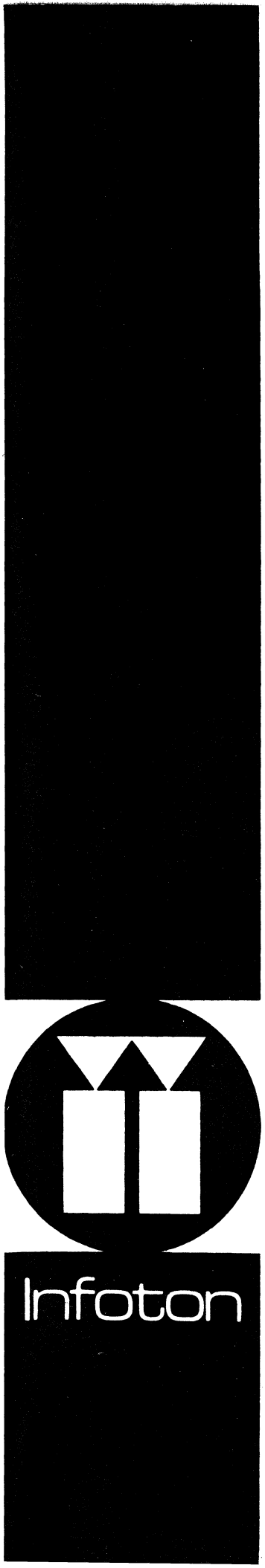

VISTAR/GTX

TECHNICAL USER'S MANUAL

INFOTON • SECOND AVENUE, BURLINGTON, MASSACHUSETTS 01803 • AREA CODE 617 272-6660

VISTAR/GTX

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April 1977

INFOTON

TECHNICAL USER'S MANUAL

VISTAR/GTX

TABLE OF CONTENTS

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TABLE OF CONTENTS — Continued

LIST OF FIGURES

1. INTRODUCTION

Figure 1-1 VISTAR/GTX Display Terminal

The INFOTON VISTAR/GTX Display Terminal is an alphanumeric display designed for use with an on-line computer as a high speed, silent, interactive terminal device. It can be utilized as a substitute for a Teletype® in an unbuffered (character-by-character) conversational mode. As a completely self-contained desk-top unit, the VISTAR/GTX is ideally suited for high speed, two way data transmission over common voice grade telephone lines. Incorporated into each unit is a keyboard, power supply, video presentation control, refresh electronics and both an RS-232C and current loop interface for on-line connection to a dataphone, computer or teletypewriter port.

2. SUMMARY OF CHARACTERISTICS

INTERCHANGEABILITY WITH TELETYPE®

The VISTAR/GTX can be substituted for a Model 33 or 35 Teletype® with no hardware or software modifications. The VISTAR/GTX can serve as an upgraded high speed terminal to all time-sharing services using ASCII* Code regardless of the computer system used by the service.

EASY-TO-READ CHARACTERS

High resolution, non-reflecting screen, and contrast-enhancing filter permit easy viewing at distances up to 10 feet under direct glare and 100 foot-candle illumination.

HIGH-SPEED TRANSMISSION RATES

Sixteen switch-selectable transmission rates from 50 to 9600 bits per second are provided.

CHOICE OF COMPUTER INTERFACE

The unit is supplied with two forms of asynchronous serial interfaces; i.e., a standard EIA RS-232C interface and a 20 or 60 ma. TTY style current loop.

ROLL MODE

The VISTAR/GTX is operated in the Roll Mode with all data entering from the bottom line. With each new line of data the screen presentation will roll up one line.

TRANSMISSION MODE

The VISTAR/GTX is operated in a character-by-character transmission mode, exactly as a Teletype®.

REMOTE KEYBOARD

The VISTAR/GTX is supplied with a remote keyboard which interconnects with a 5 foot cable.

**American Standard Code for Information Interchange.*
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3. VISTAR/GTX SPECIFICATIONS

SCREEN FORMAT

Characters per line	80
Lines per display	24
Character set	64 character ASCII upper case
Character format	5 x 7 dot matrix
Character size	0.08 inch x 0.19 inch, nominal (2 x 5 mm)
Refresh rate	50 Hz or 60 Hz
Viewing area	8.5 inches x 6 inches (21 x 15 cm)
Color	White – P4 phosphor
Readability	Screen easily read without disruptive reflections in a 100-foot-candle illumination.

MECHANICAL

TERMINAL

Size	13 inches high, 17 inches wide, 15 inches deep (33 x 43 x 38 cm)
Weight	35 pounds (15.8 kg)

KEYBOARD

Size	3 inches high, 17 inches wide, 8 inches deep (7 x 43 x 20 cm)
Weight	5 pounds (2.2 kg)

ENVIRONMENTAL

Operating temperature	0° to 50°C
Storage temperature	–30° to 70°C
Humidity	0 to 95% non-condensing

CONTROLS, SWITCHES AND CONNECTORS

	Internal	Front	Side	Rear	Keyboard
On/Off Switch		X			
Local/On Line Switch					X
TV Intensity			X		
TV Contrast			X		
Data Rate Selector				X	
Full/Half Duplex Switch				X	
10/11 Bit Code Switch				X	
Odd/Even/Mark/Space Parity Switch				X	
Current Loop Wiring Strip				X	
EIA Connector				X	
115/230 Volt Wiring Connections	X				

ELECTRICAL

Power consumption	150 watts
Domestic power	105 – 130 volts; 60 Hz
Export power	105 – 130, 210 – 260 volts; 50 Hz

STANDARDS

Underwriter's Laboratory

Export models will conform to requirements established by British Post Office Telecommunications Headquarters, the standards of the Verein Deutscher Elektrotechniker (VDE), and the Canadian Standards Association (CSA).

