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VOLKER-CRAIG
USER'S MANUAL
VC4404 THE CHAT
VIDEO DISPLAY TERMINAL

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VC4404 THE CHAT
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Product: P/N:70-400-01078-8 (Black/White CRT)
P/N:70-400-01085-4 (Green CRT)
P/N:70-400-01086-7 (Amber CRT)

Firmware: Rev. L

Manual: P/N:93-000-00000-5 (Docs.[11,10]4&3)
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This manual applies to units starting with Serial No. 24060-001.

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1. GENERAL DESCRIPTION

This high-performance, teletype-compatible display terminal is an input-output device which transmits and receives information from a central processor or computer time-share system. This interactive terminal is designed to meet requirements in the telecommunications, data processing, and computer industries. Applications include time-sharing, information display systems, credit/banking systems, and mini-computer/micro-computer systems. It is compatible with both the Volker-Craig VC404 and the Lear-Siegler ADM3A terminal.

Data communication is possible using a modem and acoustic coupler or a direct computer-to-terminal connection via the EIA, RS232C (CCITT V.24) compatible interface connector at data rates up to 19200 baud. A 20 milliamp current loop cable interface is an optional accessory. An auxiliary Bi-directional RS232C port (e.g. for a printer) is standard.

The basic terminal includes an upper/lower case typewriter style detached keyboard with control keys, communications electronics, and a 12" non-glare video display screen for a 24 line, 80 characters per line format. Data entry occurs in either a bottom line mode with single line scroll up or a page mode. Coloured display screens, (Green or Amber) and National Character Sets are optionally available.

1.1 GENERAL FEATURES

- . Detached, typewriter-style keyboard
- . Volker-Craig VC404 functional compatibility
- . Lear-Siegler ADM-3A functional compatibility
- . 10 Function keys, 14-key numeric pad, 5 cursor keys
- . Typamatic keyboard - 15 cps repeat
- . Standard 128 ASCII Character set
- . Non-Glare 12-inch Display
- . 1920 Characters, 24 lines X 80 columns
- . Independent Receive and Transmit Rates
- . 15 Transmission rates from 50 to 19200 Baud
- . Standard RS232C (CCITT V.24) interface
- . 50/60 Hz. refresh automatic line lock
- . Bi-directional Serial Peripheral Port
- . Local COPY feature
- . Normal or Reverse Video
- . Transparent (Monitor) Mode
- . Bottom or Top line data entry
- . Absolute and Relative Cursor addressing
- . Clear-end-of-Line and Clear-end-of-Screen functions
- . Character Highlighting by reduced intensity
- . Self-Test

1.2 OPTIONS

- . Green or Amber Display Screen (CDS-G or CDS-A)
- . National keyboards and Character Sets (NCS)
- . Current Loop Cable (CI04-2M)
- . Serial Data Cable (CE01-2M)

