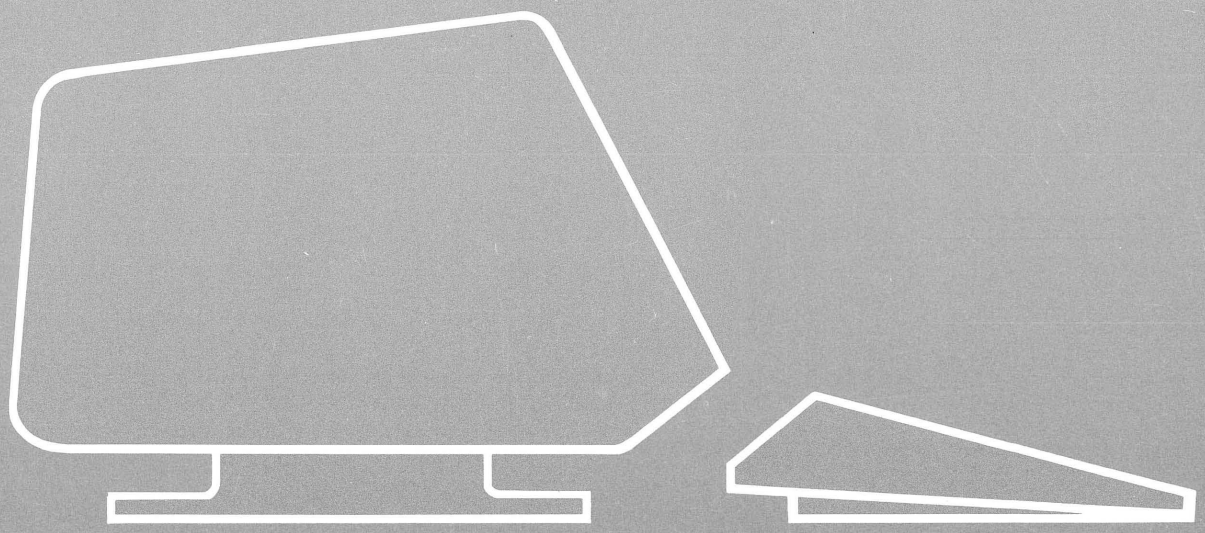
VISUAL

See for yourself

REFERENCE MANUAL

VISUAL 550



WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause interference to communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Class A Label DC 010-002 Rev A

VISUAL TECHNOLOGY INCORPORATED, 540 MAIN STREET, TEWKSBURY, MA 01876

V550

REFERENCE MANUAL

February 1983

SAFETY WARNING

Hazardous voltages 115, 220 VAC and 15 KV DC are present when the terminal is on, and may remain after power is removed. Use caution when working on internal circuits, and do not work alone.

When handling the cathode ray tube caution is required as the internal phosphor is toxic. Safety goggles and gloves must be used whenever the CRT tube is handled. Should the tube break, skin or eyes exposed to the phosphor, rinse the affected area with cold water and consult a physician.

This terminal is supplied with a cord set which includes a safety ground. Do not use this terminal with an ungrounded outlet, missing ground pin, or use any adaptor which will defeat the safety ground.

Insure that power is turned off before connecting or disconnecting the keyboard cable.

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1. INTRODUCTION

The VISUAL 550 is a sophisticated, micro-processor based, graphics and alphanumeric display terminal. The terminal employs two independent display memories: alphanumeric and graphics. This architecture allows the VISUAL 550 to deliver full feature graphics with enhanced alphanumeric functionality.

The VISUAL 550 offers nine operating modes: ALPHANUMERIC, ALPHAGRAPHICS, POINT PLOT, INCREMENTAL PLOT, VECTOR, CROSSHAIR, LOCAL, CHARACTER and BLOCK MODES.

The ALPHANUMERIC functions of the V550 are compatible with the American National Standards Institute (ANSI X3.64) standard for display terminals.

The Alphanumeric functions of the VISUAL 550 may also be selected to be code compatible with the:

Digital Equipment Corporation VT52 and VT100

These emulations are selectable in set-up mode and complete details are contained in section

The graphics functions are fully compatible with Techtronix Plot 10® software.

This manual provides programming and application details for the V550. All control sequences and their associated standard are discussed in detail.

NOTE

For clarity all commands that apply to graphics mode operation are presented with a gray, shade background.

1.1 DESIGN

The VISUAL 550 is really two independent display terminals in one.

The alphanumeric "side" is functionally identical to the VISUAL 300 and performs all the functions of a "smart editing" terminal. Alphanumeric data is stored in RAM memory on a character basis. The display matrix for alphanumeric data is 80x34.

The graphics "side" is compatible with Plot 10 software and offers advanced graphics features (primitives) such as Rectangular Draw with fill. Graphics data is stored in RAM memory on a Bit Map basis. The display matrix for graphics data is 768x585.

The VISUAL 550 employs raster scan technology, thus the CRT is not relied upon to store images. This approach offers many improvements over storage tube technology including a brighter screen, increased speed and selective erase capability.

Since both elements of the display (alphanumeric and graphics, originate from distinct memories they may be intermixed in a nondestructive manner.

The VISUAL 550 is configured using an easy to understand "Menu Style" Set-Up Mode. These operating parameters are stored in non-volatile RAM. Most operating parameter may be down loaded from the host.

The VISUAL 550 operates by receiving a sequence of ASCII characters from either the host or from the keyboard.

1.2 GLOSSARY OF COMMONLY USED TERMS

Attribute

Property of a display entity. For example, on a graphics display a line may have the following attribute – line type.

Absolute Point

An individually addressable position on the display screen, identified by specified X and Y coordinate positions (e.g., X=23, Y=32).

Absolute Vector

A line segment drawn from the current beam position to an absolute point. The end coordinates are defined in Absolute Units relative to the origin of the IMAGE DEFINITION AREA. Contrast relative vector.

Addressability

The smallest discrete unit at which a display element can be defined and to which the hardware responds. The addressability of the V550 image definition area is one part in 1024 and of the viewing area is one part in 768. The smallest addressable display element is sometimes called a Raster Unit (R.U.).

Addressable Point

Any position is the Viewing Area to which the CRT beam may be directed. These positions are specified by COORDINATES. Such addressable positions are finite in number, and form a discrete grid over the VIEWING AREA. In a matrix display such as the PLASMA PANEL, and Addressable Point and Resolution are identical.

Basic Vector

In V550, a vector in one of the eight major directions (horizontal, vertical and 45° to these directions).

Blink

A hardware mode where the displayed information "blinks", i.e., turn on and off, typically twice a second; usually to attract the attention of the operator as with a warning message (also known as FLASH).

Character Generator

A hardware or firmware option which takes character data stored in ASCII character format and causes the appropriate deflections and or intensifications on the CRT to cause the corresponding character images to appear on the screen.

Contrast

The ratio of the brightness of a display image to the screen background.

Coordinate

A positional reference on the display image relative to an origin. In a display system the hardware interprets coordinates in the raster units, whereas in a program user defined coordinates may be used.

Cursor

A flashing underscore or symbol displayed on a screen. It is usually positioned where the next alphanumeric character will be displayed, or other data entry may take place. May be moved by the driving computer, or the operator through keypress, or other operator input devices.

Data Tablet

A graphic input device which encodes X-Y data from a hand held stylus. The portion of the stylus on the tablet surface may be interrogated under program control or may be continuously input. Most writing tablets provide the coordinate information by sensing signals from parallel sets of X and Y wires under the surface. Another form of writing tablet is the sonic variety which the sound from sparks is received by microphones at the edge of the tablet.

Function Keypad

A portion of an alphanumeric keyboard, typically with 8 keys, used to invoke control functions, e.g., move cursor left, right, up, down. Sometimes called Function Keyboard, and may be separate from alphanumeric keyboard.

Graphic

Adjective. Synonomous with Display (adj.) and Graphical. Usually refers to those devices that draw lines and points.

Hard Copy

A permanent copy of a DISPLAY IMAGE.

INTENSITY

Strictly, the absolute luminosity of brightness of an image on the display screen.

Line Type

The type of line used to display vectors on the screen.

Mode

The current mode of a display processor determines how it will interpret data values accessed from a display file. For example, in vector mode data values are interpreted as vector coordinates. Other modes are incremental Plot Mode, Point Plot Mode, Alphanumeric Mode.

Monitor

Usually refers to the physical CRT unit and housing used in graphic display systems.

Phosphor

The chemical coating on the inside face of a CRT which emits visible light when energized by an electron beam.

Pixel

A single picture element, a dot.

Primitive

One of the fundamental graphics entities. A primitive is *one* vector (relative, absolute, etc.) a *point*, a *text string*. Primitives are the smallest definable objects in a display processor's instruction set.

Raster Scan

A technique for generating or recording an image with an intensity controlled, line-by-line sweep across the Display Surface.

Raster Unit

The horizontal or vertical distance between two adjacent addressable points on a CRT Display. Analogous to Plotter Step Size.

Refresh Rate

The rate at which a Display is Regenerated.

Relative Vector

A vector whose end points are defined with respect to a relative origin.

Resolution

The smallest distance between two display elements which can be perceived as two distinct elements by the viewer.

Scaling

A Transformation Function that alters one or more Display Elements by multiplying their Coordinates by constant values. The effect of Scaling is to change their size or shape in a graphics system, either in the Display Image, in the graphics data base or in both.

Scale Factor

A number which multiplies the vector end point coordinates to produce scaling.

Screen Size

The size of a cathode ray tube is the diameter of the tube outside of its housing, or for a non-round tube the length of the maximum diagonal. The screen size sometimes refers to the dimensions – length and breadth – after the CRT has been mounted in its housing. Because of tube mounting and deflection limits, the VIEWING AREA may be less than the Screen Size.

Scrolling

Conventional scrolling is the movement of an image usually a block of text up the screen to allow the display of a new line at the bottom.

Selective Erase

Removal of one or more specified Display Elements, Display Entities, or Display Groups without affecting the remainder of the Display Image.

Subpicture

An entity defined by grouping together several primitive definitions. A subpicture is analogous to a computer subroutine and is used for the same reasons – primarily modularity and efficiency. By referencing a subpicture, images can be repeated without having to respecify the primitives included in the subpicture definition.

Text Mode

The manner in which text is displayed, e.g., normal, italics, subscript, superscript, etc.

Vector

As in the classical definition of vectors, graphic vectors possess the attributes of magnitude and direction and are generally defined relative to the "current beam positions."

Vector Generator

A function generator which in hardware takes vector definition data, typically X and Y beam displacements or end point coordinates, and draws a line directly on the screen.

Vector Type

The specification of the vector appearance. For example, V550 has vector types: solid, dashed, short dashed, dot-dash.

Viewing Area

That portion of the screen on which images can be displayed. Typically the boundaries of the viewing area are set by hardware limiting amplifiers to be within the bounds of the SCREEN SIZE.

Windowing

The visual effect achieved by the apparent movement of a Viewing Area across a larger image area.

Window

A bounded area within a display image that contains a scissored subset of the display data.

2. SPECIFICATIONS

Display Format

34 x 80 Characters
Selectable to 24 x 80

Graphics Display Format

768 x 585 Pixels

Display Memory

One Page 2720 Characters
One Page 449,280 Pixels

CRT Size

14" Measured Diagonally

Image Size

9.0 x 6.75 Inches

Character Cell Size

9 x 15 Alpha
10 x 15 Graphics or
10 x 17 Graphics or
6 x 10 Graphics

Character Generation

Dot Matrix
7 x 11 Alpha
7 x 11 Graphics

Screen Attributes

Normal and Reverse

Video Attributes

Normal, Blink, Blank,
Reverse, Bold, Underline

Graphics Attributes

Reverse, 8 Line
Styles, 8 Fill Styles

Line Styles

Normal, Dotted,
Dot-Dash, Short
Dash, Long Dash, User#1,
User#2, User#3

Fill Styles

Solid, Grey, Slope up Left, Slope Up
Right, Horizontal Lines, Verticle Lines,
Slant Cross Hatch, Verticle Cross Hatch

Logical Attributes

Protect, Unprotect

Communication Interface

RS232C or 20MA

Transmission Speed

50 to 19.2K Baud
Independent transmit and receive rate

Parity

Odd, even, none, mark, space

Communication Modes

Full duplex, half duplex, local,
character or block

Message Framing

User defined: SOM, AS, FEOL, SEOL,
FEOM, SEOM, TACC, TRAILER 1,
TRAILER 2

Status Line

34th Line of display
48 Character host message
Line/local, keyboard lock, edit mode,
row, col, status

Keyboard

Detachable 95 key, ASCII compatible,
typewriter style, auto repeat, keyclick,
"N" Key rollover, numeric pad, caps lock,
sculptured and matted keys.

Function Keys

12 user programmable, down line loadable
and linkable, up to 32 codes per key

Cursor Movement Keys

Alpha mode – up, down, left, right, home, CR, LF, Tab

Graphics Mode – Horizontal, vertical, and 45° relative to each, home

Fast Move – 8 Pixel incremental move

Scrolling

Jump, definable scrolling region, up or down

Tabulation

80 Programmable stops, left or right, tabbing by field.

Editing Functions

Insert character, delete character, insert line, delete line,

Transmission Modes

Line, page, batch

Erase Functions

All, Line, field or page.
From or to cursor location

Graphics Modes

Alphagraphics, point plot, incremental point plot, vector, crosshair, memory load, memory read

Graphics Data Levels

Dots on, dots off, dots complimented, dots replaced

Graphics Scaling

.75 : 1
1 : 1

Alpha Graphics Scaling

1X, 2X, 3X, 4X

Primitives

Rectangular draw, rectangular fill, eight line styles, eight fill styles, circle, arc draw

Indicators

Caps on LED

Audible Indicators

User enabled keyclick, tone on receipt of bel code, or at col 72 if enabled

Self Test

Automatic on, power on, audible tone indicates OK

Character Set

128 ASCII Characters, 16 Line Drawing Character, 16 control code representation characters

Auxiliary Interface

Buffered Printer Port, independent transmit/receive, RS232C or 20MA

Cursor

Alphanumeric –Blinking or solid block

Alphagraphics – Underline
Crosshair – Full Screen Crosshair

External Controls

Power on/off switch
Intensity [↑] [↓]
savable in non volatile RAM

Emulation Protocol

ANSI 3.64, VT52Ⓣ, VT100Ⓣ

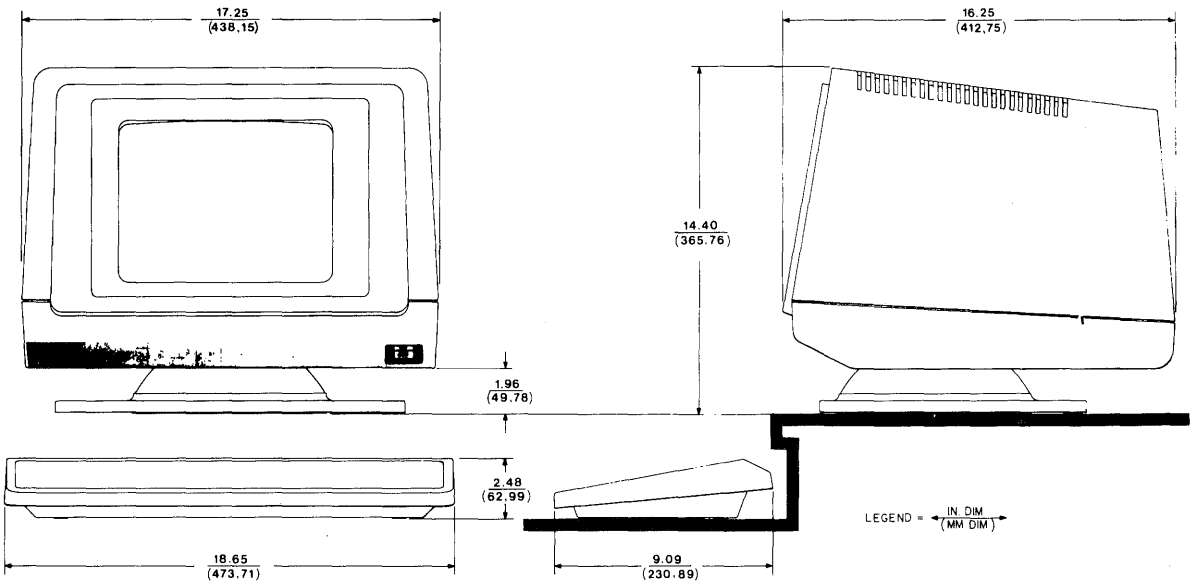
Tektronix 4010 and 4014

Input Voltage

115/240 VAC + 10%, –20%
50/60 Hz

Weight

37 lbs



3. START-UP PROCEDURES

This chapter contains the information necessary to unpack, install and set up the VISUAL 550 terminal.

3.1 UNPACKING INSTRUCTIONS

The VISUAL 550 is packed in a reinforced carton containing the following items.

- Monitor
- Keyboard
- AC Power Cord
- Keyboard Cable
- Reference Manual

Appendix VI shows the packing used with the VISUAL 550. To unpack the terminal from the shipping container use the procedure outlined in Appendix XI.

3.2 INSTALLATION

Refer to Chapter 2 specifications for external dimensions and environmental considerations.

a. Place the monitor on a level surface. A desk or table is satisfactory. However, most operators prefer a lower surface such as a typewriter stand.

b. Connect the keyboard to the monitor using the coiled cable provided.

WARNING

The VISUAL 550 can be wired for 120/240 VAC and 50/60 Hz power. The V550 Maintenance Manual details the conversion steps for each.

c. Plug the terminal into a compatible ac power source.

d. Power on the terminal.

e. The terminal will perform initial power on tests. A successful power on test will be indicated by a short audible tone. If the power on tests are unsuccessful refer to Chapter 10 First Level Maintenance.

3.3 INTERFACE OPTIONS

The VISUAL 550 is designed to exchange data through several approved hardware protocols.

RS232-CCITT
Passive Current Loop
Active Current Loop
Bell 202 Interface

The appropriate interface protocol is selected via a row of 8 miniature dip switches located on the main PWB. Table 3-1 summarizes the function of each switch.

NOTE

The VISUAL 550 is shipped from the factory with the RS232 interface selected.

TABLE 3-1
INITIAL SETTINGS AND FUNCTIONS FOR INTERNAL SWITCHES

Switch Number	Initial Setting	OFF	ON	Comments
3	OFF			
6	OFF	EIA Interface Passive Current	Current Loop Interface	
8	OFF	Loop Interface (Exterior Current Source)	Active Current Loop Interface (V330 Current Source)	Receive
7	OFF	EIA Interface or Current Loop Active	Current Loop Interface Passive	Receive
2	OFF	Passive Current Loop Interface	Active Current Loop Interface	X-mit
1	OFF	EIA Interface or Current Loop Active	Current Loop Interface Passive	X-mit
5	OFF	Pin #19 on EIA Interface Disconnected	Pin #19 Switches Appropriately	For EIA Secondary Channel
4	ON	Pin #11 on EIA Interface Disconnected	Pin #11 Switches Appropriately	For Bell 202 Secondary Channel

Examples of Typical Settings

1. Passive Current Loop Interface; Switches 1,6,7 ON
2. Active Current Loop Interface; Switches 2,6,8 ON
3. EIA RS232/CCITT V24, Switch 5 ON (all other switches OFF)
4. Bell 202 Interface, Switch 4 ON (All other switches OFF)

Other cummunication interface features include:

. . Local copy capability for applications requiring "Echoing" of transmitted data.
. . 16 data rates ranging from 50 to 19,200 baud
. . Odd, even, mark, space or no parity.
. . 7 or 8 bit ASCII Code (See Figure 2-1)
. . Half or full duplex
. . Secondary channel
. . User programmable non-volatile message framing
. . User programmable non-volatile answer back
. . DTR hardware flow control

3.3.1 Data Connectors

Data connections to the VISUAL 550 are provided through two female 25 pin EIA connectors located on the rear of the terminal. The pin definitions of these connectors are summarized in Table 3-2.

The connector labeled modem is for connection to the host or data set.

The connector labeled aux port is for connection to an external device under the V550 control, such as a printer.

TABLE 3-2
EIA RS232-C SIGNAL DEFINITIONS AND CONNECTOR PINS,
AND 20 MA CURRENT LOOP PIN POLARITY

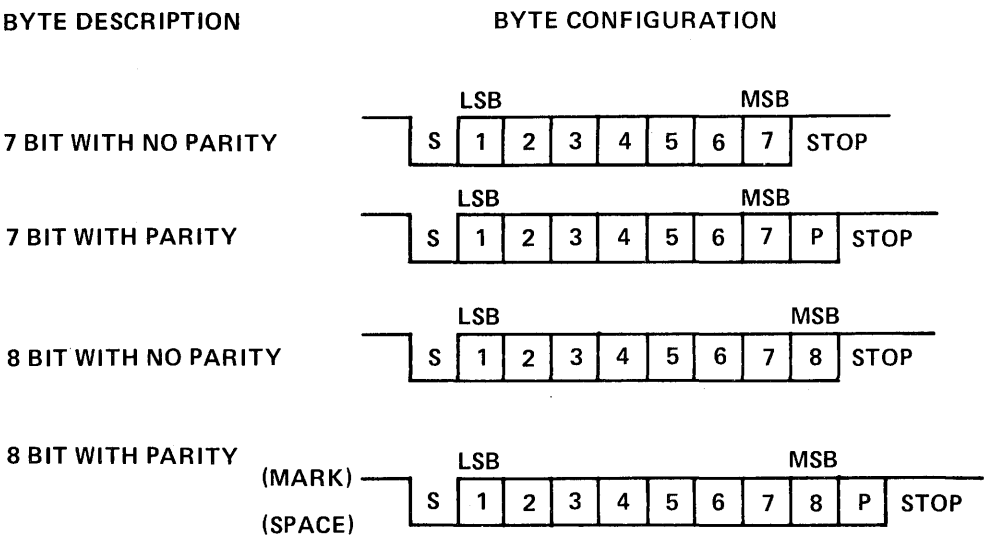
PIN	RS232-C Mnemonic	CCITT V24 Mnemonic	Definition
1	AA	101	Protective Ground
2	BA	103	Transmit Data to Modem
3	BB	104	Receive Data from Modem
4	CA	105	Request-to-Send
5	CB	106	Clear-to-Send
6	CC	107	Data Set Ready
7	AB	102	Signal Ground
8	CF	109	Carrier Detect
11	SCA	–	Secondary Channel Request-to-Send (202 modem)
12	SCF	122	Secondary Channel Carrier Detect
17	–	–	Current Loop Receive –
18	–	–	Current Loop Receive +
19	SCA	120	Secondary Channel Request-to-Send (RS232, V24 modem)
20	CD	108.2	Data Termimal Ready
21	–	–	Current Loop Transmit +
23*	CH	111	Speed Select, always ON (High Speed)
25	–	–	Current Loop Transmit –

*Pin 23 is used on some dual-speed modems to select speed. This VISUAL 550 always has this signal ON. If low speed operation of the dual-speed modem is desired, it is necessary to "float" pin 23 (extract pin 23 from the modem cable at one end).

The EIA RS232-C or Milliampere current loop interface is selected via a row of 8 miniature dip switches located at position SW on the P.C.B.

3.4 WORD LENGTH AND PARITY

The VISUAL 550 may be configured to 7 or 8 bit ASCII code and mark, space, odd, even or no parity. The byte description for each configuration is shown in Figure 3-1.



S = START BIT, ALWAYS = 0
LSB = LEAST SIGNIFICANT DATA BIT
MSB = MOST SIGNIFICANT DATA BIT
STOP = STOP: BIT(S), 2 AT 110 BAUD OR LESS, 1 AT HIGHER THAN 110 BAUD
P = PARITY BIT, ODD OR EVEN

Figure 3-1

3.5 SET UP MODE

The VISUAL 550 employs a sophisticated, easy to use MENU-STYLE parameter selection method that allows the user to define the terminals' characteristics from the keyboard in single keystrokes. The terminals' features and modes are selected and stored in a special mode called SET-UP MODE.

Terminal features and modes are stored (remembered) in a non-volatile ram memory. Once the desired parameters have been selected the terminal will function per the new configuration. The new configuration will be considered temporary, unless a save operation is performed, and a subsequent recall or power on operation will return the terminal to the previously saved characteristics. If the save operation is performed, the new configuration is considered permanent and will be recalled on subsequent recall or power up operations. A reset operation will set the terminal parameters to the previously saved state.

Set-up mode is divided into three groups; basic, menu, graphics and function key, set-up modes.

In the basic set-up mode the user selects status line modes, columnar tab stops, answer back message, reset function or menu mode. Each basic set-up mode feature is described in Section 3.7.

In menu set-up mode the user selects up to eight (8) programming menus.

Select Editing Menu
Select Transmit/Receive Menu
Select Communication Menu
Select Printer Menu
Select Printer Interface Menu
Program Message Framing Codes
Select Terminal Status
Select Graphics Parameters

Each MENU SET-UP MODE is described in Section 3.9.

In function key set-up mode the user programs the twelve (12) function keys. The function key set-up mode is described in Section 3.10.

3.6 HOW TO ENTER BASIC SET-UP MODE

BASIC SET-UP MODE is entered by depressing the set-up key on the keyboard. When the basic set-up mode is entered, the screen displays a presentation as shown in Figure 3-2. Subsequent depressions of the set-up key causes the VISUAL 550 to alternately exit and enter basic set-up mode.

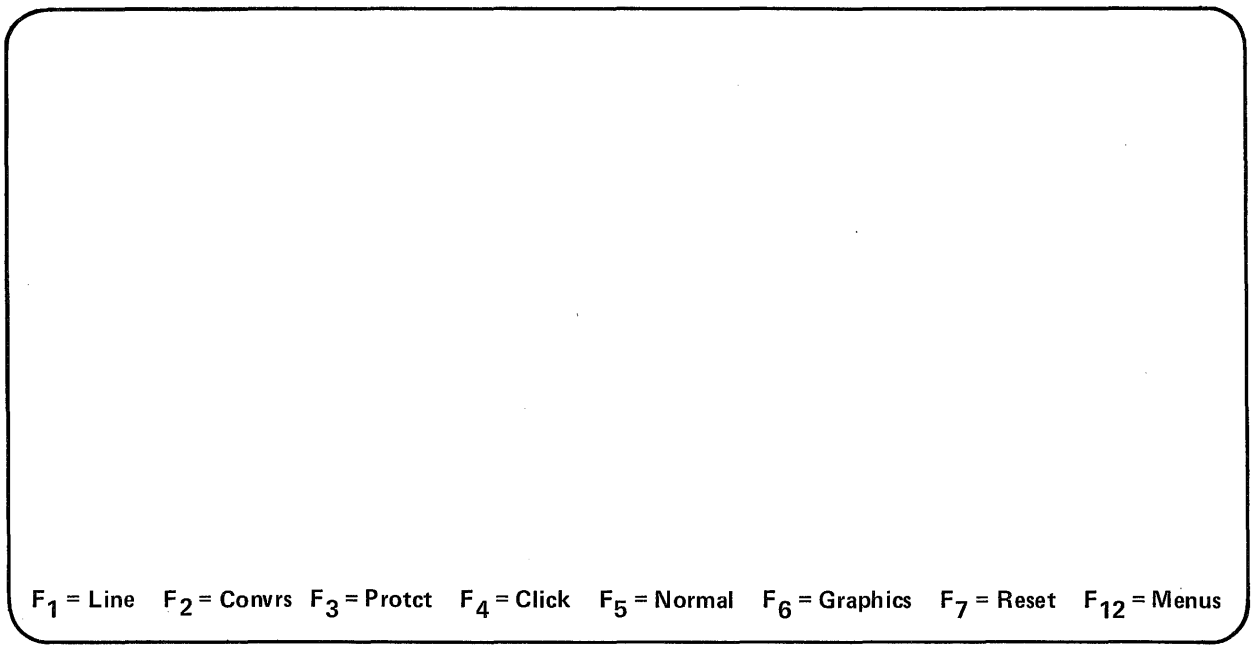


Figure 3-2. Basic SET-UP Presentation

3.7 HOW TO CHANGE BASIC SET-UP FEATURES

Once basic set-up mode has been entered any basic set-up feature may be changed from the keyboard by depressing a single key. Some basic set-up features may also be changed by the host computer via control sequence function.

3.7.1 Line/Local (F1)

On line or local operation is selected by depressing the F1 key on the keyboard.

Subsequent depressions of the F1 key alternates between Local and On Line operation.

When On Line, the terminal may send or receive data from the host computer. When in Local (Off Line) the terminal is electrically disconnected from the host computer. Any data entered at the keyboard is looped back through the terminal receiver and displayed on the screen.

3.7.2 Block/Character Mode (F2)

Block of Character mode is selected by depressing the F2 key on the keyboard.

Subsequent depressions of the F2 key alternates between Character Block mode.

This feature determines whether the terminal operates in a Block Transmission mode, or a Character Transmission mode as described in Section 5.4.6. Block/Character mode may also be changed by the host. See Section 5.4.

3.7.3 Protect/Unprotected Mode (F3)

Protect or Unprotect mode is selected by depressing the F3 key on the keyboard.

Subsequent depressions of the F3 key alternates between Protect and Unprotect mode.

This feature determines whether Area Attributes Codes (AAC) defining protected fields are recognized or not. See Section 5.4.10.

3.7.4 Click/Silent Mode (F4)

Click or Silent mode is selected by depressing the F4 key on the keyboard.

Subsequent depressions of the F4 key alternates between Silent and Click mode.

When Click is selected, an audible key click tone will be generated by the VISUAL 550 for each code generating key depression.

3.7.5 Normal/Reverse (F5)

Normal or Reverse Screen mode is selected by depressing the F5 key on the keyboard.

Subsequent depressions of the F5 key alternates between Reverse and Normal Screen mode.

Normal mode characters are formed by white dots on a black background.

Reverse mode characters are formed by black dots on a white background.

3.7.6 Alpha/Graphics Mode (F6)

Alphanumeric or Graphics Display mode is selected by depressing F6 key on the keyboard.

Subsequent depression of the F6 key steps between alphanumeric, graphics, BOTH and Auto display modes. See Section 6.

3.7.6.1 Video Mode Selection (F6)

The V550 can display either the ALPHANUMERIC video or the GRAPHICS video separately or simultaneously. Depressing F6 will select which video presentation will be displayed when SETUP Mode is exited. There are four choices:

AUTO: The video presentation will be either the ALPHANUMERIC or GRAPHICS depending upon which is presently "receiving" the incoming data stream.

GRAPHICS: The GRAPHICS video presentation will always be visible. The ALPHANUMERIC presentation will only be visible if the incoming data stream is being "received" by the ALPHANUMERIC presentation.

ALPHA: The ALPHANUMERIC video presentation will always be visable. The GRAPHICS presentation will only be visible if the incoming data stream is being "received" by the GRAPHICS presentation.

BOTH: Both the ALPHANUMERIC and GRAPHICS presentations will always be visable.

3.7.6.2 Print Page Selection

The state of video mode selection also determines which video presentation is output to the printer upon a print page command.

Alpha or Auto: Outputs the alphanumeric memory to the printer.

Graphic or Both: Outputs the graphic memory to the printer.

3.7.7 Reset (F7)

Depressing key [F7] causes the VISUAL 550 to execute a reset command.

The reset operation has the same effect as powering-down then powering-up the terminal and is used to run the self test. The reset command, however, returns the terminals' parameters to their "saved" state. This operation clears the screen of all data.

3.7.8 Menus (F12)

Depressing key [F12] causes the terminal to enter the first of eight menus.

WARNING

Entering menu set-up mode clears the screen of all alphanumeric data.

3.7.9 Tabs

Depressing the shift [T] keys in basic set-up mode cause the screen presentation shown in Figure 3-3 to be displayed.

The location of each columnar tab stop is indicated by a high intensity "T" in Figure 3-3.

All tab stops may be cleared by depressing the shift tab key. To set or clear tab stops on an individual basis the following procedure is used:

1. Position the cursor, using tab, or return, to the tab stop to be set or cleared.
2. Depress the [T] key to set/clear the tab stop at the cursor location.

Subsequent depressions of the [T] key will alternately clear/set the tab at the cursor location.

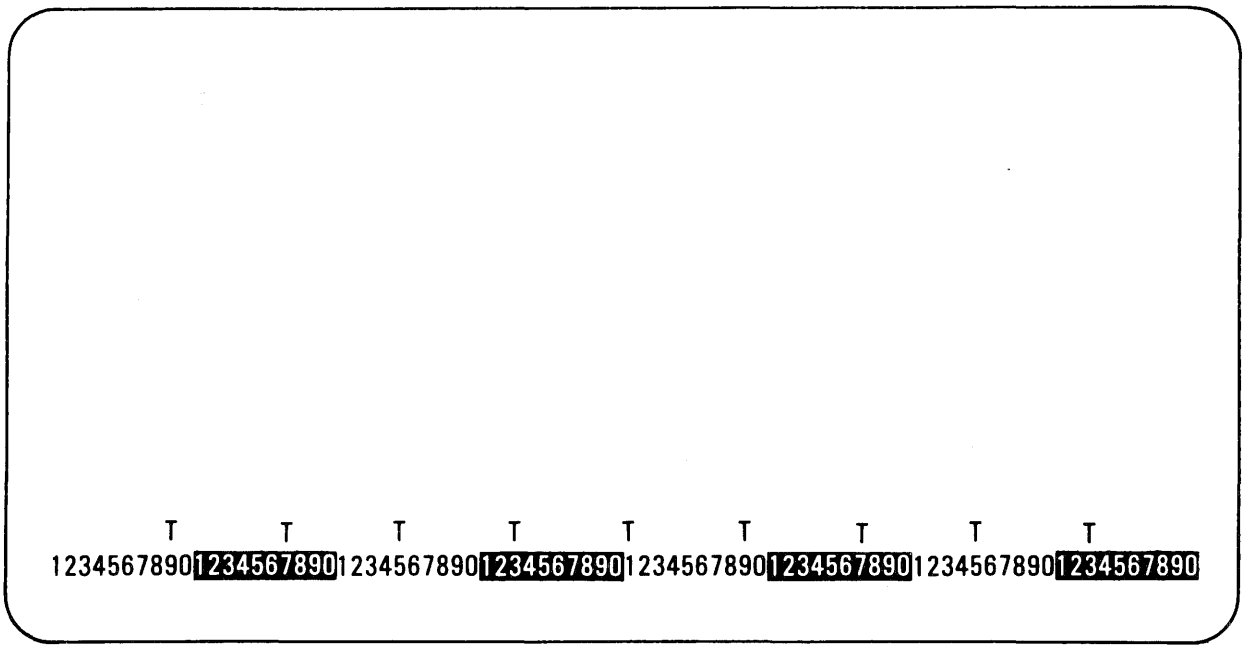


Figure 3-3. Tab Set-Up

NOTE

Tab stops indicated by "T" apply in character mode only.

Tab set up mode is exited by depressing the set-up or shift [T] key on the keyboard.

3.7.10 Answerback

Depressing the [SHIFT] [A] keys in basic set-up mode causes the screen presentation shown in Figure 3-4 to be displayed.

The answerback message of up to 32 characters is programmed at cursor location by typing a user defined delimiter followed by the text of the message and ended with the defined delimiter.

NOTE

The delimiter may be an ASCII character not used in the message. If any control codes are used as part of the message, the code is displayed as in control representation mode. Delimiters are exclusive of the 32 character limit.

EXAMPLE:

/ THIS IS VISUAL 550 /

User Defined — Text — User Defined

When the ending delimiter is typed or upon exceeding 32 characters the terminal exits answerback mode and returns to the basic set-up mode. The answerback message is considered temporary unless a save operation is performed.

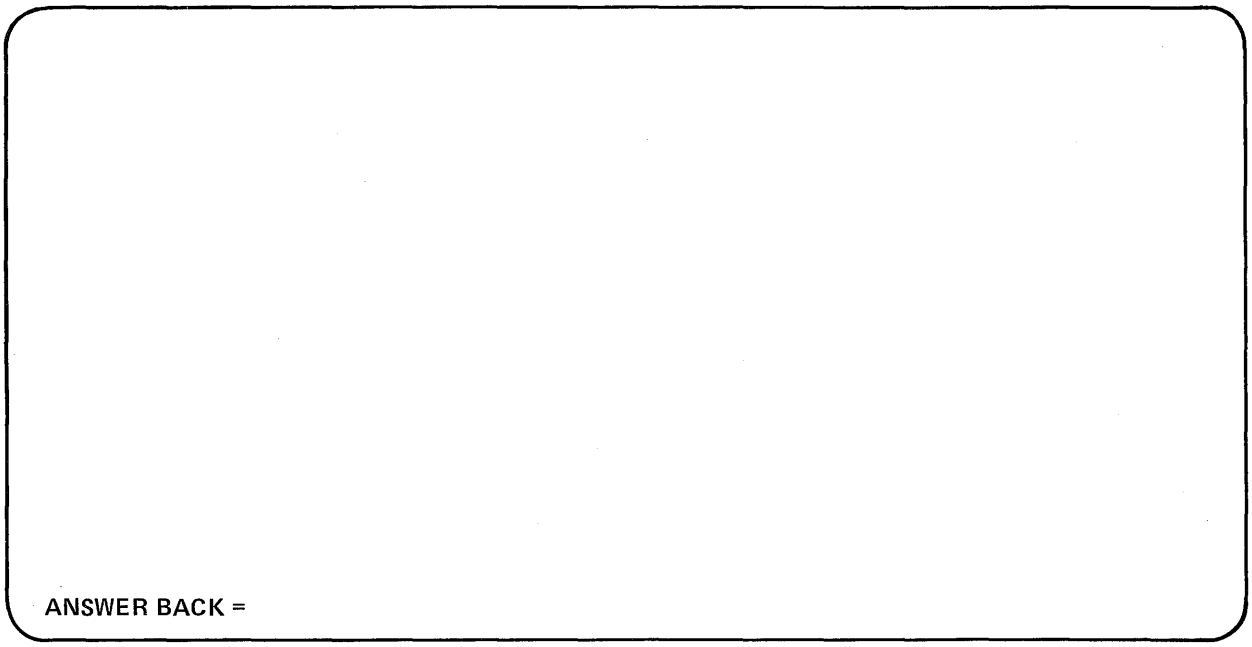


Figure 3-4. Answerback Set-Up

3.8 HOW TO ENTER MENU SET-UP MODE

The menu set-up mode is entered by depressing the set-up key followed by the F12 key. When the menu set-up mode is entered, the screen will display the first of eight set-up menus (Figure 3-4). Subsequent depressions of the F12 key causes the terminal to step through the eight available menus. Menu set-up mode is exited by depressing the set-up key on the keyboard.

