OPERATOR'S MANUAL
VIDEO DISPLAY TERMINAL
VC404

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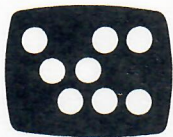
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VIDEO DISPLAY TERMINAL
VC404

CURRENT-LOOP ADAPTER: SE SISTA SIDAN (handwritten)

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INTRODUCTION

GENERAL

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 small systems, time-sharing, information display systems, credit/banking systems, and minicomputer/microcomputer systems.

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.

The basic terminal includes an upper/lower case typewriter style keyboard with control keys, communications electronics, and a 12" non-glare video display screen for a 24 line, 80 character per line format. Data entry occurs in either a bottom line mode with single line scroll up or a page mode. Options to the terminal include serial and parallel peripheral interfaces, coloured display screens, numeric pad and function keys, APL character set (non-overstrike), and many foreign keyboards and character sets.

DISPLAY TERMINAL FEATURES AND OPTIONS

The basic video display terminal is a stand-alone, ASCII, serial asynchronous computer peripheral for use on any system with an RS232C (CCITT V.24) interface.

Standard features on the terminal include:

.Detachable upper/lower case typewriter style keyboard.

.Switch selectable upper/lower case.

.Display of 1920 characters in a 24 line, 80 character per line format.

.12" anti-glare display screen.

.Normal or reverse video.

.Four-Way cursor flashing or steady -block or underline selectable.

.Front panel controls: Power Off/On, Local/Remote, Half/Full Duplex, Roll/Page, ASCII/APL switches.

.Transparent/Tape Mode switch allows display of 95 or 128 characters. All control codes displayed when mode is ON.

.Bottom line entry in Roll Mode.

.Page overwrite in Page Mode.

.Automatic word wrap around on video display after the 80th character position.

.Audible alarm (Control G, BEL code)

.Auto-Repeat, characters repeat at 15 char/sec

.Absolute x-y cursor addressing

.Clear to 'End of Line' and 'End of Screen' functions.

.8-position baud rate select switch on rear panel. Select from 110, 300, 600, 1200, 2400, 4800, 9600, 19200 baud.

.Parity select switch on rear panel.

.EIA RS232C (CCITT V.24) communications interface. (20mA. current loop accessory available).

.Serial or parallel peripheral interfaces (optional).

.Optional numeric pad and function keys.

.APL and many foreign keyboards and displays available.

.EXPORT version (230V/50Hz) easily user-configurable.

TERMINAL OPTIONS

OPTION APL	Provides front panel switch selectable ASCII and APL character set (no overstrikes). APL is typewriter paired.
OPTION SPI	Serial Peripheral Interface. This switched EIA interface is bidirectional for use with a printer, cassette, floppy disc, or other serial peripheral devices. This port is enabled locally by depressing the PRINT key on the keyboard or remotely by the Control Q (Turn On) and Control S (Turn Off) ASCII codes. This option is implemented using a 25 pin DB Type connector located on the rear of the terminal.
OPTION PIP	Auxiliary Parallel Input. ASCII input port used with accessory items such as the Bar Code Reader Interface (BRI). There are 7 input bit lines plus a strobe bit line, power and control lines. This 25-Pin connector is located on the rear panel.
OPTION CDS	Coloured anti-glare display screen (specify Amber, Green).
OPTION KB1	Adds a numeric pad and function keys to the keyboard.

VCL KEYBOARD LAYOUTS

TYPEWRITER LAYOUT (STANDARD)

TYPEWRITER-PAIRED APL (OPTION APL)

*WITH OPTION SPI

TYPEWRITER LAYOUT WITH NUMERIC PAD
AND
FUNCTION KEYS (OPTION KB1)

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. Depress a few character keys to fill the screen with a few lines of characters.
4. Adjust BRIGHTNESS control knob to display bright, crisp characters.
5. Execute a CONTROL X (or depress CLEAR key) to clear screen and home the cursor.
6. Set the PARITY ODD/EVEN/NO toggle switch on rear panel to required position.
7. Select the BAUD RATE to be used with the rear panel thumbwheel switch.
8. 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.

MODES OF OPERATION

LOCAL MODE

In the LOCAL MODE, no signal transmission is made to the computer through the input/output connectors on the rear panel. LOCAL MODE may be used for testing keyboard functions or working in an off-line mode.

HALF DUPLEX, REMOTE MODE

In this mode data is simultaneously displayed on the screen and transmitted to the computer each time a key is depressed.

FULL DUPLEX, REMOTE MODE

In this mode, two way communications exists between terminal and computer. When a key is depressed, the data is transmitted to the computer and then displayed on the terminal screen only after the computer has echoed back the character for display verification. The terminal's operator is assured character-by-character verification of the transmitted data.

