OM 860A

OPERATOR'S MANUAL

INTERVIEW™ CRT

DTM OPTIONS 18-5 THRU 18-8

JANUARY 1978

ATLANTIC RESEARCH CORPORATION
TELEPRODUCT®
ALEXANDRIA, VIRGINIA 22314

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Manufactured by:

ATLANTIC RESEARCH CORPORATION
Teleproducts Division
5390 Cherokee Avenue
Alexandria, Virginia 22314

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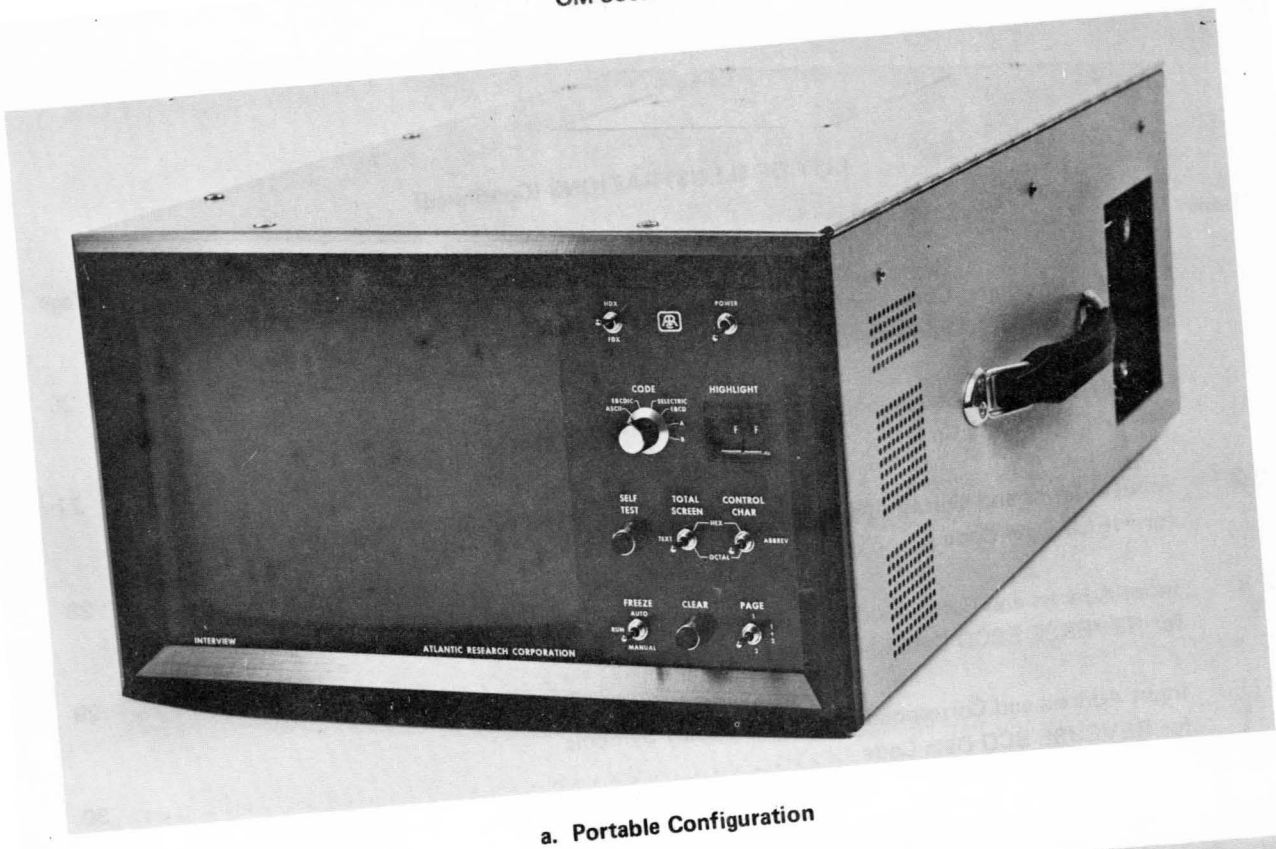

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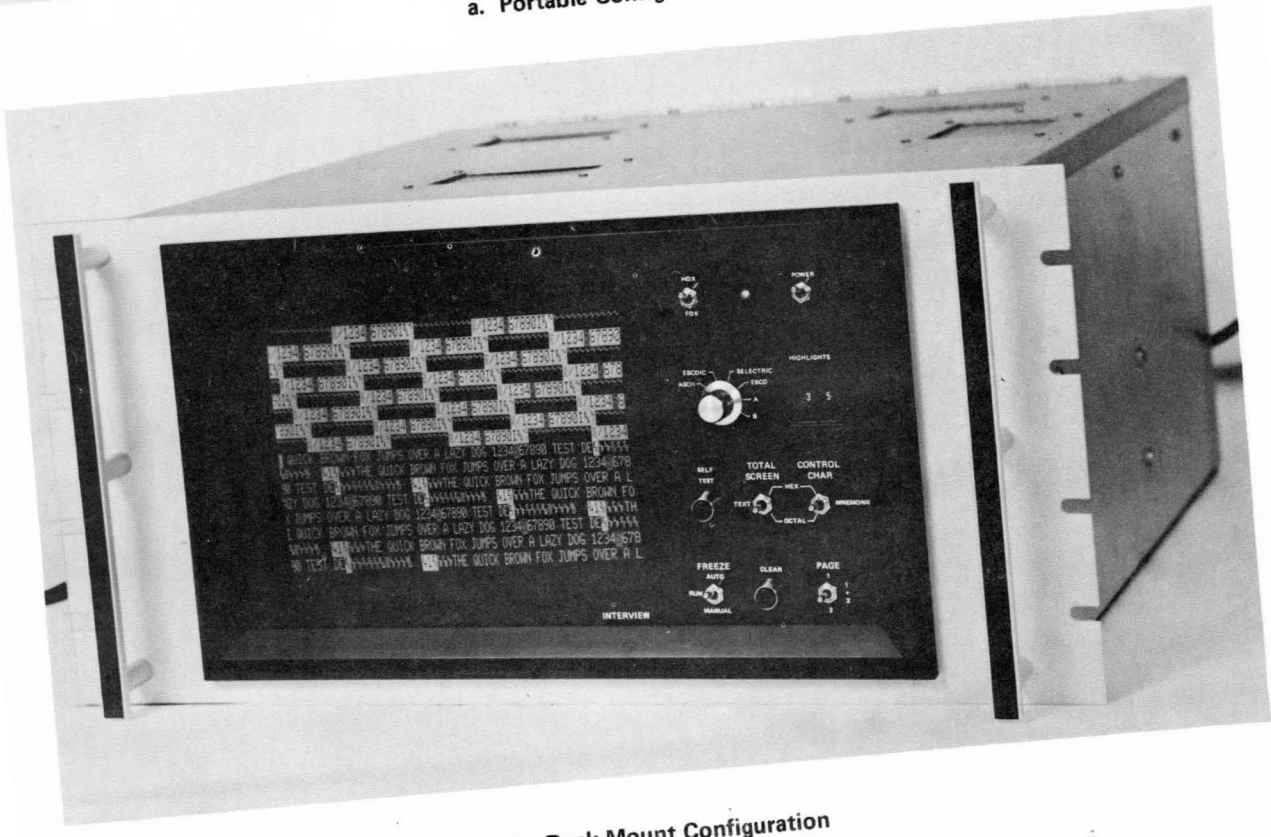


b. Rack-Mount Configuration

Figure 1-1. INTERVIEW CRT Display.

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The information in this manual covers the general description, operation, and application of the INTERVIEW™ CRT Data Dispiay, and describes the use of the instrument as a peripheral visual display with INTERSHAKE I® (DTM-1) and INTERSHAKE II® (DTM-2). The INTERVIEW CRT Data Display is shown in Figure 1-1.

1.2 PURPOSE AND USE OF EQUIPMENT

The INTERVIEW is a visual CRT data display, designed to be used as a peripheral instrument with the INTERSHAKE series of data communications test equipment.

The INTERVIEW permits test personnel to view test data as it is transmitted, received, monitored, or reviewed by the INTERSHAKE systems test equipment.

The unit operates with synchronous or asynchronous data format in full-duplex (FDX) or half-duplex (HDX) systems, and is compatible with any of six selectable data codes, including:

- ASCII
- EBCDIC
- SELECTRIC
- EBCD
- A (Customer Specified Option)
- B (Customer Specified Option)

The INTERVIEW is capable of displaying data in any of three characteristic styles (fonts), as follows:

- CLEAR TEXT: Upper/Lower Case Alpha-Numeric, 128-Character ANSI, plus two-character abbreviations, (e.g., control characters S_Y, E_T, A_K). See Figure 2-2.
- HEXADECIMAL: Two-Digit Alpha-Numeric, 256-Character total, (00-FF).
- OCTAL: Three-Digit; One dot column vertical array plus two column alpha-numeric, 256-Character total, (000-377).

Test data applied to the INTERVIEW is stored as it is received in a "CRT Refresh Display" memory. The data is then decoded and translated to the desired display font at the time of display. In this manner, it is

possible to store test data for future manual analysis. For example, a quantity of test data may be entered in the Refresh Display memory and "frozen". In this state, no new data may be entered into the Refresh Display memory, and the entered data can be displayed indefinitely. While the data is displayed, the operator may decode it in any of the selectable codes to determine the original coding scheme.

In addition to the decoding capabilities and display fonts provided by the INTERVIEW, the equipment is capable of producing a wide variety of display enhancements and other features, under control of the INTERSHAKE instrument. These display enhancements are used to highlight critical or pertinent data to attract immediate operator attention.

1.3 FUNCTIONAL DESCRIPTION

1.3.1 General Operation

The INTERVIEW is a peripheral CRT data display, designed specifically to be used with the INTERSHAKE series of test instruments. In the normal operating configuration, the INTERVIEW is connected to the INTERSHAKE through the AUX INTERFACE connector of the INTERSHAKE instrument. All data and display control signals are applied to the INTERVIEW through this interconnecting cable.

Control of the INTERVIEW display is accomplished both by commands supplied from the INTERSHAKE (through test program control functions) and by the front panel controls on the INTERVIEW. A complete description of display control, and control functions, is included in Section II (Operation) of this manual.

1.3.2 Operating Speed

Operating speed of the INTERVIEW is determined by the clock signal used in the system under test, or the data rate of the test signal. Display writing speed of the INTERVIEW can be maintained at a maximum system data rate of 56 KBPS Full-Duplex (FDX).

Clock breathing, common to FDX circuits, causes the "slower" channel to display a "fill" symbol periodically to maintain correct time correlation between the two circuits. In order to maintain a steady display, data bits applied to the INTERVIEW are first stored, and then written into the CRT memory only during sweep retrace time, which eliminates the possibility of an erroneous display which could be caused by decoding and displaying a character at the moment it is being rewritten or updated. The process of data entry into memory only during retrace imposes the maximum operating speed.

1.3.3 Display Characteristics

The INTERVIEW employs a 9-inch (diagonal) CRT to produce an image area of approximately five inches by seven inches. The basic display provides:

1024 CHARACTERS – 16 Lines of 64 Characters (Two Pages)
512 CHARACTERS – 16 Lines of 32 Characters (One Page)

This dual-page feature, when used under program control of the INTERSHAKE, permits two separate data blocks to be displayed in either a composite or comparative manner.

When Full-Duplex data is displayed with the dual-page feature, a four-quadrant comparison is achieved, where the screen is divided into four quadrants. The top two quadrants represent Page 1, and the bottom two quadrants represent Page 2. The two left quadrants represent Transmit Data, and the right two quadrants represent Receive Data (see Figure 1-2c).

As data is written onto the screen, the character sequence starts at the top of the screen at the left, and advances from left to right, top to bottom, until the display is complete. A one-page display presents 16 lines of 32 characters (512 characters total); a two-page display presents 16 lines of 64 characters (1024 characters total).

As each new line is started at the left of the CRT, the complete line displayed previously is blanked to present a clear indication of new data being displayed.

When the AUTO FREEZE is employed, the oldest character blinks rapidly, and is located in the *home* position (upper left corner). The display freezes only after a complete page is written.

When the MANUAL FREEZE is employed, the oldest character blinks rapidly, and is located immediately ahead of the last character written. The display freezes immediately when the switch is depressed, and the remainder of a line being written is unblanked to show the remaining contents of that line.

Other display characteristics include program-controlled character enhancements, undefined character enhancements, and program-controlled font selection of text and/or control characters. These display features are described in detail in Section II (Operation) of this manual.

1.4 PHYSICAL DESCRIPTION

The INTERVIEW is manufactured in both portable and rack-mounted configurations. Both models are functionally identical, but differ physically as outlined in the following paragraphs.

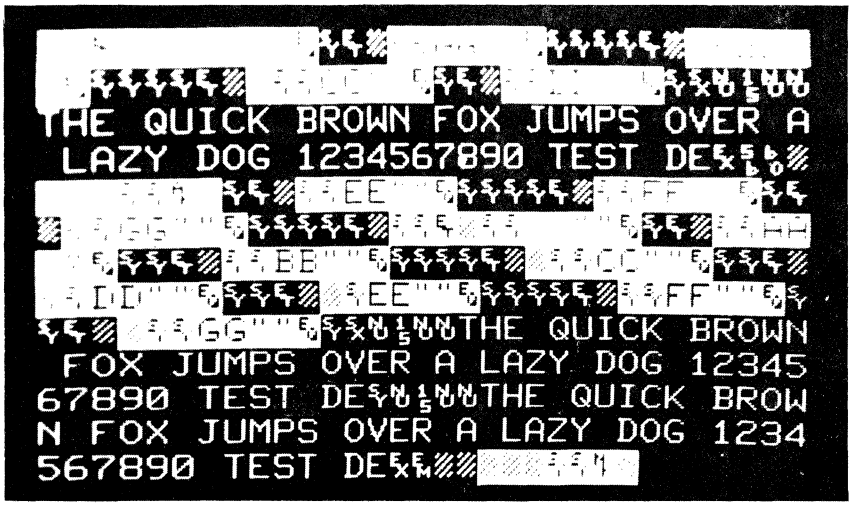
1.4.1 Portable INTERVIEW

The portable INTERVIEW is shown in Figure 1-1a. Rails on the unit permit horizontal use on a bench or desk; or the unit may be positioned vertically (on the floor), with front panel facing upward. The unit measures 8.5 inches (20.6 cm) high, 14 inches (35.6 cm) wide, and 21.5 inches (54.6 cm) deep and weighs approximately 30 pounds (13.6 Kg).

A compartment on top of the unit houses the power cord and interconnecting test cables. A panel on the side of the unit provides access to the test cable connector (AUX INTERFACE), power connector, video output connector, fuse, and input voltage (115/230) selector switch.

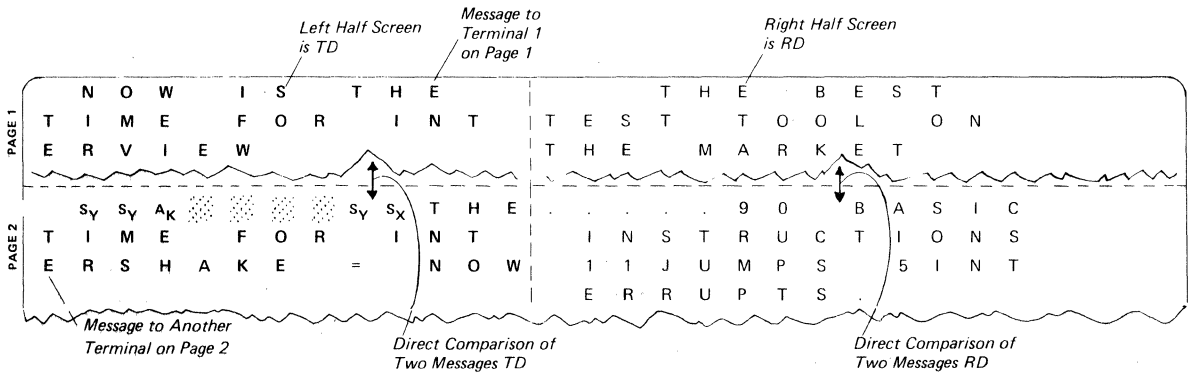
1.4.2 Rack-Mounted INTERVIEW

The rack-mounted INTERVIEW is shown in Figure 1-1b. The unit is designed to be mounted in a standard 19-inch equipment cabinet. Provisions are made on the rear of the chassis for all power, signal and interface connections. The front panel is 8.75 inches (22.2 cm) high by 19.0 inches (48.3 cm) wide. The unit is 20.0 inches (50.8 cm) deep and weighs approximately 30 pounds (13.6 Kg).



a. 512-Character Display (Page 1)

b. 1024-Character Display (Page 1 + Page 2)



c. Full-Duplex Four-Quadrant Display

Figure 1-2. INTERVIEW Display Modes.

1.4.3 Factory Settings

Internal adjustments, such as Brightness, Contrast, Horizontal and Vertical Size, Linearity, etc. have been set at the factory to provide an optimum display. These internal controls should be set by qualified service personnel.

1.4.4 Optional Code Translation

In a standard configuration, the INTERVIEW is supplied with the four following code translation capabilities:

- ASCII
- EBCDIC
- SELECTRIC
- EBCD

These codes are listed on the front panel at the CODE Selector switch. Two additional positions of the CODE Selector switch (A and B) provide for translation of two optional codes, as specified by the user. These two additional codes are available in the four following combinations:

Option 1:	A	BCD
	B	REV BCD
Option 2:	A	BCD
	B	REV EBCD
Option 3:	A	BAUDOT
	B	FIELD DATA
Option 4:	A	BAUDOT
	B	REV BCD

These options are normally installed at the factory to meet the requirements of the user. Refer to Appendix A.

NOTE

REV CODES HAVE HIGH ORDER BIT (Most Significant Bit) TRANSMITTED FIRST.

1.5 QUICK REFERENCE SPECIFICATIONS

1.5.1 Size

Portable INTERVIEW	–	8.5" X 14" X 21.5" (20.6 cm X 35.6 cm X 54.6 cm)
Rack-Mount INTERVIEW	–	8.75" X 19" X 20.0" (22.2 cm X 48.3 cm X 50.8 cm)

1.5.2 Weight

Approximately 30 pounds (13.6 Kg).

1.5.3 Power Requirements

115/230V AC, external switch selected. 50/60 Hz, internal setting. Rotate header assembly shown in Figure A-2 180° for selection. Header is shown in 60 Hz position. 110 watts maximum.

1.5.4 Input Signal Requirements

Supplied by INTERSHAKE through AUX INTERFACE Connector.

1.5.5 Video Output

Composite, 2 volts P/P, Negative sync, BNC Connector.

1.5.6 Display Area

Approximately 5" X 7" aspect ratio; 9-inch diagonal CRT.

1.5.7 Data Codes

ASCII	SELECTRIC
EBCDIC	(A) CUSTOMER SPECIFIED
EBCD	(B) CUSTOMER SPECIFIED

1.5.8 Display Characters

128-Character ANSI
256-Character HEXADECIMAL
256-Character OCTAL

1.5.9 Display Capacity

1-Page (16 Lines, 32 Characters)
2-Page (16 Lines, 64 Characters)

1.5.10 Display Enhancements

Character Reverse Image
Character Blink
Character Low Intensity
Reverse Image/Blink

1.5.11 Display Speed

Accepts Full Duplex data at data rates up to 56 KBPS.

1.6 THEORY OF OPERATION

The INTERVIEW contains a Random Access Memory (RAM) to store data which is to be displayed. The RAM is addressed alternately by a Refresh Address Counter and a Character Position Address Counter, to alternately refresh the video applied to the CRT, and to write or update data in character positions of the display.

During a CRT refresh cycle, where data in the RAM is decoded and written on the CRT, incoming data is stored momentarily by a latch. Then, during the retrace, the data is entered into the RAM from the latch.

After a write cycle, the RAM is returned to the Refresh Address configuration, and the display shows the recently-written character. In this type of "read-write" cycle, new data is entered into the RAM only during retrace time, and cannot be updated or changed during the actual display scan time. Thus, the display remains steady, and the possibility of erroneous character display (which would result in a "read-while-write" situation) is eliminated.

During the write cycle, data from the RAM is processed by a character generator, where the stored data is decoded and translated to character video signals. The setting of the front panel switches determine the code and font (character style) displayed.

In addition to storing data, the RAM also stores enhancement bits (REVERSE, LOW INTENSITY, BLINK) as required for certain displays.

Data is received by the RAM from the following sources:

- Receive or Transmit parallel data from INTERSHAKE
- FDX parallel data from the INTERVIEW receiver
- Function data from INTERSHAKE
- Symbol PROM in INTERVIEW that generates correct SPACE symbol for clearing each language, or "fill" symbols (#), (.), used to maintain time correlation in FDX operation.

SECTION II

OPERATION

2.1 INTRODUCTION

The information in this section covers the operation of the INTERVIEW CRT Data Display, and describes the application of the INTERVIEW as a peripheral visual display for the INTERSHAKE series of data communications test equipment.

2.2 OPERATING CONTROLS AND INDICATORS

Operating controls and indicators of the INTERVIEW are located in the following areas:

- Front Panel
- Inside Cabinet on CRT Frame
- Access Panel

The controls and indicators in each of these areas, and their specific functions, are listed in Tables 2-1 through 2-3. Front Panel Controls are shown in Figure 2-1.

Table 2-1. Front Panel Controls and Indicators.

Control/Indicator	Position/Function
POWER	UP POSITION – Applies primary power to energize equipment. DOWN POSITION – Deenergizes equipment.
RED INDICATOR	LIGHTS when AC power is applied to equipment and POWER switch is in the up (energize) position.
HDX/FDX Switch	HDX POSITION – Allows test data to be displayed (written) one line at a time at normal intensity, representing one channel of data. FDX POSITION – Allows test data to be displayed two lines at a time, representing full-duplex communications. The top line is written at normal intensity; the second line and every other line thereafter is written at low intensity.
CODE Selector Switch	ASCII POSITION – Initiates decoding of input data to corresponding ASCII code characters.