WARNING

Entering menu set-up mode clears the screen of all ALPHANUMERIC data.

3.9 HOW TO CHANGE MENU SET-UP FEATURES

3.9.1 Select Editing Menu

Select Editing Menu (Menu #1) screen presentation is shown in Figure 3-5.

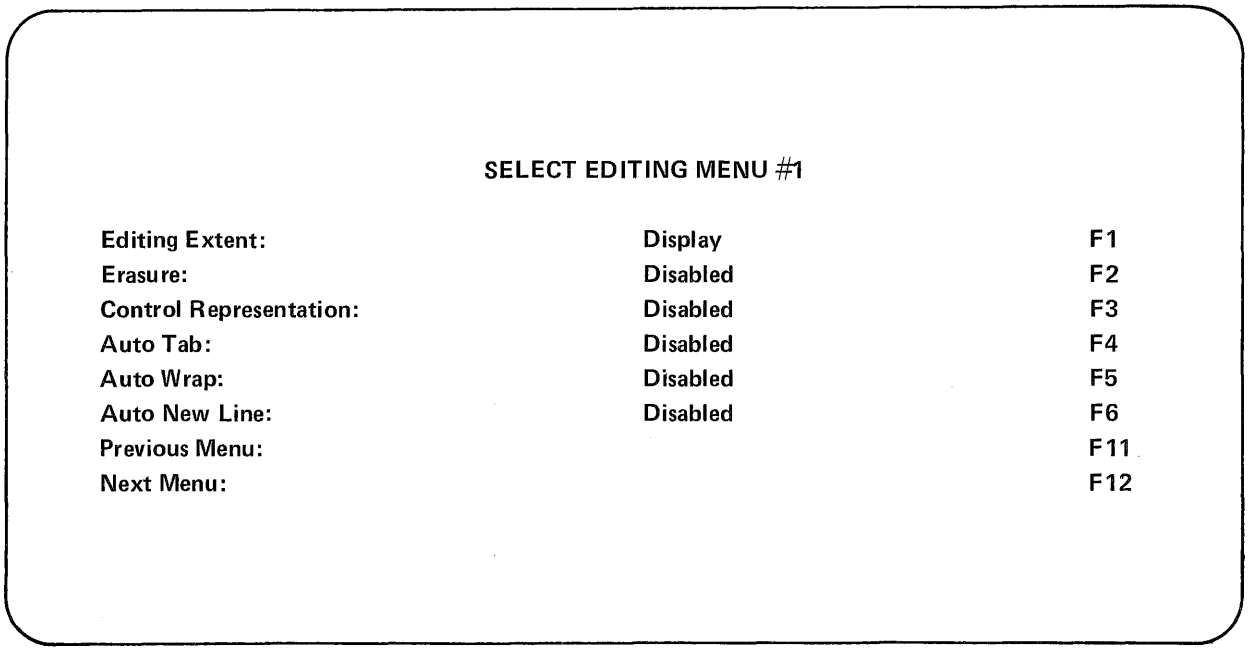


Figure 3-5.

Depressing key [F12] causes the terminal to advance to the next menu presentation.

Depressing key [F11] causes the terminal to step back to the previous menu presentation (in this case menu #8).

3.9.1.1 Editing Extent Mode (F1)

Depressing key [F1] on the keyboard causes the editing extent mode to alternate between: display, field and line modes described in Section 5.5.

3.9.1.2 Erasure Mode (F2)

Depressing key [F2] on the keyboard alternately enables or disables the erasure mode described in Section 5.4.5.

3.9.1.3 Control Representation Mode (F3)

Depressing key [F3] on the keyboard alternately enables or disables the control representation mode described in Section 5.4.3.

3.9.1.4 Auto Tab Mode (F4)

Depressing key [F4] on the keyboard alternately enables or disables the auto tab mode described in Section 5.4.11.

3.9.1.5 Auto Wrap Mode (F5)

Depressing key [F5] on the keyboard alternately enables or disables the auto line feed mode described in Section 5.4.5.

3.9.1.6 Auto New Line Mode (F6)

Depressing key [F6] on the keyboard alternately enables or disables the auto new line mode described in Section 5.4.9.

3.9.2

Select Transmit/Receive Menu (Menu #2) screen representation is shown in Figure 3-6.

Depressing key [F12] causes the terminal to advance to the next menu presentation.

Depressing key [F11] causes the terminal to step back to the previous menu presentation.

SELECT TRANSMIT/RECEIVE MENU

Line Transmit:	**Disabled**	**F1**
Guarded Areas Transmit:	**Disabled**	**F2**
Transfer Termination:	**Disabled**	**F3**
Multiple Area Transmit:	**Disabled**	**F4**
Transmit Request:	**Disabled**	**F5**
Function Message Framing:	**Disabled**	**F6**
Previous Menu:		**F11**
Next Menu:		**F12**

Figure 3-6. Select Transmit/Receive Screen Presentation

3.9.2.1 Line Transmit Mode (F1)

Depressing key [F1] on the keyboard alternately enables or disables the line transmit mode described in Section 5.4.17.

3.9.2.2 Guarded Area Transfer Mode

Depressing key [F2] on the keyboard alternately enables or disables the guarded area transfer mode described in Section 5.4.1.

3.9.2.3 Transfer Termination Mode

Depressing key [F3] on the keyboard alternately enables or disables the transfer termination mode described in Section 5.4.8.

3.9.2.4 Multiple Area Transmit Mode (F4)

Depressing key [F4] on the keyboard alternately enables or disables the multiple area transmit mode described in Section 5.4.7.

3.9.2.5 Transmit Request Mode (F5)

Depressing key [F5] on the keyboard alternately enables or disables the transmit request mode described in Section 5.4.6.

3.9.2.6 Function Message Framing (F6)

Depressing key [F6] on the keyboard alternately enables or disables function key message framing.

When enabled function key transmission will be framed as defined in Section 7.

3.9.3

Select Communication Menu (Menu #3) screen presentation is shown in Figure 3-7.

Depressing key [F12] causes the terminal to advance to the next presentation.

Depressing key [F11] causes the terminal to step back to the previous menu presentation.

3.9.3.1 Parity Sense Mode (F1)

Depressing key [F1] on the keyboard enables or disables the parity sense

SELECT COMMUNICATION MENU		
Parity Sense:	**Disabled**	**F1**
Parity Select:	**N/A**	**F2**
Bits per Character:	**7**	**F3**
Duplex	**Full**	**F4**
Auto Xon/Xoff (XMTR):	**Disabled**	**F5**
Auto Xon/Xoff (ACUR):	**Disabled**	**F6**
Local Echo	**Disabled**	**F7**
Second Channel Turnaround:	**Code**	**F8**
Transmitter Rate:	**9600**	**F9**
Receiver Rate:	**9600**	**F10**
Previous Menu		**F11**
Next Menu		**F12**

Figure 3-7. Select Communication Menu

3.9.3.2 Parity Select Mode (F2)

When parity sense mode is disabled depressing key [F2] on the keyboard causes no action.

When parity sense mode is enabled then depressing key [F2] on the keyboard causes the terminal to alternately select odd or even parity.

3.9.3.3 Bits Per Character (F3)

Depressing the key [F3] on the keyboard causes the terminal to alternately select 7, 8 bit mark or 8 bit space.

NOTE

8 bit mark – high order bit = 1
8 bit space – high order bit = 0

3.9.3.4 Duplex Mode (F4)

Depressing key [F4] on the keyboard alternately selects full of half. Duplex mode operation is defined in Section

3.9.3.5 Transmitter Flow Control Select (F5)

Depressing key [F5] on the keyboard alternately selects the flow control to be XON/XOFF, DTR busy or none. Refer to section 7.5 for details.

3.9.3.6 Auto XON/XOFF (RCVR) Mode (F6)

Depressing key [F6] on the keyboard alternately enables or disables auto XON/XOFF mode as described in Section 7.4.

3.9.3.7 Local Echo Mode (F7)

Depressing key [F7] on the keyboard alternately enables or disables local echo mode.

The local echo feature provides for an automatic "echoing" of transmitted data back to the screen. If an echoing of transmitted data is not desired, the terminal is used for half duplex, or the host computer or modem provides an echo, this feature should be disabled.

3.9.3.8 Second Channel Turnaround Mode (F8)

Depressing key [F8] on the keyboard causes the terminal to alternately select code or second channel mode.

This feature applies to half-duplex operation only and determines whether a turnaround control code or secondary channel will be used for line turnaround.

If the turnaround feature selects a turnaround control code, the turnaround control code may be any ASCII character and may be selected remotely.

3.9.3.9 Transmitter Rate (F9)

Depressing key [F9] on the keyboard causes the terminal to step through the selectable transmitter baud rates.

3.9.3.10 Receiver Rate (F10)

Depressing key [F10] on the keyboard causes the terminal to step through the selectable receiver baud rates.

3.9.4 Select Printer Modes (Menu #5)

Please refer to Section 8.0 buffered printer interface.

3.9.5 Select Printer Interface (Menu #6)

Please refer to Section 8.0 buffered printer interface.

3.9.6 Program Message Framing Codes (Menu #7)

Screen presentation is shown in Figure 3-8 depressing key [F12] causes the terminal to advance to the next menu presentation.

Depressing key [F11] causes the terminal to step back to the previous menu presentation.

PROGRAM MESSAGE FRAMING CODES

Start of Message	002	F1
Area Separator	031	F2
First End of Line	013	F3
Second End of Line	010	F4
First End of Message	003	F5
Second End of Message	004	F6
Turnaround Control Code	013	F7
Graphics Trailer Code #1	013	F8
Graphics Trailer Code #2	004	F9
Previous Menu		F11
Next Menu		F12

Figure 3-8. Program Message Framing Codes Screen Presentation

3.9.6.1 Message Framing Codes (F1-F7)

When the VISUAL 550 transmits a block of data, the transmitted data is framed by codes described in this section.

To program a particular framing code from the program message framing codes menu, depress the appropriate function key (F1 through F7). The selected code is erased and the the cursor moves to the least significant digit of the code. The new code is entered at the cursor position and will shift left for each digit entered. The entry is completed either by depressing the selected function key or by depressing the enter key. Depressing enter key causes the cursor to advance to the least significant position of the next code.

Example: To program the first end of line code ASCII character CR (013)10

1. Depress key [F3] selecting First End of Line (FEOL).
2. Enter 0 1 3
3. Depress key [F3]

A message framing code may be any one of 128 ASCII codes expressed as a decimal number. If a decimal number in excess of 128 is entered, the terminal will reject the entry and the cursor will return to the least significant position of the selected code.

3.9.6.2 Start of Message Code (F1)

The start of message code (SOM) precedes all block transmissions from the VISUAL 300 including function key transmissions and status transmissions. Receipt of a start of message code will lock the keyboard.

3.9.6.3 Area Separator Code (F2)

The area separator code (AS) is inserted into all block transmission data streams to separate each unprotected area transmitted. If protected data is transmitted, the (AS) is not used.

3.9.6.4 First End of Line Code (F3) and Second End of Line Code (F4)

The First End of Line code (FEOL) and the Second End of Line code (SEOL) are inserted into block transmission data streams to signify the end of data on each line.

3.9.6.5 First End of Message Code (F5) and Second End of Message Code (F6)

The First End of Message code (FEOM) will terminate all block transmissions from the VISUAL 550 including function key transmissions and status transmissions. Receipt of either a SEOM or FEOM will clear a keyboard locked condition previously caused by receipt of the start of message code.

3.9.6.6 Turn Around Control Code (F7)

The Turn Around Control Code(TACC) is used to switch the VISUAL 550 from a receive state to a transmit state (or vice versa) when in character mode half duplex operation. When received by the terminal the TACC causes the terminal to switch from the receive state to the transmit state. When transmitted by the terminal the TACC causes the terminal to switch from transmit state to receive state.

The TACC terminates all character mode function key transmissions, answer back transmissions and status transmissions. A TACC also clears the keyboard lock condition.

3.9.6.7 Graphics Trailer Code #1 (F8)

The Trailer Code #1 is appended to the transmission of blocks of graphic data.

3.9.6.8 Trailer Code #2 (F9)

The Trailer Code #2 is appended to the transmission of blocks of graphic data.

DEFAULT CODES MESSAGE FRAMING

Message Framing Codes	
Type	Default Code in Decimal
SOM	002
AS	031
FEOL	013
SEOL	010
FEOM	003
SEOM	004
TACC	013
TRAILER #1	013
TRAILER #2	004

SELECT TERMINAL STATUS

Refresh Rate	60 Hz	F1
Screen Saver	Enabled	F2
Status Line	Visible	F3
Cursor	Blink	F4
Default Intensity	Normal	F5
Emulation	V550	F6
Keyboard	English	F7
Screen Size	33 Lines	F8
XMIT Rate Slow Down	Disabled	F9
Previous Menu		F11
Next Menu		F12

Figure 3-9. Select Terminal Status Screen Presentation

3.9.7 Terminal Status (Menu #7)

Select terminal status is shown in Figure 3-9. Depressing key [F12] causes the terminal to advance to the next menu presentation. Depressing key [F11] causes the terminal to step back to the previous menu presentation.

3.9.7.1 Refresh Rate (F1)

Depressing key [F1] alternately selects 50 Hz or 60 Hz. The refresh rate must match the frequency of the terminal's power supply.

3.9.7.2 Screen Saver (F2)

Depressing key [F2] alternately enables or disables the screen saver feature, the screen saver feature automatically dims the screen if no character or keyboard interrupt occurs within eight minutes.

3.9.7.3 Status Line (F3)

Depressing key [F3] alternately selects visible and blanked. When blanked is selected, the 34th line is not visible to the operator.

3.9.7.4 Cursor (F4)

Depressing key [F4] alternately selects the cursor between blink or steady display.

3.9.7.5 Default Intensity (F5)

Depressing key [F5] alternately selects the default intensity between normal video or bold video characters.

3.9.7.6 Emulation (F6)

Depressing key [F6] selects one of three different emulations in alphanumeric mode.

V550 mode (ANSI 3.64), VT100 mode, VT52 mode

3.9.7.7 Keyboard (F7)

Depressing key [F7] alternately defines the keyboard layout. Subsequent depressions of key (F5) causes the V550 to step through the available foreign language layouts as shown in Appendix III.

The select keyboard layout set-up feature defines the keyboard layout only and does not alter the presently selected character set.

The select character set command is used to define the character set and requires the optional foreign character set ROM to be installed. Please refer to Section 5.

3.9.7.8 Screen Size (F8)

Depressing key [F8] alternately selects the active screen size to 33 lines or 24 lines in alphanumeric mode.

3.9.7.9 XMIT Rate Slow Down (F9)

Depressing key [F9] alternately enables or disables the internal baud rate of host requested block mode transmissions to transmit at 60 characters per second (600 baud) or the baud rate the terminal is selected for.

3.9.8 Select Graphics Operating Parameters (Menu # 8)

The select graphics operating parameters screen presentation is shown in Figure 3-10. Depressing key [F12] causes the terminal to advance to the next menu presentation, in this case menu # 1. Depressing key [F11] causes the terminal to step back to the previous menu presentation.

3.9.8.1 Alpha Character Cell Size (F1)

Depressing the key [F1] alternately sets the alphagraphics character cell size to either a 10 x 17 or 10 x 15 matrix.

SELECT GRAPHICS OPERATING PARAMETERS

Cell Size	**10 x 17**	**F1**
Space Code Operation	**OVRWRT**	**F2**
Scale Factor	**1:1**	**F3**
Aux Port RCV Data Use	**Cursor Move**	**F4**
Graphics Printer Type	**I.D.S.**	**F5**
Bit Pad Type	**GTLO**	**F6**
Bit Pad Tip Switch	**Disabled**	**F7**
Print Image Rotation	**0 Degrees**	**F8**
Extended Diagnostics	**Disabled**	**F9**
Previous Menu		**F11**
Next Menu		**F12**

Figure 3-10.

3.9.8.2 Space Code Operation (F2)

Depressing the key [F2] alternately defines the operation of space code (hex 20) to be either "overwriting" or "nondestructive".

Overwriting – a received space code moves the alphagraphics cursor one character position to the right and replaces the previous character with a space.

Nondestructive – a received space code moves the alphagraphics cursor one character position to the right. The previous character remains unchanged.

3.9.8.3 Scale Factor (F3)

Depressing the key [F3] alternately sets the scale factor to be 1:1 or 3:4. See Section 6.3.

3.9.8.4 Aux Port Rcv. Data Use (F4)

The depression of key [F4] selects one of three aux port modes.

1. Cursor Move – A local move of the cross hair cursor from the bit pad. Coordinates are sent to host upon the depression of a key or pen tip.
2. Pass B.P. to Host – Allows full bi-directional communication through the terminal to the host with the screen reflecting the cross hair cursor moves.
3. Pass to Host Transp. – Allows full Bi-directional communication through the terminal to the host without the cross hair movement on the screen.

3.9.8.5 Graphics Printer Type (F5)

The depression of key [F5] causes the V550 to step through the available printer models. See Section 9.7 for print details.

3.9.8.6 Bit Pad Type (F6)

The depression of key [F6] causes the V550 to step through the available bit pad models. See Section 9.6 for bit pad details.

3.9.8.7 Bit Pad Tip Switch (F7)

The depression of key [F7] alternately enables or disables the bit pad's pen tip switch from sending the coordinates.

NOTE

If disabled, any key may be depressed to send the cross hair coordinates to the host.

If enabled, the [ENTER] key or the pen tip must be depressed to send the coordinates to the host.

3.9.8.8 Print Image Rotation (F8)

The depression of key [F8] alternately selects 0 degrees of 90 degrees print image rotation.

A selected print image rotation of 90 degrees causes the graphics display to be rotated 90 degrees from vertical upon transmission to the printer.

3.9.8.9 Extended Diagnostics (F9)

The depression of key [F9] alternately enables and disables the extended power up diagnostic tests.

WARNING

The extended diagnostics require approximately five minutes to complete.

3.10 HOW TO ENTER FUNCTION KEY SET-UP MODE

The function key set-up mode allows the user to program the function keys from the keyboard and is entered by simultaneously depressing the function and set-up keys on the keyboard.

When the function key set-up mode is entered in VISUAL 550 will display the program function keys screen presentation Figure 3-11.

Function key set-up mode is edited by simultaneously depressing the [SET-UP] and [FUNCTION] keys on the keyboard.

PROGRAM FUNCTIONS KEYS

01	ESC A ESC\	F1
02	ESC B ESC\	F2
03	ESC C ESC\	F3
04	ESC D ESC\	F4
05	ESC E ESC\	F5
06	ESC F ESC\	F6
07	ESC G ESC\	F7
08	ESC H ESC\	F8
09	ESC I ESC\	F9
00	ESC J ESC\	F10
11	ESC K ESC\	F11
12	ESC L ESC\	F12

Figure 3-11. Program Function Keys Screen Presentation

NOTE

Entering function key set-up mode clears all screen data

3.10.1 Function Key Definition

The user programmable function keys (F1 – F12) may contain up to 32 characters each.

Each function key may be independently linked to another function key.

A link uses two (2) character positions.

A function key definition may not start with a link.

Function keys may be loaded from keyboard or remotely via command.

Function key data may be routed directly to the screen or data line.

Function key transmissions are framed as described in Section 7.2.2.

Control functions may be entered and are displayed as defined by control representation mode. See Appendix A V.

Function key data may be stored in non-volatile RAM by executing a save command.

3.11 HOW TO PROGRAM FUNCTION KEYS (F1 THRU F12)

Enter function key set-up mode (Sec. 3.7)

3.11.1 Function Keys

Select the function key to be programmed by depressing the corresponding function key (F1 – F12) on the keyboard. The selected line on the program function key screen prestation is highlighted in high intensity and the cursor moves to the first character position of the function "string" to be defined. Up to 32 characters may then be entered by typing

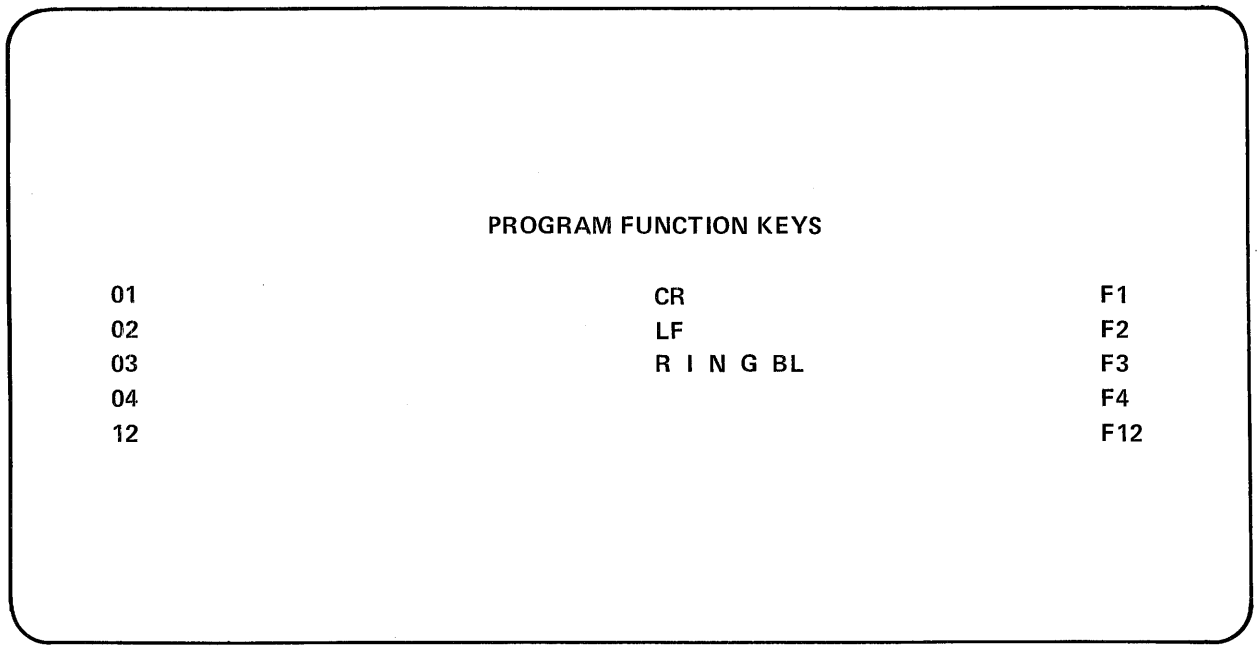
the message on the keyboard. The function key string is terminated by depressing the selected function key on the keyboard.

3.11.2 Function Key Programmable Links

A function key link is programmed by simultaneously depressing key function and the function key (F1 – F12). The selected function key (link) is displayed in high intensity.

3.11.3 Local Transmit of the Function Key

To send the programmed message to the screen (local transmit) instead of the host computer is done by depressing the FUNCTION FAST MOV key simultaneously (like a shift key) as the function key data is being entered. Proper loading of a local transmit is signified on the screen by the data being displayed underlined as the key is being programmed.



Example Screen Presentation

Example:

Key	Action	Comment
FUNCTION SET-UP	Enter Function Key Set-Up Mode	Simultaneously
F1	Selects Function Key F1	Moves cursor to Selected Line 01
CTRL L	1st Character Definition	Displays F_f
F1	Completes F1 Character String	

F2	Selects Function Key F2	Moves cursor to selected Line 02
CTRL E	1st Character Definition	Displays E_q
FUNCTION F3	Defines Link to F3 and Completes F2 String	Displays 03 in high intensity
F3	Selects Function Key F3	Moves cursor To selected Line 03
FUNCTION AND THE CHARACTERS R,I,N,G	1st, 2nd, 3rd, 4th Character Definitions	Function modifies (1) each character. Underline is displayed
CTRL G	5th Character Definition	Displays BL
F3	Completes F3 Character String	
SET-UP	Exit Program Key Set-Up Mode	Returns to Menu Set-Up Mode

NOTE

(1) Each character so modified is directly routed to the screen and is not transmitted. To program the function keys remotely, refer to Section 5.3.8.

3.12 PERFORMING A RECALL OPERATION

The stored set-up features may vary from the set-up features currently selected. If it is desired to return to the stored features, the recall operation should be performed per the following:

1. ENTER SET-UP Mode
2. DEPRESS the SHIFT R Keys simultaneously. The screen will be cleared. After a few seconds the VISUAL 550 will return to SET-UP Mode.

3.13 PERFORMING A SAVE OPERATION

The SAVE Operation is used to store all current SET-UP features, and is performed per the following:

1. ENTER SET-UP Mode
2. DEPRESS the SHIFT S Keys simultaneously. After a few seconds the VISUAL 550 will return to SET-UP Mode.

After performing the SAVE Operation the current SET-UP features are stored. To select the SET-UP features temporarily, do not use the SAVE Operation, simply EXIT SET-UP Mode.

3.14 SCREEN BRIGHTNESS

Screen brightness may be adjusted up or down in any Set-Up mode. Screen brightness is increased by depressing the [↑] key, and decreased by depressing the [↓] key.

4. KEYBOARD CONTROLS

4.1 GENERAL

This section describes the function of and the codes transmitted by each key on the VISUAL 550 keyboard. Each key as defined in terms of its legend, ASCII representation and code transmitted.

In CHARACTER transmission mode, most key depressions cause characters to be transmitted as each key is depressed. The character is displayed only when echoed back from the host. The terminal may be set to local echo mode to automatically enable transmitted data to be displayed. In BLOCK transmission mode most key depressions do not transmit to the host. As each key is depressed the character is displayed. The completed page, line or field is sent to the host by the XMIT key or by request from the host.

All GRAPHICS MODE operation is in character transmission mode. References to block mode apply to alphanumeric operation only.

4.2 KEY FUNCTIONS

The codes indicated in the following section are for ANSI 3x64 protocol. Refer to Section 8 for VT100/VT52 code sequences.

This key used to alternately enter and exit the "Menu-Style" set-up mode.

The ESC code is used to initiate all control sequences. In character mode, depressing the ESC key causes the terminal to transmit the ESC control code (HEX 1B). In block mode the ESC code causes the terminal to interpret the next received character as opposed to displaying it.

The CTRL key does not produce a code by itself. It is depressed in conjunction with other keys to produce the control codes as described in Section 5.2 and Section 6.2.

The shift key does not produce a code by itself. When depressed in conjunction with alpha-numeric keys, it causes generation of the corresponding upper case alpha code or the code whose symbol appears on the upper part of the key. Two shift keys are on the keyboard for operator convenience.

The caps lock does not produce a code when depressed. This key enables the generation and display of only upper case alpha characters. The numeric and special keys are not affected by the caps lock key.

The no scroll key alternately transmits the XOFF (DC3) and XON (DC1) control codes, if the transmitter XON/XOFF feature is enabled. These codes are used to stop/start transmissions from the host computer. If the transmitter XON/XOFF feature is disabled, the no scroll key does not transmit the XON/XOFF codes.

NOTE

When the transmitter XON/XOFF feature is enabled, the no scroll key will be synchronized with the use of XON/XOFF codes generated by the terminal.

Example:

Host's transmission causes terminal's FIFO buffer to become almost full causing terminal to automatically transmit XOFF. (DC Code (13).

If the operator now depresses the NO SCROLL key, no XOFF code is sent.

Buffer empties, no XON sent.

Operator depresses NO SCROLL, XON sent. (DC 1 Code (11)

Depressing the TAB key generates the HT (09) control code.

The alphanumeric cursor moves to the next columnar tab stop in character transmission mode and the next unprotected field in block transmission mode.

The alphagraphics cursor moves one character space to the right.

Depressing the BACKSPACE key generates the BS (08) control code.

The alphanumeric cursor moves one space to the left.

The alphagraphics cursor moves one character space to the left.

Depressing the RETURN key generates the CR (00) control code. The alphanumeric cursor moves to the first column of the current line. If the new line feature is enabled then a received return also generates a line feed and the alphanumeric cursor will move to the first column of the next line.

The alphagraphics cursor moves to first column of the current line. The auto new line feature is not recognized in alphagraphic mode.

If the VISUAL 550 is in any other graphics operating mode ie., point plot, incremental plot, vector or crosshair then a received CR character causes the terminal to enter alphagraphics mode and the alphagraphics cursor moves to to the first column of the current line.

Depressing the line feed key generates the LF (OA) control code. The alphanumeric cursor moves down one line.

The alphagraphics cursor moves down character line.

Depressing the break key causes a 250 millisecond spacing condition on the data-line. Depressing shift-break causes a 3.5 second spacing condition on the data-line and causes the data terminal ready lead to go low for 3.5 seconds. Depressing CTRL-break causes transmission of the answer-back message.

Depressing the DELETE key causes the DEL code (7F) to be generated.

SPACE BAR

Depressing the SPACE BAR generates the SP (20) control code. A space is displayed at the cursor position and the alphanumeric cursor moves one position to the right.

A space is displayed at the cursor position and the alphagraphics cursor moves one character position to the right.

HOME

Depressing the HOME key generates the code ESC[H (1B,5B,4B)

The alphanumeric cursor moves to the home position (upper left hand corner) of the screen.

The alphagraphics cursor moves to the home position (lower left hand corner) of the screen.

The crosshair cursor moves to the home position (lower left hand corner) of the screen.

The depressing of the cursor movement keys generates the codes indicated in Table 4-1.

→ ↑ ← ↓

The alphanumeric cursor moves one position in the indicated direction.

The alphagraphics cursor moves one character position in the indicated direction.

In set-up mode, the depressing of the ↑ key increase the intensity of the display. The depressing of the ↓ key lowers the intensity of the display.

TABLE 4-1
CODES GENERATED BY CURSOR POSITIONING KEYS

Key Depressed	Sequence Generated In V550 and VT100 Mode	Sequence Generated In VT52 Mode
↑	ESC [A	ESC A
↓	ESC [B	ESC B
→	ESC [C	ESC C
←	ESC [D	ESC D

TABLE 4-2
MODIFIED NUMERIC PAD

Keys Depressed	Alphanumeric Code Generate	Alphanumeric Action	Graphics Action
FUNCTION FAST MOVE + 1 IL	ESC [L	Insert Line	Move 7 Pixels Southeast
FUNCTION FAST MOVE + 2 ↓	N/A	N/A	Move 7 Pixels South
FUNCTION FAST MOVE + 3 DL	ESC [M	Delete Line	Move 7 Pixels Southwest
FUNCTION FAST MOVE + 4 ← EF	ESC [N	Erase Field from Cursor	Move 7 Pixels West
FUNCTION FAST MOVE + 5 El	ESC [K	Erase Line from Cursor	N/A
FUNCTION FAST MOVE + 6 → EP	ESC [J	Erase Page from Cursor	Move 7 Pixels East
FUNCTION FAST MOVE + 7 IC	ESC [4h ESC [4ℓ	Alternately Enables/Disables Insert Replace Mode	Move 7 Pixels Northwest
FUNCTION FAST MOVE + 8 ↑	N/A	N/A	Move 7 Pixels North
FUNCTION FAST MOVE + 9 DC	ESC [	Delete Character	Move 7 Pixels Northeast

4.2.1 Numeric Pad Functions

In alphanumeric mode, depressing any key on the numeric pad generates the ASCII code for that character. The numeric keys are not modified by SHIFT, CAPS LOCK, or CTRL keys. The ENTER key generates a CR code.

In alphanumeric mode, the depressing the FUNCTION key while simultaneously depressing the IC, DC, EF, EL, EP, IL, or DL key causes certain editing functions to be performed as detailed in Section 4-3.

In any one of the graphics operating modes (point plot, incremental point plot, vector, crosshair, stripchart), then depressing the IC, 8, DC, EF, 5, EP, IL, 2 or DL key will move the dot coordinate one pixel position in the direction indicated. In crosshair mode the dot coordinate is at the intersection of the crosshairs.

The depressing of the FAST MOV keys while simultaneously depressing any one of the directional keys moves the dot coordinate 7 pixel positions in the direction indicated.

In alphagraphics mode the dot coordinate is defined as the closer left hand corner of the character cell. Only the direction keys are enabled in alphagraphics mode.

4.2.2

PRINT

This key causes the contents of the screen to be sent out on the AUX port. If the XMITTER XON/XOFF feature is enabled, the XOFF Code (13) will be sent to the host prior to the print function and the XON Code (11) will be sent to the host upon completion of the print function.

4.2.3

XMIT

This key applies to block mode only and causes a block transmission to begin when depressed. The portion of the screen to be transmitted depends upon the various transmission modes then enabled.

The XMIT key is ignored in any one of the graphics operating modes. Block transmission of graphics memory data is initiated by the block transfer function. See Section 6.

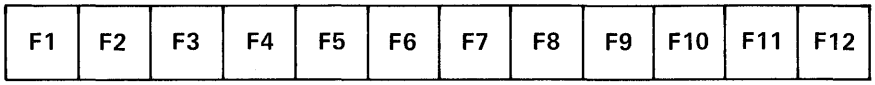
4.2.4 Clear Graphics Memory

Striking the FUNCTION and SET-UP keys simultaneously causes an unconditional *clear* of the graphics memory. See enter alphagraphics mode Section 6.6.1.2.

4.3 EDITING FUNCTIONS

In alphanumeric mode the depressing of the FUNCTION key in conjunction with the appropriate key on the numeric pad causes editing functions to be executed per Table 4.1. In character transmission mode, the defined code sequence is transmitted and the editing function is performed if the sequence is echoed to the terminal. In block transmission mode, the editing function is performed locally and no transmission occurs.

4.4 FUNCTION KEYS



The twelve Function Keys, labeled F1 – F12, are user programmable with up to thirty-two (32) characters and are independently linkable. Refer to Section 3.9 for programming details and constraints. If not programmed, each Function Key will transmit its default message as indicated in Table 4-3.

Additionally the Function Keys are used to select the various menu options during SET-UP mode.

TABLE 4-3
DEFAULT VALVE OF FUNCTION KEYS

Key	Default Value In V550 Mode	Default Value In VT100 Mode	Default Value In VT52 Mode
F1	ESC←A ESC\	ESC OP	ESC P
F2	ESC←B ESC\	ESC OQ	ESC Q
F3	ESC←C ESC\	ESC OR	ESC R
F4	ESC←D ESC\	ESC OS	ESC S
F5	ESC←E ESC\		
F6	ESC←F ESC\		
F7	ESC←G ESC\		
F8	ESC←H ESC\		
F9	ESC←I ESC\		
F10	ESC←J ESC\		
F11	ESC←K ESC\		
F12	ESC←L ESC\		

5. ALPHANUMERIC PROGRAMMING ANSI X3.64

5.1 GENERAL

The VISUAL 550 alphanumeric side operates according to the American National Standards Institute (ANSI X3.64) protocol for display terminals. This section details the control codes, modes, and control sequence function used to control the V550 per the standard X3.64.

5.2 CONTROL CODES

The VISUAL 550 responds to received control codes per Table 5-1. Control codes are defined as codes from column 0 and column 1 (HEX 00, 1F) of the ASCII code chart. Table 5-1 defines the action of control codes received while the terminal is operating in alphanumeric mode. Table 6-1 defines the action of control codes while the terminal is operating in any one of the graphics modes.

Certain control codes are used to move from alphanumeric operation to graphics mode operation. These transitional codes are detailed in Table 5-2.

TABLE 5-1
ALPHANUMERIC CONTROL CODES

Control Code	HEX Equiv.	Action
NUL	00	No action
ENQ	05	Initiate answerback message
BEL	07	Rings bell
BS	08	Backspace
HT	09	Tab
LF	0A	Move down one line (line feed)
CR	0D	Move to first column, current line
SO	0E	Enable G1 character set
SI	0F	Enable G2 character set
DC1	11	XON
DC3	13	XOFF
ESC	1B	Initiate escape sequence
CAN	18	Abort escape sequence

TABLE 5-2
TRANSITIONAL CONTROL CODES

Control Code	HEX Equi.	Action
FS (CTRL \)	1C	Enter point plot mode
GS (CTRL])	1D	Enter vector mode
RS (CTRL ∧)	1E	Enter incremental plot mode
US (CTRL –)	1F	Enter alphagraphics mode

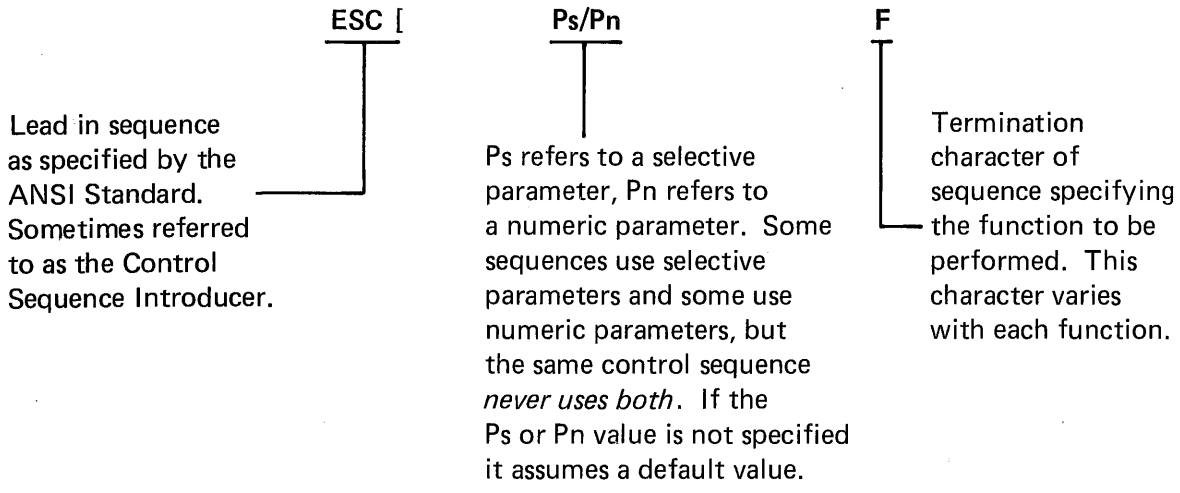
5.3 CONTROL SEQUENCE FUNCTIONS

This section describes the control sequences recognized by the VISUAL 550. Many of the control sequences described in this section conform to the basic format as specified by the ANSI X3.64 standard.