2. SPECIFICATIONS

VC4404 Specifications

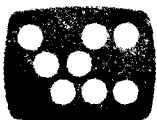
Terminal Type	TTY Compatible	Microprocessor based.
Configuration	VC4404 VC4404/EXP	115V., 50/60 Hz. Export version 230V, 50/60 Hz.
Communication	Code	ASCII
	Type	Serial asynchronous.
	Speed	15 baud rates: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 9600, 19,200, externally switch selectable; transmit and receive speeds independently selectable.
	Method	Character by character (conversational).
	Mode	Full or half duplex.
	Parity	Odd/Even/Mark/Space, externally switch selectable.
	Interface	EIA RS232C, CCITT-V.24 (20 mA current loop accessory available)
Screen Presentation	Display Unit	30 cm (12 inch) non-glare CRT (black/white standard). Light or dark background internally selectable.
	Display Format	24 lines x 80 characters, 1920 characters.
	Character Size	2 mm x 4 mm.
	Character Generation	ROM/PROM
	Refresh Rate	50 Hz., 60 Hz., automatically selected.
	Refresh Memory	Static RAM.
	Highlighting	Reduced intensity or normal (per character basis).
	Character Set	128 ASCII characters, upper/lower case plus 32 control code symbols.
Keyboard Functions	Type	Detached, microprocessor based typewriter style layout. Connected with coiled cable (extends to 4 feet).
	Keyboard	94 keys, 26 letter alphabet, upper/lower case, numeric 0 through 9, punctuation, caps lock. All keys auto repeating (15 characters/second).
	Numeric Keypad	14 keys, 0 through 9, Comma, Period, Minus, ENTER (double size).
	Cursor Control	Up, Down, Left, Right, Home.
	Functional Command Keys	Escape, Delete (Rubout), Break, Control, Line Feed, Back Space, Return, Tab, Shift, Clear Screen.
	Program Function Keys	10 Program Function Keys PF1 to PF10.
Data Entry	Roll Mode: Bottom line with single line roll-up. Page Mode: Page overwrite. Auto wrap at 80th character position, enable/disable internally selectable.	
Peripheral Port	Bi-directional serial peripheral interface On/Off selectable by PRINT key or from host. COPY key dumps contents of screen to the port for printing or storage on a peripheral device.	
Terminal Functions	Cursor	Non-destructive, blinking or steady, block or underline.
	Cursor Control Functions	Left, Right, Up, Down, Home, Clear Screen and Home, Backspace, Line Feed, Direct X-Y cursor addressing using cursor control command, EOL (Clear to End of Line), EOS (Clear to End of Screen), codes are ADM-3A* or VC404 compatible (switch selectable).
	Mode	Lear Siegler ADM-3A* or Volker-Craig VC404 compatible (externally switch selectable).
Audible Alarm	On receipt of Control G (BEL code) from host or keyboard.	
Operator Controls	Front Panel	Power Off/On, Display Brightness.
	Rear Panel	Transmit and Receive Baud Rates, Parity, Transparent Mode, ADM-3A*/404 Compatibility Selection, Screen Fill, Auxiliary Port Speed Select 300 Baud/Host Port Speed, Cursor Display Select Block/Underline—Steady/Blinking.
	Keyboard	Local/Remote, Half/Full Duplex, Roll/Page, Print, Copy.
	Internal	Background light/dark, auto wrap, enable/disable, 115V/230V select.
Power	115V ± 10VAC, 50/60 Hz., 50VA normal. Operating power, 230V ± 20VAC internally selectable, line filtered.	
Overload Protection	Terminal Primary and secondary circuits independently fused.	
Environmental (Operating)	10 DEG C to 40 DEG C 8% to 80% relative humidity (no condensation allowed). Maximum wet bulb 28 DEG C.	
Physical	Display Unit	42.0 cm (16.54") W x 37.5 cm (14.76") D x 34 cm (13.39") H, 12.9 kg (28 lbs. 7 oz.)
	Keyboard (KB4404)	51.5 cm (20.28") W x 22.5 cm (8.86") D x 8.5 cm (3.35") H, 3.2 kg (7 lbs. 1 oz.)
Documentation	VC4404 User Manual VC4404 Service Manual (optional)	

Options

Interface Cables

Option NCS:	National Keyboards and Character Sets, (Swedish, German, French, Norwegian, Danish, Finnish, United Kingdom)	CE01-2M: RS232C (CCITT-V.24) terminal to data set cable.
Option CDS:	Colored Anti-Glare Display Screen (specify: Amber or Green)	CI04-2M: 20 mA current loop adaptor cable.

Specifications subject to revision without notice.



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3. INSTALLATION

3.1 INITIAL INSPECTION

Inspect the terminal for physical damage. Check the switches, connectors, and video screen. The original shipping carton should be kept for possible future shipping of the terminal.

3.2 CLAIMS FOR TRANSIT DAMAGE

If physical damage is evident or if the instrument does not perform correctly when received, notify the nearest Volker-Craig Sales/Service office. Arrangements will be made for repair or replacement of the terminal.

VISIBLE DAMAGE

1. Accept the merchandise and sign the receipt, noting any damages thereon.
2. Keep all packing materials.
3. Notify Volker-Craig shipping department of the damage, waybill number, and all other pertinent information.
4. Call the carrier and request an immediate inspection.
5. Obtain a Return Authorization from the Company.
6. Return the merchandise via the same carrier to Volker-Craig. INCLUDE A COPY OF THE CARRIER'S INSPECTION REPORT WITH THE SHIPMENT.

HIDDEN DAMAGE

1. CALL THE CARRIER AND REQUEST AN IMMEDIATE INSPECTION.
2. Notify Volker-Craig shipping department.
3. Keep all packing materials.
4. Obtain a Return Authorization from the Company.
5. Return the merchandise via the same carrier. INCLUDE A COPY OF THE CARRIER'S INSPECTION REPORT WITH THE SHIPMENT.

3.3 INSTALLATION

The Volker-Craig Terminal can be installed in a number of configurations and locations. Its portability lends itself to being moved easily from one location to another as user requirements change. For use with a telephone, a modem may be used.

All cable connections are made at the rear panel of the terminal. These are:

1. Power cable from terminal to AC outlet. AC power can be in one of the following ranges depending on how the terminal is internally wired:

100 VAC + 10%
 120 VAC + 10%
 200 VAC + 10%
 240 VAC + 10%

2. One of the following interfaces is required:
 - A. An RS232C (CCITT V.24) 25-pin connector and cable from central computer, multiplexer, or external modem, to the rear panel connector marked SERIAL DATA.
 - B. If a 20 mA, current loop interface is required, connection is made to the same connector using a special interface cable (P/N CI04-2M).
3. An auxiliary serial device (e.g. Printer) may be connected to the SERIAL PERIPHERAL port.

