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SELMAR CORPORATION

GRAPHICS 100 PLUS

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SELANAR GRAPHICS 100 PLUS IS A TRADEMARK
OF SELANAR CORPORATION, SANTA CLARA, CALIFORNIA

TABLE OF CONTENTS

Shipping Damage.....	iv
Customer Service Information.....	iv
Unpacking.....	iv
Installation	
Preparation.....	I-1
Communication Baud Rates.....	I-1
Dip Switch Settings.....	I-2
Parts Location (Figure 1).....	I-4
Suggestions.....	I-5
Procedure.....	I-6
Installing New Hardware.....	I-6
Installation Diagram(Figure 2).....	I-8
Interconnect Diagram (Figure 3).....	I-9
Testing.....	I-10
Removal.....	I-12
Operation	
General Description.....	0-1
System Commands.....	0-2
Erasing the CRT.....	0-6
Alternate Character Sets.....	0-6
Simulated LOCAL Mode.....	0-7
Debugging Mode.....	0-8
Setting Write Modes.....	0-8
Scrolling.....	0-9
Defining Characters in RAM.....	0-9
Horizontal Tabs.....	0-10
Vector Graphics.....	0-11
Vector Plotting.....	0-11
Positioning Cursors.....	0-14
Changing Graphics Write Modes.....	0-14
Relocating Display Window.....	0-14
Gain for Image Size (Zoom).....	0-15
Limitations on Relocation and Gain.....	0-16
Vector Plot Command Summary.....	0-16
Reverse Video.....	0-17
Switchable Video.....	0-18
Light Pen Position.....	0-18
Cross Hair Cursor (SG).....	0-19
Box Fill and Pattern Generation.....	0-20
Self Test.....	0-22
Terminal Cursor Controls.....	0-23
Terminal Scroll Key.....	0-23
Selanar Graphics Cursor Control.....	0-23
Clear Selanar Graphics Display.....	0-23
Half Duplex Mode.....	0-24
Tektronix Commands.....	0-25
Tektronix Alpha Cursor Coordinates.....	0-27

SHIPPING DAMAGE

Upon receipt, carefully inspect package for shipping damage. Any observed damage caused by shipping should be reported immediately to the shipping agent.

CUSTOMER SERVICE INFORMATION

All inquires about service or repair of SELANAR GRAPHICS should be directed to the company of original purchase. If further action is required, contact the factory at the following address:

Selanar Corporation
437-A Aldo Avenue
Santa Clara, CA 95050
(408) 727-2811

TWX: 910-338-2008

All returned hardware must have a return authorization number prior to being returned.

UNPACKING

Before proceeding, verify the following items are included in shipment:

- Graphics circuit card (1)
- Communication board (1)
- Plastic card guide (2)
- 18 Pin ribbon cable (1)
- 10 Pin ribbon cable (2)
- 7 Pin power cable (1)

SELANAR GRAPHICS INSTALLATION

PREPARATION FOR INSTALLATION

The SELANAR GRAPHICS board for this terminal has several option jumper and DIP switch selections. Make the desired selection prior to installation. (See Figure 1).

COMMUNICATION BAUD RATES

(See Figure 1 for Baud Rate Selection)

Row A selects Printer Interface Baud Rate and Row B is not used (baud rate is automatically established within the Terminal). The choices are as labeled and are factory set at 9600 baud using a shorting plug. The shorting plug may be moved to alternate positions as desired.

OPTION JUMPER SELECTION TABLE (See Figure 1 for location on board -- P11)

Position (From Top to Bottom)	Function		Factory Setting
	Jumpers In	Jumper Out	
1	Factory Set	Factory Set	In
2	Factory Set	Factory Set	In
3	Parity Disabled	Parity Enabled	In
4	8 Data Bits	7 Data Bits	In out
5	Odd Parity	Even Parity	In
6	One Stop Bit	Two Stop Bits	In

SW 1 ?

DIP SWITCH SETTINGS
SW 1

Position	FUNCTION		FACTORY SETTING
	ON	OFF	
1	(Secondary terminal mode for power up*)		OFF
2			ON
3			ON
4 NC	Factory setting	Factory setting	ON
5 NC	Factory setting	Factory setting	ON
6	No TEK terminator	CR for TEK terminator	ON
7	Factory setting	Factory setting	ON
8	Power up in primary terminal mode	Power up in secondary terminal mode	ON

OFF
OFF


*Secondary Terminal Modes

1	2	3	Function
ON	ON	ON	Hardware monitor
ON	ON	OFF	Hardware monitor
ON	OFF	ON	TEKTRONIX
ON	OFF	OFF	TEKTRONIX, Clear Screen
OFF	ON	ON	Selнар Graphics-Alpha Mode
OFF	ON	OFF	Selнар Graphics-Graphics Mode
OFF	OFF	ON	For Printer Option
OFF	OFF	OFF	For Printer Option

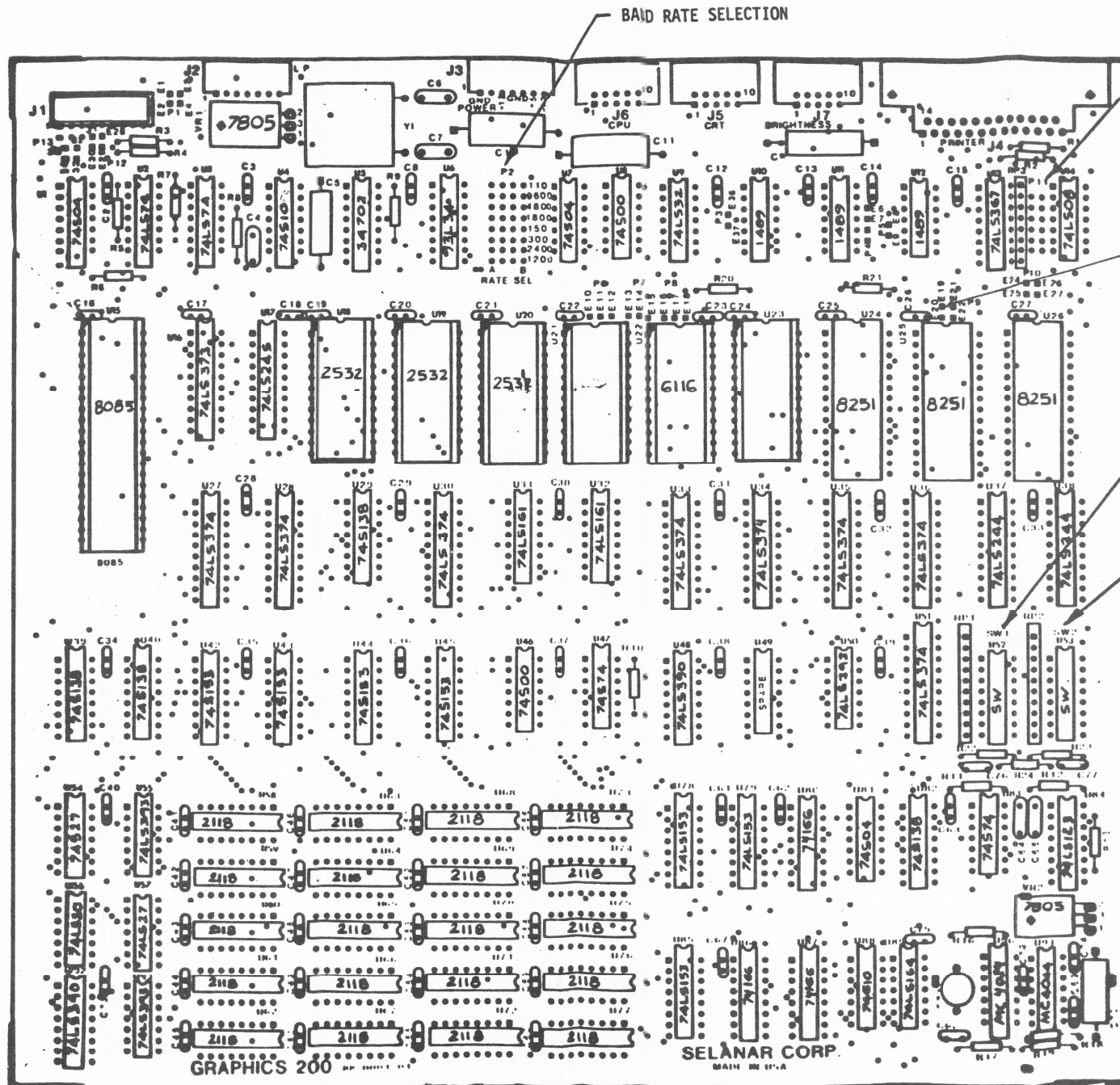
X

Dip Switch Settings

SW2 Switch on Graphics Board
(See figure #1 for location)

Position	Function		Factory Setting
	On	Off	
1*	Power Up Brightness (minimum) *  Power up Brightness (maximum) *		ON
2*			ON
3*			ON
4*			ON
5	Do hardware self test on power up	No hardware self test	OFF
6	Full Duplex	Half Duplex	ON
7	Reverse video	Normal video	OFF
8	Enter Graphics Board with <ESC> 1	Enter Graphics Board with <ESC> !	ON

* All "on" for maximum brightness and all "off" for minimum brightness.



