	C	C3	ETX	03
D	d	84	D	C4	EOT	37
E	e	85	E	C5	ENQ	2D
F	f	86	F	C6	ACK	2E
G	g	87	G	C7	BELL	2F
H	h	88	H	C8	BS	16
I	i	89	I	C9	HT	05
J	j	91	J	D1	LF	25
K	k	92	K	D2	VT	0B
L	l	93	L	D3	FF	0C
M	m	94	M	D4	GS	1D
N	n	95	N	D5	SO	0E
O	o	96	O	D6	SI	0F
P	p	97	P	D7	DLE	10
Q	q	98	Q	D8	DC1	11
R	r	99	R	D9	DC2	12
S	s	A2	S	E2	DC3	13
T	t	A3	T	E3	DC4	3C
U	u	A4	U	E4	NAK	3D
V	v	A5	V	E5	SYN	32
W	w	A6	W	E6	ETB	26
X	x	A7	X	E7	CAN	18
Y	y	A8	Y	E8	EM	19
Z	z	A9	Z	E9	SUB	3F
0	0	F0	¦	6A	—	—
1	1	F1	!	5A	—	—
2	2	F2	"	7F	—	—
3	3	F3	#	7B	—	—
4	4	F4	$	5B	—	—
5	5	F5	%	6C	—	—
6	6	F6	&	50	—	—
7	7	F7	'	7D	—	—
8	8	F8	(	4D	—	—
9	9	F9	)	5D	—	—
SPACE	SPACE	40	SPACE	40	—	—
:	:	7A	*	5C	ESC	27
;	;	5E	+	4E	NULL	00
,	,	6B	<	4C	RS	35
– DASH	-	60	=	7E	—	—
.	.	4B	>	6E	—	—
/	/	61	?	6F	FS	22
[	—	—	{	C0	—	—
\	\	E0	@	7C	—	—
]	—	—	}	D0	—	—
^	—	—	~	A1	—	—
UNDERLINE	_	6D	`	79	DEL	07
NL	LF	25	LF	25		
CR	CR	0D	CR	0D	CR	0D

ASCII and HEX (Space Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	61	A	41	SOH	01
B	b	62	B	42	STX	02
C	c	63	C	43	ETX	03
D	d	64	D	44	EOT	04
E	e	65	E	45	ENQ	05
F	f	66	F	46	ACK	06
G	g	67	G	47	BELL	07
H	h	68	H	48	BS	08
I	i	69	I	49	HT	09
J	j	6A	J	4A	LF	0A
K	k	6B	K	4B	VT	0B
L	l	6C	L	4C	FF	0C
M	m	6D	M	4D	GS	1D
N	n	6E	N	4E	SO	0E
O	o	6F	O	4F	SI	0F
P	p	70	P	50	DLE	10
Q	q	71	Q	51	DC1	11
R	r	72	R	52	DC2	12
S	s	73	S	53	DC3	13
T	t	74	T	54	DC4	14
U	u	75	U	55	NAK	15
V	v	76	V	56	SYN	16
W	w	77	W	57	ETB	17
X	x	78	X	58	CAN	18
Y	y	79	Y	59	EM	19
Z	z	7A	Z	5A	SUB	1A
0	0	30	¦	7C	—	—
1	1	31	!	21	—	—
2	2	32	"	22	—	—
3	3	33	#	23	—	—
4	4	34	$	24	—	—
5	5	35	%	25	—	—
6	6	36	&	26	—	—
7	7	37	'	27	—	—
8	8	38	(	28	—	—
9	9	39	)	29	—	—
SPACE	SPACE	20	SPACE	20	—	—
:	:	3A	*	2A	ESC	1B
;	;	3B	+	2B	NULL	00
,	,	2C	<	3C	RS	1E
– DASH	-	2D	=	3D	—	—
.	.	2E	>	3E	VS	1F
/	/	2F	?	3F	FS	1C
[	[	5B	{	7B	—	—
\	\	5C	@	40	—	—
]	]	5D	}	7D	—	—
^	^	5E	~	7E	—	—
UNDERLINE	_	5F	`	60	DEL	7F
NL	LF	0A	LF	0A	FLAG	7E
CR	CR	0D	CR	0D	CR	0D

EBCD (Odd Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	23	A	23	SOH	—
B	b	13	B	13	STX	—
C	c	73	C	73	ETX	—
D	d	0B	D	0B	EOT	7C
E	e	6B	E	6B	ENQ	—
F	f	5B	F	5B	ACK	—
G	g	3B	G	3B	BELL	—
H	h	07	H	07	BS	5D
I	i	67	I	67	HT	2F
J	j	61	J	61	LF	6E
K	k	51	K	51	VT	—
L	l	31	L	31	FF	—
M	m	49	M	49	GS	—
N	n	29	N	29	SO	—
O	o	19	O	19	SI	—
P	p	79	P	79	DLE	—
Q	q	45	Q	45	DC1	—
R	r	25	R	25	DC2	—
S	s	52	S	52	DC3	—
T	t	32	T	32	DC4	—
U	u	4A	U	4A	NAK	—
V	v	2A	V	2A	SYN	—
W	w	1A	W	1A	ETB	—
X	x	7A	X	7A	CAN	—
Y	y	46	Y	46	EM	—
Z	z	26	Z	26	SUB	—
0	0	54	¦	—	—	—
1	1	20	!	75	—	—
2	2	10	"	34	—	—
3	3	70	#	34	—	—
4	4	08	$	75	—	—
5	5	68	%	68	—	—
6	6	58	&	43	—	—
7	7	38	'	58	—	—
8	8	04	(	64	—	—
9	9	64	)	54	—	—
SPACE	SPACE	40	SPACE	40	—	—
:	:	08	*	04	ESC	—
;	;	6B	+	43	NULL	—
,	,	76	<	10	RS	2C
DASH	-	37	=	13	—	—
.	.	37	>	38	US	—
/	/	62	?	07	FS	—
[	[	20	{	—	—	—
\	\	—	@	10	—	—
]	]	20	}	—	—	—
Λ	Λ	—	~	—	—	—
UNDERLINE	_	—	—	—	DEL	7F
NL	NL	6D	LF	6E	FLAG	7E
CR	CR	6D	CR	6D	CR	6D

XS-3 (SY = 35; EOM = 55)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	14	A	14	SOH	—
B	b	15	B	15	STX	—
C	c	16	C	16	ETX	—
D	d	17	D	17	EOT	—
E	e	18	E	18	ENQ	—
F	f	19	F	19	ACK	—
G	g	1A	G	1A	BELL	—
H	h	1B	H	1B	BS	—
I	i	1C	I	1C	HT	—
J	j	24	J	24	LF	—
K	k	25	K	25	VT	—
L	l	26	L	26	FF	—
M	m	27	M	27	GS	—
N	n	28	N	28	SO	—
O	o	29	O	29	SI	—
P	p	2A	P	2A	DLE	—
Q	q	2B	Q	2B	DC1	—
R	r	2C	R	2C	DC2	—
S	s	35	S	35	DC3	—
T	t	36	T	36	DC4	—
U	u	37	U	37	NAK	—
V	v	38	V	38	SYN	—
W	w	39	W	39	ETB	—
X	x	3A	X	3A	CAN	—
Y	y	3B	Y	3B	EM	—
Z	z	3C	Z	3C	SUB	—
0	0	03	¦	—	—	—
1	1	04	!	23	—	—
2	2	05	"	—	—	—
3	3	06	#	1F	—	—
4	4	07	$	22	—	—
5	5	08	%	2D	—	—
6	6	09	&	33	—	—
7	7	0A	'	2E	—	—
8	8	0B	(	31	—	—
9	9	0C	)	3D	—	—
SPACE	SPACE	00	SPACE	00	—	—
:	:	11	*	21	ESC	—
;	;	0E	+	10	NULL	—
,	,	32	<	1E	RS	—
DASH	-	02	=	1D	—	—
.	.	12	>	3E	US	—
/	/	34	?	13	FS	—
[	[	0F	{	—	—	—
\	\	0D	@	20	—	—
]	]	01	}	—	—	—
Λ	Λ	2F	~	—	—	—
UNDERLINE	_	—	`	—	DEL	—
NL	NL	—	LF	—	FLAG	—
CR	CR	—	CR	—	CR	—

IPARS

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	31	A	31	SOH	—
B	b	32	B	32	STX	—
C	c	33	C	33	ETX	1D
D	d	34	D	34	EOT	—
E	e	35	E	35	ENQ	—
F	f	36	F	36	ACK	—
G	g	37	G	37	BELL	0F
H	h	38	H	38	BS	—
I	i	39	I	39	HT	0D
J	j	21	J	21	LF	—
K	k	22	K	22	VT	—
L	l	23	L	23	FF	—
M	m	24	M	24	GS	—
N	n	25	N	25	SO	—
O	o	26	O	26	SI	—
P	p	27	P	27	DLE	3D
Q	q	28	Q	28	DC1	—
R	r	29	R	29	DC2	—
S	s	12	S	12	DC3	1E
T	t	13	T	13	DC4	—
U	u	14	U	14	NAK	2D
V	v	15	V	15	SYN	3E
W	w	16	W	16	ETB	—
X	x	17	X	17	CAN	—
Y	y	18	Y	18	EM	—
Z	z	19	Z	19	SUB	—
0	0	0A	¦	—	—	—
1	1	01	!	—	—	—
2	2	02	"	—	—	—
3	3	03	#	1B	—	—
4	4	04	$	30	—	—
5	5	05	%	3C	—	—
6	6	06	&	—	—	—
7	7	07	'	—	—	—
8	8	08	(	2F	—	—
9	9	09	)	2E	—	—
SPACE	SPACE	1C	SPACE	1C	—	—
:	:	2A	*	0B	ESC	—
;	;	1F	+	—	NULL	00
,	,	1A	<	—	RS	—
DASH	-	3B	=	—	—	—
.	.	—	>	—	US	—
/	/	—	?	3A	FS	—
[	[	—	{	—	—	—
\	\	—	@	20	—	—
]	]	—	}	—	—	—
^	^	—	~	—	—	—
UNDERLINE	_	—	—	—	DEL	—
NL	NL	—	LF	—	FLAG	7E
CR	CR	0C	CR	0C	CR	0C

REVERSE EBCD (Odd Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	31	A	31	SOH	—
B	b	32	B	32	STX	—
C	c	73	C	73	ETX	—
D	d	34	D	34	EOT	5E
E	e	75	E	75	ENQ	—
F	f	76	F	76	ACK	—
G	g	37	G	37	BELL	—
H	h	38	H	38	BS	6E
I	i	79	I	79	HT	3D
J	j	61	J	61	LF	5D
K	k	62	K	62	VT	—
L	l	23	L	23	FF	—
M	m	64	M	64	GS	—
N	n	25	N	25	SO	—
O	o	26	O	26	SI	—
P	p	67	P	67	DLE	—
Q	q	68	Q	68	DC1	—
R	r	29	R	29	DC2	—
S	s	52	S	52	DC3	—
T	t	13	T	13	DC4	—
U	u	54	U	54	NAK	—
V	v	15	V	15	SYN	—
W	w	16	W	16	ETB	—
X	x	57	X	57	CAN	—
Y	y	58	Y	58	EM	—
Z	z	19	Z	19	SUB	—
0	0	4A	¦	—	—	—
1	1	01	!	6B	—	—
2	2	02	"	0B	—	—
3	3	43	#	0B	—	—
4	4	04	$	6B	—	—
5	5	45	%	45	—	—
6	6	46	&	70	—	—
7	7	07	'	46	—	—
8	8	08	(	49	—	—
9	9	49	)	0A	—	—
SPACE	SPACE	40	SPACE	40	SPACE	40
:	:	04	*	08	ESC	—
;	;	03	+	70	NULL	—
,	,	5B	<	02	RS	0D
DASH	-	20	=	01	—	—
.	.	3B	>	07	US	—
/	/	51	?	51	FS	—
[	[	4C	{	—	—	—
\	\	2C	@	10	—	—
]	]	4C	}	—	—	—
^	^	2C	~	—	—	—
UNDERLINE	_	—	—	—	DEL	7F
NL	NL	5D	LF	5D	FLAG	7E
CR	CR	6D	CR	6D	CR	6D

BAUDOT

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	03	A	03	SOH	—
B	b	19	B	19	STX	—
C	c	0E	C	0E	ETX	—
D	d	09	D	09	EOT	—
E	e	01	E	01	ENQ	—
F	f	0D	F	0D	ACK	—
G	g	1A	G	1A	BELL	—
H	h	14	H	14	BS	—
I	i	06	I	06	HT	—
J	j	0B	J	0B	LF	02
K	k	0F	K	0F	VT	—
L	l	12	L	12	FF	—
M	m	1C	M	1C	GS	—
N	n	0C	N	0C	SO	—
O	o	18	O	18	SI	—
P	p	16	P	16	DLE	—
Q	q	17	Q	17	DC1	—
R	r	0A	R	0A	DC2	—
S	s	05	S	05	DC3	—
T	t	10	T	10	DC4	—
U	u	07	U	07	NAK	—
V	v	1E	V	1E	SYN	—
W	w	13	W	13	ETB	—
X	x	1D	X	1D	CAN	—
Y	y	15	Y	15	EM	—
Z	z	11	Z	11	SUB	—
0	0	16	¦	—	—	—
1	1	17	!	0D	—	—
2	2	13	"	11	—	—
3	3	01	#	14	—	—
4	4	0A	$	09	—	—
5	5	10	%	—	—	—
6	6	15	&	—	—	—
7	7	07	'	0B	—	—
8	8	1A	(	0F	—	—
9	9	18	)	12	—	—
SPACE	SPACE	04	SPACE	04	—	—
:	:	0E	*	—	ESC	—
;	;	1E	+	—	NULL	—
,	,	0C	<	—	RS	—
DASH	-	03	=	—	—	—
.	.	1C	>	—	US	—
/	/	1D	?	19	FS	—
[	[	—	{	—	—	—
\	\	—	@	—	—	—
]	]	—	}	—	—	—
Λ	Λ	—	~	—	—	—
UNDERLINE	_	—	—	—	DEL	—
NL	NL	02	LF	02	FLAG	7E
CR	CR	08	CR	08	CR	08

SELECTRIC

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	39	A	39	SOH	—
B	b	36	B	36	STX	—
C	c	3A	C	3A	ETX	—
D	d	2A	D	2A	EOT	3C
E	e	0A	E	0A	ENQ	—
F	f	33	F	33	ACK	—
G	g	23	G	23	BELL	—
H	h	26	H	26	BS	1D
I	i	19	I	19	HT	2F
J	j	03	J	03	LF	2E
K	k	1A	K	1A	VT	—
L	l	06	L	06	FF	—
M	m	21	M	21	GS	—
N	n	12	N	12	SO	—
O	o	05	O	05	SI	—
P	p	0B	P	0B	DLE	—
Q	q	1B	Q	1B	DC1	—
R	r	29	R	29	DC2	—
S	s	25	S	25	DC3	—
T	t	02	T	02	DC4	—
U	u	32	U	32	NAK	—
V	v	31	V	31	SYN	—
W	w	35	W	35	ETB	1E
X	x	22	X	22	CAN	—
Y	y	27	Y	27	EM	—
Z	z	14	Z	14	SUB	—
0	0	24	¦	—	—	—
1	1	20	!	—	—	—
2	2	10	"	09	—	—
3	3	30	#	30	—	—
4	4	04	$	04	—	—
5	5	08	%	08	—	—
6	6	18	&	28	—	—
7	7	28	'	09	—	—
8	8	38	(	34	—	—
9	9	34	)	24	—	—
SPACE	SPACE	00	SPACE	00	—	—
:	:	AB	*	38	ESC	—
;	;	2B	+	13	NULL	—
,	,	3B	<	—	RS	2C
DASH	-	37	=	13	—	—
.	.	11	>	—	VS	—
/	/	07	?	07	FS	—
[	[	A0	{	—	—	—
\	\	1F	@	10	—	—
]	]	20	}	—	—	—
Λ	Λ	1C	~	—	—	—
UNDERLINE	_	B7	`	—	DEL	3F
NL	LF	2E	LF	2E	FLAG	7E
CR	CR	2D	CR	2D	CR	2D