4. FUNCTIONAL DESCRIPTION

The VISTAR/GTX Display Terminal is a completely self-contained desk top unit which can be used as a plug-for-plug replacement for a Teletype®. The unit consists of a keyboard, video monitor, refresh memory, control logic, and serial data interface. The modes of operation and communications are described in the following paragraphs.

LOCAL/ON LINE

In LOCAL, the VISTAR/GTX is disconnected from the data line but is functional in all other respects. The LOCAL position is used only for demonstration and testing purposes. The LOCAL/ON LINE selection is made by a switch on the keyboard of the terminal.

When the terminal is supplied without a keyboard, or when the keyboard is disconnected the terminal automatically is ON LINE.

The remainder of this description refers to various types of ON LINE operation.

DATA FLOW

The keyboard communicates only to the interface transmitter, and only the interface receiver communicates to the display memory. All transmissions are on a character-by-character basis. All codes generated by the keyboard, including control or function codes, go directly to the transmitter and then to the data lines.

The VISTAR/GTX may be placed in full or half duplex. In half duplex, the interface receiver is actuated in series with the transmitter, and transmitted codes are routed back through the receiver and displayed. Control codes either perform their specific function (e.g., BELL, LINE FEED, etc.) or are ignored.

In full duplex, the receiver is independent of the transmitter. Only data received from the data line will appear on the display. As in half duplex, control codes either perform their specific function or are ignored. In full duplex, therefore, information will be displayed only if the computer at the end of the data line echoes back the information transmitted from the keyboard.

5. OPERATIONAL FEATURES

TELETYPEWRITER COMPATIBILITY

The VISTAR/GTX reacts to the full ASCII character set (see Appendix A) receiving both upper and lower case codes. The effect of each ASCII code on the VISTAR/GTX is shown in Appendix B. All characters are displayed as upper case characters. Lower case characters received on the data line are stored in memory and are displayed as upper case characters. Although the terminal may be programmed as a teletypewriter, the full advantages of the VISTAR/GTX as an interactive terminal are realized when the software makes full use of the unit's features described in the following sections:

CURSOR

The cursor indicates the position at which the next data character will be displayed and is always on the bottom line.

The cursor appears on the display screen as a blinking underscore, blinking approximately five times a second. The blinking prevents the operator from losing track of the cursor. The cursor will advance one step for each character that is typed. The Carriage Return, Rub Out, and Line Feed codes also generate cursor movements.

The actual position of the cursor cannot be directly read by the computer. However, since all cursor movements entered by the operator via the keyboard are transmitted to the computer, the computer can at all times follow the position of the cursor. This feature allows software editing of textual data on the last line of the screen.

ROLL MODE

The VISTAR/GT is always in Roll Mode. When the screen fills, the data on the screen rolls up one line; the former top line is lost and the bottom line is blank. As line after line of text is written on the screen, the visual effect is that of a continuous scroll of text moving past a window.

Rolling is caused when a LINE FEED character is received by the terminal. Rolling is also caused when the cursor is in the right corner of the screen and any displaying code including SPACE is received.

The VISTAR/GTX has been designed so that no restrictions are placed on the high speed transfer of data in the roll mode. Data will not be lost even at 9600 bits per second.

RESPONSE TO COMMANDS

The VISTAR/GTX terminal is controlled and manipulated from its data stream. The data stream control logic is defined as follows:

1. Certain characters are designated as command characters (Appendix B).
2. The computer inserts these command characters within the text transmitted to the VISTAR/GTX.
3. The VISTAR/GTX continually monitors the input data stream for these command characters, performing a designated action upon reception of a command character.

A description of the commands used to control the display follows.

ERASE SCREEN

All data on the screen is erased. Cursor moves to first position of last line. This code is generated from the keyboard by "Control L".

BELL

The bell will sound only when the Bell Code (Control G) is received.

CARRIAGE RETURN

Places the cursor in left-most position of the bottom line.

LINE FEED

Moves all data on the screen up one line. The cursor does not move.

NULL

No action is taken when this code appears on the data line. This code is generated from the keyboard by "Control Shift P".

BREAK

Depressing the break key forces a "space" condition on the data line as long as the key is depressed.

RUBOUT

Causes a rubout code (all one bits) to be transmitted. A factory installed option allows the cursor to backspace one position. This movement is nondestructive, e.g. the backspace does not erase any character present.

CONTROL H

A factory installed option allows the cursor to backspace one position. This movement is nondestructive, e.g. the backspace does not erase any character present.

SPACE

A factory installed option allows one of two functions to occur when a SPACE code is received along with moving the cursor one position to the right. They are:

A. Erase the character at the present cursor location prior to moving.
B. Move the cursor to the right without erasing any data.

6. EQUIPMENT DESCRIPTION

The basic VISTAR/GTX unit logically and physically consists of three parts; keyboard, display and control. These components and the controls and indicators on the unit are described in this section.

KEYBOARD

The operator interacts with the VISTAR/GTX and the computer via the keyboard shown in Figure 6-1.