Option Jumpers
For
Communication Protocol

Jumper should be
installed from
E21 to E22

Dip Switch SW1

Dip Switch SW2

Graphic Board
PARTS LOCATION
FIGURE 1

THE FOLLOWING SUGGESTIONS ARE OFFERED FOR INSTALLATION:

- ° Do not subject Selanar Graphics to impact of any kind.
- ° Make sure all parts in sockets are secure. Certain components are installed in sockets and may come loose with improper handling.
- ° Unless you are a qualified technician, do not attempt to repair, make adjustments, rewire parts, or touch any internal parts when power is applied or when unit is plugged into an AC power source.

NOTE: FAILURE TO TAKE THESE PRECAUTIONS BY UNQUALIFIED PERSONS
MAY RESULT IN ELECTRICAL SHOCK OR BURNS.

- ° Prior to installation, verify that the Terminal is operational and functions properly.
- ° Review the Terminal User's Manual to become completely familiar with terminal operation.

INSTALLATION PROCEDURE

Obtaining Access

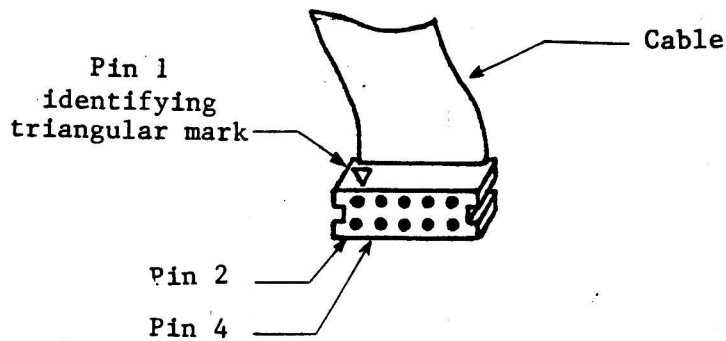
Verify that power is removed from terminal and power switch is OFF.
Remove the exterior terminal case:

- Disconnect keyboard.
- Remove four screws and rear cover retaining circuit board.
- Remove Terminal circuit board by sliding it out through the rear access area.

Installing New Hardware (See Figure 2)

- 1) Adjacent to the Terminal circuit board, install new plastic card guide leaving one slot blank for good ventilation. Card guides just snap into place, one on top and one on the bottom.
- 2) Slide Selanar Graphics board into card guides.
- 3) Insert 10 pin cable into Terminal socket as shown in Figure 2.
- 4) Insert the communication board into the Terminal as shown in Figure 2. The component side of the board should be visible after installation.
- 5) Slide the Terminal board into the Terminal card cage; however, don't insert all the way so that the communications board is still exposed.
- 6) Attach cables between communications board and Selanar Graphics board per diagram of Figure 2 and 3. A total of four (4) cables are used; care should be made to properly install cables in the proper locations and direction. See note below for details.
- 7) Adjust the routing of all cables to avoid interference with enclosure.
- 8) Replace rear covers using the four retaining screws. Plug in keyboard and power cord.

The Terminal now is ready to use as a graphics terminal. Before proceeding become familiar with the operation of Selanar Graphics as described in the following sections of this manual.

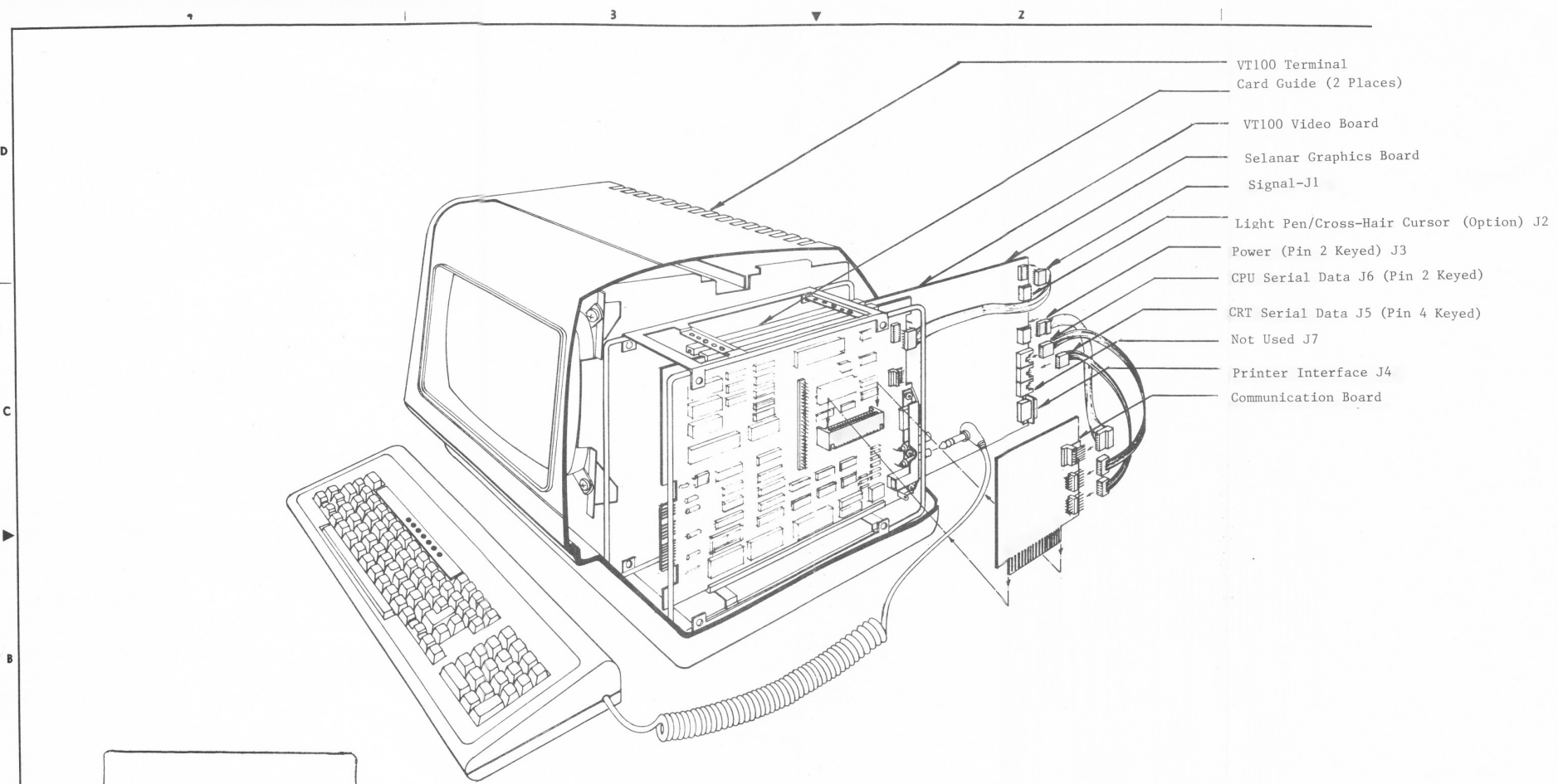


IMPORTANT NOTE:

The following guidelines should be used to ensure that you have installed the cables in the proper location in the proper direction.

There are two ten-wire flat cables ("CPU Serial Data" cable, and "CRT Serial Data" cable) which are identical in appearance. These cables have been keyed to avoid improper installation. The "CPU" cable has "pin 2" keyed and the "CRT" cable has "pin 4" keyed. All connectors on these cables and on the circuit boards have a triangular pin 1 identifying mark which must be aligned upon installation, on both ends.