Appendix B
Input-to-Display Translation Tables

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			LC	UC			LC	UC	LETTERS	FIGURES	LC	UC
00	NU	NU	(SPACE)	(SPACE)	(SPACE)	(HEX)	(SPACE)	(SPACE)	(HEX)	(HEX)	SP	SP
01	SH	SH	—	—	]	1	1	=	E	3	!	–
02	SX	SX	@	(HEX)	—	2	2	<	LF	LF	t	T
03	EX	EX	&	+	0	3	3	;	A	—	j	J
04	ET	(HEX)	8	*	1	4	4	:	(SPACE)	(HEX)	4	$
05	EQ	HT	q	Q	2	5	5	%	S	(HEX)	o	O
06	AK	(HEX)	y	Y	3	6	6	'	I	8	l	L
07	BL	(HEX)	h	H	4	7	7	>	U	7	/	?
08	BS	(HEX)	4	:	5	8	8	*	CR	CR	5	%
09	HT	(HEX)	m	M	6	9	9	(	D	$	'	"
0A	LF	(HEX)	u	U	7	0	0	)	R	4	e	E
0B	VT	VT	d	D	8	*	#	"	J	'	p	P
0C	FF	FF	D2	D2	9	(HEX)	[	]	N	,	(HEX)	(HEX)
0D	CR	CR	(HEX)	(HEX)	\	(HEX)	FF	FF	F	!	(HEX)	(HEX)
0E	SO	SO	(HEX)	(HEX)	;	=	^	^	C	:	(HEX)	(HEX)
0F	SI	SI	D4	D4	[	(HEX)	(HEX)	(HEX)	K	(	(HEX)	(HEX)
10	DL	DL	2	<	+	(HEX)	@	(HEX)	T	5	2	@
11	D1	D1	k	K	:	(HEX)	/	?	Z	(HEX)	.	.
12	D2	D2	s	S	.	S	s	S	L	)	n	N
13	D3	D3	b	B	?	T	t	T	W	2	=	+
14	D4	(HEX)	0	)	A	U	u	U	H	#	z	Z
15	NK	(HEX)	#	#	B	V	v	V	Y	6	(HEX)	(HEX)
16	SY	BS	.	.	C	W	w	W	P	0	(HEX)	(HEX)
17	EB	(HEX)	(HEX)	(HEX)	D	X	x	X	Q	1	(HEX)	(HEX)
18	CN	CN	6	'	E	Y	y	Y	O	9	6	(HEX)
19	EM	EM	o	O	F	Z	z	Z	B	?	i	I
1A	SB	(HEX)	w	W	G	—	.	.	G	&	k	K
1B	EC	(HEX)	f	F	H	#	,	(HEX)	^	^	q	Q
1C	FS	FS	^	^	I	(SPACE)	}	{	M	.	^	^
1D	GS	GS	BS	BS	=	(HEX)	(HEX)	(HEX)	X	/	BS	BS
1E	RS	RS	(HEX)	(HEX)	<	(HEX)	(HEX)	(HEX)	V	;	EB	EB
1F	US	US	\	\	#	,	(HEX)	(HEX)	\	\	\	\

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			LC	UC			LC	UC	LETTERS	FIGURES	LC	UC
20	(SPACE)	(HEX)	1	=	@	@	—	—	(HEX)	(HEX)	1	[
21	!	(HEX)	j	J	*	J	j	J	(HEX)	(HEX)	m	M
22	"	(HEX)	Λ	?	$	K	k	K	(HEX)	(HEX)	x	X
23	#	(HEX)	a	A	!	L	l	L	(HEX)	(HEX)	g	G
24	$	(HEX)	9	(	]	M	m	M	(HEX)	(HEX)	0	)
25	%	LF	r	R	K	N	n	N	(HEX)	(HEX)	s	S
26	&	EB	z	Z	L	O	o	O	(HEX)	(HEX)	h	H
27	'	EC	i	I	M	P	p	P	(HEX)	(HEX)	y	Y
28	(	(HEX)	5	%	N	Q	q	Q	(HEX)	(HEX)	7	&
29	)	(HEX)	n	N	O	R	r	R	(HEX)	(HEX)	r	R
2A	*	(HEX)	v	V	P	:	#	#	(HEX)	(HEX)	d	D
2B	+	(HEX)	e	E	Q	<	$	!	(HEX)	(HEX)	;	:
2C	,	(HEX)	RS	RS	R	+	\	Λ	(HEX)	(HEX)	RS	RS
2D	-	EQ	CR	CR	%	(HEX)	CR	CR	(HEX)	(HEX)	CR	CR
2E	.	AK	LF	LF	'	)	BS	BS	(HEX)	(HEX)	LF	LF
2F	/	BL	HT	HT	Λ	(	(HEX)	(HEX)	(HEX)	(HEX)	HT	HT
30	0	(HEX)	3	;	-	$	&	+	(HEX)	(HEX)	3	#
31	1	(HEX)	l	L	(	A	a	A	(HEX)	(HEX)	v	V
32	2	SY	t	T	,	B	b	B	(HEX)	(HEX)	u	U
33	3	(HEX)	c	C	&	C	c	C	(HEX)	(HEX)	f	F
34	4	(HEX)	#	"	/	D	d	D	(HEX)	(HEX)	q	(
35	5	(HEX)	$	!	S*	E	e	E	(HEX)	(HEX)	w	W
36	6	(HEX)	,	3B	T	F	f	F	(HEX)	(HEX)	b	B
37	7	ET	.	Λ	U	G	g	G	(HEX)	(HEX)	DASH	UNDERLINE
38	8	(HEX)	7	>	V	H	h	H	(HEX)	(HEX)	$\bar{8}$	*
39	9	(HEX)	p	P	W	I	i	I	(HEX)	(HEX)	a	A
3A	:	(HEX)	x	X	X	?	(HEX)	(HEX)	(HEX)	(HEX)	c	C
3B	;	(HEX)	g	G	Y	.	.	(HEX)	(HEX)	(HEX)	,	,
3C	<	D4	ET	ET	Z	%	~	`	(HEX)	(HEX)	ET	ET
3D	=	NK	SY	SY	)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
3E	>	(HEX)	SH	SH	>	(HEX)	\	\	(HEX)	(HEX)	(HEX)	(HEX)
3F	?	SB	(PAD)	(PAD)	"	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	PAD (DEL)	PAD (DEL)

* SYNC = even parity S (35_{16}).

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			LC	UC		HEX	LC	UC	LETTERS	FIGURES	LC	UC
40	@	(SPACE)	(SPACE)	(SPACE)	(SPACE)	(HEX)	(SPACE)	(SPACE)	(HEX)	(HEX)	SP	SP
41	A	(HEX)	—	—	]	(HEX)	1	=	(HEX)	(HEX)	|	—
42	B	(HEX)	@	(HEX)	-	(HEX)	2	<	(HEX)	(HEX)	t	T
43	C	(HEX)	&	+	0	(HEX)	3	;	(HEX)	(HEX)	j	J
44	D	(HEX)	8	*	1	(HEX)	4	:	(HEX)	(HEX)	4	$
45	E	(HEX)	q	Q	2	(HEX)	5	%	(HEX)	(HEX)	o	O
46	F	(HEX)	y	Y	3	(HEX)	6	'	(HEX)	(HEX)	l	L
47	G	(HEX)	h	H	4	(HEX)	7	>	(HEX)	(HEX)	/	?
48	H	(HEX)	4	:	5	(HEX)	8	*	(HEX)	(HEX)	5	%
49	I	(HEX)	m	M	6	(HEX)	9	(	(HEX)	(HEX)	'	"
4A	J	(HEX)	u	U	7	(HEX)	0	)	(HEX)	(HEX)	e	E
4B	K	.	d	D	8	(HEX)	#	"	(HEX)	(HEX)	p	P
4C	L	<	D2	D2	9	(HEX)	[	]	(HEX)	(HEX)	(HEX)	(HEX)
4D	M	(	(HEX)	(HEX)	\	(HEX)	FF	FF	(HEX)	(HEX)	(HEX)	(HEX)
4E	N	+	(HEX)	(HEX)	;	(HEX)	Λ	Λ	(HEX)	(HEX)	(HEX)	(HEX)
4F	O	(HEX)	D4	D4	[	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
50	P	&	2	<	+	(HEX)	@	(HEX)	(HEX)	(HEX)	2	@
51	Q	(HEX)	k	K	:	(HEX)	/	?	(HEX)	(HEX)	.	.
52	R	(HEX)	s	S	.	(HEX)	s	S	(HEX)	(HEX)	n	N
53	S	(HEX)	b	B	?	(HEX)	t	T	(HEX)	(HEX)	=	+
54	T	(HEX)	0	)	A	(HEX)	u	U	(HEX)	(HEX)	z	Z
55	U	(HEX)	#	#	B*	(HEX)	v	V	(HEX)	(HEX)	(HEX)	(HEX)
56	V	(HEX)	.	.	C	(HEX)	w	W	(HEX)	(HEX)	(HEX)	(HEX)
57	W	(HEX)	(HEX)	(HEX)	D	(HEX)	x	X	(HEX)	(HEX)	(HEX)	(HEX)
58	X	(HEX)	6	'	E	(HEX)	y	Y	(HEX)	(HEX)	6	(HEX)
59	Y	(HEX)	o	O	F	(HEX)	z	Z	(HEX)	(HEX)	i	I
5A	Z	!	w	W	G	(HEX)	.	.	(HEX)	(HEX)	k	K
5B	[	$	f	F	H	(HEX)	,	(HEX)	(HEX)	(HEX)	q	Q
5C	\	*	Λ	Λ	I	(HEX)	}	{	(HEX)	(HEX)	Λ	Λ
5D	]	)	BS	BS	=	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	BS	BS
5E	Λ	;	(HEX)	(HEX)	<	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	EB	EB
5F	—	(HEX)	\	\	#	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	\	\

* EOM = even parity B (55_{16}).

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			LC	UC			LC	UC	LETTERS	FIGURES	LC	UC
60	`	—	1	=	@	(HEX)	—	—	(HEX)	(HEX)	1	[
61	a	/	j	J	*	(HEX)	j	J	(HEX)	(HEX)	m	M
62	b	(HEX)	Λ	?	$	(HEX)	k	K	(HEX)	(HEX)	x	X
63	c	(HEX)	a	A	!	(HEX)	l	L	(HEX)	(HEX)	g	G
64	d	(HEX)	9	(	J	(HEX)	m	M	(HEX)	(HEX)	0	)
65	e	(HEX)	r	R	K	(HEX)	n	N	(HEX)	(HEX)	s	S
66	f	(HEX)	z	Z	L	(HEX)	o	O	(HEX)	(HEX)	h	H
67	g	(HEX)	i	I	M	(HEX)	p	P	(HEX)	(HEX)	y	Y
68	h	(HEX)	5	%	N	(HEX)	q	Q	(HEX)	(HEX)	7	&
69	i	(HEX)	n	N	O	(HEX)	r	R	(HEX)	(HEX)	r	R
6A	j	¦	v	V	P	(HEX)	#	#	(HEX)	(HEX)	d	D
6B	k	,	e	E	Q	(HEX)	$	!	(HEX)	(HEX)	;	:
6C	l	%	RS	RS	R	(HEX)	\	Λ	(HEX)	(HEX)	RS	RS
6D	m	_	CR	CR	%	(HEX)	CR	CR	(HEX)	(HEX)	CR	CR
6E	n	>	LF	LF	'	(HEX)	BS	BS	(HEX)	(HEX)	LF	LF
6F	o	?	HT	HT	Λ	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	HT	HT
70	p	(HEX)	3	;	—	(HEX)	&	+	(HEX)	(HEX)	3	#
71	q	(HEX)	l	L	(	(HEX)	a	A	(HEX)	(HEX)	v	V
72	r	(HEX)	t	T	,	(HEX)	b	B	(HEX)	(HEX)	u	U
73	s	(HEX)	c	C	&	(HEX)	c	C	(HEX)	(HEX)	f	F
74	t	(HEX)	#	"	/	(HEX)	d	D	(HEX)	(HEX)	q	(
75	u	(HEX)	$	!	S	(HEX)	e	E	(HEX)	(HEX)	w	W
76	v	(HEX)	,	(HEX)	T	(HEX)	f	F	(HEX)	(HEX)	b	B
77	w	(HEX)	.	Λ	U	(HEX)	g	G	(HEX)	(HEX)	DASH	UNDERLINE
78	x	(HEX)	7	>	V	(HEX)	h	H	(HEX)	(HEX)	8	*
79	y	`	p	P	W	(HEX)	i	I	(HEX)	(HEX)	a	A
7A	z	:	x	X	X	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	c	C
7B	{	#	g	G	Y	(HEX)	.	(HEX)	(HEX)	(HEX)	,	,
7C	¦	@	ET	ET	Z	(HEX)	~	`	(HEX)	(HEX)	ET	ET
7D	}	'	SY	SY	)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)
7E	~	=	SH	SH	>	(HEX)	\	\	(HEX)	(HEX)	(HEX)	(HEX)
7F	(PAD) DEL	"	(PAD) DEL	(PAD) DEL	"	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	PAD (DEL)	PAD (DEL)

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	SELECTRIC	
			LC	UC			LC	UC	LETTERS FIGURES	LC	UC
80	NU	(HEX)			(HEX)	(HEX)					
81	SH	a			(HEX)	(HEX)					
82	SX	b			(HEX)	(HEX)					
83	EX	c			(HEX)	(HEX)					
84	ET	d			(HEX)	(HEX)					
85	EQ	e			(HEX)	(HEX)					
86	AK	f			(HEX)	(HEX)					
87	BL	g			(HEX)	(HEX)					
88	BS	h			(HEX)	(HEX)					
89	HT	i			(HEX)	(HEX)					
8A	LF	(HEX)			(HEX)	(HEX)					
8B	VT	(HEX)			(HEX)	(HEX)					
8C	FF	(HEX)			(HEX)	(HEX)					
8D	CR	(HEX)			(HEX)	(HEX)					
8E	SO	(HEX)			(HEX)	(HEX)					
8F	SI	(HEX)			(HEX)	(HEX)					
90	DL	(HEX)			(HEX)	(HEX)					
91	D1	j			(HEX)	(HEX)					
92	D2	k			(HEX)	(HEX)					
93	D3	l			(HEX)	(HEX)					
94	D4	m			(HEX)	(HEX)					
95	NK	n			(HEX)	(HEX)					
96	SY	o			(HEX)	(HEX)					
97	EB	p			(HEX)	(HEX)					
98	CN	q			(HEX)	(HEX)					
99	EM	r			(HEX)	(HEX)					
9A	SB	(HEX)			(HEX)	(HEX)					
9B	EC	(HEX)			(HEX)	(HEX)					
9C	FS	(HEX)			(HEX)	(HEX)					
9D	GS	(HEX)			(HEX)	(HEX)					
9E	RS	(HEX)			(HEX)	(HEX)					
9F	US	(HEX)			(HEX)	(HEX)					