3.4 TURN-ON PROCEDURE

Become familiar with all controls, switches, and indicators on the terminal before attempting to sign on to any computer system. The following procedure should be followed when signing on:

1. Turn the BRIGHTNESS control knob clockwise to turn the power ON.
2. Place LOCAL switch on keyboard to LOCAL.
3. Type a few characters on the screen.
4. Adjust BRIGHTNESS control knob to display bright, crisp characters.
5. Set the PARITY ODD/EVEN/NO switches to required position.
6. Select the BAUD RATE to be used.
7. Set the LOCAL keyswitch to the Up position and the FULL Duplex (Up for HALF, down for FULL) keyswitch to the required position and begin sign-on procedure

4. SALES-SERVICE SUPPORT

4.1 WARRANTY

Volker-Craig warrants all products against defects in materials and workmanship in accordance with the Company's standard warranty period. The warranty is limited to the servicing and adjustment of any product returned to Volker-Craig for that purpose. Included is the replacement or repair of any product or any part thereof. Transportation charges must be prepaid by the purchaser.

This warranty shall not apply to any product or part thereof that is defective or unworkable due to abuse, mishandling, accident, alteration, negligence, or improper installation. Volker-Craig reserves the right to service equipment at the customer's site. No other warranty is expressed or implied and Volker-Craig is not liable for consequential damages.

4.2 SERVICE REQUESTS

Volker-Craig is concerned with "after sales" service support. To ensure fast and efficient service we suggest the following procedure when calling Volker-Craig or any authorized sales/service office.

1. Give the Volker-Craig model number and serial number of the defective instrument (an Instrument History file and Unit Control Record is kept on each instrument).
2. Supply the exact physical location of the equipment, i.e., building, department, room number, and/or person to contact for further information.
3. Describe to the best of your ability the nature of the trouble so that we may form a "mental picture" of the problem. (Many service problems are solved over the telephone).
4. The necessary action to solve the outstanding problem will be taken by Volker-Craig personnel as quickly as possible.

4.3 SERVICE FACILITIES

Service facilities are maintained by Volker-Craig and its authorized service organizations worldwide. Please contact your sales office for details.

5. COMMUNICATIONS

5.1 HALF DUPLEX

In this mode, the VC4404 can send and receive information to and from the computer. As each character is typed, it is transmitted to the computer and simultaneously displayed on the screen.

The phrase "half duplex" refers to two features. The feature usually implemented on terminals and termed half duplex should more properly be called local echo. This implies that all characters transmitted by the terminal are treated as if they were also received. This eliminates the need for the computer or modem to echo transmitted data to the terminal in order to display it. When half duplex operation is selected, the terminal performs local echo.

The other feature commonly termed half duplex is used when the communication system is capable of transmission in only one direction at a time (e.g., with a 202-type modem). The terminal uses the RTS wire on the EIA RS-232-C interface to control the data set, directing it to perform transmission from or transmission to the terminal, as required. When half duplex operation is selected, the terminal performs this data set control function in addition to local echo.

5.2 FULL DUPLEX

Full duplex operation is usually selected when the communication system supports two-way, simultaneous transmission. Data entered at the keyboard is immediately transmitted and has no effect upon the display. In most systems, this data is then echoed by the computer or by the modem, received by the terminal, and displayed or acted upon.

5.3 THE CURSOR

The cursor is normally a blinking block which appears on the display in the position at which the next received character will be displayed. It may also be displayed as a blinking underscore. In both cases, blinking may be disabled so that the cursor is steady. When a displayable character is received it is placed on the display at the cursor position, and the cursor is advanced to the next position. (cf. Table 2).

5.4 RECEPTION ERRORS

As the terminal receives data, it examines the data for correct parity and for the presence of a stop bit (two stop bits if selected). With odd parity selected, the sum of all "one" bits of each character including its parity bit, must be odd. With even parity, the sum must be even. (With always-one or always-zero parity selected, no check is made on the parity of received data.) (cf. Table 4)

When a parity error or framing error (no stop bit) is detected in a received character, the character is replaced with a "?" character, which is entered on the display at the cursor position.

5.5 EIA RS232-C INTERFACE

The communications interface conforms to the EIA RS232C (CCITT V.24) standards.

Connector Signals (25-PIN female D-Connector)

<u>Pin Number</u>		<u>Signal Description</u>	
1	AA	Chassis Ground	
2	BA	Output (Transit Data)	OUTPUT
3	BB	Input (Receive Data)	INPUT
4	CA	Request to send - RTS	OUTPUT
5	CB	Clear to send - CTS	INPUT
7	AB	Signal Ground	
8	CF	Data Carrier Detect - DCD	INPUT
11		Supervisory Transmit - SUPTX	OUTPUT
14		+12V DC 100 MA MAX	OUTPUT
18		-12V DC 100 MA MAX	OUTPUT
20		Data Terminal Ready - DTR	OUTPUT

5.6 PERIPHERAL PORT INTERFACE

The following table defines the peripheral port interface signals. (25 Pin female D-type connector). This part looks like a modem port to the peripheral.