Table 2-1. Front Panel Controls and Indicators. (Continued)

Control/Indicator	Position/Function
CODE (continued)	EBCDIC POSITION – Initiates decoding of input data to corresponding EBCDIC code characters. SELECTRIC POSITION – Initiates decoding of input data to corresponding SELECTRIC code characters. EBCD POSITION – Initiates decoding of input data to corresponding EBCD code characters. A or B POSITION – Initiates decoding of input data to corresponding customer-specified code characters.
SELF TEST Switch	MOMENTARILY DEPRESSED – Initiates display of all characters, symbols and fonts produced by the character generator circuits. A set of fonts or symbols is repeated on the screen several times in Normal, Reverse, Low Intensity and Blink; and in combinations thereof. The CODE switch may be set to any position; and the display will correspond to the code selected. Unassigned characters in the selected code will appear in hexadecimal form and will blink. Unassigned characters will appear in hexadecimal, but will *not* blink on all units series "A" and up. NOTE During self-test display, the normal test data is stored in memory. When the SELF TEST button is released, the normal data display is resumed. Data applied to the memory from the INTERSHAKE during the self-test interval is stored and then displayed when normal display is resumed.
TOTAL SCREEN	HEX POSITION – Sets character generator to display hexadecimal value of input data characters. The hexadecimal value is displayed diagonally, and increments from ØØ to FF for a 256-character capacity. TEXT POSITION – Sets character generator to display alpha-numeric characters (128-Character ANSI) which correspond to input data. (The CODE switch must be set properly to initiate correct decoding.) Control characters are displayed as a diagonal double character abbreviation (mnemonic) for the specific control functions. For example:

Table 2-1. Front Panel Controls and Indicators. (Continued)

Control/Indicator	Position/Function
TOTAL SCREEN (continued)	A_K = ACK E_T = EOT D_1 = DC1, etc. OCTAL POSITION – Octal Position undefined when displaying an INTERSHAKE program in the load mode or play mode. Sets character generator to display octal representation of input data. The octal display increments from ØØØ through 377, for a total of 256 characters. The first digit of the display uses a vertical dot convention; the two remaining digits are displayed in a single vertical column.
CONTROL CHARACTERS	HEX POSITION – Performs same function as TOTAL SCREEN switch in HEX position, but *only* for control characters. (Control characters are decoded in accordance with setting on CODE selector switch.) MNEMONIC POSITION – Enables display of abbreviated control characters in diagonal alpha-numeric format. OCTAL POSITION – Octal Position undefined when displaying an INTERSHAKE program in the load mode or play mode. Enables display of control character octal equivalent. NOTE: The CONTROL CHARACTER switch is electrically overridden by the TOTAL SCREEN switch to avoid conflict between settings of the two switches. The above switch funtions are appliable only when the TOTAL SCREEN switch is set to the TEXT Position.
FREEZE	AUTO POSITION – Causes the display to freeze automatically when the screen has been written full. The oldest character displayed is in the "home" position, and is enhanced by blinking. Data occurring while display is frozen is *not* entered into the display memory. RUN POSITION – Enables display to be written normally as data is supplied by the INTERSHAKE. However, the display may be frozen by program command from the INTERSHAKE. MANUAL POSITION – Causes the display to freeze instantly. If enabled while a line is being written, the remainder of the line will be unblanked and will be displayed. The oldest character blinks at a fast rate. While frozen, input data is lost, and the screen cannot be cleared by command from INTERSHAKE. *Freeze does not disable Page Control by INTERSHAKE.*

Table 2-1. Front Panel Controls and Indicators. (Continued)

Control/Indicator	Position/Function
CLEAR	MOMENTARY DEPRESSED – Initiates clearing of display memory. Clears 1 or 2 pages, corresponding with setting of PAGE switch. Requires minimum of 2.0 milliseconds.
PAGE	1 or 2 POSITION – Selects either Page 1 or Page 2 for display. Each provides 16 lines of 32 characters for a total of 512 characters. 1 + 2 POSITION – Selects combination of Page 1 *and* Page 2 for display. This setting provides a display of 16 lines of 64 characters for a total of 1024 characters. NOTES: If Page 1 is recorded in FDX, with TD and RD on alternate lines, the PAGE 1+2 display separates the two and displays TD on the top left screen, and RD on the top right of the screen (or, for Page 2, TD is displayed on the lower left of the screen, and RD on the lower right). In this manner, data is displayed in four quadrants to facilitate quick comparison. The INTERSHAKE is capable of selecting Page 1, Page 2, or Page 1+2 when the PAGE switch is set to the 1+2 position.

Table 2-2. Internal CRT Controls (see Paragraph 1.4.3).

Control/Indicator	Position/Function
BRIGHTNESS	Adjusts brightness of CRT display to desired intensity.
CONTRAST	Control is adjusted to set desired display contrast.
VERTICAL SIZE	Control is set to provide desired vertical dimension of CRT image area.
VERTICAL LINEARITY	Control is set to produce equal spacing between scan lines from top to bottom of CRT. Characters should be of equal amplitude at top and bottom of screen.
WIDTH	Control is set to produce the proper width of CRT image area.
HORIZONTAL LINEARITY	Control is set to produce equal character spacing (horizontal scan velocity) throughout total scan length. Character width and spacing should be identical at both the left and right sides of image.
FOCUS	Control is set to produce clearly-defined characters.

Table 2-3. Access Panel Controls and Connectors.

Control/Indicator	Position/Function
AC CONNECTOR	The AC Line Cord is connected to this connector to supply primary AC power to the equipment.
FUSE	Overcurrent protection device, 3.0 amp slow-blow.
115/230 VOLTS	Switch is set to correspond with source of primary power.
VIDEO OUTPUT	Type BNC connector used to supply composite video and sync signal to external display instrument. Signal is 2 volts P/P.
AUXILIARY CONTROL CONNECTOR	50-Pin Amphenol Connector used for control and signal interface with INTERSHAKE.

2.2.1 DTM-2 Control of Data Format

With the DTM-2, the INTERVIEW will display dual-line Full Duplex. The receiver internal to INTERVIEW must be controlled to be compatible with the receiver in the DTM-2. All data format control signals are provided through the cable for:

- SPEED (Internal/External) Derived clock is not available to the INTERVIEW receiver
- INFO BITS
- PARITY
- SYNC, ASYNC
- SYNC BITS (Uses Function 90, see Paragraph 3-2.)
- SDLC (NRZI not available on INTERVIEW channel.)

2.3 TYPICAL OPERATING SEQUENCES (DTM-2)

2.3.1 Display of Program Listings in LOAD Mode

In the *LOAD* mode, the DTM-2 automatically conditions the INTERVIEW to display the DTM-2 program listing. The FDX position is electrically selected so that DTM-2 DATA are displayed on the top and every alternate row; the *corresponding* Function numbers are displayed in the second and every alternate row. (Hex is automatically selected for the Function row so that the 2-digit function number is displayed.) Any program step with a function that does not relate to transmission characters will be displayed reverse image, and Data will be displayed in HEX.

Display Sequence

1. The DTM-2 is set to the LOAD mode. The Data Switches are set to FO and the FUNCTION switch is set to 99.

2. Select AUTO FREEZE then CLEAR the INTERVIEW

3. Operate the STEP switch on DTM-2 to display Step 00.

4. Operate the UP switch on DTM-2 to scroll the program onto the INTERVIEW.

5. Note that the *DATA* or *FUNCTION* switches on the DTM-2 may terminate the scroll if DATA FO or FUNCTION 99 are in the Program being listed, repeated operation of the UP switch will continue the scroll.

NOTE

When in the LOAD mode, the CLEAR push button will initiate a display of the HEX character indicative of the SPACE character for the code selected on the INTERVIEW and is *not* representative of the contents of the Program Memory. As steps are displayed, the contents of the Program Memory will appear.

2.3.2 Display of Program Listings in RUN Mode

In the *RUN* mode, the operator may select HDX or FDX. In HDX the data analyzed by the DTM-2 will be presented to the INTERVIEW. In FDX the data analyzed by the DTM-2 will be presented to the top and alternate rows, while data on the second signal path will be displayed on the second and alternate rows. Signals on the TD and RD paths will be displayed maintaining vertical time correlation for characters occurring at the same instant on the data path. Should one path be "silent," an internally-selected "fill" symbol will be displayed to maintain time correlation with the active path.

Sequence

1. On the INTERVIEW, set the FREEZE control to RUN, PAGE switch to 1+2. This enables the DTM-2 to perform these functions under program control.

2. Set other INTERVIEW controls as may be appropriate to the test.

3. To terminate a test, depress the STOP MARK button on the DTM-2.

4. While the test is running, use of the Manual Freeze control on the INTERVIEW will prevent the program from clearing the display. Multi-Page control will continue to be under the DTM-2 control, if so programmed.

2.3.3 Display of Test Results in PLAY Mode

In the *PLAY* mode, the operator may select HDX or FDX. FDX displays the Results Memory in the same format as LOAD displays the program listing. Data is displayed on the top and odd lines; and Functions are

displayed on the even lines. Non-character transmission functions will appear in reverse image. In HDX, the Data will be displayed with reverse image for non-character transmission-related data.

Sequence

The display technique for the Play Memory is similar to that for the LOAD mode. Reset to STEP 00, step *down* to STEP 63 (last page), then operate CLEAR switch. Then step UP.

2.4 TYPICAL OPERATING SEQUENCES (DTM-1)

2.4.1 Display of Program Listings in LOAD Mode

In the *LOAD* mode, the DTM-1 automatically conditions the INTERVIEW to display the DTM-1 program listing. The FDX position is electrically selected so that DTM-1 DATA are displayed on the top and odd rows and the *corresponding* Function numbers in the even rows. (Hex is automatically selected for the Function row so that the 2-digit Function number is displayed.) Any program step with a function that does not relate to transmission characters will be displayed reverse image and the Data will be displayed in HEX.

Display Sequence

1. Select AUTO FREEZE, then CLEAR* the CRT.

2. Operate STEP on DTM-1 to display Step 00.

3. Operate UP on DTM-1 to scroll the program onto the INTERVIEW display.

***NOTE**

When in the LOAD mode, CLEAR will write a HEX character indicative of the SPACE character for the code selected on INTERVIEW and is *not* representative of the contents of the Program Memory. As steps are displayed, the contents of the Program Memory will appear.

2.4.2 Receiving Display Data in RUN Mode

When the DTM is in the *RUN* mode, the operator may only select HDX. In HDX, the data analyzed by the DTM-1 will be presented to the INTERVIEW.

Sequence

1. On the INTERVIEW, set the FREEZE switch to RUN, PAGE switch to 1+2. This enables the DTM-1 to perform these functions under program control.

2. Set other INTERVIEW controls as appropriate to the test.

3. Leave the DTM-1 in the RUN mode, and set the INTERVIEW FREEZE switch to MANUAL position. When RUN indicator on DTM-1 de-energizes, alternate lines on

the INTERVIEW will appear in HEX. If this is undesirable, the last step in the program could be "WAIT FOR RI OFF"; then with RI patched ON, the step could never be completed. This would allow the RUN indicator to remain energized.

4. While the test is running, setting the FREEZE control to the MANUAL position on the INTERVIEW will prevent the DTM-1 program from clearing the display.

2.4.3 Display of Test Results in PLAY Mode

With the DTM-1 in the *PLAY* mode, the operator may manually select display of HDX or FDX. FDX displays the Results Memory in the same format as LOAD displays the program listing. Data is displayed on the top and odd lines and Function on the even lines (low intensity). Non-character transmission functions will also be displayed reverse image. In HDX, the Data will be displayed with reverse image for non-character transmission-related data.

Sequence

The display technique for the Play Memory is the same as for the LOAD Mode.

2.5 CODE SELECTION

2.5.1 General

The operator may choose up to six data codes for translation of any input data. The six codes consist of four standard codes and two optional customer-specified codes. (Refer to Paragraph 1.4.4.)

STANDARD:	ASCII
	EBCDIC
	SELECTRIC
	EBCD
OPTIONS:	BCD and REV BCD or
	BCD and REV EBCD or
	BAUDOT and FIELD DATA or
	BAUDOT and REV BCD

Translation for display always follows the conventions of the selected code, regardless of how the input data may be coded. When the CODE selector switch is set to a code which does not correspond with the coding of the input data, the display will be unintelligible. Code translation charts for the above codes are provided in Appendix C of this manual.

2.5.2 Shift Codes

All Shift Codes will display the HOME character on the screen in the "unshift" set. The instrument logic assumes a preceding unshift character until it is updated by the next received "shift" character.

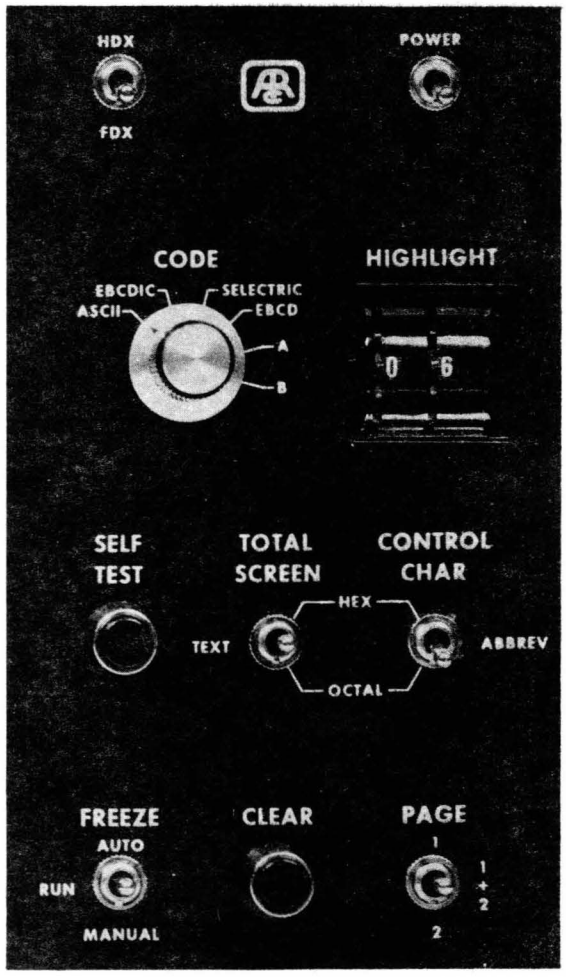


Figure 2-1. INTERVIEW Front Panel Controls.

2.6 DISPLAY SYMBOLS AND FORMAT

2.6.1 Display Font

The display font (letter and symbol style) used in the INTERVIEW is the ANSI Standard for a 7-bit code. This symbol set is shown in Figure 2-2. The ASCII code for this set is referenced at the top and side of the set. (The code shown is in the order of transmission; i.e., A0 = Least Significant Digit.) Each character of the set is composed of a number of dots in a 7- by 9-dot matrix.

2.6.2 Display Format

Data may be displayed by the INTERVIEW by the use of three separate formats: Text, Hexadecimal, and Octal. These formats are described in the following paragraphs.

2.6.2.1 Text Format

When the INTERVIEW is set to display characters in TEXT, the display consists of the character set shown in Figure 2-2. However, in instances where an input character has no defined symbol, the character is displayed in HEXADECIMAL and will blink only on units prior to Series "A" to alert the operator that an undefined character has been received. In EBCDIC/BI-SYNC, the cursor addressing characters and BCC calculations are included in this category. Examples of TEXT display are shown in the left-hand column of Figure 2-3. The display symbols associated with each of the possible eight (8) input codes are shown in Tables 2-4 through 2-11.

2.6.2.2 Hexadecimal Format

An eight-bit code provides 256 unique combinations which can be displayed as two hexadecimal digits. The INTERVIEW provides a hexadecimal display format of two digits per input character, with the two digits aligned diagonally in one symbol position. Examples of the hexadecimal display format are shown in the center column of Figure 2-3. The hexadecimal equivalents of binary input data are provided in Appendix C of this manual.

2.6.2.3 Octal Format

The 256 unique combinations provided by an 8-bit binary code can also be displayed as three octal digits. When desired, the INTERVIEW provides an octal display of input characters as shown in Figure 2-4. In this format, the symbol position is divided into three (3) sections for the octal representation. The left-hand section of the symbol position is used to display the first (most significant) using a vertical column of up to three dots. The three-dot display capacity provides a choice of four digits (0, 1, 2, 3) as the most significant digit.

The remaining two digits of the octal format are displayed in a vertical column at the right of the symbol position, with the least significant digit at the bottom (see Figure 2-4).

Examples of the octal display format are shown in the right-hand column of Figure 2-3.

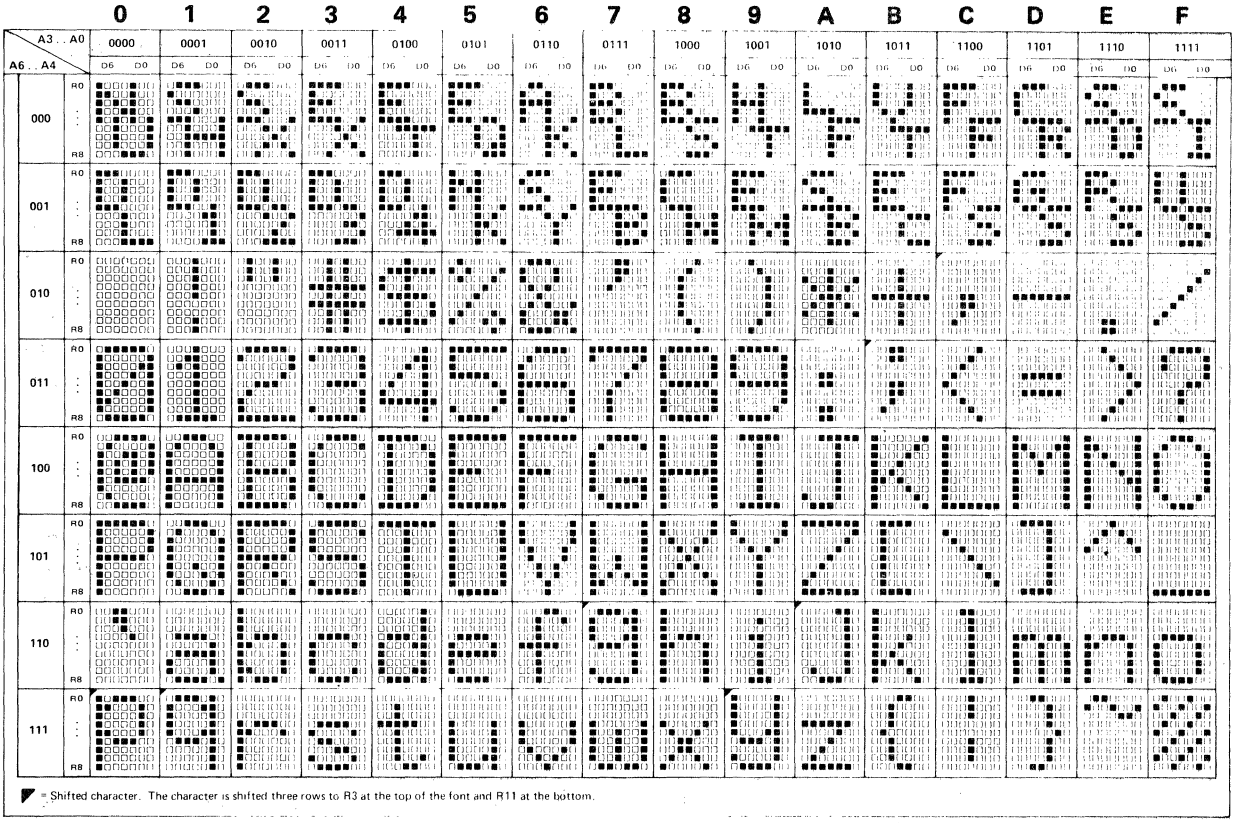
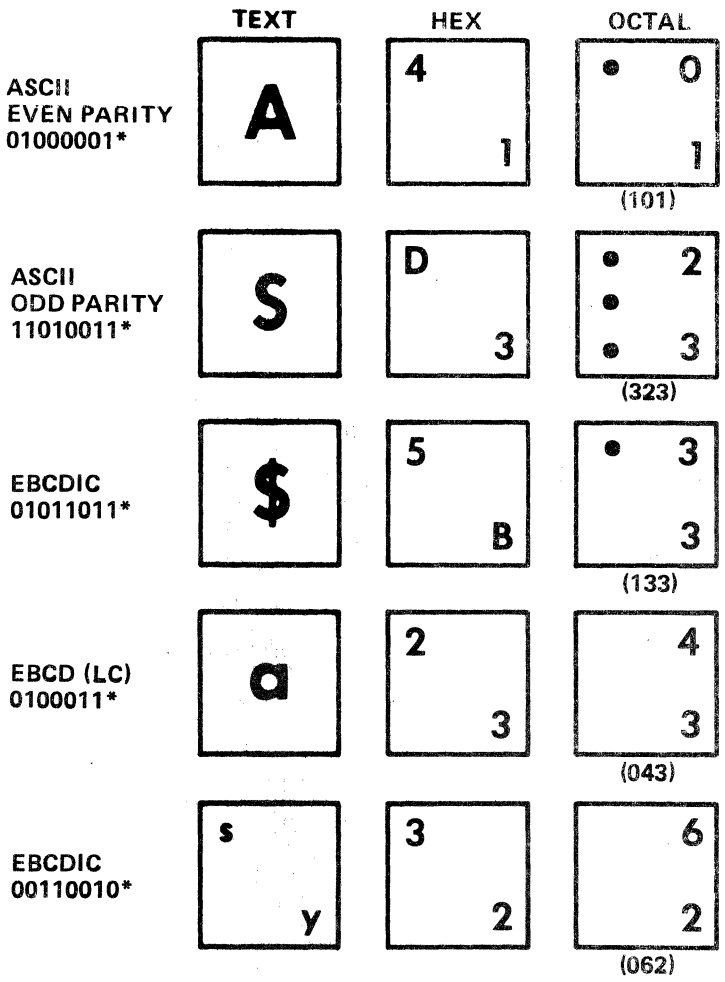


Figure 2-2. 128-Character ANSI Symbol Set for Data Communications Formed in 7 x 9 Dot Matrix Display Format.



*Least Significant Bit (LSB) is on right, and is transmitted (or received) first.

Figure 2-3. Examples of Display Format in Text, Hex and Octal.