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT	SELECTRIC	
			LC	UC			LC	UC	LETTERS FIGURES	LC	UC
A0	(SPACE)	(HEX)			(HEX)	(HEX)					
A1	!	~			(HEX)	(HEX)					
A2	"	s			(HEX)	(HEX)					
A3	#	t			(HEX)	(HEX)					
A4	$	u			(HEX)	(HEX)					
A5	%	v			(HEX)	(HEX)					
A6	&	w			(HEX)	(HEX)					
A7	'	x			(HEX)	(HEX)					
A8	(	y			(HEX)	(HEX)					
A9	)	z			(HEX)	(HEX)					
AA	*	(HEX)			(HEX)	(HEX)					
AB	+	(HEX)			(HEX)	(HEX)					
AC	,	(HEX)			(HEX)	(HEX)					
AD	-	(HEX)			(HEX)	(HEX)					
AE	.	(HEX)			(HEX)	(HEX)					
AF	/	(HEX)			(HEX)	(HEX)					
B0	0	(HEX)			(HEX)	(HEX)					
B1	1	(HEX)			(HEX)	(HEX)					
B2	2	(HEX)			(HEX)	(HEX)					
B3	3	(HEX)			(HEX)	(HEX)					
B4	4	(HEX)			(HEX)	(HEX)					
B5	5	(HEX)			(HEX)	(HEX)					
B6	6	(HEX)			(HEX)	(HEX)					
B7	7	(HEX)			(HEX)	(HEX)					
B8	8	(HEX)			(HEX)	(HEX)					
B9	9	(HEX)			(HEX)	(HEX)					
BA	:	(HEX)			(HEX)	(HEX)					
BB	;	(HEX)			(HEX)	(HEX)					
BC	<	(HEX)			(HEX)	(HEX)					
BD	=	(HEX)			(HEX)	(HEX)					
BE	>	(HEX)			(HEX)	(HEX)					
BF	?	(HEX)			(HEX)	(HEX)					

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE	REV EBCD CBA8421		BAUDOT	SELECTRIC	
			LC	UC		HEX	LC	UC	LETTERS FIGURES	LC	UC
C0	@	{			(HEX)	(HEX)					
C1	A	A			(HEX)	(HEX)					
C2	B	B			(HEX)	(HEX)					
C3	C	C			(HEX)	(HEX)					
C4	D	D			(HEX)	(HEX)					
C5	E	E			(HEX)	(HEX)					
C6	F	F			(HEX)	(HEX)					
C7	G	G			(HEX)	(HEX)					
C8	H	H			(HEX)	(HEX)					
C9	I	I			(HEX)	(HEX)					
CA	J	(HEX)			(HEX)	(HEX)					
CB	K	(HEX)			(HEX)	(HEX)					
CC	L	(HEX)			(HEX)	(HEX)					
CD	M	(HEX)			(HEX)	(HEX)					
CE	N	(HEX)			(HEX)	(HEX)					
CF	O	(HEX)			(HEX)	(HEX)					
D0	P	}			(HEX)	(HEX)					
D1	Q	J			(HEX)	(HEX)					
D2	R	K			(HEX)	(HEX)					
D3	S	L			(HEX)	(HEX)					
D4	T	M			(HEX)	(HEX)					
D5	U	N			(HEX)	(HEX)					
D6	V	O			(HEX)	(HEX)					
D7	W	P			(HEX)	(HEX)					
D8	X	Q			(HEX)	(HEX)					
D9	Y	R			(HEX)	(HEX)					
DA	Z	(HEX)			(HEX)	(HEX)					
DB	[	(HEX)			(HEX)	(HEX)					
DC	\	(HEX)			(HEX)	(HEX)					
DD	]	(HEX)			(HEX)	(HEX)					
DE	^	(HEX)			(HEX)	(HEX)					
DF	-	(HEX)			(HEX)	(HEX)					

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE	REV EBCD CBA8421		BAUDOT	SELECTRIC	
			LC	UC		HEX	LC	UC	LETTERS FIGURES	LC	UC
E0	`	\			(HEX)	(HEX)					
E1	a	E1			(HEX)	(HEX)					
E2	b	S			(HEX)	(HEX)					
E3	c	T			(HEX)	(HEX)					
E4	d	U			(HEX)	(HEX)					
E5	e	V			(HEX)	(HEX)					
E6	f	W			(HEX)	(HEX)					
E7	g	X			(HEX)	(HEX)					
E8	h	Y			(HEX)	(HEX)					
E9	i	Z			(HEX)	(HEX)					
EA	j	(HEX)			(HEX)	(HEX)					
EB	k	(HEX)			(HEX)	(HEX)					
EC	l	(HEX)			(HEX)	(HEX)					
ED	m	(HEX)			(HEX)	(HEX)					
EE	n	(HEX)			(HEX)	(HEX)					
EF	o	(HEX)			(HEX)	(HEX)					
F0	p	0			(HEX)	(HEX)					
F1	q	1			(HEX)	(HEX)					
F2	r	2			(HEX)	(HEX)					
F3	s	3			(HEX)	(HEX)					
F4	t	4			(HEX)	(HEX)					
F5	u	5			(HEX)	(HEX)					
F6	v	6			(HEX)	(HEX)					
F7	w	7			(HEX)	(HEX)					
F8	x	8			(HEX)	(HEX)					
F9	y	9			(HEX)	(HEX)					
FA	z	(HEX)			(HEX)	(HEX)					
FB	{	(HEX)			(HEX)	(HEX)					
FC	¦	(HEX)			(HEX)	(HEX)					
FD	}	(HEX)			(HEX)	(HEX)					
FE	~	(HEX)			(HEX)	(HEX)					
FF	(PAD)	(HEX)			(HEX)	(HEX)					

Appendix C
Control Character Mnemonics

AK	ACK: Acknowledgment
BL	BEL: Bell
BS	Backspace
CN	CAN: Cancel
CR	Carriage return
D1	DC1: Device control 1
D2	DC2: Device control 2
D3	DC3: Device control 3
D4	DC4: Device control 4
DL	DLE: Data link escape
EB	ETB, EOB: End of transmission block
EC	EOC: End of card
EM	EOM: End of message
EQ	ENQ: Enquiry
ET	EOT: End of transmission
EX	ETX: End of text
FF	Form feed
FS	Field separator
GS	Group separator (or Interchange group separator)
HT	Horizontal tabulate
LF	Line feed
NK	NAK: Negative acknowledgment
NU	Null
Pad	DEL or idle line
RS	Record separator
SB	SUB: Substitute
SH	SOH: Start of header
SI	Shift in
SO	Shift out
SX	STX: Start of text
SY	SYN: Synchronization character
US	Unit separator
VT	Vertical tabulate

Appendix D
Capture Memory
Messages to Operator

Message and Code	Comments
BLOCK NOT FOUND (14)	Block specified cannot be found because tape has not been fully recorded or formatted.
BOARD "G" (MEMORY OPTION) NOT INSTALLED!	Board G has failed or been disconnected after power-up (not recommended procedure) and a memory command has been attempted. Power down and verify that cable to memory board is connected properly and memory board is seated in connector.
BOARD "G" PAGE ADDRESS SELECT ERROR	Failure of the logic that finds a block other than zero. Board may, possibly, still be usable to record, play back, or transfer starting from Block 000.
CAPTURE MEMORY FULL	RAM: Indicates that STOP AT END has been SELECTED and recording has stopped at end of RAM.
CHECKING TAPE TYPE	Tape is being read to determine whether a Program-Data or a Program Only Tape is installed.
CONDITIONING DESTINATION TAPE	The destination tape for a duplication is being retensioned.
CONDITIONING TAPE	The tape presently inserted is being retensioned.

Message and Code	Comments
DIRECTORY VERSION NOT SUPPORTED	The directory read from tape cannot be converted to the format of the particular unit being used.
DIRECTORY WRITE ERROR (20)	After two tries, the directory could not be verified when read back from the tape after being written.
DUMMY ERR, SOFTWARE TEST (13)	Indicates processor error on Board F. May be seen if recording to tape is attempted at data rate above 19.2 kbps (9.6 kbps with EIA status). (Unlikely to be seen.)
DUPLICATING TAPE	Tape duplication (reading data, writing data, formatting tape, conditioning tape, or waiting for a tape exchange) is in progress.
END OF MEMORY: XXX BLOCKS TRANSFERRED	In transfer from RAM to tape, end of memory encountered before last block to be transferred is reached. (No more data to transfer.) In transfer from tape to RAM, memory full before all specified blocks have been transferred.
FORMATTING DESTINATION TAPE	The destination tape for a duplication is being formatted.
FORMATTING TAPE	The tape presently inserted is being formatted as selected.
INSERT DESTINATION (WRITE ENABLED) TAPE	The operator is being asked to insert the tape which is to be written to during a duplication.
INSERT SOURCE (WRITE PROTECTED) TAPE	The operator is being asked to insert the tape which is to be read from during a duplication.
INVALID MEMORY COMMAND	Indicates communication error between Board C and Board F. (Unlikely to be seen).
INVALID PROGRAM NUMBER	The operator has entered a program number of 0 (load program) or greater than 100 (load or save program).

Message and Code	Comments
INVALID TAPE COMMAND (05)	Indicates communication error between Board C and Board F. (Unlikely to be seen.)
LOADING DIRECTORY	The unit is loading the directory read from the Tape Control Module to the Operator Interface Module and formatting it for display on the CRT.
LOADING PROGRAM	The program read from the tape is being loaded into the Operator Interface Module from the Tape Control Module and stored in memory.
MEMORY BLOCK NOT FOUND - MAX BLK # = XXX	RAM block number selected for recording or playback is too large. For 128k RAM option, the maximum block number is 054. Also will occur if RAM-to-tape transfer XFER FROM BLOCK is too large or if tape-to-RAM transfer STARTING AT BLOCK is too large.
NO PROGRAM FOUND (04)	Program-Data Tape contains no recorded INTERVIEW 4500 program. For Program-Only Tape, no program has been recorded in the program record specified to be loaded.
NO PROGRAM TAPE OPTION	An attempt has been made to load or save with a Program-Only Tape installed, or CONTROL-LOAD PROG has been entered on a unit that does not have the Program-Only Tape option.
NO PROGRAM/DIRECTORY FOUND (16)	No program or directory was found when the tape was read to determine its type.
PROGRAM LOADED	A program has been successfully read from the tape and loaded into the program storage memory for use.
PROGRAM SAVED	A program has been successfully written onto a Program-Data Tape and verified.

Message and Code	Comments
PROGRAM TAPE INSTALLED	A program-only tape was read by the unit during the power-up tape read. Since it is not known which program should be used for the automatic power-up, read program, and run procedure, nothing is done.
PROGRAM TAPE INSTALLED (21)	A program-only tape has been left in the unit when RUN has been pressed and record either is selected or could be selected via a trigger. No recording is allowed to occur.
PROGRAM VERSION NOT SUPPORTED	The program read from the tape cannot be converted to the format of the particular unit being used.
PROGRAM WRITE ERROR (19)	After two tries, the program could not be verified after it was written onto the tape.
RAM TO TAPE TRANSFER ERROR	RAM-to-tape transfer has wrapped past the end of memory and encountered the end of memory again before reaching last block to be transferred. Probable failure of end-of-memory detect logic.
REMOVE DESTINATION (WRITE ENABLED) TAPE	The operator is being asked to remove the tape which is to be written to during a duplication.
REMOVE SOURCE (WRITE PROTECTED) TAPE	The operator is being asked to remove the tape which is to be read from during a duplication.
REWIND ATTEMPT FAILED (03)	Tape may have run off reel, or has been removed.
SAVED	A program and directory or just a directory has been successfully written onto a program-only tape and verified.
SAVING DIRECTORY	The currently displayed directory (with a new entry if a program is being saved) is being written onto a program-only tape.

Message and Code	Comments
SAVING PROGRAM	The program currently in the unit is being written onto either a Program-Data or Program-Only Tape.
TAPE BLOCK NOT FOUND (16)	The specified program recorded could not be found on the tape installed. This can occur if a Program-Data Tape is inserted while the Tape Directory Menu is displayed, if the tape drive has a mechanical problem, or if the program tape has lost data.
TAPE CHECKSUM ERROR TAPE CHECKSUM ERROR (17)	Logic could not read program from tape. For a Program-Only Tape, a checksum error has been detected on a program or directory stored on tape before load point. When this message appears several times after SAVE PROGram is operated the tape may be defective, or the tape head may need cleaning.
TAPE CONDITIONED	Retensioning of the tape installed has been completed.
TAPE CRC ERROR (18)	A program has been found in the specified program record of a Program-Only Tape, but a CRC error was detected during reading.
TAPE DCE BUFFER OVERFLOW (06) TAPE DTE BUFFER OVERFLOW (07)	See TAPE RECORD OVERRUN.
TAPE FORMAT ERROR -- INVALID BLOCK SIZE	Tape-to-RAM transfer attempted from tape other than INTERVIEW 3500 or 4500 Program-Data data tape. Or defective tape (or tape read error).
TAPE IS OFF REEL (56)	The tape in the cartridge installed has either run off one of the reels or is positioned with a position detection hole directly over the hole sensor.

Message and Code	Comments
TAPE IS WRITE PROTECTED (02)	RECORD command has been given while tab on tape is in protected position.
TAPE IS WRITE PROTECTED (42)	An attempt has been made to save a program onto a tape with the tape tab in the protected position.
TAPE NOT INSTALLED (01) TAPE NOT INSTALLED (41)	Power-up display. Will also appear if tape load point hole is over tape hole sensor, or if tape operation has been attempted with no tape inserted.
TAPE PLAY OVERRUN (09) TAPE PLAY OVERRUN (10) TAPE PLAY OVERRUN (11) TAPE PLAY OVERRUN (12)	If EIA lead status has been recorded, maximum playback speed is 9.6 kbps.
TAPE POSITION ERROR (15)	Tape is positioned between two sets of warning holes at either the beginning or end of the tape. The situation may be corrected by making sure at least one set of double holes (beginning of tape) is wound onto the takeup reel (righthand reel) and then playing the tape from Block 000. (Error results from attempting to record or play from block other than zero if tape is stopped between beginning of tape and load point or beyond early warning at far end of tape.)
TAPE RECORD OVERRUN (08)	May be seen if operator tries to record interface lead status at 19.2 kbps. May be seen if Transmit and Receive data rates are not equal. Split-speed circuits may not be recorded and always generate TAPE OVERRUN error messages.
TAPE REWIND ATTEMPT FAILED (03)	Tape was found to be removed when a rewind was attempted.
TAPE STOPPED @ END	Indicates that STOP AT END has been selected and recording has stopped at end of tape.

Message and Code	Comments
TAPE STOPPED @ END: XXX BLOCKS TRANSFERRED	RAM-to-tape transfer has filled tape before all specified blocks have been transferred.
TAPE TO RAM TRANSFER MODE X FORMAT ERROR	X = 1, 2, or 3. Tape block format does not match standard INTERVIEW 3500 or 4500 data format. (Mode 1 is data only. Modes 2 and 3 are data with RS-232/V.24 information.)
VERIFYING DIRECTORY	The Program-Only Tape directory is being read back after being written to assure that it was written correctly.
VERIFYING PROGRAM	The program just written onto the tape is being read back to assure that it was written correctly.
XFER COMPLETE: XXX BLOCKS TRANSFERRED	RAM-to-tape or tape-to-RAM transfer successfully completed as specified.
XFER IN PROCESS: XXX BLOCKS TRANSFERRED	Displayed as transfer between tape and RAM is running. XXX is the count of blocks transferred from the SOURCE.

Appendix E

Packing and Shipping

The INTERVIEW 4500 is usually shipped either as baggage or as freight. The basic difference, of course, is in the quantity and quality of handling to which the unit is subjected. It follows that different packing methods are called for.

When a unit is shipped as baggage, it will probably be subjected to much less severe treatment than when it is shipped by freight. Atlantic Research Corporation offers its INTERVIEW Option Padded Travel Bag, stock No. 37408, for this purpose. This bag provides two inches of high-density foam protection for all surfaces of the INTERVIEW. It is yellow for easy identification among other luggage. An identification card case, FRAGILE markings, and leather appointments are standard features. Inside is a large pocket for carrying notes, manuals, and so forth. The bag is considered to be reasonable protection for the INTERVIEW 4500 when it is shipped as baggage. However, Atlantic Research Corporation can assume no liability for damage to units shipped this way, owing to circumstances beyond our control.