TRANSPARENT/TAPE MODE

When the TRANSPARENT MODE switch located on the rear chassis is in the ON position all control codes received by the terminal from the computer or keyboard are displayed on the screen. No cursor control codes are active and all data is continuously displayed as one string, wrapping around at the 80th character position. Control characters are displayed preceded by a small c to identify them as such (i.e. Control G is ^cG, Control X is ^cX, etc.). This mode is extremely useful for debugging computer programs or monitoring completely the communications line data.

COMMUNICATIONS INTERFACE

This consists of a 25-PIN, rear panel input/output connector marked "SERIAL DATA (RS232-C DTE)" and conforms to the EIA RS232C (CCITT V.24) standards. The pin connections are described in APPENDIX F. A 20 mA current loop can be implemented using a special cable assembly, Part Number CI04-2M.

RECOMMENDED EIA CABLING LENGTHS

BAUD RATE	MAXIMUM CABLE LENGTH(M)
110	2400
300	1200
600	600
1200	300
2400	150
4800	75
9600	40

For speeds greater than 2400 Baud and lengths greater than 15 meters, all data and control signals should be carried as twisted pairs using pins 1 or 7 as returns.

MODEMS AND ACOUSTICAL COUPLERS

If external modems and couplers are used, connection to the terminal is made through the 25 PIN RS232C (CCITT V.24) connector. When the computer operates in HALF DUPLEX mode the modem and the terminal must be operating in different modes, otherwise, characters will be repeated on the terminal display screen due to the signal echo back from the modem and the locally generated character.

VC404 Specifications

Terminal Type	TTY compatible	
Configuration	VC404	
	VC404/EXP	Export version 230V, 50/60 Hz.
	VC404/RO	Receive only terminal (Deletes keyboard from VC404).
Communication	Code	ASCII
	Type	Serial asynchronous.
	Speed	110, 300, 600, 1200, 2400, 4800, 9600, 19200, baud externally switch selectable.
	Method	Character by character (conversational).
	Mode	Half or full duplex.
	Parity	Odd/Even/Mark/Space, switch selectable.
	Interface	EIA RS232C, CCITT-V.24 (20 mA current loop accessory available).
Screen Presentation	Display Unit	12 inch non-glare CRT.
	Display Format	24 line X 80 character, 1920 characters.
	Character Type	5 X 7 dot matrix (7 X 10 field).
	Character Size	12" Screen: .20".
	Character Generation	ROM/PROM.
	Refresh Rate	60 Hz., 50 Hz. switch selectable.
	Refresh Memory	Static RAM.
	Character Set	128 ASCII characters, upper/lower case.
Keyboard	Detached typewriter keyboard with Auto Repeat, Line Feed, Back Space, Cursor Up, Cursor Right, Home, Clear Screen, Escape, Break, Tab, and Caps Lock Keys.	
Data Entry	Roll Mode: Bottom line with single line roll-up. Page Mode: Page overwrite.	
Terminal Functions	Cursor	Non-destructive, blinking block cursor.
	Control Functions	Left, Right, Up, Down, Home, Clear and Home, Direct X-Y cursor addressing using cursor control command, EOL (Clear to End of Line), EOS (Clear to End of Screen).
Audible Alarm	On receipt of Control G (BEL code) from computer or keyboard.	
Operator Controls	Front Panel: Power Off/On, Display Brightness. Rear Panel: Baud Rate, Parity, Transparent/Tape Mode. Keyboard: Local/Remote, Half/Full Duplex, Roll/Page, ASCII/APL.	
Indicators	Lighted Caps Lock Key on keyboard. Lighted Print Key (with Option SPI).	
Power	115 ± 10 VAC, 50/60 Hz, 35 VA. CSA Approved. Optional: 230 ± 20 VAC, 50/60 Hz, 35 VA.	
Overload Protection	Terminal: 3A Fast Blow. (1.5A Fast Blow with 230V option). Display: Internal 3A Fast Blow.	
Physical	VC404	41 cm. W X 52 cm. D X 34 cm. H, 14 kg.
	VC404/RO	41 cm. W X 37 cm. D X 34 cm. H, 12 kg.
	Keyboard (Standard)	41 cm. W X 20 cm. D X 7 cm. H, 2 kg.
	Keyboard (KB1)	53 cm. W X 22 cm. D X 7 cm. H, 3 kg.
Documentation	VC404 Operator's Manual. VC404 Service Manual (Optional).	