PIN NUMBER -----	DESCRIPTION -----
PIN 1	CHASSIS GROUND
PIN 2	INPUT DATA (i.e., from the peripheral)
PIN 3	OUTPUT DATA (i.e., to the peripheral)
PIN 5	ON level (Clear to Send) (Note 1)
PIN 6	ON level (DataSet Ready) (Note 1)
PIN 7	GROUND
PIN 8	ON level (Carrier Detect) (Note 1)
PIN 11	Printer Busy (Supervisory TX) (Note 2)
PIN 20	Printer Ready (Data Terminal Ready)

NOTE 1: Pins 5, 6 and 8 are tied "high".

NOTE 2: Control signal from printer on Pin 11 is propagated to Pin 11 on the main I/O connector if the SERIAL PERIPHERAL port is on. If not used, signal will default to OFF.

5.7 RS232 SIGNAL DEFINITION

Marking condition (OFF) is indicated by a negative voltage from -3V to -25V. A Spacing condition (ON) is indicated by a positive voltage from +3V to +25V.

The least significant bit (LSB) is received first during serial transmission.

5.8 PORT CONTROL LINES

These lines control transmission to/from the ports as described herein.

Request to Send (RTS - Pin 4) OUTPUT

RTS is always asserted in Full Duplex mode. In Half-Duplex, it is asserted when transmission is in progress. A transmission begins when any character is sent and terminates when a terminator character is sent. This may be any of CR, EOT, or ETX. LOCAL mode overrides other modes and RTS is deasserted in this case.

Data Terminal Ready (DTR - Pin 20) OUTPUT

DTR is always deasserted in LOCAL mode. DTR is deasserted when the input buffer fills completely (any characters sent to the terminal when DTR is deasserted will be lost). It is asserted whenever the buffer has character positions available. This line is not directly affected by the Printer Ready line on the peripheral port.

Clear to Send (CTS - Pin 5) INPUT

CTS must be asserted (or disconnected) for transmission to occur. If an attempt is made to transmit a character from the terminal, the cursor will disappear. Once CTS is asserted, the character will then be transmitted and the cursor will reappear.

Data Carrier Detect (DCD - Pin 8) INPUT

DCD is handled identically to CTS.

Supervisory Transmit (SUPTX - Pin 11) OUTPUT

SUPTX is normally deasserted. SUPTX is asserted simultaneously with any transmission of a BREAK signal. SUPTX is asserted if the peripheral port's Printer Busy signal is asserted (provided the port is enabled). Note that Printer Busy appears deasserted if it is disconnected. On the peripheral port, SUPTX functions as the Printer Busy line.

5.9 MAIN PORT

All characters received at the main port are processed for display or control. This port can be disabled by placing the terminal in the LOCAL mode.

There is a 46 byte received character input buffer. This allows the port to receive lengthy control code sequences requiring long execution times (e.g. clear screen, clear to end of screen functions). This permits a throughput of up to 9600 Baud without the need for X-ON/X-OFF flow control. At 19200, such flow control is required. NUL characters do not alleviate the need for flow control since it takes as much time to process a NUL as it does a displayable character. A BREAK signal, when received, is converted to a NUL and placed in the buffer.

X-ON/X-OFF flow control may be disabled by installing a jumper, J9, on the logic PCB. This may be required for systems which use X-ON/X-OFF codes for other purposes. In such cases, communications at 19,200 Baud is not possible. At other Baud rates, the repeated reception of certain codes (e.g., several clear-to-end-line codes in succession), may cause the input buffer to fill completely. In this case, DTR is deasserted until buffer space becomes available.

When the input buffer only has 10 empty character positions, an X-OFF control code (ASCII DC3) is sent. X-ON (ASCII DC1) is sent when the buffer is empty. In Half Duplex, RTS becomes asserted momentarily while X-OFF or X-ON are being sent. These codes are only sent from the main port (never to the peripheral port). When X-OFF/X-ON protocol is used, the logic keeps track of X-OFFs received from both the peripheral and those generated internally. This is done to prevent the logic from transmitting an X-ON until both it and the peripheral are ready.

The cursor will disappear momentarily if an attempt is made to transmit characters (e.g. by typing on the keyboard) faster than that permitted by the baud rate setting. This only occurs at low baud rates (110 baud or less) if characters are being typed at a faster rate.