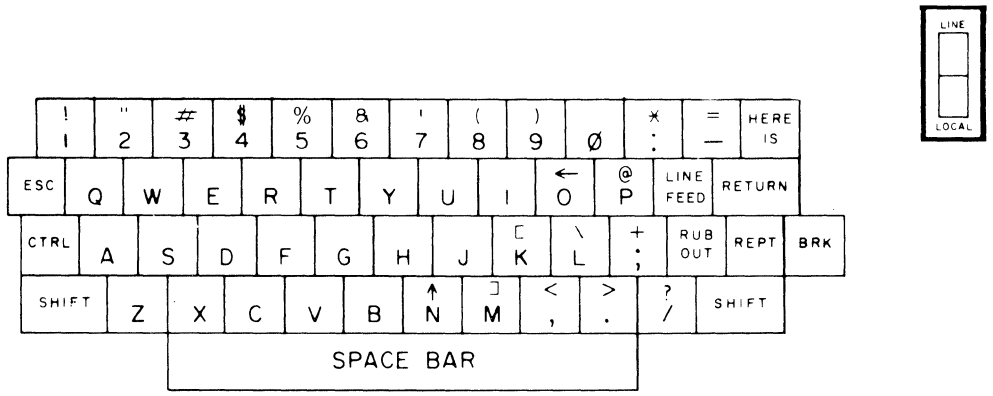


Figure 6-1 VISTAR/GTX Keyboard

The VISTAR/GTX keyboard is composed of a set of 53 keys identical in placement to those of a Model 35KSR Teletype® and a LINE/LOCAL switch.

Appendix B illustrates the full code set, how to generate the codes from the keyboard, and the effect of the codes on the display.

Both the SHIFT key and the CTRL (Control) key establish a mode for the keyboard; i.e., data is not actually generated until a coded key is depressed. Depressing the SHIFT key in conjunction with another key causes upper case characters to be transmitted. The keyboard on the VISTAR/GTX generates upper case codes for the alphabetic characters whether or not the SHIFT key is depressed. The lower case codes are not generated by the VISTAR/GTX keyboard. For operator convenience, two SHIFT keys are on the keyboard. Each of these keys has the same effect on the data.

Control codes do not display on the screen, but in most applications are used as function codes. Some of the control codes have been used as functions for the VISTAR/GTX. For example, Control L erases the screen.

The HERE IS key is inoperative since no answerback function is offered for the VISTAR/GTX.

The REPEAT key when depressed in conjunction with a coded key or function key generates repeated transmission of the code or function at a rate of 10 per second.

The BREAK key places "space"; i.e., a logical "0" condition, on the data line for as long as the key is depressed.

The keyboard has an interlock feature and a roll-over feature which govern operation when two coded keys are simultaneously depressed.

When one or more keys are depressed and held, and an additional key is depressed the code for this additional key will be generated.

DISPLAY

The display screen is a cathode ray tube (CRT) with a P4 (white) phosphor. The viewing area of the display is 9 inches wide and 7 inches high. The screen format is 24 lines, each 80 characters long.

The displayed characters are white on a dark background. The characters are generated on the display surface 50 or 60 times per second to provide flicker-free viewing. Characters are displayed on the screen in a rectangular array (i.e., horizontal lines and vertical columns). Each of the possible character positions on the display consists of a 7 x 10 matrix. The 5 x 7 dot matrix format is illustrated in Figure 6-2 for the letters J and K. The dot matrix forming the character is always in the upper left portion of the 7 x 10 matrix.

The position of the cursor within the 7 x 10 matrix is illustrated in Figure 6-3.

CONTROL LOGIC

The Control Logic contains the logic, power supply, central timing and control, refresh memory, character generator, and communications interface. The most important functions of the Control Logic are:

- Stores in a refresh memory all data received.
- Converts the ASCII characters into dot matrix form and presents them on the CRT.
- Maintains the display by refreshing the image at the rate of 50 to 60 times per second.
- Provides the electrical interface between the electrical operating levels of the VISTAR/GTX and the equipment with which the terminal is operating. The interface is described in detail in Section 7.
- Decodes command codes received on the data line and performs the appropriate function.

REFRESH RATE

A factory installed option selects the refresh rate at 50 or 60 Hz.