For freight shipment, the INTERVIEW 4500 should be packed only in High Density Styrofoam "Clamshell" and a heavy-duty outer cardboard carton, as delivered by Atlantic Research. This packing system has been designed to provide maximum reasonable protection to the INTERVIEW and insure its safe arrival. However, damages due to mishandling must be the responsibility of the Carrier.

NOTE: Please do not return any unit to Atlantic Research Corporation without prior authorization.

Appendix F

Rack Mount Kit

A Rack Mount Kit (INTERVIEW option OPT-895-02-1) is offered to allow the INTERVIEW 4500 to be installed in a standard 19-inch wide equipment rack.

F.1 GENERAL DESCRIPTION

The kit will fit either standard vertical or sloped-front-panel, low-boy racks. Please note that, for proper installation, the rack must be equipped with a horizontal writing shelf (see Figure F-1).

The Rack Mount Kit offers the user four basic mounting styles:

(1) Secure mounting, with flat keyboard position.
(2) Secure mounting, with sloped keyboard position.
(3) Slide-in/out mounting, with flat keyboard position.
(4) Slide-in/out mounting, with sloped keyboard position.

Physical Specifications:

Height, 8.75 inches
Width, 19.0 inches
Depth, 17.4 inches
Weight, 20 lb
Material, Steel, with ABS plastic fittings

F.2 INSTALLATION

Installation is accomplished as follows:

1. Remove the carrying handle and detent mechanism from the INTERVIEW, following drawing TP-895-SA-43564.

2. Remove the top plate assembly from the rack mount kit.

3. Fit the INTERVIEW into the main frame of the rack mount kit.

4. Reinstall the top plate assembly.

5. Attach the two half-moon trim pieces.

6. Install the unit in the equipment rack.

Detailed, step-by-step instructions and exploded views are provided on drawings TP-895-SA-43564 and TP-895-32178. Copies of these drawings are shipped with the Rack Mount Kit.

Total time for the installation should be less than one hour.

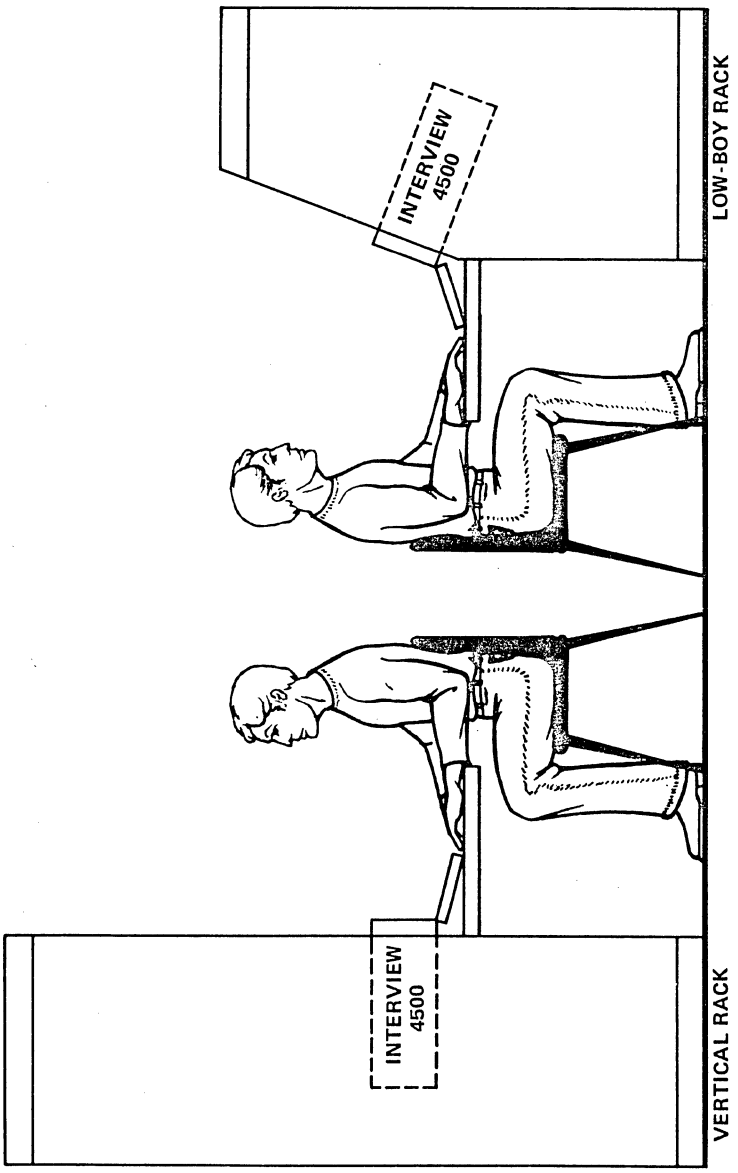


Figure F-1

Appendix G
Acronyms and Abbreviations

(See also Tables 4-1, 16-1, and 16-2 and Appendix C.)

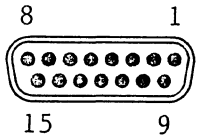
ASYNC	ASYNChronous format (indicates START and STOP bits)
AUTOSYNC	Automatically recognizes synchronization pattern as 16-bit pattern
AUX	Auxiliary
BCC	Block Check Calculation
BDLC	Burroughs Data Link Control
BISYNC	Binary Synchronous Communications Protocol (IBM); also BSC
BLI	BLInk (CRT enhancement)
BOP	Bit-Oriented Protocols, e.g., HDLC, bit stuffing
bps	bits per second
BSC	See BISYNC
CCITT	Consultive Committee, International Telephone and Telegraph
CHARS	CHARacterS
CRT	Cathode Ray Tube
D	D bit (Bit 7 in Octet 3 of packet-level X.25)
DB-25	25-Pin D connector (standard for RS-232/V.24)
DC	Don't Care character (keyboard key); also Device Control
DCE	Data Communications Equipment
DEC	DECrement
DLE	Data Link Escape (used principally in transparent BISYNC)
DSR	Data Set Ready (RS-232/V.24 control lead)
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
EM	Emulate
FDX	Full Duplex (permits simultaneous data in both directions)
FCS	Frame Check Sequence (used in BOP)
Flag	HDLC $7E_{16}$ framing; the 4500's FLAG key
HDLC	High Level Data Link Control procedure
HDX	Half Duplex (data cannot be transmitted in both directions simultaneously)
HEX	Hexadecimal number; also the 4500's HEXadecimal key
Hz	Hertz
ID	IDentification
INC	INCrement
INFO	INFOrmation (usually refers to a type of frame)

kbps	Kilobits per second
LED	Light-Emitting Diode
LCN	Logical Channel Number (X.25 packet-level term)
LO	LOw intensity (CRT enhancement)
LRC	Longitudinal Redundancy Check
M	M bit (X.25 packet-level, Bit 4 of Octet 3)
MIL-188	Military Specification 188
MOD	MODulus (number of outstanding frames or packets, usually 8)
MON	MONitor mode
MSG	Message
N(R)	Number Received (frames)
NRZI	Non-Return to Zero Inverted (used with SDLC and ASYNC modems--sometimes with clocked modems)
N(S)	Number Sent (frames)
OUTSYNC	OUT of SYNChronization
P/F	Poll/Final bit used in control byte at frame level (X.25/SDLC)
P(R)	Packet Received
P(S)	Packet Sent
Q	Q bit (Bit 8 of Octet 1 in packet-level X.25)
RD	Received Data
REV	REVerse (black character on white background on CRT)
RLSD	Received Line Signal Detect (RS-232/V.24 signal)
RAM	Random Access Memory; the INTERVIEW 4500's high-speed memory option
ROM	Read Only Memory (firmware/software storage)
RS-232/V.24	List of definitions for interchange circuit between data terminal equipment and data circuit termination equipment established by EIA
SDLC	Synchronous Data Link Control (IBM); analogous to frame level
SNA	System Network Architecture (IBM)
SY, SYNC	Abbreviations for synchronization character in the code set (SY used in CRT font)
SYNC	SYNChronous format (as distinct from ASYNC or X.25 or SDLC)
TD	Transmitted Data
TP	Test Point
TX	Transmit Message
X.25	See HDLC
XFER	Transfer
XMIT	Transmit; transmission

Appendix H

Auxiliary Interface

The INTERVIEW 4500 has a 15-pin AUXILIARY interface on the rear panel. It is a female D-connector, numbered as follows:



Pin No.	Pin Name	Explanation
1	--	Not connected
2	AUX IN 2	No current use (not connected)
3	AUX IN 3	No current use (not connected)
4	AUX OUT 3	Follows Flag 8 (see Note 1)
5	--	Not connected
6	--	Not connected
7	Ground	--
8	Ground	--
9	AUX OUT 2	Follows Flag 7 (see Note 1)
10	AUX IN 1	No current use (not connected)
11	AUX OUT 1	Follows Flag 6 (see Note 1)
12	--	Not connected
13	--	Not connected
14	Ground	--
15	Ground	--

NOTE 1: Driven by a 74LS04. When Flag = 1, output is +3.5 V; when Flag = 0, output is 0 V.

Appendix I
Factory-Stored Message

Unshifted code (54 characters):

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789

Upper/lower case shifted code (56 characters):

^THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG \0123456789

Letters/figures shifted code (56 characters):

\THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG ^0123456789

Appendix J
Program-Only Tape
(OPT-23)

This option for the 4500 allows you to store up to 100 programs on a single tape and automatically writes a directory on the tape.

You can select any program on the tape to load in the 4500; and save a program at any selected location on the tape. Tapes are automatically preformatted for either program-data or program-only use. You can duplicate your program-only tapes automatically.

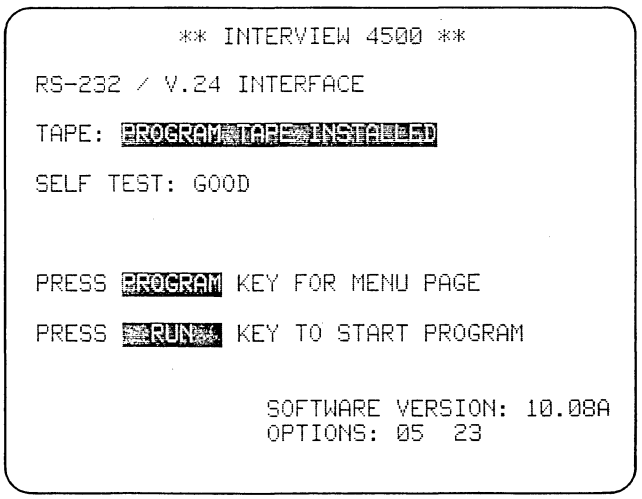


Figure J-1

This option will be useful whether or not you also have the High-Speed Memory (RAM) option in your unit, but the RAM greatly increases the convenience and speed of operation. Figure J-1 shows the power-up menu when both the RAM and the Program-Only Tape option are installed and a Program-Only tape has been inserted before power-up.

You can still record and use Program-Data tapes just as in the standard 4500.

Tapes can easily be formatted, retensioned, or duplicated by clerical personnel.

J.1 FORMATTING TAPES

For operation in the standard INTERVIEW 4500, all new tapes must be preformatted. When the Program-Only Tape option is installed, all new tapes must be preformatted specifically as program-data tapes (approx. 255 blocks) or as program-only tapes (100 program records). All formatting can be done automatically.

Press PARAMETERS and numeral 5 to display the Tape Utility menu (see Figure J-2). Use this menu to select the tape type, PROGRAM/DATA (the standard 4500 tape format) or PROGRAM ONLY. Install the blank tape--or a tape to be reformatted--in the unit with the tab in the RECORD position (toward the outside of the cartridge) and press the yellow EXECUTE key.

If the Record tab is in the PROTECTED position the tape cannot be formatted, and the status line will display the message TAPE IS WRITE PROTECTED (Figure J-3). If the tape is not protected, the message FORMATTING TAPE (Figure J-4) will blink on the Status line. When formatting is completed, after about 2 1/2 minutes, the STATUS will change to TAPE FORMATTED.

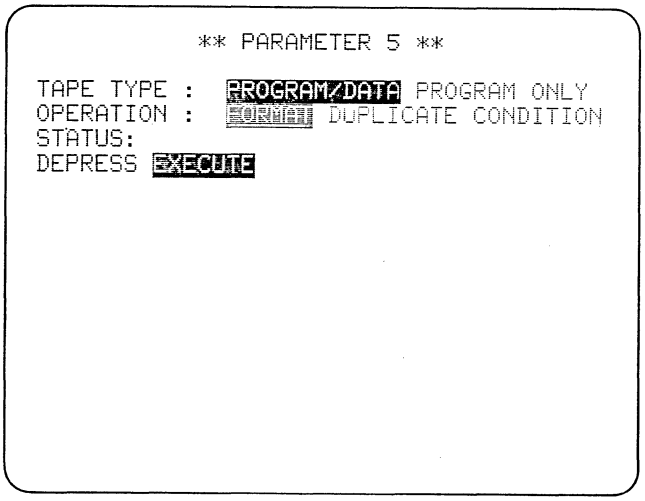


Figure J-2

Program-Only tapes are formatted with the lowest numbered records at the beginning and the highest-numbered records at the end. All odd-numbered records will be on one track, and all even-numbered records on the other track. Program-Data tapes are formatted with the block number sequence going up one track and back the other, so that the lowest and highest numbers are at the beginning of the tape.

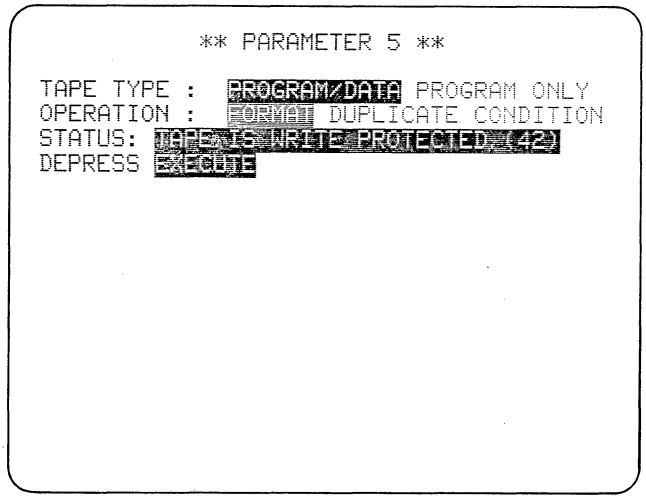


Figure J-3

The INTERVIEW 4500 can now always identify the tape as a Program-Data or Program-Only tape and can find any data block or program record on it.

J.2 RETENSIONING TAPES

Tapes that have been stored for long periods or have been subjected to extremes of heat and cold need to be retensioned before use in the 4500. The Program-Only option allows this to be done automatically. Each time you format or duplicate a tape, it is automatically retensioned.