There is a connector (J2) for the light pen option and cross hair cursor option of the Selanar Graphics board that is not shown clearly in the installation diagram (Figure 2). DO NOT PLUG THE POWER CABLE INTO THIS CONNECTOR. See interconnect diagram (Figure 3) to verify the location of the connector (J3) for the power cable. It is located immediately above the set of three connectors (J6, J5, J7).



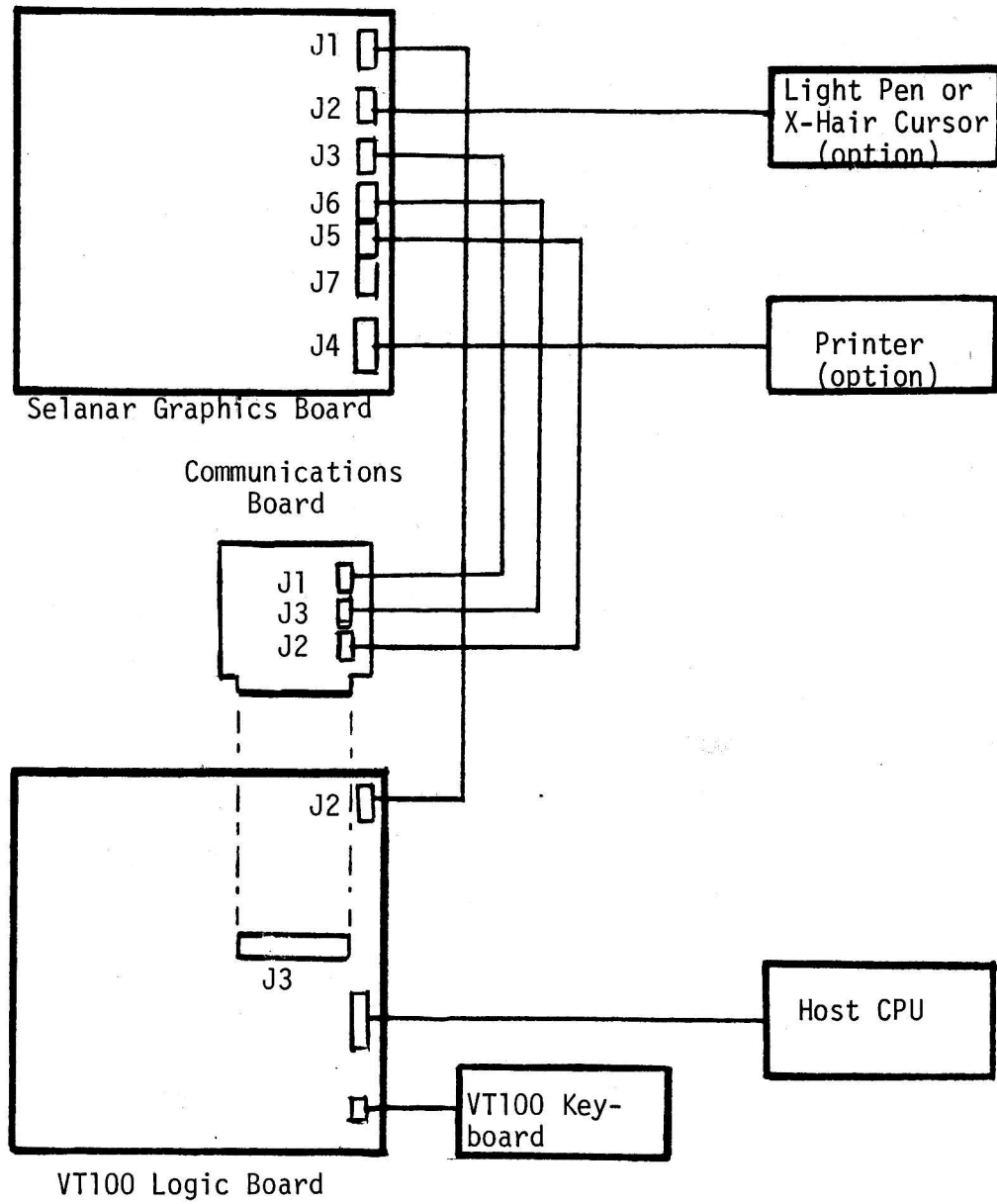
See Figure 3 for cable connections.

READ IMPORTANT NOTE ON PAGE 8 BEFORE ATTEMPTING TO INSTALL SELANAR GRAPHICS BOARD FOR DETAILED INFORMATION ON CONNECTING CABLES.

INSTALLATION DIAGRAM
Figure 2

I-8

MUST COMPLETE TO SHOW OR MATERIAL		(ALL DIMENSIONS ARE IN INCHES) DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED		SELANAR CORPORATION	
PART NO. _____ QTY. _____ DATE _____		VOL. _____ SHEET _____ OF _____ REV. _____		TITLE _____ DWG. NO. _____ SCALE _____	
NEXT ASSY _____ USED IN _____ APPLICATION _____		DESIGNED BY _____ CHECKED BY _____ DATE _____		DRAWN BY _____ DATE _____ SCALE _____	



SG100 PLUS INTERCONNECT DIAGRAM

Figure 3

TESTING

Plug the Terminal into appropriate power source. Position the power switch to ON. After a slight pause, the Terminal should self test as usual.

Use the Terminal ON LINE and/ or LOCAL to verify normal operation before proceeding.

NOTE: It is not possible to communicate from the keyboard to Selanar Graphics while in LOCAL: therefore, a simulated local mode is provided (see ESC \$) and is to be used while ON LINE.

The following example may be used for testing from the keyboard while terminal is ON LINE:

ESC \$	Enters simulated local mode (L1 indicator illuminates)
ESC 1	Selects Selanar Graphics
cL	Clears Screen (Selanar Graphics Memory)
ESC 5	Prints entire character set
ESC Ø	Selects double width characters
cL	Clear Screen
ESC 5	Prints entire set at top line
ESC E	Positions cursor to home
ESC C	Resets characters to normal size
ESC K	Enters box fill mode
Ø,Ø. (1224,239.)@	Reverses screen images (screen becomes all white)
)@	Reverses screen image (screen becomes black)
ESC C	Resets special modes
ESC B	Enters Graphics mode
Ø,Ø. (1224,)	Horizontal line along top of display
(239.)	Vertical line along right edge
(Ø,)	Horizontal line along bottom
(Ø.)	Vertical line along left edge
(1224,239.)	Diagonal line, top left to bottom right

Ø, (1224,Ø.)	Diagonal line, bottom left to top right
ESC C	Exit Graphics mode
ESC \$	Exits simulated local mode

To again operate in the Terminal mode, send ESC 2 prior to the ESC \$.

In all cases, the display should provide clearly defined lines and characters without extraneous dots.

See also ESC cT, self test. (Pg. 0-22)

Ventilation

The Terminal has adequate cooling vents along the top of the terminal. DO NOT OPERATE THE TERMINAL WITH THE VENTS COVERED. There may be a temptation to place paper on top of the terminal; if the vents are covered, excessive internal heating may cause problems.

SELANAR GRAPHICS REMOVAL

Selanar Graphics removal is accomplished by reversing the installation procedure. The following suggestion is offered.

RIBBON CABLE REMOVAL

When disconnecting ribbon cable plugged into DIP Socket, use a small flat screw driver to carefully pry plug from socket. This is done in a similar way as removing an IC. Attempting to pull the cable from the socket using fingers may bend or damage pins upon removal.

SELANAR GRAPHICS OPERATION

SELANAR GRAPHICS OPERATION

General Description

Selancar Graphics is a powerful graphics modification to the Terminal. It does not affect the normal operation, but once the Selancar Graphics mode is selected (ESC 1) all subsequent data are processed through Selancar Graphics and ignored by the Terminal. Both Terminal images and Selancar Graphics images can be simultaneously displayed or individually erased. It is as if two terminals were sharing the same CRT display. ESC 2 resumes normal Terminal operation again.

Selancar Graphics has numerous modes. In general, this includes character, vector graphics, box fill, and system control. Character modes include:

3 Character Sets

- Normal
- APL
- RAM

3 Character Variations

- Normal
- Double Width
- Rotations in Four Directions

Vector plotting is done by specifying the end points address of the line to be plotted.

A box fill mode allows the user to specify the diagonal corners of a box which can be filled with unique patterns.

System commands are shown in the following section. One need not use all of the commands to gain the benefit of Selancar Graphics, but by being familiar with available commands, one can gain additional usefulness.