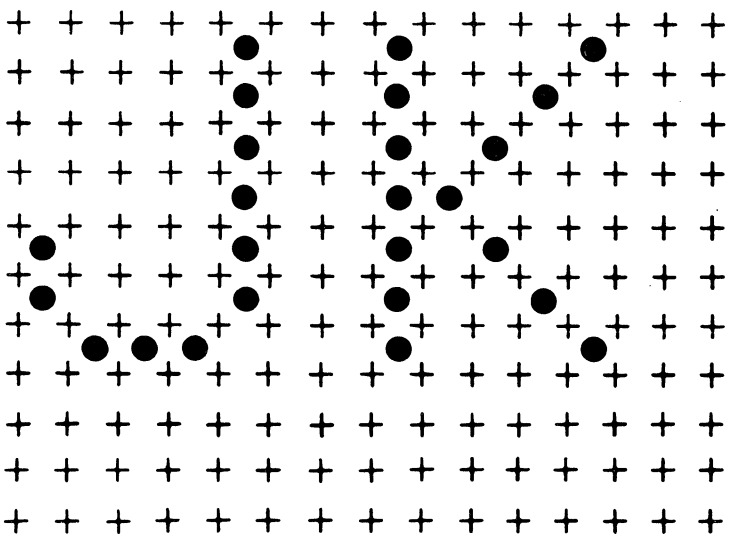


Figure 6-2 Dot Matrix Character Format

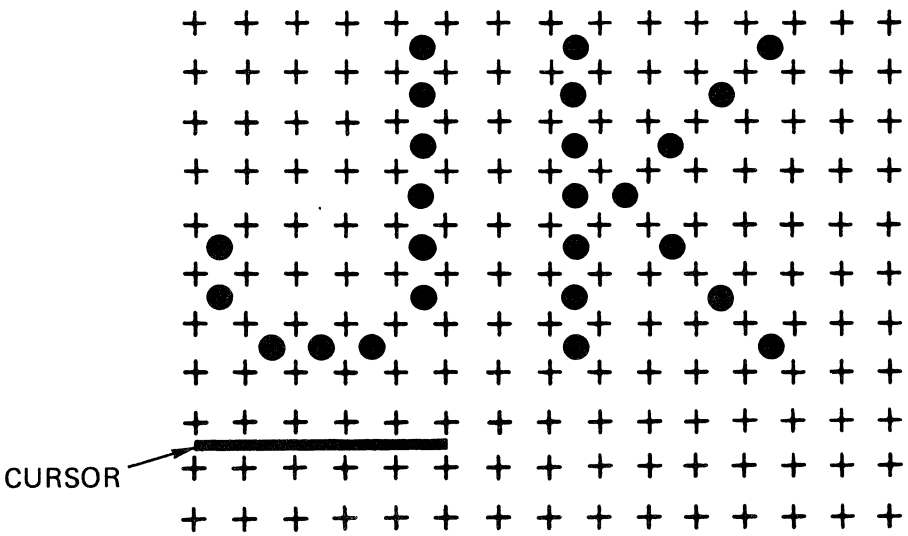


Figure 6-3 Dot Matrix with Cursor

CONTROLS

The following two operator controls are located on the front of the terminal.

- POWER ON/OFF Switch — In the OFF position, power is not connected to the terminal. In the ON position the terminal is in the operating state. After the switch is turned to ON, a 30-second warm-up period is required. A light, built into the switch, glows when the switch is in the ON position.
- LOCAL/LINE Switch — This switch determines whether the terminal is disconnected from the data line (LOCAL) or connected to the data line (LINE).

The controls which govern the video presentation of characters are placed on the side of the unit to the operator's left. The INTENSITY knob permits the brightness of the screen to be set for the operator's comfort.

The placement of the video presentation controls is shown in Figure 6-4 below.