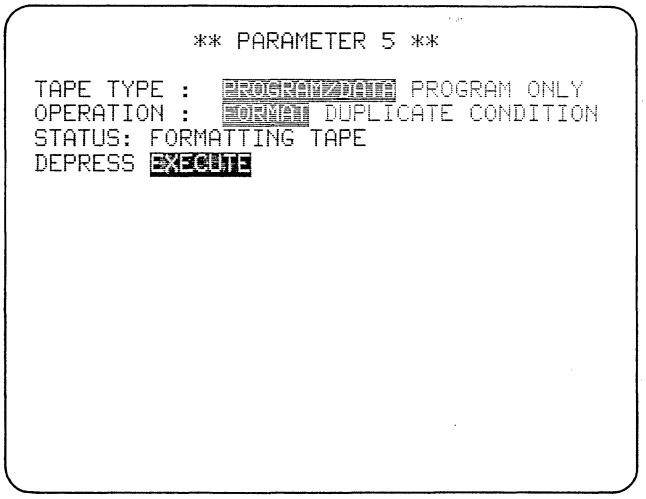


Figure J-4

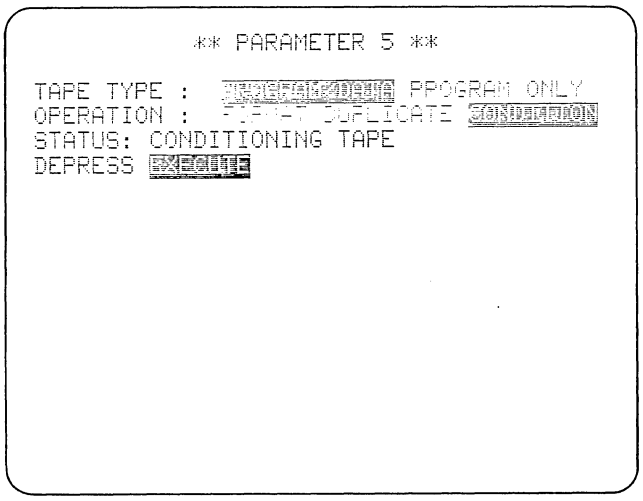


Figure J-5

You may also retension any tape without affecting its content by selecting CONDITION on the Parameters 5 menu. Insert the tape with the tab in the PROTECTED position and press EXECUTE. The Status line will display CONDITIONING TAPE (Figure J-5) while the tape is being retensioned; then TAPE CONDITIONED when it is finished.

J.3 SAVING PROGRAMS

When you press the SAVE PROG key, the Tape Load/Save menu will appear displaying the ID of the program currently in the unit. The message CHECKING TAPE TYPE will blink on the Status line while the tape type is being checked (Figure J-6). If the tape has not been formatted, the 4500 will proceed no further. If the tape has been formatted, and the tape type is program-data, the program will be saved as in the standard 4500.

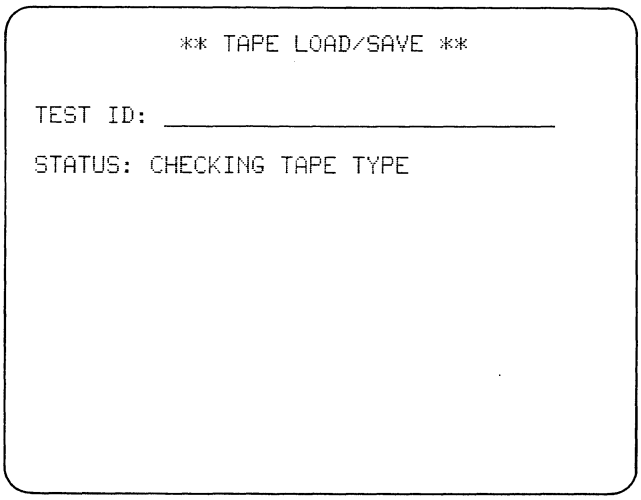


Figure J-6

J.3.1 THE PROGRAM TAPE DIRECTORY MENU

If the 4500 finds that a Program-Only tape is installed, CHECKING TAPE TYPE will be momentarily replaced by LOADING DIRECTORY; then a Program Tape Directory menu (see Figure J-7) will be displayed. In the PROGRAM # data entry field is the decimal number of the first blank program record on the tape. If the tape is full, the Program # displayed will be 1. The TEST ID line shows the title of the program that is in the unit waiting to be saved. The Tape Name line identifies the tape, if the tape has been previously named.

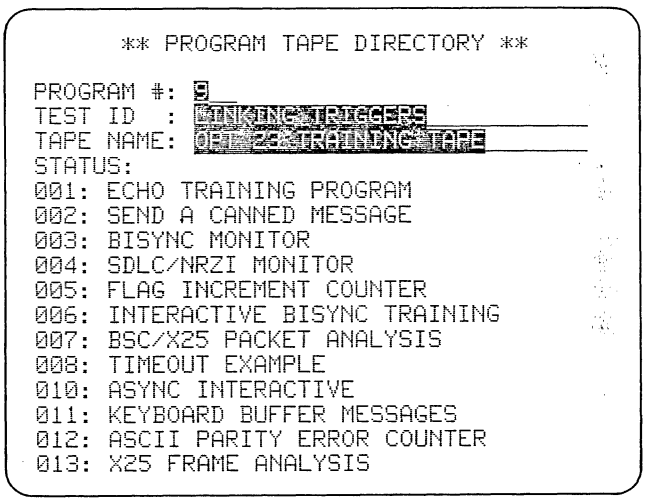


Figure J-7

J.3.2 PROGRAM DIRECTORY

Below the menu selections is the program directory itself, with the list of the record numbers and IDs of all programs (there may be up to 100) on the tape. To see the next page of the directory, use CONTROL plus the DOWN cursor arrow. Use

CONTROL plus the UP arrow to return to the previous page. (Compare Figure J-7 with Figure J-8.)

To erase any program from the directory, enter the record number of the program in the PROGRAM # field and press CONTROL plus CLEAR FIELD. That program title will be deleted from the directory, although the program itself will remain on the tape until it is overwritten.

The Program Directory will automatically be revised and saved each time you save a program.

J.3.3 TAPE NAME

If the tape has been given a name, it will appear on this line. You can name, or rename, the tape simply by typing in the name on this line before you save a program: the tape name will automatically be saved at the same time as the program and the directory. The tape name will then be saved with the revised directory each time you save a program.

To save only the Tape Name and the Tape Directory, enter a 0 in the Program # field and press the SAVE PROG key.

J.3.4 PROCEDURE

If you wish to record your program in the default record posted on the PROGRAM # line, press SAVE PROG again. The status line will display five successive messages:

SAVING PROGRAM.

VERIFYING PROGRAM -- If the program has not been recorded correctly and cannot be verified, this message will be replaced by PROGRAM WRITE ERROR.

SAVING DIRECTORY.

VERIFYING DIRECTORY -- If the directory has not been recorded correctly and cannot be verified, this message will be replaced by DIRECTORY WRITE ERROR.

SAVED.

When this sequence is finished, the new program will have been recorded and also added to the directory (compare Figure J-7 with J-9).

You can save a program to any program record by writing over the default record number on the PROGRAM # line before you press SAVE PROG.

J.3.5 LOADING PROGRAMS

To load a program from either tape type, insert the tape with the tab in the

```
** PROGRAM TAPE DIRECTORY **

PROGRAM #: 0
TEST ID  : LINKING TRIGGERS
TAPE NAME: OPT 23 TRAINING TAPE
STATUS:
014: SNA LU LU
015: IPARS TERMINAL TEST
```

Figure J-8

```
** PROGRAM TAPE DIRECTORY **

PROGRAM #: 0
TEST ID  : LINKING TRIGGERS
TAPE NAME: OPT 23 TRAINING TAPE
STATUS: SAVED
001: ECHO TRAINING PROGRAM
002: SEND A CANNED MESSAGE
003: BISYNC MONITOR
004: SDLC/NRZI MONITOR
005: FLAG INCREMENT COUNTER
006: INTERACTIVE BISYNC TRAINING
007: BSC/X25 PACKET ANALYSIS
008: TIMEOUT EXAMPLE
009: LINKING TRIGGERS
010: ASYNC INTERACTIVE
011: KEYBOARD BUFFER MESSAGES
012: ASCII PARITY ERROR COUNTER
```

Figure J-9

```
      ** PROGRAM TAPE DIRECTORY **

PROGRAM #: 09
TEST ID  : LINKING TRIGGERS
TAPE NAME: OPT 23 TRAINING TAPE
STATUS:
001: ECHO TRAINING PROGRAM
002: SEND A CANNED MESSAGE
003: BISYNC MONITOR
004: SDLC/NRZI MONITOR
005: FLAG INCREMENT COUNTER
006: INTERACTIVE BISYNC TRAINING
007: BSC/X25 PACKET ANALYSIS
008: TIMEOUT EXAMPLE
009: LINKING TRIGGERS
010: ASYNC INTERACTIVE
011: KEYBOARD BUFFER MESSAGES
012: ASCII PARITY ERROR COUNTER
```

Figure J-10

Protected position and press the LOAD PROG key. The Tape Load/Save menu will be displayed with the status message CHECKING TAPE TYPE.

If the tape is the program-data type, the 4500 will briefly display LOADING PROGRAM on the status line; then announce PROGRAM LOADED and display the Test ID.

If a Program-Only tape has been inserted, CHECKING TAPE TYPE will change to LOADING DIRECTORY momentarily and then the Program Tape Directory menu will be displayed (Figure J-10). On the

```
      ** PROGRAM TAPE DIRECTORY **

PROGRAM #: 09
TEST ID  : LINKING TRIGGERS
TAPE NAME: OPT 23 TRAINING TAPE
STATUS:
001: ECHO TRAINING PROGRAM
002: SEND A CANNED MESSAGE
003: BISYNC MONITOR
004: SDLC/NRZI MONITOR
005: FLAG INCREMENT COUNTER
006: INTERACTIVE BISYNC TRAINING
007: BSC/X25 PACKET ANALYSIS
008: TIMEOUT EXAMPLE
009: LINKING TRIGGERS
010: ASYNC INTERACTIVE
011: KEYBOARD BUFFER MESSAGES
012: ASCII PARITY ERROR COUNTER
```

Figure J-11

Program # line will be the number of the first blank record on the tape; on the Test ID line, the ID of the program currently in the unit, if there is one. (Notice that the directory menu does not distinguish between the Load and Save modes.)

Select the program you wish to load by entering its number on the Program # line (as in Figure J-11) and press LOAD PROG. LOADING PROGRAM will be shown on the Status line; then PROGRAM LOADED; then the name of the program will come up on the TEST ID line (Figure J-12).

```
      ** PROGRAM TAPE DIRECTORY **

PROGRAM #: 04
TEST ID  : SDLC/NRZI MONITOR
TAPE NAME: OPT 23 TRAINING TAPE
STATUS: PROGRAM LOADED
001: ECHO TRAINING PROGRAM
002: SEND A CANNED MESSAGE
003: BISYNC MONITOR
004: SDLC/NRZI MONITOR
005: FLAG INCREMENT COUNTER
006: INTERACTIVE BISYNC TRAINING
007: BSC/X25 PACKET ANALYSIS
008: TIMEOUT EXAMPLE
009: LINKING TRIGGERS
010: ASYNC INTERACTIVE
011: KEYBOARD BUFFER MESSAGES
012: ASCII PARITY ERROR COUNTER
```

Figure J-12

J.4 DUPLICATING TAPES

CAUTION: If the unit used for duplicating has the High-Speed Memory option (OPT 05), its data content will be overwritten during the tape duplication process.

J.4.1 FORMATTING AND CONDITIONING

If the source tape is a Program-Only tape, the 4500 will automatically verify whether the new tape is in the same format as the master and format it only if it is blank or in the wrong format.

If the source tape is a Program-Data tape, the 4500 will copy the formatting during duplication and pad out any empty blocks at the end of the destination tape.

The destination tape will be retensioned automatically during the duplication process.

J.4.2 PROCEDURE

On the Parameters 5 menu, select the correct Tape Type for the tape you want to copy and select DUPLICATE. Set the tab on the SOURCE tape (that is, the tape you want to copy) to the inside, or PROTECTED, position; set the tab on the DESTINATION tape (that is, the new tape) to the outside, or RECORD, position. Install the source tape. Press the EXECUTE key. The message DUPLICATING TAPE will appear on the Status line (Figure J-13).

If there is no tape in the drive when you press EXECUTE, the 4500 will use Line 2 (see Figure J-14) to ask you to

INSERT SOURCE (WRITE PROTECTED) TAPE.

If the tape in the unit has the tab in the RECORD position, the 4500 will assume it is not the source tape and ask you to

REMOVE DESTINATION (WRITE ENABLED) TAPE

and then, once you have removed the tape, to

INSERT SOURCE (WRITE PROTECTED) TAPE.

Once the source tape has been inserted, you will be asked to

REMOVE SOURCE (WRITE PROTECTED) TAPE

(see Figure J-13) and then

INSERT DESTINATION (WRITE ENABLED) TAPE.

If the destination tape has not been formatted, it will be formatted automatically now. Line 2 will announce,

FORMATTING DESTINATION TAPE.

All destination tapes will be tensioned automatically at this point:

CONDITIONING DESTINATION TAPE.

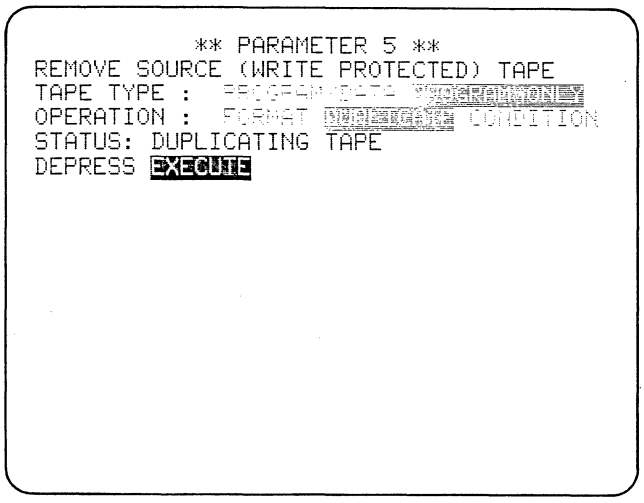


Figure J-13

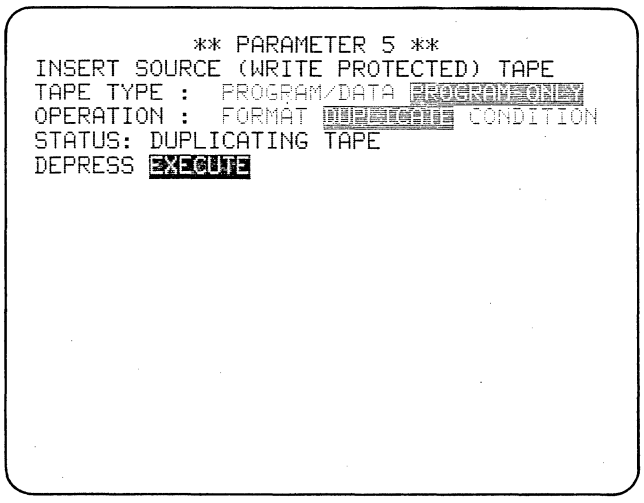


Figure J-14

After conditioning, you will be asked to

REMOVE DESTINATION (WRITE ENABLED) TAPE

and then to

INSERT SOURCE (WRITE PROTECTED) TAPE.

The 4500 will then read from the source tape. When it has copied as much as it can from the source tape, it will ask you to

REMOVE SOURCE (WRITE PROTECTED) TAPE

and then to

INSERT DESTINATION (WRITE ENABLED) TAPE.

After all the temporarily stored data has been transferred to the destination tape, you will be asked to insert the source tape again.

Thus, the 4500 will guide you through the number of tape swaps necessary to copy the entire tape on the destination tape. If your unit has the High-Speed Memory (RAM) option, the 4500 will automatically use it to store the content of the source tape, and a maximum of 5 tape exchanges will be required. Without RAM, up to 101 tape exchanges may be required.

When the process has been completed, TAPE DUPLICATED will appear on the Status line.

J.5 BYPASSING TAPE OPERATION SAFEGUARDS

CAUTION: The following two actions override the automatic safeguards on the Program Tape Directory, and thus carry the risk of erasing the Program Tape Directory.