ESC [Lead in sequence as specified by the ANSI standard. Sometimes referred to as the control sequence introducer.

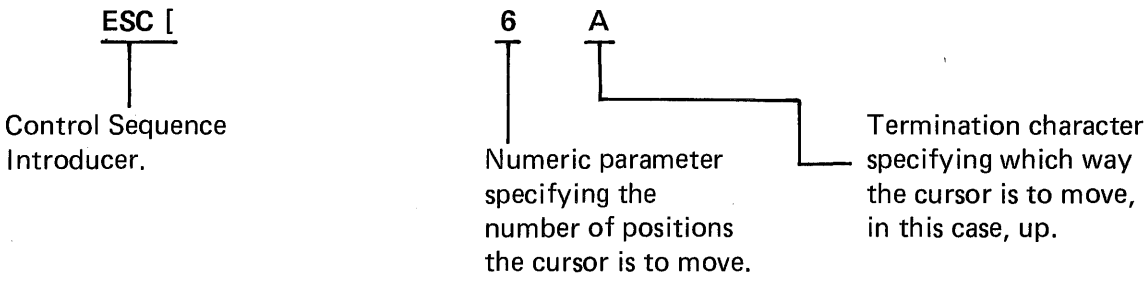
Ps/Pn Ps refers to a selective parameter, Pn refers to a numeric parameter. Some sequences use selective parameters and some use numeric parameters, but the same control sequence never uses both. If the Ps or Pn value is not specified it assumes a default value.

F Termination character of sequence specifying the function to be performed. This character varies with each function.

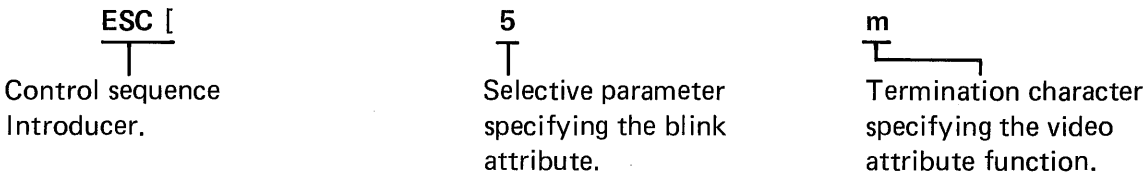


The following examples demonstrate the use of all three elements of the control sequence as specified by the ANSI X3.64 standard. Spaces are used for clarity only are not part of the sequence.

Example 1: Control Sequence Using Numeric Parameter, Move Cursor up 6 lines

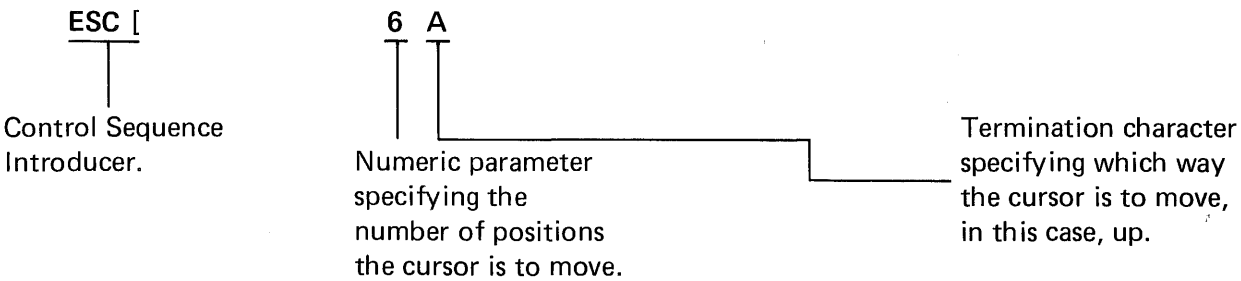


Example 2: Control Sequence Using Selective Parameter, Turn on Blink Attribute

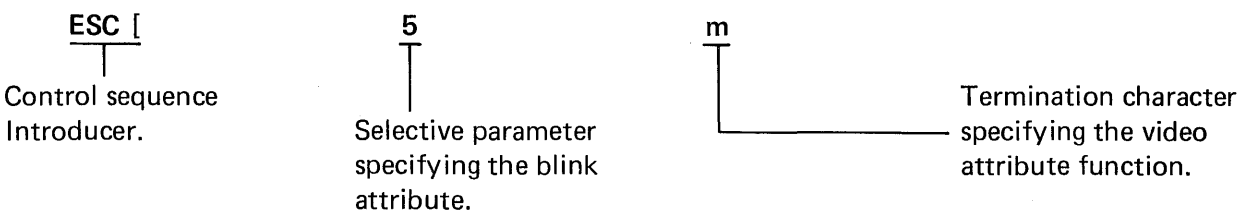


The following examples demonstrate the use of all three elements of the control sequence as specified by the ANSI X3.64 standard. Spaces are used for clarity only are not part of the sequence.

Example 1: Control sequence using numeric parameter, move cursor up 6 lines



Example 2: Control Sequence Using Selective Parameter, Turn on Blink Attribute



If multiple numeric or selective parameters are used in a single control sequence they must be separated with a semi-colon character.

5.3.1 Scrolling Region Command ESC [X;Yr

This command is applicable in character mode only and is used to set the top and bottom lines of the screen scrolling region. The first numeric parameter, x, sets the top boundary and the second numeric parameter, y, sets the bottom boundary of the scrolling region. (Both numeric parameters are in decimal notation.) The default values are the entire screen, i.e., x=1 and y=33. The minimum size of the scrolling region is two lines.

Once the scrolling region is defined, incremental cursor positioning commands (up, down, right, left) can position the cursor anywhere within the scrolling region, but cannot position the cursor outside of the scrolling regiona. The absolute cursor positioning commands remain unaffected by the screen scrolling region.

After the screen scrolling region is defined, a choice is provided, via origin mode, for having line numbers on the screen dependent or independent of the defined scrolling region. For example, if line numbers are independent of the defined scrolling regiona, a received absolute cursor positioning command with line and column parameters of 1, would position the cursor to the upper left-hand corner of the screen. If line and column numbers are dependent on the defined scrolling region, the aforementioned command would position the cursor to the upper left-hand corner of the screen. If line and column numbers are dependent on the defined scrolling regiona, the aforementioned command would position the cursor to the upper left-hand corner of the scrolling region. Simply stated, the current state of origin mode affects only the numbering of lines on the screen and thus only the absolute cursor positioning command.

5.3.2 Cursor Movement Commands

The VISUAL 550 provides a wide variety of cursor positioning commands including incremental and absolute positioning and forward and back tabbing. This wide variety insures that the user can position the cursor in the most efficient manner for his particular application.

Incremental Cursor Positioning, ESC [Pn F

The cursor may be moved any number of increments up, down, right or left by using a single control sequence. The numeric parameter specifies in decimal the number of increments the cursor is to move, and the value of the termination character, F, specifies the direction of movement per Table 5-3.

The incremental cursor positioning commands will always cause the cursor to wrap screen boundaries and will never cause the screen to scroll.

TABLE 5-3
INCREMENTAL CURSOR POSITIONING COMMANDS

Command Names	"F" Value	Sequence
Cursor Up (Pn times)	A	ESC [Pn A
Cursor Down (Pn times)	B	ESC [Pn B
Cursor Right (Pn times)	C	ESC [Pn C
Cursor Left (Pn times)	D	ESC [Pn D

Absolute Cursor Positioning, ESC [y;xH OR ESC [y;xf

Either of the above commands may be used for positioning the cursor on an absolute basis. The above sequences will position the cursor to the line specified by y, and the column specified by x. Both the line and column parameters are in decimal notation and are numbered from 1-33 and 1-80 respectively. The default value for x and y is one. If an attempt is made to position the cursor past screen boundaries the cursor will move to the screen boundary.

Index, ESC D

This sequence causes the cursor to move down one line. If the cursor is positioned on the bottom line of the screen of the bottom line of a defined scrolling region, the contents of the screen or scrolling region will scroll up one line if in character mode. In BLOCK mode a defined scrolling is never allowed. In this case the cursor will wrap from the bottom line to the top line.

5.3.3 Tabbing Commands

The VISUAL 550 supports forward and backward horizontal tabbing. In character mode, tabbing is columnar much as it is on a standard typewriter. In block mode, tabbing is by field, i.e., from beginning of field to beginning of field.

In character mode, TAB STOPS are set remotely using the SET TABS command. TAB STOPS are cleared remotely (character mode only) using the TAB CLEAR command. TAB STOPS may also be set or cleared in the basic set-up mode as described in Section

In Block mode, tabs are defined as the first unprotected location after a protected location.

Once TAB STOPS have been defined, forward tabbing is initiated using the cursor Tab or Back Tab command.

Tab Clear, ESC[Ps g

This command clears one or more columnar TAB STOPS according to the value of Ps.

Character mode only

Ps Value	Action
0 (default)	Clear Tab at Current Column
3	Clear All Tabs in Terminal

Set Tab, ESC H

This command sets a columnar TAB STOP in the current column.

Cursor Horizontal Tab, ESC [Pn I

This command moves the cursor forward the number of TAB STOPS as specified by the value of Pn. The default value of Pn is 1.

In Character mode, the state of autowrap determines cursor movement. If autowrap is set, the cursor moves from one line to the next. If autowrap is reset, then the cursor will not move off the current line.

If no TAB STOPS exist, in Character mode, then the cursor will move to the last column of the screen.

In Block mode, the cursor will move from one line to the next regardless of the setting of autowrap. If no TAB STOPS exist the cursor will move to the HOME position.

Cursor Back Tab, ESC [Pn Z

This command moves the cursor backward the number of TAB STOPS specified by the value of Pn.

In Character mode, the cursor will not move off the current line. If no TAB STOPS exist the cursor will move to the first column of the screen.

In Block mode, the cursor will move from one line to the next as necessary. If no TAB STOPS exist then the cursor will move to the HOME position.

5.3.4 Save/Restore Cursor Command ESC (Ps s

This command saves or restores the current cursor location, video attributes and character set in alphanumeric operating mode.

Ps = 7 Save parameters
Ps = 8 Restore previous saved parameters

5.3.5 Report Commands and Sequences (Alphanumeric Mode)

The following list describes host generated commands and possible terminal responses.

Please note that all terminal responses transmitted to the host will be "framed" as described.

Host Command	Sequence	Terminal Response(s)	Sequence
1. What are you?	ESC [Ø c or ESC [c	VISUAL V550	ESC [2 c
2. Is terminal OK?	ESC [5 n	Terminal is OK	ESC [Ø n
3. What is Cursor location?	ESC [6 n	Cursor is positioned on line y, and column x. Both x and y are in decimal notation. The line number is dependent on Origin mode	ESC [y;xR

5.3.6 Select Character Sets Command, ESC [P0;P1 (D

This command is used to define the G0 and G1 character sets. Of the nine character sets provided, the user may define any particular set as the G0 set and any particular set as the G1 set by using the appropriate P0 and P1 selective parameters respectively. Once the G0 and G1 sets are defined they may be easily enabled via the S1 and S0 control codes respectively. (Resetting the terminal will enable the G0 set.) Once defined the G0 and G1 sets may be saved in non-volatile memory by performing the save operation (shirt S in set-up mode).

TABLE P0/P1 VALUE CHARACTER SETS	
0 = US	6 = Spanish
1 = UK	7 = Portugese
2 = French	8 = Line Drawing
3 = German	9 = Danish
4 = Swedish	10 = Math Font 1
5 = Norwegian	11 = Math Font 2

NOTE

The select character set command defines G0/G1 character fonts only, and does not alter the keyboard configuration. The keyboard layout must be defined in set-up mode when optional character sets are available. Line drawing is considered a subset of the US character font.

TABLE 5-4
LINE DRAWING CHARACTER SET

Graphic	Hex Code	ASCII Char	Graphic	Hex Code	ASCII Char
	80			88	h
	81	a		89	i
	82	b		8A	j
	83	c		8B	k
	84	d		8C	ℓ
	85	e		8D	m
	86	f		8E	n
	87	g		8F	o

5.3.7 Screen Alignment Command

Screen Alignment Display, ESC [8v

This command causes the screen to be filled with upper-case E's and is used for focus and alignment of the display.

5.3.7.1 Remote Video Display Modes

ESC [PsV

This command selects the video display mode according to the value of the selective parameter Ps.

VALUE Ps	VIDEO ENABLED
?2	AUTO
?3	GRAPHIC
?4	ALPHA
?5	BOTH

The display mode is also selected in set-up mode. Refer to Section 3.7.6.

5.3.8 Program Function Key Command

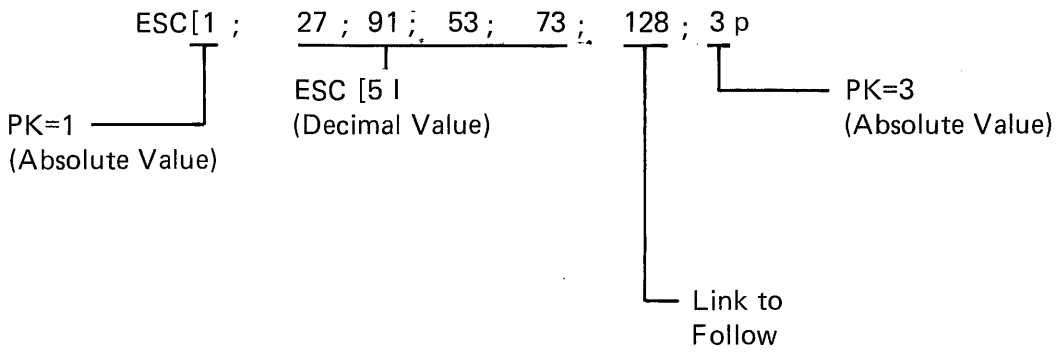
ESC [PK; D_1;. . . D_{32}P

This command is used to program a function key with data. PK defines which of the twelve function key (F1 – F12) is to be programmed. A PK value of 1 will program key F1, a value of 5 will program key F5, etc., etc.

D1 through D32 are the decimal values of the ASCII characters desired in the message. ESCape sequences may be included in the message. Refer to Appendix V for decimal values. Up to thirty-two (32) characters may be programmed into any function key.

Each function key may be independently linked to another function key. A link requires two (2) character positions and it terminates the data string. A link is defined as decimal value 128 followed by the function key number.

Example: To program function key 1 to horizontal tab five (5) spaces and to link to function key 3 the following sequence would be used:



Selective data within the character string may be routed directly to the screen by adding decimal value 128 to the decimal value of that ASCII character, i.e., to screen route ASCII character A, decimal value 65 + 128 = 193. Once a function key has been programmed it may be stored via the save operation.

NOTE

To program the function key from the keyboard refer to Section 3.11.

5.3.9 Erasure Commands

Erasure may be accomplished on a line, field or page basis when in Block mode. The user may also define whether erasure commands affect only unprotected data or both unprotected and protected data. Erasure mode provides this choice, see Section 5.4.5.

In Character mode erasure is on a line or page basis only.

Erasure commands detailed in this Section do not alter the position of the cursor.

Erase in Page, ESC [Ps J

This command erases some or all of the page according to the Ps value.

Ps Value	Action
Ø (default)	Erase from cursor to end of page
1	Erase from start of page to cursor
2	Erase entire page

In Block mode, with Erasure mode set, the Erase Page command will erase the selected area of the page including protected data and tab stops.

In Block mode, with Erasure mode reset, the Erase Page commands will erase only unprotected data within the selected area of the page.

In Character mode, the Erase Page command will erase the selected area of the page including Block mode tab stops.

Erase in Line, ESC [Ps K

This command erases some or all of the current line according to the Ps value.

Ps Value	Action
Ø (default)	Erase from cursor to end of line
1	Erase from start of line to cursor
2	Erase entire line

In Block mode, with Erasure mode set, the Erase Line command will erase the selected area of the line including protected data and tab stops.

In Block mode, with Erasure mode reset, the Erase Line command will erase only unprotected data within the selected area of the line.

In Character mode, the Erase Line command will erase the selected area of the line including Block mode tab stops.

Erase in Field, ESC [Ps N

This command erases some or all of the current field according to the Ps value.

Ps Value	Action
Ø (default)	Erase from cursor to end of field
1	Erase from start of field to cursor
2	Erase entire field

In Block mode, with Erasure mode set, the Erase Field command, will erase the selected area within the field including protected data.

In Block mode, with Erasure mode reset, the Erase Field command will erase only unprotected data within the selected area of the field.

Fields do not exist in Character mode. The use of an Erase Field command in Character mode will cause the Erase Page command to be executed.

5.3.10 Editing Commands

The VISUAL 550. Editing commands provide a single control sequence to insert or delete one or multiple lines, or delete one or multiple characters.

Insert Replace mode provides a method of inserting characters and is described in Section 5.4.4. The user may also limit the portion of the screen affected by Editing commands to the current line, field or screen. This choice is provided by the select Editing Extent mode, see Section 5.5.

Insert Line(s), ESC [Pn L

This command causes Pn lines to be inserted starting at the cursor line. The Insert Line command will push the current line and all lines below the current line down to make room for the newly inserted line(s). All lines pushed off the screen are lost from memory.

In Block mode the Select Editing Extent mode must be set to edit in display and Protect mode must be reset for the Insert Line command to be executed.

In Character mode, the Insert Line command will always be executed.

Delete Line(s), ESC [Pn M

This command causes Pn lines to be deleted starting at the cursor line. The Delete Line command will delete the current line and Pn-1 lines below the current line. Lines below the deletion will move up to fill the gap created by the deletion.

In Block mode the select Editing Extent mode must be set to edit in display and the Protect mode must be reset for the Delete Line command to be executed.

In Character mode the Delete Line command will always be executed.

Delete Character(s), ESC [Pn P

This command causes Pn characters to be deleted starting at the cursor location with Pn-1 characters shifting left to fill the gap created by the deletion. No cursor movement will occur.

In Block mode, the select Editing Extent mode will limit the shifted characters to the current line, page or field.

In Character mode, the select Editing Extent mode will limit the shifted characters to the current line or page.

5.3.11 Set Communication Control Codes Command, ESC [P1;P2;P3;P4;P5;P6;P7 t

This command allows the user to remotely select any ASCII code for each of the seven communication control codes. The user may also select each communication control code from the keyboard in SET-UP mode. In either case, once the communication control codes are defined they may be saved on a non-volatile basis by performing a SAVE operation (SHIFT S in SET-UP mode).

Each time the Set Communication Control Code command is used it will change *all* of the seven codes, thus the command must specify each code even if it is not to be changed.

Each selective parameter in the command (P1 – P7) is defined using decimal notation for the desired ASCII code.

The designations for P1 through P7 are as follows:

P1 = Start of Message Code
P2 = Area Separator Code
P3 = First End of Line Code
P4 = Second End of Line Code
P5 = First End of Message Code
P6 = Second End of Message Code
P7 = Turnaround Control Code

Codes P1 – P6 are used for "framing" buffered transmissions from the VISUAL 550 and P7 applies primarily when the terminal is transmitting character by character in a half-duplex environment. A complete description of each communication control code is located in Section 7.0.

5.3.12 Video Attribute Command, ESC [Ps; . . . Ps m

Alphanumeric data on the screen may be displayed in any combination of the following video attributes: Bold, Underline, Blink, Blank and Reverse Video.

The attributes are enabled by using the Video Attribute command with the selective parameters specifying which attributes to enable. Table 5-5 summarizes all video attributes and their associated selective parameters. The video attributes are cumulative, i.e., received data will be displayed according to all attributes then enabled.

ALPHA GRAPHICS CHARACTERS DO NOT POSSESS VIDEO ATTRIBUTES.

TABLE 5-5
SUMMARY OF VIDEO ATTRIBUTES AND SELECTIVE PARAMETERS

Attribute	Selective Parameter	Control Sequence
Attributes OFF	0 (default)	ESC [m
High Intensity	1	ESC [1 m
Blanking	2	ESC [2 m
Underline	4	ESC [4 m
Blink	5	ESC [5 m
Reverse Video	7	ESC [7 m

Example:

Display on the screen the Blinking, Underline word "NAME", then display on the screen the name "JONES" with no video attributes.

1. Turn on the Blink and Underline attributes with control sequence, ESC [4;5m or control sequences ESC [4m and ESC [5m.
2. Send the word "NAME" to the screen.
3. Turn off all attributes with the control sequence ESC [m (default value is 0).
4. Send the name "JONES" to the screen.

5.3.13 Remote Transmit Command, ESC S EOM

This command remotely initiates a block transmission. The portion of the screen transmitted depends on the various transmission modes then enabled. The EOM is the First or Second End of Message code then defined.

5.3.14 Reset Command ESC c

This command resets the terminal, and has the same effect as powering-down then powering-up the terminal.

5.3.15 Define Area Qualification Command ESC [Ps o

This command is used to define qualified areas on the screen. Qualified areas may be defined as protect or unprotect.

Qualified areas may be defined while in Character or Block mode but will only be recognized while in Block mode with Protect mode set. Protect mode is typically RESET when qualified areas are being defined and SET once all qualified areas are defined.

TABLE 5-6
SELECTIVE PARAMETERS ASSOCIATED WITH DEFINE AREA QUALIFICATION COMMAND

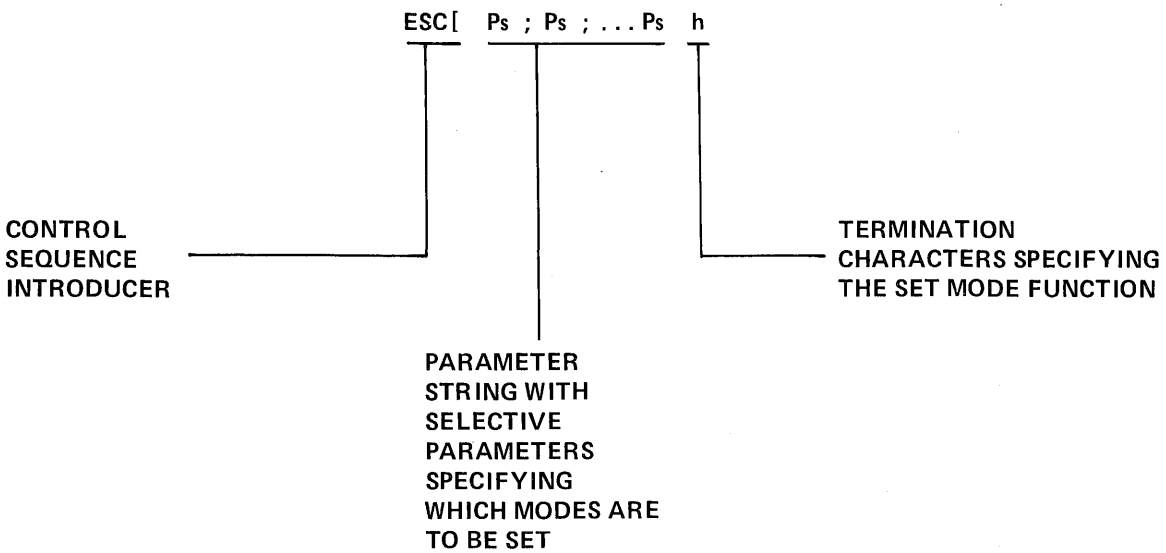
Area Qualification	Selective Parameter	Code Sequence	Comments
Unprotected	0 (default)	ESC [Ø o	Area will accept all input. This is the power-up state for the VISUAL 300.
Protected	1	ESC [1 o	Area is protected against alteration from the keyboard and will not be transmitted unless Guarded Area Transfer mode is set.

5.4 MODES (SET/RESET)

This section describes the ANSI specified operating parameters used to control the operation of the VISUAL 550 in Alphanumeric Operating mode.

Each mode described in this section has two possible states; set or reset. A single control sequence may set one or a maximum of 16 modes, or reset one or a maximum of 16 modes. Many of the modes are also selectable and changeable in SET-UP mode. Modes that are selectable in SET-UP mode may also be stored in non-volatile memory giving the user the ability to determine their power-up states.

The control sequence format for the Set Mode function is:



The control sequence format for Reset Mode is:

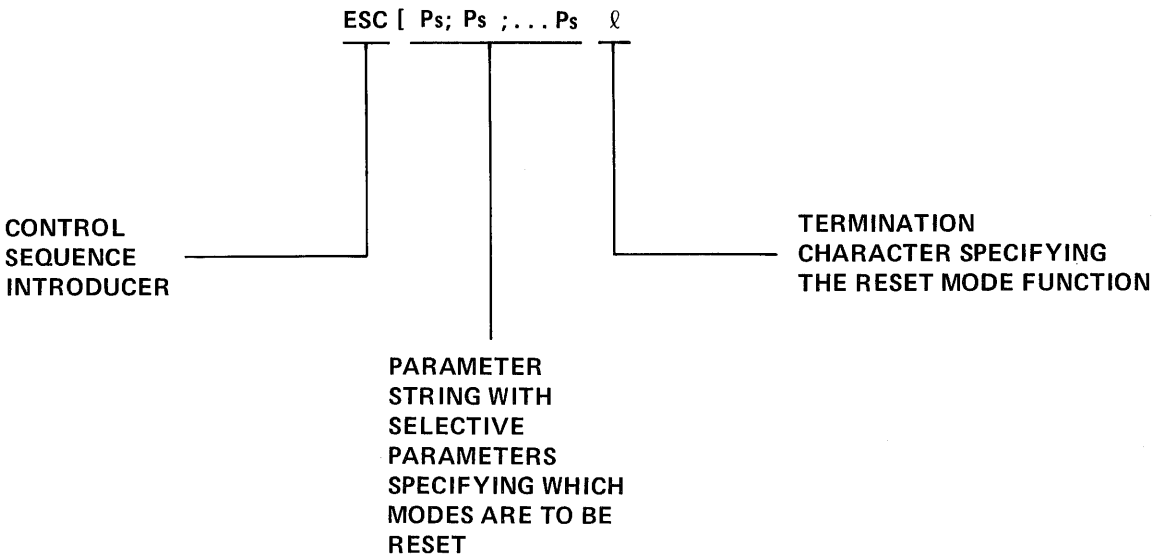


Table 5-7 lists all modes applicable to set/reset mode control sequences, with their associated selective parameter are private modes that have been added to enhance the operational SET-UP mode. The modes that include the question mark character (?) as part of the selective parameter are private modes that have been added to enhance the operational capabilities of the terminal and are not actually specified in the ANSI X3.64 standard.

TABLE 5-7

SELECTIVE PARAMETERS ASSOCIATED WITH SET/RESET MODE CONTROL SEQUENCES

Mode Name	Selective Parameter (Ps)	Changeable and Saveable In Set-Up Mode
Guarded Area Transfer	1	Yes
Keyboard Action	2	No
Control Representation	3	Yes
Insert Replace	4	No
Erasure	6	Yes
Character/Block	12	Yes
Multiple Area Transfer	15	Yes
Transfer Termination	16	Yes
Line Feed/New Line	20	Yes
Protect	?0	Yes
Auto Tab	?1	Yes
Screen	?5	Yes
Origin	?6	Yes
Autowrap	?7	Yes
Transmit Request	?9	Yes
Line Transmit	160	Yes
Screen Size	166	Yes

5.4.1 Guarded Area Transfer Mode, Ps=1

This mode applies to Block mode only and determines whether areas defined as protected may be transmitted.

When set, protected areas may be transmitted.

When reset, protected areas will never be transmitted.

It is important to note that Guarded Area Transfer mode is only one of four modes that condition Block mode transmissions. See Section ? for a description of the interaction between all four modes.

5.4.2 Keyboard Action Mode, Ps=2

When Set, this mode causes the keyboard to be locked thus disallowing local data entry. KBD locked will be displayed on the 34th status line. Depressing the SET-UP key will clear the locked condition. When reset, the keyboard will be unlocked.

5.4.3 Control Representation Mode Ps = 3 (Transparent Mode)

When set, this mode causes control codes to be displayed as opposed to being acted upon and is primarily used as an aid in program debugging.

Appendix II details the graphic rendition assumed by each control code when received with Control Representation mode set.

When reset, control codes will be acted upon as usual.

5.4.4 Insert Replace Mode, Ps = 4

When set this mode causes the entry of displayable characters to be inserted at the cursor location. Data at and to the right of the cursor will shift right one position for each character entered. The cursor location will also shift right for each character entered. INSERT MODE will be displayed on the 34th status line to indicate the set state of Insert/Replace mode.

The state of Select Editing mode will determine the extent of the shifted character string.

In Character mode, the character string may be limited to the current line or the entire page.

In Block mode, the character string may be limited to the current field line or page. Protected areas will not be affected by the shifted character string.

5.4.5 Erasure Mode, Ps = 6

This mode is applicable to Block mode only and determines whether erase commands erase protected and unprotected data or only unprotected data.

When set, Erasure mode conditions erase commands to erase all data (protected and unprotected). All tab stops are also erased.

When reset, erase commands will erase only unprotected data. Tab stops are not altered.

5.4.6 Character Mode, Ps = 12

This mode determines whether the terminal operates in Character or Block transmission mode.

When set, the terminal will operate in Character mode (conversational) and transmission will occur on a character by character basis. CONVRS mode will be displayed on the status line to indicate the set state of Character mode.

When reset, the terminal will operate in Block mode and transmission will not occur until the XMIT key is depressed or transmission is initiated by the Remote Transmit command. BLOCK mode will be displayed on the status line.

When operating in Block mode a choice is provided for transmitting all or any part of the screen. The transmitted portion of the screen is determined by the Multiple Area Transfer mode, Transfer Termination mode, Guarded Area Transfer mode and Line Transmit mode. Each of these modes is described later in this section and also in Section 7.0.

WHEN THE VISUAL 550 IS IN ANY OF THE GRAPHICS OPERATING MODES, THE TRANSMISSION WILL OCCUR ON A CHARACTER BY CHARACTER BASIS REGARDLESS OF THE STATE OF CHARACTER MODE.

5.4.7 Multiple Area Transfer Mode, Ps = 15

This mode applies to Block mode only and determines whether one or many areas will be transmitted when transmission is initiated. When set, many areas may be transmitted.

When reset, only the area containing the cursor may be transmitted.

It is important to note that Multiple Area Transfer mode is only one of four modes that condition Block mode transmissions. See Table 7-1 for a description of the interaction between all four modes.

5.4.8 Transfer Termination Mode, Ps = 16

This mode applies to Block mode only and determines whether transmission will occur from the beginning of the page, line or area regardless of cursor location.

When set, transmission will occur up to and including the cursor location.

When reset transmission of the entire page, line or area will occur regardless of the cursor location. It is important to note that Transfer Termination mode is only one of 4 modes that condition Block mode transmission. See Table 7-1.

5.4.9 Linefeed New Line Mode, Ps = 20

When set, this mode causes the RETURN key to generate the CR and LF codes, and a received LF causes a new line function. When reset, the RETURN key generates CR and a received LF causes only line feed.

5.4.10 Protect Mode, Ps = ?0

This mode applies to Block mode only and determines whether or not protected areas are recognized.

When set protected areas are recognized.

PROTCT will be displayed on the 34th status line.

When reset protected areas are not recognized.

UNPROT will be displayed on the 34th status line.

This mode is typically reset while areas on the screen are being defined and set once all areas have been defined.

5.4.11 Autotab Mode, Ps = ?1

This mode applies to Block mode only and determines the action taken by the terminal in response to attempted data entry into a protected area.

When set, attempted data entry into a protected area will cause the bell to ring and the cursor to be moved to the next unprotected position.

When reset, attempted data entry into a protected area will cause the bell to ring and the cursor position to remain unchanged.

5.4.12 Screen Mode, Ps = ?5

When set, this mode causes the screen to form characters by black dots on a white background.

When reset, the screen will form characters by white dots on a black background.

5.4.13 Origin Mode, Ps = ?6

This mode applies only to Character mode and determines whether or not line numbers are dependent on the selected scrolling region.

When set, this mode causes line numbers to be dependent on the selected scrolling region of the screen. Column 1, line 1 will be the upper left-hand corner of the *scrolling region*.

When reset, line numbers will be independent of the selected scrolling region. Column 1, line 1 will be the upper left-hand corner of the *screen*.

5.4.14 Autowrap Mode, Ps = ?7

When set, this mode will cause the cursor to automatically advance to the first position of the next line upon entering characters beyond the last position of the present line.

When reset, the cursor will not wrap around automatically. Any characters entered will overlay the last character on the line.

5.4.15 Transmit Request Mode, Ps = ?9

This mode applies to Block mode only. When set, this mode causes the XMIT Key to send a request for transmission as opposed to initiating a block transmission. The request format is ESC_Z ESC\. Typically the host will then set the desired transmission modes, allocate buffer space and initiate transmission via the Remote Transmit command.

When reset, the XMIT Key will initiate a block transmission in accordance with the modes then enabled.

5.4.16 Line Transmit Mode, Ps = 160

Line Transmission mode applies to *Block Mode only*, and *when set, conditions the VISUAL for transmitting only the line containing the cursor*. All of the other transmission modes interact with Line Transmission mode to determine the transmitted portion of the line. For

example, if Transfer Termination mode is set and a line transmission is initiated, only data on the line up to the cursor location will be transmitted.

Line Transmission mode may be set or reset remotely via control sequence or from the keyboard in SET-UP mode.

5.4.17 Screen Size, Ps = 166

When set, the alphanumeric screen size is defined as 24 lines of 80 columns.

When reset, the alphanumeric screen size is defined as 33 lines of 80 columns.

The scrolling region command cannot define a scrolling region greater than the selected screen size. The cursor however may be directly addressed to lines 25 through 33 in 24 line mode. This feature provides for up to eight lines of "locked" data.

Clear, erase, and/or edit commands affect only the selected screen size.

5.5 SELECTED EDITING EXTENT MODE ESC [Ps Q

This mode selects the extent of the display to be affected by the delete character commands and terminal operation with Insert/Replace mode set.

In Block mode, these editing functions may be limited to the current field, line or display according to the value of Ps (Table 5-8.)

TABLE 5-8

SELECTIVE PARAMETERS ASSOCIATED WITH SELECTED EDITING EXTENT MODE

Selective Parameter (Ps)	Meaning	Control Sequence
Ø (default)	Edit in Display	ESC [Ø Q or ESC [Q
1	Edit in Line	ESC [1 Q
2	Edit in Field	ESC [2 Q

In Character mode edit in field will default for edit in display.

5.6 SEND STATUS LINE MESSAGE COMMAND ESC [w D_1 D_2 . . . D_{48} FEOL

This command is used to send a status line message from the host to the VISUAL 550. The message may be up to 48 ASCII characters in length and is terminated by the selected FEOL code.

Control Codes, except as noted, are acted upon and are exclusive of the 48 character limit.

NOTE

Control Codes, NULL, ENQ, TAB, LF, FF and DEL are ignored.

Escape sequence commands, except as noted, are ignored.

NOTE

The escape sequence commands that are acted upon in the status line message are:

Video Attribute Command	ESC[P_s;. . . P_sm
Character Set Command	ESC[P_o;P_1 (D

When the send status line message command is executed the current cursor address, current video attributes and current GØ/G1 Character sets are saved.

6. GRAPHICS PROGRAMMING

This section explains to the programmer the use of control and format instructions required to display, transmit, process and represent graphics data. This section also provides the syntax and parameter values of graphics commands.

6.1 GRAPHICS DISPLAY COORDINATES

The graphics display of the VISUAL 550 is a rectangular grid comprised of 768 horizontal and 585 vertical coordinates. Anyone of the more than 400,000 grid coordinates are specified by the respective X (horizontal) and Y (vertical) value. Each of these displayable points is a pixel.

Figure 6-1 shows the coordinates of the four corners and the center of the graphics display. The origin (X=0, Y=0) is at the lower left hand corner of the grid.