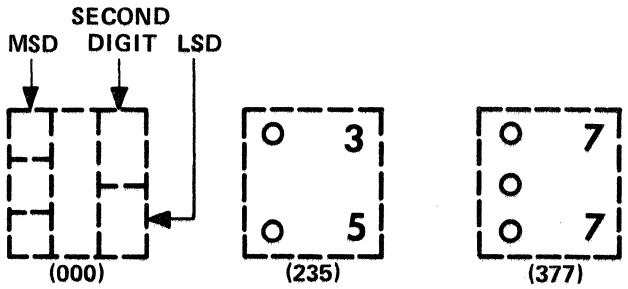


Figure 2-4. Octal Display Format Grouping in Symbol Position.

After SN-291 the following changes are effective:

HEX 07	DISPLAYS	07
60		– (minus)
61		/ (slash)
79		' (accent)
A1		~
EO		\ (reverse slash)

Table 2-4. Input Address and Corresponding Output Display Symbols for EBCDIC Data Code.

HEX ADDR	SYMB.	HEX ADDR	SYMB.	HEX ADDR	SYMB.	HEX ADDR	SYMB.	HEX ADDR	SYMB.	HEX ADDR	SYMB.
00	N_U	30*	3_0	60*	6_0	90*	9_0	C0	{	F0	0
01	S_H	31*	3_1	61*	6_1	91	j	C1	A	F1	1
02	S_X	32	S_Y	62*	6_2	92	k	C2	B	F2	2
03	E_X	33*	3_3	63*	6_3	93	l	C3	C	F3	3
04	0_4	34*	3_4	64*	6_4	94	m	C4	D	F4	4
05	H_T	35*	3_5	65*	6_5	95	n	C5	E	F5	5
06*	0_6	36*	3_6	66*	6_6	96	o	C6	F	F6	6
07	▒	37	E_T	67*	6_7	97	p	C7	G	F7	7
08*	0_8	38*	3_8	68*	6_8	98	q	C8	H	F8	8
09*	0_9	39*	3_9	69*	6_9	99	r	C9	I	F9	9
0A*	0_A	3A*	3_A	6A	¦	9A*	9_A	CA*	C_A	FA*	F_A
0B	V_T	3B*	3_B	6B	,	9B*	9_B	CB*	C_B	FB*	F_B
0C	F_F	3C	D_4	6C	%	9C*	9_C	CC*	C_C	FC*	F_C
0D	C_R	3D	N_K	6D	-	9D*	9_D	CD*	C_D	FD*	F_D
0E	S_O	3E*	3_E	6E	>	9E*	9_E	CE*	C_E	FE*	F_E
0F	S_I	3F	S_B	6F	?	9F*	9_F	CF*	C_F	FF	▒
10	D_L	40	(SP)	70*	7_0	A0*	A_0	D0	}		
11	D_1	41*	4_1	71*	7_1	A1*	A_1	D1	J		
12	D_2	42*	4_2	72*	7_2	A2	s	D2	K		
13	D_3	43*	4_3	73*	7_3	A3	t	D3	L		
14*	1_4	44*	4_4	74*	7_4	A4	u	D4	M		
15*	1_5	45*	4_5	75*	7_5	A5	v	D5	N		
16	B_5	46*	4_6	76*	7_6	A6	w	D6	O		
17*	1_7	47*	4_7	77*	7_7	A7	x	D7	P		
18	C_N	48*	4_8	78*	7_8	A8	y	D8	Q		
19	E_M	49*	4_9	79	`	A9	z	D9	R		
1A*	1_A	4A*	4_A	7A	:	AA*	A_A	DA*	D_A		
1B*	1_B	4B	R_S	7B	#	AB*	A_B	DB*	D_B		
1C	F_S	4C	<	7C	@	AC*	A_C	DC*	D_C		
1D	G_S	4D	(	7D	'	AD*	A_D	DD*	D_D		
1E	R_S	4E	+	7E	=	AE*	A_E	DE*	D_E		
1F	U_S	4F*	4_F	7F	"	AF*	A_F	DF*	D_F		
20*	2_0	50	&	80*	8_0	B0*	B_0	E0*	E_0		
21*	2_1	51*	5_1	81	a	B1*	B_1	E1*	E_1		
22*	2_2	52*	5_2	82	b	B2*	B_2	E2	S		
23*	2_3	53*	5_3	83	c	B3*	B_3	E3	T		
24*	2_4	54*	5_4	84	d	B4*	B_4	E4	U		
25	L_F	55*	5_5	85	e	B5*	B_5	E5	V		
26	E_B	56*	5_6	86	f	B6*	B_6	E6	W		
27	E_C	57*	5_7	87	g	B7*	B_7	E7	X		
28*	2_8	58*	5_8	88	h	B8*	B_8	E8	Y		
29*	2_9	59*	5_9	89	i	B9*	B_9	E9	Z		
2A*	2_A	5A	!	8A*	8_A	BA*	B_A	EA*	E_A		
2B*	2_B	5B	$	8B*	8_B	BB*	B_B	EB*	E_B		
2C*	2_C	5C	*	8C*	8_C	BC*	B_C	EC*	E_C		
2D	EQ	5D	)	8D*	8_D	BD*	B_D	ED*	E_D		
2E	AK	5E	;	8E*	8_E	BE*	B_E	EE*	E_E		
2F	BL	5F*	5_F	8F*	8_F	BF*	B_F	EF*	E_F		

***Symbol will be displayed in OCTAL when CONTROL CHARACTER switch is set to OCTAL.**

Table 2-5. Input Address and Corresponding Output Display Symbols for ASCII Data Code.

HEX ADDR	SYMB.	HEX ADDR	SYMB.	HEX ADDR	SYMB.	HEX ADDR	SYMB.
00	N_U	20	(SP)	40	@	60	`
01	S_H	21	!	41	A	61	a
02	S_X	22	"	42	B	62	b
03	E_X	23	#	43	C	63	c
04	E_T	24	$	44	D	64	d
05	E_Q	25	%	45	E	65	e
06	A_K	26	&	46	F	66	f
07	B_L	27	'	47	G	67	g
08	B_S	28	(	48	H	68	h
09	H_T	29	)	49	I	69	i
0A	L_F	2A	*	4A	J	6A	j
0B	V_T	2B	+	4B	K	6B	k
0C	F_F	2C	,	4C	L	6C	l
0D	C_R	2D	-	4D	M	6D	m
0E	S_O	2E	.	4E	N	6E	n
0F	S_I	2F	/	4F	O	6F	o
10	D_L	30	ϕ	50	P	70	p
11	D_1	31	1	51	Q	71	q
12	D_2	32	2	52	R	72	r
13	D_3	33	3	53	S	73	s
14	D_4	34	4	54	T	74	t
15	N_K	35	5	55	U	75	u
16	S_Y	36	6	56	V	76	v
17	E_B	37	7	57	W	77	w
18	C_N	38	8	58	X	78	x
19	E_M	39	9	59	Y	79	y
1A	S_B	3A	:	5A	Z	7A	z
1B	E_C	3B	;	5B	[	7B	{
1C	F_S	3C	<	5C	/	7C	¦
1D	G_S	3D	=	5D	]	7D	}
1E	R_S	3E	>	5E	^	7E	~
1F	U_S	3F	?	5F	-	7F	▒

Table 2-6. Input Address and Corresponding Output Display Symbols for EBCD Data Code.

ADDR	OUT LC	OUT UC	ADDR	OUT LC	OUT UC
00	(SP)	(SP)	20	1	=
01	-	-	21	j	J
02	@	0_2	22	^	?
03	&	+	23	a	A
04	8	*	24	9	(
05	q	Q	25	r	R
06	y	Y	26	z	Z
07	h	H	27	i	I
08	4	:	28	5	%
09	m	M	29	n	N
0A	u	U	2A	v	V
0B	d	D	2B	e	E
0C	D_2	D_2	2C	R_S	R_S
0D*	0_D	0_D	2D	C_R	C_R
0E*	0_E	0_E	2E	L_F	L_F
0F	D_4	D_4	2F	H_T	H_T
10	2	<	30	3	;
11	k	K	31	ℓ	L
12	s	S	32	t	T
13	b	B	33	c	C
14	ϕ	)	34	#	"
15	#	#①	35	$	!
16	.	.①	36	,	3_6
17*	1_7	1_7	37	.	^
18	6	'	38	7	>
19	o	O	39	p	P
1A	w	W	3A	x	X
1B	f	F	3B	g	G
1C	^	^	3C	E_T	E_T
1D	B_S	B_S	3D	S_Y	S_Y
1E*	1_E	1_E	3E	S_H	S_H
1F	\	\	3F	⁘	⁘

① NOTE: These characters are undefined in EBCD. The INTERVIEW uses these two characters to generate the fill symbols in FDX.

*Characters will be displayed in OCTAL when CONTROL CHARACTER switch is set to OCTAL.

Table 2-7. Input Address and Corresponding Output Display Symbols for SELECTRIC Data Code.

HEX ADDR	SYMBOL		HEX ADDR	SYMBOL	
	LC	UC		LC	UC
00	(SP)	(SP)	20	1	N_U
01	!	0_1	21	m	M
02	t	T	22	x	X
03	j	J	23	g	G
04	4	$	24	ϕ	)
05	o	O	25	s	S
06	ℓ	L	26	h	H
07	/	?	27	y	V
08	5	%	28	7	&
09	'	"	29	r	R
0A	e	E	2A	d	D
0B	p	P	2B	;	:
0C	D_2	D_2	2C	R_S	R_S
0D*	0_D	0_D	2D	C_R	C_R
0E*	0_E	0_E	2E	L_F	L_F
0F*	D_4	D_4	2F	H_T	H_T
10	2	@	30	3	#
11	.	.①	31	v	V
12	n	N	32	u	U
13	=	+	33	f	F
14	z	Z	34	9	(
15	#	#①	35	w	W
16*	1_6	1_6	36	b	B
17*	1_7	1_7	37	-	-
18	6	1_8	38	8	*
19	i	I	39	a	A
1A	k	K	3A	c	C
1B	q	Q	3B	,	,
1C	^	^	3C	E_T	E_T
1D	B_S	B_S	3D	S_Y	S_Y
1E*	1_E	1_E	3E	S_H	S_H
1F	\	\	3F	⁘	⁘

① NOTE: These characters are undefined in SELECTRIC. The INTERVIEW uses these two characters to generate the fill symbols for FDX.

*Characters will be displayed in OCTAL when CONTROL CHARACTER switch is set to OCTAL.

Table 2-8. Input Address and Corresponding Output Display Symbols for BAUDOT Data Code.

HEX ADDR	SYMB		HEX ADDR	SYMB	
	FIGS	LTRS		FIGS	LTRS
00	0_0	0_0	10	5	T
01	3	E	11	"	Z
02	L_F	L_F	12	)	L
03	-	A	13	2	W
04	0_4	(SP)	14	#	H
05	0_5	S	15	6	Y
06	8	I	16	ϕ	P
07	7	U	17	1	Q
08	C_R	C_R	18	9	O
09	$	D	19	?	B
0A	4	R	1A	8	G
0B	'	J	1B	^	^
0C	,	N	1C	.	M
0D	!	F	1D	/	X
0E	:	C	1E	;	V
0F	(	K	1F	\	\

Table 2-9. Input Address and Corresponding Output Display Symbols for FIELD Data Code.

HEX ADDR	SYMB	HEX ADDR	SYMB	HEX ADDR	SYMB	HEX ADDR	SYMB
00	0_0	10	K	20	)	30	ϕ
01	&	11	L	21	-	31	1
02	^	12	M	22	+	32	2
03	[	13	N	23	<	33	3
04	]	14	O	24	=	34	4
05	(SP)	15	P	25	>	35	5
06	A	16	Q	26	#	36	6
07	B	17	R	27	$	37	7
08	C	18	S	28	*	38	8
09	D	19	T	29	(	39	9
0A	E	1A	U	2A	%	3A	'
0B	F	1B	V	2B	:	3B	;
0C	G	1C	W	2C	?	3C	/
0D	H	1D	X	2D	!	3D	.
0E	I	1E	Y	2E	,	3E	F_F
0F	J	1F	Z	2F	@	3F	C_R

Table 2-10. Input Address and Corresponding Output Display Symbols for REVERSE EBCD Data Code.

HEX ADDR	SYMB LC	SYMB UC	HEX ADDR	SYMB LC	SYMB UC
00	(SP)	(SP)	20	-	-
01	1	=	21	j	J
02	2	<	22	k	K
03	3	;	23	l	L
04	4	:	24	m	M
05	5	%	25	n	N
06	6	'	26	o	O
07	7	>	27	p	P
08	8	*	28	q	Q
09	9	(	29	r	R
0A	ϕ	)	2A	#①	#①
0B	#	"	2B	$	!
0C	[	]	2C	\	^
0D	F_F	F_F	2D	C_R	C_R
0E	^	^	2E	B_S	B_S
0F*	0_F	0_F	2F*	2_F	2_F
10	@	1_0	30	&	+
11	/	?	31	a	A
12	s	S	32	b	B
13	t	T	33	c	C
14	u	U	34	d	D
15	v	V	35	e	E
16	w	W	36	f	F
17	x	X	37	g	G
18	y	Y	38	h	H
19	z	Z	39	i	I
1A	.①	.①	3A*	3_A	3_A
1B	,	'B	3B*	.	3_B
1C	}	{	3C	~	`
1D	'D	'D	3D*	3_D	3_D
1E	'E	'E	3E	\	\
1F	'F	'F	3F*	3_F	3_F

① NOTE: These characters are undefined in REVERSE EBCD. The INTERVIEW uses these characters to generate the fill symbols for FDX.

*Characters will be displayed in OCTAL when CONTROL CHARACTER switch is set to OCTAL.

Table 2-11. Input Address and Corresponding Output Display Symbols for REVERSE BCD Data Code.

HEX ADDR	SYMB		HEX ADDR	SYMB	
	LC	UC		LC	UC
00	(SP)	(SP)	20	-	-
01	1	=	21	j	J
02	2	0_2	22	k	K
03	3	;	23	l	L
04	4	:	24	m	M
05	5	%	25	n	N
06	6	'	26	o	O
07	7	"	27	p	P
08	8	*	28	q	Q
09	9	(	29	r	R
0A	ϕ	)	2A	#①	#①
0B	'	0_B	2B	$	!
0C	0_C	0_C	2C*	2_C	2_C
0D	R_S	R_S	2D	C_R	C_R
0E	^	^	2E	B_S	B_S
0F	E_T	E_T	2F*	2_F	2_F
10	@	1_0	30	&	+
11	/	?	31	a	A
12	s	S	32	b	B
13	t	T	33	c	C
14	u	U	34	d	D
15	v	V	35	e	E
16	w	W	36	f	F
17	x	X	37	g	G
18	y	Y	38	h	H
19	z	Z	39	i	I
1A*	1_A	1_A	3A*	3_A	3_A
1B	1_B	,	3B	.	.
1C*	1_C	1_C	3C*	3_C	3_C
1D	L_F	L_F	3D	H_T	H_T
1E*	1_E	1_E	3E	\	\
1F*	1_F	1_F	3F	⁘	⁘

① NOTE: This character is actually undefined in REV BCD. The INTERVIEW uses this character to generate one of the fill symbols for FDX.

*Characters will be displayed in OCTAL when CONTROL CHARACTER switch is set to OCTAL.

SECTION III

DISPLAY CONTROL BY DTM-2

3.1 GENERAL

While a test with the DTM-2 is in progress, the display features of the INTERVIEW can be controlled by certain test functions of the DTM-2 test program. Program functions which control the display features of the INTERVIEW are outlined in the following paragraphs.

3.2 FUNCTION 90 – SYNCHRONOUS SIGNALS

When the INTERVIEW and INTERSHAKE II are used in testing a synchronous circuit, the appropriate SYNC character must be entered into the DTM-2, and in full-duplex (FDX) operation, into the INTERVIEW also.

The SYNC character is loaded into the DTM-2 and INTERVIEW by using Function 90 and the SYNC character. The INTERVIEW contains an AUTO SYNC circuit which will initiate synchronized operation after receiving *two* SYNC characters. These characters *are not* displayed by the INTERVIEW; any character which follows the two SYNC characters will be displayed. When seven or eight consecutive characters with no transitions occur (FF or 00), the receiver will disable synchronization, and data input to the INTERVIEW is inhibited to increase the effective display of significant data.

NOTE

When using DTM-2 equipment with serial number D241 or below in FDX synchronous operation, the SYNC CHARACTER must be entered as follows:

1. In LOAD mode, enter SYNC CHARACTER using BIT SWITCHES and ENTER push button.

2. Step down one step to observe (on the DTM-2 Data Display) the SYNC CHARACTER which has been entered.

3. Depress ENTER SYN BITS switch on DTM-2 while the character is being displayed.

4. Write over the (dummy) entry of STEP 1 if necessary.

5. DO NOT USE FUNCTION 90 as part of the test program. Such use will automatically update SYNC character to an unknown random character. This character will be any character which is occurring on the *receive bus* at the time FUNCTION 90 is executed during the program.

3.3 FUNCTION 95 – SYNC SEARCH

When the DTM-2 receiver is not in synchronization, no data will be routed to the INTERVIEW. This condition may be induced by using a Function 95 in the test program, where the SYNC SEARCH mode is forced.

For example, when the display must be "quiet" after a certain test sequence (to preserve a display), a Function 95 will immediately inhibit any new data until a new SYNC character sequence is recognized in the data.

3.4 FUNCTION 39 – CRC CALCULATION

Function 39 is used in a test program to check the CRC calculation. The CRC characters will be displayed by the INTERVIEW while **the calculation is being performed.**

NOTE

When using DTM-2 equipment with serial number C238 and below, the CRC characters will *not* be displayed, but will repeat the character preceding EXT *and* the ETX.

3.5 FUNCTION 94 – PERIPHERAL CONTROL

Function 94 is used to activate any of eight flags which initiate control of the INTERVIEW. These flags are selected using the "X" portion of the hexadecimal data character "XY." The "Y" portion can then be either a "1" to enable the flag or a "0" to disable the flag. The flags are assigned as follows:

FLAG	INTERVIEW CONTROL
0	CLEAR
1	PAGE 1
2	PAGE 2
3	FREEZE
4	UNASSIGNED
5	REVERSE ENHANCEMENT
6	LOW INTENSITY ENHANCEMENT
7	BLINK ENHANCEMENT

These control flags initiate control as follows:

- CLEAR — The CLEAR operation requires two milliseconds delay to ensure that data will be displayed following the operation. Thus, a preferred sequence is:

FUNCTION	DATA	OPERATION
94	01	CLEAR ON
80	02	DELAY 2 mS
94	00	CLEAR OFF

The CLEAR operation also returns the CRT cursor to the HOME position.

- PAGE 1 / PAGE 2 — The PAGE selection permits display of PAGE 1 or PAGE 2. Without this selection, the display automatically shows the 1024-character composite of PAGE 1 + PAGE 2.
- FREEZE — Freezes display in three microseconds and inhibits display of new data in any mode. When used, the DTM-2 cannot clear screen. Display can be cleared manually.
- REVERSE — This flag initiates display of character(s) with reverse video, providing black symboi on white background.
- LOW INTENSITY — This enhancement causes character or symbol to be displayed at reduced brightness.
- BLINK — This enhancement causes a displayed character to blink ON and OFF at approximately one-second intervals.

Combinations of REVERSE, LOW INTENSITY and BLINK can be programmed to provide up to eight unique enhancements.

3.6 HALF-DUPLEX SYNCHRONOUS OPERATION (HDX)

For HDX operation, the receiver in the DTM-2 if fully programmable. The following Functions should be used:

FUNCTION	DESCRIPTION
90	Enter SYNC bits. (See Paragraph 3.2.)
94	Peripheral controller will be initialized by the start switch to enable normal display; e.g., enhancements are OFF, FREEZE is OFF, PAGES 1 and 2 controlled by front panel switch on INTERVIEW. Set Enhancements as desired.
95	AUTO SYNC (HEX 10) will present Receive data to the INTERVIEW until eight PAD or NULL characters are received. HEX 14 will inhibit the data to the display after four PAD or NULL characters. This eliminates INTERVIEW space filled by idle time. NOTE: Timing should NEVER be estimated by counting IDLE characters on the CRT display.

3.7 SDLC OPERATION

In SDLC the following Functions must be used in either HDX or FDX:

FUNCTION	DESCRIPTION
90	Enter SYNC bits as 7E
94	Peripheral Controller
95	AUTO SYNC
96	SDLC Mode selection

NOTE

The Receiver in the INTERVIEW will delete "0" and display data. NRZI decoding is NOT included for the INTERVIEW receiver in FDX (this is the only limitation with FDX).

3.8 AUTOMATIC SYNCHRONIZATION (AUTO SYNC)

The AUTO SYNC (Function 95, Data 10) maintains synchronization of the receiver logic at all times in *both* INTERVIEW and INTERSHAKE instruments. There is no requirement for *bit shifting* or *bit sliding*. When a short IDLE period occurs, the following SYNC characters may not be delayed an exact multiple of character times. The following SYNC character will occur "bit shifted" from its anticipated position. The receiver, upon receipt of the entire SYNC pattern (one or two characters as selected), will automatically become synchronized. During the receipt of the skewed SYNC characters, they will be assembled bit skewed and will be displayed on the INTERVIEW as random characters (depending on the number of Bits skewed) until a complete SYNC pattern is received.

An example of skewed SYNC characters is found in most BI-SYNC Polling sequences: "SY, SY, SY, ET, IDLE, SY, SY, 40, 40 . . ." The IDLE is usually four bits long; therefore, the second pair of SYNCs will be displaced four bits. The INTERVIEW will DISPLAY: "SY, ET, F3, 23, 40, 40 . . ." Had the IDLE been 12 bits long, the display would be: "SY, ET, FF, F3, 23, 40, 40 . . ." It should be noted in these examples that only the SYNC characters appear skewed. Skew is eliminated after the first complete SYNC pattern has been received.

3.9 SCREEN FULL SENSING

When the INTERVIEW screen is full, a logic signal is available to the DTM-2. This signal may be tested in several ways using Functions 73, 75, 77 and 78 and Data Bit 1 instead of the RS-232 interface leads, as follows:

FUNCTION	DATA	DESCRIPTION
73	01	Wait until screen is full (receive data will display until screen is full, then next step can Freeze the display).
75	01	Interrupts when screen is full. The interrupt Vectors to step 60 (last page) and should be serviced within 2 mS to freeze the display before vertical retrace completes.
77,78	01	Jump decisions can be used to continue a repeated program or sub-routine until the screen is full.