Options

Option APL:	APL/ASCII Switchable Character Sets — Typewriter Paired (no overstrikes)
Option SPI:	Switched Serial Bidirectional Peripheral Interface
Option PIP:	Auxiliary Parallel Input
Option CDS:	Coloured Anti-Glare Display Screen (specify Amber, Green)
Option KB1:	Numeric Pad and Twelve Function Keys

MTI:	Multiple Terminal Interface. Connects up to five terminals to one serial printer.
BRI:	Bar Code Reader Interface.

Interface Cables

CE01-2M:	RS232C (CCITT-V.24) Terminal to Data Set Cable
CI04-2M.	20 mA. Current Loop Adaptor Cable.

Specifications subject to revision without notice.

VC404 ASCII ENCODING CHART
(Including Hex-code Equivalents)

←— CONTROL CHARACTERS* —→   DISPLAYED CHARACTERS —→

B4	B3	B2	B1	ROW	COL 0	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7
B7					0	0	0	0	1	1	1	1
B6					0	0	1	1	0	0	1	1
B5					0	1	0	1	0	1	0	1
0	0	0	0	0	NUL @ 00	DLE (CURSOR P ADDRESS) 10	20	0 30	@ 40	P 50	` 60	p 70
0	0	0	1	1	SOH A 01	DC1 (SPI ON) Q 11	! 21	1 31	A 41	Q 51	a 61	q 71
0	0	1	0	2	STX B 02	DC2 R 12	'' 22	2 32	B 42	R 52	b 62	r 72
0	0	1	1	3	ETX C 03	DC3 (SPI OFF) S 13	# 23	3 33	C 43	S 53	c 63	s 73
0	1	0	0	4	EOT D 04	DC4 T 14	$ 24	4 34	D 44	T 54	d 64	t 74
0	1	0	1	5	ENQ E 05	NAK (CURSOR RIGHT) U 15	% 25	5 35	E 45	U 55	e 65	u 75
0	1	1	0	6	ACK F 06	SYN (CLEAR TO EOL) V 16	& 26	6 36	F 46	V 56	f 66	v 76
0	1	1	1	7	BEL (BELL) G 07	ETB CLEAR TO EOS W 17	' 27	7 37	G 47	W 57	g 67	w 77
1	0	0	0	8	BS (CURSOR LEFT) H 08	CAN (CLEAR) X 18	(28	8 38	H 48	X 58	h 68	x 78
1	0	0	1	9	HT I 09	EM (HOME) Y 19	) 29	9 39	I 49	Y 59	i 69	y 79
1	0	1	0	10	LF (CURSOR DOWN) J 0A	SUB (CURSOR UP) Z 1A	* 2A	: 3A	J 4A	Z 5A	j 6A	z 7A
1	0	1	1	11	VT K 0B	ESC [1B	+ 2B	; 3B	K 4B	[5B	k 6B	{ 7B
1	1	0	0	12	FF L 0C	FS \ 1C	, 2C	< 3C	L 4C	\ 5C	l 6C	¦ 7C
1	1	0	1	13	CR (CARRIAGE M RETURN) 0D	GS] 1D	– 2D	= 3D	M 4D	] 5D	m 6D	} 7D
1	1	1	0	14	SO N 0E	RS ^ 1E	. 2E	> 3E	N 4E	∧ 5E	n 6E	~ 7E
1	1	1	1	15	SI O 0F	US – 1F	/ 2F	? 3F	O 4F	– 5F	o 6F	DEL 7F

[00] Hex-Code

[ ] Displayed characters

[▦] Terminal Functions

[▒] Codes generated and transmitted by terminal but no action taken on display.

*All control Characters displayed in Transparent/Tape Mode i.e. HT as ^I, STX as ^B.

APPENDIX F

ASYNCHRONOUS SERIAL DATA EIA RS232C (CCITT
V.24) CONNECTOR SIGNALS (25-PIN Female
D-Connector)

| PIN NUMBER	SIGNAL DESCRIPTION
1	CHASSIS GROUND
2	OUTPUT (TRANSMIT DATA)
3	INPUT (RECEIVE DATA)
4	REQUEST TO SEND (NOTE 1) *oT*
5 *In*	CLEAR TO SEND (NOTE 2)
7	SIGNAL GROUND *= CHASSIS GROUND*
11	SUPERVISORY TRANSMIT (NOTE 3)
18	-12V DC
20	DATA TERMINAL READY (NOTE 4)

NOTE 1. In LOCAL mode RTS is OFF. In REMOTE
mode RTS turns ON when a character
is to be transmitted. RTS turns OFF
after a control code has been
transmitted.