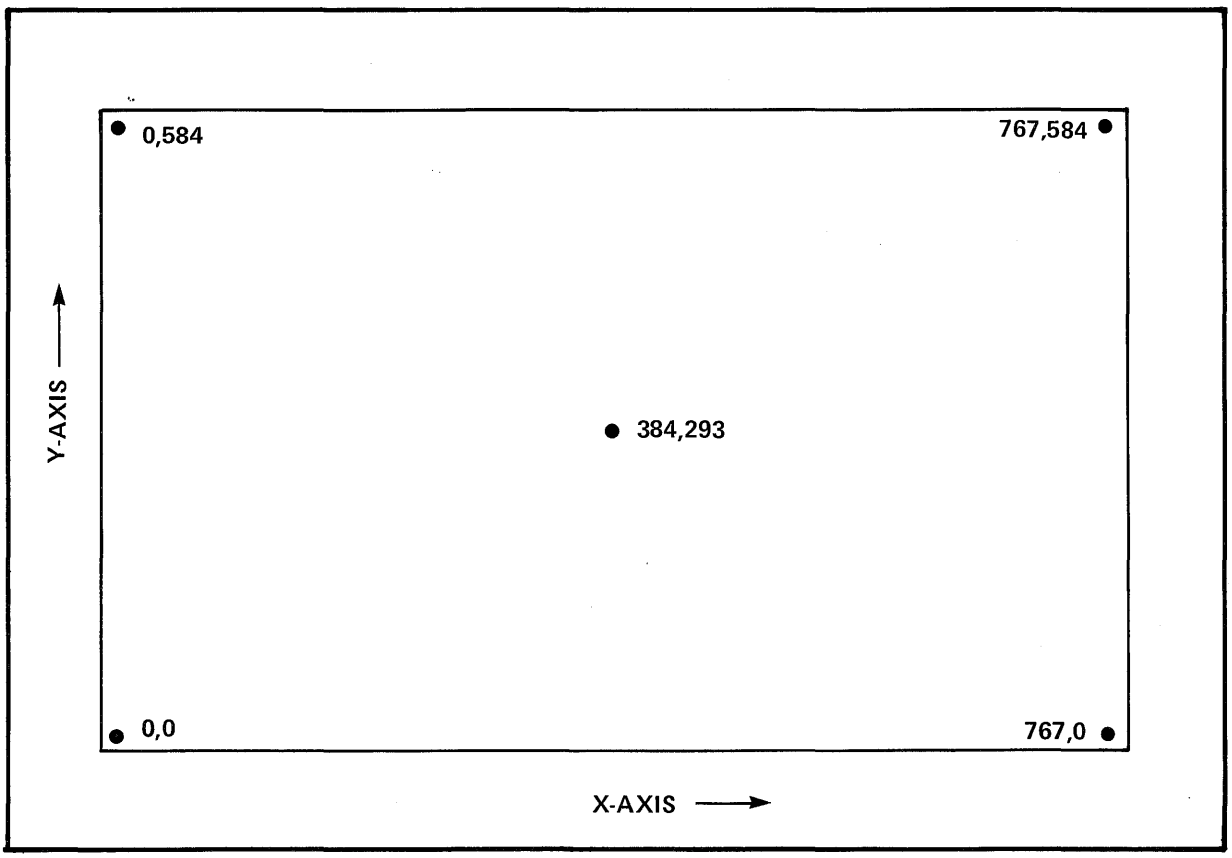


Figure 6-1 Screen Format

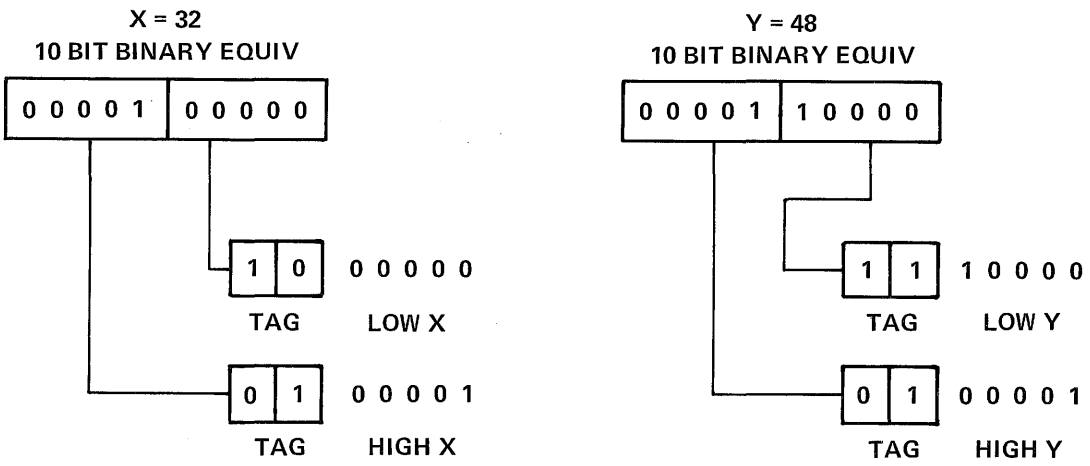
6.2 DISPLAY COORDINATE FORMAT

Each of the X and Y coordinates are converted to a 10 bit binary equivalent as shown in Figure 6.2. Each is then divided into the high and low 5 bits of each axis. The VISUAL 550 receives this display data in four byte sequences in the following sequence:

BYTE 1	HIGH Y	P01	Y_9 Y_8 Y_7 Y_6 Y_5
BYTE 2	LOW Y	P11	Y_4 Y_3 Y_2 Y_1 Y_0
BYTE 3	HIGH X	P01	X_9 X_8 X_7 X_6 X_5
BYTE 4	LOW X	P10	X_4 X_3 X_2 X_1 X_0

Each byte may contain parity (P) and two tag bits and thus encodes to an ASCII character. The ASCII equivalents of grid coordinates are listed in Table 6-1.

Example: To convert X,Y display coordinates to a 4 byte format



		7 BIT ASCII	HEX	ASCII CHAR
BYTE 1	HIGH Y	0 1 0 0 0 0 1	21	!
BYTE 2	LOW Y	1 1 1 0 0 0 0	70	P
BYTE 3	HIGH X	0 1 0 0 0 0 1	21	!
BYTE 4	LOW X	1 0 0 0 0 0 0	40	@

To plot a point at coordinate 32, 48 the code sequence is ₀₀

FS	CTRL\	ENTER POINT PLOT MODE
HIGH Y	!	BYTE 1
LOW Y	P	BYTE 2
HIGH X	!	BYTE 3
LOW X	@	BYTE 4

Figure 6-2

How to Use Table 6-1

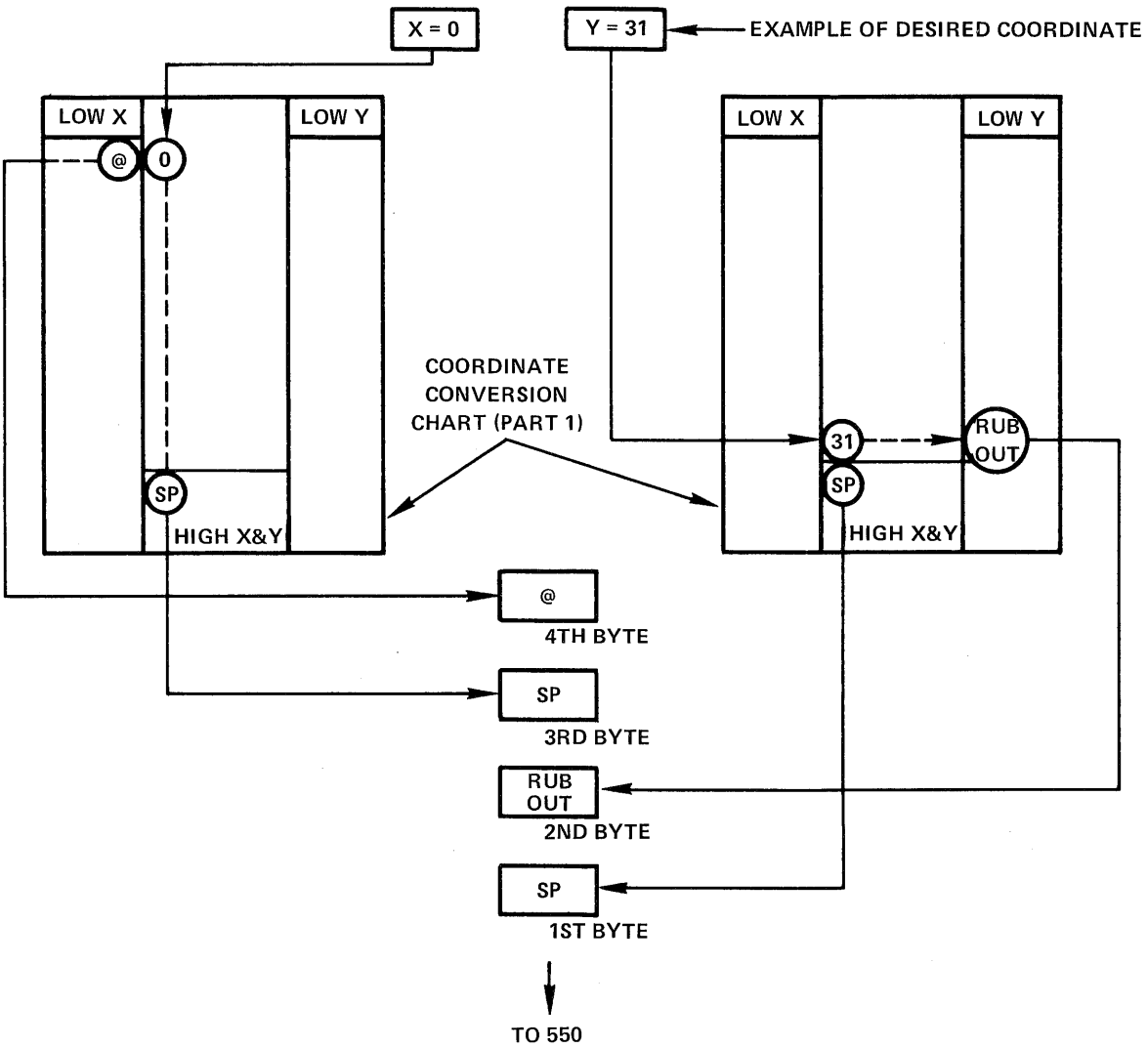


TABLE 6-1

Low Order X ASCII	DEC.	X or Y Coordinate								Low Order Y ASCII	DEC.
@	64	0	32	64	96	128	160	192	224	`	96
A	65	1	33	65	97	129	161	193	225	a	97
B	66	2	34	66	98	130	162	194	226	b	98
C	67	3	35	67	99	131	163	195	227	c	99
D	68	4	36	68	100	132	164	196	228	d	100
E	69	5	37	69	101	133	165	197	229	e	101
F	70	6	38	70	102	134	166	198	230	f	102
G	71	7	39	71	103	135	167	199	231	g	103
H	72	8	40	72	104	136	168	200	232	h	104
I	73	9	41	73	105	137	169	201	233	i	105
J	74	10	42	74	106	138	170	202	234	j	106
K	75	11	43	75	107	139	171	203	235	k	107
L	76	12	44	76	108	140	172	204	236	l	108
M	77	13	45	77	109	141	173	205	237	m	109
N	78	14	46	78	110	142	174	206	238	n	110
O	79	15	47	79	111	143	175	207	239	o	111
P	80	16	48	80	112	144	176	208	240	p	112
Q	81	17	49	81	113	145	177	209	241	q	113
R	82	18	50	82	114	146	178	210	242	r	114
S	83	19	51	83	115	147	179	211	243	s	115
T	84	20	52	84	116	148	180	212	244	t	116
U	85	21	53	85	117	149	181	213	245	u	117
V	86	22	54	86	118	150	182	214	246	v	118
W	87	23	55	87	119	151	183	215	247	w	119
X	88	24	56	88	120	152	184	216	248	x	120
Y	89	25	57	89	121	153	185	217	249	y	121
Z	90	26	58	90	122	154	186	218	250	z	122
[	91	27	59	91	123	155	187	219	251	{	123
\	92	28	60	92	124	156	188	220	252	¦	124
]	93	29	61	93	125	157	189	221	253	}	125
^	94	30	62	94	126	158	190	222	254	~	126
_	95	31	63	95	127	159	191	223	255	RUBOUT (DEL)	127
		32	33	34	35	36	37	38	39		
		SP	!	"	#	$	%	&	'		

High Order X & Y

TABLE 6-1 (Cont.)

Low Order X										Low Order Y	
ASCII	DEC.	X or Y Coordinate								ASCII	DEC.
@	64	256	288	320	352	384	416	448	480	`	96
A	65	257	289	321	353	385	417	449	481	a	97
B	66	258	290	322	354	386	418	450	482	b	98
C	67	259	291	323	355	387	419	451	483	c	99
D	68	260	292	324	356	388	420	452	484	d	100
E	69	261	293	325	357	389	421	453	485	e	101
F	70	262	294	326	358	390	422	454	486	f	102
G	71	263	295	327	359	391	423	455	487	g	103
H	72	264	296	328	360	392	424	456	488	h	104
I	73	265	297	329	361	393	425	457	489	i	105
J	74	266	298	330	362	394	426	458	490	j	106
K	75	267	299	331	363	395	427	459	491	k	107
L	76	268	300	332	364	396	428	460	492	l	108
M	77	269	301	333	365	397	429	461	493	m	109
N	78	270	302	334	366	398	430	462	494	n	110
O	79	271	303	335	367	399	431	463	495	o	111
P	80	272	304	336	368	400	432	464	496	p	112
Q	81	273	305	337	369	401	433	465	497	q	113
R	82	274	306	338	370	402	434	466	498	r	114
S	83	275	307	339	371	403	435	467	499	s	115
T	84	276	308	340	372	404	436	468	500	t	116
U	85	277	309	341	373	405	437	469	501	u	117
V	86	278	310	342	374	406	438	470	502	v	118
W	87	279	311	343	375	407	439	471	503	w	119
X	88	280	312	344	376	408	440	472	504	x	120
Y	89	281	313	345	377	409	441	473	505	y	121
Z	90	282	314	346	378	410	442	474	506	z	122
[	91	283	315	347	379	411	443	475	507	{	123
\	92	284	316	348	380	412	444	476	508	|	124
]	93	285	317	349	381	413	445	477	509	}	125
^	94	286	318	350	382	414	446	478	510	~	126
_	95	287	319	351	383	415	447	479	511	RUBOUT (DEL)	127
		40	41	42	43	44	45	46	47		
		(	)	*	+	,	-	.	/		
		High Order X & Y									

TABLE 6-1 (Cont.)

Low Order X ASCII	DEC.	X or Y Coordinate								Low Order Y ASCII	DEC.
@	64	512	544	576	608	640	672	704	736	`	96
A	65	513	545	577	609	641	673	705	737	a	97
B	66	514	546	578	610	642	674	706	738	b	98
C	67	515	547	579	611	643	675	707	739	c	99
D	68	516	548	580	612	644	676	708	740	d	100
E	69	517	549	581	613	645	677	709	741	e	101
F	70	518	550	582	614	646	678	710	742	f	102
G	71	519	551	583	615	647	679	711	743	g	103
H	72	520	552	584	616	648	680	712	744	h	104
I	73	521	553	585	617	649	681	713	745	i	105
J	74	522	554	586	618	650	682	714	746	j	106
K	75	523	555	587	619	651	683	715	747	k	107
L	76	524	556	588	620	652	684	716	748	l	108
M	77	525	557	589	621	653	685	717	749	m	109
N	78	526	558	590	622	654	686	718	750	n	110
O	79	527	559	591	623	655	687	719	751	o	111
P	80	528	560	592	624	656	688	720	752	p	112
Q	81	529	561	593	625	657	689	721	753	q	113
R	82	530	562	594	626	658	690	722	754	r	114
S	83	531	563	595	627	659	691	723	755	s	115
T	84	532	564	596	628	660	692	724	756	t	116
U	85	533	565	597	629	661	693	725	757	u	117
V	86	534	566	598	630	662	694	726	758	v	118
W	87	535	567	599	631	663	695	727	759	w	119
X	88	536	568	600	632	664	696	728	760	x	120
Y	89	537	569	601	633	665	697	729	761	y	121
Z	90	538	570	602	634	666	698	730	762	z	122
[	91	539	571	603	635	667	699	731	763	{	123
\	92	540	572	604	636	668	700	732	764	¦	124
]	93	541	573	605	637	669	701	733	765	}	125
^	94	542	574	606	638	670	702	734	766	~	126
_	95	543	575	607	639	671	703	735	767	RUBOUT (DEL)	127
		48	49	50	51	52	53	54	55		
		0	1	2	3	4	5	6	7		
		High Order X & Y									

TABLE 6-1 (Cont.)

Low Order X ASCII	DEC.	X or Y Coordinate								Low Order Y ASCII	DEC.
@	64	768	800	832	864	896	928	960	992	`	96
A	65	769	801	833	865	897	929	961	993	a	97
B	66	770	802	834	866	898	930	962	994	b	98
C	67	771	803	835	867	899	931	963	995	c	99
D	68	772	804	836	868	900	932	964	996	d	100
E	69	773	805	837	869	901	933	965	997	e	101
F	70	774	806	838	870	902	934	966	998	f	102
G	71	775	807	839	871	903	935	967	999	g	103
H	72	776	808	840	872	904	936	968	1000	h	104
I	73	777	809	841	873	905	937	969	1001	i	105
J	74	778	810	842	874	906	938	970	1002	j	106
K	75	779	811	843	875	907	939	971	1003	k	107
L	76	780	812	844	876	908	940	972	1004	l	108
M	77	781	813	845	877	909	941	973	1005	m	109
N	78	782	814	846	878	910	942	974	1006	n	110
O	79	783	815	847	879	911	943	975	1007	o	111
P	80	784	816	848	880	912	944	976	1008	p	112
Q	81	785	817	849	881	913	945	977	1009	q	113
R	82	786	818	850	882	914	946	978	1010	r	114
S	83	787	819	851	883	915	947	979	1011	s	115
T	84	788	820	852	884	916	948	980	1012	t	116
U	85	789	821	853	885	917	949	981	1013	u	117
V	86	790	822	854	886	918	950	982	1014	v	118
W	87	791	823	855	887	919	951	983	1015	w	119
X	88	792	824	856	888	920	952	984	1016	x	120
Y	89	793	825	857	889	921	953	985	1017	y	121
Z	90	794	826	858	890	922	954	986	1018	z	122
[	91	795	827	859	891	923	955	987	1019	{	123
\	92	796	828	860	892	924	956	988	1020	¦	124
]	93	797	829	861	893	925	957	989	1021	}	125
^	94	798	830	862	894	926	958	990	1022	~	126
_	95	799	831	863	895	927	959	991	1023	RUBOUT (DEL)	127
		56	57	58	59	60	61	62	63		
		8	9	:	;	<	=	>	?		

High Order X & Y

6.3 SCREEN FORMAT 4010/4014 COMPATIBILITY

Grid coordinates may be considered to measure 1024 by 780. The automatic scaling feature will scale the coordinates to insure compatibility with Tektronix Plot 10 software. The coordinates are scaled to the following relationship.

X′ = .75X
Y′ = .75Y

6.4 CONTROL CODES

Table 6-2 lists the control codes that the VISUAL 550 responds to in ALPHAGRAPHICS VECTOR and POINT PLOT MODES.

TABLE 6-2
GRAPHICS CONTROL CODES

BEL	CTRL G	Rings bell
BS	CTRL H	Move left one character space
HT	CTRL I	Move right one character space
LF	CTRL J	Move down one character space
VT	CTRL K	Move up one character space
CR	CTRL M	Enter alphagraphics mode
CAN	CTRL X	Enter alphanumeric mode
ESC	CTRL [	Begin escape sequence
FS	CTRL \	Enter point plot mode
GS	CTRL]	Enter vector mode
RS	CTRL ^	Enter incremental point mode
US	CTRL _	Enter alphagraphics mode
EM	CTRL Y	Home alphagraphics cursor, reset margin one flag

6.4.1 BEL CTRL G

Sounds an audible tone on receipt of BEL CODE (HEX 07)

6.4.2 BS CTRL H

Moves the cursor left on receipt of BS CODE (HEX 08). The cursor moves 10 pixel positions.

6.4.3 HT CTRL I

Moves the cursor right on receipt of HT CODE (HEX 09). The cursor moves 10 pixel positions.

6.4.4 LF CTRL J

Moves the cursor down on receipt of LF CODE (HEX OA). The cursor moves 17 pixel positions. (15 pixel positions if 10 X 15 cell size is selected).

6.4.5 VT CTRL K

Moves the cursor up on receipt of VT CODE (HEX OB). The cursor moves 17 pixel positions. (15 pixel positions if 10 X 15 cell size is selected).

6.4.6 EM CTRL Y

Positions the ALPHAGRAPHICS cursor at the home position of 0,568 @ 1:1 scaling with a 10x17 cell size or 0,570 @ 1:1 scaling and a 10x15 cell size.

6.5 ALPHANUMERIC MODE

The ALPHANUMERIC mode is entered automatically upon power up of the VISUAL 550 terminal. This mode allows the terminal to function as a full feature alphanumeric device using a display memory separate from the graphics display memory. ALPHANUMERIC mode operation is independent of and transparent to graphics mode operation. Please refer to Chapter 5 for ALPHANUMERIC mode programming details.

6.5.1 CAN CTRL X

Enters ALPHANUMERIC mode upon receipt of CAN CODE (HEX 18). If a CAN CODE is received when the terminal is already in ALPHANUMERIC mode then the command will abort an ESC sequence.

6.5.2 ALPHANUMERIC CURSOR

The ALPHANUMERIC mode cursor is user selectable to either solid or blinking cursor. Please refer to Section 3.0 Set-up Mode for details.

6.6 ALPHAGRAPHICS MODE

The alphagraphics mode allows full 96 character alphanumerics to be written at any location on the graphics display. The ALPHAGRAPHICS mode allows four character sizes (1X, 2X, 3X, 4X) and the margin 1 feature for full compatibility with Plot 10 software. An ALPHAGRAPHICS cursor is displayed on the screen to indicate the character position.

6.6.1 CR CTRL M

Enters ALPHAGRAPHICS mode upon receipt of CR CODE (HEX 00). If and only if the V550 is already in vector, print plot or inc. print plot mode.

NOTE

This command also performs a carriage return and sets the data level to dots on.

6.6.1.1 US CTRL—

Enters ALPHAGRAPHICS mode upon receipt of US CODE (HEX 1F).

NOTE

A carriage return is not performed and the data level is unchanged.

6.6.1.2 ESC FF ESC, CTRL L

Enters ALPHAGRAPHICS mode upon receipt of ESC, FF CODE (HEX 1B, 0C)

NOTE

This command also homes the ALPHAGRAPHICS cursor, clears the graphics memory, sets the data level to dots on and resets the character size and line styles.

6.6.1.3 [SHIFT] [SET-UP]

Generates a local ESC CTRL-L. This alternate key stroke is for the convenience of the operator only.

6.6.2

ALPHAGRAPHICS cursor is a blinking underline: The ALPHAGRAPHICS may be positioned in one of three ways;

1. Use of the BS, HT, LF, VT, CR, EM CTRL codes.
2. The ALPHAGRAPHICS cursor is always positioned at the last grid coordinates accessed in vector or point plot modes. Thus the alphagraphics cursor may be positioned by entering point plot or vector mode, sending the desired 4 byte X and Y coordinate and then entering alphagraphic mode by use of the US command.
3. Use of the cursor positioning keys on the keyboard. The home position for the alphagraphics cursor is the upper left hand corner.

6.6.3 Alphagraphics Character Size

The ALPHAGRAPHICS mode offers four character sizes listed in Table 6-3. Each is selected by the appropriate escape sequence for the character size desired. Character size is not line dependent and characters of different size may be mixed. However the line format will change per Table 6-3.

TABLE 6-3
ALPHAGRAPHICS CHARACTER SIZE

Char Size	Escape Sequence	Screen Format
Normal	ESC 0	80 X 34
2X	ESC 1	40 X 17
3X	ESC 2	26 X 11
4X	ESC 3	20 X 8

6.6.4 Alphagraphics Margins

Two margins are available in the ALPHAGRAPHICS mode.

Margin 0 is at the left hand side of the screen (column 0). Attempts to enter alphagraphics beyond the screen limits will generate a local carriage return and line feed.

Margin 1 is at the center of the screen. Margin 1 is automatically enabled when the alphagraphics cursor is positioned on the last available line and a line feed is received.

Margin 1 is useful in creating two columns of text and is compatible with Plot 10 software.

NOTE

Any characters that extend beyond the center of the screen may be written over when Margin 1 is enabled.

The numeric column location of Margin 1 and the numeric last available line vary with character size per Table 6-4.

TABLE 6-4
MARGIN 1 LOCATION

Character Size	Margin 1 Col #	# of Lines Available
1X	40	34
2X	20	17
3X	13	11
4X	10	8

6.7 POINT PLOT MODE

The POINT PLOT mode allows individual points to be plotted on the graphics display screen of the VISUAL 550. Point plot is entered by a FS CODE. The point to be plotted is specified via the same addressing scheme as that used for specifying the end points of vectors, the only exception being that only the end point dots are plotted and not the whole vector.

6.7.1 FS CTRL \

Enters point plot mode upon receipt of a FS CODE (HEX1C). The data level and status of the alpha and graphics memory are unchanged. There is no POINT PLOT mode cursor.

NMN	ASCII CODE	ACTION
FS	P 0 0 1 1 1 1 0 0	ENTER POINT PLOT MODE
HIGH Y	P 0 1 Y_9 Y_8 Y_7 Y_6 Y_5	Y COORDINATE
LOW Y	P 1 1 Y_4 Y_3 Y_2 Y_1 Y_0	
HIGH X	P 0 1 X_9 X_8 X_7 X_6 X_5	X COORDINATE
LOW X	P 1 0 X_4 X_3 X_2 X_1 X_0	
HIGH Y	P 0 1	2ND POINT TO BE PLOTTED
LOW Y	P 1 1	
HIGH X	P 0 1	
LOW X	P 1 0	
LOW X	P 1 0	3RD POINT, Y-AXIS DID NOT CHANGE
HIGH Y	P 0 1	4TH POINT, X-AXIS DID NOT CHANGE
HIGH Y	P 0 1	5TH POINT, NEW X AND Y-AXIS
LOW Y	P 1 1	
HIGH X	P 0 1	
LOW X	P 1 0	
	•	
	•	
	•	
	•	
GS	P 0 0 1 1 1 0 1	TRANSITION TO VECTOR MODE

Figure 6-4. Data Sequence Point Plot Mode

6.8 INCREMENTAL POINT PLOT MODE

INCREMENTAL POINT PLOT mode allows points to be plotted in one of eight directions relative to the current position. The absence of dots (DATA OFF) may be plotted by use of the "PEN UP" and "PEN DOWN" characters.

6.8.1 RS CTRL ^

Enters INCREMENTAL POINT PLOT mode upon receipt of RS CODE (HEX 1E). Points are incrementally plotted in the direction defined by the received character. Figure 6-5 shows the direction of each character. The action of the "drawing pen" is defined by the ASCII characters:

ASCII	ACTION
SP	PEN UP
P	PEN DOWN

Example: The received character string

RS, P, E,E,E,E,E

Would enable incremental point plot mode, issue a "PEN DOWN" and plot five incremental points at a 45 degree angle in a northeasterly direction.

6.9 VECTOR MODE

Vector mode allows the VISUAL 550 to automatically draw vectors connecting two specified points. The first coordinate received specifies the begin point and the second coordinate specifies the end point. A third coordinate received would connect a vector from coordinate two to coordinate three. Each subsequent coordinate received defines the end point of the vector.

Up to eight line styles are available in vector mode. Three of these line styles may be user defined. Please refer to Section

CAUTION

Certain long vector calculations may cause buffer overflow at high baud rates. Please refer to the Communication Section for details.

6.9.1 GS CTRL]

VECTOR MODE is entered upon receipt of a CODE GS (HEX 1D).

If the V550 is already in VECTOR MODE the CODE GS will draw a dark vector from the current point to the next point received.

Graphic plotting information is sent from the computer in a 4 byte sequence containing High and Low order Y, and High and Low order X. Each byte contains the two tag bits plus 5 binary bits. Each byte thus encodes to an ASCII character.

To obtain the 4 ASCII characters for each addressable point on the display, use the instruction as outlined on Page 6-3, and the Conversion chart Part 1 through 4 as shown in Table 6-1. With X = 0 and Y = 31 as an example of a desired coordinate display. This chart is useful for determining the ASCII encoding of a coordinate when it is not convenient to use a computer subroutine.

Figure 6-2 shows a method of computing the 4 bytes using the example of the desired coordinate of X = 32 and Y = 48. The numbers are converted to a 10-bit binary equivalent.

Each is divided into High and Low 5 bits. The bytes are assembled as shown with the two tag bits added. This method is used where computer sub-routines are set up to do this conversion.

Required Coordinate Bytes

HIY	LOY	HIX	LOX
X	X	X	X
X	X		X
X			X
	X	X	X
	X		X
			X

X = changed or required byte.

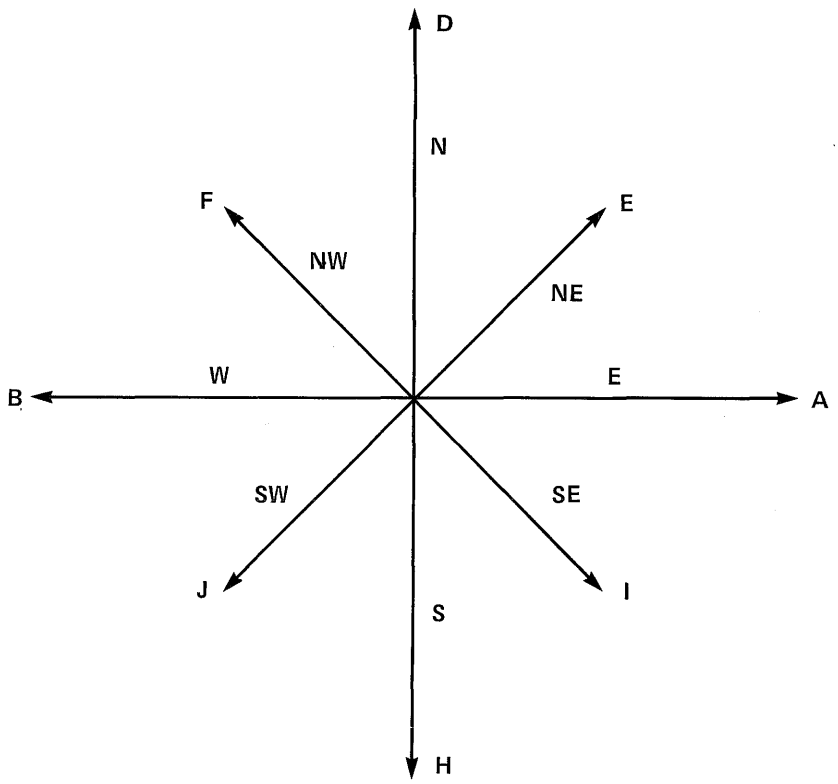


Figure 6-5 Incremental Point Plot Directional Characteristics

NMN	ASCII CODE	ACTION
GS	P 0 0 1 1 1 0 1	ENTER VECTOR MODE
HIGH Y	P 0 1 Y_9 Y_8 Y_7 Y_6 Y_5	Y COORDINATE — VECTOR BEGIN POINT
LOW Y	P 1 1 Y_4 Y_3 Y_2 Y_1 Y_0	
HIGH X	P 0 1 X_9 X_8 X_7 X_6 X_5	X COORDINATE — VECTOR BEGIN POINT
LOW X	P 1 0 X_4 X_3 X_2 X_1 X_0	
HIGH Y	P 0 1	Y COORDINATE — VECTOR END POINT
LOW Y	P 1 1	
HIGH X	P 0 1	X COORDINATE — VECTOR END POINT
LOW X	P 1 0	
HIGH Y	P 0 1	Y COORDINATE — VECTOR END POINT
LOW Y	P 1 1	
HIGH X	P 0 1	X COORDINATE — VECTOR END POINT
LOW X	P 1 0	
GS	P 0 0 1 1 1 0 1	REINITIALIZE VECTOR MODE
HIGH Y	P 0 1	Y COORDINATE — VECTOR BEGIN POINT
LOW Y	P 1 1	
HIGH X	P 0 1	X COORDINATE — VECTOR BEGIN POINT
LOW X	P 1 0	
HIGH Y	P 0 1	Y COORDINATE — VECTOR END POINT
LOW Y	P 1 1	
HIGH X	P 0 1	X COORDINATE — VECTOR END POINT
LOW X	P 1 0	
ESC	P 0 0 1 1 0 1 1	ESCAPE CODE
a	P 1 1 0 0 0 0 1	SELECT DOTTED LINE STYLE
	•	
	•	
	•	
	•	
	•	
FS	P 0 0 1 1 1 0 0	TRANSITION TO POINT PLOT MODE

Figure 6-6 Data Sequence Vector Mode

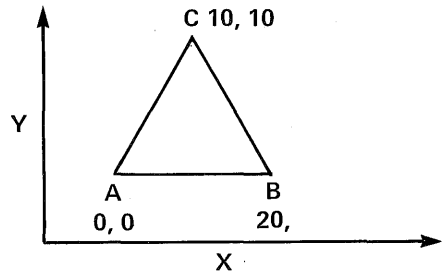
INCREMENTAL PLOT CHARACTERS

CHAR	CODE	DIR	ANGLE
D	44	N	90°
E	45	NE	45°
A	41	E	0°
I	49	SE	315°
H	48	S	270°
J	4A	SW	225°
B	42	W	180°
F	46	NW	135°

The data sequence for vector mode is defined in Figure 6-6.

There is no cursor displayed in vector mode.

Example: To draw the triangle ABC then the



The following ASCII character sequence would be sent to the V550.

ASCII Character	Action
GS	Enter Vector Mode
SP	High Y Coordinate A
`(DECIMAL 39)	Low Y Coordinate A
SP	High X Coordinate A
@	Low X Coordinate A
T	Low X Coordinate B
j	Low Y Coordinate C
J	Low X Coordinate C
`(DECIMAL(39))	Low Y Coordinate A
@	Low X Coordinate A

NOTE

That after the first 4 bytes are sent only those bytes that change must be sent. However, although not evident in this example, if the High X byte changes then the Low X byte must be re-sent.

6.9.2 Line Types

Up to eight line types or styles are available in vector mode. The VISUAL 550 is set to "normal" line at power up. The received GS code does not reset the selected line style.

6.9.2.1 Select Line Style ESC Ps

The CODE ESC followed by the appropriate character listed in Table 6-5 selects the desired line style.

Line style is set to normal (reset) on Power on and upon entering alphagraphics mode by use of the ESC FF command. User defined line styles are selected by the appropriate character, but must have been previously defined. (See 6.9.2.2)

TABLE 6-5 LINE STYLES

Ps	LINE STYLE SELECTED
ESC \	NORMAL_____
ESC a	DOTTED . . . . .
ESC b	DOT DASH .—.—.—.—.—.
ESC c	SHORT DASH ----------
ESC d	LONG DASH_____
ESC x	USER DEFINED #1
ESC y	USER DEFINED #2
ESC z	USER DEFINED #3

NOTE

The line style select command must precede a GS command.

6.9.2.2 Define User Line Styles

User line styles are defined by the following commands.

ESC/Pn a	STYLE #1
ESC/Pn b	STYLE #2
ESC/Pn c	STYLE #3

Where Pn is a decimal number derived by considering the line type definition to be a sixteen bit binary number with each bit defining a dot or pixel of the line. The Low Order bit is the first dot in the line style.

A binary "1" is a dot on. A binary "0" is a dot off.

The value of Pn is the range of 0 to 65535 inclusive.

6.10 RECTANGULAR DRAW AND FILL

The VISUAL 550 is capable of drawing a rectangle by specifying a starting point and the delta distance along the X and Y axis. The rectangle may be automatically filled with any one of eight filling styles. Additionally the rectangle may be rotated in 45 degree increments.

6.10.1 ESC/x;y;△X;△Y x

The above command will cause a rectangle to be drawn, starting at coordinate X Y that is △X dots wide and △Y dots high. The values are specified in decimal format.

Figure 6-7 shows a rectangle that begins at location coordinate 20, 50 and 50 dots square. The figure is drawn by the following sequence being received by the V550.

ESC / 2 0 ; 5 0 ; 5 0 ; 5 0 x

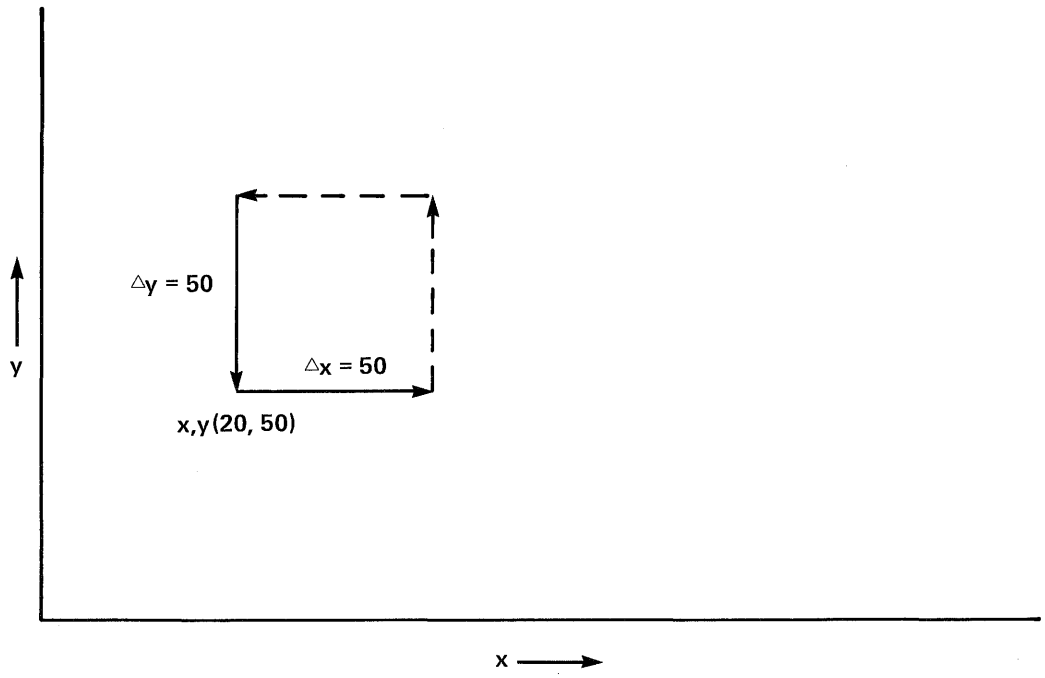


Figure 6-7 Rectangular Draw

6.10.2 ESC/x; y; △x; △y y

The above command will cause a rectangle to be drawn and filled with one of the selected filling styles. The rectangle begins at location coordinate x,y and is △x dots wide and △y dots high. The values are specified in decimal format. The data sequence is identical to a rectangular draw with the exception of the last character being an ASCII y rather than an ASCII x.

The desired filling style must be selected (or enabled) by one of the eight commands defined in Paragraph 6.10.3. Filling is between the boundaries of the defined rectangle.

6.10.3 Filling Command

The filling style ID defined by following commands.

ESC @	Solid fill (all dots on)
ESC A	Grey fill (50% dots on)
ESC B	Slope up (left to right lines)
ESC C	Slope up (right to left lines)
ESC D	Horizontal lines
ESC E	Vertical lines
ESC F	Slant cross hatch lines
ESC G	Vertical cross hatch lines

The filling style must be selected before a rectangular draw and fill command is received.

6.10.4 Direction Command

A defined rectangle may be rotated on its X axis in 45 degree increments by use of the direction command

ESC/Ps e

Where Ps is a selective parameter from 0 to 7 defining the direction of the X axis.

The Y axis will always be defined as 90 degrees from the X axis.

Example: If the rectangle defined in Figure 6-7 had been prefaced by the command

ESC/4e

Then it would appear rotated 90°.