Note the signal is true or ON until the screen is full. When the screen is full, the signal is OFF.

3.10 PROMPTING MESSAGES TO INTERVIEW

MESSAGES to operator via INTERVIEW. Comments can be programmed into the DTM and written to the INTERVIEW to explain a test result or call the attention of the operator.

When the DTM-2 is in the ON-LINE (or MONITOR) mode, the transmitter in the DTM-2 can not transmit onto either the TD or RD leads. However, the transmit Functions 50's and 60's operate internally at the selected data rate. Using these functions to send specific characters or messages will initiate their display on the INTERVIEW without disrupting the data path being monitored. Enhancements are also operative, to allow the "comment" from the DTM-2 to be clearly highlighted.

NOTE

In the OFF line mode the Auto-Panel Function 93 can be used to momentarily place the DTM-2 in the monitor TD or RD mode so the comment can be written to the INTERVIEW without transmitting it onto the circuit under test. Temporary selection of the highest data speed using Function 92 (e.g., INT OSC 56KBS) will shorten the time required to write the comment.

3.11 FULL DUPLEX OPERATION IN TEST MODE

This configuration permits the operator to observe the response of various system equipment to a local test. In the TEST MODEM or TEST TERMINAL configuration, the serial data applied to the INTERVIEW originates from the "other" source. For example, in the TEST TERMINAL configuration, the serial data signal is obtained from the MODEM.

In order to observe FDX, the following manual operations are required:

1. The equipment *not under test* must be disconnected from the DTM-2.

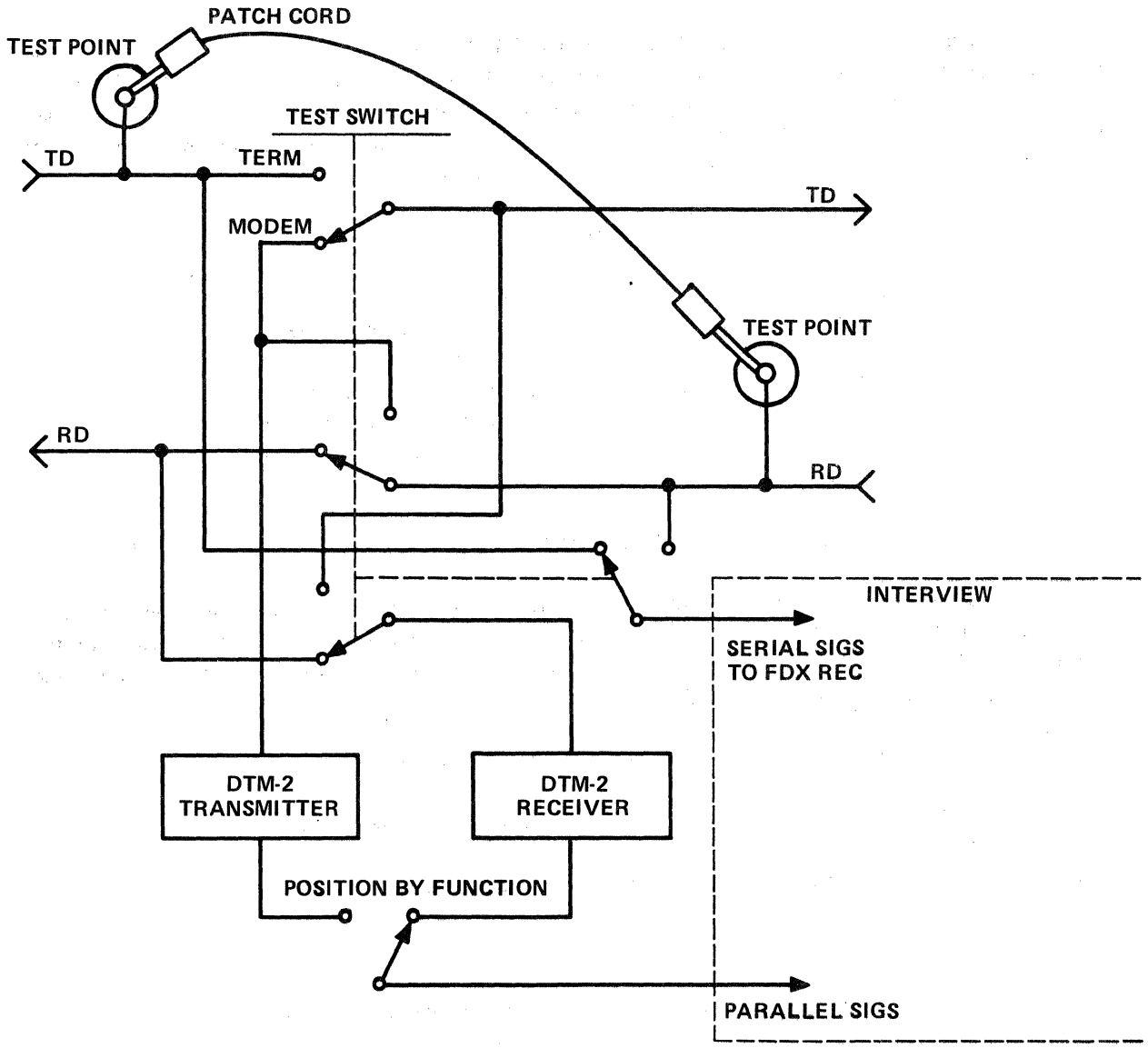
2. The TD and RD test points on the DTM-2 must be patched together.

NOTE

This is the *only* configuration which requires that the equipment *not under test* be disconnected.

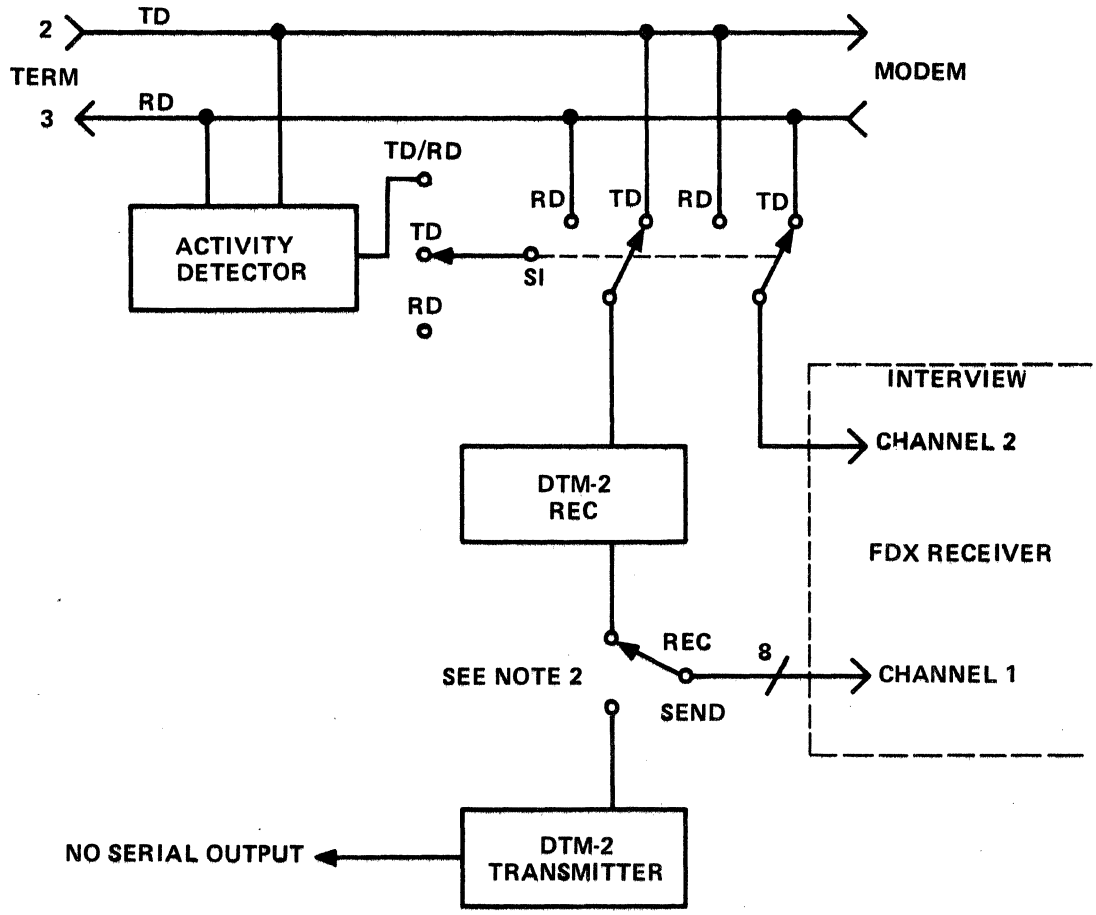
3.12 SIGNAL PATHS FOR TEST CONFIGURATIONS

The two basic signal paths established by the DTM-2 and INTERVIEW are shown in Figures 3-1 and 3-2. Figure 3-1 relates the "Test Mode," where TEST TERMINAL or TEST MODEM is selected. Figure 3-2 shows the signal path while the DTM-2 is used as a monitoring instrument.



PATCH CORD is only required for FDX display when DTM-2 is in TEST MODEM or TEST TERMINAL mode.

Figure 3-1. Signal Patch for INTERSHAKE (DTM-2) and INTERVIEW in Test Mode.



NOTES:

1. SI is manually selected on the Front Panel (or by Auto Panel Function 93).
2. Receiver Data are always presented in the RUN mode EXCEPT:
   A) Function 90 to enter SYNC bits
   B) Functions 50, 51, 52, 53, 54 and 60 thru 67 presents Send Data characters.

Figure 3-2. Signal Path for INTERSHAKE (DTM-2) and INTERVIEW in MONITOR mode.

SECTION IV

DISPLAY CONTROL BY DTM-1

4.1 GENERAL

Display control of the INTERSHAKE I (DTM-1) is somewhat limited, as opposed to control of the INTERSHAKE II (DTM-2). Available control functions are outlined in the following paragraphs:

The DTM-1 presents *receive* data only to the INTERVIEW. The HDX/FDX switch on the INTERVIEW may *not* be operated in the FDX position.

While the DTM-2 presents transmitted data (FUNCTIONS 5X, 6X) to the INTERVIEW, the DTM-1 presents only received signals.

4.2 DTM-1 CONTROL FUNCTIONS

The DTM-1 can be programmed to control the INTERVIEW display using the following Functions:

FUNCTION	DATA	DESCRIPTION
70	02	Enables display
71	02	Freezes display
70	XX	Reverse ON (Patch selected control)
71	XX	Reverse OFF (lead to DET T.P.)

The following Enhancements are automatically obtained:

Enhancement	Responds to
LOW INTENSITY	Low intensity is assigned to active data on the RD lead.
BLINK	Characters containing Parity Errors will blink.

4.3 TESTING SYNCHRONOUS SIGNALS

The INTERVIEW will display data after it is in SYNC. The DTM-1 must be programmed with the correct SYNC character, either manually or with Function 90. One or two SYNC characters can be selected within the DTM-1 by using a strap. The INTERVIEW will not display the first SYNC character when in the two-character SYNC mode.

The criteria for being OUT SYNC are also important because the DTM-1 must be out of SYNC to look for new SYNC (whereas the DTM-2 has AUTO SYNC). Refer to the DTM-1 manual for the OUT OF SYNC

convention. See also "INTERSHAKE ANSWER" No. 23. Generally, after the information is extracted from the signal, a SYNC SEARCH FUNCTION 95 will quiet the receiver (no more INTERVIEW data will be displayed) and enable it to look for the next SYNC pattern.

4.4 PROMPTING MESSAGES TO INTERVIEW

Comments or messages can be programmed into the DTM and displayed to the INTERVIEW. Alert the operator by using "AUTO PANEL" Function 93 to select *SELF MONITOR*. The internal receiver will then receive the prompt message and display it.

When the DTM-1 is in the ON-LINE (or MONITOR) mode, the transmitter in the DTM-1 cannot transmit onto either the TD or RD leads; however, the transmit Functions 50s and 60s will operate internally at the selected data rate. Using these functions to send specific characters or messages for comments will display them on the INTERVIEW without disrupting the data Path being monitored by using Function 93 to select SELF MONITOR.

NOTE

In the Off-Line mode, the Auto Panel Function 93 can be used to momentarily place the DTM-1 in the SELF MONITOR mode so the comment can be written to the INTERVIEW without transmitting it to the circuit under test. Temporary selection of the highest data speed will shorten the time required to write the comment.

The Reverse enhancement is also operative, thus allowing the "comment" from the DTM-1 to be clearly highlighted.

SECTION V

INTERVIEW APPLICATIONS (DTM-2)

5.1 GENERAL

The applications covered in this section are typical examples of how the INTERVIEW may be used in practical test configurations. Applications are shown for operation with the INTERSHAKE II (DTM-2) instrument.

The following paragraphs show techniques for programming the DTM-2 to provide control of the INTERVIEW display.

The START switch on DTM-2 initializes the INTERVIEW controls to UNFREEZE, 1024 characters (Page 1 + 2), and Enhancements OFF. These controls may be generated at any point in the user's test program to obtain the desired display characteristics.

5.2 MONITOR: DISPLAY ALL DATA ON TD AND RD (Single Line)

Select the TEST TD/RD position on the DTM-2 so the DTM-2 will assign itself to the active signal path. Enhance the Receive Data by REVERSE image to assist in distinguishing between Transmit and Receive Data.

5.2.1 Circuit Description

- SYNC
- BI-SYNC Protocol, EBCDIC
- FDX, Point-to-Point, idle time between turn-around of system (transmission is *not* simultaneous on both paths).

5.2.2 DTM-2 Set-up

CONTROL	SETTING
BIT RATE	EXTERNAL (use modem clocks)
INFO BITS	8
PARITY	NONE
SYNC/ASYNC	SYNC
TEST	TD/RD
CONTROL EIA (toggle)	OFF
EIA (toggle)	EIA

5.2.3 INTERVIEW Set-up

CONTROL	SETTING
FDX/HDX	HDX
CODE	EBCDIC
PAGE	1 + 2
FREEZE	RUN
TOTAL SCREEN	TEXT
CONT. CHAR.	ABBREV.

5.2.4 Program Techniques

See Program Form (Figure 5-1).

NOTES

1. A maximum of 8 idle characters (PAD-FF or NULL-00) will be displayed by the CRT. Idle characters will then be inhibited in order to use the display more efficiently when long turnaround times exist in the system under test.

2. The two characters *following* an idle period of less than eight characters in duration are to be disregarded. They can be SYNC characters that are bit-skewed by an idle period not containing a multiple of eight bits. See Paragraph 3.3 for an explanation of AUTO SYNC operation.

3. Timing should not be inferred by counting idle FF characters. Use the DTM-2 time duration measurement, Function 87.

5.3 MONITOR: DISPLAY ALL DATA ON TD AND RD (Dual Line)

Select the TEST TD or the TEST RD position on the DTM-2 as desired. Data from the selected lead will be presented to the DTM-2 for program analysis and will be displayed in full intensity on the CRT. The data on the other (non-selected) path will be displayed on the CRT in low intensity. No other enhancement is necessary to distinguish the TD from the RD data.

5.3.1 Circuit Description

- SYNC
- BI-SYNC Protocol
- FDX — Simultaneous transmission in each direction is permitted.

INTERSHAKE II PROGRAM

TITLE: *MONITOR: DISPLAY ALL DATA ON TD AND RD (Single Line)*

FILE NO.

SHEET 1 OF 1

DESCRIPTION:

For displaying synchronous data occurring on both the TD and the RD leads in in systems using non-simultaneous transmission. Refer to paragraph 5.2.

OBJECTIVE:

ADDRESS PAGE (CIRCLE ONE) 3 2 1 (0)		ENTRY STEP	DATA	FUNCTION	FUNCTION DESCRIPTION/COMMENTS	JUMP ← →
C 8 4 (0)	0	0	32	90	Enter SYNC Bits	
	1	1	10	95	AUTO SYNC	
	2	2	59	94	RD ACTIVITY = REVERSE IMAGE	
	3	3	00	00	HALT	
	4	4				
	5	5				
	6	6				
	7	7				
	8	8				
	9	9				
	A	10				
	B	11				
	C	12				
	D	13				
	E	14				
	F	15				
D 9 5 1	0	16				
	1	17				
	2	18				
	3	19				
	4	20				
	5	21				
	6	22				
	7	23				
	8	24				
	9	25				
	A	26				
	B	27				
	C	28				
	D	29				
	E	30				
	F	31				

APPLICABLE INFORMATION (WRITE IN OR CIRCLE)

- CODE: *EBCDIC*
- SPEED: *EXT*
- ASYNC / (SYNC)
- SYN CHARACTER: *HEX 32*
- STOP BIT: 1.0 , 1.5 , 2.0
- INFO BITS: 5 , 6 , 7 , (8)
- PARITY: (NONE) , ODD , EVEN
- CONTROL EIA (OFF)
- ON-LINE (TD/RD) TD , RD
- OFF-LINE: TERM / MODEM
- MON SIGS (NORMAL)
- PATCH CORDS
- CONTROL EIA (V.24)
- COUNTER ZONE
- INTERRUPTS
- FLAGS
- LATCH

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Figure 5-1.

5.3.2 DTM-2 Set-up

CONTROL	SETTING
BIT RATE	EXTERNAL (MODEM CLOCK)
INFO BITS	8
PARITY BITS	NONE
ASYNC/SYNC	SYNC
TEST	TD or RD
CONTROL EIA/OFF	OFF
EIA/MIL	EIA

5.3.3 INTERVIEW Set-up

CONTROL	SETTING
FDX/HDX	FDX
CODE	EBCDIC
PAGE	1 + 2
FREEZE	RUN
TOTAL SCREEN	TEXT
CONTROL. CHAR.	ABBREV.

5.3.4 Program Technique

See Program Form (Figure 5-2).

NOTES

1. Data are written on the INTERVIEW two lines at a time. The time correlation is indicated by horizontal time slots. For example:

   . . ABCD . .
   . . . . QZ . .

   The Q occurred after B, but before C.

2. TIME FILL symbol (.) or (#) is presented to the screen to indicate that no character was present on that Path between two consecutive characters on the other Path.

3. When either receiver is out of Sync, in the DTM-2 or INTERVIEW, a time fill symbol will be generated to indicate IN SYNC and OUT SYNC conditions.

4. See also NOTES for Paragraph 5.2.4.

INTERSHAKE II PROGRAM

TITLE: *MONITOR: DISPLAY ALL DATA ON TD AND RD (Dual Line)*

FILE NO.

SHEET *1* OF *1*

DESCRIPTION:

For displaying synchronous data occurring on both the TD and RD leads in systems using simultaneous transmission. Refer to paragraph 5.3.

OBJECTIVE:

ADDRESS PAGE (CIRCLE ONE) 3 2 1 0		ENTRY STEP	DATA	FUNCTION	FUNCTION DESCRIPTION/COMMENTS	JUMP ← →
C 8 4 (0)	0	0	*32*	*90*	*Enter SYNC Bits*	
	1	1	*10*	*95*	*AUTO SYNC*	
	2	2	*00*	*00*	*HALT*	
	3	3				
	4	4				
	5	5				
	6	6				
	7	7				
	8	8				
	9	9				
	A	10				
	B	11				
	C	12				
	D	13				
	E	14				
	F	15				
D 9 5 1	0	16				
	1	17				
	2	18				
	3	19				
	4	20				
	5	21				
	6	22				
	7	23				
	8	24				
	9	25				
	A	26				
	B	27				
	C	28				
	D	29				
	E	30				
	F	31				

APPLICABLE INFORMATION (WRITE IN OR CIRCLE)

- CODE: *EBCDIC*
- SPEED: *EXT*
- ASYNC / (SYNC)
- SYN CHARACTER: *HEX 32*
- STOP BIT: 1.0 , 1.5 , 2.0
- INFO BITS: 5 , 6 , 7 , (8)
- PARITY: (NONE) ODD , EVEN
- CONTROL EIA / (OFF)
- ON-LINE TD/RD , (TD) , (RD)
- OFF-LINE TERM / MODEM
- MON SIGS / (NORMAL)
- PATCH CORDS
- CONTROL EIA (V. 24)
- COUNTER ZONE
- INTERRUPTS
- FLAGS
- LATCH

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Figure 5-2.

5.4 MONITOR: SELECTIVELY DISPLAY, ENHANCE, AND CAPTURE DATA

The objective of this application is to accomplish the following:

1. Display receive data in Reverse Image (in response to the RLSD lead OFF).
2. Display in Low Intensity the portion of a message after STX through ETX (BCC will be bright).
3. Ignore any response from the STATION with address AA.
4. Freeze the display after receipt of a NAK.
5. Indicate capture of NAK message with an audible tone.

5.4.1 Circuit Description

- SYNC
- BI-SYNC Protocol, EBCDIC
- FDX, multi-point, nonsimultaneous transmission

5.4.2 DTM-2 Set-up

CONTROL	SETTING
BIT RATE	EXTERNAL
INFO BITS	8
PARITY	NONE
ASYNC/SYNC	SYNC
TEST	TD or RD
EIA/MIL	EIA
CONTROL EIA/OFF	OFF

5.4.3 INTERVIEW Set-up

CONTROL	SETTING
FDX/HDX	HDX
CODE	EBCDIC
PAGE	1 + 2
FREEZE	RUN
TOTAL SCREEN	TEXT
CONT. CHAR.	ABBREV.

5.4.4 Program Techniques

See Figure 5-3.

INTERSHAKE II PROGRAM

TITLE: *MONITOR: SELECTIVELY DISPLAY, ENHANCE AND CAPTIVE DATA.*

FILE NO.

SHEET *1* OF *1*

DESCRIPTION:

Refer to paragraph 5.4.