There are several options available including light pen, cross hair cursor, Hardcopy, and graphics software for RT-11, RSX-11M and VMS operating systems.

SYSTEM COMMANDS

In the following description, 'c' indicates 'control' code; see appendix for ASCII definitions. 'ESC' is the 'escape' character (ASCII 27-decimal). ESC codes are used as two character commands, ESC followed by another character.

cH	Backspace	Backspaces one character position.
cI	Horizontal Tab	Advances cursor to the next column position in which the tab was set.
cJ	Line Feed	Advances cursor one line.
cL	Clear Screen	Erases screen and resets cursor to upper left corner.
cN	APL Character Set	Selects all characters as defined by the APL character set.
cØ	Normal Character Set	Selects normal character set.
ESC 1	Selects Selanar Graphics	Switches data communication to Selanar Graphics processor. All characters (except ESC 2) will be ignored by the Terminal processor.
ESC 2	Selects Terminal processor	Switches data communication to Terminal processor. All characters (except ESC 1) will be ignored by the Selanar Graphics processor.
ESC 5	Prints Entire* Character Set	TEST MODE. Prints the entire character on three lines.
ESC 7	VBOD Print Mode	Rotates characters. All subsequent received characters will be displayed in rotated orientation. ESC C returns to normal character rotation.

ESC 8	A B C D Print Mode	Rotates character. All subsequent received characters will be displayed in rotated orientation. ESC C returns to normal character rotation.
ESC 9	∇ A B C D Print Mode	Same as above.
ESC Ø	Double Width Characters	All subsequently received characters will be displayed as double width size. Use ESC C to obtain normal characters. (Ø = zero, O = letter).
ESC B	Enter Graphics Mode	Enters the graphics plot mode. Only characters associated with plotting will be recognized. To exit graphics mode use ESC C or any unused escape code such as ESC <Space>.
ESC C	Reset Special Modes	This command exits the graphics mode and sets characters to normal size and rotation and selects normal character set.
ESC D	UP Line Feed	Advances line position of cursor one whole line up.
ESC E	Cursor Home	Positions the cursor to upper left corner of screen.
ESC F	Power Up Reset*	Resets Selanar Graphics to power up configuration: Clears screen, resets tabs, selects normal character set, etc; also enables Terminal mode.
ESC G	Up ¼ Line	Moves cursor up one quarter line feed. If followed with a full line feed command, cursor moves to the next available full line position.
ESC I	Toggle Auto Line Feed Mode	When auto line feed mode is selected, a line feed will be generated with every carriage return command. Enter this mode with ESC I and exit with ESC I.

*NOTE: ESC F is not recommended to be used on line from computer.

ESC K	Box Fill	Fills a rectangular area with a selected pattern of dots. (See detailed explanation on page 0-20.)
ESC O	Select Standard Character Set	Selects normal characters. Same as c0 (0= letter, Ø = zero).
ESC P	Selects RAM Character Set	Selects third character set as defined in RAM.
ESC Q	Load RAM Character Set	Defines third character set to be loaded into RAM. When this mode is entered, the next 672 bytes will represent the horizontal dots of 96 printable characters, seven bytes per character. See text for further explanations. Once this mode is entered, it <u>must</u> be completed before any operation will be recongnized, including reset commands.
ESC Y	Set Horizontal Tab	Set horizontal tab to the current position of the cursor.
ESC Z	Reset Horizontal Tab	Resets horizontal tab at the current cursor position.
ESC +	Displays Cursor	Displays Selanar Graphics cursor in the character mode. This is the power up default.
ESC -	Removes Cursor Display	Selanar Graphics cursor is not displayed.
ESC ?	Light Pen Position Request	This command will inititate a single response specifying the horizontal and vertical position of the light pen.
ESC (	Toggles Reverse Video	Each time command is received the background will alternate black and white.
ESC [	Set character write mode	} See following text for mode option
ESC \	Set vector write mode	
ESC]	Set box fill write mode	
ESC ,	Turn on Cross Hair Cursor	Turns on Cross-Hair Cursor Selanar Graphics Mode

ESC .	Return Cross Hair Cursor co-ordinates	
ESC cD	Begin debug mode	Enters a mode to let the operator see the commands generating graphics.
ESC cE	End debug mode	Exits debug mode.
ESC cL	Clear screen white	Similar to cL which clears screen black.
ESC cT	Self Test	Enters Self Test, see page 0-22.
ESC '	Graphics Video off	Switches the graphics Video display off. Does not affect the Terminal Video Display.
ESC "	Graphics Video on	Switches Graphics Video on.
ESC \$	Simulated Local Mode	Toggles alternately on/off for talking to Selanar Graphics from keyboard while ON LINE. Can be entered only from the keyboard.

Erasing the CRT

To erase the CRT with other than power up reset, it may be required to reset both the terminal and Selanar Graphics; this must be done separately.

To reset the Terminal:

ESC 2	Select Terminal processor
ESC [2J	Erases Screen

or

ESC 2	Selects Terminal processor
ESC [H	Moves cursor to home position
ESC [J	Erases Screen

To reset Selanar Graphics:

ESC 1	Selects Selanar Graphics processor
c1	Clears Screen

or

ESC F	Resets Selanar Graphics to power up configuration. (This command is not recommended for use from host CPU.)
-------	---

Alternate Character Sets cN, ESC P

Three complete character sets are available and selectable upon command. These are Normal, APL, and User Defined RAM. The RAM character set allows the user to define his own characters using a 7 x 7 dot matrix. Power up and ESC F resets the RAM characters set to blanks. Once a character set is selected, that set remains selected until another character set is selected or ESC C (reset modes) is executed.

Simulated LOCAL Mode ESC \$

Due to the terminal design architecture: it is not possible to talk to Selanar Graphics when the terminal is in local. Therefore, a special simulated local mode is provided to accomplish the equivalent capability.

ESC \$ sent from the keyboard while ON LINE enters the Simulated Local Mode for Selanar Graphics. While in this mode the L1 indicator illuminates. To exit the Selanar Graphics Simulated Local Mode again type ESC \$. The terminal automatically returns to the Selanar Graphics Mode (as if ESC 1 was used). To return to the Terminal Mode instead, type ESC 2 prior to exiting the Simulated Local Mode. ESC\$ is easy to remember since it is the same key depressed when putting the terminal in Local.

The usefulness of this mode is for operating the terminal without a computer or for arranging for Selanar Graphics to be in certain modes without sending additional commands from computer.

For example, using Tektronics Software, the computer must send the following commands.

```
ESC 1  SELECTS SELANAR GRAPHICS.  
ESC *  ENTERS TEKTRONIX MODE
```

If it is desirable to enter Tektronix Mode off line the following commands may be sent (Terminal must be ON LINE):

```
ESC $  ENTERS SIMULATED LOCAL MODE  
ESC 1  SELECTS SELANAR GRAPHICS  
ESC *  SELECTS TEKTRONIX MODE  
ESC $  RETURNS TERMINAL ON LINE IN THE TEKTRONIX  
        MODE OF SELANAR GRAPHICS
```

To select the Terminal mode (instead of Selanar Graphics Mode):

```
ESC $  
ESC 2  
ESC $
```

To re-enter Selanar Graphics Mode:

```
ESC $  
ESC $
```

Selanar Graphics will be entered in the same modes as previously selected.

When ESC \$ is sent from the keyboard while ON LINE, an ESCAPE followed by the cancel character (Decimal 27 followed by 24) will be sent to the computer.

ESC \$ sent from the computer will ignored by Selanar Graphics. This function is only operable from the keyboard.

The terminal should be in the ANSI Mode: operation in the VR52 Mode is acceptable however, there will be no L1 indication.

Debugging Mode - ESC cD, ESC cE

Debugging Mode was implemented to aid the graphics programmer in developing applications. Debugging Mode may be entered from Selanar Native Mode (that is, non-Tektronix Mode) with ESC cD and exited with ESC cE. Once the debug mode is entered, all characters received will be displayed as usual characters or graphics; however, the characters being received also will be displayed in Terminal Mode so the operator can simultaneously review data being interpreted by Selanar Graphics.

Control characters are translated to <up arrow> <upper case character> form except for carriage return and linefeed.

If the debug mode is selected before entering the Tektronix Mode, the debug feature will continue to operate in the Tektronix Mode.