The direction of the X-axis remains as selected until either a new direction command is received or a power on resets the X-axis to the default value:

X = 0

Table 6-6
Selective Parameters Direction Command

Ps	Degrees
2	0°
3	45
4	90
5	135
6	180
7	225
0	270
1	315

6.10.5

The direction command may also be used to position characters in alphagraphics mode.

The selective parameters define the axis and direction of cursor movement in alphagraphics mode per Table 6-7.

Table 6-7

Ps	X Axis	Cursor Movement
0	0	Left to right
2	90	Top to bottom
4	180	Right to left
6	270	Bottom to top

6.11 DATA LEVEL

Data is plotted into alphagraphics, point plot, vector, or incremental point plot mode according to one of four data level settings: dots on, dots off, compliment, and replace.

6.11.1 ESC/Ps d

The above command sets the data level according to the value of the selective parameter (Ps).

Ps Value	Data Level
0	Dots on
1	Dots off
2	Compliment
3	Replace

The data level is set to dots on upon power up and by entering alphagraphics mode by use of an ESC FF command.

DOT ON – The normal data level whereby plotted data, vectors or alphagraphics characters are visible.

DOTS OFF – Used to draw invisible vectors or to selectively erase dots or vectors by turning the data level off and replotting or redrawing the data.

COMPLIMENT – Causes the data stored in graphics memory to be complimented when replotted or redrawn with the data level set to compliment. Compliment is also used to selectively erase graphics data.

REPLACE – Causes the data being plotted to replace unconditionally the data already in the display bit map.

6.12 CROSSHAIR MODE

Crosshair mode is used primarily to allow interaction between the host and the operator in graphics mode.

When entered, a full screen cursor (crosshair), is displayed at the last point or vector coordinate. The crosshair may be positioned in one of eight directions by depressing the desired key on the numeric pad. See Keyboard Section

Each depression of the key selected will move the intersection of the crosshair one dot (pixel) in the direction indicated on the key. If the key is simultaneously depressed with the movement key then the crosshair will move eight dots (pixels) in the indicated direction.

6.12.1 ESC SUB or ESC CTRL Z

These commands cause the VISUAL 550 to enter crosshair mode.

The cursor is displayed at the last loaded dot or vector location. The crosshair may then be positioned by use of the cursor movement keys.

The location coordinates are transmitted to the host by depressing any alphanumeric key. The VISUAL 550 will transmit the code (ASCII) of the alphanumeric key and the location coordinates of the crosshair. The byte coordinates are in the format specified in Section 6.13.

NOTE

Transmission of crosshair coordinates causes the V550 to enter alpha-graphics mode.

The transmission sequence in crosshair mode is as follows:

High X
Low X
High Y
Low Y
Trailer 1
Trailer 2

6.12.2 Load Crosshair ESC/f

The load crosshair command positions the crosshair to the defined coordinates.

Example:

To position the crosshair to location 60, 40, the following code sequence would be used.

NMN	7 Bit ASCII	Code
High Y	01 0001	!
Low Y	11 0100	h
High X	01 0001	!
Low X	10 1110	\
ESC	0011011	ESC
\	0101111	/
f	1100110	f
ESC	0011011	ESC
SUB	0011010	SUB

6.13 INQUIRY

The VISUAL 550 will respond to an inquiry command in point plot, incremental plot, vector, crosshair and alphagraphics modes.

The VISUAL 550 will respond to an inquiry with the following data format.

Status Word
High X
Low X
High Y
Low Y
FEOL
SEOM

NOTE

If the V550 is in crosshair mode then the cursor location is the crosshair location.

The byte format for V550 response to an inquiry command is as follows:

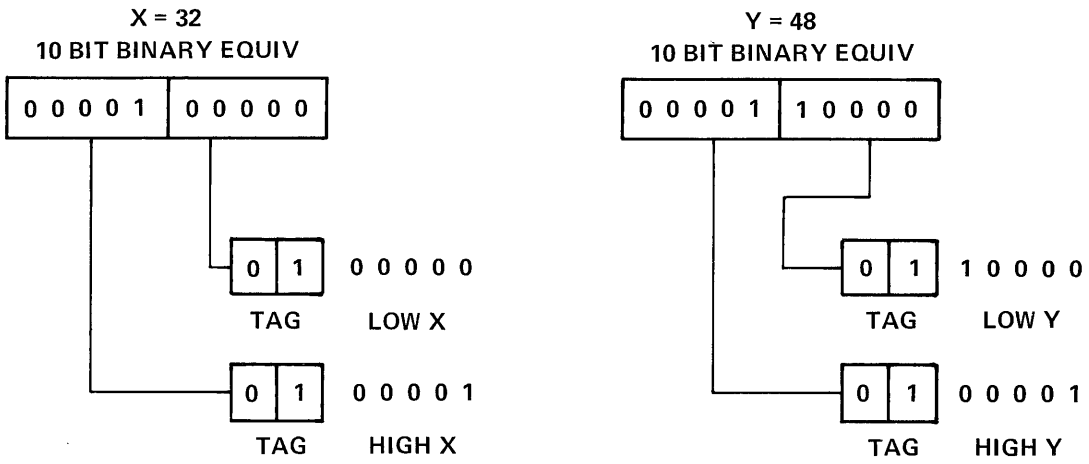
RESPONSE BYTE FORMAT

Each of the X and Y coordinates are converted to a 10 bit binary equivalent as shown in figure. Each is then divided into the high and low 5 bits of each axis. The VISUAL 550 transmits this data in four byte sequences in the following format:

BYTE 1	HIGH Y	P01	Y_9 Y_8 Y_7 Y_6 Y_5
BYTE 2	LOW Y	P01	Y_4 Y_3 Y_2 Y_1 Y_0
BYTE 3	HIGH X	P01	X_9 X_8 X_7 X_6 X_5
BYTE 4	LOW X	P01	X_4 X_3 X_2 X_1 X_0

Each byte may contain parity (P) and two tag bits and thus encodes to an ASCII character. The ASCII equivalents of grid coordinates are listed in Table 6-1.

Example: To convert X,Y display coordinates to a 4 byte format



		7 BIT ASCII	HEX	ASCII CHAR
BYTE 1	HIGH Y	0 1 0 0 0 0 1	21	!
BYTE 2	LOW Y	0 1 1 0 0 0 0	30	Ø
BYTE 3	HIGH X	0 1 0 0 0 0 1	21	!
BYTE 4	LOW X	0 1 0 0 0 0 0	20	SP

6.13.1 ESC ENQ

Returns status information and cursor location to the host.

6.13.2 Status Word

The V550 responds to an inquiry command with a status word in the following format.

PARITY	0	1	HCU	0	Mode	Margin

HCU – 0 Hard Copy Unit Ready
Mode – 0 Graphics Mode Enabled
1 Alphagraphics Mode Enabled
Margin – 1 at Margin 1
0 at Margin 0

The status word is the first byte sent in response to an inquiry command (ESC ENQ).

6.14 SCALING

Two scales are available in the V550.

1 : 1 Normal Scale
3 : 4 Plot 10 Scale

See 6.17 for method of setting scale factor.

6.15 BLOCK TRANSFER

All functions of the VISUAL 550 graphics modes are interactive (character by character action). However the V550 can accept blocks of graphics memory data. These block transfers allow the host to rapidly update the graphics memory.

A block transfer from the host is accomplished by use of the address load and data load commands.

A block read from the VISUAL 550 to the host is accomplished by use of the memory read command.

6.15.1 Address Load ESC" X; Ya

The address load command specifies the starting address of a block transfer where: X and Y are decimal numbers indicating the starting location in graphics memory. X is in the range of 0 to 768 and Y is in the range of 0 to 585. 0,0 would represent the home position of the graphics memory.

6.15.2 Data Load ESC + <CHAR><CHAR> . . .

The data load command loads the graphics memory with data beginning at the previously specified address where:

<CHAR> is an ASCII character in the range of @(HEX40) to–(HEX5F).
<CHAR> represents 5 bits of data encoded into an ASCII character.

Data is loaded at the beginning address from the low order five bits of starting with D1 and ending with D5.

Example:

To lead an alternating pattern of data starting at location 10,20 of graphics memory, the following sequence would be sent to the VISUAL 550.

NMN	7 Bit ASCII Code	Char. ASCII
ESC	0011011	ESC
"	0100010	"
Decimal X(10)	0110001	1
;	0110000	0
	0111011	;
Decimal Y(20)	0010100	2
	0111011	0
a	1100001	a
ESC	0011011	ESC
+	0101011	+
Char 1	1001010	J
Char 2	1010101	U
o	o	o
o	o	o
o	o	o
#	0100011	#

6.15.3 Memory Read ESC "X; Y; <COUNT> b

Due to the Physical Limitations of the VISUAL 550 buffer, the memory read command must be issued twice to read the entire graphic memory. The two recommended commands are as follows:

ESC "0; 0; 44928b
ESC "0; 298;44928b

The memory read command allows the VISUAL 550 to transmit the contents of graphics memory where:

X., Y is the starting location expressed decimally and count is the number (decimal) of five bit words to be transmitted. The five bit words are transmitted as ASCII characters (SOH through us). Where there are 89,856 5 bit characters on the screen or 449,280 pixels. Nulls or groups of nulls are transmitted as a decimal count preceded by a # sign.

Though there are potentially 89,856 five bit characters able to be sent, the maximum number that can be requested at one time is 65535. This represents 72% of the graphic memory.

For example: To transmit 72% of the graphic memory from location 0,0 could be:

ESC "0;0;65535b

If the graphic memory were cleared, i.e., no data, the V550 response would be:

#65535 FEOL SEOM

This transmission would take approximately 3 minutes and 10 seconds at 9600 baud.

6.16 GRAPHICS COMMUNICATIONS

When the VISUAL 550 sends blocks of data to the host compute the message is ended with up to two trailer codes:

TRAILER CODE #1
TRAILER CODE #2

These codes are user definable (Section 3.9.6) and are used to indicate the end of transmission.

A full description of communication protocols is contained in Chapter 7.

6.16.1 Handshaking

A method of handshaking is normally required at transmission speeds above 2400 baud to insure that data is not lost. This is especially true when certain graphics functions such as long vectors are being plotted. Two handshaking methods are available on the VISUAL 550: XON-XOFF and status readback control of the two XON-XOFF is the more desirable.

6.16.1.2 XON/XOFF

A full discussion of the XON-XOFF protocol is contained in Chapter 7, Section 7.3.

6.16.1.3 Status Readback Control

This method uses the inquiry function to determine if the V550 is ready to receive data and involves sending the VISUAL 550 the inquiry sequence ESC ENQ and waiting for the status byte to be returned before resuming data transmission.

Since the VISUAL 550 uses a transmission input buffer, it is not necessary to send an inquiry after each function. A general rule of thumb would be to send an inquiry after every 20 coordinate pairs and after every long vector coordinate pair. A rectangular draw with fill is considered a long vector.

As previously stated if the host supports XON-XOFF, then this automatic protocol is more desirable.

Other "trick" methods such as sending nulls, dummy characters or breaks, used to delay communications are time consuming and should be avoided.

6.17 REMOTE PARAMETER SELECTION

The following V550 graphics mode set-up parameters may be remotely set or reset by the host:

Auto Scaling
Space Code Operation
Cell Size

6.17.1 ESC / Ps h — Set Parameter
ESC / Ps ℓ — Reset Parameter

PARAMETER SELECTION

Ps	Parameter	Set/Reset	Action
1	Auto Scaling	Set	1:1
1	Auto Scaling	Reset	3:4
2	SP Code Operation	Set	Destructive
2	SP Code Operation	Reset	Non Destructive
3	Cell Size	Set	10x15
3	Cell Size	Reset	10x17

6.17.2 Aux Port Rec. Data Use Menu # 8

This set-up parameter is used for bi-directional communication using the aux port. This mode can be changed in set-up or remotely. The remote commands are as follows:

ESC / 1 p — Cursor Move

Data from the bit pad is used by the V550 to move cross hair.

ESC / 2 p — Pass BP to Host

Data from the bit pad is passed to the host and also displaying the movements on the screen.

ESC / 3 p — Pass to Host Transp.

Data from the bit pad is passed to the host but not displayed on the screen.

WARNING

There is no flow control on the data stream coming into the Aux. Port. There is, however, a 256 byte buffer into which the data is written. It is up to the customer to insure that the buffer is not overrun.

6.18 4014 FONT COMPATIBILITY

Release eight (08.00) of the V550 firmware has a new character font included for Tektronix 4014 compatibility. The new font is a 5 x 7 dot character (2 dot decender for lower case) in a 6 x 10 cell. With this new font you can display 58 lines of 128 characters in Alpha-graphics Mode. To select the new font, the 4014 font commands have been added to the V500/V550, these commands are:

<ESC> 8 – Select 10 x 17 character cell size, 34 lines of 78 char.

<ESC> 9 – Select 9 x 15 character cell size, 39 lines of 85 char.

<ESC> : – Select 6 x 10 character cell size, 58 lines of 128 char.

<ESC> ; – Select 6 x 10 character cell size, 58 lines of 128 char.

NOTE

<ESC> ; is included for 4014 code compatibility.

The new font may only be selected by command. The first two character cell sizes are selectable in Set Up Mode as before and by the old command that was present in previous release of the /V550 firmware. The old command and the Set Up selection is being left in the /V550 firmware for compatibility with software systems written for the older releases of the firmware.

6.19 CIRCLE AND ARC DRAW

The VISUAL 550 is capable of drawing a circle or an arc by specifying the starting point and radius of the circle.

6.18.1 ESC/X; Y; R; T; P A

The above command draws a circle or arc of R radius at coordinates XY.

Where:

X – X Coordinate (decimal value) of the center of the circle
Y – Y Coordinate (decimal value) of the center of the circle
R – Radius expressed in number of pixels
T – Starting point of arc expressed in degrees
P – Length of arc expressed in degrees

if P is omitted or P=0 or P $>$ 360° then a circle is drawn

Example 1

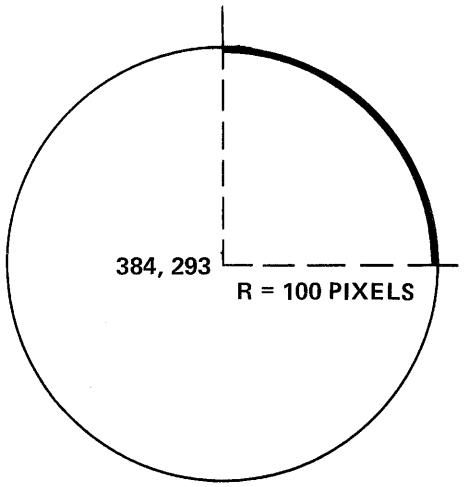
ESC/384; 293; 100 A

Would draw a circle at coordinates 384, 293 (center of screen) that has a radius of 100 pixels.

Example 2

ESC/384; 293; 100; 0; 90 A

Would draw an arc whose center is at coordinates 384, 293 that has a radius of 100 pixels beginning at 0° and ending at 90°



7. DATA TRANSMISSION

The VISUAL 550 supports both character by character and block transmissions while operating in Alphanumeric mode. In any of the graphics operating modes or if VT52 or VT100 mode is selected then all transmission is on a character by character basis (conversational).

7.1 MODES

When operating in Block mode, five transmission modes are used to condition the portion of the display to be transmitted when transmission is initiated. By using various set/reset combinations of these modes the user may condition transmission to include all or any part of the screen.

The five modes that condition Block mode transmissions are Multiple Area Transfer mode, Transfer Termination mode, Guarded Area Transfer mode, Line Transmit, and Transmit Request mode. Each of these modes is explained in Section 5.

Table 7-1 illustrates the portion of the screen transmitted for the various set/reset combinations of the transmission modes. Table 7-1 does not include Transmit Request mode since this mode does not condition the transmittable screen portion, but determines whether the XMIT key causes a data transmission or transmission of a request for permission to transmit data.

In all cases, the VISUAL 550 will automatically delete insignificant space codes at the end of each transmitted line.

7.2 MESSAGE FRAMING

When the VISUAL 550 transmits a block of data, the transmitted data stream will be "framed" per the following:

- Start of Message Code (SOM) precedes all data characters in the transmitted message
- Area Separator Code (AS) is included in the data stream to separate unprotected areas
- First and Second End of Line Codes (FEOL and SEOL) are included in the data stream to signify the end of data on a line
- First and Second End of Message Codes (FEOM and SEOM) terminates all data characters in the transmitted message
- Turn Around Control Code (TACC) is used only in half-duplex Character mode operation and to terminate answerback, Function Key, and Status transmissions in Character mode.

The message framing codes are user programmable and each may be defined to be any one of the 128 ASCII codes including NULL. The codes may be defined in mode as described in Section 3.9.6 or may be defined remotely as described in Section 5.3.11. Message framing may be disabled by setting each message framing code to a null.

TABLE 7-1.
COMBINATIONS OF TRANSMISSION MODES

	MODE	STATE															
	LINE TRANSMIT	R	R	R	R	R	R	R	R	S	S	S	S	S	S	S	S
	MULTIPLE AREA TRANSFER	R	R	R	S	S	S	S	R	R	R	R	S	S	S	S	R
	TRANSFER TERMINATION	R	S	S	R	R	S	S	R	R	S	S	R	R	S	S	R
	GUARDED AREA TRANSFER	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R
ONLY AREA CONTAINING CURSOR		•	•	•					•	•	•	•					•
MANY AREAS					•	•	•	•					•	•	•	•	
TO CURSOR LOCATION			•	•			•	•			•	•			•	•	
INCLUDING PROTECTED AREAS		•		•		•		•		•		•		•		•	
ENTIRE AREA/LINE PAGE REGARDLESS OF CURSOR LOCATION		•			•	•			•	•			•	•			•
		DATA TRANSMITTED															

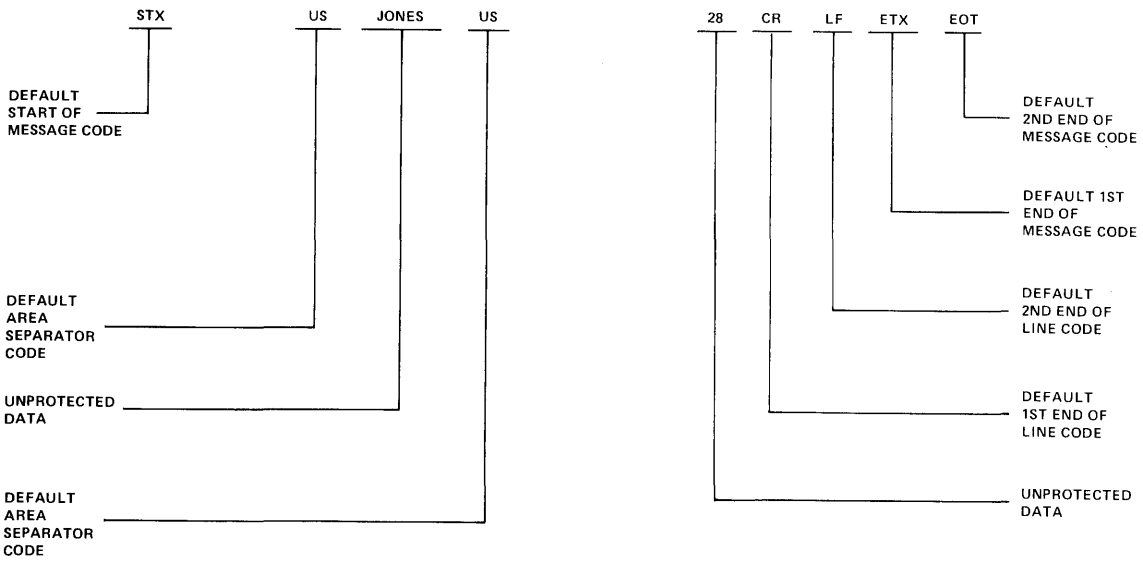
S = SET R = RESET

7.2.1 Block Mode Transmission Framing

The following example illustrates the use of all six message framing codes as they relate to a block data transmission.

NAME:	JONES	AGE:	28
Protected Area	Unprotected Area	Protected Area	Unprotected Area

If the above data appeared on the screen and transmission was initiated, the data stream to the host would be:



NOTE:

PROTECTED DATA IS NOT TRANSMITTED

7.2.2 Function Key, Answerback and Status Transmissions

All Function Key, Answerback and Status transmissions are framed regardless of whether Character mode or Block mode is selected.

In Block mode these transmissions are framed as follows:

SOM DATA FEOM SEOM

In Character mode these transmissions are framed as follows:

SOM DATA TACC

NOTE

Message framing of function key messages may be disabled in Set-Up mode menu#7 section

In Graphics Operating mode a Status message in response to an inquiry command (ESC ENQ) is ended with two trailer codes

TRAILER CODE 1
TRAILER CODE 2

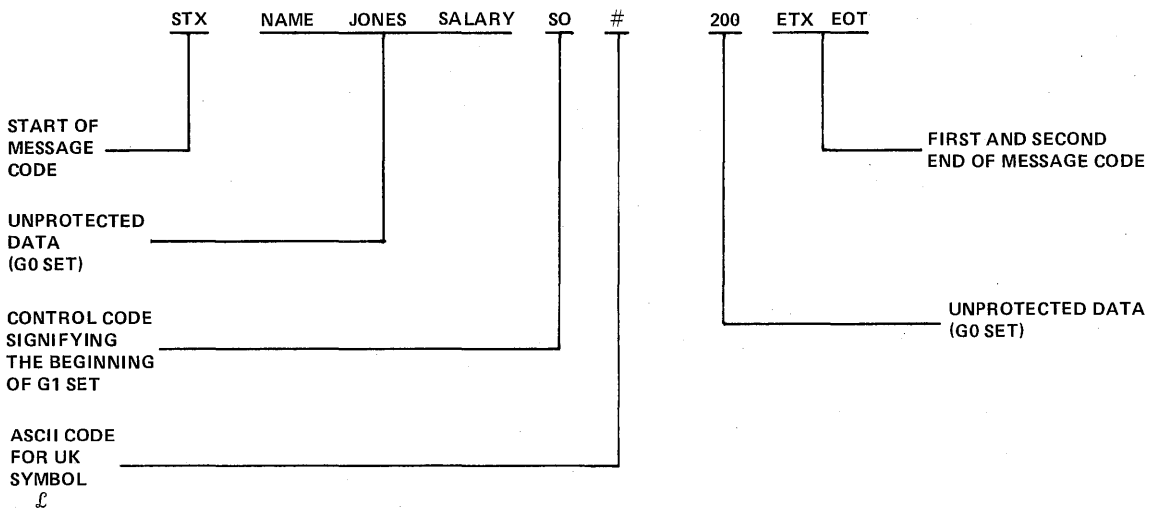
7.2.3 Line Drawing and Foreign Character Sets

The terminal provides for eight foreign character sets and also a line drawing character set. When a portion of the screen displaying more than one character set is transmitted, the code sequences for enabling the character sets are appended to the beginning of each screen portion containing the character set to signify the character set being transmitted. By "framing" character sets in this manner the host may distinguish between different character sets in a transmitted data stream.

In this case, only the SI and SO control codes will be used to frame the character sets since these are the codes used to enable the GØ and G1 character sets respectively. The following example illustrates the framing of GØ and G1 character sets in a transmitted data stream. The example assumes that the GØ character set is U.S., and the G1 set is U.K. The example also assumes that the data is in the same area.

NAME: JONES SALARY £200

If the above data is transmitted, the date stream to the host would be:



7.3 HALF/FULL DUPLEX

The VISUAL 550 supports both half and full-duplex communication in either Character or Block mode. When operating in half-duplex the XON/XOFF protocol is disabled thus placing the burden of not overflowing the terminal's receive buffer on the host.

7.3.1 Half-Duplex

There is a problem unique to half-duplex operation, who is to be the transmitter and who is to be the receiver, i.e., when should the communications line be turned around. The terminal uses two methods to determine when the line should be turned around. The first is the use of a control code to signal the end of a transmission and the second is the use of the secondary channel of the modem if it is available and allowed by the user.

When the VISUAL 550 is in Character mode, the control code used to turn the line around is the turnaround control code (TACC). When the TACC is received from the host, the V550 will assume that it is the last character of the message and switch from the receive state (request-to-send low) to the transmit state (request-to-send high).

When the TACC is transmitted by the V550 it switches from the transmit state to the receive state.

When the V550 is in Character mode and the use of the secondary channel is selected, the terminal monitors the secondary channel for a "break". If a "breaking" signal is received, the V550 switches to the receive state and monitors the carrier detect lead from the modem for incoming signal on the communications line. If no carrier is detected for a period of approximately 500 milliseconds after switching to the receive state, the V550 switchback to the transmit state.

When the V550 is in Block mode, the TACC is not used since all transmissions are framed, i.e., they start with a start of message code and end with either of two end of message codes. The end of message code signals when the line is to be turned around. The secondary channel may be used the same as when the V550 is in Character mode.

7.3.2 Full-Duplex

When the VISUAL 550 is in full-duplex, the problem of line turnaround is not encountered. The terminal may send and receive data simultaneously, with the request to send lead always high.

7.4 XON/XOFF PROTOCOL

The terminal can operate at transmission speeds up to 19,200 baud. However, the terminal may not be able to keep up with incoming data. The terminal stores incoming characters in a buffer called the FIFO, and processes them on a first-in/first-out basis. When the FIFO begins to fill up, the terminal will transmit an XOFF (DC 3) code. On this signal, the host is supposed to suspend its transmission to the V550. Eventually, if the host stops transmitting, the V550 will process all of the characters out of the FIFO. When the FIFO is nearly empty, the V550 will transmit and XON (DC 1) code to signal the host it may resume transmission.

If the host fails to respond to the XOFF from the V550, the FIFO continues to fill up. When the capacity of the FIFO is exceeded, a condition occurs called "FIFO overflow".

If the FIFO overflows, the V550 begins to discard incoming characters. The error character (checker board pattern) is displayed on a FIFO overflow.

Two of the V550 functions, reset terminal and terminal self-test, re-initialize the terminal and erase the FIFO. This means that if characters received directly following commands to perform either of these two functions were placed in the FIFO, they would be destroyed before they were processed. For this reason, these two functions invoke an "implicit XOFF" rule: immediately after sending the terminal commands to perform either of these functions, the host must act as if it had received XOFF from the terminal, sending no more characters until it receives XON. The VISUAL 550 transmits XON after it completes the specified operation.

The XOFF/XON synchronization scheme has an advantage over requiring the host to insert delays or filler characters in its data stream. Requiring a minimum of software support, XOFF/XON insures that every character of command sent to the VISUAL 550 is processed in correct order. It frees interface programs for all timing considerations, and results in more reliable operation.

Besides the FIFO filling condition, there are two other means of transmitting XOFF and XON, namely the NO SCROLL key, and control S and control Q. If the transmitter XON/XOFF feature is enabled, the V550 coordinates these three sources of XOFF and XON so that the desired effect occurs. For example, if the FIFO filling condition has caused an XOFF to be sent, and then the operator types the NO SCROLL key, a second XOFF is not sent. The V550 waits until the operator types the NO SCROLL key again before sending XON.

Also, entering Set-Up mode causes the V550 to temporarily stop taking characters from the FIFO. An XOFF is sent if the FIFO becomes full.

If the V550 is operating in Character mode on a full-duplex network with the host echoing back the data and the user transmits an XOFF to the host (by control S) he should be aware that the host can no longer echo any further type-in until the user types an XON. This places the burden of not overloading the host's output buffer on the user.

Entering the exiting Set-Up mode clears the Transmit and Keyboard Locked modes if the host has not set the "Keyboard-Action" mode. The "Keyboard-Action" mode lock can only be cleared by the host.

The following is a summary of the various interactions of these occurrences assuming the transmitter XON/XOFF feature is enabled.

Sending XOFF – the first occurrence of:

1. FIFO filling condition
2. Pressing the NO SCROLL key
3. Pressing control S

Sending XON – if XOFF hasn't been sent, then control Q will send XON. – If XOFF has been sent, then the last occurrence of:

1. FIFO empty condition and
2. Either depressing NO SCROLL or control Q

Inhibiting transmit (assuming receiver XON/XOFF enabled) – receiving XOFF. Locking keyboard (in Character mode) – attempting to send too many keys after inhibiting transmit.

Allowing transmit and/or unlocking keyboard

1. Exiting Set-Up mode (assuming "Keyboard Action" mode not set) or
2. Receiving XON.

7.5 DTR DATA TERMINAL READY

In Firmware Revision 8.0 and above, the alternate method of valid data flow control is DTR.

To enable DTR BUSY, please refer to Section 3.9.3.5.

DTR works with the FIFO buffer much like X/ON – X/OFF protocol does. At 75% capacity (196 characters) of the FIFO Buffer, the terminal drops pin 20 of the RS232C interface from a true +5 volt state to 0 volts. This signifies to the host computer to stop data transmission.

Once the FIFO Buffer reaches 25% capacity (64 characters), pin 20 is then raised back up from 0 volts to +5 volts, indicating to the host computer to start data transmission.

With DTR BUSY enabled, the NO SCROLL key on the keyboard alternately toggles the DTR strap for operator data flow control.

8. VT100 AND VT52 COMPATIBILITY

The terminal may be configured to be code compatible with the DEC VT100 and DEC VT52. While using the terminal in these modes, some restrictions and some enhancements are present. This chapter covers the operational features of these emulations.

8.1 TRANSITIONAL CONTROL CODES

8.1.1

Different modes can be entered by using remote control codes. Table 8.1 identifies the codes.

Entering ⟶	V300	VT100	VT52
in V550	-	ESC<	ESC [? 2 l
in VT100	ESC[?2h	-	ESC [? 2 l
in VT52	*	ESC<	-

NOTE:

VT100 mode must be entered to enter VISUAL 550 mode from VT52 mode.

Example:

ESC<ESC [? 2h - enters VISUAL 550 mode from VT52 mode

8.2 VISUAL 300 ENHANCEMENTS IN VT100 AND VT52 MODE

Some of the standard functions of the terminal are carried over into the two modes.

8.2.1 Programmable Function Keys

The VT100 and VT52 have fixed function keys. When the V550 enters VT100 or VT52 mode, function keys 1-4 assume the proper fixed values. The Table below defines the function key values.

	VT100	VT52
PF 1	ESC O P	ESC P
PF 2	ESC O Q	ESC Q
PF 3	ESC O R	ESC R
PF 4	ESC O S	ESC S

NOTE:

Function keys 5-12 transmit the user defined sequence covered in Section 3.11. Function keys 1-4 still contain the user defined message. To transmit the message in keys 1-4, SHIFT and the function key desired must be depressed.

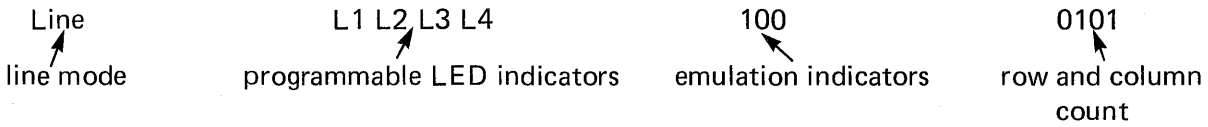
The function keys cannot be remotely loaded in VT100 or VT52 mode.

8.2.2 Status Line

The status line feature of VISUAL 550 mode is also present in the VT100 and VT52 mode.

8.2.2.1

In the VT100 mode the status line appears as follows:



NOTE

When an LED indicator is on, the particular LED indicator appears in reverse video.

8.2.2.2

In the VT52 mode the status line appears as follows:

NOTE:

The LED indicators in VT52 mode are non-programmable.

8.3 VISUAL 550 RESTRICTIONS IN VT100 MODE

Due to the construction of the terminal some commands used by the VT100 are ignored purposely in VT100 mode.

8.3.1

Enter 132 column mode command clears the screen and homes the cursor. The terminal is not capable of producing 132 columns.

8.3.2

Any double high – double wide or single high – single wide command will be ignored by the terminal in VT100 mode.

8.4 VT100 AND VT52 MODE COMMANDS

8.4.1 VT100 Mode Commands

8.4.1.1 Cursor Next Line — ESC E

This sequence causes the cursor to move to the first column of the next line. If the cursor is positioned on the bottom line of the scrolling region, the contents of the scrolling region will scroll up one line. If the cursor is positioned on the bottom line of the screen and that line is not part of the defined scrolling region the cursor will wrap to the top of the screen.

8.4.1.2 Save Cursor — ESC 7

This sequence causes the current cursor position, character set and video attributes to be saved.

8.4.1.3 Restore Cursor — ESC 8

This sequence causes restoration of the previously saved cursor position, character set and video attributes.

8.4.1.4 Align Display — ESC #8

This command will fill the entire screen with upper-case E's and is used for focus and alignment of display.

8.4.1.5 Program LEDs — ESC [Ps; Ps . . . Ps q

The four programmable LED indicators may be turned on or off by using the above sequence with the selective parameters (Ps) listed below. The LED indicators are displayed on the Status Line in VT100 and VT52 modes.

Parameter	Meaning
0 (Default)	Turn off all LEDs
1	Turn on L1
2	Turn on L2
3	Turn on L3
4	Turn on L4

8.4.1.6 Enter Alternate Keypad Mode — ESC =

This sequence causes the terminal to enter Alternate Keypad Mode. When entered, this mode causes keys on the numeric pad to transmit special escape sequences instead of their regular codes. The code sequences generated by each key is summarized in the table below:

KEY	VT52 MODE	VT100 MODE
0	ESC ? p	ESC O p
1	ESC ? q	ESC O q
2	ESC ? r	ESC O r
3	ESC ? s	ESC O s

KEY	VT52 MODE	VT100 MODE
4	ESC ? t	ESC O t
5	ESC ? u	ESC O u
6	ESC ? v	ESC O v
7	ESC ? w	ESC O w
8	ESC ? x	ESC O x
9	ESC ? y	ESC O y
–	ESC ? m	ESC O m
,	ESC ? l	ESC O l
.	ESC ? n	ESC O n
ENTER	ESC ? M	ESC O M

8.4.1.7 Exit Alternate Keypad Mode ESC >

This sequence causes the terminal to exit Alternate Keypad Mode.

8.4.1.8 Set Modes ESC [Ps;Ps . . . Ps h (ANSI)
ESC [? Ps;Ps . . . Ps h (Private)

This sequences set (enable) any or all of the modes described below.

8.4.1.9 Reset Modes ESC [Ps;Ps . . . Ps l (ANSI)
ESC [? Ps;Ps . . . Ps l (Private)

This sequences reset (disable) any or all of the modes described below. The question mark character (?) is needed to set/reset any of the Private modes. Once specified, the terminal assumes that all parameters following are private functions. The applicable modes are listed below:

MODE	PARAMETER (Ps)	
8.4.1.10 AUTO-REPEAT MODE:	? 8	(private)

When enabled, allows each key to generate its code at a rate of thirty (30) characters per second when the key is depressed for more than 0.75 seconds. All keys will auto-repeat except: SETUP, F1 through F12, HOME, PRINT, XMIT and BREAK.

When disabled, no keys will repeat.

8.4.1.11 EMULATION MODE:	? 2	(private)

When set, switches the terminal to V300 (normal) mode. When reset, switches the terminal to VT52 mode.

8.4.1.12 CURSOR KEY MODE:	? 1	(private)

When set, cursor keys generate sequences as listed below. When reset, cursor keys will generate their normal sequences (also listed below). This mode is only applicable in VT100 mode.

NOTE

In V300 mode, this parameter sets/resets Auto-Tab mode.

KEY	VT52	VT100	VT100 (with Cursor Key mode set)
Cursor up	ESC A	ESC [A	ESC O A
Cursor down	ESC B	ESC [B	ESC O B
Cursor right	ESC C	ESC [C	ESC O C
Cursor left	ESC D	ESC [D	ESC O D

8.4.1.13 LOCAL ECHO MODE: 12

When set, this mode causes transmitted data to be echoed back to the screen within the terminal.

When reset, no local echo will occur.

NOTE:

In V550 mode, this parameter selects character or block mode.

8.4.1.14

CHARACTER SET COMMANDS

DEFINE G0 SET:	ESC (x
DEFINE G1 SET:	ESC) x

The above commands are used to define the G0 and G1 character sets. Of the eleven character sets available, the user may define any particular set as the G0 set and any particular set as the G1 set. The value assigned to 'x' determines the font used for each character set. (See list below) Note that if the Foreign/National Character Set option is not installed only U.S., Line/Block Graphics and parts of VT52 Graphics will be available.

VALUE	CHARACTER SET	
A	U.K.	
B	U.S.	(standard)
C	German	
D	French	
E	Norweigan	
F	Swedish/Finnish	
G	Portuguese	
H	Spanish	
I	Danish	
J	Line/Block Graphics	(standard)
0	VT52 Mode Graphics	

8.4.1.15 STATUS COMMANDS AND RESPONSES

IDENTIFY	ESC [c ESC Z

RESPONSES:

VT100 Mode	ESC [? 1; 2 c
VT100 Mode with printer	ESC [? 1; 3 c

8.4.1.16 REPORT TERMINAL PARAMETERS — ESC [0 x
ESC [1 x

RESPONSE: ESC [s; p; n; x; r; c; f; x

Values are defined in the table below:

PARAMETERS	POSSIBLE VALUES	MEANING
s	2	This message is a report. (s assumes a value of 2 in response to ESC [0 x)
	3	This message is a report. (s assumes a value of 3 in response to ESC [1 x)
p	1	No parity
(parity)	4	Odd parity
	5	Even parity
n	1	Eight bits per character
(bits per character)	2	Seven bits per character
x	0	50 Baud
and	8	75 Baud
r	16	110 Baud
(transmit and	24	134.5 Baud
receive rate)	32	150 Baud
	40	200 Baud
	48	300 Baud
	56	600 Baud
	64	1200 Baud
	72	1800 Baud
	80	2000 Baud
	88	2400 Baud
	96	3600 Baud
	104	4800 Baud
	112	9600 Baud
	120	19200 Baud
c	1	Baud rate multiplier is 6
f	0	Reserved for future use

8.4.2 VT52 MODE COMMANDS

8.4.2.1 Cursor Movement Commands

Cursor Up — ESC A

Moves the cursor to the same column on the previous line. If the cursor is on the top line of the screen it will move to the same column on the bottom line of the screen.