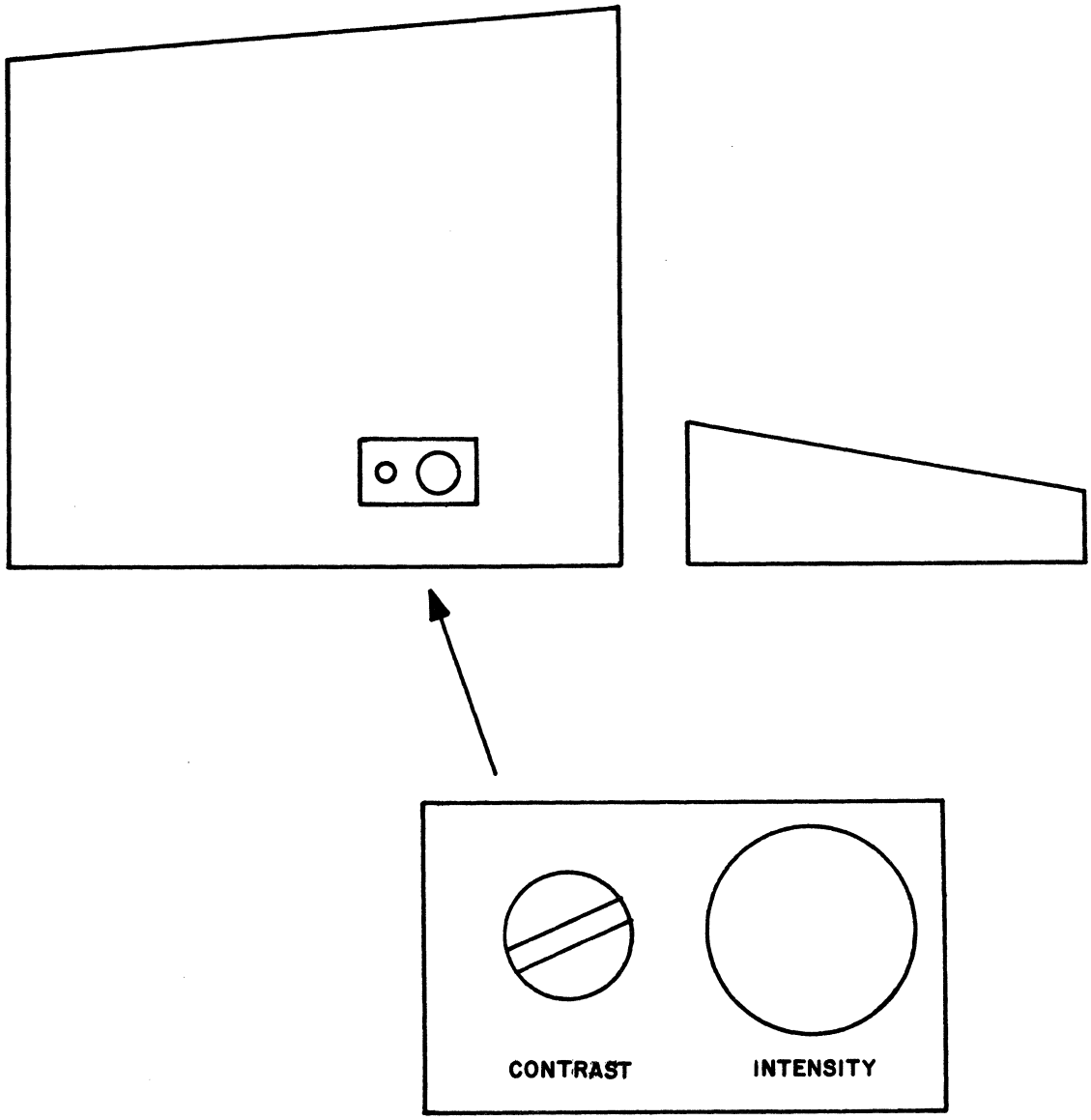


Figure 6-4 Location of Video Presentation Controls on VISTAR/GTX

7. INTERFACE

INTRODUCTION

The VISTAR/GTX operates with a computer over either telephone lines (via a modem) or on local connection by direct cable. The signal interface accommodates a wide range of computer systems and a wide range of data rates. This has been accomplished by adhering to commonly accepted standards for data transmission mode, transmission method (asynchronous) and transmission rate. There are no restrictions imposed by data rate limits upon any of the command codes of the VISTAR/GTX. Thus cursor movement commands, erase commands, etc., may be executed at the maximum rate at which the terminal can accept ordinary displaying codes. The Interface logic makes the necessary conversion between the electrical operating levels of the VISTAR/GTX and those of the external circuit or computer with which the terminal is designed to operate. Also, the interface arranges data in the format required by the circuit or computer.

ASYNCHRONOUS SERIAL INTERFACE

The VISTAR/GTX communicates in a bit-serial, character asynchronous mode. The term asynchronous is synonymous with START-STOP and implies that the receiver comes to rest between characters. The START bit allows the receiving device to initiate its timing in proper synchronism with the incoming data. The STOP bit(s) ensure that the communication line is returned to the mark condition ready for a new START.

Transmitted data characters contain 10 or 11 bits, depending on the setting of a switch. (The Model 33 and 35 Teletype® terminals transmit 11-bit code.) In receiving, the VISTAR/GTX will operate with 10 or 11-bit formats. It is customary to use an 11-bit format at 110 bits per second or below, and 10 bits at higher speeds, but the VISTAR/GTX is completely flexible both in transmission and reception.

The following bit configuration and character structure is used by the Asynchronous Interface:

Bit:
1. START – "space" polarity – first bit transmitted
2. b 1 – least significant data bit
3. b 2 – data bit
4. b 3 – data bit
5. b 4 – data bit
6. b 5 – data bit
7. b 6 – data bit
8. b 7 – most significant data bit
9. Parity bit
10. STOP – "mark" polarity
11. STOP – "mark" polarity (note comments above on 11th bit).

When the interface is transmitting, it adds the start bit, computes and adds the parity bit, and adds the stop bit to every seven-bit code being sent. When it is receiving, it removes the start and stop bits, and transfers only the seven information bits to the appropriate logic.

When receiving, parity is checked. A code with incorrect parity is replaced by the question mark (?) code and displayed as such.

Transmission is always initiated with the start bit. Bits b 1 through b 7, shown above, bear a one-to-one correspondence with the bits b 1 through b 7 of the ASCII code (reference Appendix B). The "Space" and the "Mark" polarities are as defined by the EIA Standard

RS-232C.* Even parity implies that the total number of ones in every character should be an even number; odd implies that it should be odd. Mark parity means that the parity bit is always set to 1. Space parity means that the parity bit is always set to 0.

The multipurpose interface panel in the rear of the unit is shown in Figure 7-1. This interface allows a user to select a number of computer interfaces with any one of a number of data rates.

The interface panel shown in Figure 7-1 contains:

(a) Data Rate Selector.

This switch has 16 rates – 50, 75, 110, 134.5, 150, 300, 600, 900, 1200, 2400, 3600, 4800, 7200, 9600 bits per second and EXT. The EXT setting provides for handling data rates other than the 15 fixed rates enumerated. The external clock must be a TTL compatible pulse source cycling at 16 times the rate (maximum date rate is 1800 char/second).