Setting Write Modes - ESC [, ESC \, ESC]

Selanar Graphics offers 4 Write Modes: OR, XOR, Clear, and Absolute. These modes may be set independently for characters (ESC [), Vector Graphics (ESC \), and Box Fill Modes (ESC]). OR Mode reads the screen dot to be written, OR's in a one, and writes the result. XOR Mode reads the screen dot, complements it, and writes the result. Clear Mode turns off the bit to be written. Absolute Mode writes an absolute 5 bit field on the screen (only useful in Character Mode). Defaults set on power up, ESC C or ESC F are:

Character: Absolute

Vector: OR

Box Fill: XOR

To set a Write Mode, follow the appropriate command with a character such as 0, 1, 2 or 3; the least significant bits of the character used will determine the Write Mode as follows:

<u>Bit 1</u>	<u>Bit 0</u>	<u>Mode</u>	<u>Suggest Character</u>
0	0	OR	0
0	1	XOR	1
1	0	Clear	2
1	1	Absolute	3

Scrolling

The Selanar Graphics memory is scrolled while in the Character Mode when doing a line feed and the cursor was previously on the bottom line. The line feed will scroll the entire image on one line and the top line will be erased.

While in the graphics modes, ESC B and ESC K, a number (N) followed by an S will scroll the screen image to the Nth line up; the top of the image will wrap around to the bottom.

Defining Characters in RAM - ESC Q, ESC P

The character RAM contains 96 characters. The characters are specified in sequential order starting with the first printable character (normally a space). To define the RAM character set, send ESC Q. The characters that follow will represent the binary pattern of horizontal dots; 7 characters are required to define one RAM character. Care should be taken to avoid extra characters (such as space, carriage return, line feed, etc.) since these will be used in the character definition. Once ESC Q is selected, 672 bytes (characters) must be received before any further command will be recognized. ESC P will select the RAM character set and ESC 5 can be used to inspect the results.

Example of defining a RAM character set:

<u>Character Set</u>	<u>Binary Pattern</u>
ESC Q	
CH	0001000
c \	0011100
	0111110
DEL	1111111
c \	0011100
c \	0011100
c \	0011100

Plus 665 other characters to complete RAM loading.

When RAM is loaded, send:

ESC P
Space

The resulting character will be:



Also, try ESC Ø and a space for double width character; and try a space after rotating characters using ESC 7, ESC 8, and ESC 9. Use ESC C to obtain normal characters again.

Horizontal Tabs - ESC Y, ESC Z

Using the tab commands, tabs may be set or reset in any column position. There are 124 horizontal column positions. To set or reset a tab, position cursor to desired location and use the appropriate command. Power up tabs are set for every eight horizontal positions (that is columns 1, 9, 17...121)

Vector Graphics

The CRT is arranged with 1225 horizontal dots (0 to 1224) and 240 vertical dots (0 to 239). Each point is addressable for defining the beginning and end points of a line. The upper left corner is point 0, 0 (for convenience we will refer to X as the horizontal axis and Y as the vertical axis). The positive direction for X is to the right and down for Y.

Lines can be plotted where the end points are off the displayable area, therefore the view on the CRT is really a window with 1225 x 240 dots. The addressable plotting space for both X and Y is plus or minus 16,383.

For convenience, the display window can be moved around within this space by relocating the upper left hand screen coordinates in the larger plotting area. The commands for this will be discussed later.

Vector Plotting ESC B

Enter the vector plot mode ESC B (and exit this mode with ESC C). Once in the graphics mode, only certain characters associated with graphics will be recognized. To do graphics, only the following characters need be used:

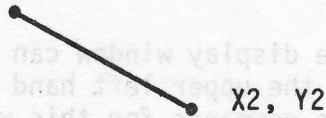
- # (# signifies an integer number)
- ,
- .
- ((left parenthesis)
-) (right parenthesis)

Once in the graphics mode, any number followed by a comma (,) will make that number an X coordinate; any number followed by a period (.) will make that number the Y coordinate. These coordinates will be the end point of the line. The left parenthesis '(' copies the end point coordinate to be the beginning of the line so that new end points can be specified, and the right parenthesis ')' causes the line to be displayed. That's all there is to it. As an example:

X1, Y1. (X2, Y2.)

is a standard format for drawing a line between X1, Y1, and X2, Y2. (X1, Y1, X2, Y2 are integer numbers representing the beginning and end of a line):

X1, Y1



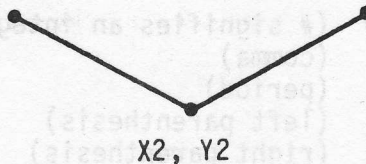
To continue this line to X3, Y3, all that is required is to additionally send:

(X3, Y3.)

The result would be:

X1, Y1

X3, Y3



Notice that the commands sent were X1, Y1. (X2, Y2.)(X3, Y3.)

This is identical to using the standard format (however, more characters are required):

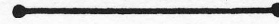
X1, Y1. (X2, Y2.)

X2, Y2. (X3, Y3.)

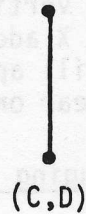
Both methods accomplish the same results.

Other examples which should be reviewed and understood are given below:

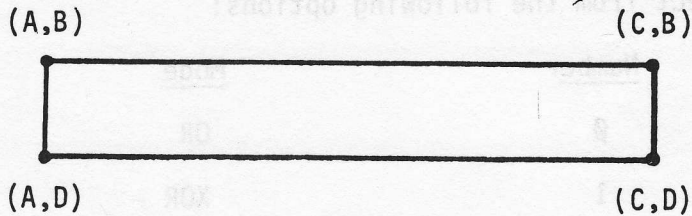
Horizontal line: (A,B).(C,B)



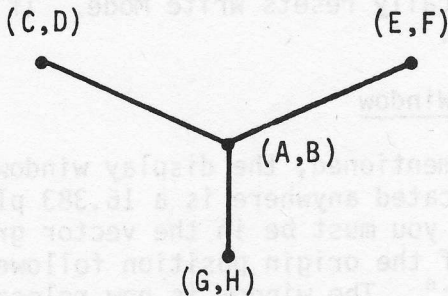
Vertical line: (C,B).(D.)



Rectangle: (A,B).(C,)(D.)(A,)(B.)



Radials: (A,B).(D,D.)E,F.)G,H.)



Single dot: (A,B) () • (A,B)

Positioning Cursor Using Selanar Graphics Mode

The alphanumeric cursor can be positioned while in the Selanar Graphics Mode by using the] character after specifying the X and Y coordinates.

For example, for X=300 and Y=100, the following command can be used while in the Selanar Graphics Mode (ESC B):

300,100.]

Now, if you exit the Selanar Graphics Mode (such as using ESC C) the upper left hand corner of the alphanumeric cursor will be located approximately at this position. Positioning of the cursor will be to the nearest half character position horizontally (multiples of 5 dots), and the vertical position will be to the nearest line position. For example, any X address 0 through 4 will appear as position 0; X address 5 through 9 will appear as position 5; etc.; any Y position between 0 and 9 will appear on the first line, 10 through 19 on the second line, etc.

Changing Graphics Write Modes

Normally graphics will be drawn as absolute white dots overlaying any existing dots on the screen (OR Mode). Two other modes are available and can be specified while in the Graphics Mode (ESC B & ESC K) as <number>W. That is, a number 0 to 2 followed by the letter W will select from the following options:

<u>Number</u>	<u>Mode</u>	<u>Descriptions</u>
0	OR	draws a white line
1	XOR	complements dots as line is drawn
2	Clear	draws a black line

ESC B automatically resets Write Mode. If this is not desired, use ESC \ (see page 23).

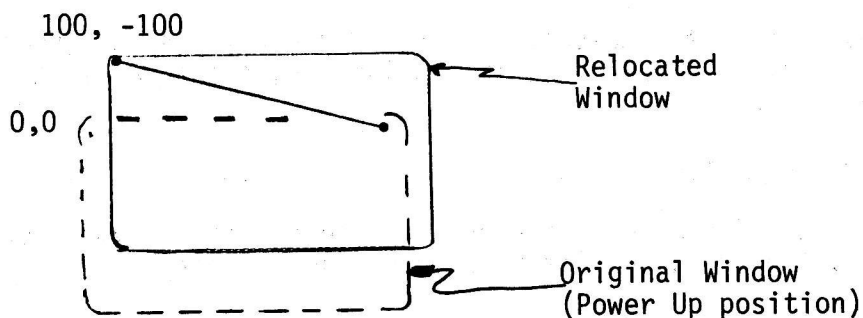
Relocating Display Window

As previously mentioned, the display window origin (upper left corner) may be relocated anywhere in a 16,383 plotting space. To relocate this window, you must be in the vector graphics mode (ESC B). Enter the X value of the origin position followed by ";" and the Y value followed by ":". The window is now relocated with the upper left hand corner of CRT to be X,Y. An example for relocating X to 100 and Y to -100:

```
ESC B
100;
-100:
```

Now a line from 100, -100 to 1000, 0 would be :

100, -100. (1000,0.)