8.4.2.2 Cursor Down — ESC B

Moves the cursor to the same column on the next line. If the cursor is on the bottom line of the screen it will move to the same column on the top line of the screen.

8.4.2.3 Cursor Right ESC C

Moves the cursor to the next column on the same line. If the cursor is on column 80 it will move to column 1 of the next line.

8.4.2.4 Cursor Left ESC D

Moves the cursor to the previous column on the same line. If the cursor is on column 1 it will move to column 80 of the previous line.

8.4.2.5 Cursor Home ESC H

Moves the cursor directly to line 1, column 1.

8.4.2.6 Reverse Line Feed ESC I

Moves the cursor to the same column on the previous line. If the cursor is on the top line of the screen a scroll down will occur and the cursor will not move.

8.4.2.7 Cursor Addressing ESC Y c r

Moves the cursor to the specified row and column. ('r' and 'c' values are in ASCII code and defined in the Cursor Addressing chart on page 8-).

8.4.2.8 Erase Commands
Erase to End-of-Line ESC K

Erases all data from the cursor position to the end of the current line.

8.4.2.9 Erase to End-of-Page ESC J

Erases all data from the cursor position to the end of the page.

8.4.2.10 Enter Graphics ESC F
Exit Graphics ESC G

These commands cause the terminal to enter or exit Graphics mode. When Graphics mode is entered, all received lower-case ASCII codes (octal 141 thru 172) and the codes for _, `, {, :, } and ~ (octal 137,140 and 173 thru 176) are displayed as graphic characters. The table below describes the graphic character associated with each ASCII code.

VT 52 LINE DRAWING GRAPHIC SET					
ASCII CODE	OCTAL VALUE	DESCRIPTION OF GRAPHIC	ASCII CODE	OCTAL VALUE	DESCRIPTION OF GRAPHIC
_	137	Blank	o	157	Center Bar
\	140	Delta	p	160	Center Bar
a	141	Checkerboard	q	161	Center Bar
b	142	Horiz. Tab	r	162	Center Bar
c	143	Form Feed	s	163	Center Bar
d	144	Carr. Return	t	164	T left
e	145	Line Feed	u	165	T right
f	146	Degree	v	166	T down
g	147	Plus or Minus	w	167	T up
h	150	New Line	x	170	Vertical bar
i	151	Vertical Tab	y	171	LT. or equal
j	152	Lower right corner	z	172	GT. or equal
k	153	Upper right corner	{	173	Pi
l	154	Upper left corner	!	174	Double Vertical Bar
m	155	Lower left corner	}	175	Pound sign
n	156	Intersecting lines	~	176	Infinity

8.4.2.11 Enter Alternate Keypad Mode ESC =
Exit Alternate Keypad Mode ESC >

See page 2 for details.

8.4.2.12 Enter VT100 Mode ESC <

This command causes the terminal to enter VT100 mode. All succeeding commands will be interpreted as VT100 mode commands. There is no way to enter V300 mode directly from VT52 mode.

8.4.2.13 Identify ESC Z

This command requests the terminal to verify that it is a VT52 and is ready for communication.

RESPONSES:

VT52 (without Printer) ESC / Z
VT52 (with Printer) ESC / M

VT52 MODE CURSOR ADDRESSING VALUES

ASCII Code	Octal Value	Column Number	Line Number	ASCII Code	Octal Value	Column Number	Line Number
SPC	040	01	01	H	110	41	
!	041	02	02	I	111	42	
"	042	03	03	J	112	43	
#	043	04	04	K	113	44	
$	044	05	05	L	114	45	
%	045	06	06	M	115	46	
&	046	07	07	N	116	47	
'	047	08	08	O	117	48	
(	050	09	09	P	120	49	
)	051	10	10	Q	121	50	
*	052	11	11	R	122	51	
+	053	12	12	S	123	52	
,	054	13	13	T	124	53	
-	055	14	14	U	125	54	
.	056	15	15	V	126	55	
/	057	16	16	W	127	56	
0	060	17	17	X	130	57	
1	061	18	18	Y	131	58	
2	062	19	19	Z	132	59	
3	063	20	20	[	133	60	
4	064	21	21	\	134	61	
5	065	22	22	]	135	62	
6	066	23	23	^	136	63	
7	067	24	24	_	137	64	
8	070	25		`	140	65	
9	071	26		a	141	66	
:	072	27		b	142	67	
;	073	28		c	143	68	
<	074	29		d	144	69	
=	075	30		e	145	70	
>	076	31		f	146	71	
?	077	32		g	147	72	
@	100	33		h	150	73	
A	101	34		i	151	74	
B	102	35		j	152	75	
C	103	36		k	153	76	
D	104	37		l	154	77	
E	105	38		m	155	78	
F	106	39		n	156	79	
G	107	40		o	157	80	

SUMMARY OF COMMANDS

Command	VT52	VT100	V300
CURSOR UP	ESC A	ESC [Pn A	ESC [Pn A
CURSOR DOWN	ESC B	ESC [Pn B	ESC [Pn B
CURSOR RIGHT	ESC C	ESC [Pn C	ESC [Pn C
CURSOR LEFT	ESC D	ESC [Pn D	ESC [Pn D
CURSOR HOME	ESC H		
CURSOR ADDRESSING	ESC Y c r	ESC [r; c H	ESC [r; c H
INDEX		ESC D	ESC D
REVERSE INDEX	ESC I	ESC M	ESC M
NEXT LINE		ESC E	ESC [Pn E
SAVE CURSOR		ESC 7	ESC [7 s
RESTORE CURSOR		ESC B	ESC [8 s
ERASE LINE	ESC K	ESC [Ps K	ESC [Ps K
ERASE PAGE	ESC J	ESC [Ps J	ESC [Ps J
SET TAB		ESC H	ESC H
CLEAR TAB		ESC [Ps g	ESC [Ps g
PROGRAM LEDs		ESC [Ps q	
VIDEO ATTRIBUTES		ESC [Ps m	ESC [Ps m
ALIGN DISPLAY		ESC # 8	ESC [8 v
ENTER ALT KEYPAD	ESC =	ESC =	
EXIT ALT KEYPAD	ESC >	ESC >	
ENTER VT100 MODE	ESC <		ESC <
ENTER VT52 MODE		ESC [?2 l	ESC [?2 l
ENTER V300 MODE		ESC [?2 h	
REPORT PARAMETERS		ESC [Ps x	
IDENTIFY	ESC Z	ESC Z	
		ESC [c	ESC [c
DEFINE G0 SET		ESC (Ps	
DEFINE G1 SET		ESC) Ps	
DEFINE G0/G1 SETS			ESC [Ps;Ps (D
AUTO REPEAT MODE		ESC [?8 h	
LOCAL ECHO MODE		ESC [12 h	
SET COMMAND		ESC [Ps h	
RESET COMMAND		ESC [Ps l	

NOTE

This table does not contain a complete list of V300 mode Escape sequences.

9. AUXILIARY INTERFACE

9.1 GENERAL

The auxiliary port interface allows the VISUAL 550 to be connected to a variety of serial printers, graphics printers and input devices.

The connector pin outs for the auxiliary port are listed in Table 9-1.

TABLE 9-1
AUXILIARY PORT PIN DESIGNATIONS

Pin Number	Signal Name	Definition
1	AA	Protective Ground
2	BA	Receive Data
3	BB	Transmit Data
4		Printer Busy
5*	CB	Clear to Send
6*	CC	Data Set Ready
7	AB	Signal Ground
8*	CF	Carrier Detect

* Internally tied together and to a +12V source.

9.2 SERIAL PRINTER INTERFACE

The auxiliary port is designed to accept a wide variety of serial printers and offers the following features.

- 256 character FIFO buffer
- Independent print/communication baud rates
- Independent print/communication parity
- 16 print baud rate selection
- Printer busy monitored using XON/XOFF protocol or control line
- Printer Controller mode
- Auto Print mode
- Copy mode
- Print line/page from keyboard or remote

9.3 SERIAL PRINTER SET-UP MODE

How to Select Printer Modes (Menu #4)

Enter Menu Set-Up mode by depressing key SET-UP followed by key F12. Step the "menus" by depressing key F12 until Select Printer mode is displayed. The screen presentation for Select Printer modes is shown in Figure 9-1.

Depressing key F11 causes the terminal to step back to the previous menu presentation.

The menu Set-Up mode is exited by depressing the SET-UP key.

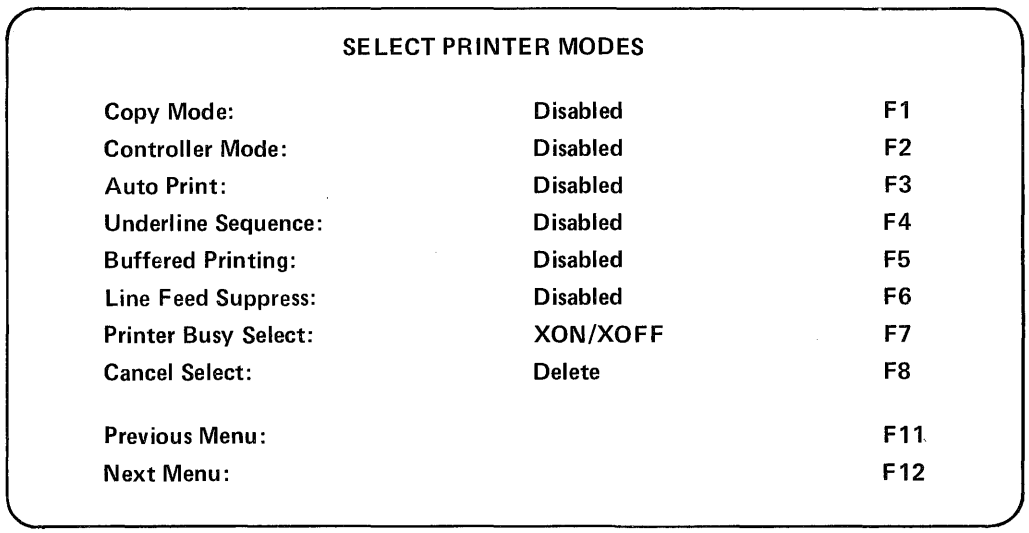


Figure 9-1. Select Printer Modes Screen Presentation

Copy Mode (F1)

Depressing key [F1] alternately enables and disables the Copy mode.

Copy mode allows a variable number to be output to the printer. When Copy mode is entered, all data received by the terminal will be sent to the screen and the printer simultaneously.

Controller Mode (F2)

Depressing key [F2] alternately enables and disables the Controller mode.

Printer Controller mode allows the host to pass all data through the terminal to the printer without affecting the terminal screen. In effect, the terminal acts as a controller for the printer by using the XON/XOFF synchronization codes to limit the transmitted data to a rate that the printer can accept. The receiver XON/XOFF synchronization codes to limit the transmitted data to a rate that the printer can accept. The receiver XON/XOFF feature must be enabled for XON/XOFF to be used.

Auto Print (F3)

Depressing key [F3] alternately enables and disables auto print.

Auto Print mode allows a variable number of lines to be output to the printer.

When Auto Print mode is entered, a received LF code causes the line containing the cursor to be output to the printer. Each line transmitted to the printer will be ended with the CR/LF codes or the CR code as the LF suppress feature dictates. The XON/XOFF synchronization code will be used in Auto Print mode. See Table 7-3.

Underline Sequence (F4)

Depressing key [F4] alternately enables and disables the underline sequence.

This feature is applicable to the print page command only. When enabled, this feature causes underlined data on the screen to also be underlined on the printer. This is accomplished by sending the data character followed by the backspace character (BS) followed by the underline character to the printer for every underlined character on the screen.

When this feature is disabled only the characters on the screen will be sent to the printer when the print page function is initiated.

Buffered Printing (F5)

Depressing key [F5] alternately enables and disables buffered printing.

This feature applies to printer Controller mode and Copy mode and determines whether or not the terminal will pass the code sequences for exiting these modes on to the attached printer.

When this feature is set to the OFF position, the ESC code sequences for exiting printer Controller and Copy modes will be transmitted to the printer. The cancel select feature will then append the CAN or DEL code to cancel the effect of the ESC code on the printer. This feature should be set to the OFF position for full-line buffered printers.

When this feature is set to the OFF position, the ESC code sequences for exiting printer Controller and Copy modes will be transmitted to the printer. The cancel select feature will then append the CAN or DEL code to cancel the effect of the ESC code on the printer. This feature should be set to the OFF position for full-line buffered printers.

When this feature is set to the ON position, no codes in the sequences for exiting printer Controller and Copy modes will be transmitted to the printer. Thus, the setting of the cancel select feature is disregarded. This feature should be set to the ON position for FIFO buffered printers, or printers with no buffer at all.

Line Feed Suppressions (F6)

Depressing key [F6] alternately enables and disables line feed suppression.

This feature determines whether or not LF codes received by the terminal are sent to the printer. In the ON state, no LF codes will be sent to the printer. In the OFF state, all LF codes will be sent to the printer.

Printer busy select (F7). Depressing key [F7] alternately selects CTRL Line or XON/XOFF.

The setting of this feature depends on how the attached printer indicates a busy condition to the terminal.

If the printer uses a printer busy control line to indicate a busy condition, this feature should be set to the CTL state. If the printer uses XON/XOFF to indicate a busy condition, this feature should be set to the XON/XOFF state.

NOTE

The receiver XON/XOFF set-up feature must be enabled for the terminal to send XOFF/XON to the host when the printer is busy.

Cancel Select (F8)

Depressing key [F8] alternately selects CANCEL or DELETE.

This feature applies to Printer Controller mode and Copy mode, (see Section) and determines whether the terminal will automatically append and transmit to the printer the CAN code or the DEL code immediately following the control sequence to exit printer Controller mode, or exit Copy mode.

How to Select Printer Interface Modes (Menu #5)

Enter menu Set-Up mode by depressing key SET-UP followed by key [F12] . Step the menus by depressing key [F12] until select printer Interface modes is displayed. The screen presentation for select printer Interface modes is shown in Figure 9-2. Depressing key [F11] causes the terminal to step back to the previous menu presentation. The menu Set-Up mode is exited by depressing the SET-UP key.

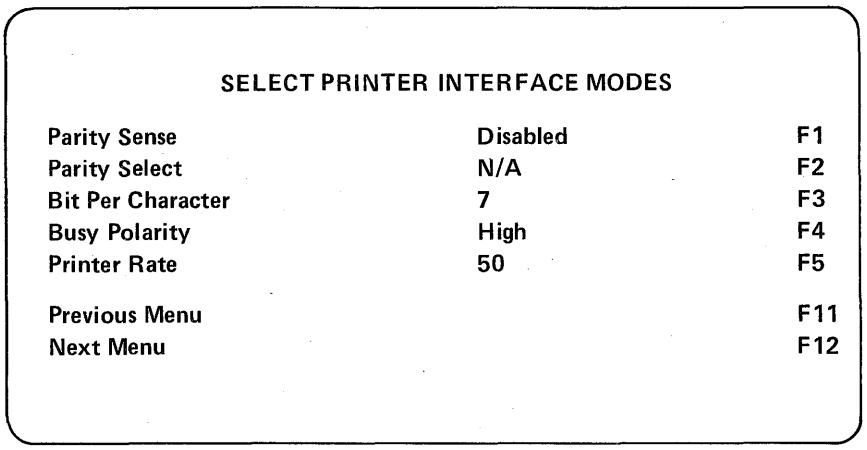


Figure 9-2. Select Printer Interface Modes Screen Presentation

Parity Sense (F1)

Depressing key [F1] alternately enables and disables parity sense.

Parity Select (F2)

When parity sense is disabled, depressing key [F2] does not have any action.

When parity sense is enabled then depressing key [F2] alternately selects odd or even parity.

Bits Per Character (F3)

Depressing key [F3] alternately selects 7 or 8.

This feature determines whether 7 or 8 data bits will be used for each character. If 8 bit codes is elected, the most significant bit (bit#8) is always set to space (0). Refer to Figure 2-1 for further definition.

Busy Polarity (F4)

Depressing key [F4] alternately selects low or high.

This feature determines whether the terminal interprets the printer busy signal as a true high or a true low level.

The setting of this feature depends on the printer being used. Some printers "swing" their printer busy lead high when busy and some printers swing their printer busy lead low when busy. Check your printer documentation for the correct setting of this feature.

Printer Rate (F5)

Depressing key [F5] sequentially steps through the selectable printer baud rates.

Print speed indicates the rate at which data is transmitted to the printer. The printer option provides for 16 baud rates (50 – 19,200 baud).

Serial Printer Commands

In Alphanumeric Operating mode the print line/page commands may be initiated via remote command from the host or by the operator from the keyboard. When the print line/page function is initiated the terminal will use the XON/XOFF synchronization codes if the receiver XON/XOFF feature is enabled. XOFF will be sent to the host upon initiation of a print line/page function, and XON will be sent to the host on conclusion of the print line/page function. Each line will be transmitted at the selected print rate and be ended with the CR/LF codes. (If LF suppress is enabled, only CR will be sent to the printer). Table summarizes the various ways to obtain alphanumeric hard copy via the print page/line commands.

9.4 GRAPHIC PRINTER INTERFACE

The auxiliary port is designed to accept approved graphics printers.

The type of printer to be connected to the auxiliary port and accessed in Graphics Operaing mode is defined in set-up MENU#8 Section

Consult the manufacturers manual for details on specific operation and command structure of the graphics printer selected.

9.5 SUMMARY OF GRAPHICS PRINT COMMANDS

TABLE 9-2
SUMMARY OF GRAPHICS PRINT COMMANDS

Function	From Keyboard	Remote	Action
Print Page	PRINT Key	ESC [i	XOFF code sent to host to suspend transmission. Contents of screen transmitted to printer. XON code sent to host to resume transmission.
Print Graphics Page	ESC CTRL W	ESC ETB	Unconditional Graphics Print

TABLE 9-3
SUMMARY OF ALPHANUMERIC PRINT COMMANDS AND MODES

Function	From Keyboard	Remote	Action
Print Page	PRINT Key	ESC [i	XOFF code sent to host to suspend transmission. Contents of screen transmitted to printer with CR/LF codes or only CR after each line. XON code sent to host to resume transmission once Print Page function complete.
Print Cursor Line	Echoed Sequence	ESC [? 1 i	XOFF code sent to host to suspend transmission. Contents of cursor line transmitted to printer with CR/LF codes or only CR after line. XON code sent to host to resume transmission once Print Line function complete.
Print Line "P"	Echoed Sequence	ESC [? 1 ; Pi	XOFF code sent to host to suspend transmission. Contents of line "P" transmitted to printer with CR/LF codes or only CR after line. XON code sent to host to resume transmission once Print Line function complete. Line P is in decimal notation between the limits of 1 and 24.
Print Lines "P" to "Q"	Echoed Sequence	ESC [? 1 ; P ; Qi	XOFF Code sent to host to suspend transmission. Contents of lines "P" through "Q" transmitted to printer with CR/LF codes or only CR after each line. XON code sent to host to resume transmission once Print function complete. Line P and Q are both in decimal notation between the limits of 1 and 24.

Note: To print from the keyboard PRINT KEY, ALPHA or AUTO for display mode allows print of the alphanumeric memory. GRAPHICS or BOTH for display mode allows print of the graphics memory.

TABLE 9-3
SUMMARY OF ALPHANUMERIC PRINT COMMANDS AND MODES (Cont.)

Function	From Keyboard	Remote	Action
Enter Copy Mode	FUNCTION PRINT or change in SET-UP MENU #4	ESC [? 7 i	Received data displayed on screen and sent to printer simultaneously. XOFF code sent to host in response to printer busy. XON code sent to host in response to printer not busy.
Exit Copy Mode	FUNCTION PRINT or change in SET-UP MENU #4	ESC [? 6 i	Terminal exits Copy mode and automatically appends the CAN or DEL code as the CANCEL SELECT feature dictates. If the PRINTER TYPE feature is ON, no code will be appended.
Enter Printer Controller Mode	Echoed Sequence or change in SET-UP MENU #4	ESC [5 i	Data sent from host passed through terminal to printer. XOFF code sent to host in response to printer busy. XON code sent to host in response to printer not busy.
Exit Printer Controller Mode	Echoed Sequence or change in SET-UP MENU #4	ESC [4 i	Terminal exits printer Controller mode, and automatically appends the CAN or DEL code as the CANCEL SELECT feature dictates. If the PRINTER TYPE feature is ON, no code will be appended.
Enter Auto Print Mode	Echoed Sequence or change in SET-UP MENU #4	ESC [? 5 i	On receipt of LF code XOFF code sent to host. Contents of line transmitted to printer with CR/LF or only CR after-line. XON code sent to host after line is transmitted.
Exit Auto Print Mode	Echoed Sequence or change in SET-UP MENU #4	ESC [? 4 i	Terminal exits Auto Print mode.

9.6 DATA TABLETS

The VISUAL 550 supports two tablet types in firmware revision 8.0 and above. (2-83) Listed below are the two tablets and their recommended switch settings.

NOTE

The following recommended switch settings for the tablets demand the VISUAL 550 to operate at 9600 baud, 8 bit, no parity, 1 stop bit. Please refer to section 8.4 and 3.9.8.4 for proper printer/tablet set-up parameters. These parameters may be changed at operators choice.

9.6.1 G.T.C.O. Digi Pad-5

Manufacturer	Model	Size
GTCO 1055 First St. Rockville, MD 20850 (301) 279-9550	Demi-Pad 5 Digi-Pad 5	11" x 11" 11" x 11", 11" x 17", 20" x 20" 36" x 48", 41" x 60"

	1	2	3	4	5	6	7	8
Switch #1	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
Switch #2	ON	ON	ON	ON	ON	OFF	OFF	OFF
Switch #3	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF

Definitions:

Switch #1;
- 1-4 – 9600 baud
- 5 – no parity
- 6 – no parity
- 7 – 1 stop bit
- 8 – 8 bit character

Switch #2;
- 1 – include push button code
- 2 – include space
- 3 – include carriage return
- 4 – include line feed
- 5 – 5 digit ASCII
- 6-7 – serial port A & B
- 8 – audible alarm disabled

Switch #3;
- 1 – not used
- 2-3 – 200 coordnate pairs per second
- 4 – continuous mode
- 5 – 5 button pen/cursor
- 6 – inch data
- 7 – ASCII data
- 8 – RS232 Interface control line activity not monitored

9.6.2 Summagraphics – Bit Pad I

Summagraphics 35 Brentwood Ave. Box 781 Fairfield, CT 06430 (203) 384-1344	Bit Pad MM Series	11" x 11" 9" x 6", 12" x 12"

	1	2	3	4	5	6	7	8	9	10
#6 Switch Bank	ON	OFF	ON	ON	ON	ON	–	–	–	–
#9 Switch Bank	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	ON	–
#10 Switch Bank	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Definitions:

#6 Switch	1-5	– 200 samples continuous stream
	6	– not used
#9 Switch	1-5	– 100 not adjust – factory calibration setting
	6	– not used
ASCII bld output	8	– crl f
	9	– english (inch) (.005")
#10 Switch	1-10	– 9600 baud

NOTE

Parity and stop bits are preset at factory, refer to Summagraphic manual for options.

9.7 GRAPHIC PRINTERS

The VISUAL 550 supports the following printers in Firmware Revision 8.0 and above (2-83). The parameters to operate the printers are selected in Section 3.9.8.5.

NOTE

The mode commands are *automatically* sent to the printer by the V550. If an unsupported printer is warranted, select pass through mode described in Section 3.9.8.4.

9.7.1

Manufacturer	**Model**	**Printe Width**
Anadex Inc. 9725 DeSoto Ave. Chatsworth, CA 91311 (213) 988-8010	DP9001A DP9501A DP9620A WP6000	80 col. 132 col. 132 col.

Mode Command:

Enter Graphics: CTRL \ (FS)
Graphi LF: 6
Exit Graphics: CTRL] (GS)

9.7.2

IDS	Prism 80 (2080)	80 col.
Milford, NH 03055	Prism 132 (2132)	132 col.
(603) 673-9100	Microprism	80 col.

Mode Command:

Enter Graphics: CTRL c (ETX)
Graphics LF: CTRL c CTRL o (EXT) (SO)
Exit Graphics: CTRL]

9.7.3

Datasouth	DS180	132 col.
P.O. Box 240947		
Charlotte, NC 28224		
(704) 523-8500		

Mode Command:

Same as Anadex

9.7.4

Texprint	DECPlot (LA120)	132 col.
8 Blanchard Road		
Burlington, MA 01803		
(617) 273-3384		

Mode Command:

Enter Graphics: CR ESC [2; 4; 6; 9; 10y
Graphics LF: –
Exit Graphics: ESC ESC

9.7.5

M.P.I.	MP150G	136 col.
4426 South Century Dr.	MP99G	132 col.
Salt Lake City, UT 84107		
(801) 263-3081		

Mode Command:

Enter Graphics: CR ESC CTRL w (ETB)
Graphic LF: 6 ESC CTRL w (ETB)
Exit Graphics: Ø

9.7.6

Hi-G 980 80 col.
580 Spring Street
Windsor Lock, CT 06096
(203) 623-3363

Mode Command:

Enter Graphics: CR ESC G
Graphic LF: /
Exit Graphics: +

10. FIRST LEVEL MAINTENANCE

10.1 GENERAL

The terminal has been designed with subassembly exchange as the prime mode of service. Fault isolation is provided in this section to identify the failing subassembly. Unless otherwise noted the power cord should be disconnected before disassembly of the terminal. Hazardous voltages may be present.

10.2 TOP COVER

The removal of the top cover will allow the removal of the logic printed circuit board, removal of the TV monitor printed circuit board, and access to the AC terminal block allowing rewiring from 110 volts to 220 volts.

10.2.1 Top Cover Removal

Consult Figure 10-1 to locate the three screws which attach the top cover to the base at the rear. Loosen these screws and simply rotate top cover off by lifting at the rear of unit.

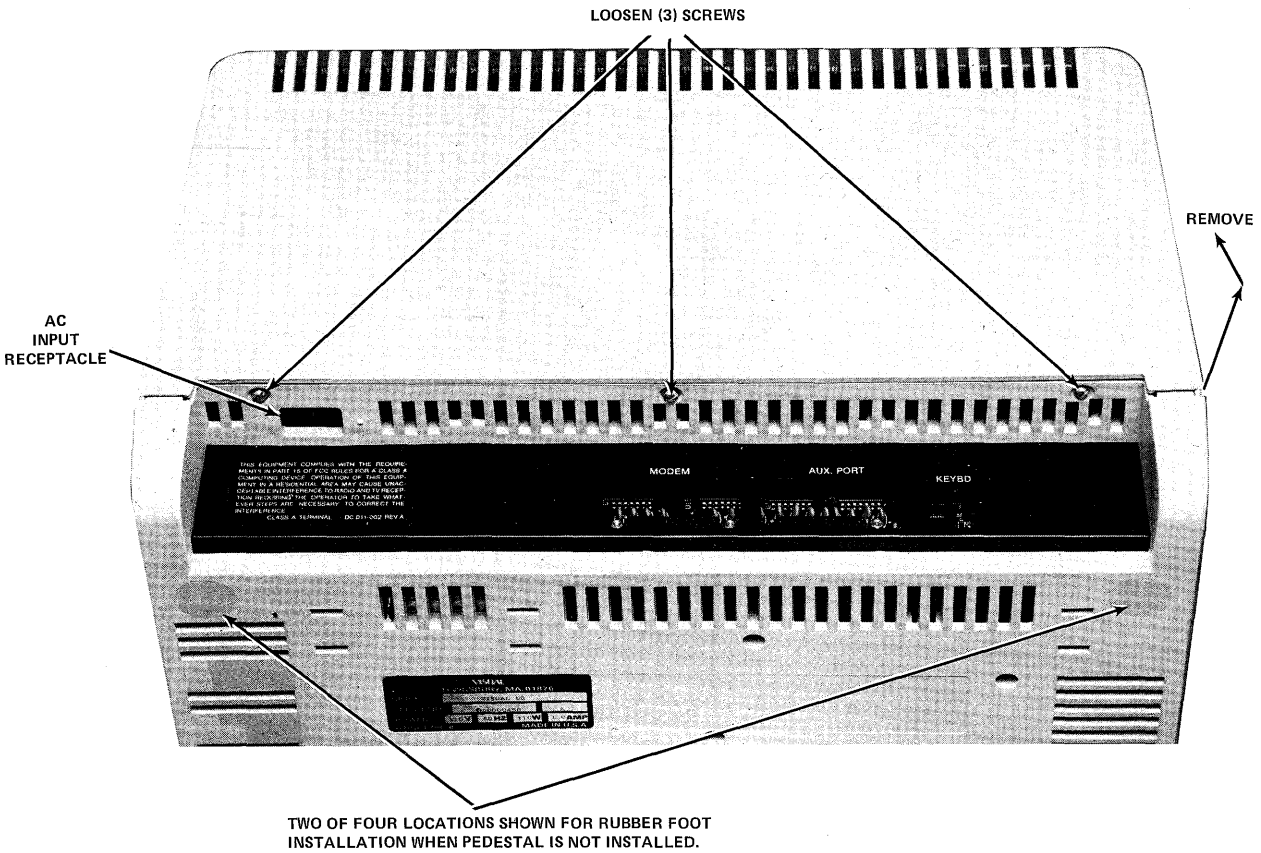


Figure 10-1. Top Cover Removal

10.3 PRINTED CIRCUIT BOARD REMOVAL AND INSTALLATION

Once the top cover has been removed, the main logic PCB may be removed by removing two screws shown in Figure 10-2, unplugging any modern cables and keyboard cable and by rotating the top of the PCB toward the rear while lifting it carefully out of the housing.

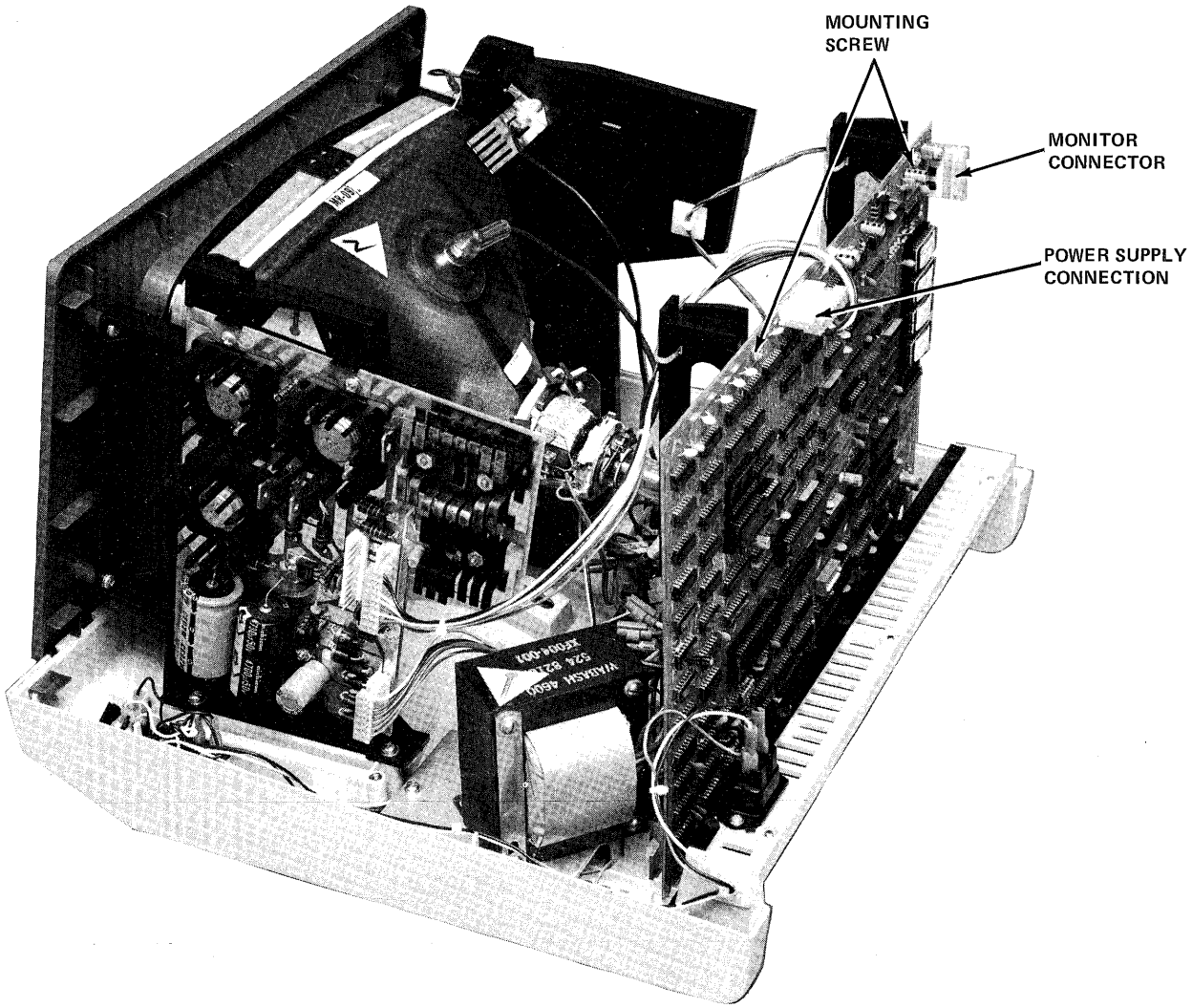


Figure 10-2. PCB Mounting

10.4 TV MONITOR PCB REMOVAL AND INSTALLATION

In order for the TV monitor PCB to be removed it is necessary to remove the top cover. Disconnect the cable connecting the logic PCB and the TV PCB at the TV end. Disconnect the yellow and black connector and the blue and red connector connecting the TV PCB to the yoke from the TV PCB, and the flyback transformer cable from the TV PCB. Unplug the connector assembly from the end of the picture tube. Squeeze the four nylon post locking levers one at a time (a ball point pen is an ideal tool) while carefully lifting the TV PCB nearby. Repeat until all four corners are free.

10.5 CRT AND FLYBACK REMOVAL AND INSTALLATION

Before removing the picture tube it is necessary to discharge the tube. With an insulated handled screwdriver short out the high voltage lead to the tube. Carefully lift the top edge of the high voltage connector and insert the end of the screwdriver. Cause the screwdriver shaft to touch the sheet metal bracket and the contact of the high voltage connector simultaneously. The high voltage connector can now be removed by rocking it while pulling it up. Disconnect the yoke, ground wire, and the tube socket assembly as described in Section 4. While holding the lower front edge of the picture tube in one hand, remove the four mounting screws, and remove the picture tube. The picture tube neck should not be subjected to any pressure or shock. Store the picture tube on its face. The flyback transformer can now be removed by unplugging it from the TV PCB and removing two mounting screws. When installing the picture tube install the lower two screws first. Insert the ground finger between the mounting bracket and the top picture tube mounting tab. Install the top two screws and connect the cables. Be sure that the black ground wire is installed!

10.6 TV MONITOR ADJUSTMENTS

Refer to Figure 10-3 for the location of the adjustments.

Adjust intensity to highest level.

Set terminal to reverse video.

Brightness Control: Adjust it so that the raster lines are visible.

Horizontal Phasing Control: Adjust the phasing control so that the video area is centered horizontally within the raster area.

Brightness Control: Reduce the brightness until the raster just disappears.

Reduce the screen intensity to a comfortable level.

Focus: Adjust the focus control for the best focus over the entire screen.

Set the terminal to local mode.

Fill the screen with E's.

Vertical Size: Adjust so that the total height is 6.00 ± 0.25 inches (152.4 ± 6.4 mm).

Horizontal Size: Adjust so that the total width of the screen of data is 8.25 ± 0.25 inches (209.5 ± 6.4 mm).

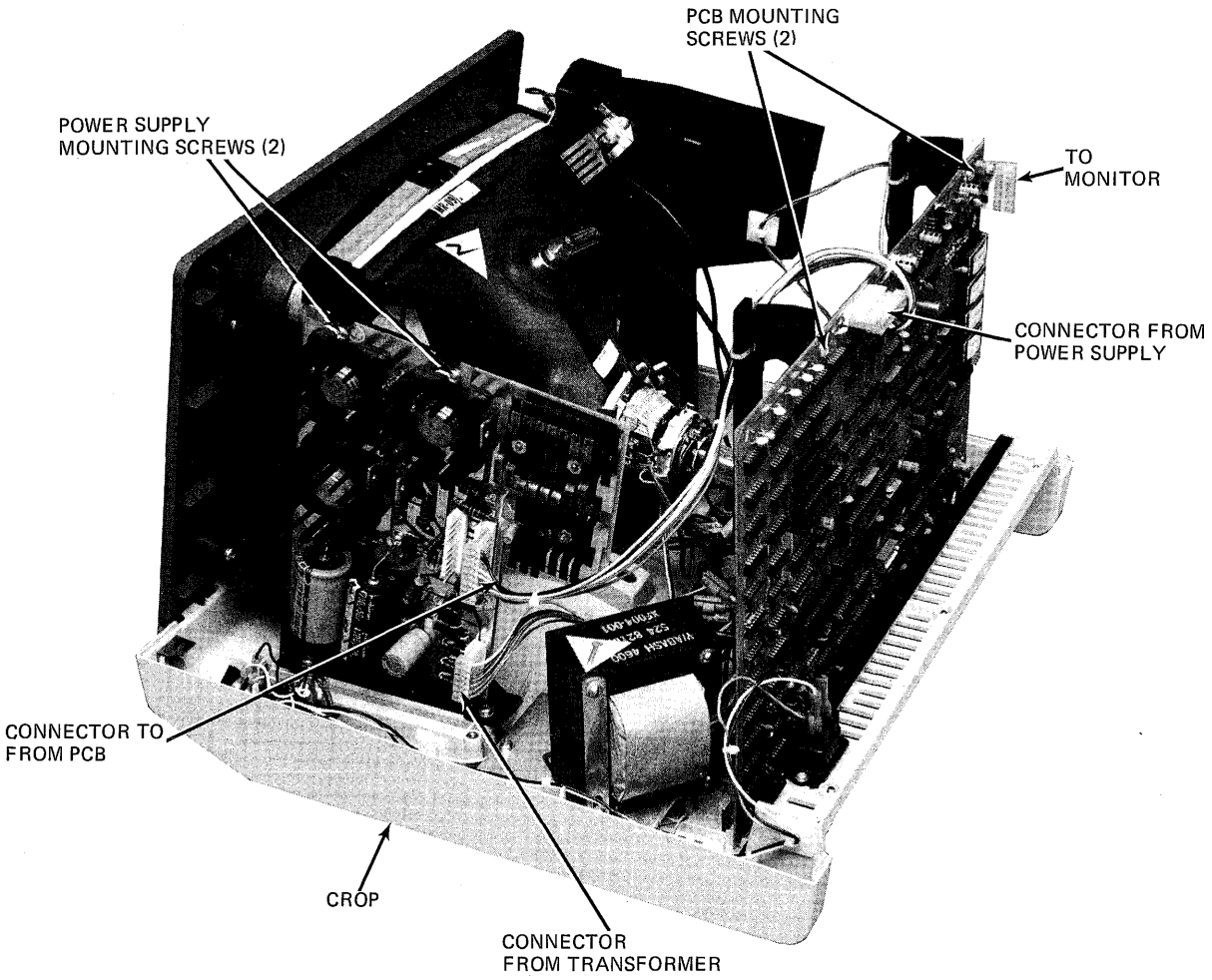


Figure 10-3. PCB Mounting

10.7 110/220 VOLT SELECTION

Remove the top cover. MAKE SURE THE LINE CORD IS DISCONNECTED! Refer to Figure 10-4 for new connection. 220 volt units are provided with two inputs, 220 volts nominal, and 250 volts nominal. The highest input resulting in satisfactory operation should be used.