If the optional answer-back code is received, the main port transmits the pre-programmed text string. This is not sent to the peripheral port. In Half Duplex mode, RTS is asserted at the start of the text and is restored to its original state at the end of the transmission.

5.10 PERIPHERAL PORT

This port permits the transmission of data from the terminal to a peripheral device, such as a printer. This data can originate from the terminal (e.g. the display screen memory) or by being passed through from the main port.

The peripheral port has an independently selectable baud rate. This baud rate is factory-set to 300 Baud. For transmission from the main port to the peripheral port, the baud rate settings must correspond. However, the keyboard can send data to the peripheral (when in LOCAL mode) and the screen can send data to the peripheral port (in COPY mode) at a speed independent of the main port speed.

When in COPY mode, the peripheral can control the flow of data to it by using DTR or X-ON/X-OFF flow control. (N.B. This has no relevance to Jumper J9). When the COPY key is depressed, the screen contents are sent to the peripheral port. A CR/LF pair is transmitted at the end of each line, with trailing spaces not being transmitted. The sequence of events following the depressing of the COPY key is as follows:

1. Keyboard is disabled
2. X-OFF is sent from the the main port (flow control may be disabled by installing jumper J9 on the logic PCB).
3. If the transfer takes place at the independent speed, a .25 sec delay is executed to allow time for the host to stop sending data. DTR is dropped and the UARTs are reconfigured for the new baud rate.
4. Screen contents are transmitted from the peripheral port.
5. The keyboard is enabled.
6. DTR, baud rates are restored and an X-ON is sent.

This port can be turned on or off remotely via the main port upon receipt of a DC2 code (ON) and DC4 code (OFF) or from the terminal keyboard by depressing the PRINT key.

When the port is enabled, any characters received at the main port are sent to the peripheral port. Any characters entered at the keyboard are also sent. The port will only send data if Printer Ready (DTR - Pin 20) is asserted (or disconnected) and if Printer Busy (Supervisory Tx - Pin 11) is deasserted (or disconnected). If either condition is not satisfied, the terminal will wait until both are satisfied. The Printer Busy signal controls the Supervisory Transmit signal (Pin 11) on the main port.

The Printer Ready signal controls only the flow of data to the printer. The main DTR signal is deasserted if the terminal's input queue becomes filled. It should be noted that if J9 is not installed, an X-OFF will be sent to the host before the input queue fills. Therefore it is possible to use a printer with DTR flow control on a system which requires X-OFF will be sent to the host before the input queue fills. Therefore it is possible to use a printer with DTR flow control on a system which requires X-OFF/X-ON flow control.

Depressing the BREAK key causes a 200 msec BREAK to be transmitted from both main and peripheral ports, provided they are enabled. The BREAK is transmitted from the peripheral port first, then the main port.

Characters received at this port from the peripheral are recognized by polling a UART. These characters appear to the terminal as if they originated at the keyboard. Characters can be received from the peripheral at a maximum continuous rate of 30 characters/sec. A BREAK received at the peripheral port is passed as a 200 msec BREAK to the main port. X-ON/X-OFF codes are also passed through to the main port when received.

6. KEYBOARD

6.1 KEYBOARD LAYOUT

Table 10 defines the keyboard layout (USASCII version)

6.2 AUTOREPEAT

When a key is held down for more than one-half second, the key will automatically repeat at approximately 15 characters per second. This is often referred to as "Typamatic".

6.3 KEYBOARD MODE SWITCHES

The keyboard includes the following latching mode switches:

PRINT: depressed - turns peripheral port on.

PAGE: depressed - selects page overwrite (e.g., a line feed received when in bottom line moves cursor to top of screen).

not depressed - selects scrolling (e.g., line feed received when in bottom line causes screen to scroll upwards).

FULL: depressed - selects full duplex

not depressed - selects half duplex

LOCAL: depressed - selects local mode

not depressed - selects remote mode

6.4 PROGRAM FUNCTION (PF) KEYS

Ten PF keys are operational in both VC404 and ADM3A modes. However, the different modes cause different codes to be transmitted, as described in Table 8.

6.5 BREAK KEY

Depressing the BREAK key causes the RS232-C Transmit line to be put into a spacing condition for approximately 200 milliseconds. This key is often used to interrupt host processor program execution.

7.0 CONTROL FUNCTIONS

Two modes of operation exist: VC404 mode and ADM-3A mode. They differ in terms of software compatibility. (see Table 6).

7.1 ESCAPE SEQUENCES AND CONTROL CODES

Both ASCII control codes and "ESCAPE" sequences control the terminal's operation. A Control Code is a single character code which can be used to invoke a function. The ESC character (ASCII hexadecimal 1B), indicates that the following character is not to be displayed, but is to be interpreted as an instruction to perform a special function. All escape sequences, with the exception of relative and absolute cursor positioning consist of the ESC character followed by a single character. Table 6 summarizes these functions.