OBJECTIVE:

ADDRESS PAGE (CIRCLE ONE) 3 2 1 0		ENTRY STEP	DATA	FUNCTION	FUNCTION DESCRIPTION/COMMENTS	JUMP ← →
C 8 4 (0)	0	0	32	90	Enter SYNC Bits	
	1	1	10	95	AUTO SYNC	
	2	2	5A	94	RLSD OFF = Reverse Image	
(0) 3	3	3	30	94	Freeze OFF "REPEAT"	←
	4	4	01	94	Clear ON	
	5	5	02	80	2ms	
	6	6	00	94	Clear OFF	
	7	7	02	98	NO-OP	
(0) 8	8	8	01	14	Wait 1 Char "NEXT"	←
	9	9	02	98	NO-OP	
(0) A	10	16	41	Preset "FIND"	←	
	B	11	02	46	Retest and Jump = STX "LOW ON"	→
	C	12	19	41	Preset	
	D	13	03	46	Retest and Jump = ETX "LOW OFF"	→
	E	14	28	41	Preset	
	F	15	37	46	Retest and Jump = EOT "FREEZE OFF"	→
D 9 5 1	0	16	2D	46	Retest and Jump = ENQ "FREEZE OFF"	→
	1	17	2B	41	Preset	
	2	18	3D	46	Retest and Jump = NAK "CAPTURE"	→
	3	19	20	41	Preset	
	4	20	C1	46	Retest and Jump = A "ADDRESS"	→
	5	21	08	40	JUMP "NEXT"	→
1 (6)	22	61	94	LOW ON "LOW ON"	←	
	7	23	08	40	JUMP "NEXT"	→
	8	24	/	/		
1 (9)	25	60	94	LOW OFF "LOW OFF"	←	
	A	26	08	40	JUMP "NEXT"	→
	B	27				
	C	28				
	D	29				
	E	30				
	F	31				

APPLICABLE INFORMATION (WRITE IN OR CIRCLE)

- CODE: *EBCDIC*
- SPEED: *EXT*
- ASYNC / (SYNC)
- SYN CHARACTER
- STOP BIT: 1.0 , 1.5 , 2.0
- INFO BITS: 5 , 6 , 7 , (8)
- PARITY: (NONE), ODD , EVEN
- CONTROL EIA (OFF)
- ON-LINE TD/RD , (TD) , (RD)
- OFF-LINE: TERM / MODEM
- MON SIGS / NORMAL
- PATCH CORDS
- CONTROL EIA (V. 24)
- COUNTER ZONE
- INTERRUPTS
- FLAGS
- LATCH

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Figure 5-3.

ADDRESS PAGE (CIRCLE ONE) 3 2 1 0		ENTRY STEP	DATA	FUNCTION	FUNCTION DESCRIPTION/COMMENTS		JUMP ← →	ADDITIONAL INFORMATION (WRITE IN)
E A 6 2	0	32	0A	41	Preset	"ADDRESS"	←	
	1	33	C1	45	Jump ≠ A	"FIND"	→	
	2	34	7F	45	Jump ≠ " (7F)	"FIND"	→	
	3	35	7F	45	Jump ≠ " (7F)	"FIND"	→	
	4	36	2D	45	Jump ≠ ENQ	"FIND"	→	
	5	37	31	94	Freeze ON			
	6	38	0A	40	Jump	"FIND"	→	
	7	39						
	8	40	30	94	Freeze OFF	"Freeze OFF"	←	
	9	41	08	40	Jump	"NEXT"	→	
	A	42						
	B	43	31	94	Freeze ON	"CAPTURE"	←	
	C	44	01	70	Beep ON			
	D	45	10	81	100 ms			
	E	46	01	71	Beep OFF			
	F	47	00	00	HALT			
F B 7 3	0	48	03	41	Jump	"REPEAT"	→	
	1	49						
	2	50						
	3	51						
	4	52						
	5	53						
	6	54						
	7	55						
	8	56						
	9	57						
	A	58						
	B	59						
	C	60						
	D	61						
	E	62						
	F	63						

ADDITIONAL REMARKS

PROGRAM LOCATION
DTM S/N
CELL
RAM
PROM

PROGRAM WRITTEN BY: DATE

COMPANY NAME: TEL. NO.

ADDRESS:

FORM NO. TP-139-3-77

Figure 5-3. Continued.

NOTES

1. STX and BCC will be normal. Text and ETX will be low intensity.

2. Poll address C1, C1, 7F, 7F, 2D will be displayed but no traffic will be displayed until after an EOT is present on either the TD or RD lead indicating that an acceptable response has been received.

3. If C1, C1, 7F, 7F does not respond and there is no reply EOT, the display will be re-enabled by the next ENQ (Step 16).

4. Other approaches to re-enabling the display for the situation of Note 3 are: using an interrupt time out; "jump testing" the RLSD lead; or RTS lead status.

5. Operating start or halt will clear the screen.

6. Manual selection of the Page switch would allow capturing one NAK message on Page 1, then another on Page 2. The Page can be automatically sequenced under program control.

7. See also notes to Paragraph 5.2.4.

SECTION VI

INTERVIEW APPLICATIONS (DTM-1)

6.1 GENERAL

The following paragraphs show techniques for programming two typical examples of DTM-1 control of the INTERVIEW.

The START switch on DTM-1 initializes the INTERVIEW controls to UNFREEZE and Enhancements OFF. These controls may be generated at any point in the user's test program to obtain the desired INTERVIEW display characteristics.

6.2 MONITOR: PROTOCOL DISPLAY AND NAK CAPTURE

This program performs these basic operations:

1. Deletes message text (character after STX through ETX).
2. Receive Data is displayed LOW INTENSITY.
3. All NAK characters are displayed in Highlight.

6.2.1 Circuit Characteristics

SYNC
BI-SYNC, EBCDIC
NON-Simultaneous transmission FDX

6.2.2 DTM-1 Settings

CONTROL	SETTING
BIT RATE	EXTERNAL
INFO BITS	8
PARITY	NONE
ASYNC/SYNC	SYNC
TEST	TD/RD
EIA/MIL	EIA
CONTROL EIA/OFF	OFF

6.2.3 INTERVIEW Settings

CONTROL	SETTING
FDX/HDX	HDX
CODE	EBCDIC
TOTAL SCREEN	TEXT
HIGHLIGHT	3D (NAK)
FREEZE	RUN

6.2.4 Program

See Figure 6-1.

NOTES

1. Leave the DTM-1 in the RUN mode and set FREEZE switch to MANUAL position on the INTERVIEW. When the DTM-1 RUN indicator is OFF, alternate lines will appear in HEX (as in the LOAD mode). Last step in program could be "wait for RI OFF" and then patch RI ON, so that step never completes – RUN indicator stays lit.

2. Text following STX through and including ETX will not be displayed.

3. All NAK characters will be highlighted on the CRT screen as they appear. The Reverse blink enhancement is easily visible.

6.3 MONITOR: FREEZE NAK MESSAGES

This program performs the following basic operations in displaying the data:

1. Receive data is displayed LOW INTENSITY.

2. All data to the INTERVIEW is displayed until a NAK freezes the display for visual analysis.

3. All ENQ characters are Highlighted.

4. All characters with Parity errors Blink.

INTERSHAKE II PROGRAM

TITLE: *MONITOR: PROTOCOL DISPLAY AND NAK CAPTURE*

FILE NO.

SHEET *1* OF *1*

DESCRIPTION:

Refer to paragraph 6.2.

OBJECTIVE:

ADDRESS PAGE (CIRCLE ONE) 3 2 1 0		ENTRY STEP	DATA	FUNCTION	FUNCTION DESCRIPTION/COMMENTS	JUMP ← →
C 8 4 0	0	0	00	94	*WRITE OVER RESULTS MEMORY*	
	1	1	00	96	*RESTART HERE (STEPS 03,04)*	
	2	2	00	95	*RESYNC REC*	
	3	3	32	24	*TEST FOR VALID SYN #2*	
	4	4	37	24	*TEST FOR EOT*	
	5	5	00	95	*RESYNC REC*	
	6	6	00	96	*RESTART HERE*	
	7	7	02	24	*TEST FOR STX*	
	8	8	02	70	*FREEZE ON*	
	9	9	03	20	*TRAP ETX*	
	A	10	02	71	*FREEZE OFF*	
	B	11	00	98		
	C	12				
	D	13				
	E	14				
	F	15				
D 9 5 1	0	16				
	1	17				
	2	18				
	3	19				
	4	20				
	5	21				
	6	22				
	7	23				
	8	24				
	9	25				
	A	26				
	B	27				
	C	28				
	D	29				
	E	30				
	F	31				

APPLICABLE INFORMATION (WRITE IN OR CIRCLE)

- CODE: *EBCDIC*
- SPEED: *EXT*
- ASYNC / (SYNC)
- SYN CHARACTER: *HEX 32*
- STOP BIT: 1.0 , 1.5 , 2.0
- INFO BITS: 5 , 6 , 7 , (8)
- PARITY: (NONE) , ODD , EVEN
- CONTROL EIA: (OFF)
- ON-LINE: (TD/RD) TD , RD
- OFF-LINE: TERM / MODEM
- MON SIGS: (NORMAL)
- PATCH CORDS
- CONTROL EIA (V.24)
- COUNTER ZONE
- INTERRUPTS
- FLAGS
- LATCH

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Figure 6-1.

6.3.1 Circuit Characteristics

SYNC
EBCDIC
NON-Simultaneous transmission FDX

6.3.2 DTM-1 Settings

CONTROL	SETTING
BIT RATE	EXTERNAL
INFO BITS	8
PARITY	NONE
ASYNC/SYNC	SYNC
TEST	TD/RD
EIA/MIL	EIA
CONTROL EIA/OFF	OFF

6.3.3 Interview Setting

CONTROL	SETTING
FDX/HDX	HDX
CODE	EBCDIC
TOTAL SCREEN	TEXT
HIGHLIGHT	2D (ENQ)
FREEZE	RUN

6.3.4 Program

See Figure 6-2.

NOTES

1. Note 1 of Paragraph 6.2.4 applicable.
2. Functions requiring a BCD match such as Function 32 will never find a match with Data=FF and this step will never complete. The RUN indicator will remain ON.
3. On a multi-drop Poll, the addresses after EOT may be displayed as "displaced," bit shifted codes if idle periods of less than 8 bits are present.

INTERSHAKE II PROGRAM

TITLE: *MONITOR: FREEZE NAK MESSAGE*

FILE NO.

SHEET *1* OF *1*

DESCRIPTION:

Refer to paragraph 6.3.

OBJECTIVE:

ADDRESS PAGE (CIRCLE ONE) 3 2 1 0		ENTRY STEP	DATA	FUNCTION	FUNCTION DESCRIPTION/COMMENTS	JUMP ← →
C 8 4 0	0	0	32	90	ENTER SYNC	
	1	1	00	94	WRITE OVER RESULTS MEMORY	
	2	2	00	95	START SYNC SEARCH	
	3	3	3D	20	TRAP NAK	
	4	4	02	70	FREEZE ON	
	5	5	F	32	LOG CHARACTERS ("forever")	
	6	6				
	7	7				
	8	8				
	9	9				
	A	10				
	B	11				
	C	12				
	D	13				
	E	14				
	F	15				
D 9 5 1	0	16				
	1	17				
	2	18				
	3	19				
	4	20				
	5	21				
	6	22				
	7	23				
	8	24				
	9	25				
	A	26				
	B	27				
	C	28				
	D	29				
	E	30				
	F	31				

APPLICABLE INFORMATION (WRITE IN OR CIRCLE)

- CODE: *EBCDIC*
- SPEED: *EXT*
- ASYNC / (SYNC)
- SYN CHARACTER: *HEX 32*
- STOP BIT: 1.0 , 1.5 , 2.0
- INFO BITS: 5 , 6 , 7 , (8)
- PARITY: (NONE) ODD , EVEN
- CONTROL EIA (OFF)
- ON-LINE: (TD/RD) TD , RD
- OFF-LINE: TERM / MODEM
- MON SIGS (NORMAL)
- PATCH CORDS
- CONTROL EIA (V. 24)
- COUNTER ZONE
- INTERRUPTS
- FLAGS: 7
- LATCH

CONTINUE ON OTHER SIDE

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CONTINUE ON OTHER SIDE

Figure 6-2.

APPENDIX A

MODIFICATIONS REQUIRED

FOR IMPLEMENTATION OF

OPTIONAL CODES A & B

TRANSLATION CAPABILITY

A-1 GENERAL

The information in this Appendix contains instructions for performing the required modifications for implementing translation of Optional Codes A and B. The procedure requires the addition of five (5) PROM modules, and the installation of straps on the circuit board.

A-2 VALID COMBINATIONS

A-2.1 A and B USED AS TWO 6-BIT CODES

In this configuration, Codes A and B are used as two separate 6-bit (or less) codes which use "shift" and "unshift" characters to produce Upper/Lower case, or Figures/Letters, using 64 code patterns to generate 128 character symbols.

Examples of this combination are codes such as BAUDOT (5 data bits, 32 code patterns, 64 character symbols), EBCD, and SELECTRIC (6 data bits, 64 code patterns, 128 character symbols). This type of combination is available installed at the time of manufacture, as listed in Section I (General Information) of this manual.

A-2.2 A and B USED AS TWO 7-BIT CODES

In this configuration, Codes A and B are used as two separate 7-bit codes which each produce 128 character symbols. An example of such a code is ASCII (7 bits, no parity).

A-2.3 A and B USED AS ONE 8-BIT CODE

In this configuration, Codes A and B are combined to form one 8-bit code, such as EBCDIC, to produce 256 character symbols.

A-3 STRAP INSTALLATION

Table A-1 shows the straps which must be installed for each of the valid code combinations outlined in Paragraph A-2. The table also shows the strapping necessary for generation of fill characters for FDX Idle Symbols. The location of these straps are shown in Figures A-1 and A-2.

NOTE

ONLY TWO STRAPS ARE USED FOR ANY ONE COMBINATION.

Table A-1. Strapping Requirements for Code A/B Combinations.

Strap Location	Function	Par. A-2.1	Par. A-2.2	Par. A-2.3
A D1-D27	Code A/B	64 CH. SHFT	128 CH.	–
B D2-D28	Code A/B	64 CH. SHFT	–	–
C D3-D29	Code A/B	–	–	256 CH.
D D4-D30	Code A/B	–	128 CH.	256 CH.
E D5-D31	FDX FILL SYMBOL (#)			
F D6-D32	FDX FILL SYMBOL (.)			

A-4 PROM MODULE INSTALLATION

A-4.1 MODULES INVOLVED

The following modules are involved in the implementation procedure and are shown in Figure A-2:

PROM MODULE	FUNCTION
860 M	Control Character Detect
860 O	Translate High-Order Bits
860 P	Translate Low-Order Bits
860 E	Shift Detect
860 D	Clear/Symbol

A-4.2 INSTALLATION PROCEDURE

Modules are installed in steps as follows:

STEP 1. Install PROM 860 M with Pin 1 at DF10

STEP 2. Install PROM 860 O with Pin 1 at DH10

STEP 3. Install PROM 860 P with Pin 1 at DH10

STEP 4. Replace existing PROM 860 D with new module with Pin 1 at BB46.

STEP 5. When implementation of Codes A and B is performed to use two separate 6-bit (or less) codes, as outlined in Paragraph A-2.1, the existing PROM 860 E is replaced with a new module, with Pin 1 positioned at DH28.

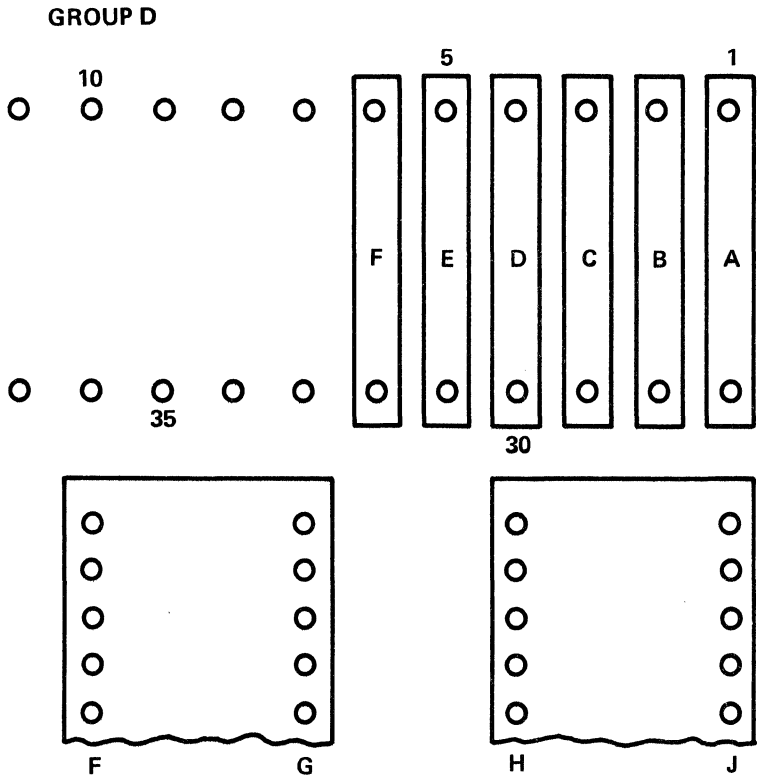

Figure A-1. Location of Strapping on Circuit Board.

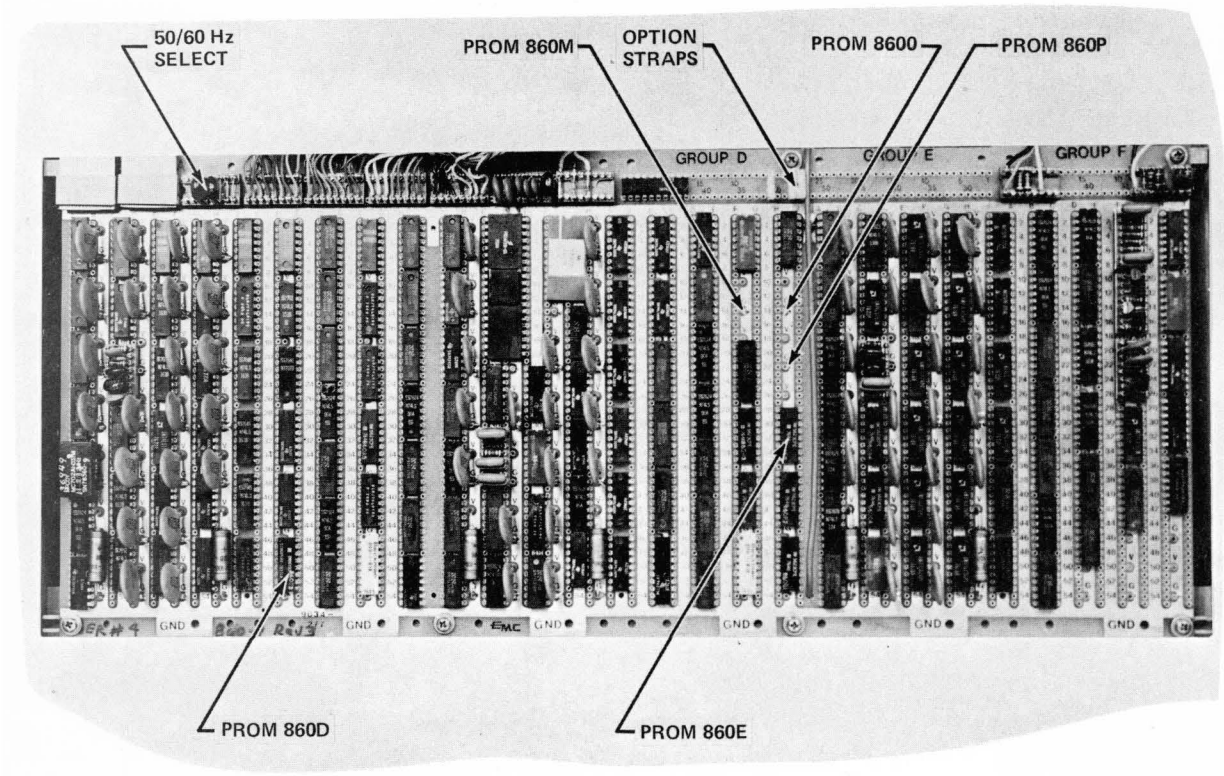

Figure A-2. Circuit Board Assembly.

APPENDIX B

INTERSHAKE FUNCTION LIST AND TEST AID

INTERSHAKE™ DTM-1

FUNCTION LIST

Revised 8/18/75

Group	Function	Description	LOAD (TEST) Enter Data Bits (HEX) 8 7 6 5 4 3 2 1	PLAY (TEST RESULTS) Data	Function
	(added functions underlined)				
If Test	00	Fill Results Memory (follow with Function 98)	(01)	(01)	00
onitor					
Library	01	Trap on TD & RD	Char	Char	02 or 03
	02	Trap only TD	Char	Char	02
	03	Trap only RD	Char	Char	03
	09	End of Monitor Trap Library	(00)		
TD⇄RD	10	Wait til TD⇄RD Change	(00)		
	11	Log til TD⇄RD Change	(F0)	Char	11
	12	Record TD or RD Status	(01)	01	02 or 03
	13	Time Out or TD⇄RD	0.1-9.9 sec		
eceive					
Trap	20	Char	Char	Char	20
	21	First Char in Sequence	Char	Char	21
	22	Middle Char in Sequence	Char	Char	22
	23	Last Char in Sequence	Char	Char	23
	†24	Test Next Char	Char	Char	24
Log	30	Next Char	(00)	Char	30
	31	Char N	01-99 in BCD	Char	31
	32	N Characters	01-63 in BCD	Char	32
	33	Char before Trap	Trap Char	Char	33
	34	Next Char with Parity Error	(01)	Char	34
LRC	37	Start LRC ODD	0*	0*	37
	38	Start LRC EVEN	0*	0*	38
	39	Test LRC & LOG	(00)	Char	39
ransmit					
Characters	50	Send Char	Char		
	51	Send Char & Log Char	Char	Char	51
LRC	57	Start LRC ODD	0*	0*	57
	58	Start LRC EVEN	0*	0*	58
	59	Send LRC			
Message	60	Baudot Fox N Times	01-99 in BCD		
	61	ASCII Fox N Times	01-99 in BCD		
	**64	EBCDIC Msg N Times	01-99 in BCD		
	**65	EBCD Msg N Times	01-99 in BCD		
	**66	Field Data Msg N Times	01-99 in BCD		
	**67	Selectric Msg N Times	01-99 in BCD		
			RTS CTS DSR RLSD DTR RI TP 8 7 6 5 4 3 2 1		
RS232	70	Turn On	One or More 0*	Leads 0*	70
	71	Turn Off	One or More 0*	0*	71
	72	Detect On	Any		
	73	Detect Off	Any		
	74	Stop On	Any 0*	0*	74
	75	Stop Off	Any 0*	0*	75
	76	Cancel 74,75 Stop	(00) 0*	0*	76
	†77	Test On	One –		
	†78	Test Off	One –		
			8 7 6 5 4 3 2 1		
Time					
Generate	80	01-99 ms	01-99 –		
	81	.01-.99 sec	01-99 –		
	82	.1-9.9 sec	01-99 –		
Measure	86	DET RTS-CTS Delay			
	87	Start Duration	0*	0*	87
	88	Stop Duration	0*	0*	88
	89	Event Count	0*	0*	89
Auto Panel	90	SYN Char	Char –		
	91	Sync-Bits-Parity-Mil	Code 91 0*	Code 0*	91
	92	Bit-Rate - Term CLK	Code 92 0*	Code 0*	92
	93	Test-Control EIA-Monitor	Code 93 0*	Code 0*	93
Control	94	Write over Results Memory	0*	0*	94
	95	Start Sync Search	0*	0*	95
	96	Restart from ≠24, 77, 78	0*	0*	96
	97	Skip over this step	0*	0*	97
	98	Recycle Test	(00) –		
	99	Stop Test = Complete Lite	(00) –		

†Note: If character/condition is other than that entered for test, the test sequence returns to the preceding Function 96 or 21 for recycle of the test.