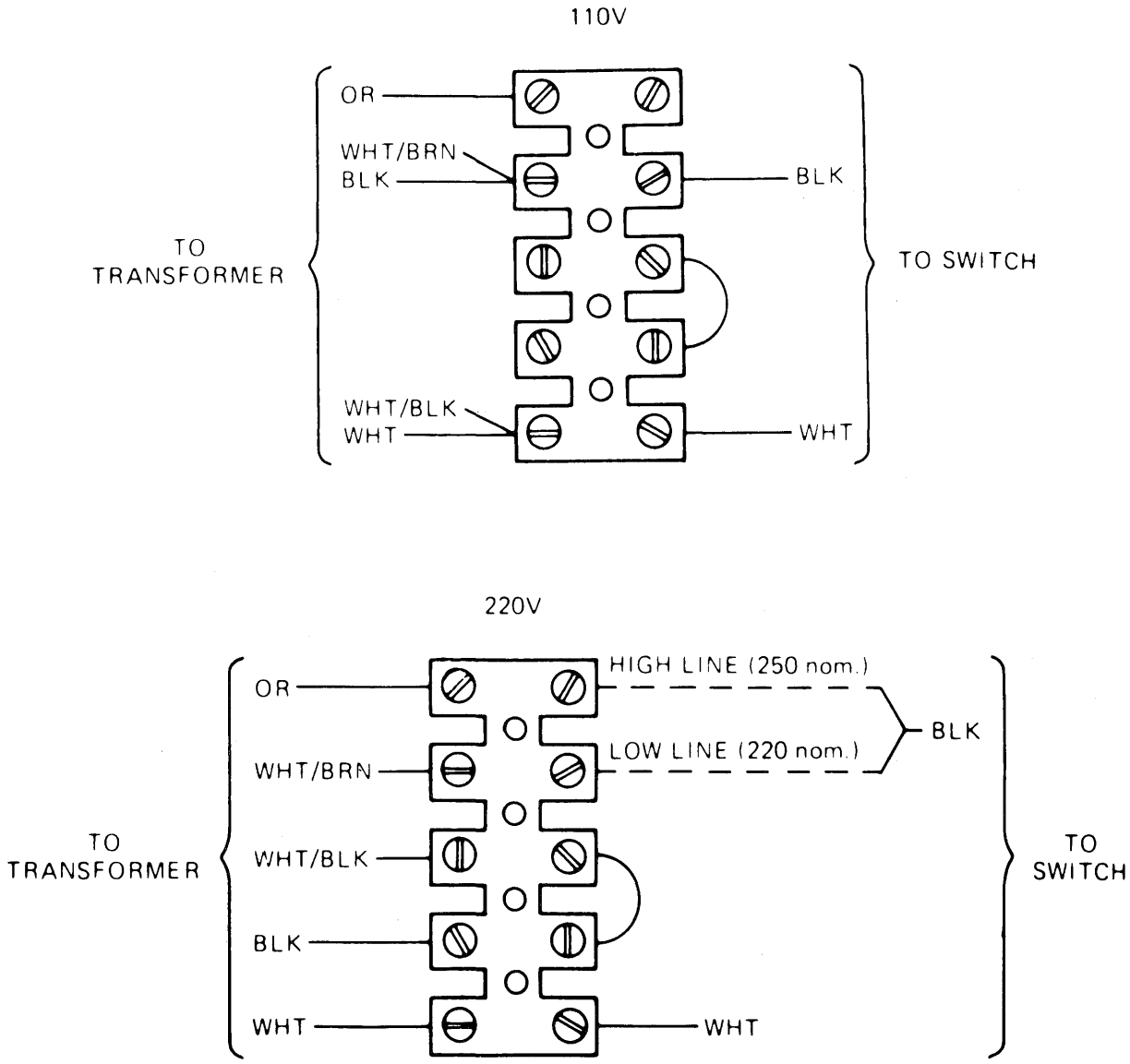


Figure 10-4. 110/220 Volt Selection

10.8 TROUBLESHOOTING V500/550

Operation	Fault	Probable Cause	Remedy
Turn On	No bell but there is cursor and line or local appear on bottom of screen	Keyboard not plugged in	Plug keyboard in
Turn On	No cursor and bell	Unit not plugged into AC outlet or circuit breaker tripped	Plug in Reset circuit breaker
Turn On	Unit does not pass self test	Main logic	Replace main PCB
Self test completed	Bell sounds twice	Non-volatile RAM failure set up New firmware installed	Default RAM by depressing shift for function R Replace main PCB
No height	Horizontal line on TV	Yoke disconnected	Plug in yellow-black connector
No width	Vertical line on TV	Yoke disconnected	Plug in bue-red connector
Video tilted	Yoke adjustment	Yoke rotated from normal position	Adjust yoke
Video jittering	Wrong frequency	50/60 Hz parameter incorrect	Set-up Select terminal status screen presentation menu
Keyboard	No entry	Terminal on line Defective keyboard Defective logic PCB	Switch to local Replace Replace
No data	Line or local	Keyboard disconnected Defective keyboard Defective logic PCB	Plug in Replace Replace
On line	Parity errors	Wrong data rate Wrong parity Wrong bits/character Defective PCB	Select communication menu Replace
On line or local	Wrong character	Defective keyboard Defective PCB	Replace Replace
On line	EIA ok current	Internal switches not set	See table 2-2
On line or local	Snapping sound	CRT ground wire not connected	Connect

10.9 SELF TEST

The Visual 500/550 executes a self test each time it is powered on. A checksum is calculated and checked against the checksum stored in the last two locations of the firmware PROMs, a RAM test is executed and the non-volatile RAM is checked. If all are correct, the screen initializes and a cursor is displayed. If either the firmware checksum or RAM test fails, the screen is not initialized and either a black screen or a black screen with a horizontal line in the center results. If the non-volatile RAM fails the screen is initialized, default set up parameters are selected, and the bell is sounded twice. In this situation operation is allowed, however it will be necessary to manually set any parameters which differ from default set up parameters.

If extended dianostics is enabled, the graphic memory RAMs are checked and a test pattern is displayed on the screen. This test takes a minute and a half to complete. If there is a RAM failure, then the RAM failure is displayed in the following message: AAAA BP.

10.10 V500/V550

Extended Diagnostic

RAM RAILURE MESSAGE DECODE

The extended diagnostic displays the following message on detection of a RAM failure.

AAAA B P

where

AAAA – is the address of the failed RAM expressed in Hex in the range of 0000 thru 7FFF

B – is the Hex value of the bit that failed 0 thru F

P – is number of the pass on which the test failed

1 – pass1 data is the address

2 – pass2 data is the compliment of the address

The addressing scheme of the bit map memory is linear. Therefore the address failure corresponds to the faulty chip location per the following table.

V550/V500
RAM TEST CHIP LOCATOR

Chip Location		
Bit Failure	**Address 0000-3FFF**	**Address 4000-7FFF**
0	U17	U34
1	U16	U33
2	U15	U32
3	U14	U31
4	U13	U30
5	U12	U29
6	U11	U28
7	U10	U27
8	U9	U26
9	U8	U25
A	U7	U24
B	U6	U23
C	U5	U22
D	U4	U21
E	U3	U20
F	U2	U19

APPENDIX I
ALPHANUMERIC CONTROL SEQUENCES

CURSOR MOVEMENT		Reference Section
COMMANDS		5.3.2
Cursor Up	ESC [Pn A	5.3.2
Cursor Down	ESC [PN B	5.3.2
Cursor Right	ESC [Pn C	5.3.2
Cursor Left	ESC [Pn D	5.3.2
Cursor Addressing	ESC [y ; x H or ESC [y ; x f	5.3.2
Index	ESC D	5.3.2
Reverse Index	ESC M	
SCROLLING REGION COMMAND	ESC [y ; x r	5.3.1
ERASE COMMANDS		5.3.9
Erase in Page	ESC [Ps J	
Erase in Line	ESC [Ps K	
Erase in Field	ESC [Ps N	
Ps = 0 (Default) From Cursor to End		
Ps = 1 Erase From Start to Cursor		
Ps = 2 Erase All		
TABBING COMMANDS		5.3.3
Tab Clear	ESC [Ps g	
Ps = 0 (Default) Clear Tab At Cursor		
Ps = 2 Clear Tabs in Display		
Set Tab	ESC H	
Cursor Horizontal Tab	ESC [Pn I	
Cursor Back Tab	ESC [Pn Z	
SCREEN ALIGNMENT COMMAND	ESC [Ps v	5.3.7
Ps = 8 Align Display		5.3.7
?2 = Video Enable in "AUTO" Mode		3.7.6
?3 = Video Enable in "GRAPHICS" Mode		3.7.6
?4 = Video Enable in "ALPHA" Mode		3.7.6
?5 = Video Enable in "BOTH" Mode		3.7.6

		Reference Section
PROGRAM FUNCTION KEY COMMAND	ESC [Pk., D1. , ; ; ;D32 P PK = 1-12 Function Key Number D1 -D32 = ASCII Character Expressed in Decimal Notation	5.3.8
SAVE/RESTORE COMMAND Ps = 7 Save Cursor, Character Set and Attributes Ps = 8 Restore Cursor, Character Set and Attributes	ESC [Ps s	5.3.4

REPORT COMMANDS AND RESPONSES 5.3.5

Report Question	Sequence	Answer	Sequence
What are You?	ESC [0 c	V300	ESC [0 c
		V300 with Printer Option	ESC [2 c
Is Terminal OK?	ESC [5 n	Terminal OK	ESC [0 n
What is Cursor Location?	ESC [6 n	Cursor on Line Y Column x	ESC [y ; x R

		Reference Section
CHARACTER SET COMMAND	ESC [P0 ; P1 (D	5.3.6

TABLE
P0/P1 VALUE CHARACTER SETS

0 = US	6 = Spanish
1 = UK	7 = Portugese
2 = French	8 = Line Drawing
3 = German	9 = Danish
4 = Swedish	10 = Math Font 1
5 = Norwegian	11 = Math Font 2

EDITING COMMANDS 5.3.10

Insert Line	ESC [Pn L
Delete Line	ESC [Pn M
Delete Character	ESC [Pn P

SET COMMUNICATION CONTROL CODES COMMAND 5.3.11

ESC [SOM; AS: FEOL; SEOL; FEOM; SEOM; TACC t

Expressed in Decimal Notation

VIDEO ATTRIBUTE COMMAND ESC [Ps; . . . Ps m 5.3.12

Ps = 0 (Default) Attributes Off
Ps = 1 High Intensity
Ps = 2 Blank
Ps = 4 Underline
Ps = 5 Blink
Ps = 7 Reverse

REMOTE XMIT COMMAND ESC S EOM 5.3.13

		Reference Section
RESET COMMAND	ESC c	5.3.14
DEFINE AREA QUALIFICATION COMMAND	ESC [Ps o	5.3.15
Ps = 0 (Default) Accept All		
Ps = 1 Protect		
MODES		
Set Mode	ESC [Ps; . . .Ps h	5.4
Reset Mode	ESC [Ps; . . .Ps ℓ	
Ps = 1 Guarded Area Transfer		
Ps = 2 Keyboard Action		
Ps = 3 Control Representation		
Ps = 4 Insert - Replace		
Ps = 6 Erase		
Ps = 12 Char/Block		
Ps = 15 Multiple Area Transfer		
Ps = 16 Transfer Termination		
Ps = 20 Linefeed New Line		
Ps = ?0 Protect		
Ps = ?1 Auto Tab		
Ps = ?4 Scrolling		
Ps = ?5 Screen		
Ps = ?6 Origin		
Ps = ?7 Autowrap		
Ps = ?9 Transmit Request		
Ps = 160 Line Transmit		
Ps = 166 Screen Size		
SELECT EDITING EXTENT MODE	ESC [Ps Q	5.3.10
Ps = 0 (Default) Edit in Display		
Ps = 1 Edit in Line		
Ps = 2 Edit in Field		

AUX PORT COMMANDS AND MODES

PRINTER COMMANDS AND MODES	
Print Page	ESC [i
Print Cursor Line	ESC [? 1 i
Print Line "P"*	ESC [? 1 ; P i
Print Lines "P" through "Q"*	ESC [? 1 ; P; Q i
Enter Copy Mode	ESC [? 7 i
Exit Copy Mode	ESC [? 6 i
Enter Printer Controller Mode	ESC [5 i
Exit Printer Controller Mode	ESC [4 i
Enter Auto Print Mode	ESC [? 5 i
Exit Auto Print Mode	ESC [? 4 i

APPENDIX II
GRAPHIC COMMANDS

Transitional Commands

			Reference Section
Ctrl \	(FS)	Enter point plot mode	5.2
Ctrl]	(GS)	Enter vector mode	5.2
Ctrl ^	(RS)	Enter incremental point plot	5.2
Ctrl _	(US)	Enter alphagraphics mode	5.2
Ctrl x	(CAN)	Enter alphanumeric mode	

Control Codes

Ctrl G	(BEL)	Sounds Bell	6.4.1
Ctrl H	(BS)	Backspace (10 pixels)	6.4.2
Ctrl I	(HT)	10 pixels forward	6.4.3
Ctrl J	(LF)	15 or 17 pixels down	6.4.4
Ctrl K	(VT)	15 or 17 pixels up	6.4.5
Ctrl Y	(EM)	Homes alphagraphics cursor	6.4.6
Ctrl X	(CAN)	Aborts escape sequence	6.5.1
Ctrl M	(CR)	Enters aophagraphics mode	6.6.1

Escape Commands

ESC Ctrl L (ESC FF)	Clears graphic memory Enters alphagraphics	6.6.1.2
SHIFT – SET-UP (ESC FF)	Clears graphic memory	6.6.1.3
ESC Ctrl Z (ESC SUB)	Enters cross hair mode	6.12.1
ESC Ctrl w (ESC ETB)	Unconditional graphic print	8.5
ESC / f	Load crosshair vector	6.12.3
ESC " X; Y a	Load block transfer	6.15.1
ESC "X; Y b	Read graphic memory	6.15.3

ALPHAGRAPHICS CHARACTER SIZE

Reference Section

Char Size	Escape Sequence	Screen Format
Normal	ESC 0	80 X 34
2X	ESC 1	40 X 17
3X	ESC 2	26 X 11
4X	ESC 3	20 X 8

6.6.3

MARGIN 1 LOCATION

Character Size	Margin 1 Col #	# of Lines Available
1X	40	34
2X	20	17
3X	13	11
4X	10	8

6.6.4

SELECT LINE STYLES ESC PS

PS	LINE STYLE SELECTED
ESC \	NORMAL
ESC @	DOTTED . . . . .
ESC b	DOT DASH .-.-.-.-.-.-.
ESC c	SHORT DASH----------
ESC d	LONG DASH _____
ESC x	USER DEFINED #1
ESC y	USER DEFINED #2
ESC z	USER DEFINED #3

INCREMENTAL PLOT CHARACTERS

CHAR	CODE	DIR	ANGLE
D	44	N	90°
E	45	NE	45°
A	41	E	0°
I	49	SE	315°
H	48	S	270°
J	4A	SW	225°
B	42	W	180°
F	46	NW	135°

6.9.1

Section 6.9.2.1

Rectangular Draw: ESC / x ; y ; △X; △Y x — 6.10.1

Rectangular Draw & Fill: ESC / x; y; △X; △Y y — 6.10.2

Fill Command — 6.10.3

FILLING COMMAND

The filling style ID defined by following

ESC @	Solid fill (all dots on)
ESC A	Grey fill (50% dots on)
ESC B	Slope up (left to right lines)
ESC C	Slope up (right to left lines)
ESC D	Horizontal lines
ESC E	Vertical lines
ESC F	Slant cross hatch lines
ESC G	Vertical cross hatch lines

Reference Section

Direction Command (Rotation): ESC / Ps e — 6.10.4

Selective Parameters Direction Command

Ps	Degrees
2	0°
3	45
4	90
5	135
6	180
7	225
0	270
1	315

Data Level ESC / Ps d — 6.11.1

Ps Value	Data Level
0	Dots on
1	Dots off
2	Compliment
3	Replace

ESC / Ps h Set Parameter
ESC / Ps ℓ Reset Parameter — 6.17.1

PARAMETER SELECTION

Ps	Parameter	Set/Reset	Action
1	Auto Scaling	Set	1.1
1	Auto Scaling	Reset	3.4
2	SP Code Operation	Set	Destructive
2	SP Code Operation	Reset	Non Destructive
3	Cell Size	Set	10 x 15
3	Cell Size	Reset	10 x 17

Circle and Arc Draw: ESC / X; Y; R; T; PA — 6.18.1

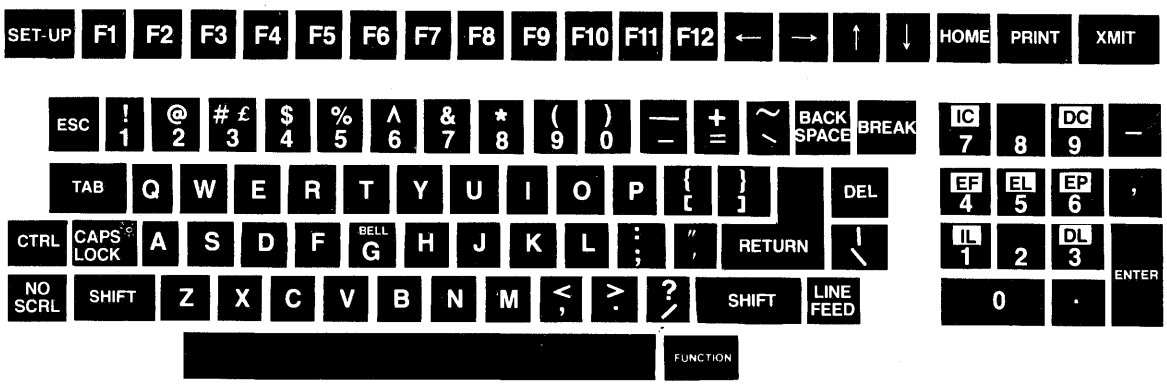
X — X Coordinate (decimal value) of the center of the circle
Y — Y Coordinate (decimal value) of the center of the circle
R — Radius expressed in number of pixels
T — Starting point of arc expressed in degrees
P — Length of arc expressed in degrees

if P is omitted or P=0 or P> 360° then a circle is drawn

APPENDIX III
U.S./U.K. CODE CHART

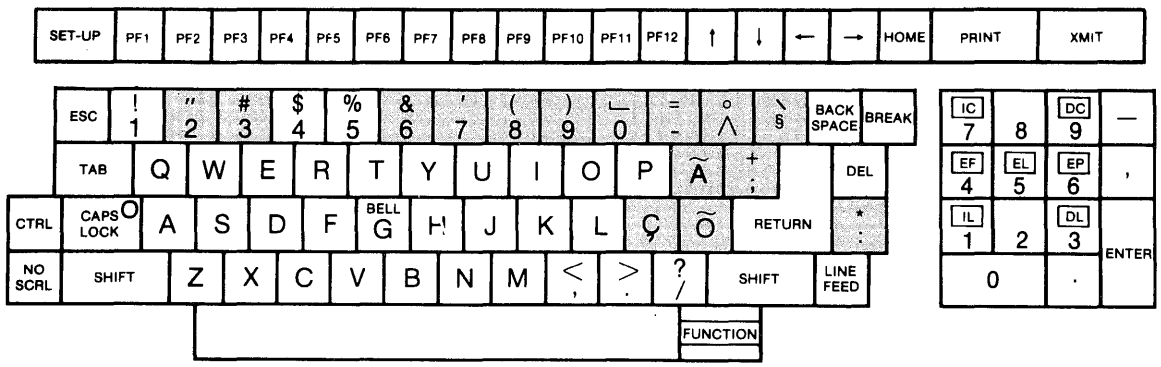
				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	[	k	{
1	1	0	0	C	FF	FS	,	<	L	\	l	¦
1	1	0	1	D	CR	GS	-	=	M	]	m	}
1	1	1	0	E	SO	RS	.	>	N	^	n	~
1	1	1	1	F	SI	US	/	?	O	—	o	DEL

U.K. version uses £ in Column 2 Row 3 in place of #



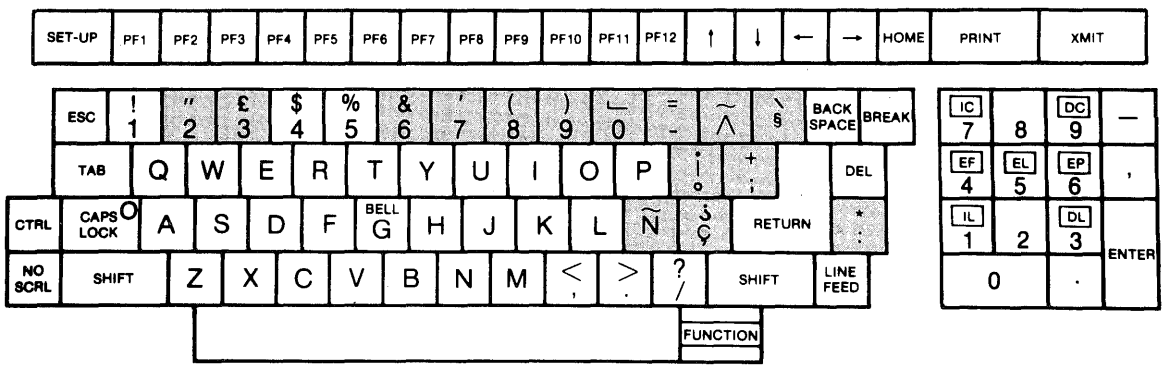
APPENDIX III
PORTUGUESE CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	§	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	Ã	k	ã
1	1	0	0	C	FF	FS	,	<	L	Ç	l	ç
1	1	0	1	D	CR	GS	-	=	M	Õ	m	õ
1	1	1	0	E	SO	RS	.	>	N	^	n	°
1	1	1	1	F	SI	US	/	?	O	_	o	DEL



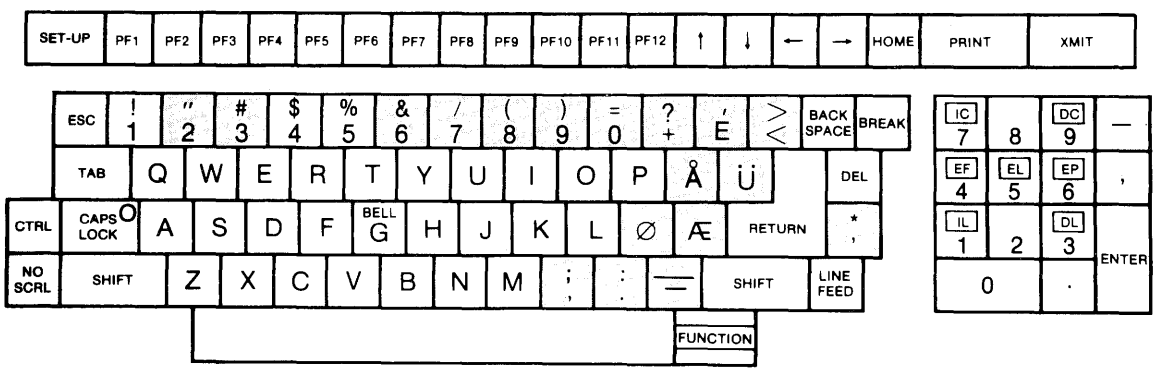
APPENDIX III
SPANISH CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	§	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	£	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	¡	k	°
1	1	0	0	C	FF	FS	,	<	L	Ñ	l	ñ
1	1	0	1	D	CR	GS	-	=	M	¿	m	Ç
1	1	1	0	E	SO	RS	.	>	N	^	n	~
1	1	1	1	F	SI	US	/	?	O	—	o	DEL



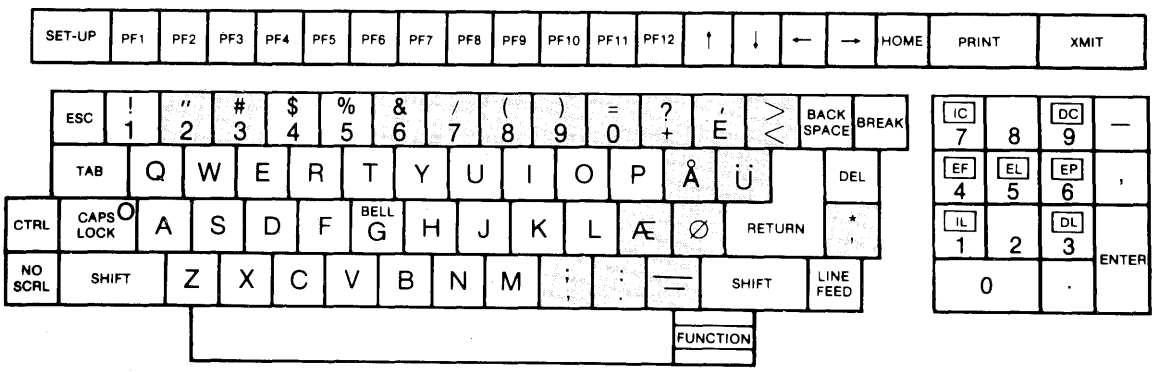
APPENDIX III
NORWEGIAN CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	É	P	é	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	AE	k	ae
1	1	0	0	C	FF	FS	,	<	L	Ø	l	ø
1	1	0	1	D	CR	GS	-	=	M	Å	m	å
1	1	1	0	E	SO	RS	.	>	N	Ü	n	ü
1	1	1	1	F	SI	US	/	?	O	—	o	DEL



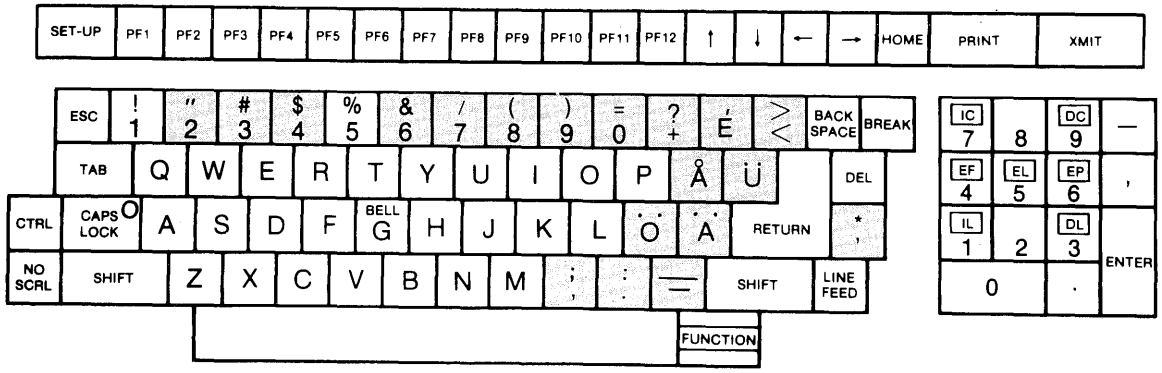
APPENDIX III
DANISH CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	É	P	é	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	AE	k	ae
1	1	0	0	C	FF	FS	,	<	L	Ø	l	ø
1	1	0	1	D	CR	GS	-	=	M	Å	m	å
1	1	1	0	E	SO	RS	.	>	N	Ü	n	ü
1	1	1	1	F	SI	US	/	?	O	—	o	DEL



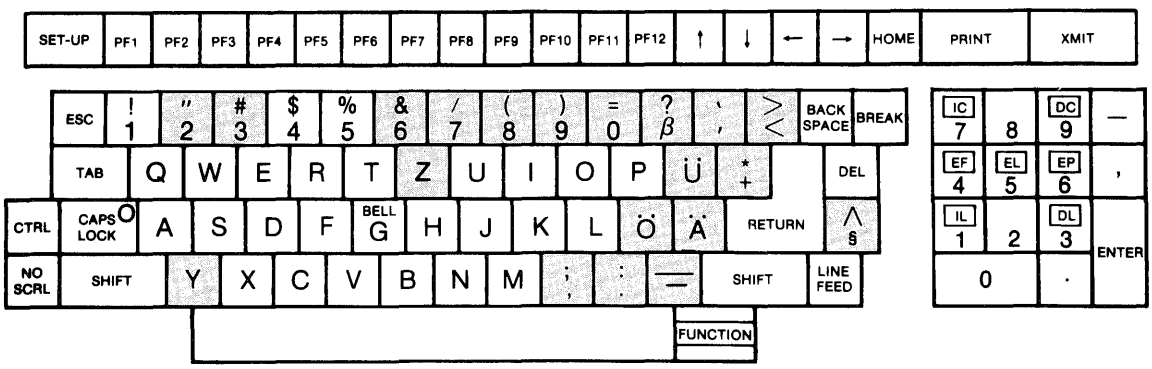
APPENDIX III
SWEDISH/FINNISH CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	É	P	e′	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	Ä	k	ä
1	1	0	0	C	FF	FS	,	<	L	Ø	l	ø
1	1	0	1	D	CR	GS	-	=	M	Å	m	å
1	1	1	0	E	SO	RS	.	>	N	Ü	n	ü
1	1	1	1	F	SI	US	/	?	O	—	o	DEL



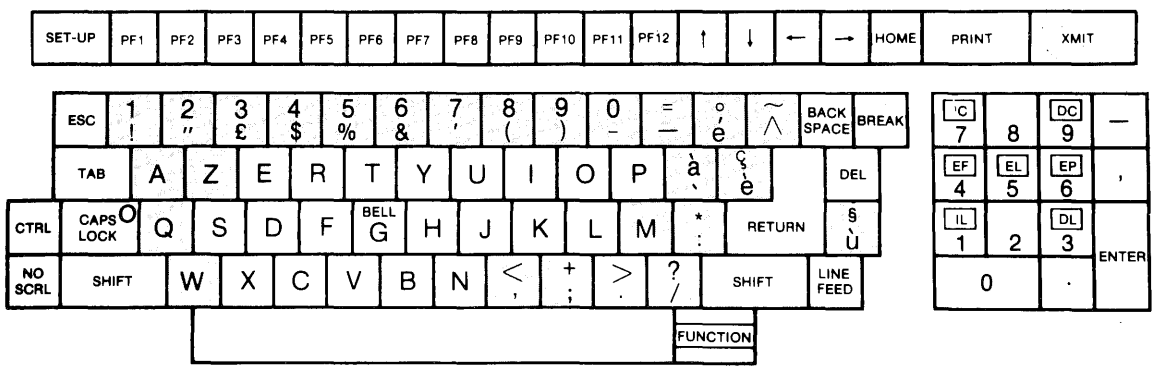
APPENDIX III
GERMAN CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	§	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	Ä	k	ä
1	1	0	0	C	FF	FS	,	<	L	Ö	l	ö
1	1	0	1	D	CR	GS	-	=	M	Ü	m	ü
1	1	1	0	E	SO	RS	.	>	N	^	n	β
1	1	1	1	F	SI	US	/	?	O	—	o	DEL



APPENDIX III
FRENCH CODE CHART

				BIT 7	0	0	0	0	1	1	1	1
				BIT 6	0	0	1	1	0	0	1	1
				BIT 5	0	1	0	1	0	1	0	1
BIT 4	BIT 3	BIT 2	BIT 1	COL / ROW	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	à	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	£	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	°	k	é
1	1	0	0	C	FF	FS	,	<	L	Ç	l	ù
1	1	0	1	D	CR	GS	-	=	M	§	m	è
1	1	1	0	E	SO	RS	.	>	N	^	n	~
1	1	1	1	F	SI	US	/	?	O	—	o	DEL



APPENDIX IV
NUMERIC EQUIVALENT OF ASCII CHART

ASCII	Decimal	Octal	Hexa-Decimal	ASCII	Decimal	Octal	Hexa-Decimal
NUL	0	0	0	SP	32	40	20
SOH	1	1	1	!	33	41	21
STX	2	2	2	"	34	42	22
ETX	3	3	3	#	35	43	23
EOT	4	4	4	$	36	44	24
ENQ	5	5	5	%	37	45	25
ACK	6	6	6	&	38	46	26
BEL	7	7	7	'	39	47	27
BS	8	10	8	(	40	50	28
HT	9	11	9	)	41	51	29
LF	10	12	A	*	42	52	2A
VT	11	13	B	+	43	53	2B
FF	12	14	C	'	44	54	2C
CR	13	15	D	-	45	55	2D
S0	14	16	E	.	46	56	2E
S1	15	17	F	/	47	57	2F
DLE	16	20	10	0	48	60	30
DC1	17	21	11	1	49	61	31
DC2	18	22	12	2	50	62	32
DC3	19	23	13	3	51	63	33
DC4	20	24	14	4	52	64	34
NAK	21	25	15	5	53	65	35
SYN	22	26	16	6	54	66	36
ETB	23	27	17	7	55	67	37
LAN	24	30	18	8	56	70	38
EM	25	31	19	9	57	71	39
SUB	26	32	1A	:	58	72	3A
ESC	27	33	1B	;	59	73	3B
FS	28	34	1C	<	60	74	3C
GS	29	35	1D	=	61	75	3D
RS	30	36	1E	>	62	76	3E
US	31	37	1F	?	63	77	3F

NUMERIC EQUIVALENT OF ASCII CHART (Cont.)