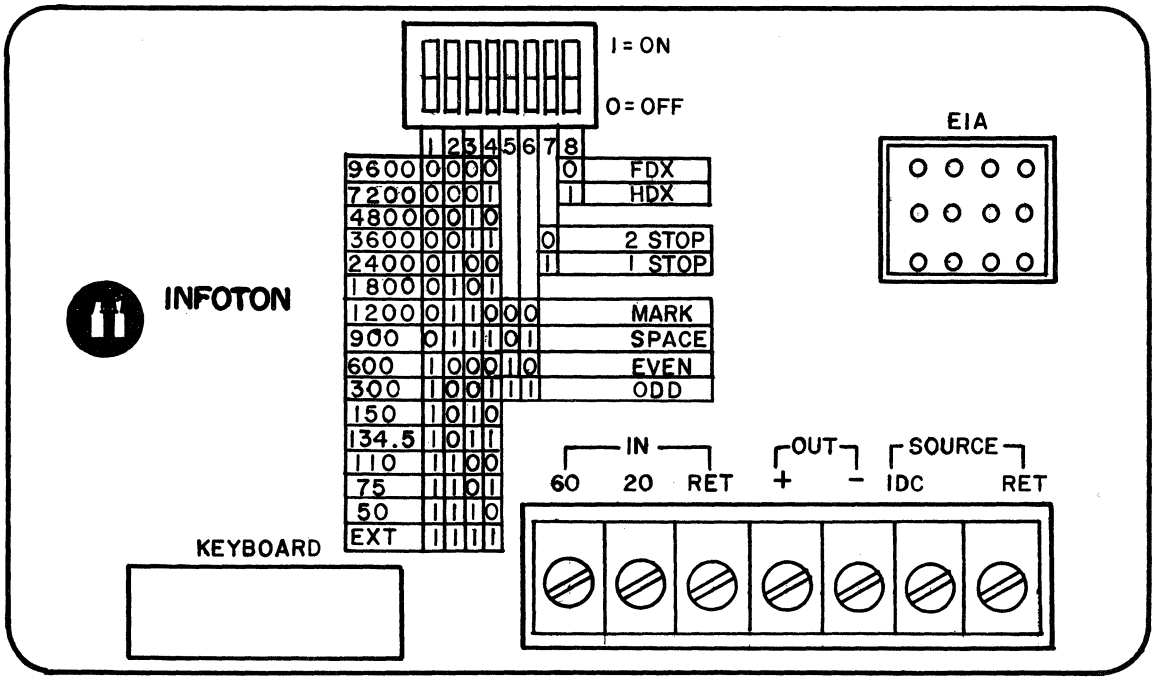


Figure 7-1 VISTAR/GTX Interface Panel

* *This is the accepted interface standard for serial data transmission which is adhered to by the communication carriers. It was formed by the Electronic Industries Association and issued as specification, RS-232. Version C is the current version of the specification.*

(b) CHAR LENGTH

Switch to Select 10 or 11 Bit Code. The setting of these two switches determine whether transmitted characters contain 10 bits (i.e., one STOP bit) or 11 bits (two STOP bits).

(c) Full Duplex/Half Duplex Switch.

This two-position switch (FDX/HDX) determines whether the terminal is operating in full duplex or half duplex.

(d) PARITY Selection Switch.

This two position slide switch allows selection of ODD, EVEN, MARK, or SPACE parity (in the SPACE and MARK positions received parity is ignored).

(e) Current Loop Wiring Strip.

Depending upon the wiring to the terminal strip connector screws, the current loop interface will be 20 or 60 milliamperes, full or half duplex. (The wiring also determines full duplex/half duplex operation in the current loop interface; the switch is significant only for the EIA interface and should be in the FDX position when operating current loop.)

(f) EIA Connector.

This MOLEX connector attaches to a cable supplied with the terminal. This cable is terminated with a 25-pin connector equivalent to Cannon DB-19604-432 or to the Cinch Jones and Cannon DB-25P. In Appendix C, the pin connections for both the MOLEX and the 25-pin connectors are specified.

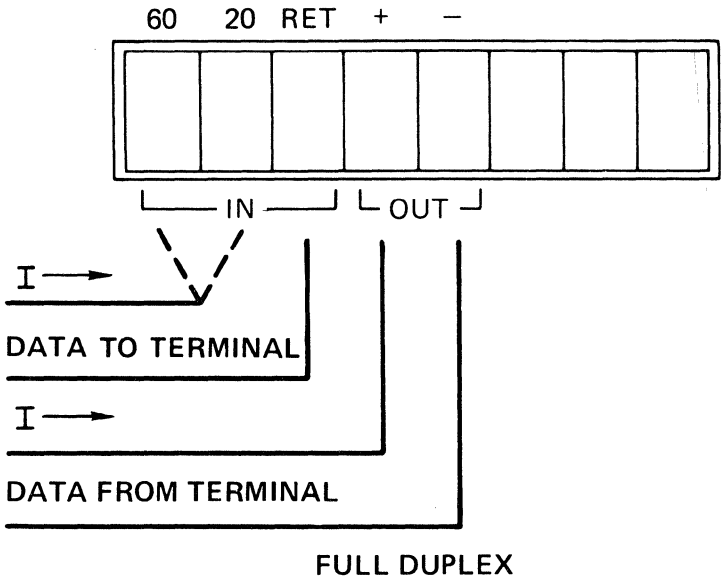
WIRING OF CURRENT LOOP INTERFACE

Full duplex and half duplex operation and 20 to 60 milliampere operation are determined by wiring. Figure 7-2 illustrates the wiring for the various modes of operation. Two-wire twisted pairs are recommended for half or full duplex.

Over limited distances (less than 250 feet) it is preferable to use a true current source input to the interface so that voltage drops in the circuit and line do not affect the signal current.

For driving long lines (greater than 250 feet), a simple voltage-resistor driving source may be used. Appendix D shows the maximum data rates as a function of cable length for two voltages and two currents.

When the VISTAR/GTX is connected to the data line by the EIA RS-232C interface, the current loop output is also available for transmitting data to other VISTAR/GTX displays or to other Teletype®-like devices.



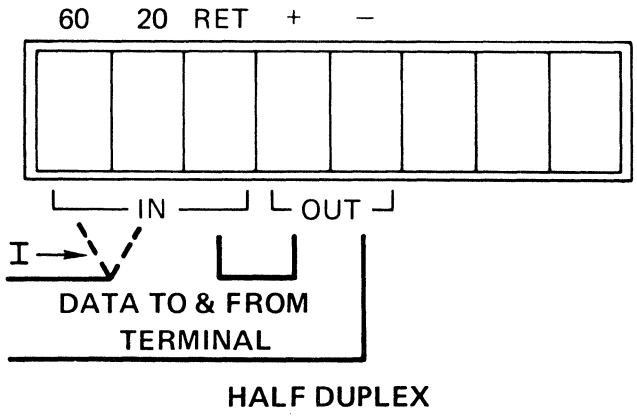


Figure 7-2 Wiring to VISTAR/GTX Current Loop Terminal Strip

8. OPERATING INSTRUCTIONS

INITIAL SETUP

At the start of any operating period, we recommend that you follow these procedures before transmitting data to the data line.