Gain for Image Size (Zoom)

A feature is provided which will allow an image to be increased or decreased in size by changing the X or Y gain prior to sending data. The gain may be changed by powers of 2. For example, to make the X values 8 times as big and the Y values $\frac{1}{2}$ as big:

ESC B	(enter the graphics mode)
3	$2^3 = 8$
X	Sets X gain
-1	$2^{-1} = \frac{1}{2}$
Y	Sets Y gain

Now any further received values for X1, Y1, or X2, Y2, the values of X and Y will be multiplied by the corresponding X gain of 8 and Y gain of .5 before being plotted.

Limitations on Relocation and Gain

The calculations for an absolute screen address are:

$$\begin{aligned} X_{Abs} &= (X - X \text{ Origin}) * (2^{\uparrow} X \text{ Gain}) \\ Y_{Abs} &= (Y - Y \text{ Origin}) * (2^{\uparrow} Y \text{ Gain}) \end{aligned}$$

If at any step in the calculation, the temporary result cannot be represented by a two's complement, 16 bit integer, the final value is unpredictable.

Vector Plot Command Summary

Ø - 9	Digits of Plot coordinates are entered into accumulator (multiplies accumulator by 10 and adds digit).
(	Copy X2 → X1, Y2 → Y1 and clear accumulator
,	Put accumulator into X2 and clear accumulator
.	Put accumulator into Y2 and clear accumulator
)	Draw a line between X1, Y1, and X2, Y2, and clear accumulator
;	Put accumulator into X origin, zero accumulator
:	Put accumulator into Y origin, zero accumulator
s	Put accumulator into scroll register, zero accumulator
X	Put accumulator into X gain, zero accumulator
Y	Put accumulator into Y gain, zero accumulator
W	Use accumulator to set write mode, zero accumulator

Reverse Video ESC (

Normally the background of the Selanar Graphics is black and characters and graphics are shown white. If reverse background is desired, this capability exists with some limitations.

To power up in reverse background, see "Dip Switch" setting. To change the video background, use ESC (. Each time this command is sent, the background will reverse- a black background will become white and a white background will become black.

Use of cL clears the screen to the background color selected and ESC cL to the opposite color. So if black background is selected, cL clears the screen black and ESC cL clears the screen white; if a white background is selected, cL clears the screen white and ESC cL clears the screen black.

NOTE:

Because of hardware limitations, the reverse video illuminates an area slightly longer than the addressable memory space; the extra area is along the left edge of the screen approximately one character width. Therefore, if you make the screen background white with ESC (and then use ESC cL, a white strip will remain along the left edge of the screen. One would not normally use the product in this way so it should offer no difficulty to the user.

Switchable Video ESC ', ESC "

Selancar Graphics contains a feature for switching Selancar Graphics video image on or off upon command. If switched off, the image memory can still be written to even though it is not displayed. Use ESC ' to turn Video off and ESC " to turn Video on.

Screen Resolution

Selancar Graphics provides 1225 dots horizontally by 240 dots vertically within an approximate area of 8.3 dots per inch (58 dots per cm) by 47 dots per inch (18.5 dots per cm).

In order to draw a circle, the difference in horizontal and vertical resolution can be compensated by multiplying the horizontal data by a factor of 3.25 and then converting to an integer value.

Light Pen Position ESC ?, ESC /

The light pen is optional. Use of the light pen requires:

- Serial communication board
- Light pen assembly

The position of the light pen is given to the vertical dot and the horizontal half character position. From a software point of view, reading the location of the pen requires sending "ESC ?" while in the graphics mode. The response from Selancar Graphics to the CPU is:

Byte 0	Most significant nibble of X position.
Byte 1	Least significant nibble of X position.
Byte 2	Most significant nibble of Y position.
Byte 3	Least significant nibble of Y position.
Byte 4	Carriage return

Bytes 0 through 3 are in Hex ASCII representation. For example, the response

0A2E <cr>

would be interpreted as:

$$X \text{ dot position} = ((0 * 16) + (10)) * 5 = 50$$

$$Y \text{ dot position} = (2 * 16) + (15) = 47$$

with the following limits on X and Y:

$$1 < = X < = 241 \quad \{XE1, 3, 5, 7...\}$$

$$0 < = Y < = 239$$

A separate request is made by the CPU each time the position of the light pen is sought. The light pen has a push switch for activation.

The light pen operates only in areas of the screen which are illuminated. The light pen has a small adjustment for sensitivity and may need adjustment to meet the application requirements.

The ? form of the request allows for continuous triggering of the position. The / form of the request requires that the pen be lifted from the screen before a new request for position will be honored.

Cross Hair Cursor ESC, ESC. (Selanar Graphics Mode)

The cross hair cursor is an option consisting of an external box with arrow key controls to position the crosshair. The video for the crosshair is generated in the external box; therefore, the crosshair will not appear on the screen unless this option is installed.

The Selanar Cross Hair cursor is turned on by ESC,. Any other video control command, such as ESC " (video normal), ESC ' (video off) and ESC & (change brightness), will turn off the cross hair cursor. ESC. returns the current position of the cross hair in exactly the same format as the light pen.

Box Fill and Pattern Generation ESC K

A special capability is provided for generating dot patterns on the screen over any selected rectangular area.

Following selection of this mode using ESC K, first specify the screen location of this image, then a single character for the dot pattern desired. The screen location is specified like a vector between diagonal corners of a rectangle (such as the upper left corner and lower right corner). The character specifying the dot pattern functions by using the least significant 6 bits of ASCII character code to determine how many spaces there are between dots. For example:

ESC K

500, 10. (1000, 100.) #

is a single character which immediately follows the right parenthesis. Examples of this character are (see appendix for ASCII table):

<u>#</u> <u>Character</u>	<u>ASCII</u> <u>Hex Code</u>	<u>Decimal No. Corres-</u> <u>ponding to least</u> <u>significant 6 bits</u>	<u>No. of spaces</u> <u>between dots</u>
@	40	0	0
A	41	1	1
B	42	2	2
C	43	3	3
.	.	.	.
.	.	.	.
Z	5A	26	26
[	5B	27	27
.	.	.	.

For the entire screen to be white:

ESC C	If needed to exit graphics mode
cL	Clears screen
ESC K	Enters Block pattern mode
Ø,Ø.(1224,239.)@	Specifies the area to be written with no spaces between dots.

As dots are written in this mode, each dot on the screen is complemented (white dots become black and black dots become white). Since the screen was clear, the above command makes the screen white. The following commands will therefore erase the screen (assumes above commands were the last commands sent):

)@	Erases screen
)@	Writes screen white again

This mode can therefore be used for reversing the video around characters and graphics. Very unusual patterns can be made by overwriting an area. This is done by sending right parenthesis followed by a character to specify the desired pattern. An example is:

```
ESC C
cL
ESC K
(123,Ø.(333,1ØØ.
)A
)F
))
)Z
)Q
)D
)B
)D
)H
)A
etc...
```

Using the ESC K mode, the screen may also be selectively erased using the right bracket > followed by a single character which specifies the number of spaces between black dots. In this mode, dots are erased (displayed black) rather than complemented.

control Shift T

Self Test ESC cT

Self test is accomplished by ESC cT. Remaining on the screen is a summary of data. A typical example is:

Slot	Checksum	Type	Pos	Ver	Date	Title
0	7DD7	Prom	0	04-B	13-Feb-82	SG100+ Monitor
1	1B3B	Prom	1	04-B	13-Feb-82	SG100+ Native Mode
2	7648	Prom	2	04-A	09-Feb-82	SG100+ TEK 4010
3	Not Identified					
4	Good	Ram				
5	Not Identified					

Option Settings:

SWI : 81 SW2 : 40 JMPR : 10

Screen Test

Reviewing the data shows that the right prom is plugged into the appropriate socket and also the revision level and checksum. Any screen Ram errors will show up under "screen test".