7.2 CURSOR CONTROLS

Refer to Table 6 for the exact definitions for these codes. They are defined depending on whether the VC404 or ADM-3A mode is set. These codes are transmitted to the host, with the noted exceptions.

CURSOR LEFT - Moves the cursor one character position to the left. If the cursor is positioned at the beginning of a line, issuing this command will have no effect.

CURSOR RIGHT - Moves the cursor one position to the right. When the cursor reaches the last character position in a line, it wraps around to the beginning of the next line. In PAGE mode, the cursor moves from the last position of the last line to the first position of the first line when a cursor right command is issued. (Wraparound occurs if AUTO WRAP is not disabled (see Table 5, J12.)

CURSOR DOWN - This command moves the cursor down one line. If the cursor is on the bottom line the text scrolls up. In PAGE Mode, the cursor moves to the top line.

CURSOR UP - Moves the cursor up one position. If the cursor is on the top line, cursor remains fixed.

CURSOR HOME - Moves the cursor to the upper left hand corner, without clearing screen.

CLEAR - The entire screen is cleared of all information and the cursor moves to the upper left hand corner. In ADM-3A mode, this code is not transmitted to the host when entered from the keyboard.

CLEAR TO END OF LINE - The line upon which the cursor is currently positioned is cleared from the cursor position to the end of that line. The cursor position remains unchanged.

CLEAR TO END OF SCREEN - All information is cleared from the cursor position to the end of the screen. The cursor position remains unchanged.

RETURN (or ENTER) - The cursor is moved to the beginning of the line on which it is positioned.

7.3 CURSOR POSITIONING

Absolute and Relative cursor positioning escape sequences allow the cursor to be placed at any desired position on the display without moving it sequentially through all of the intervening positions. Each sequence consists of four characters ESC+ (for relative positioning) or ESC= (for absolute positioning), one character indicating the new vertical position, and one character indicating the new horizontal position. In the VC404 mode, CTRL P is used instead of ESC=. Relative cursor addressing is not available in the VC404 mode. The position implied by each ASCII character is indicated in the following table:

Absolute Positioning		Relative Positioning	
-----		-----	
1	ESC	1	ESC
2	=	2	+
3	Vertical Position	3	Vertical Position
4	Horizontal Position	4	Horizontal Position

After reception of the ESC=, the absolute positioning sequence is started and the cursor moves to the new position after valid codes have been received.

Relative positioning causes the vertical position to be added to the current cursor vertical position and the horizontal position to be added to the current cursor horizontal position.

Absolute and relative positioning are implemented in wrap-around fashion. Thus, if the new position exceeds the horizontal size of the display, the cursor wraps around to the left of the display. Cursor addressing will not cause the display to scroll. Any values larger than 24 for the vertical and 80 for the horizontal are ignored. This allows vertical or horizontal cursor positioning, independent of horizontal or vertical position, respectively. The display positions are numbered as follows:

		HORIZONTAL POSITION									
		0	1	2	3	4	5	.	.	.	79
	1										
	2										
	3										
											(see Table 7)
VERTICAL	4										
POSITION	5										Monitor Screen
	.										
	.										
	.										
	23										

Cursor Addressing Examples:

Sequence of Codes Received -----	Effort on Cursor -----
ESC = SP SP	Cursor to HOME
ESC + SP SP	Position unchanged
ESC + * ,	Cursor down 10 and right 12
ESC + 7 o	Cursor down 23 and right 79 (or effectively, cursor up 1 and left 1)
ESC = , 4	Cursor to line 12, column 20
ESC = G G	Cursor to column 39, line unchanged (line unchanged because 39 for vertical is >24 and is ignored).

8. GENERAL FEATURES

8.1 DIP SWITCHES

Table 1 defines the DIP switches.

8.2. JUMPER STRAPS

Table 5 defines the Jumper Straps.

8.3 STOP BITS

2 stop bits are used at 50, 75 and 110 baud.

1 stop bit is used at all other rates.

8.4 50/60 HZ

The terminal logic will automatically select the appropriate refresh rate, in accordance with the line frequency.

8.5 COMPOSITE VIDEO OUTPUT

Composite video output is available on the logic board. A rear panel connector must be installed if this feature is to be activated.

8.6 POWER SWITCH/BRIGHTNESS CONTROL

This is a combined switch to control power on/off to the terminal. Rotation adjusts the contrast (appears to the user as brightness) of the display.

8.7 REVERSE VIDEO

Characters may be displayed light on a dark background or dark on a light background. Terminals are normally shipped with a dark background (Table 5).

8.8 AUTOWRAP

When the cursor reaches the end of a line, automatic wrap-around to the next line occurs. This may be disabled (Table 5).