J.5.1 CONTROL-SAVE PROG (TAPE DIRECTORY MENU NOT DISPLAYED)

You may save the program in the unit without checking tape type by pressing the CONTROL and SAVE PROG keys simultaneously. The 4500 will assume that a program-data tape is installed and save the program without checking for tape type. The program will be saved in the program area according to the program-data format and, if the tape was a program-only tape, the directory will be lost.

This is intended to be used for a program-data tape where a Program Write Error has occurred during a program Save. Since the 4500 will not write over an unrecognizable tape type, and an incorrectly written program is unrecognizable, CONTROL-SAVE PROG must be used if the tape data is to be retained (it would be lost if the tape were reformatted).

J.5.2 CONTROL-LOAD PROG (TAPE DIRECTORY MENU NOT DISPLAYED)

If you press the CONTROL and the LOAD PROG keys simultaneously, you will be shown a blank Program Tape Directory Menu. This allows you to load programs from a Program-Only tape whose directory has been lost. This may also be used as a fast method to load a program from a Program-Only tape if the program record number is known.

CAUTION: If you use CONTROL-LOAD to quickly enter the Program Tape Directory Menu and then save a program, your directory will then have only one entry: the program you just saved.

J.6 PRINTING THE TAPE DIRECTORY

You may print the entire Program Tape Directory by pressing the PRINT key while the directory menu is displayed. (See Section 15 for Printer Control instructions.)

Subject Index

Issue 1, August 1982

ADDENDUM

TO

TECHNICAL MANUAL for INTERVIEW 4500
ATLC-107-895-105, Issue 2, February 1982

page 37, Section 7.6. Add the paragraph on page 36B, which explains use of the RUN key in Software Version 10.08B.

page 52, Table 11-1. Replace with Table 11-1 on the attached page 52A, which shows additional parity selections available.

page 53, Section 11.2.8 (c). Add the paragraph on the attached page 52B, which explains use of 8-bit codes plus parity.

page 56, Section 11.2.9 (a). Add the paragraph on the attached page 56A, which explains how to select stop bits in asynchronous format.

page 71, Section 12.3.6. Add the paragraph on the attached page 70B, which explains new functions of the MAINTAIN selection on Parameters 4.

page 78. Add Section 12.4.6 (d) on the attached page 78A, which explains the function of the MAINTAIN selection on the Parameters 4 menu when using the Transmit Variable.

page 90, Section 13.3.1 (c). Add Section 13.3.1A on the attached page 90A. It explains two new selections for line use.

Also, replace Table 13-2 with the attached Table 13-2, which includes the new selections for line use available in Software Version 10.08B.

Add Figures 13-7A, 13-7B, 13-7C, 13-7D, and 13-7E, on the attached pages 90B, 90C, and 90D.

page 92, Section 13.3.3 (b). Replace this section with Section 13.3.3 (b) on the attached page 92A, which explains additional functions of the MAINTAIN selection on the Parameters 4 menu.

page 95, Section 13.5.6. Replace Section 13.5.6(a) with the revised section on the attached page 94B, which corrects references to NS and NR. Add the attached paragraphs, which explain new functions of the MAINTAIN selection on Parameters 4.

page 124, Section 16.2.1. In third paragraph, the block check polynomial is $X^{16} + X^{12} + X^5 + 1$. In Section 16.2.2, second paragraph, the block check polynomial is $X^{16} + X^{15} + X^2 + 1$. (This changes the subscripts to superscripts in the polynomials.)

page 129, Section 16.7. Add the paragraph on the attached page 128B, which explains the function of the MAINTAIN selection on Parameters 4 when transmitting N(S) and N(R).

page 133, Section 17.3.1. Replace the list of switch settings and the explanation with the revised version on the attached page 132B, which explains how to select stop bits for asynchronous format.

APPENDIX K Add this appendix on using the 4500 in conjunction with an INTERVIEW 30A or 40A.

There are 17 sheets attached to this addendum.

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Add the following after Section 7.6:

A special Program menu selection allows you to use the RUN key in yet a fourth way. When you select MAINTAIN on the Parameters 4 menu, the RUN key will initialize the INTERVIEW program, but will not change key program parameters -- the trigger flags, and transmit counters. This enables you to run several different INTERVIEW test programs, without going through the often complex process of reestablishing a logical session with the computer or terminal being tested. The use of the MAINTAIN selection is explained in Sections 13.3.3 and 12.3.6.

Replace Table 11-1 with the following:

TABLE 11-1
PARAMETERS RESULTING FROM CODE SELECTIONS (Note 1)

Default				Other Choices	
Code	Info. Bits	Parity	SY1 SY2 (hex)	Info. Bits	Parity
EBCDIC	8	None	32 32	--	Even, Odd (Note 2)
ASCII	7	Odd	16 16 (Note 3)	8	Even, Odd (Note 2)
				7	Even, Mark, Space, None
EBCD	(6)	Odd	3D 3D (Note 4)	--	Even, Mark, Space, None
XS-3	(6)	Odd	35 35	--	----------
IPARS	(6)	(None)	3F 3E	--	----------
Rev. EBCD	(6)	Odd	1A 1A	--	Even, Mark, Space, None
Selectric	(6)	Odd	--	--	Even, Mark, Space, None
HEX	7	Odd	16 16	--	Even, Mark, Space, None
				8	----------
				6,5	Even, Mark, Space, None
Baudot (Note 5)	(5)	(None)	--	--	----------

Note 1. This table lists code selections available in Software Version 10.08B. Other software versions may not have every selection.

Note 2. Mark and Space are not valid selections for 8-bit codes plus parity. Eight bits plus parity valid only for Synchronous and Asynchronous formats.

Note 3. Also applies to space parity and 8-bit ASCII. For even or mark parity ASCII, SY SY defaults to 96 96_{16}.

Note 4. Also applies to space parity EBCD. For even or mark parity EBCD, SY SY defaults to 7D $7D_{16}$.

Note 5. Baudot is available as an option.

Add following paragraph after Section 11.2.8 (c):

(d) INTERVIEWs with Software Version 10.08B can monitor and transmit 8-bit codes plus parity. You may select either odd or even parity -- mark and space are invalid in this case. Eight bits plus parity is permitted only in Synchronous or Asynchronous format (Section 11.2.9). When a bit-oriented format is selected (BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI), eight bits plus parity is invalid.

Add the following paragraph at the end of Section 11.2.9(a):

In units with software version 10.08 and 10.08B, the number of stop bits in asynchronous format can be selected by setting a DIP switch inside the unit. See Section 17.3.1 for an explanation on setting this switch.

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Add the following to Section 12.3.6:

If your unit has Software Version 10.08B, you can store the states of the internal flags when you exit Run Mode. On the Parameters 4 menu (Section 13.3.3) select MAINTAIN for LEAD STATUS EXITING RUN. This allows you to interrupt a test in progress by pressing the PROGRAM key, make changes in the program, and then resume the test. The trigger program will continue from where it left off when you exited Run Mode.

Add following after Section 12.4.6 (c):

(d) Units with Software Version 10.08B can store the value of the Transmit Variable when Run mode is exited. On the Parameters 4 menu, select MAINTAIN for LEAD STATUS EXITING RUN (see Section 13.3.3). Now, when you perform an interactive test, then press PROGRAM, the value of the Transmit Variable is preserved. When you resume the test by pressing RUN again, the Transmit Variable will increment from that value.

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Replace Table 13-2 with the following:

TABLE 13-2
PARAMETERS 4 MENU SELECTIONS

Mode					
Parameters 4	Parameters 1	Static Leads	Leads Controlled by INTERVIEW	Leads Monitored by INTERVIEW	Selectable Delays
FDX (Figure 13-2)	EM DTE	DTR, RTS	(None)	(None)	(None)
FDX (Figure 13-3)	EM DCE	RI, DSR, RLSD, CTS	CTS	RTS, TD	T2, T5
SWITCHED (Figure 13-4)	EM DTE	DTR	RTS, TD	CTS	T1, T3, T4
SWITCHED (Figure 13-5)	EM DCE	RI, DSR	CTS, RLSD, RD	RTS, TD	T2, T5, T6, T7
MULTIDROP (Figure 13-6)	EM DTE	DTR	RTS, TD	CTS	T1, T3, T4
MULTIDROP (Figure 13-7)	EM DCE	RI, DSR	CTS, RLSD, RD	RTS, TD	T2, T5, T6, T7
EM DROP* (Figure 13-7B)	EM DTE	DTR	RTS, TD	CTS	T1, T3, T4
EM DROP* (Figure 13-7C)	EM DCE	RI, DSR	CTS, RLSD, RD	RTS, TD	T2, T5, T6, T7
EM HOST* (Figure 13-7D)	EM DTE	DTR, RTS	(None)	(None)	(None)
EM HOST* (Figure 13-7E)	EM DCE	RI, DSR, RLSD, CTS	CTS	RTS, TD	T2, T5

* Software Version 10.08B only.

Add the following after Section 13.3.1 (c):

13.3.1A MULTIDROP OPERATION (SOFTWARE VERSION 10.08B, LINE 3)

In a multidrop environment, you can configure the INTERVIEW to emulate either a host or a drop. Units with software version 10.08B have two menu selections specifically for multidrop testing. Figure 13-7A shows the possible configurations in a multidrop network.

(a) Emulate Drop. When emulating a DTE, the INTERVIEW behaves as though in a Switched network (Figure 13-7B). The 4500 turns RTS on, and waits for CTS before transmitting data. The delay between CTS coming high and data transmission is selectable.

When the INTERVIEW is emulating a DCE, CTS and RLSD are switched (Figure 13-7C). You may select the RTS-CTS delays, and the delay between RLSD high and data transmission.

(b) Emulate Host. When emulating DTE, the INTERVIEW transmits as though in a full-duplex network (Figure 13-7D). RTS is a static lead (normally high).

The 4500 switches CTS when emulating DCE, and RTS-CTS delays can be selected on the menu (Figure 13-7E).

Add the following figures:

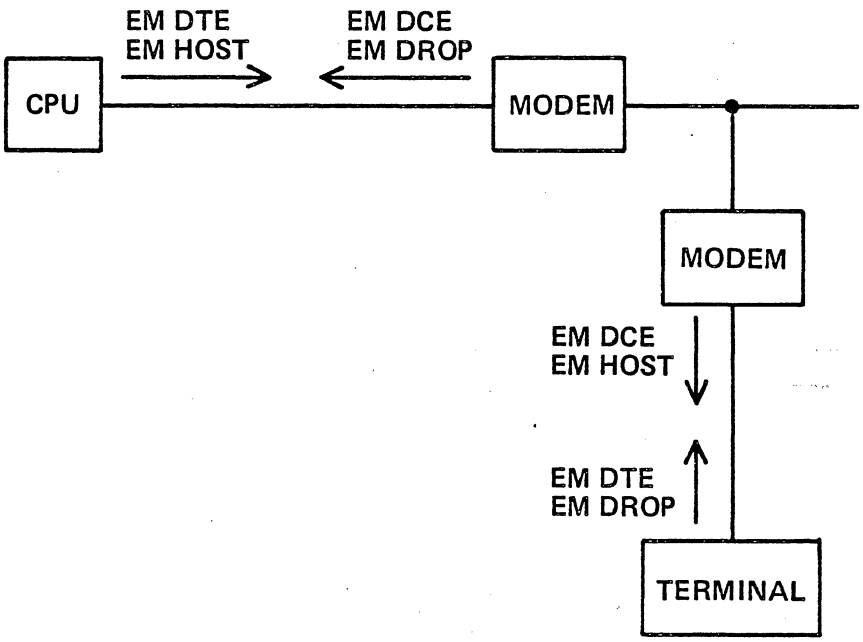

Figure 13-7A

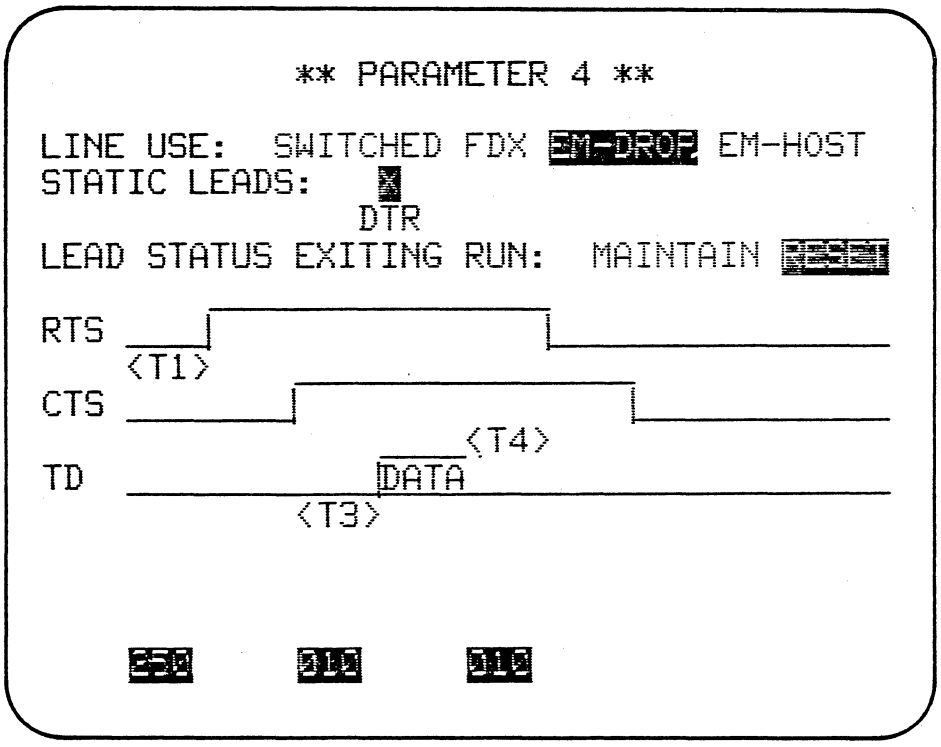

Figure 13-7B

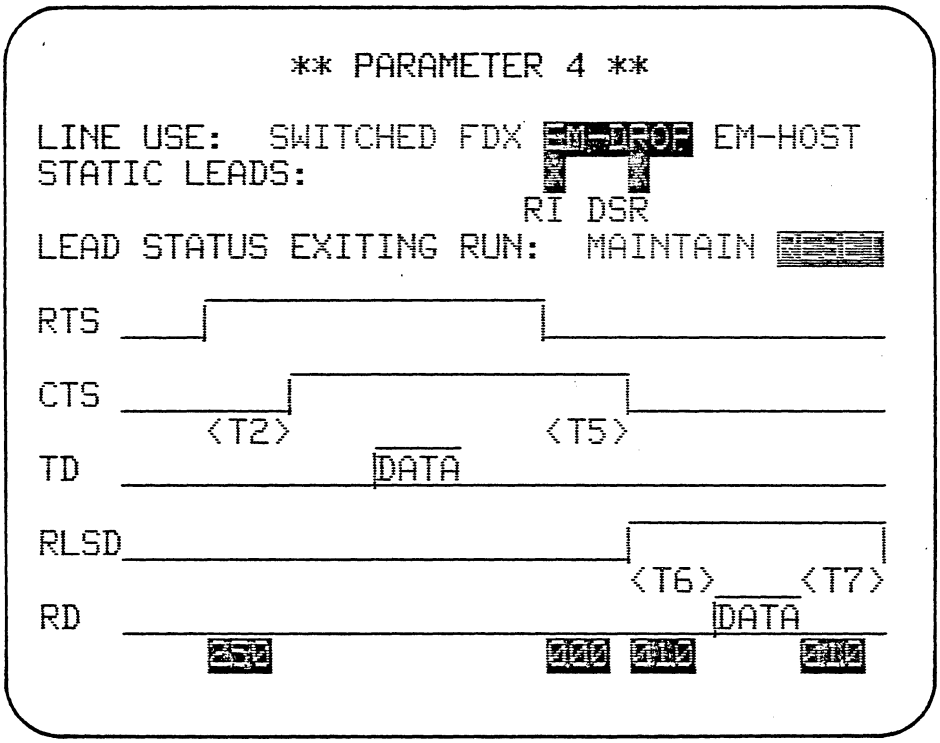

Figure 13-7C

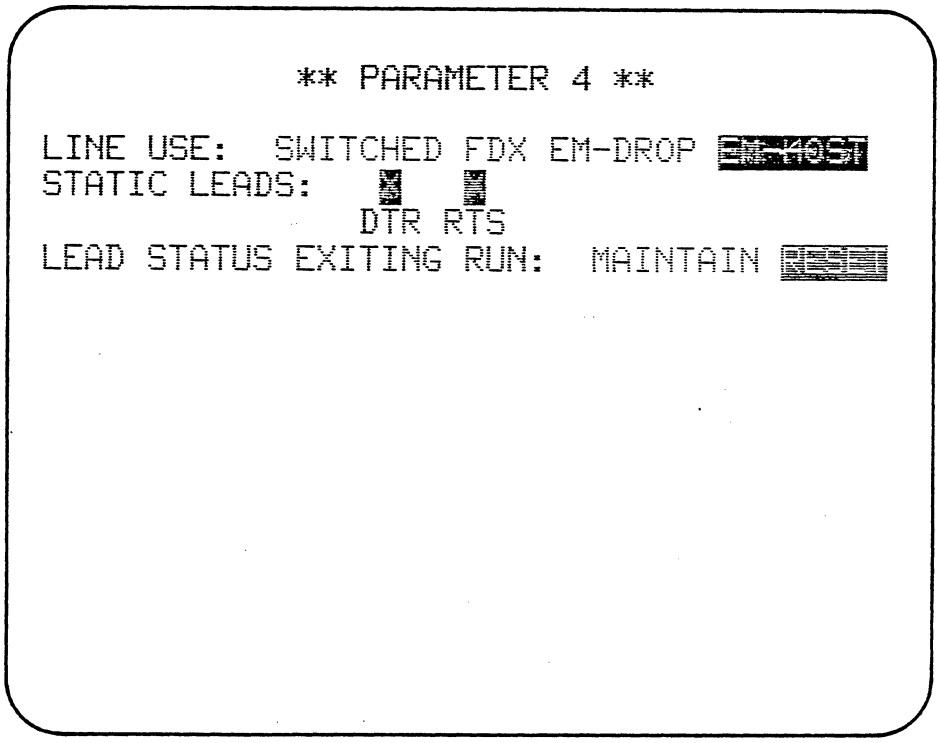

Figure 13-7D

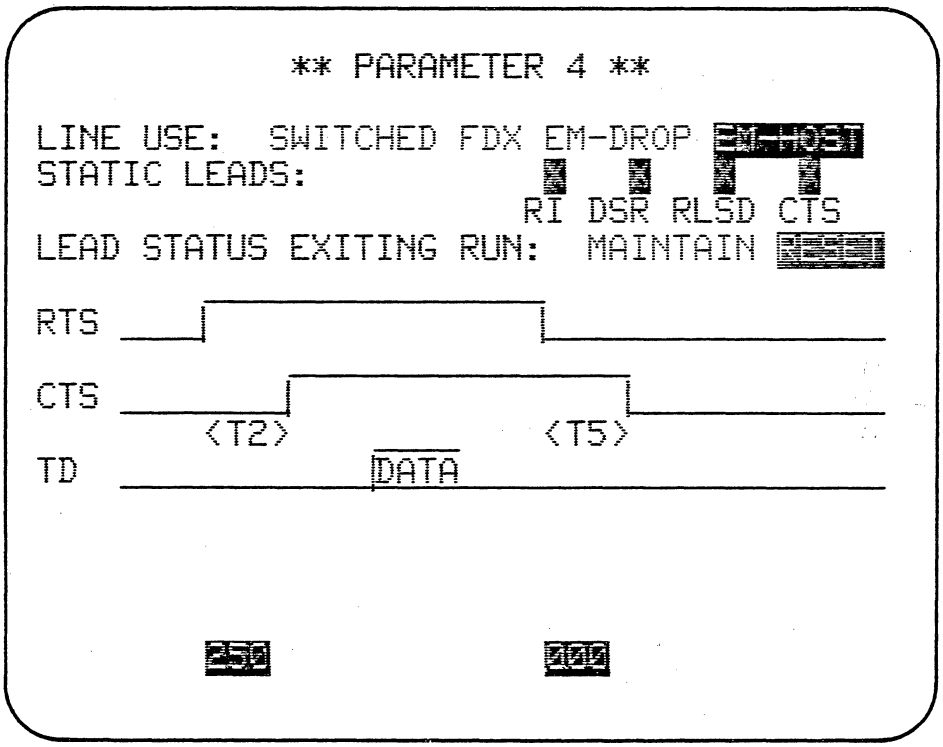
** PARAMETER 4 **
LINE USE: SWITCHED FDX EM-DROP
STATIC LEADS:
RI DSR RLSD CTS
LEAD STATUS EXITING RUN: MAINTAIN
RTS
CTS
<T2>
<T5>
TD
DATA

Figure 13-7E

Replace 13.3.3 (b) with the following:

(b) MAINTAIN. Selecting MAINTAIN allows you to preserve data communications parameters even though the INTERVIEW has exited Run mode.. The active static leads of the RS-232/V.24 interface controlled by the 4500 maintain their voltage levels, even though the 4500 is in Program mode. In units with Software Version 10.08B, MAINTAIN also does the following:

- The values of NS and NR (for HDLC protocols) are stored. When the unit reenters Run Mode, transmission continues from the last values of NS and NR (see Sections 13.5.6 and 13.5.7).

- The value of the Transmit Variable is stored (Section 12.4.6). When the INTERVIEW resumes transmitting in Run Mode, it will increment the Transmit Variable from the last value sent.

- The status of the eight internal Trigger flags is stored (Sections 12.3.6 and 12.4.5). This allows you to interrupt a test in the middle by pressing PROGRAM, make changes in the test procedure, and then resume the test from wherever it left off.

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Replace Section 13.5.6 (a) with the following:

(a) AUTO is the default selection. If you select AUTO, then NR sent will be the last good received NS incremented by 1. The received NS is good if it is in sequence and the block had a good block check. The NR count will not be incremented until a good NS is received.

Add following after Section 13.5.6 (b):

(c) When you select MAINTAIN on the Parameters 4 menu (Section 13.3.3), the INTERVIEW will remember the value of NR even after you exit Run mode into Program mode. Then, when you reenter Run mode, the unit will resume transmitting starting from the last NR value used.

Add following after Section 13.5.7 (d):

(e) When you select MAINTAIN on the Parameters 4 menu (Section 13.3.3), the INTERVIEW stores the value of NS when you exit Run mode. Then, when you resume testing by pressing the RUN key again, the 4500 will transmit starting from the last NS value sent.

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Add following after Section 16.7:

16.8 INTERACTIVE TESTING

Software Version 10.08B has several special features for interactive testing of BOP networks. These features make it possible to perform a series of tests without reestablishing a logical session between each test.

Select MAINTAIN for the Parameters 4 menu selection LEAD STATUS EXITING RUN. This has the following effects:

- The static leads controlled by the INTERVIEW maintain their voltage levels when the unit exits Run Mode.
- The values of N(S), N(R), and the Transmit Variable (Section 12.4.6) are stored when Run Mode is exited. When testing is resumed, transmission continues from the next values of these parameters.
- The status of the eight trigger flags is stored (Section 12.4.5). When the RUN key is pressed again, the test program initializes, counters and timers are reset, timeout is reset, CRT enhancements are turned off; but the flags remain constant.

These features greatly increase the programming capacity of the 4500. You can write several programs to perform numerous tests of a terminal. Use the flag mask in a similar fashion in all the programs -- for example, to keep track of control transmissions, or to count a single variable through the entire series of tests. When one test is completed, enter Program Mode, load the next program into the INTERVIEW, and continue testing by reentering Run Mode.

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Replace the list of switch settings and the following note in Section 17.3.1 with the following:

S1-1, OFF
S1-2, OFF
S1-3, OFF
S1-4, OFF
S1-5, OFF
S1-6, OFF for 2 stop bits in asynchronous format*
ON for 1 stop bit in asynchronous format*
S1-7, OFF
S1-8, OFF for 60-Hz power frequency
ON for 50-Hz power frequency

NOTE: Switches S1-1 through S1-5 and S1-7 must be off for proper operation. Their use is for testing by the factory.

* Software versions 10.08 and 10.08B only.

APPENDIX K
USING THE 4500 WITH THE INTERVIEW 30/40 REMOTE TRANSFER OPTION

```
*EM DCE/TAPE*   BLOCK=003   DTE=10010110
BOTH/ASCII/7/EVEN/ASYNC
▪%%%%%%%A000017%ASYNC ASCII 7-ODD SETUP%
▪%%%%%%%%%%H000080%7F0000FFFFFFFF17415
3594E43204153434949203 72D4F4444205345545
550DAD7D4D1CECBC8C55200F400020101010402 1
60016000201FF400131000101020 1%▪%%%%H0001
78%0101010432343030000200000000000000000
0000000000000000000000000000000000000000
0000000000000000000302D2A2724211E1B18151
2EA%▪%%%%%M%%%%%A000011%SDLC EBCDIC SE
TUP%▪%%%%%%%%%%H000080%7F0001FFFFFFFF1
153444C43204542434449432053455455502053 4
5545550DAD7D4D1CECBC8C58205530002010101 0
402160016000201FF400131000101020 1%▪%%%%H
000180%0101010432343030000200000000000000
0000000000000000000000000000000000000000
0000000000000000000000302D2A2724211E1B1
```

Figure K-1

APPENDIX K
USING THE 4500 WITH THE INTERVIEW 30/40 REMOTE TRANSFER OPTION

You can use the 4500 to store programs and data from an INTERVIEW 30 or 40 equipped with the Remote Transfer option, and to play back this information to a 30/40 in the field. This enables you to store data for future analysis, or to develop a library of 30/40 tests and setups on a 4500 Program-Data Tape.

The Remote Transfer option is explained in the Technical Manual for the INTERVIEW 29/30/40. This appendix explains how to set up the 4500 for use with the INTERVIEW 30/40 Remote Transfer option.

K.1 DUMP FORMAT

A dump of setup, test, or data from an INTERVIEW 30/40 consists of a transmission header and the actual data or program. The transmission header includes the name assigned to the dump record, in clear text. The data portion is in hexadecimal-encoded ASCII -- each eight-bit character is translated into two ASCII characters 0 through F. (For example, the ASCII character "b" is translated into the two ASCII characters "62".) The transmission is divided into blocks, with an even LRC block check for each block, set off by BISYNC protocol characters. Figure K-1 shows a portion of a data dump recorded by a 4500. The dump includes protocol, transmission header with the assigned name, and the blocks of data.

A complete 30/40 setup can be stored on less than one block of a 4500 tape or RAM. A 30/40 test program requires about five blocks of tape. Slightly more than five lines from the 30/40 data buffer fit in a block of the 4500 Capture Memory.

```
                    ** PARAMETER 1 **

TEST ID:  _____________________________
MODE    :  MON  EM DTE  EM DCE  H-SPD MON
SOURCE  :  LINE  TAPE  RAM

MON     :  BOTH  DTE  DCE
CODE    :  EBCDIC   ASCII    EBCD   XS-3
           IPARS  REV EBCD  SELECTRIC HEX
   BITS  :8  7
   PARITY:EVEN  ODD  SPACE  MARK  NONE
FORMAT  :  SYNC  BSC/X.25  7E/X.25  SDLC
           SDLC/NRZI  ASYNC


BLK CHK:  OFF  ON  TYPE: CRC16  EVLRC  ODLRC
I/F     :  EIA  MIL
CLOCK   :  EXT  INT   SPEED:  9600
```

Figure K-2

```
                    ** PARAMETER 2 **

                      CRT CONTROL
DISPLAY MODE:  SINGLE  DUAL
SUPPRESS    :  _____
ENHANCE     :  CHAR  PARITY
            :  _____


                    RECORD CONTROL
CAPTURE MEM :  TAPE  RAM
INITIAL COND:  NOT RECORD  RECORD
START AT    :  CONT  BLOCK 000
STOP AT     :  ENDLESS LOOP  END
INTERFACE   :  NO  YES  CLOCK:  INT  EXT
```

Figure K-3

K.2 RECORDING AN INTERVIEW 30/40 DUMP

K.2.1 General Setup

To record a dump of data, setup, or test from a 30/40, set up the 4500 as follows. It doesn't matter what type of dump the 4500 is receiving. On the Parameters 1 menu (Figure K-2), select

- MODE: MONitor
- SOURCE: LINE
- MONitor: BOTH
- CODE: ASCII
- BITS: 7
- PARITY: EVEN
- FORMAT: ASYNChonous
- BLOCK CHECK: ON; TYPE: EVen LRC
- IF: EIA
- CLOCK: INTernal
- SPEED: the same as the speed selected on the PROG A menu of the INTERVIEW 30/40.

On the Parameters 2 menu (Figure K-3), select TAPE for Capture Memory, initial condition RECORD. The START AT selection should be the tape block where you want the record to begin. Select INTernal clock.

> CAUTION: The 4500 must be in Run Mode and the tape at the first block number to be recorded before you start the dump from the 30/40. Otherwise, some of the header could be omitted from the recording, and the record could not be read by the 30/40.
>
> If the 30/40 receives any data before the beginning of the record header, it may be unable to interpret the header. Therefore, you should leave at least one blank block before and after each dump record on the tape.

K.2.2 Local Dump

If you are dumping from a 30/40 locally, without the use of modems, connect the MONITOR jack on the rear of the 4500 to the REMOTE jack of the 30/40, using the special INTERVIEW-to-Modem cable provided with the 30/40. Connect the end labeled MODEM to the 4500, and the connector labeled INTERVIEW 30A/40A to the 30/40.

> CAUTION: The INTERVIEW-to-Modem cable crosses the TD and RD leads; it also crosses and loops back certain handshaking leads required by the REMOTE port of the 30/40. Do not substitute any other cable. Figure K-4A shows the INTERVIEW-to-Modem cable configuration.

Select MONITOR for the MODE selection on the Parameters 1 menu. Press the RUN key on the 4500. Wait for the tape block number to appear on line 1 of the CRT, then press the XEQ key on the 30/40, to start transfer of the dump. When the 30/40 indicates that the dump is completed, press PROGRAM on the 4500 to stop the tape.

If you plan to record other data on the tape, be sure to make a note of the last block used for the dump record.

This procedure records the dump as transmitted (TD) data. Figure K-4B shows the lead crossing performed by the special cables.

K.2.3 Remote Dump

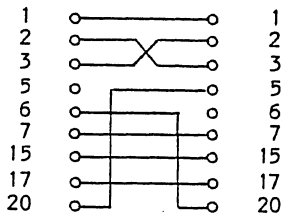
To record a dump remotely, using modems, you must connect the 4500 to the modem with a modem-to-modem cable which crosses the TD and RD leads. This enables you to record the dump from the modem as TD data, so it can be easily played back to the 30/40. The specific cable configuration will depend on your system configuration.

One simple way to record a dump is to establish the physical link between a terminal and a modem with a T-cable. Then, connect the 4500 to the T-cable with a three-wire crisscross cable (TD and RD crossed, and ground). Select MONITOR on the Parameters 1 menu. Press the RUN key, and and wait for the tape to wind to the first block; then tell the 30/40 operator to start the dump by pressing XEQ. When the dump is complete -- when you see no more data on the line, or the 30/40 operator tells you the transfer is finished -- press PROGRAM.