Terminal Cursor Controls

The Terminal cursor control keys ↑ ↓ ← →, have different meaning when operating under Selanar Graphics. These keys generate two character ESCAPE codes and Selanar Graphics interprets them as different commands. The Corresponding Selanar Graphics commands are:

- ↑ ESC A Select Normal Characters
- ↓ ESC B Enter Graphics Mode
- ← ESC D Up line feed
- ESC C Character mode select and reset

Terminal Scroll Key

For system software using cS and cQ for stopping and starting data transmission, the Terminal Keyboard Scroll Key may be used. Each time this key is depressed, data will alternatively stop and start. Even though data stops, the display will continue until the communication buffer is empty (the buffer is approximately 1000 characters).

Selanar Graphics Cursor Control ESC +, ESC -

The Selanar Graphics cursor may be displayed in the character modes by using the ESC + command. To eliminate the cursor, use ESC -. The cursor will not be displayed in any of the graphics modes. Once the cursor is turned off, it will require a new command to be displayed.

Clear Selanar Graphics Display ESC cL

To clear screen black use cL; to clear screen white use ESC cL. Also see reverse video, page 32.

Half Duplex Mode ESC %, ESC #)

Once this mode is selected, all characters typed on the keyboard will be sent to the computer and echoed within the Terminal.

Use ESC # to return to manual full duplex operation. This mode is usable for the Terminal Mode as well as Selanar Graphics modes.

TEKTRONIX COMMANDS

The following are commands associated with Tektronix 4010 compatibility:

- ESC * Enters the 4010 mode (must be in the Graphics mode by using ESC 1).
- ESC 0 Exits the 4010 mode (0 = letter)

After entering the 4010 mode:

- ESC cL Clears screen
- cH Back space
- cI Forward space
- cJ Line feed
- cK Up line feed
- cM Carriage return
- c] Enters graphic mode
- US Exits graphics mode
- CR Carriage return and return to alpha mode

NOTE: ASCII definition of US is Deciaml 31

When in the 4010 Graphics Mode, Selanar Graphics follows 4010 programming conventions. For additional information, the user may refer to Tektronix 4010 Users Manual and other application data relating to Plot 10.

In the Tektronix mode, the screen is organized as 1024 x 1024 dots where the origin is located in the lower left corner. The screen address advances to the right from 0 to 1023 and vertically up from 0 to 780 dots.

The alpha mode consists of 74 characters per line and 40 lines. In the alpha mode, a small underline cursor is displayed. When the last line is reached, the cursor advances to the middle of the screen (address 512,767). The displayed area is mapped onto the available 240 vertical lines, and the 1024 horizontal dots are addressed directly; however, the Selanar Graphics has 1224 dots horizontally so only the center 1024 dots are used.

To draw vectors you enter the graphics mode with C]; to go back to the alpha mode, use (US) or a carriage return (cR). In the graphics mode vectors are drawn by specifying the end points of a line. The line is specified with four characters. The four byte sequence consists of a high and low order Y and a high and low order X. Each byte contains a two bit tag in the ASCII character set to specify which of the four bytes it is. The high X and low X as well as high Y and low Y are each put together as a 10 bit word.

The format of the four byte sequence is:

Byte	Tag Bits	Bit	Data Bits (5 Bits Each)
1	0	1	High Y (MSB)
2	1	1	Low Y (LSB)
3	0	1	High X (MSB)
4	1	0	Low X (LSB)

The first coordinate pairs after entering the graphics mode is assumed to be the beginning of the line and the following coordinates are assumed to be the continuation of a line. Therefore to do a "pen up," exit and re-enter the graphics mode (c]).

TEKTRONIX ALPHA CURSOR COORDINATES ESC cE

The coordinates of the alpha cursor will be returned to the computer. The sequence consists of 5 bytes, the first of which is either 10100000 or 10100100 for alpha or graphics mode, followed by 4 bytes in the same format as the X-hair response.

If the X-hair cursor has been requested and has not been sent back yet, then the Esc cE sequence will return the X-hair address instead of the alpha cursor and it will leave off the first status byte.

CROSS HAIR CURSOR OPTION ESC cZ (TEKTRONIX MODE)

ESC cZ request turns on the cross hair cursor and requests the X and Y coordinates. Cursor coordinates will be returned when any key is pressed and the cursor will be erased. The bell sounds when the cursor is turned on. The cursor response consists of 4 characters; high X, low X, high Y, and low Y. Each character consists of 01XXXXX

Note that the first character to be received by the computer will be the one hit by the operator.

WARRANTY

The Selanar Graphics board is under warranty to the original owner for a period of 90 days from the date of shipment. This warranty states that the equipment delivered is free of defects in materials or workmanship and shall operate as stated when properly installed and used as directed. This warranty is voided if the equipment is improperly installed or altered in any way.

Selanar's responsibility and liability shall be limited to the replacement of only the Selanar Graphics circuit board. Selanar assumes no other responsibility.

No other warranty than what is stated here is implied.

APPENDIX

SUMMARY OF ALL ESCAPE CODES

CONTROL CODES

cG	Bell
cH	Back Space
cI	Horizontal Tab
cL	Clear Screen = "14
cN	Select APL character set
cO	Select normal character set

ESCAPE CODES

"	screen on
#	full duplex
\$	off/on line (simulated local mode)
%	half duplex
'	screen off
(	Toggles Reverse Video
)	Enter Tektronix mode, clear screen
*	enter Tektronix mode
+	cursor on
,	turns on cross hair cursor
-	cursor off
.	returns cross hair cursor coordinates
/	light pen one shot request
Ø	double wide characters
1	switch from Terminal Mode to Selanar Graphics Mode
2	switch from Selanar Graphics Mode to Terminal Mode
5	character set dump
7	upside down characters
8	right sideways characters
9	left sideways characters
:	printer option
;	printer option
?	light pen request
B	enter vector graphics
C	enter normal char mode/reset special modes
D	up feed
E	home
F	power restart
G	up 1/4 feed
I	toggle auto feed
O	return to standard char set
P	select RAM char set
Q	load RAM char set

ESCAPE CODES cont.

Y set horizontal tab
Z reset horizontal tab
[set character write mode
/ set vector write mode
] set box fill write mode
cD enter debug mode
cE exit debug mode

In Tektronics Mode (entered with ESC *)

ESCAPE CODES

cL erase screen
cE request character cursor position
cZ request cross hair cursor position
0 exit Tektronix mode (0 = letter)