* "1" causes unit to record function
"0" will not record function
( ) data in Hex

**Option allows customer to specify Msg type and content.

USE OF BIT SWITCHES

The eight toggle switches marked 1 through 8 correspond to the eight bits in a data character. Bit 1 is the first data bit transmitted or received. (Start and stop bits are added automatically in Asynchronous operation.)

The MARK position of each switch represents a logic "1" and the SPACE position represents a logic "0." The BIT switches are used for the following functions:

a. Entry of data bits.

b. Control of RS-232 leads in conjunction with program functions 70 - 78.

c. Entry of BCD digits required by some program functions. Panel markings indicate the relative binary value assignments (80, 40, 20, 10, 8, 4, 2, 1).

d. Bit 1 is used with some program functions to log them into the results memory.

e. Entry of the special codes required with program functions 91, 92 and 93.

f. Entry of the SYN character bit pattern into the INTERSHAKE receiver via the ENTER SYN BITS switch in the TRANSMISSION DATA FORMAT ZONE (Zone 1).

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AUTO PANEL FUNCTION

	Sw Position	BIT 8	7	6	5	4	3	2	1
FUNCTION 91	Sync	S	M	–	–	–	–	–	0*
	Async 1.0 Stop	S	S	–	–	–	–		–
	Async 1.5 Stop	M	S	–	–	–	–		–
	Async 2.0 Stop	M	S	–	–	–	–		–
	Info Bits 5	–	–	S	S	–	–		–
	Info Bits 6	–	–	M	S	–	–		–
	Info Bits 7	–	–	S	M	–	–		–
	Info Bits 8	–	–	M	M	–	–		–
	Parity Even	–	–	–	–	S	M		–
	Parity Odd	–	–	–	–	S	S		–
	Parity None	–	–	–	–	M	S		–
FUNCTION 92	Internal Source					M	–		–
	•External Source					S	–		–
	EIA					–	M		–
	MIL					–	S		–
	Osc	S	S	S	S	–	–		–
	50	S	S	S	M	–	–		–
	75	S	S	M	S	–	–		–
	110	S	S	M	M	–	–		–
	134.5	S	M	S	S	–	–		–
	150	S	M	S	M	–	–		–
	300	S	M	M	S	–	–		–
	600	S	M	M	M	–	–		–
	900	M	S	S	S	–	–		–
	1.2K	M	S	S	M	–	–		–
	1.8K	M	S	M	S	–	–		–
	2.4K	M	S	M	M	–	–		–
	3.6K	M	M	S	S	–	–		–
	4.8K	M	M	S	M	–	–		–
	7.2K	M	M	M	S	–	–		–
	9.6K	M	M	M	M	–	–		–
FUNCTION 93	TD/RD	S	M	M	M	M	–	–	–
	TD	M	S	M	M	M	–	–	–
	RD	M	M	S	M	M	–	–	–
	Test Term	M	M	M	S	M	–	–	–
	Test Modem	M	M	M	M	S	–	–	–
	Monitor Sigs Out	–	–	–	–	–	S	–	–
	(Mon Sigs Out) Normal	–	–	–	–	–	M	–	–
	Control EIA (On)	–	–	–	–	–	–	S	–
	(Control EIA) Off	–	–	–	–	–	–	M	–

•Conditions DTM for terminal-provided clock via pin 24.

INTERSHAKE II FUNCTION LIST

THESE FUNCTIONS CAN BE COMBINED IN ANY ORDER TO SIMULATE OR TEST DATA COMMUNICATION SYSTEMS AND EQUIPMENT.

NOTE: The "Bit Entry Method" shown in the following Table is All Space, Mark/Space, BCD, Binary or "XY". No method is shown where a language character is to be entered. When a character must be entered, the user should utilize the method familiar to him, i.e., HEX, Octal, Bit Switch arrangement, etc.

LOAD INTO MEMORY								READ OUTCOME IN RESULTS MEMORY (when applicable)		
GROUP	FUNCTION	DESCRIPTION	ENTER	BIT ENTRY METHOD	BIT SWITCH 8765 POSITION	BIT SWITCH 4321 POSITION	DATA HEX DISPLAY (Range)	DATA HEX DISPLAY (Range)	ITEM REPRESENTED	FUNCTION
HALT	00	Stop Program, Operate Step To Continue	00	All Space	SSSS	SSSS	00	-	-	-
MONITOR	01	Start Character Search	00	All Space	SSSS	SSSS	00	-	-	-
	02	Trap Characters On TD Only	Character				00-FF	00-FF	Character	02
	03	Trap Characters On RD Only	"				"	"	"	03
	04	Trap Characters On TD or RD	"				"	"	"	02(TD) or 03(RD)
	05	End Character Search	00	All Space	SSSS	SSSS	00	"	"	-
RECORD	07	Record Bit Switch Arrangement Entered	Desired Tab Mark	Mark/Space	As Desired		00-FF	00-FF	Tab Mark/Space	07
	08	Record Loop "L" Count (See Fun 42 & 43)	00	All Space	SSSS	SSSS	00	00-0F	No. of Loops (in BCD)	08
	09	Record Interrupt Step	"	"	"	"	"	00-FF	Step (in Binary)	09
RECEIVE	#10	Wait Until TD/RD Change	00	All Space	SSSS	SSSS	00	-	-	-
	#11	Record Until TD/RD Change	"	"	"	"	"	00-FF	Character (Continues until TD/RD change)	11
	12	Record TD/RD and RS-232(V.24) Status	"	"	"	"	"	"	8 7 6 5 4 3 2 1 AUX DETECT (7X) DETECT TP RI DTR RLSD DSR CTS RTS	02(TD) or 03(RD)
									NOTE: MARK (ON) = ACTIVE SPACE (OFF) = INACTIVE	
INDEX	#13	Time Out or TD/RD Change	01-99 (for 0.1 to 9.9 Sec.)	BCD	80 40 20 10	8 4 2 1	01-99	-	-	-
	14	Wait N Received Characters	No. of Characters	"	"	"	"	-	-	-
	15	Wait To Complete Transmit Character (Must be used with Function 57 when in synchronous operation)	00	All Space	SSSS	SSSS	00	-	-	-
	16	Wait Until = Character	Character				00-FF	-	-	-
	17	Wait Until ≠ Character	"				"	-	-	-
	19	Enter Interrupt Character (Enable with Function 97 (03))	"				"	-	-	-
	#	The Test Selector Switch must be in the TD/RD position.								
TRAP	20	Trap Character	Character				00-FF	00-FF	Character	20
	21	Trap First Character in Sequence	"				"	"	"	21
	22	Trap Middle Character(s) in Sequence	"				"	"	"	22
								(Continues until Trap Last Character)		
	23	Trap Last Character in Sequence	"				"	00-FF	Character	23
RECORD	25	Record Until Trap Character	Trap Character				"	"	Any Character	25
								(Continues until Trap Character)		
								00-FF	Trap Character	25
	26	Record Next ≠ Character	= Character				"	"	≠ Character	26
	30	Record Next Character	00	All Space	SSSS	SSSS	00	00-FF	Character	30
	31	Record Character N	Character No.	BCD			01-99	"	"	31
	32	Record N Characters	No. of Characters	"	"	"	"	"	"	32
								(Continues until Nth Character is recorded)		
	33	Record Character Before Trap	Trap Character				00-FF	00-FF	Character -1	33
	*34	Jump and Record PE	00	All Space	SSSS	SSSS	00	"	PE Character	34
	*35	Record Latch Mode								
		Normal OFF	00	All Space	SSSS	SSSS	00	-	-	-
		Record Receive Data	01	BCD	"	SSSM	01	00-FF	Character	Undefined
								(Continues until turned OFF by 35(00)		
		Self Monitor	02	"	"	SSMS	02	-	-	-
		Record All Transmit Data	03	"	"	SSMM	03	00-FF	Character	Undefined
								(Continues until turned OFF by 35(00)		
	36	Record Current Character	00	All Space	"	SSSS	00	00-FF	Character	36
	*	Preceded by Function 41 for Jump Instruction.								
	*	This Function is latched into Memory and must be restored to Normal OFF (00) at the point in the program sequence where it is desired that subsequent Functions not be effected.								

INTERSHAKE II FUNCTION LIST

(Continued)

LOAD INTO MEMORY								READ OUTCOME IN RESULTS MEMORY (when applicable)		
GROUP	FUNCTION	DESCRIPTION	ENTER	BIT ENTRY METHOD	BIT SWITCH 8765 POSITION	4321	DATA HEX DISPLAY (Range)	DATA HEX DISPLAY (Range)	ITEM REPRESENTED	FUNCTION
RECEIVE (cont'd)	38	Start BCC		XY	X	Y				
		Define "X" for:			8421	8421				
		Normal calculation of CRC and EVEN LRC	0-		SSSS		00-08			
		Inverted data for calculation of CRC and ODD	1-		SSSM		10-18			
		Define "Y" for:								
		EBCDIC/CRC-16	-0			SSSS	00 or 10			
		CRC-16 Reverse	-1			SSSM	01 or 11			
		Old IBM	-2			SSMS	02 or 12			
		CRC-12	-3			SSMM	03 or 13			
		CCITT/SDLC-CRC	-6			SMMS	06 or 16			
		CCITT/CRC Reverse	-7			SMMM	07 or 17			
		LRC (6, 7, 8 Level)	-8			MSSS	08 or 18			
RECEIVE BCC	*39	Jump If = BCC Error								
		Jump on Error	00	BCD	SSSS	SSSS	00			
		Jump and Record on Error	01	"	"	SSSM	01	00-FF	LRC Character	39
								or		
	*	Preceded by Function 41 for Jump Instruction.						00-FF	CRC_1 Character	39
								00-FF	CRC_2 Character	39
								NOTE: Results Memory is not applicable for Functions 40 through 99 (except for 89). However, this column space is continued for the purpose of: REMARKS AND USERS NOTES		
JUMP AND TEST	40	Unconditional Jump to Program Step XY	Step No.	Binary	128 64 32 16	8421	00-FF	Binary Address 0-255		
	41	Preset to Instruct Subsequent "Jump(s)" to Jump to Step "XY"		"	"	"	"	Binary Address 0-255		
	42	Repeat (Loop) "L" Times	No. of Loops	BCD	80 40 20 10	8421	01-99			
	*43	Jump Until "L" Loops	00	All Space	SSSS	SSSS	00	Functions 43 through 47 must be preceded by Function 41 for "Jump To" Instructions.		
	*44	Jump If = Character	Character				00-FF			
	*45	Jump If ≠ Character	"				"			
	*46	Retest and Jump If = Character	"				"			
	*47	Flags: Set and Jump		XY	X	Y				
		Define "X" for:								
		Eight Settable and Testable Flags	0-		SSSS		00-03	The "X" digit is used to select Flag 0 through Flag 7. All Flags are reset cleared to "0" by the start switch. Once selected, the Flag is set or tested as determined by the "Y" digits 0, 1, 2 or 3 (see below).		
			1-		SSSM		10-13			
			2-		SSMS		20-23			
			3-		SSMM		30-33			
			4-		SMSS		40-43			
			5-		SMSM		50-53			
			6-		SMMS		60-63			
			7-		SMMM		70-73			
		Define "Y" for:								
		Eight Selectable and Testable Flags								
		Set Flag to 0	-0			SSSS	00-70	All "Y" digits 1 through 3 are applicable to "X" digits 1 through 7.		
		Set Flag to 1	-1			SSSM	01-71			
		Jump If = 0	-2			SSMS	02-72			
		Jump If = 1	-3			SSMM	03-73			
		Define "X" for:								
		Internal Signals (Jump Only)								
		Memory Overflow	8-		MSSS		82,83	The "X" digit selects one of eight fixed assigned signals. Once selected, the Flag is provided Jump Instructions as determined by the "Y" digits 2 and 3 (see below).		
		Parity Error	9-		MSSM		92,93			
		Overflow Counter (on Front Panel)	A-		MSMS		A2,A3			
		END Counter (on Front Panel)	B-		MSMM		B2,B3			
		Timeout (Function 84 Presets Timer)	C-		MMSS		C2,C3			
		Out of Sync	D-		MMSM		D2,D3			
		Frame Detect (SDLC)	E-		MMMS		E2,E3			
		SDLC BCC Error	F-		MMMM		F2,F3			
		Define "Y" for:								
		Internal Signals (Jump Only)								
		Jump If = 0	-2			SSMS	02-F2	Only the "Y" digits 2 and 3 are applicable to "X" digits 8 through F.		
		Jump If = 1	-3			SSMM	03-F3			
	*	Functions 43 through 47 must be preceded by Function 41 for Jump Instructions.								

INTERSHAKE II FUNCTION LIST

(Continued)

LOAD INTO MEMORY								REMARKS AND USERS NOTES
GROUP	FUNCTION	DESCRIPTION	ENTER	BIT ENTRY METHOD	BIT SWITCH 8765 4321 POSITION		DATA HEX DISPLAY (Range)	
RESULTS MEMORY	48	Select Results Memory Step	Step No.	Binary	126 64 32 16	8 4 2 1	00-3F	Binary Address 0-63
	49	Select Results Memory Page and Step 00	Page No.	"	SSSS	"	00-0F	Binary Address 0-15
TRANSMIT SEND DATA	50	Send Character	Character				00-FF	
	51	Send a Progression		XY	X (8 4 2 1)	Y		Must be used in a program containing a loop using Functions 41, 42 and 43 in order to generate the incrementing action.
		High order "X" digit bits are used to position the sequence in the alpha or numeric field of the desired code. The amount of Progression is obtained from incrementing action provided by Functions 41, 42 and 43.	0-F for "X" All Space for "Y"		"	SSSS	00-FF	Although "All Space" is set in for the low order "Y" digits, the information actually transmitted for "Y" is a Hex ("Y") representation of the increment number obtained from the Loop Counter, Function 43.
SEND FROM RM	52	Send Single Results Memory (RM) Character	00	All Space	SSSS	SSSS	00	Functions 52, 53 and 54 are normally used with Functions 48 and 49.
	53	Send from RM including Trap Character	Trap Character				00-FF	
	54	Send from RM until Trap Function	00-99	BCD	80 40 20 10	8 4 2 1	00-99	Also, Function 68.
SEND MODE	°55	Mode: Echo/Mark/Space						
		Normal OFF	00	BCD	SSSS	SSSS	00	
		Send Steady Mark	01	"	"	SSSM	01	
		Send Steady Space	02	"	"	SSMS	02	
		Echo Mode	04	"	"	SMSS	04	Receive data is transmitted with one bit delay.
	°56	Parity Bit Mode						
		Normal OFF	00	"	"	SSSS	00	
		Invert Parity Bit	01	"	"	SSSM	01	
		Parity Bit Mark	02	"	"	SSMS	02	
		Parity Bit Space	03	"	"	SSMM	03	
	57	Load Fill Character	Fill Character				00-FF	
	°	This Function is latched into Memory and must be restored to normal OFF (00) at the point in the program sequence where it is desired that subsequent Functions not be effected.						
SEND BCC	58	Start BCC		XY	X	Y		
		Define "X" for:						
		Normal calculation of CRC and EVEN LRC	0-		SSSS		00-08	Function 59 (below Function 58) will send one character for LRC and two characters for CRC as determined by Function 58.
		Inverted data for calculation of CRC and ODD LRC.	1-		SSSM		10-18	
		Define "Y" for:						
		EBCDIC/CRC-16 (ASCII SYNC)	-0			SSSS	00 or 10	When sending CRC, Function 57 is used prior to Function 59 to select a fill character after the second CRC character.
		CRC-16 Reverse	-1			SSSM	01 or 10	
		IBM Special	-2			SSMS	02 or 12	
		CRC-12	-3			SSMM	03 or 13	Function 59 must be the next step after the last character to be included in the calculation.
		CCITT/SDLC-CRC	-6			SMMS	06 or 16	
		CCITT/CRC Reverse	-7			SMMM	07 or 17	
		LRC (6, 7, 8 Level)	-8			MSSS	08 or 18	
	59	Send BCC (Must be preceded by Function 57 when in synchronous operation)	00	All Space	SSSS	SSSS	00	If Idle Mark is to follow BCC, use Function 55 next after Function 59.
SEND MSG/FOX MSG			No. of Characters Total / Print					Applications:
	60	Send ASCII Fox	74 / 72	Times Sent	BCD	80 40 20 10	8 4 2 1	01-99 TTY Model 33, 35, 37
	61	" ASCII Msg	82 / 80	"	"	"	"	" IBM 2260 CRT
	62	" ASCII "	124 / 122	"	"	"	"	" IBM 2260 Printer & TTY Wide Platen #38
	63	" EBCDIC "	82 / 80	"	"	"	"	" IBM 3270 CRT
	64	" EBCDIC "	124 / 122	"	"	"	"	" IBM 3270 Printer
	65	" EBCD "	127 / 122	"	"	"	"	" IBM 2740 Printer
	66	" SELECTRIC "	127 / 122	"	"	"	"	" 2741 Printer
	67	" BAUDOT Fox	77 / 72	"	"	"	"	" EARLIER TTY MODELS
		BCD, Field Data and Reverse Codes are available on Special Order.						

INTERSHAKE II FUNCTION LIST

(Continued)

LOAD INTO MEMORY								REMARKS AND USERS NOTES
GROUP	FUNCTION	DESCRIPTION	ENTER	BIT ENTRY METHOD	BIT SWITCH 8765 4321 POSITION		DATA HEX DISPLAY (Range)	
TRANSMIT (Cont'd)	°68	Code Translate Mode		XY	X	Y		Must be followed by Function 52 or 53.
		Define "X" for:			8421	8421		
		Disable Function 68	00		SSSS	SSSS	00	
		Results Memory (RM) to HEX ASCII	10		SSSM	"	10	
		RM to CODE selected by "Y"	2-		SSMS		20-27	Entries 20 through 27 convert from one language text to another language text.
		RM to HEX EBCDIC (Y=2), HEX EBCD (Y=5) and HEX SELECTRIC (Y=7)	3-		SSMM		32-37	
CODE TRANSLATE		Define "Y" for:						
		EBCDIC to ASCII	-0			SSSS	20	
		ASCII to EBCDIC	-2			SSMS	22, 32	Entries 32, 36 and 37 convert Results Memory to HEX EBCDIC, HEX EBCD and HEX SELECTRIC.
		EBCD to ASCII	-4			SMSS	24	
		ASCII to EBCD	-5			SMSM	25, 35	
		SELECTRIC to ASCII	-6			SMMS	26	
		ASCII to SELECTRIC	-7			SMMM	27, 37	
		Other Translations are available on Special Order.						
	°	This Function is latched into Memory and must be restored to Normal (disable) (00) at the point in the program sequence where it is desired that subsequent Functions not be effected.						
RS232/ V.24 CONTROLS AND DECISIONS					80 40 20 10 8421			
				MARK=ON/ SPACE=OFF	RTS CTS DSR RLSD DTR R1 (7X) TEST POINT AUDIBLE ALARM 87654321			
	70	Turn ON Leads	MARK/SPACE Any Lead	"	One or More		00-FF	For Functions 70 and 71, Bit 1 controls the Audible Alarm.
	71	Turn OFF Leads	"	"	"		"	Bit 2 controls the test point output CONTROL OUT (7X).
	72	Wait Until Lead ON	"	"	First of Any		"	For Functions 72 through 78, Bit 1 is used to sense status of AUX DET devices (e.g., CRT). Bit 2 detects the input to DETECT IN (7X).
	73	Wait Until Lead OFF	"	"	"		"	
	74	Interrupt if Lead ON	Any One	"	Any One Lead		01-80	
	75	Interrupt if Lead OFF	"	"	"		"	
	76	Cancel Interrupt 74 and 75	00	"	All Space		00	
	*77	Jump if ON	Any One	"	Any One Lead		01-80	Note Priority below for Functions 74 and 75:
	*78	Jump if OFF	"	"	"		"	
	*	Functions 77 and 78 must be preceded by Function 41 for Jump Instructions						Interrupt Source Priority Order / Jumps to Last Page, Step
					See Interrupts priority in Remarks Column			97 (01) Mem Ovfl 63 97 (03) Character 62 97 (09-0F) Selection 61 75 (01-80) Detect OFF 60 74 (01-80) Detect ON 59
								NOTE: Internal Select Switch toggle number 5 determines if program cell is two pages or four pages, i.e., if last page is page "1" or "3".
								See "Internal Select Switch" below Function 93.
TIMER	80	01 to 99 Milliseconds	01-99	BCD	80 40 20 10 8421		01-99	
	81	0.01 to 0.99 Seconds	"	"	"		"	
	82	0.1 to 9.9 Seconds	"	"	"		"	
	83	Generate 1-99 Bit Periods of Delay	"	"	"		"	
	84	0.1 to 9.9 Seconds Timeout Interval for Interrupt Function 97 or Jump Function 47						Enable with Function 97 (0C) or Function 47 (C3)
COUNTER	△85	Advance Base Count	00	All Space	SSSS	SSSS	00	Select EVENTS -10X on Panel.
	86	Measure RTS-CTS Delay	"	"	"	"	Counter Indication	Front Panel Counter Switch positioned to DURATION RTS-CTS (8X).
	87	Counter Control						
		Reset (All Counter Positions)	"	"	"	"	00	
		Reset to 0 and Start Counter	01	BCD	"	SSSM	01	Select DURATION (8X) on Panel
		Stop Counter	02	"	"	SSMS	02	Select DURATION (8X) on Panel
		Advance Counter by One Event	03	"	"	SSMM	03	Select EVENTS (8X) on Panel
	*88	Jump if Counter is Greater than DATA	Number	"	80 40 20 10 8421		01-99	Compares two High-Order counter digits.
	89	Record Counter	00	All Space	SSSS	SSSS	00	Function 89 will cause the two High Order digits to be recorded into RESULTS MEMORY, i.e., 01-99. Read Outcome of Function 89 in Results Memory.
	△	Function 85 not available in early production models.						
	*	Preceded by Function 41 for Jump Instructions.						