If you plan to record other data on the tape, be sure to make a note of the last block number of the dump record.

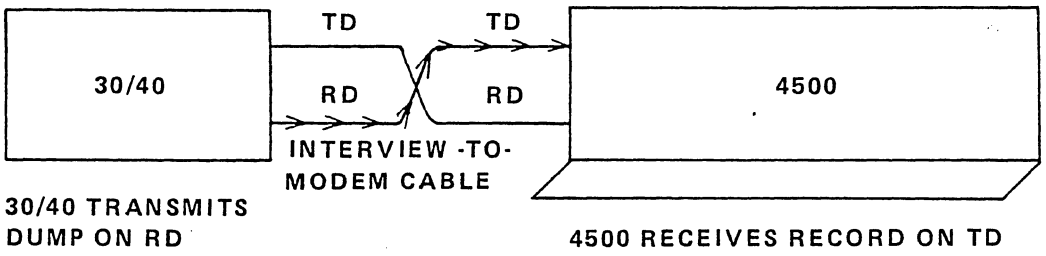
Figure K-4C shows the lead crossing performed by the special cables.

A INTERVIEW-TO-MODEM CABLE:



(other pins not connected)

B LOCAL DUMP:



C REMOTE DUMP:

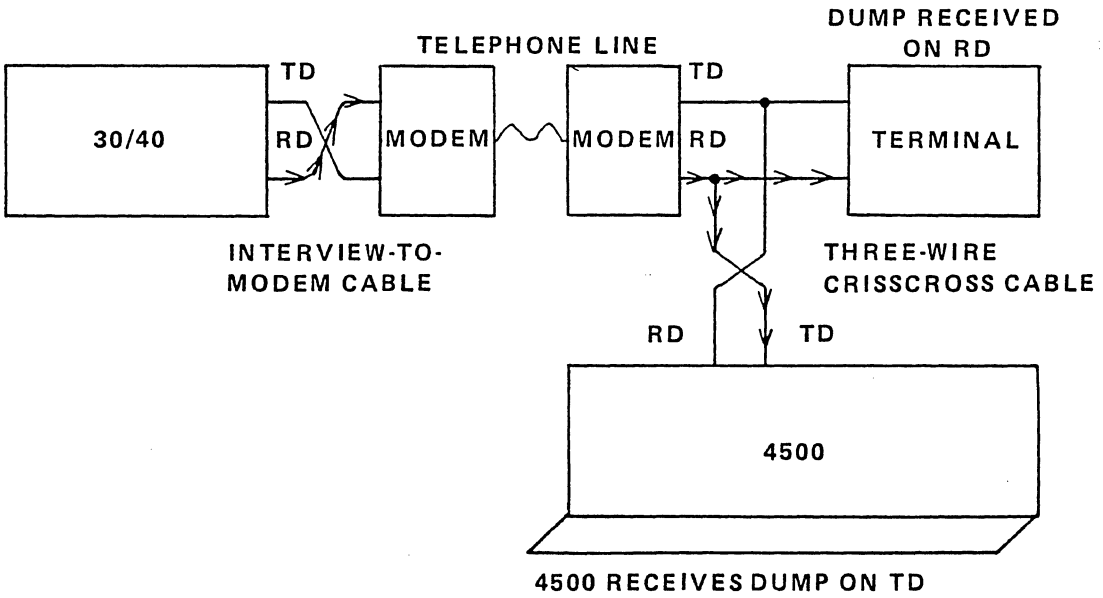


Figure K-4

K.3 PLAYING BACK A RECORD TO AN INTERVIEW 30/40

K.3.1 General Setup

To play back a recorded dump to a 30/40, set up the Parameters 1 menu to show

- MODE: EMulate DCE
- SOURCE: TAPE
- START AT: the blank block preceding the dump data
- MONitor: BOTH
- CODE: ASCII
- BITS: 7
- PARITY: EVEN
- FORMAT: ASYNChronous
- BLOCK CHECK: ON
- TYPE: EVen LRC
- IF: EIA
- CLOCK: INTernal
- SPEED: same as speed selection for 30/40 (on PROG A menu).

K.3.2 Local Playback

Connect the EMULATE DTE connector on the 4500 to the REMOTE connector on the 30/40 with a standard EIA cable. Press XEQ on the 30/40 to start reception of the dump, then press the RUN key on the 4500.

> NOTE: When playing back tape, the 4500 transmits both the TD and RD data on the tape, out of both connectors. By connecting to the EMULATE DTE connector, but selecting EMulate DCE on the Parameters 1 menu, you can transmit the TD data through the connector, and monitor it on the CRT at the same time.

You will see the data being played back to the 30/40 on the 4500 CRT. When the transfer is complete -- when you see no more data, or the 30/40 indicates the record is received -- press PROGRAM.

K.3.3 Remote Playback

The 4500 is not designed to transmit taped data to a modem. Therefore, we recommend that you transfer the record to a local 30/40 using the above procedure, then use the 30/40 to download the record to the remote unit.

K.4 BUILDING A LIBRARY OF 30/40 PROGRAMS

You can build a library of 30/40 setups and test procedures to transfer to field units as needed. The library is stored on a

standard 4500 Program-Data tape, with the Message Buffer used as a tape directory.

K.4.1 Writing the Program

Use a blank tape, formatted as a Program-Data Tape. Set up the Parameters 1 menu to receive a dump, as described in Section K.2. On the Parameters 2 menu, select

- CAPTURE MEMory: TAPE
- INITIAL CONDition: NOT RECORD
- START AT: BLOCK 000
- INTERFACE: NO
- CLOCK: INTernal

Set up the Triggers as shown in Figure K-5.

- Trigger 0 Conditions: MONitor DTE for STRING SOH A (Start Of Header, A)
  Actions: SET CRT REVerse video 1 (on); SET ALARM
- Trigger 1 Conditions: MONitor DTE for STRING ETX (End Of Text)
  Actions: SET CRT REVerse video 0 (off)

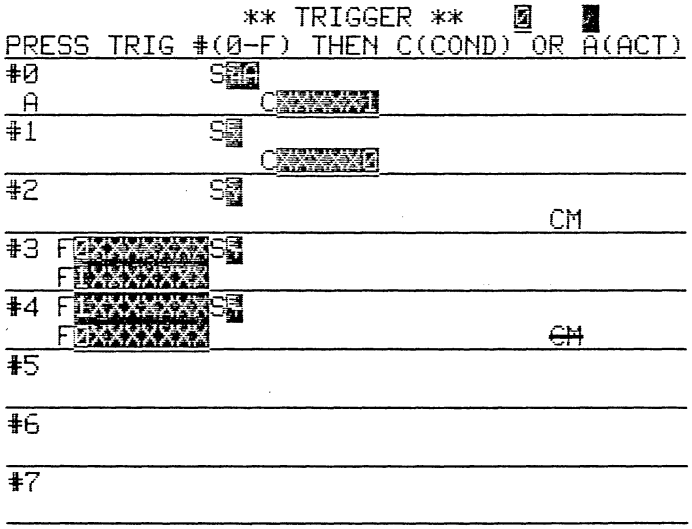


Figure K-5

- Trigger 2 Conditions: MONitor DTE for STRING SY
  (synchronization character)
  Actions: SET CaPTure MEMory ON
- Trigger 3 Conditions: MONitor DTE for STRING EOT
  (End Of Transmission); MONitor FLAGS
  for flag 8 0 (off)
  Actions: SET FLAG YES, setting
  flag 8 1 (on)
- Trigger 4 Conditions: MONitor DTE for STRING EOT
  (End Of Transmission); MONitor FLAGS
  for flag 8 1 (on)
  Actions: SET CaPTure MEMory OFF

Triggers 0 and 1 cause the clear text name of the record to appear in reverse video, to make it stand out. Trigger 2 turns on the tape when the 4500 sees the first synchronization character of the dump record. Trigger 3 looks for the EOT at the end of the transmission header, and sets flag 8. Trigger 4 looks for the second EOT (at the end of the dump), and turns the tape off.

Press the SAVE PROGram key. The program will be recorded on the tape.

K.4.2 Recording Dumps

When you wish to record a dump from a 30/40, insert the tape in the 4500, and press LOAD PROGram, to load the dump program in the unit.

Press MESSAGE (or ENTER MSG). This displays the Message Buffer menu. Select Message 0, and enter the name of the 30/40 setup or test procedure you wish to record. On the same line, enter 000 -- the tape block number where the first dump is to begin. Figure K-6 shows how the Message Buffer menu will look when several programs have been stored on the tape.

Set up the Parameters 1 menu to receive the dump. On the Parameters 2 menu, enter BLOCK 000 for the START AT selection. Now record the dump, using the procedure in Section K.2. When recording is complete, save the program, so that the updated library directory (the Message Buffer) will be stored on the tape.

When using this program, there is no need to leave a full blank tape block between each dump record. Simply start recording at the first available blank block following the last recorded record. The program automatically finds the beginning of the record, starts the tape, and stops the tape at the end of the record. This allows you much greater flexibility in recording dumps, and also enables you to fit more dumps on a single tape.

Each time you record a dump, enter the name of the dump and the starting tape block on the Message Buffer menu, and be sure to enter the starting tape block on the Parameters 2 menu as well. Then, when the dump is complete, save the program, along with the updated directory.

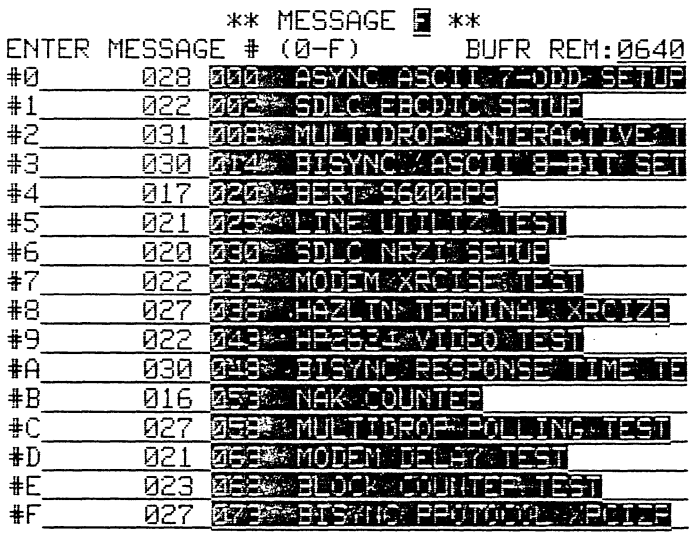

** MESSAGE F **
ENTER MESSAGE # (0-F)
BUFR REM:0640
#0 028 000 ASYNC ASCII 7-ODD SETUP
#1 022 002 SDLC EBCDIC SETUP
#2 031 008 MULTIDROP INTERACTIVE T
#3 030 014 BISYNC ASCII 8-BIT SET
#4 017 020 BERT 9600BPS
#5 021 025 LINE UTILIZ TEST
#6 020 030 SDLC NRZI SETUP
#7 022 032 MODEM XRCISE TEST
#8 027 038 HAZLTN TERMINAL XRCIZE
#9 022 043 HP2624 VIDEO TEST
#A 030 049 BISYNC RESPONSE TIME TE
#B 016 053 NAK COUNTER
#C 027 058 MULTIDROP POLLING TEST
#D 021 063 MODEM DELAY TEST
#E 023 068 BLOCK COUNTER TEST
#F 027 073 BISYNC PROTOCOL XPCIZE

Figure K-6

If you use only the first line of each message, you can list 16 different 30/40 dumps on the Message Buffer menu. If you wish to keep more than 16 dumps on a tape, you may use more lines of each message. Since only the first line of the message is displayed on the Message Buffer menu, you may wish to use the first line of the message for a key word which describes the other setups or test procedures listed in the message. This enables you to list 80 different dumps on the tape.

K.4.3 Playing Back from a Library Tape

To transfer a stored setup or test procedure to a 30/40, locate the starting block of the dump record on the library directory. Set up the 4500 to play back a dump, as described in Section K.3. On the START AT line, enter the tape block number where the record begins. Then transfer the dump.

You can easily identify the beginning of each dump on the tape. If you play back the tape, the transmission header, with the name of the dump in clear text, is displayed in reverse video. Figure K-7 shows playback of a library tape. This is an added aid in finding setups or test procedures on the tape.

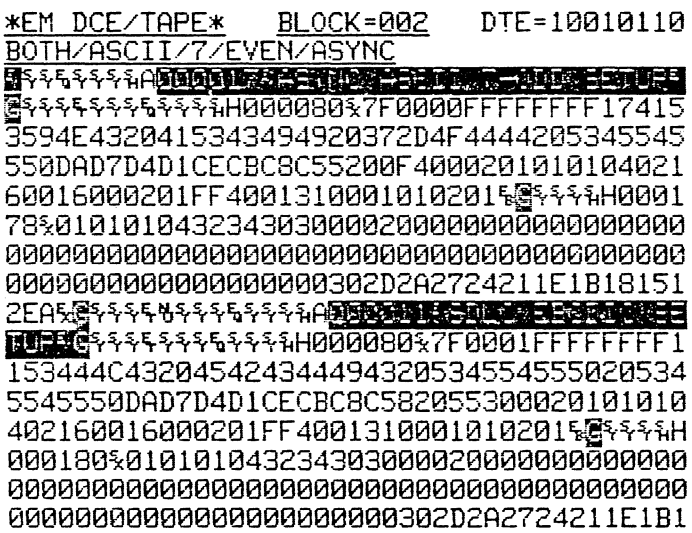


Figure K-7

Issue 1, August, 1982

ADDENDUM

TO

TRAINING MANUAL for INTERVIEW 4500
ATLC-107-895-106, Issue 2, February 1982

Section 7.2.3 (2). Add the attached paragraph to the end of the section.

Section 8.10.4. Add the attached paragraph to the end of the section.

There are 2 sheets attached to this addendum.

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Section 7.2.3 (2). Add the following paragraph at the end of the section:

If your unit has Software Version 10.08B, selecting MAINTAIN also preserves key transmission parameters -- N(S), N(R) (for bit-oriented protocols) and the Transmit Variable -- and the status of the internal trigger flags. This feature is extremely useful when you are performing complex tests or a series of tests. If your system uses SDLC protocol, for example, you can use one program to establish a logical session, a second program to perform tests, and a third program to terminate the session. By selecting MAINTAIN, you can make the 4500 transmit as though it were performing one continuous test, instead of three discrete tests.

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Section 8.10.4. Add the following to the end of the section:

If your unit has Software Version 10.08B, you can use separate programs to establish a logical session, perform tests, and terminate the session. Select MAINTAIN for LEAD STATUS EXITING RUN on the Parameters 4 menu. This causes the INTERVIEW to maintain the voltages of the static RS-232/V.24 leads controlled by the 4500, and to store the basic program parameters -- N(S), N(R), the Transmit Variable, and the status of the internal trigger flags. This enables you to exit Run Mode, load a new program into the INTERVIEW, and reenter Run Mode, without having to reestablish the communications link.

August 1981

Dear INTERVIEW 4500 User:

This binder contains two manuals for your new INTERVIEW 4500.

The TECHNICAL MANUAL, ATLC-107-895-105, will be your complete reference document for every aspect of 4500 operation and service.

The TRAINING MANUAL, ATLC-107-895-106, is intended to be used with the following training tapes:

TAP-895-106-1 -- Interactive BISYNC Training Tape, containing BISYNC data and an interactive BISYNC training program.

TAP-895-106-2 -- X.25-SNA Training Tape, containing X.25 and SDLC data and a training program for monitoring 7E-framed X.25.

Two Blank Tapes.

The Training Manual and the accompanying Training Tapes comprise a very effective way of learning to use your 4500. We strongly urge you to use them for initial training, no matter what data you intend to monitor.

You may order extra copies of these manuals and tapes from Atlantic Research Corporation.