8.9 **TRANSPARENT MODE**

This is set by a Dipswitch (Table 1). All characters received are displayed, including the control characters. This mode can only be turned off via the Dipswitch in Vc404 mode. In ADM-3A mode, this can also be set using ESC codes. However, the Dipswitch should be "off" when using software control.

8.10 **HIGHLIGHTING**

This causes dim highlighting on all subsequent displayable characters until re-set. (See Table 6 for the appropriate codes).

Table 1: DIPSWITCH SETTINGS

"0" means that the dipswitch is in the UP position
 "1" means that the dipswitch is in the DOWN position

SWITCHES S1 and S2 are located on the rear of the terminal
 Switch S1 is to the left of switch S2 (when viewed from the back)

SWITCH S1:

- 1 Mode (0=404 mode/1=ADM-3 mode)
- 2-3 Cursor (Table 2)
- 4 Transparent (if 1, all characters including control codes are displayed)
- 5 Fill (if 1, fill screen with next character typed)
- 6 Independent peripheral speed (0=RX speed/1=300 baud)
- 7-8 Parity (Table 4)

SWITCH S2:

- 1-4 Receive baud rate (Table 3)
- 5-8 Transmit baud rate (Table 3)

Table 2: Cursor DIP Switch Settings

S1-2	S1-3	Effect
0	0	Steady/Block
0	1	Flashing/Block
1	0	Steady/Underscore
1	1	Flashing/Underscore

Table 3: Baud Rate Dip Switch Settings

Switch S2, positions 1-4 for Receive Baud Rate,
positions 5-8 for Transmit Baud Rate.

SETTING	BAUD RATE
0000	50
0001	75
0010	110
0011	134.5
0100	150
0101	300
0110	600
0111	1200
1000	1800
1001	2400
1010	3600
1011	4800
1100	7200
1101	9600
1110	19200
1111	use for terminal self test

Table 4: Parity DIP Switch Settings

S1-7	S1-8	PARITY
0	0	ODD
0	1	EVEN
1	0	MARK
1	1	SPACE

Table 5: Jumper Strap Settings

USER-ORIENTED JUMPERS:

There are three user-oriented features which can be defined by changing "jumpers" located on the main logic circuit board. Their use is:

- J3 This reverses the background. i.e. when installed, light characters appear on a dark background. When removed, dark characters appear on a light background.
- J9 Installing this jumper disables X-ON/X-OFF flow protocol.
- J12 This provides the "Autowrap" feature. When the cursor reaches the end of a line (80-th position), it "wraps" to the beginning of the next line. When the jumper is removed, the cursor will remain in the 80-th column.

Jumpers J9 & J12 are "installed" at the factory.

OTHER JUMPERS:

Other jumpers have been provided to allow for future features and to offer flexibility for special or custom versions of the product. These jumpers and their use are:

- J1, J4 Used to Change the Character ROM from an 8 X 16 (128-Character) to an 8 X 8 (256-Character) format. This also requires a firmware change.
- J2, J7, J10 These change the number of characters per line from 80 to 40. A firmware change is also required.
- J5, J6 These permit the use of various ROMS and EPROMS, notably 2716, 2732, and 2764 types.
- J11 This disconnects chassis ground from systems ground.
- J8 Not used.

Table 6. FUNCTION CODES

(REV K)

FUNCTION	VC404	ADM-3A
BELL	CTRL G	CTRL G
CURSOR LEFT	CTRL H	CTRL H
CURSOR RIGHT	CTRL U	CTRL L
CURSOR UP	CTRL Z	CTRL K
CURSOR DOWN	CTRL J	CTRL J
CURSOR HOME	CTRL Y	CTRL ^
CARRIAGE RETURN (ENTER)	CTRL M	CTRL M
CLEAR SCREEN	CTRL X	CTRL Z
CLEAR TO END OF LINE	CTRL V	|1) ESC T
CLEAR TO END OF SCREEN	CTRL W	|1) ESC Y
BEGIN ABS CURSOR ADDRESS	CTRL P	ESC =
BEGIN REL CURSOR ADDRESS		|1) ESC +
HALF INTENSITY ON (DIM)	CTRL N	|1) ESC)
HALF INTENSITY OFF (BRIGHT)	CTRL O	|1) ESC (
LOCK KEYBOARD		|2) CTRL O
UNLOCK KEYBOARD		| CTRL N
PERIPHERAL PORT ON	CTRL R	|1) CTRL R
PERIPHERAL PORT OFF	CTRL T	|1) CTRL T
ENTER TRANSPARENT MODE		|1) ESC U
EXIT TRANSPARENT MODE		|1) ESC X

1) Denotes added features - not available on the ADM-3A

2) If issued from keyboard, unit must be powered down to clear the command.