1. Set the LOCAL/LINE switch to LOCAL.
2. Set POWER switch to ON position. Watch for the indicator light to come on. Allow 30 seconds for warm-up.
3. Adjust the INTENSITY control for your viewing comfort.
4. Type a message and see that it is correctly written on the screen. When completing the message on a given line, press the carriage RETURN and then the LINE FEED key. This action places the cursor in the first character position of the bottom line and causes the data to roll up one line.

ESTABLISH COMMUNICATION

The next step depends upon the communication link used to the computer. If this is a direct connection or a private wire phone-line connection, the VISTAR/GTX is ready to operate.

To begin, on the rear interface control panel set the FDX/HDX switch to agree with the operation of the computer. Also the PARITY switch, and the number of bits per character (CHAR LENGTH). If power is provided to the communication link, then switching the unit from LOCAL to LINE will connect the terminal to the computer, and any depression of a code-generating key will cause a transmission to the computer.

If the VISTAR/GTX is connected via switched phone lines the computer must be called to establish the line. Before placing the call, however, switch the unit from LOCAL to LINE. Make the appropriate settings (rear of unit) for the FDX/HDX, data rate, bits per character and parity.

Operation at this point depends upon the particular computer system used.

In Full Duplex, information will be displayed only if the computer at the end of the data line echoes back the information transmitted from the keyboard. This allows you to verify that the message you transmitted on the data line was in fact received by the computer. All computers do not necessarily have this "echo back" capability.

In Half Duplex, data is routed from the keyboard to the display so you see what is actually being transmitted to the data line. In this mode, the computer does not echo data back. If, by mistake, you should select Half Duplex when the computer is operating in Full Duplex, double characters will appear on the screen. The switch should then be turned to the FDX position.

Whenever a character is received with incorrect parity, that character will be replaced by a displayed "?". If repeated parity errors occur, check that the PARITY switch on the rear interface panel is set to correspond to the parity required by the computer system to which the terminal is connected.

APPENDIX A

VISTAR/GTX CODE SET

Bits	Bits 7, 6, 5							
4, 3, 2, 1	000	001	010	011	100	101	110	111
0000	NULL		SPACE	0	@	P	@	P
0001			!	1	A	Q	A	Q
0010			"	2	B	R	B	R
0011			#	3	C	S	C	S
0100			$	4	D	T	D	T
0101			%	5	E	U	E	U
0110			&	6	F	V	F	V
0111	BELL		'	7	G	W	G	W
1000			(	8	H	X	H	X
1001			)	9	I	Y	I	Y
1010	LF		*	:	J	Z	J	Z
1011		ESC	+	;	K	[	K	[
1100	ERASE PAGE		'	<	L	\	L	\
1101	CR		-	=	M	]	M	]
1110			.	>	N	↑	N	↑
1111			/	?	O	←	O	RUB OUT

The shaded area represents lower case codes displayed as upper case characters.

APPENDIX B

VISTAR/GTX INPUT-OUTPUT CODES

7 Bit Octal Code		Remarks
000	Null, Control Shift P	
001	Control A	
002	Control B	
003	Control C	
004	Control D	
005	Control E	
006	Control F	
007	*Control G.	Rings bell.
010	*Control H.	Backspaces or ignored depending on installed options.
011	Control I.	Horizontal tab on some TTYs.
012	*Control J.	Line feed; advances display to next line - rolls screen.
013	Control K	
014	*Control L.	Erases screen. Cursor is then sent to first position of bottom line.
015	*Control M.	Carriage Return to beginning of line.
016	Control N	
017	Control O	
020	Control P	
021	Control Q	
022	Control R	
023	Control S	
024	Control T	
025	Control U	
026	Control V	
027	Control W	
030	Control X	
031	Control Y	
032	Control Z	
033	Escape.	This code is generated by control shift K.
034	Control Shift L	
035	Control Shift M	
036	Control Shift N	
037	Control Shift O	
040	Space	
041	!	
042	"	

* Appears next to the codes which are VISTAR/GTX commands.

VISTAR/GTX INPUT-OUTPUT CODES (continued)

7 Bit Octal Code		Remarks
043	#	
044	$	
045	%	
046	&	
047	'	Apostrophe
050	(	
051	)	
052	*	
053	+	
054	,	
055	-	
056	.	
057	/	
060	ϕ	
061	1	
062	2	
063	3	
064	4	
065	5	
066	6	
067	7	
070	8	
071	9	
072	:	
073	;	
074	<	
075	=	
076	>	
077	?	
100	@	
101	A	
102	B	
103	C	
104	D	
105	E	
106	F	
107	G	
110	H	
111	I	
112	J	
113	K	
114	L	

VISTAR/GTX INPUT-OUTPUT CODES (continued)

7 Bit Octal Code			Remarks
115		M	
116		N	
117		O	
120		P	
121		Q	
122		R	
123		S	
124		T	
125		U	
126		V	
127		W	
130		X	
131		Y	
132		Z	
133		[	Shift K.
134		\	Shift L.
135		]	Shift M.
136		↑	Shift N.
137		←	Shift O.
140		@	
141		A	
142		B	
143		C	
144		D	
145		E	
146		F	
147		G	
150		H	
151		I	
152	SEE	J	
153		K	
154		L	
155	NOTE	M	
156		N	
157		O	
160		P	
161		Q	
162		R	
163		S	
164		T	
165		U	

VISTAR/GTX INPUT-OUTPUT CODES (continued)

7 Bit Octal Code		Remarks
166		V
167		W
170		X
171	SEE	Y
172		Z
173	NOTE	[
174		\
175		]
176		↑
177		Delete, Rub Out. Non-displaying. Moves cursor to left, or ignored depending on installed options.