ASCII	Decimal	Octal	Hexa-Decimal	ASCII	Decimal	Octal	Hexa-Decimal
@	64	100	40	\	96	140	60
A	65	101	41	a	97	141	61
B	66	102	42	b	98	142	62
C	67	103	43	c	99	143	63
D	68	104	44	d	100	144	64
E	69	105	45	e	101	145	65
F	70	106	46	f	102	146	66
G	71	107	47	g	103	147	67
H	72	110	48	h	104	150	68
I	73	111	49	i	105	151	69
J	74	112	4A	j	106	152	6A
K	75	113	4B	k	107	153	6B
L	76	114	4C	l	108	154	6C
M	77	115	4D	m	109	155	6D
N	78	116	4E	n	110	156	6E
O	79	117	4F	o	111	157	6F
P	80	120	50	p	112	160	70
Q	81	121	51	q	113	161	71
R	82	122	52	r	114	162	72
S	83	123	53	s	115	163	73
T	84	124	54	t	116	164	74
U	85	125	55	u	117	165	75
V	86	126	56	v	118	166	76
W	87	127	57	w	119	167	77
X	88	130	58	x	120	170	78
Y	89	131	59	y	121	171	79
Z	90	132	5A	z	122	172	7A
[	91	133	5B	{	123	173	7B
\	92	134	5C	'	124	174	7C
[	93	135	5D	}	125	175	7D
^	94	136	5E	~	126	176	7E
—	95	137	5F	DEL	127	177	7F

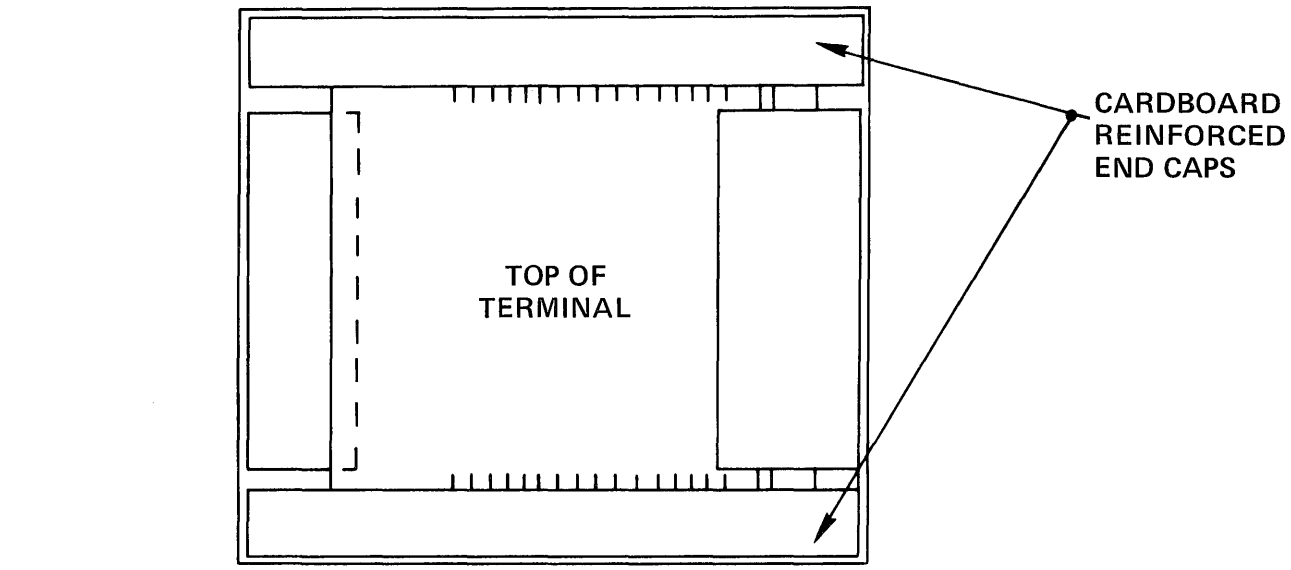
APPENDIX V
GRAPHIC RENDITION OF CONTROL CODES

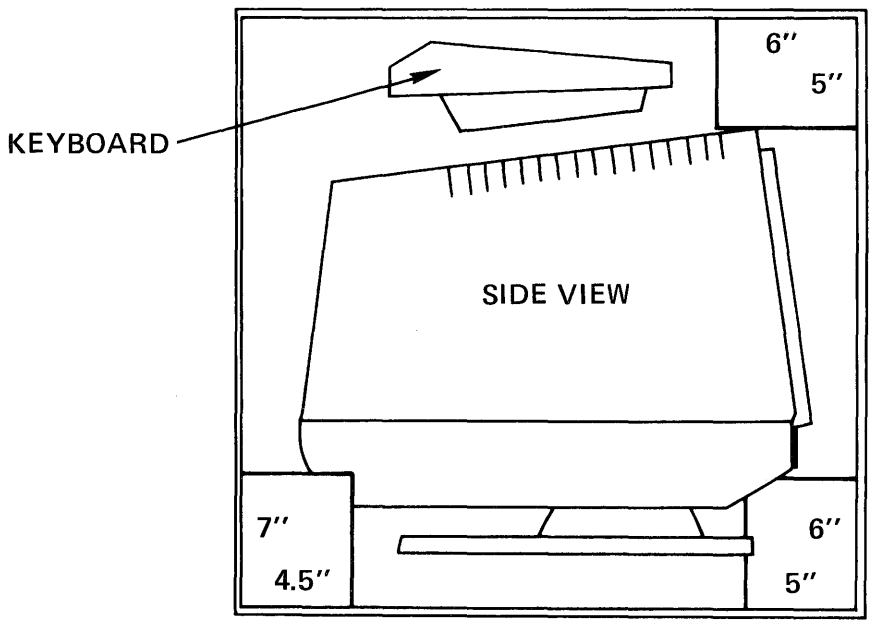
Control Code	Graphic Rendition	Control Code	Graphic Rendition
SOH	S_H	DLE	D_E
STX	S_X	*DC1/XON	D_1
ETX	E_X	DC2	D_2
EOT	E_T	*DC3/XOFF	D_3
ENQ	E_Q	DC4	D_4
ACK	A_K	NAK	N_K
BEL	B_L	SYN	S_N
BS	B_S	ETB	E_B
HT	H_T	CAN	C_N
LF	L_F	EM	E_M
VT	V_T	SUB	S_B
FF	F_F	ESC	E_C
CR	C_R	FS	F_S
SO	S_O	GS	G_S
SI	S_I	RS	R_S

*The XON(DC1) and XOFF(DC3) characters will not be displayed unless the Receiver XON/XOFF SET-UP feature has been disabled.

APPENDIX VI
TERMINAL PACKAGING

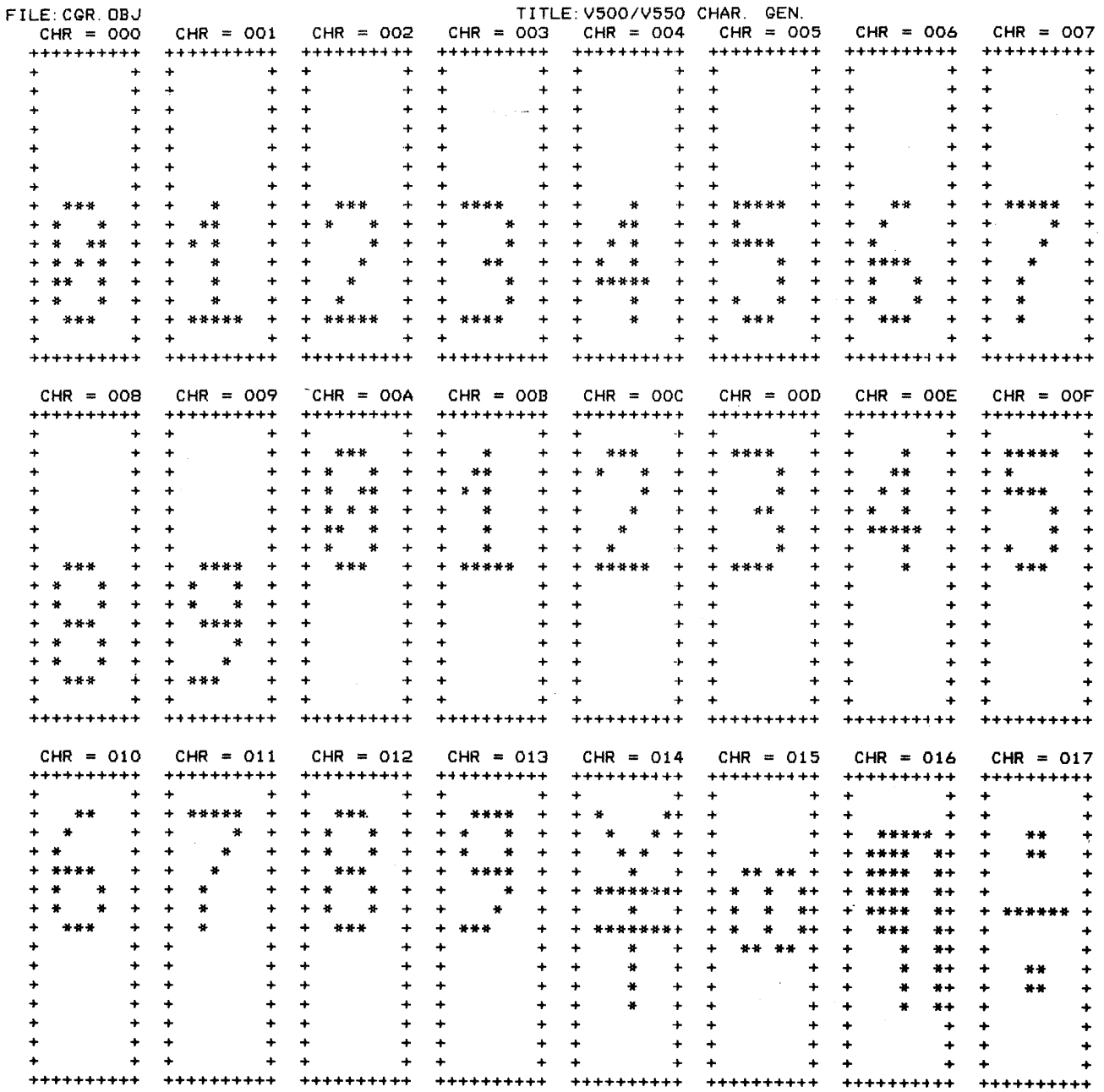
PACKING SCHEME





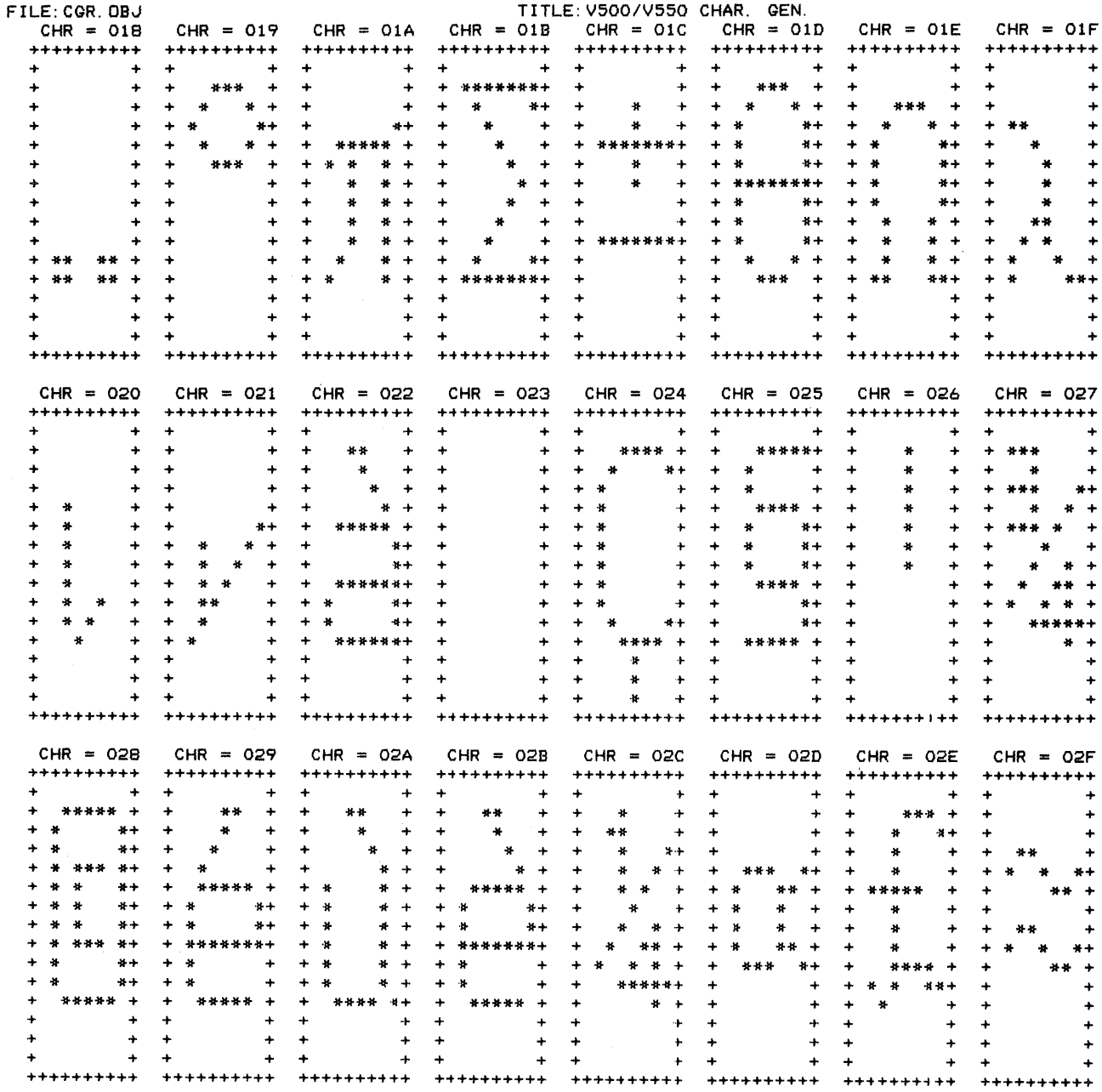
APPENDIX VII
MATH SYMBOL SET #1

FILE: CGR.OBJ TITLE: V500/V550 CHAR. GEN.



DATE: JUN-28-1982 16:11:15

FILE: CGR.OBJ TITLE: V500/V550 CHAR. GEN.



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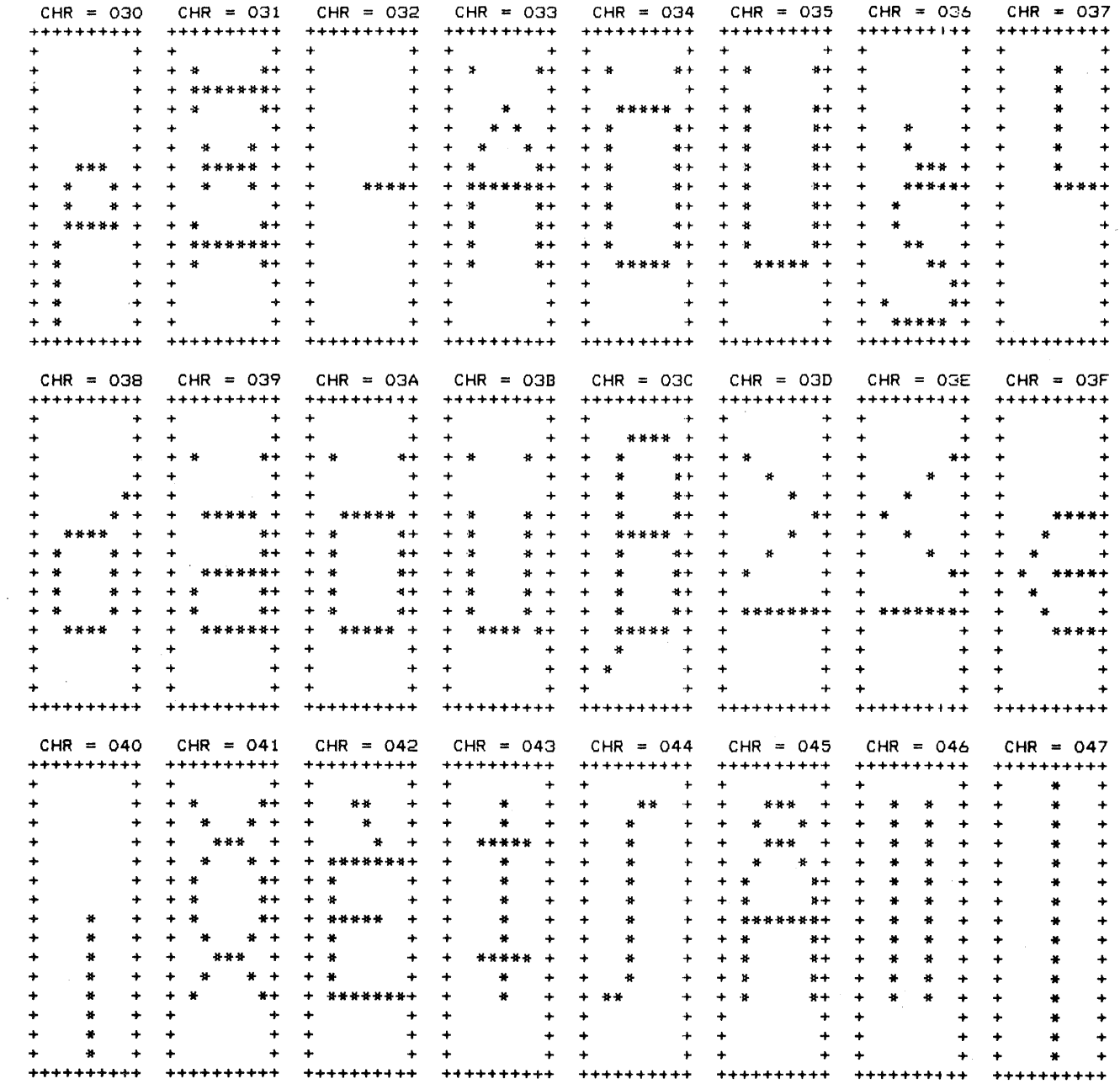
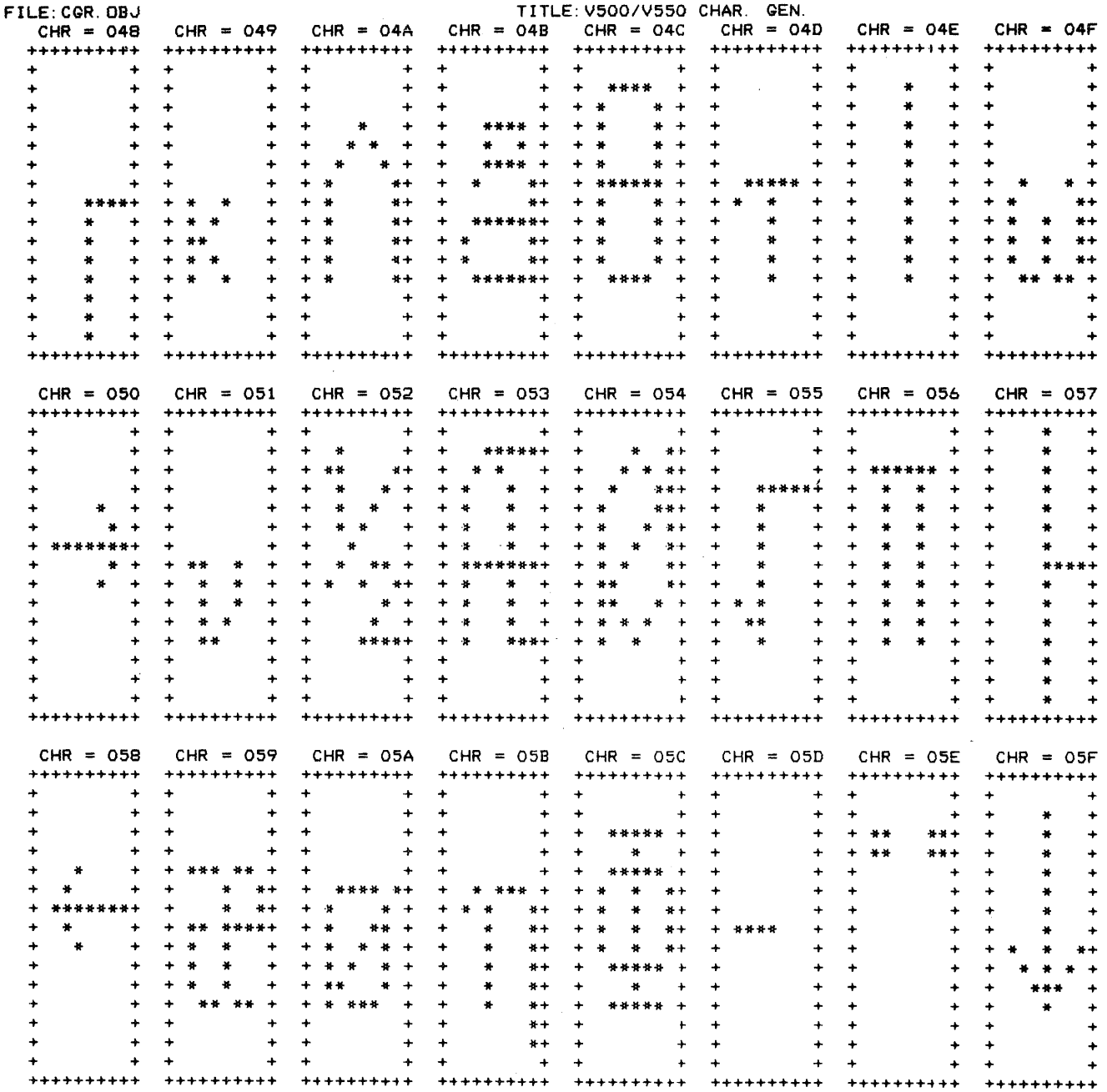
FILE: CGR.OBJ TITLE: V500/V550 CHAR. GEN.



APPENDIX VIII
MATH SYMBOL SET #2

DATE: JUN-28-1982 16:11:15

FILE: CGR.OBJ TITLE: V500/V550 CHAR. GEN.



DATE: JUN-28-1982 16:11:15

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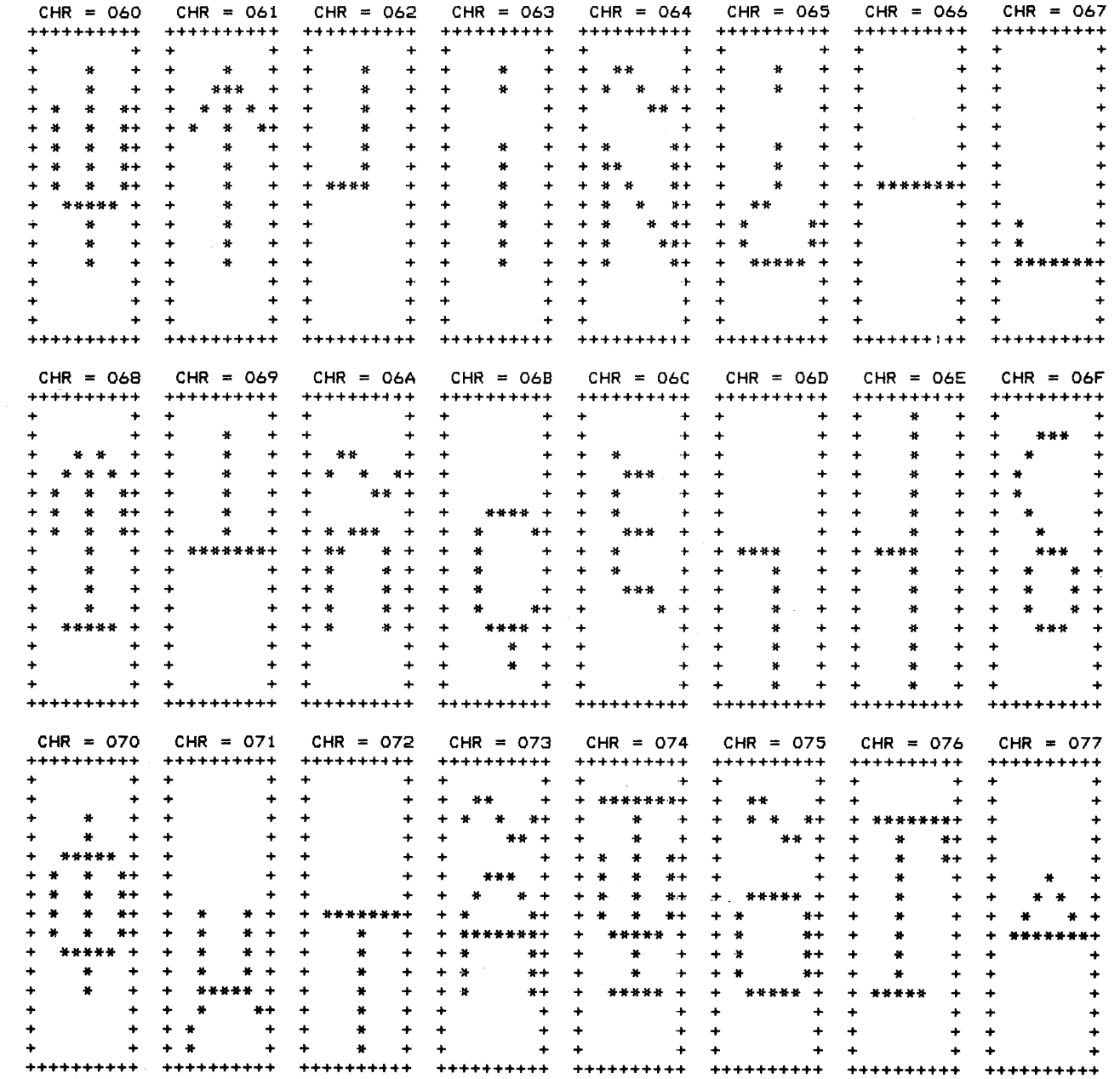

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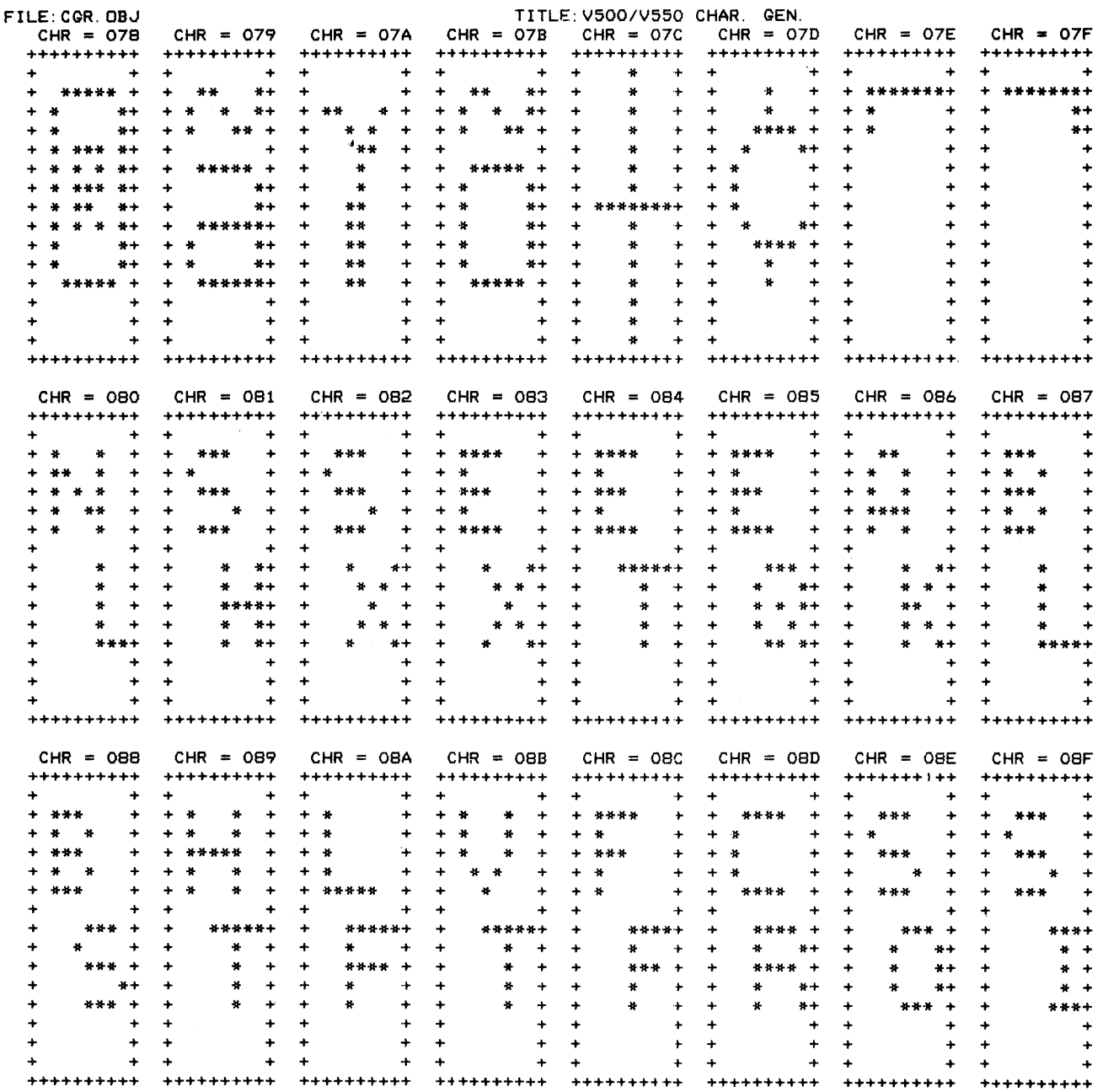


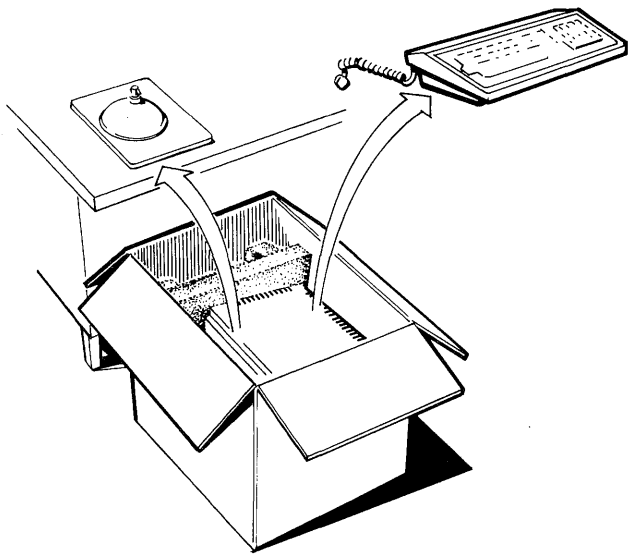
APPENDIX IX
VT52 GRAPHICS FONT

ASCII Code	Octal	Graphic	Description	Comment
_	137		Blank	
`	140	△	Delta	Replaces Diamond
a	141	⁝⁝	Checkerboard	
b	142	H_T	Horz. Tab	
c	143	F_F	Form Feed	
d	144	C_R	Carriage Ret.	
e	145	L_F	Line Feed	
f	146	°	Degree	
g	147	±	Plus/Minus	
h	150	N_L	New Line	
i	151	V_T	Verticle Tab	
j	152	┘	Lower Right Corner	
k	153	┐	Upper Right Corner	
l	154	┌	Upper Left Corner	
m	155	└	Lower Left Corner	
n	156	+	Intersect Lines	
o	157	⎺	Bar at Scan 5	Replaces Bar at Scan 3
p	160	⎺	Bar at Scan 5	Replaces Bar at Scan 3
q	161	–	Bar at Scan 5	
r	162	⎽	Bar at Scan 5	Replaces Bar at Scan 7
s	163	⎽	Bar at Scan 5	Replaces Bar at Scan 9
t	164	├	T left	
u	165	┤	T right	
v	166	┴	T down	
w	167	┬	T up	
x	170	|	Verticle Bar	
y	171	≤	Less than or equal	
z	172	≥	Greater than or equal	
{	173	π	P_1	
|	174	‖	Double Bar	Replaces Not Equal Sign
}	175	£	Pound Sign	
~	176	∞	Infinity Symbol	Replaces Center Dot

APPENDIX X
LINE DRAWING CHARACTER SET

LINE DRAWING CHARACTER SET

Graphic	Hex Code	ASCII Char	Graphic	Hex Code	ASCII Char
	80			88	h
	81	a		89	i
	82	b		8A	j
	83	c		8B	k
	84	d		8C	ℓ
	85	e		8D	m
	86	f		8E	n
	87	g		8F	o

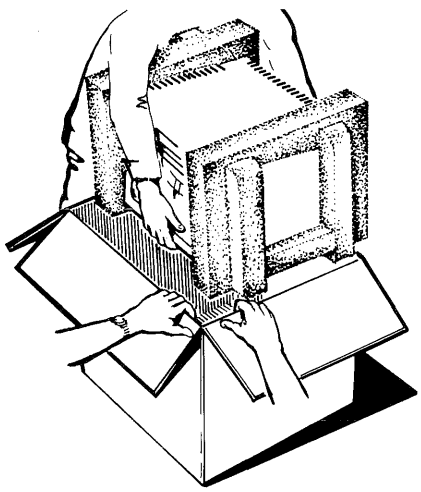


REMOVING TERMINAL FROM CARTON

- Prepare a working area large enough to accommodate the terminal with stand and the keyboard. Approximately 20″ × 20″
- Place carton on floor near the work area and open top flaps. Lift off top cardboard panel and *save*.
- Remove the Tilt and Swivel Pedestal from carton and *set* it near the operating site.
- Lift the cardboard protector from above the keyboard and *save*.
- Remove plastic bag containing keyboard, keyboard cable, and operating manual from the carton and *set aside*.
- Remove the cardboard tray from the top of the terminal and *save*.
- Firmly grasp the terminal at the bottom in front and rear and lift from the carton. Both foam side packing supports will lift from the carton with the terminal. (*Do not* attempt to remove the terminal by lifting on the foam supports.)

NOTE

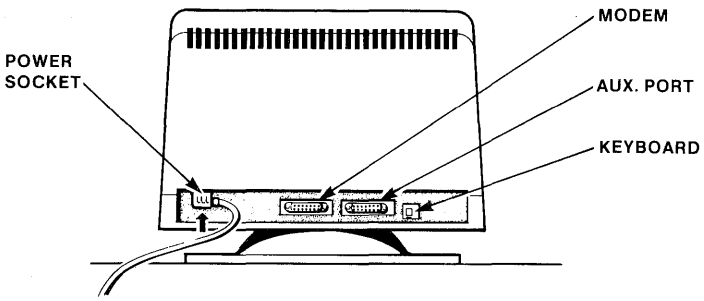
Because the equipment is packed tightly in the carton, a second person should be available to hold down the carton while the terminal is being lifted out and also to assist in removing the foam support from the terminal.



- Save the two foam side supports.
- Remove the plastic bag containing the power cord and four (4) rubber feet and *set aside*.

NOTE

All of the equipment for the terminal has now been removed from the carton. Return all of the internal packing to the carton and store in a dry place for possible future use.



REAR VIEW

REAR PANEL CONNECTORS

All VISUAL Terminals have essentially the same rear panel configuration, with all of the connectors clearly labelled.

AC Power Socket: Use power cord provided with the terminal to supply A/C power.

Modem Port: Main interface allows intercommunication via direct computer hook-up or with dial-up telephone modem.

Aux Port: Secondary port allowing RS232C interface to peripheral equipment such as printers.

Keyboard Port: Direct plug-in for VISUAL's supplied keyboard.

Shown is an example of the VISUAL 50's rear panel configuration. The chart below is for reference.

Plug connections at the rear, from left to right are as follows:

MODEL	REAR PANEL CONNECTORS			
V50	AC Power	(EIA) modem	Aux port	Keyboard
V100/110	AC Power	Keyboard	(EIA) modem	Aux port
V200/210	AC Power	Keyboard	Aux port	(EIA) modem
V300/310/330	AC Power	(EIA) modem	Aux port	Keyboard
V400	AC Power	Keyboard	(EIA) modem	Aux port
V500/550	AC Power	(EIA) modem	Aux port	Keyboard

INTERNAL DIP-SWITCH SETTINGS

To provide flexibility in communication interface, some models of the VISUAL terminal have internal dipswitches. These switches are located on the main printed circuit board and may be set for different configurations according to the chart below.

INTERNAL DIP SWITCH SETTING
FOR COMMUNICATION INTERFACE

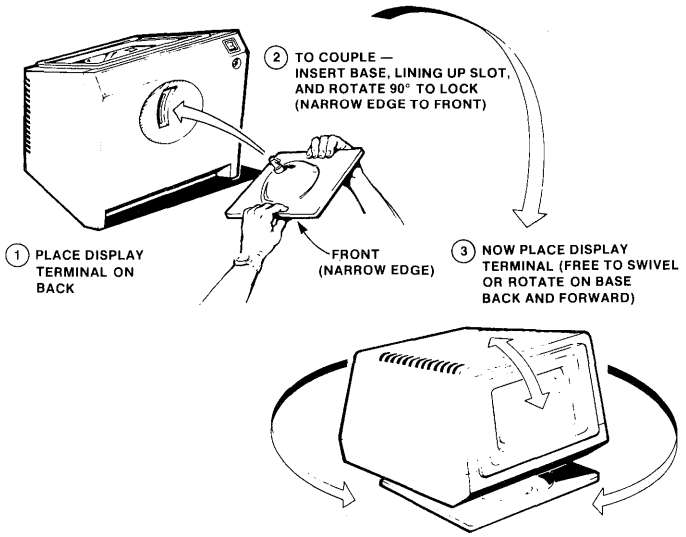
Model	Location	RS232 EIA		Current Loop (Passive)		Current Loop (Active)	
		On	Off	On	Off	On	Off
V50	—	Std	—	Optional	—	N/A	—
V100/110	U73	8	1,2,3,4, 5,6,7	2,3,5	1,4,6, 7,8	2,4,6	1,3,5, 7,8
V200	—	Std	—	Std	—	N/A	—
V300/310,330	SW	4	1,2,3,5, 6,7,8	1,6,7	2,3,4, 5,8	2,6,8	1,3,4, 5,7
V400	U73	8	1,2,3,4, 5,6,7	2,3,5	1,4,6, 7,8	2,4,6	1,3,5, 7,8
V500/550	SW	4	1,2,3,5, 5,6,7	1,6,7	2,3,4, 5,8	2,6,8	1,3,4, 5,7

POWER UP PROCEDURE

- Plug line cord into power socket in rear of terminal
- Plug line cord into A/C receptacle
- Turn on terminal power switch
- Allow approximately 10 seconds for cursor to appear on terminal screen.

CAUTION

The electrical outlet should be located within reach of power cord length supplied with the unit. In the United States, the following is required: a 115 volt (±10%), 15 ampere, single



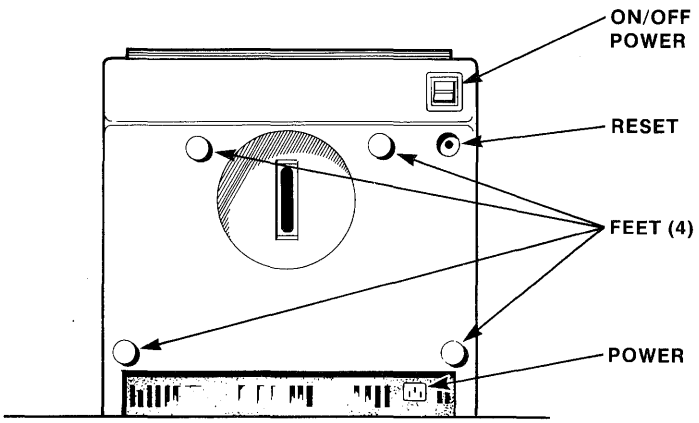
CONNECTING PEDESTAL TO TERMINAL

- Carefully place the terminal on its back panel with the bottom towards you.
- Insert the locking tab on the tilt and swivel pedestal into the slot in the bottom of the terminal.
- Rotate the pedestal 90°, locking the pedestal and terminal.

NOTE

The narrow edge of the pedestal is positioned to the front of the terminal (facing up).

- Return the terminal and pedestal to an upright position. The tilt and swivel feature is now fully operational.
- The tilt and swivel feature allows the operator to adjust the terminal for maximum ease and comfort.



BOTTOM VIEW

USING TERMINAL WITHOUT PEDESTAL

- Place terminal on rear panel with bottom towards you as described before.
- Remove the four (4) rubber feet from the plastic bag containing the power cord and attach the feet to the smooth plastic circles on the bottom.
- Return unit to upright position for operation.

NOTE

The location of the On/Off power switch, the circuit breaker reset button, and the A/C power receptacle is shown.

CAUTION

Because of the lower profile of the terminal with the rubber feet in place, care should be taken not to obstruct the rear cooling vents on the bottom of the cabinet.

VISUAL TECHNOLOGY INCORPORATED

540 MAIN STREET, TEWKSBURY, MA 01876, TELEPHONE (617) 851-5000, TELEX 951-539

REFERENCE MANUAL/**VISUAL 550**

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