NOTE 2. CTS must be ON or open circuited to *CTS mode was ON*
enable data to be sent. In LOCAL *over for all be emot*
mode this signal is ignored. *data. ?? Verkum no*

NOTE 3. In LOCAL mode SA is OFF. In REMOTE
mode SA is OFF except when the BREAK
key is depressed or when the PRINTER
BUSY signal is ON at the Serial
Peripheral Interface (see Appendix G).

NOTE 4. In LOCAL mode DTR is OFF. In REMOTE
mode DTR is ON except when the
PRINTER READY signal is OFF at the
Serial Peripheral Interface (see
Appendix G).

NOTE 5. All other pins have no internal
connections.

RS232 SIGNAL DEFINITION

Marking condition is indicated by a
negative voltage from 3 to 25. A Spacing
condition is indicated by a positive
voltage from 3 to 25.

DATA idle (MARK)

The least significant bit (LSB) is received
first during serial transmission.
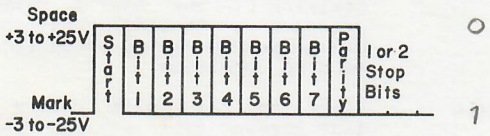
There are 2 stop bits at 110 baud and 1
stop bit at all other speeds.

APPENDIX G - OPTIONS

1. APL/ASCII

This option allows the APL (no overstrikes)
or ASCII character sets to be selected by
the front panel APL/ASCII switch. The APL
character set is typewriter paired and the
keyboard is defined by clear decals with
white legends located on the front of the
ASCII keycaps.

2. SERIAL PERIPHERAL INTERFACE (Option SPI)
(AUXILIARY 25 PIN RS232C PORT)

This bidirectional EIA interface is
switched on/off from the keyboard by
depressing the illuminating "PRINT" key.
With the key depressed, it can also be
controlled by means of control codes.
Control Q (DC1) will turn on the port and
Control S (DC3) will turn off the port (the
light will extinguish).

The 25 pin female D-connector signal
descriptions and assignments follow RS232C
(CCITT V.24) pin conventions (viewed as a
modem port). The connector is located on
the rear panel.

PIN NUMBER	DESCRIPTION
PIN 1	GROUND
PIN 2	INPUT (Transmit) DATA
PIN 3	OUTPUT (Receive) DATA
PIN 5	ON level (Clear to Send-- Note 1)
PIN 6	ON level (Data Set 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 3)

NOTES:
NOTE 1. Pins 5, 6 and 8 are tied to a
positive voltage
NOTE 2. Control signal from printer on
pin 11 is propagated to pin 11
on the main I/O connector if
SPI is ON.
NOTE 3. Data Terminal Ready signal from
printer is propagated to pin 20
on main I/O connector if SPI is
ON. If not used, signal will
default to ON.

3. AUXILIARY PARALLEL INPUT (OPTION PIP)

This option provides an auxiliary TTL
compatible parallel input to allow
connecting parallel devices such as Bar
Code Reader Interface or detached numeric
key cluster to the auxiliary input of the
terminal's control (CON) card. When the
auxiliary input is activated by the
external device, the terminal's keyboard is
disconnected. Once the data from the
auxiliary device has been presented to the
terminal, it is handled the same as
keyboard data. The Input Acknowledge
signal goes high when data can be accepted.

The option is terminated on a 25 pin
connector mounted on the rear panel of the
terminal.

PIN NUMBER	SIGNAL DESCRIPTION
1	SIGNAL GROUND
2	INPUT BIT 0
3	" " 1
4	" " 2
5	" " 3
6	" " 4
7	" " 5
8	" " 6
9	" " 7 (not used)
10	INPUT STROBE'
11	INPUT ACKNOWLEDGE
12	INPUT SELECT'
13	+5VDC

4. COLOURED DISPLAY SCREEN (OPTION CDS)

This option allows the selection of a
coloured anti-glare display screen instead
of the standard grey/white display.
Specify amber or green.

5. NUMERIC AND FUNCTION KEYS (OPTION KB1)

A numeric pad and function keys are added
to the keyboard layout. This option is
most useful for data entry applications and
terminal requirements where user definable
key commands are necessary. Twelve
function keys appear as the top row of
keys on the keyboard. These 12 keys issue
the following ASCII Control Codes:

PF1 CTRL A (SOH)		PF7 CTRL R (DC2)	
PF2 CTRL B (STX)		PF8 CTRL T (DC4)	
PF3 CTRL C (ETX)		PF9 CTRL \ (FS)	
PF4 CTRL D (EOT)		PF10 CTRL] (GS)	
PF5 CTRL E (ENQ)		PF11 CTRL ^ (RS)	
PF6 CTRL F (ACK)		PF12 CTRL - (US)	