VC4404 TABLES

Table 7. Cursor Addressing Codes (Applies to both VC404, ADM3A modes)

Position or Displacement Value	ASCII	Position or Displacement Value	ASCII	Position or Displacement Value	ASCII
0	Space	27	;	54	V
1	!	28	<	55	W
2	"	29	=	56	X
3	#	30	>	57	Y
4	\$	31	?	58	Z
5	%	32	@	59	[
6	&	33	A	60	\
7	'	34	B	61]
8	(	35	C	62	^
9	)	36	D	63	_
10	*	37	E	64	`
11	+	38	F	65	a
12	,	39	G	66	b
13	-	40	H	67	c
14	.	41	I	68	d
15	/	42	J	69	e
16	0	43	K	70	f
17	1	44	L	71	g
18	2	45	M	72	h
19	3	46	N	73	i
20	4	47	O	74	j
21	5	48	P	75	k
22	6	49	Q	76	l
23	7	50	R	77	m
24	8	51	S	78	n
25	9	52	T	79	o
26	:	53	U		

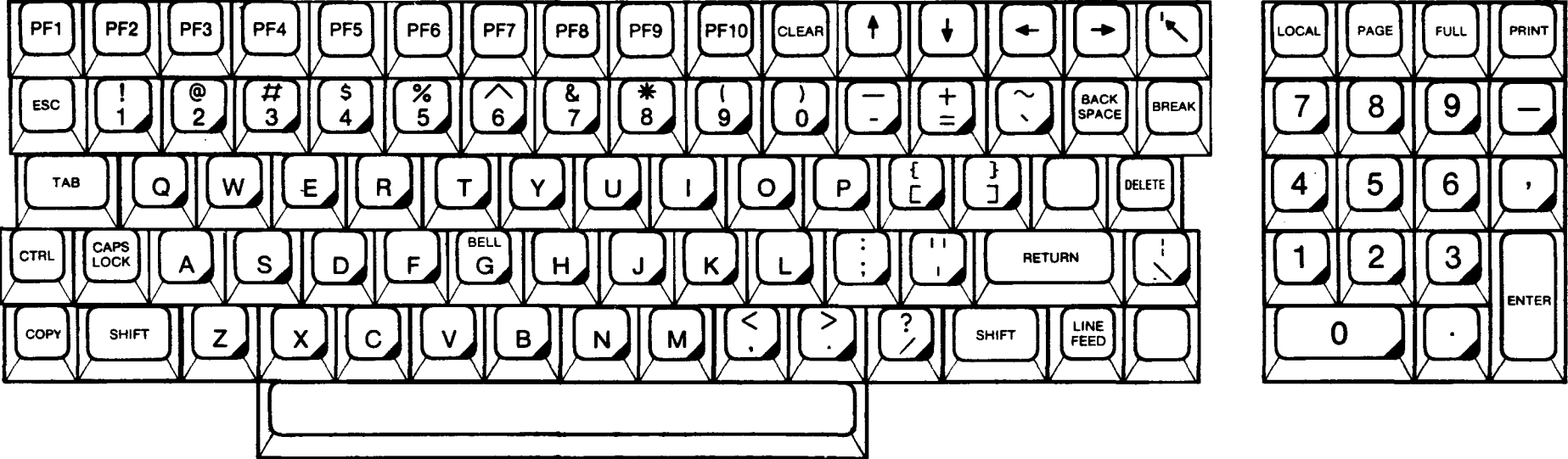
Table 8. Program Function (PF) Key Codes

KEY	VC404 Mode	ADM-3A Mode
---	-----	-----
PF1	CTRL A (SOH)	ESC P
PF2	CTRL B (STX)	ESC Q
PF3	CTRL C (ETX)	ESC R
PF4	CTRL D (EOT)	ESC (SPACE)
PF5	CTRL E (ENQ)	ESC !
PF6	CTRL F (ACK)	ESC "
PF7	CTRL R (DC2)	ESC #
PF8	CTRL T (DC4)	ESC \$
PF9	CTRL \ (FS)	ESC %
PF10	CTRL] (GS)	ESC &



Table 9. Character Font

5	P	(	8	H	X	h	x
A	o	)	9	I	Y	i	u
B	R	*	:	J	Z	j	z
C	E	+	;	K	L	k	l
D	T	,	<	L	\	l	!
E	U	-	=	M	I	m	3
F	V	.	>	N	^	n	~
G	W	/	?	O	_	o	##### ##### ##### ##### ##### ##### #####
H	X	0	@	P	`	p	
I	Y	1	A	Q	a	q	
J	Z	2	B	R	b	r	
K	E	3	C	S	c	s	
L	E	4	D	T	d	t	
M	%	5	E	U	e	u	
N	&	6	F	V	f	v	
O	'	7	G	W	g	w	

VC 4404 The Chat



Legend

-  White key with black lettering
-  Black key with white lettering