INTERSHAKE II FUNCTION LIST

(Continued)

LOAD INTO MEMORY								REMARKS AND USERS NOTES
GROUP	FUNCTION	DESCRIPTION	ENTER	BIT ENTRY METHOD	BIT SWITCH 8765 4321 POSITION		DATA HEX DISPLAY (Range)	
AUTO PANEL	90	Enter Syn Character	Character				00-FF	Use Internal Select Switch toggle number 7 for one sync character operation. Function 90 must be used with the INTERVIEW CRT for Full Duplex operation.
	°91	Async/Sync, Info Bits, Parity	Mark/Space	XY	X 8421	Y 8421	00-88	
		Async: 1 Stop			SSZZ	ZZSS		
		Async: 2 Stop			MSZZ	ZZSS		
		Sync			SMZZ	ZZSS		
		Info Bits 5			ZZSS	ZZSS		Async: 2 Stop selects 1.5 Stop Bits for 5 Info Bit code only.
		6			ZZMS	ZZSS		
		7			ZZSM	ZZSS		"Z" indicates other selections which must be made to complete the instruction.
		8			ZZMM	ZZSS		
		Parity - None			ZZZZ	MSSS		
		Parity - Odd			ZZZZ	SSSS		
		Parity - Even			ZZZZ	SMSS		
	°92	Bit Rate	Bit Rate	HEX			00-F0	
		INT OSC	00		SSSS	SSSS	00	For INT OSC selections, use Internal Switch toggles "ON" to select as follows:
		50 bps	10		SSSM	"	10	
		75 bps	20		SSMS	"	20	1 – Plug-in Crystal thru 64 Kbps.
		110 bps	30		SSMM	"	30	2 – Var. Osc. 160 to 2500 bps.
		134.5 bps	40		SMSS	"	40	3 – Var. Osc. 60 to 1000 bps.
		150 bps	50		SMSM	"	50	4 – Var. Osc. 30 to 500 bps.
		300 bps	60		SMMS	"	60	(See "Internal Select Switch" below)
		600 bps	70		SMMM	"	70	
		900 bps	80		MSSS	"	80	
		1.2 Kbps	90		MSSM	"	90	
		1.8 Kbps	A0		MSMS	"	A0	
		2.4 Kbps	B0		MSMM	"	B0	
		3.6 Kbps	C0		MMSS	"	C0	
		4.8 Kbps	D0		MMSM	"	D0	
		7.2 Kbps	E0		MMMS	"	E0	
		9.6 Kbps	F0		MMMM	"	F0	
	°93	Test Mode, EIA/MIL, Ext, Clock Control EIA Position:	Mark/Space	XY	X 8421	Y 8421	00-FF	As is the case for Functions 91 and 92 above, all 8 bits must be selected. "Z" indicates other selections which must be made.
		TD/RD			SMMM	MZZZ		
		TD			MSMM	"		
		RD			MMSM	"		
		TERM			MMMS	"		
		MODEM			MMMM	SZZZ		
		INT BIT RATE			ZZZZ	ZMZZ		
		EXTERNAL CLOCK			"	ZSZZ		
		CONTROL EIA OFF			"	ZZMZ		
		CONTROL EIA ON			"	ZZSZ		
		EIA			"	ZZZM		
		MIL			"	ZZZS		
	°	Function is latched into Memory and remains for the duration of the program sequence unless changed by a subsequent step containing a Function 91, 92 or 93 Instruction.						

The INTERNAL SELECT SWITCH (8-Position DIP Switch) Position:

- No. 1 ON – Enables the Crystal Controlled Oscillator for high-speed operation.
- No. 2 ON – Enables the HIGH range of the variable-frequency oscillator (160-2500 Baud).
- No. 3 ON – Enables the MIDDLE range of the variable-frequency oscillator (60-1000 Baud).
- No. 4 ON – Enables the LOW range of the variable-frequency oscillator (30-500 Baud).
  NOTE: Only one of the above switches (1-0) can be turned ON at one time.
- No. 5 ON – Enables 256-Step Program format. The OFF position enables the 128-Step Program format.
- No. 6 ON – SYNC Mode Internal Clock Rec. Enables internally-generated clock signal when no clock is supplied by system Modem. Clock is then synchronized to DATA. OFF position is used when clock is supplied from system Modem.
- No. 7 ON – Enables recognition of only one SYN character in lieu of the two characters normally required for recognition.
- No. 8 UNASSIGNED.

INTERSHAKE II FUNCTION LIST

(Continued)

LOAD INTO MEMORY								REMARKS AND USERS NOTES
GROUP	FUNCTION	DESCRIPTION	ENTER		BIT ENTRY METHOD	BIT SWITCH 8765 4321 POSITION		DATA HEX DISPLAY (Range)	
PERIPHERAL CONTROLLER	94 OUTPUTS	Peripheral Controller OUTPUTS							The Control items for the INTERVIEW CRT have been completed for information and as a sample. The Control items for other external devices should be filled-in by the User from the particular DTM Option Manual. In the case of User furnished option, the User should provide the Control item list. Once selected, the Flag 0 thru 7 is set to "0" or "1" as determined by selection of the "Y".
		Define "X" for:							
		User Peripheral (User Fill In) (Typical for INTERVIEW CRT)			XY	X 8421	Y 8421		
		Clear Screen	0-			SSSS		00-01	
		Select Page 1	1-			SSSM		10-11	
		Select Page 2	2-			SSMS		20-21	
		Freeze Display	3-			SSMM		30-31	
		Unassigned	4-			SMSS		40-41	
		Reverse Image	5-			SMSM		50-51	
		Low Intensity	6-			SMMS		60-61	
		Blink	7-			SMMM		70-71	
		Define "Y" for:							
		User Peripheral (User Fill In) (Typical for INTERVIEW CRT)							
		Disable	-0 Output Only				SSSS	00-70	OUTPUT Only: Y 0 sets Flag to "0", Y=1 sets Flag to "1".
		Enable	-1 "				SSSM	01-71	
	*94 INPUTS	Sensing eight INPUT leads from external device to be controlled by DTM-2							*Function 94 must be preceded by Function 41 for Jump Instructions.
		Define "X" for:							
		User Peripheral (User Fill In)				X 4321	Y 4321		The "Y" digit determines if the Flag is an INPUT Flag and to JUMP if the Flag is a "0" with Y=2 or to JUMP if the Flag is a "1" with Y=3.
			0-			SSSS		02,03	
			1-			SSSM		12,13	
			2-			SSMS		22,23	
			3-			SSMM		32,33	
			4-			SMSS		42,43	
			5-			SMSM		52,53	
			6-			SMMS		62,63	
			7-			SMMM		72,73	
		Define "Y" for:							
		User Peripheral (User Fill In)							
			-2 Input Only				SSMS	02-72	INPUT Only: Y=2 causes Jump if Flag = "0" Y=3 causes Jump if Flag = "1"
			-3 "				SSMM	03-73	
	94 OTHER OUTPUTS	Other Assignable OUTPUTS			XY	X 8421	Y 8421		
		Define "X" for:							
		(Take definition as assigned below)	5-			SMSM			
			6-			SMMS			
			7-			SMMM			
		Define "X" and "Y" for:	X	Y		8421			
		Restore assignable output to SET 1, SET 1 Mode.	5,6,7	8		"	MSSS	58,68,78	
		Generate a "1" when:							
		Data received on RD Lead	5,6,7	9		"	MSSM	59,69,79	
		RLSD Lead Turning OFF	5,6,7	A		"	MSMS	5A,6A,7A	
		DETECT TEST POINT Senses +12V	5,6	B		"	MSMM	5B,6B	
		Cause Output Signal to remain "1" when:							
		DETECT TEST POINT Senses a transient OFF	7	B		SMMM	MSMM	7B	
		Generate a "1" when:							
		Character contains PARITY ERROR	5,6,7	C		8421	MMSS	5C,6C,7C	
		Period of 1ms (X=5), 10ms (X=6), 100ms (X=7).	5,6,7	D		"	MMSM	5D,6D,7D	
		Generate 900ns positive pulse	5	E		SMSM	MMMS	5E	
		Unassigned for X=6 and X=7	6,7	E		8421	"	,6E,7E	
		Loop signal back from external device	5,6,7	F		"	MMMM	5F,6F,7F	
		Preceded by Function 41 for Jump Instructions.							

INTERSHAKE II FUNCTION LIST

(Continued)

LOAD INTO MEMORY								REMARKS AND USERS NOTES
GROUP	FUNCTION	DESCRIPTION	ENTER	BIT ENTRY METHOD	BIT SWITCH 8765 4321 POSITION X (8421)	BIT SWITCH 8765 4321 POSITION Y (8421)	DATA HEX DISPLAY (Range)	
RECEIVE SYNC	°95	Auto Resync and Sync Search		XY				Related Functions are: 90 – Enter Syn Character 96 – SDLC Control
		Define "X" for Auto Resync:						Anytime Function 95 is used, it always takes the out-of-sync and looks for a new sync.
		OFF (Normal OFF)	0-		SSSS			
		ON	1-		SSSM			
		Define "Y" for Out-Of-Sync:						For Full Duplex operation with the INTERVIEW CRT, the Test Selector Switch must be in the TD/RD position.
		Normal (8 pads or change of signal)	-0			SSSS	00	
		Other (1-7 pads or change os signal)	-1 thru -7				01-17	
SDLC/ ADCCP	°96	SDLC/ADCCP		XY			00-76	The "Y" value selected must be "0" (of no consequence - zero delay) or one of the other "1" thru "6" values below.
		Define "X" for:						
		SDLC Mode OFF (Normal OFF)	0-		SSSS		00-06	
		SDLC Mode ON	1-		SSSM		10-16	
		SDLC NRZ ON	3-		SSMM		30-36	
		SDLC Mode ON (Inhibit "0" insert)	5-		SMSM		50-56	Used for sending Flag for X=1
		SDLC/NRZ ON (Inhibit "0" insert)	7-		SMMM		70-76	Used for sending Flag for X=3
RECEIVER DELAY	°96	Define "Y" for: ASYNC / SYNC						The "X" value selected must be "0" (of no consequence - modes OFF) or one of the other "1" thru "7" values above.
		Zero Delay / Zero Delay (Normal OFF)	-0			SSSS	00-70	
		4 Bits Delay / 64 Bits Delay	-1			SSSM	01-71	
		8 Bits Delay / 128 Bits Delay	-2			SSMS	02-72	
		64 Bits Delay / 1024 Bits Delay	-3			SSMM	03-73	The Delay is between the RS-232 Interface and the Receiver for Signal Path and Detect Test Point Path.
		128 Bits Delay / 2048 Bits Delay	-4			SMSS	04-74	
		192 Bits Delay / 3072 Bits Delay	-5			SMSM	05-75	
		256 Bits Delay / 4096 Bits Delay	-6			SMMS	06-76	
INTERRUPTS	°97	Interrupts		HEX	8421	8421	00-FF	
		Results Memory:						Vectors to Step 63, Last Page.
		Memory Full Disable (Normal OFF)	00		SSSS	SSSS	00	
		Memory Full Enable	01		"	SSSM	01	
		Character Interrupt:						Vectors to Step 62, Last Page.
		Character Disable (Normal OFF)	02		"	SSMS	02	
		Character Enable (Function 19)	03		'	SSMM	03	
		Interrupt Group 8-F						Vectors to Step 61, Last Page.
		Disable 09-0F (Normal OFF)	08		"	MSSS	08	Other Interrupt related Functions: 09-Record Interrupt Step 19-Enter Interrupt Step 74-Interrupt RS-232(V.24) ON 75-Interrupt RS-232(V.24) OFF 76-Cancel Interrupt 74 and 75 84-Enter Interrupt Timeout 98-(01) Restart at Interrupted Step.
		Parity Error	09		"	MSSM	09	
		Counter Overflow Indicator	0A		"	MSMS	0A	
		Counter End Indicator	0B		"	MSMM	0B	
		Timeout (Function 84 presets Timer)	0C		"	MMSS	0C	
		Out-of-Sync	0D		"	MMSM	0D	
		Frame Detect	0E		"	MMMS	0E	
		Unassigned	0F		"	MMMM	0F	
	°	This Function is latched into Memory and must be restored to normal OFF at the point in the program sequence where it is desired that subsequent Functions not be effected.						
					See Interrupts Priority in Remarks Column			Interrupt Source Priority Order / Jumps To Last Page, Step 97 (01) Mem Ovfl 63 97 (03) Character 62 97 (09-0F) Selection 61 75 (01-80) Detect OFF 60 74 (01-80) Detect ON 59 NOTE: Internal Select Switch toggle number 5 determines if program cell is two pages or four pages, i.e., if last page is page "1" or "3".
END	98	Recycle/Restart/Skip		BCD	8421	8421		
		Restarts the Test at 00 Page 0	00		SSSS	SSSS	00	
		Restarts the Test at the Interrupted Step	01		"	SSSM	01	
		Skips the Step (or No-Op)	02		"	SSMS	02	
		Clear CRC Calculation (Receive SDLC)	03		"	SSMM	03	
	99	Stop	00	All Space	"	SSSS	00	