NOTE: When received on the data line, these codes are stored in memory as upper case. Normally, they are reserved for the display of lower case characters.

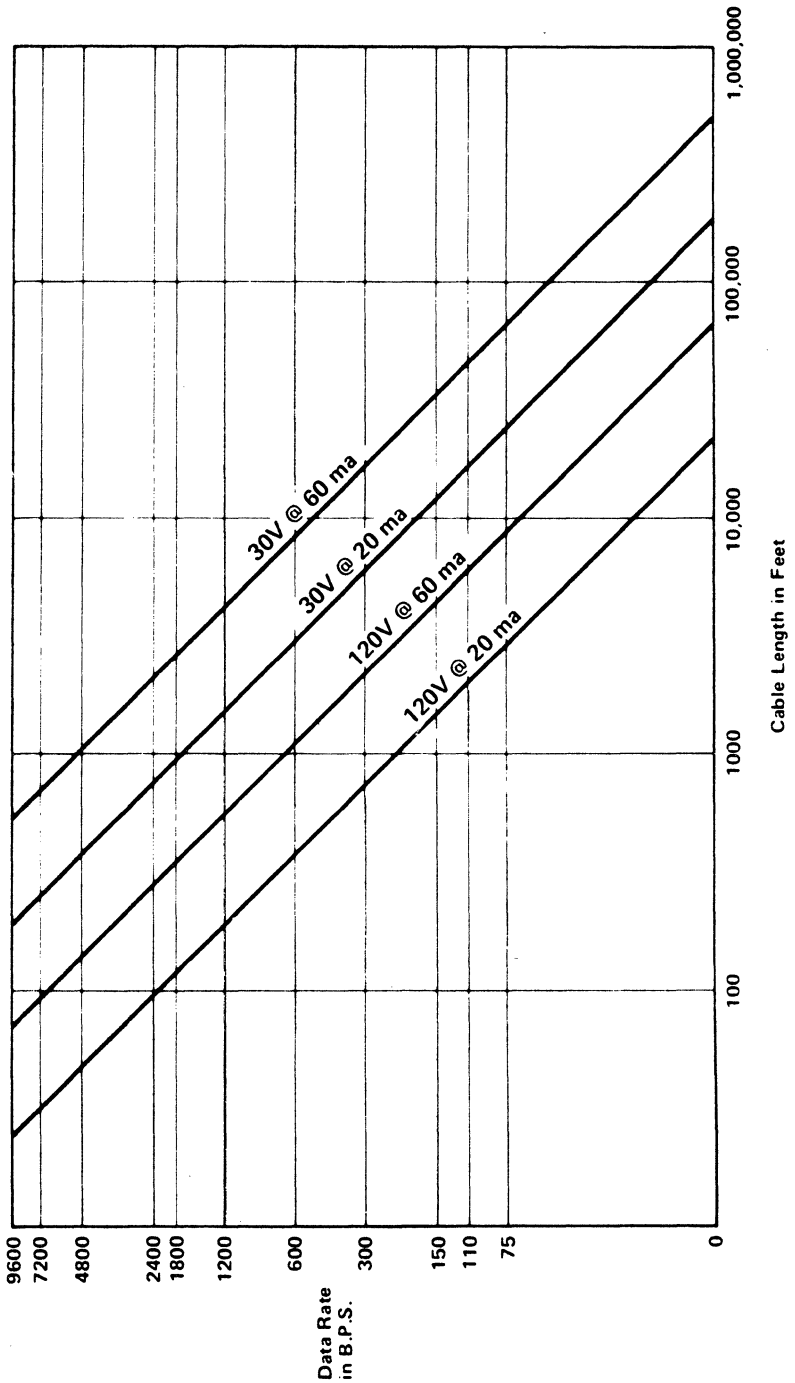
APPENDIX C

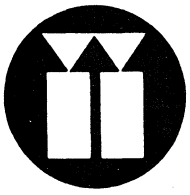
VISTAR/GTX ASYNCHRONOUS SERIAL INTERFACE EIA SIGNALS AND PIN CONNECTIONS

EIA RS-232C Name	CCITT V-24 Name	Description	EIA Pin No.	MOLEX Pin No.	Comments
BA	103	Data transmitted from terminal	2	1	Logical "1" = OFF = −12V Logical "0" = ON = +12V 300-ohm source impedance.
CA	105	Request to send signal from terminal	4	2	Goes high (+12V) when the terminal is ready to transmit
CB	106	Clear to send signal to terminal	5	3	Must be high to allow terminal to send; is supplied by a modem.
BB	104	Data transmitted to terminal	3	4	Logical "1" = OFF = −5V to −25V Logical "0" = ON = +5V to +25V 6.8K ohm load impedance
CF	109	Carrier present signal to terminal	8	5	Must be high to allow terminal to receive; is supplied by a modem.
CD	108.2	Data terminal ready signal from terminal	20	8	Goes high (+12V) when terminal is on LINE; is low when terminal is in LOCAL mode.
		External clock input at TTL logic level	No connection to EIA Interface	10	For use with RECEIVE RATE selector switch in EXT position.
AB	102	Signal ground	7	12	
CC	107	Data Set Ready	6	7	Must be high to allow terminal to operate; is supplied by a modem.

APPENDIX D

I/O RATES AS A FUNCTION OF DISTANCE





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