APPENDIX C

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

8-BIT ASCII			7-BIT ASCII			EVEN PARITY ASCII			ODD PARITY ASCII			EBCDIC			6-BIT TRANSCODE			6-BIT TYPESETTER			EBCD			SELECTRIC			FIELD DATA			BAUDOT		
	BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY C 1248AB	HEX		BINARY C 1248AB	HEX		BINARY	HEX		BINARY	HEX
A	11 000 001	C1	A	1 000 001	41	A	01 000 001	41	A	11 000 001	C1	A	11 000 001	C1	A	000 001	01	A	000 011	03	A	0 100 011	23	A	1 111 001	79	A	000 110	06	A	–	00 011	03
B	11 000 010	C2	B	1 000 010	42	B	01 000 010	42	B	11 000 010	C2	B	11 000 010	C2	B	000 010	02	B	001 001	19	B	0 010 011	13	B	1 110 110	76	B	000 111	07	B	?	11 001	19
C	11 000 011	C3	C	1 000 011	43	C	11 000 011	C3	C	01 000 011	43	C	11 000 011	C3	C	000 011	03	C	001 110	0E	C	1 110 011	73	C	1 111 010	7A	C	001 000	08	C	:	01 110	0E
D	11 000 100	C4	D	1 000 100	44	D	01 000 100	44	D	11 000 100	C4	D	11 000 100	C4	D	000 100	04	D	001 001	09	D	0 001 011	0B	D	0 101 010	2A	D	001 001	09	D	$	01 001	09
E	11 000 101	C5	E	1 000 101	45	E	11 000 101	C5	E	01 000 101	45	E	11 000 101	C5	E	000 101	05	E	000 001	01	E	1 101 011	6B	E	1 001 010	4A	E	001 010	0A	E	3	00 001	01
F	11 000 110	C6	F	1 000 110	46	F	11 000 110	C6	F	01 000 110	46	F	11 000 110	C6	F	000 110	06	F	001 101	0D	F	1 011 011	5B	F	1 110 011	73	F	001 011	0B	F	!	01 101	0D
G	11 000 111	C7	G	1 000 111	47	G	01 000 111	47	G	11 000 111	C7	G	11 000 111	C7	G	000 111	07	G	011 010	1A	G	0 111 011	3B	G	0 100 011	23	G	001 100	0C	G	8	11 010	1A
H	11 001 000	C8	H	1 001 000	48	H	01 001 000	48	H	11 001 000	C8	H	11 001 000	C8	H	001 000	08	H	010 100	14	H	0 000 111	07	H	0 100 110	26	H	001 101	0D	H	#	10 100	14
I	11 001 001	C9	I	1 001 001	49	I	11 001 001	C9	I	01 001 001	49	I	11 001 001	C9	I	001 001	09	I	000 110	06	I	1 100 111	67	I	0 011 001	19	I	001 110	0E	I	8	00 110	06
J	11 001 010	CA	J	1 001 010	4A	J	11 001 010	CA	J	01 001 010	4A	J	11 010 001	D1	J	010 001	11	J	001 011	0B	J	1 100 001	61	J	1 000 011	43	J	001 111	0F	J	'	01 011	0B
K	11 001 011	CB	K	1 001 011	4B	K	01 001 011	4B	K	11 001 011	CB	K	11 010 010	D2	K	010 010	12	K	001 111	0F	K	1 010 001	51	K	0 011 010	1A	K	010 000	10	K	(	01 111	0F
L	11 001 100	CC	L	1 001 100	4C	L	11 001 100	CC	L	01 001 100	4C	L	11 010 011	D3	L	010 011	13	L	010 010	12	L	0 110 001	31	L	1 000 110	46	L	010 001	11	L	)	10 010	12
M	11 001 101	CD	M	1 001 101	4D	M	01 001 101	4D	M	11 001 101	CD	M	11 010 100	D4	M	010 100	14	M	011 100	1C	M	1 001 001	49	M	1 100 001	61	M	010 010	12	M	.	11 100	1C
N	11 001 110	CE	N	1 001 110	4E	N	01 001 110	4E	N	11 001 110	CE	N	11 010 101	D5	N	010 101	15	N	001 100	0C	N	0 101 001	29	N	1 010 010	52	N	010 011	13	N	,	01 100	0C
O	11 001 111	CF	O	1 001 111	4F	O	11 001 111	CF	O	01 001 111	4F	O	11 010 110	D6	O	010 110	16	O	011 000	18	O	0 011 001	19	O	1 000 101	45	O	010 100	14	O	9	11 000	18
P	11 010 000	D0	P	1 010 000	50	P	01 010 000	50	P	11 010 000	D0	P	11 010 111	D7	P	010 111	17	P	010 110	16	P	1 111 001	79	P	0 001 011	0B	P	010 101	15	P	0	10 110	16
Q	11 010 001	D1	Q	1 010 001	51	Q	11 010 001	D1	Q	01 010 001	51	Q	11 011 000	D8	Q	011 000	18	Q	010 111	17	Q	1 000 101	45	Q	1 011 011	5B	Q	010 110	16	Q	1	10 111	17
R	11 010 010	D2	R	1 010 010	52	R	11 010 010	D2	R	01 010 010	52	R	11 011 001	D9	R	011 001	19	R	001 010	0A	R	0 100 101	25	R	0 101 001	29	R	010 111	17	R	4	01 010	0A
S	11 010 011	D3	S	1 010 011	53	S	01 010 011	53	S	11 010 011	D3	S	11 100 010	E2	S	100 010	22	S	000 101	05	S	1 010 010	52	S	0 100 101	25	S	011 000	18	S	Bell	00 101	05
T	11 010 100	D4	T	1 010 100	54	T	11 010 100	D4	T	01 010 100	54	T	11 100 011	E3	T	100 011	23	T	010 000	10	T	0 110 010	32	T	0 000 010	02	T	011 001	19	T	5	10 000	10
U	11 010 101	D5	U	1 010 101	55	U	01 010 101	55	U	11 010 101	D5	U	11 100 100	E4	U	100 100	24	U	000 111	07	U	1 001 010	4A	U	0 110 010	32	U	011 010	1A	U	7	00 111	07
V	11 010 110	D6	V	1 010 110	56	V	01 010 110	56	V	11 010 110	D6	V	11 100 101	E5	V	100 101	25	V	011 110	1E	V	0 101 010	2A	V	0 110 001	31	V	011 011	1B	V	;	11 110	1E
W	11 010 111	D7	W	1 010 111	57	W	11 010 111	D7	W	01 010 111	57	W	11 100 110	E6	W	100 110	26	W	010 011	13	W	0 011 010	1A	W	1 110 101	75	W	011 100	1C	W	2	10 011	13
X	11 011 000	D8	X	1 011 000	58	X	11 011 000	D8	X	11 011 000	58	X	11 100 111	E7	X	100 111	27	X	011 101	1D	X	1 111 010	7A	X	1 100 010	62	X	011 101	1D	X	/	11 101	1D
Y	11 011 001	D9	Y	1 011 001	59	Y	01 011 001	59	Y	11 011 001	D9	Y	11 101 000	E8	Y	101 000	28	Y	010 101	15	Y	1 000 110	46	Y	1 100 111	67	Y	011 110	1E	Y	6	10 101	15
Z	11 011 010	DA	Z	1 011 010	5A	Z	01 011 010	5A	Z	11 011 010	DA	Z	11 101 001	E9	Z	101 001	29	Z	010 001	11	Z	0 100 110	26	Z	1 010 100	54	Z	011 111	1F	Z	"	10 001	11
a	11 100 001	E1	a	1 100 001	61	a	11 100 001	E1	a	01 100 001	61	a	10 000 001	81																				
b	11 100 010	E2	b	1 100 010	62	b	11 100 010	E2	b	01 100 010	62	b	10 000 010	82																				
c	11 100 011	E3	c	1 100 011	63	c	01 100 011	63	c	11 100 011	E3	c	10 000 011	83	(NO LOWER CASE)			CAPS = "SHIFT" LC = "UNSHIFT" UNSHIFT 011 111 1F SHIFT 011 011 1B			CAPS = "UC" LC = "LC" LC 00 011 111 1F UC 00 011 100 1C			CAPS = "UC" LC = "LC" LC 00 011 111 1F UC 00 011 100 1C			(NO LOWER CASE)			(NO LOWER CASE) "LETTERS" 11 111 1F "FIGURES" 11 011 1B		
d	11 100 100	E4	d	1 100 100	64	d	11 100 100	E4	d	01 100 100	64	d	10 000 100	84																				
e	11 100 101	E5	e	1 100 101	65	e	01 100 101	65	e	11 100 101	E5	e	10 000 101	85																				
f	11 100 110	E6	f	1 100 110	66	f	01 100 110	66	f	11 100 110	E6	f	10 000 110	86																				
g	11 100 111	E7	g	1 100 111	67	g	11 100 111	E7	g	01 100 111	67	g	10 000 111	87																				
h	11 101 000	E8	h	1 101 000	68	h	11 101 000	E8	h	01 101 000	68	h	10 001 000	88																				
i	11 101 001	E9	i	1 101 001	69	i	01 101 001	69	i	11 101 001	E9	i	10 001 001	89																				
j	11 101 010	EA	j	1 101 010	6A	j	01 101 010	6A	j	11 101 010	EA	j	10 010 001	91																				
k	11 101 011	EB	k	1 101 011	6B	k	11 101 011	EB	k	01 101 011	6B	k	10 010 010	92																				
l	11 101 100	EC	l	1 101 100	6C	l	01 101 100	6C	l	11 101 100	EC	l	10 010 011	93																				
m	11 101 101	ED	m	1 101 101	6D	m	11 101 101	ED	m	01 101 101	6D	m	10 010 100	94																				
n	11 101 110	EE	n	1 101 110	6E	n	11 101 110	EE	n	01 101 110	6E	n	10 010 101	95																				
o	11 101 111	EF	o	1 101 111	6F	o	01 101 111	6F	o	11 101 111	EF	o	10 010 110	96																				
p	11 110 000	F0	p	1 110 000	70	p	11 110 000	F0	p	01 110 000	70	p	10 010 111	97																				
q	11 110 001	F1	q	1 110 001	71	q	01 110 001	71	q	11 110 001	F1	q	10 011 000	98																				
r	11 110 010	F2	r	1 110 010	72	r	01 110 010	72	r	11 110 010	F2	r	10 011 001	99																				
s	11 110 011	F3	s	1 110 011	73	s	11 110 011	F3	s	01 110 011	73	s	10 100 010	A2																				
t	11 110 100	F4	t	1 110 100	74	t	01 110 100	74	t	11 110 100	F4	t	10 100 011	A3																				
u	11 110 101	F5	u	1 110 101	75	u	11 110 101	F5	u	01 110 101	75	u	10 100 100	A4																				
v	11 110 110	F6	v	1 110 110	76	v	11 110 110	F6	v	01 110 110	76	v	10 100 101	A5																				
w	11 110 111	F7	w	1 110 111	77	w	01 110 111	77	w	11 110 111	F7	w	10 100 110	A6																				
x	11 111 000	F8	x	1 111 000	78	x	01 111 000	78	x	11 111 000	F8	x	10 100 111	A7																				
y	11 111 001	F9	y	1 111 001	79	y	11 111 001	F9	y	01 111 001	79	y	10 101 000	A8																				
z	11 111 010	FA	z	1 111 010	7A	z	11 111 010	FA	z	01 111 010	7A	z	10 101 001	A9																				
0	10 110 000	B0	0	0 110 000	30	0	00 110 000	30	0	10 110 000	B0	0	11 110 000	F0	0	110 000	30	0	110 110 U	36	0	01 010 100 L	54	0	01 100 100 L	64	0	110 000	30	0		10 110	F 16
1	10 110 001	B1	1	0 110 001	31	1	10 110 001	B1	1	00 110 001	31	1	11 110 001	F1	1	110 001	31	1	111 101 U	3D	1	00 100 000 L	20	1	00 100 000 L	20	1	110 001	31	1		10 111	F 17
2	10 110 010	B2	2	0 110 010	32	2	10 110 010	B2	2	00 110 010	32	2	11 110 010	F2	2	110 010	32	2	110 011 U	33	2	00 010 000 L	10	2	00 010 000 L	10	2	110 010	32	2		10 011	F 13
3	10 110 011	B3	3	0 110 011	33	3	00 110 011	33	3	10 110 011	B3	3	11 110 011	F3	3	110 011	33	3	100 001 U	21	3	00 110 000 L	30	3	01 110 000 L	70	3	110 011	33	3		00 001	F 01
4	10 110 100	B4	4	0 110 100	34	4	10 110 100	B4	4	00 110 100	34	4	11 110 100	F4	4	110 100	34	4	101 010 U	2A	4	00 001 000 L	08	4	00 000 100 L	04	4	110 100	34	4		01 010	F 0A
5	10 110 101	B5	5	0 110 101	35	5	00 110 101	35	5	10 110 101	B5	5	11 110 101	F5	5	110 101	35	5	110 000 U	30	5	01 101 000 L	68	5	00 001 000 L	08	5	110 101	35	5		10 000	F 10
6	10 110 110	B6	6	0 110 110	36	6	00 110 110	36	6	10 110 110	B6	6	11 110 110	F6	6	110 110	36	6	110 101 U	35	6	01 011 000 L	58	6	01 011 000 L	58	6	110 110	36	6		10 101	F 15
7	10 110 111	B7	7	0 110 111	37	7	10 110 111	B7	7	00 110 111	37	7	11 110 111	F7	7	110 111	37	7	100 111 U	27	7	01 101 000 L	68	7	01 101 000 L	68	7	110 111	37	7		00 111	F 07
8	10 111 000	B8	8	0 111 000	38	8	10 111 000	B8	8	00 111 000	38	8	11 111 000	F8	8	111 000	38	8	100 110 U	26	8	00 000 100 L	04	8	00 111 000 L	38	8	111 000	38	8		11 010	F 1A
9	10 111 001	B9	9	0 111 001	39	9	00 111 001	39	9	10 111 001	B9	9	11 111 001	F9	9	111 001	39	9	111 000 U	38	9	01 100 100 L	64	9	00 110 100 L	34	9	111 001	39	9		11 000	F 18
SP	10 100 000	A0	SP	0 100 000	20	SP	10 100 000	A0	SP	00 100 000	20	SP	01 000 000	40	SP	011 010	1A	SP	000 100 S/U	04	SP	01 000 000 –	40	SP	01 000 000 –	40	SP	000 101	05	SP		00 100	– 04
!	10 100 001	A1	!	0 100 001	21	!	00 100 001	21	!	10 100 001	A1	!	01 011 010	5A				!	100 011 S	23	!	01 110 101 U	75	!	00 000 001 L	01	!	101 101	2D	!		01 101	F 0D
"	10 100 010	A2	"	0 100 010	22	"	00 100 010	22	"	10 100 010	A2	"	01 111 111	7F							"	00 110 100 U	34	"	01 001 001 U	49				"		10 001	F 11
#	10 100 011	A3	#	0 100 011	23	#	10 100 011	A3	#	00 100 011	23	#	01 111 011	7B	#	111 011	3B				#	00 110 100 L	34	#	01 110 000 U	70	#	100 110	26	#		10 100	F 14
$	10 100 100	A4	$	0 100 100	24	$	00 100 100	24	$	10 100 100	A4	$	01 011 011	5B	$	011 011	1B	$	100 011 U	23	$	01 110 101 L	75	$	00 000 100 U	04	$	100 111	27	$		01 001	F 09
%	10 100 101	A5	%	0 100 101	25	%	10 100 101	A5	%	00 100 101	25	%	01 101 100	6C	%	101 100	2C				%	01 101 000 U	68	%	00 001 000 U	08	%	101 010	2A				
&	10 100 110	A6	&	0 100 110	26	&	10 100 110	A6	&	00 100 110	26	&	01 010 000	50	&	010 000	10	&	111 000 S	38	&	01 000 011 L	43	&	01 101 000 U	68	&	000 001	01				
'	10 100 111	A7	'	0 100 111	27	'	00 100 111	27	'	10 100 111	A7	'	01 111 101	7D							'	01 011 000 U	58	'	01 001 001 L	49	'	111 010	3A	'		01 011	F 0B
(	10 101 000	A8	(	0 101 000	28	(	00 101 000	28	(	10 101 000	A8	(	01 001 101	4D				(	110 001 S	31	(	01 100 100 U	54	(	00 110 100 U	34	(	101 001	29	(		01 111	F 0F
)	10 101 001	A9	)	0 101 001	29	)	10 101 001	A9	)	00 101 001	29	)	01 011 101	5D				)	110 001 U	31	)	00 100 100 U	54	)	01 100 100 U	64	)	100 000	20	)		10 010	F 12
*	10 101 010	AA	*	0 101 010	2A	*	10 101 010	AA	*	00 101 010	2A	*	01 011 100	5C	*	011 100	1C				*	00 000 100 U	04	*	00 111 000 U	38	*	101 000	28				
+	10 101 011	AB	+	0 101 011	2B	+	00 101 011	2B	+	10 101 011	AB	+	01 001 110	4E							+	01 000 011 U	43	+	00 010 011 U	13	+	100 010	22				
,	10 101 100	AC	,	0 101 100	2C	,	10 101 100	AC	,	00 101 100	2C	,	01 101 011	6B	,	101 011	2B				,	01 110 100 U	74	,	00 111 011 *	3B	,	101 110	2E	,		01 100	F 0C
-	10 101 101	AD	-	0 101 101	2D	-	00 101 101	2D	-	10 101 101	AD	-	01 100 000	60	-	100 000	20	-	101 001 U	29	–	00 000 001 *	01	–	00 110 111 L	37	–	100 001	21	–		00 011	F 03
.	10 101 110	AE	.	0 101 110	2E	.	00 101 110	2E	.	10 101 110	AE	.	01 001 011	4B	.	001 011	0B	.	111 100 S/U	3C	.	00 110 111 L	37	.	01 010 001 *	51	.	111 101	3D	.		11 100	F 1C
/	10 101 111	AF	/	0 101 111	2F	/	10 101 111	AF	/	00 101 111	2F	/	01 100 001	61	/	100 001	21				/	01 100 010 L	62	/	00 000 111 L	07	/	111 100	3C	/		11 101	F 1D

COURTESY OF

ATLANTIC RESEARCH CORPORATION

5390 CHEROKEE AVENUE · ALEXANDRIA, VIRGINIA · 22314

703-354-3400

MANUFACTURERS OF INTERSHAKE and DATA TEK 9600

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

8-BIT ASCII			7-BIT ASCII			EVEN PARITY ASCII			ODD PARITY ASCII			EBCDIC			6-BIT TRANSCODE			6-BIT TYPESETTER			EBCD				SELECTRIC				FIELD DATA		BAUDOT	
	BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY	HEX		BINARY C 12 4 8 A B		HEX		BINARY C 12 4 8 A B		HEX		BINARY	HEX	BINARY	HEX
:	10 111 010	BA	:	0 111 010	3A	:	00 111 010	3A	:	10 111 010	BA	:	01 111 010	7A				:	111 010 S	3A	:	00 001 000	U	08	:	01 101 011	U	6B	:	101 011	2B	: 01 110	F 0E
;	10 111 011	BB	;	0 111 011	3B	;	10 111 011	BB	;	00 111 011	3B	;	01 011 110	5E				;	111 010 U	3A	;	00 110 000	U	30	;	01 101 011	L	6B	;	111 011	3B	; 11 110	F 1E
<	10 111 100	BC	<	0 111 100	3C	<	00 111 100	3C	<	10 111 100	BC	<	01 001 100	4C	<	001 100	0C				<	00 010 000	U	10					<	100 011	23		
=	10 111 101	BD	=	0 111 101	3D	=	10 111 101	BD	=	00 111 101	3D	=	01 111 110	7E							=	00 100 000	U	20	=	00 010 011	L	13	=	100 100	24		
>	10 111 110	BE	>	0 111 110	3E	>	10 111 110	BE	>	00 111 110	3E	>	01 101 110	6E							>	00 111 000	U	38					>	100 101	25		
?	10 111 111	BF	?	0 111 111	3F	?	00 111 111	3F	?	10 111 111	BF	?	01 101 111	6F				?	110 110 S	36	?	01 100 010	U	62	?	00 000 111	U	07	?	101 100	2C	? 11 001	F 19
@	11 000 000	C0	@	1 000 000	40	@	11 000 000	C0	@	01 000 000	40	@	01 111 100	7C	@	111 100	3C	@	101 001 S	29	@	00 000 010	L	02	@	00 010 000	U	10	@	101 111	2F		
[	11 011 011	DB	[	1 011 011	5B	[	11 011 011	DB	[	01 011 011	5B														[	00 100 000	U	20	[	000 011	03		
\	11 011 100	DC	\	1 011 100	5C	\	01 011 100	5C	\	11 011 100	DC	\	11 100 000	E0																		
]	11 011 101	DD	]	1 011 101	5D	]	11 011 101	DD	]	01 011 101	5D														]	00 100 000	L	20	]	000 100	04		
^	11 011 110	DE	^	1 011 110	5E	^	11 011 110	DE	^	01 011 110	5E																		^	000 010	02		
–	11 011 111	DF	–	1 011 111	5F	–	01 011 111	5F	–	11 011 111	DF	–	01 101 101	6D											–	00 110 111	U	37					
			\	1 100 000	60	\	01 100 000	60	\	11 100 000	E0	\	01 111 001	79																		
{	11 111 011	FB	{	1 111 011	7B	{	01 111 011	7B	{	11 111 011	FB	{	11 000 000	C0								UPPER CASE (U) LOWER CASE (L) EITHER (*)				UPPER CASE (U) LOWER CASE (L) EITHER (*)							
¦	11 111 100	FC	¦	1 111 100	7C	¦	11 111 100	FC	¦	01 111 100	7C	¦	01 101 010	6A																		
}	11 111 101	FD	}	1 111 101	7D	}	01 111 101	7D	}	11 111 101	FD	}	11 010 000	D0																		
~	11 111 110	FE	~	1 111 110	7E	~	01 111 101	7E	~	11 111 110	FE	~	10 100 001	A1																		
												¢	01 001 010	4A							¢	00 000 010	U	02	¢	01 011 000	U	58					
												¬	01 011 111	5F							¬	00 110 111	U	37									
												]	01 001 111	4F				√	101 000 S/U	28		01 110 110	U	76									
																					±	00 100 000	U	20								
																						00 000 001	U	01								
																		UNSHIFT 011 111 1F SHIFT 011 011 1B				UC 00 011 100 1C LC 00 011 111 1F				UC 00 011 100 1C LC 00 011 111 1F						FIGS 11 011 1B LTRS 11 111 1F	
ACK	10 000 110	86	ACK	0 000 110	06	ACK	00 000 110	06	ACK	10 000 110	86	ACK	00 101 110	2E																		
BEL	10 000 111	87	BEL	0 000 111	07	BEL	10 000 111	87	BEL	00 000 111	07	BEL	00 101 111	2F	BEL	001 101	0D	BEL	101 011	2B												
BS	10 001 000	88	BS	0 001 000	08	BS	10 001 000	88	BS	00 001 000	08	BS	00 010 110	16							BS	01 011 101		5D	BS	01 011 101		5D				
												BYP	00 100 100	24							BYP	00 001 110		0E	BY	00 001 110		0E				
CAN	10 011 000	98	CAN	0 011 000	18	CAN	00 011 000	18	CAN	10 011 000	98	CAN	00 011 000	18																		
												CC	00 011 010	1A																		
CR	10 001 101	8D	CR	0 001 101	0D	CR	10 001 101	8D	CR	00 001 101	0D	CR	00 001 101	0D				RET	001 000	08									CR	111 111	3F	CR 01 000	08
DC1	10 010 001	91	DC1	0 010 001	11	DC1	00 010 001	11	DC1	10 001 001	91	DC1	00 010 001	11																		
DC2	10 010 010	92	DC2	0 010 010	12	DC2	00 010 010	12	DC2	10 010 010	92	DC2	00 010 010	12																		
DC3	10 010 011	93	DC3	0 010 011	13	DC3	10 010 011	93	DC3	00 010 011	13	DC3	00 010 011	13																		
DC4	10 010 100	94	DC4	0 010 100	14	DC4	00 010 100	14	DC4	10 010 100	94	DC4	00 011 100	3C																		
DEL	11 111 111	FF	DEL	1 111 111	7F	DEL	11 111 111	FF	DEL	01 111 111	7F	DEL	00 000 111	07	DEL	111 111	3F	RUBOUT	111 111	3F	DEL	01 111 111		7F	DEL	01 111 111		7F				
DLE	10 010 000	90	DLE	0 010 000	10	DLE	10 010 000	90	DLE	00 010 000	10	DLE	00 010 000	10	DLE	011 111	1F															
												DS	00 100 000	20				ELEVATE	000 010	02												
EM	10 011 001	99	EM	0 011 001	19	EM	10 011 001	99	EM	00 011 001	19	EM	00 011 001	19	EM	111 110	3E	THIN SP	100 000	20												
ENQ	10 000 101	85	ENQ	0 000 101	05	ENQ	00 000 101	05	ENQ	10 000 101	85	ENQ	00 101 101	2D	ENQ	101 101	2D	ADD TH SP	100 100	24												
												EOB	00 100 110	26				EM SP	100 101	25	EOB	01 011 110		5E	EOB	01 011 110		5E				
EOT	10 000 100	84	EOT	0 000 100	04	EOT	10 000 100	84	EOT	00 000 100	04	EOT	00 110 111	37	EOT	011 110	1E	EN SP	101 110	2E	EOT	01 111 100		7C	EOT	01 111 100		7C				
ESC	10 011 011	9B	ESC	0 011 011	1B	ESC	00 011 011	1B	ESC	10 011 011	9B	ESC	00 100 111	27	ESC	101 010	2A	QR	101 111	2F												
ETB	10 010 111	97	ETB	0 010 111	17	ETB	00 010 111	17	ETB	10 010 111	97	ETB	00 100 110	26	ETB	001 111	0F	V RULE	110 010	32												
ETX	10 000 011	83	ETX	0 000 011	03	ETX	00 000 011	03	ETX	10 000 011	83	ETX	00 000 011	03	ETX	101 110	2E	EM LEAD	110 100	34												
FF	10 001 100	8C	FF	0 001 100	0C	FF	00 001 100	0C	FF	10 001 100	8C	FF	00 001 100	0C				EN LEAD	110 111	37									FF	111 110	3E		
FS	10 011 100	9C	FS	0 011 100	1C	FS	10 011 100	9C	FS	00 011 100	1C	FS	00 100 010	22				U RAIL	111 001	39												
GS	10 011 101	9D	GS	0 011 101	1D	GS	00 011 101	1D	GS	10 011 101	9D							L RAIL	111 011	3B												
HT	10 001 001	89	HT	0 001 001	09	HT	00 001 001	09	HT	10 001 001	89	HT	00 000 101	05	HT	101 111	2F	Q CENT	111 110	3E	HT	00 101 111		2F	HT	00 101 111		2F				
												IFS	00 011 100	1C																		
												IGS	00 011 101	1D																		
												IL	00 010 111	17							IL	00 111 101		3D	IL	00 111 101		3D				
												IRS	00 011 110	1E																		
												IUS	00 011 111	1F																		
												LC	00 000 110	06							LC	00 011 111		1F	LC	00 011 111		1F				
LF	10 001 010	8A	LF	0 001 010	0A	LF	00 001 010	0A	LF	10 001 010	8A	LF	00 100 101	25							LF	01 101 110		6E	LF	01 101 110		6E			LF	00 010	02
NAK	10 010 101	95	NAK	0 010 101	15	NAK	10 010 101	95	NAK	00 010 101	15	NAK	00 111 101	3D	NAK	111 101	3D															
												NL	00 010 101	15							NL	01 101 101		6D	NL	01 101 101		6D				
NUL	10 000 000	80	NUL	0 000 000	00	NUL	00 000 000	00	NUL	10 000 000	80	NUL	00 000 000	00															PER	111 101	3D		
												PF	00 000 100	04				PF	100 010	22	PF	01 001 111		4F	PF	01 001 111		4F				
												PN	00 110 100	34							PN	01 001 100		4C	PN	01 001 100		4C				
												PRE	00 100 111	27							PRE	00 111 110		3E	PRE	00 111 110		3E				
												RES	00 010 100	14							RES	00 001 101		0D	RES	00 001 101		0D				
												RLF	00 001 001	09																		
RS	10 011 110	9E	RS	0 011 110	1E	RS	00 011 110	1E	RS	10 011 110	9E	RS	00 110 101	35							RS	00 101 100		2C	RS	00 101 100		2C				
SI	10 001 111	8F	SI	0 001 111	0F	SI	00 001 111	0F	SI	10 001 111	8F	SI	00 001 111	0F																		
												SM	00 101 010	2A																		
												SMM	00 001 010	0A																		
SO	10 001 110	8E	SO	0 001 110	0E	SO	10 001 110	8E	SO	00 001 110	0E	SO	00 001 110	0E																		
SOH	10 000 001	81	SOH	0 000 001	01	SOH	10 000 001	81	SOH	00 000 001	01	SOH	00 000 001	01	SOH	000 000	00														
												SOS	00 100 001	21																		
STX	10 000 010	82	STX	0 000 010	02	STX	10 000 010	82	STX	00 000 010	02	STX	00 000 010	02	STX	001 010	0A															
SUB	10 011 010	9A	SUB	0 011 010	1A	SUB	10 011 010	9A	SUB	00 011 010	1A	SUB	00 111 111	3F	SUB	001 110	0E															
SYN	10 010 110	96	SYN	0 010 110	16	SYN	10 010 110	96	SYN	00 010 110	16	SYN	00 110 010	32	SYN	111 010	3A															
												UC	00 110 110	36							UC	00 011 100		1C	UC	00 011 100		1C				
US	10 011 111	9F	US	0 011 111	1F	US	10 011 111	9F	US	00 111 111	1F				US	011 101	1D															
VT	10 001 011	8B	VT	0 001 011	0B	VT	10 001 011	8B	VT	00 001 011	0B	VT	00 001 011	0B																		

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