BINARY - ASCII TABLES

ASCII			ASCII			ASCII			ASCII		
DEC	BINARY	HEX	DEC	BINARY	HEX	DEC	BINARY	HEX	DEC	BINARY	HEX
0	00000000	00	64	01000000	40 @	128	10000000	80	192	11000000	C0
1	00000001	01	65	01000001	41 A	129	10000001	81	193	11000001	C1
2	00000010	02	66	01000010	42 B	130	10000010	82	194	11000010	C2
3	00000011	03	67	01000011	43 C	131	10000011	83	195	11000011	C3
4	00000100	04	68	01000100	44 D	132	10000100	84	196	11000100	C4
5	00000101	05	69	01000101	45 E	133	10000101	85	197	11000101	C5
6	00000110	06	70	01000110	46 F	134	10000110	86	198	11000110	C6
7	00000111	07	71	01000111	47 G	135	10000111	87	199	11000111	C7
8	00001000	08	72	01001000	48 H	136	10001000	88	200	11001000	C8
9	00001001	09	73	01001001	49 I	137	10001001	89	201	11001001	C9
10	00001010	0A	74	01001010	4A J	138	10001010	8A	202	11001010	CA
11	00001011	0B	75	01001011	4B K	139	10001011	8B	203	11001011	CB
12	00001100	0C	76	01001100	4C L	140	10001100	8C	204	11001100	CC
13	00001101	0D	77	01001101	4D M	141	10001101	8D	205	11001101	CD
14	00001110	0E	78	01001110	4E N	142	10001110	8E	206	11001110	CE
15	00001111	0F	79	01001111	4F O	143	10001111	8F	207	11001111	CF
16	00010000	10	80	01010000	50 P	144	10010000	90	208	11010000	D0
17	00010001	11	81	01010001	51 Q	145	10010001	91	209	11010001	D1
18	00010010	12	82	01010010	52 R	146	10010010	92	210	11010010	D2
19	00010011	13	83	01010011	53 S	147	10010011	93	211	11010011	D3
20	00010100	14	84	01010100	54 T	148	10010100	94	212	11010100	D4
21	00010101	15	85	01010101	55 U	149	10010101	95	213	11010101	D5
22	00010110	16	86	01010110	56 V	150	10010110	96	214	11010110	D6
23	00010111	17	87	01010111	57 W	151	10010111	97	215	11010111	D7
24	00011000	18	88	01011000	58 X	152	10011000	98	216	11011000	D8
25	00011001	19	89	01011001	59 Y	153	10011001	99	217	11011001	D9
26	00011010	1A	90	01011010	5A Z	154	10011010	9A	218	11011010	DA
27	00011011	1B	91	01011011	5B [	155	10011011	9B	219	11011011	DB
28	00011100	1C	92	01011100	5C \	156	10011100	9C	220	11011100	DC
29	00011101	1D	93	01011101	5D]	157	10011101	9D	221	11011101	DD
30	00011110	1E	94	01011110	5E ^	158	10011110	9E	222	11011110	DE
31	00011111	1F	95	01011111	5F _	159	10011111	9F	223	11011111	DF
32	00100000	20	96	01100000	60 `	160	10100000	A0	224	11100000	E0
33	00100001	21 !	97	01100001	61 a	161	10100001	A1	225	11100001	E1
34	00100010	22 "	98	01100010	62 b	162	10100010	A2	226	11100010	E2
35	00100011	23 #	99	01100011	63 c	163	10100011	A3	227	11100011	E3
36	00100100	24 \$	100	01100100	64 d	164	10100100	A4	228	11100100	E4
37	00100101	25 %	101	01100101	65 e	165	10100101	A5	229	11100101	E5
38	00100110	26 &	102	01100110	66 f	166	10100110	A6	230	11100110	E6
39	00100111	27 '	103	01100111	67 g	167	10100111	A7	231	11100111	E7
40	00101000	28 (	104	01101000	68 h	168	10101000	A8	232	11101000	E8
41	00101001	29)	105	01101001	69 i	169	10101001	A9	233	11101001	E9
42	00101010	2A *	106	01101010	6A j	170	10101010	AA	234	11101010	EA
43	00101011	2B +	107	01101011	6B k	171	10101011	AB	235	11101011	EB
44	00101100	2C ,	108	01101100	6C l	172	10101100	AC	236	11101100	EC
45	00101101	2D -	109	01101101	6D m	173	10101101	AD	237	11101101	ED
46	00101110	2E .	110	01101110	6E n	174	10101110	AE	238	11101110	EE
47	00101111	2F /	111	01101111	6F o	175	10101111	AF	239	11101111	EF
48	00110000	30 0	112	01110000	70 P	176	10110000	B0	240	11110000	F0
49	00110001	31 1	113	01110001	71 q	177	10110001	B1	241	11110001	F1
50	00110010	32 2	114	01110010	72 r	178	10110010	B2	242	11110010	F2
51	00110011	33 3	115	01110011	73 s	179	10110011	B3	243	11110011	F3
52	00110100	34 4	116	01110100	74 t	180	10110100	B4	244	11110100	F4
53	00110101	35 5	117	01110101	75 u	181	10110101	B5	245	11110101	F5
54	00110110	36 6	118	01110110	76 v	182	10110110	B6	246	11110110	F6
55	00110111	37 7	119	01110111	77 w	183	10110111	B7	247	11110111	F7
56	00111000	38 8	120	01111000	78 x	184	10111000	B8	248	11111000	F8
57	00111001	39 9	121	01111001	79 y	185	10111001	B9	249	11111001	F9
58	00111010	3A :	122	01111010	7A z	186	10111010	BA	250	11111010	FA
59	00111011	3B ;	123	01111011	7B {	187	10111011	BB	251	11111011	FB
60	00111100	3C <	124	01111100	7C |	188	10111100	BC	252	11111100	FC
61	00111101	3D =	125	01111101	7D }	189	10111101	BD	253	11111101	FD
62	00111110	3E >	126	01111110	7E ~	190	10111110	BE	254	11111110	FE
63	00111111	3F ?	127	01111111	7F	191	10111111	BF	255	11111111	FF

SELANAR GRAPHICS PRINTER PORT OPTION

SELANAR GRAPHICS PRINTER OPTION

Selana Graphics Printer Option Commands

The Selana Graphics printer option allows the user to do either raster dumps of the Selana Graphics screen to any port, or use the printer port in 'transparent' mode.

Note that the printer option consists of a prom installed in the Selana Graphics circuit board in location U21, and a UART (8251) installed in U26 (see Figure 1-a).

Also, the printer option requires firmware revision level 6 in proms U18, U19 and U20. Each prom is labeled, such as:

06A
16B
26A

The first digit indicates the location of the prom, the second digit the version, and the third digit is the revision level of the specific prom.

There are separate prom options for each printer. In addition, the baud rate selection jumpers on the Selana Graphics board must be set to match the printer. In all cases, the printer must contain the appropriate graphics option.

Raster Dump Mode

Before a dump, an XOFF is sent to the CPU. When the dump is finished, an XON is sent to the CPU. For each dump, the user may specify the screen window, height expansion, width expansion, and a termination character. These options are chosen through printer set mode. The default values will do a full screen, half wide dump.

The user should be very careful when choosing width expansions and windows as Selana Graphics does not test whether the number of dots you are trying the dump will actually fit on the printer. Read the documentation on your particular printer to determine the maximum number of horizontal dots allowed. The calculation for the number of dots dumped by Selana Graphics is:

$$\text{Horizontal Dots} = \begin{matrix} (\text{XRight} - \text{XLeft} + 1) * \text{Width} & \text{Width} > 0 \\ (\text{XRight} - \text{XLeft} + 1) / 2 & \text{Width} = 0 \end{matrix}$$

Full XON/XOFF and DSR handshaking is provided on all ports.

Printer Transparent Mode

Esc ; <

Printer transparent mode allows the user to link the printer port directly to the CPU port. This allows the user to dump printer listings to his printer without changing any cabling or tying up another RS-232 line. While in printer transparent mode, characters are handled as follows:

- From CPU: All characters are sent directly to the printer port. If debug mode is selected, characters will also be echoed on the CRT.
- From CRT: All characters are sent to the CPU. If local mode is selected, characters are simulating CPU input.
- From PTR: All characters are sent to the CPU except XON and XOFF which are used for synchronization.

Since Selanar Graphics buffers CPU characters, the printer port and CPU port may be set to differing baud rates. XON/XOFF and DSR protocol is supported for the printer port.

To exit printer transparent mode, the character specified by Exit CH must be received from the CPU or entered from the keyboard while in local mode.

Ende: ^W

Entering Printer Option Code

From Selanar Graphics native mode:

ESC ; Enter Printer Option set mode

ESC : Do printer dump

From Selanar Graphics TEK 4010 emulation mode:

ESC cW Do printer dump

Printer Option Set Mode

Printer option set mode allows the user to modify internal variables that affect where and how the screen will be dumped. The variables are:

Port	RS-232 output port to be used Ø - Printer 1 - CPU 2 - CRT Default - Ø
XLeft	Left boundary for dump window Default - Ø
XRight	Right boundary for dump window Default - 1224
YTop	Top boundary for dump window Default - Ø
Y Bottom	Bottom boundary for dump window Default - 239
Heigth	Heigth expansion count. Each dot will be expanded (Heigth) times vertically when dumping. Legal values are 1 to 127. Default - 1
Width	Width expansion count. Each dot will be expanded (Width) times horizontally when dumping. Width=Ø is a special case which will produce a ½ wide compression. Legal values are Ø to 127. Default - Ø
TermCh	Contains the ASCII value of the character to be sent to the selected port at the end of the dump. This is typically used to product a top of form between pictures being dumped to the printer or to set a special sentinal character at the end of a CPU dump. Default - Ø
ExitCh	Contains the ASCII value of the character that will cause Selanar Graphics to exit printer transparent mode. Default - <u>23</u> (cw, End of transmission block).

The format for specifying set mode parameters is:

ESC; <ASCII digit string> <character >

'ESC;' enters the parameter set mode.

'ASCII digit string' is optional; the numeric string is entered into a 16 bit accumulator (acc). If no number is entered, zero is assumed.

The 'character' specifies the parameter set using the accumulator as data when applicable. The following are the character commands:

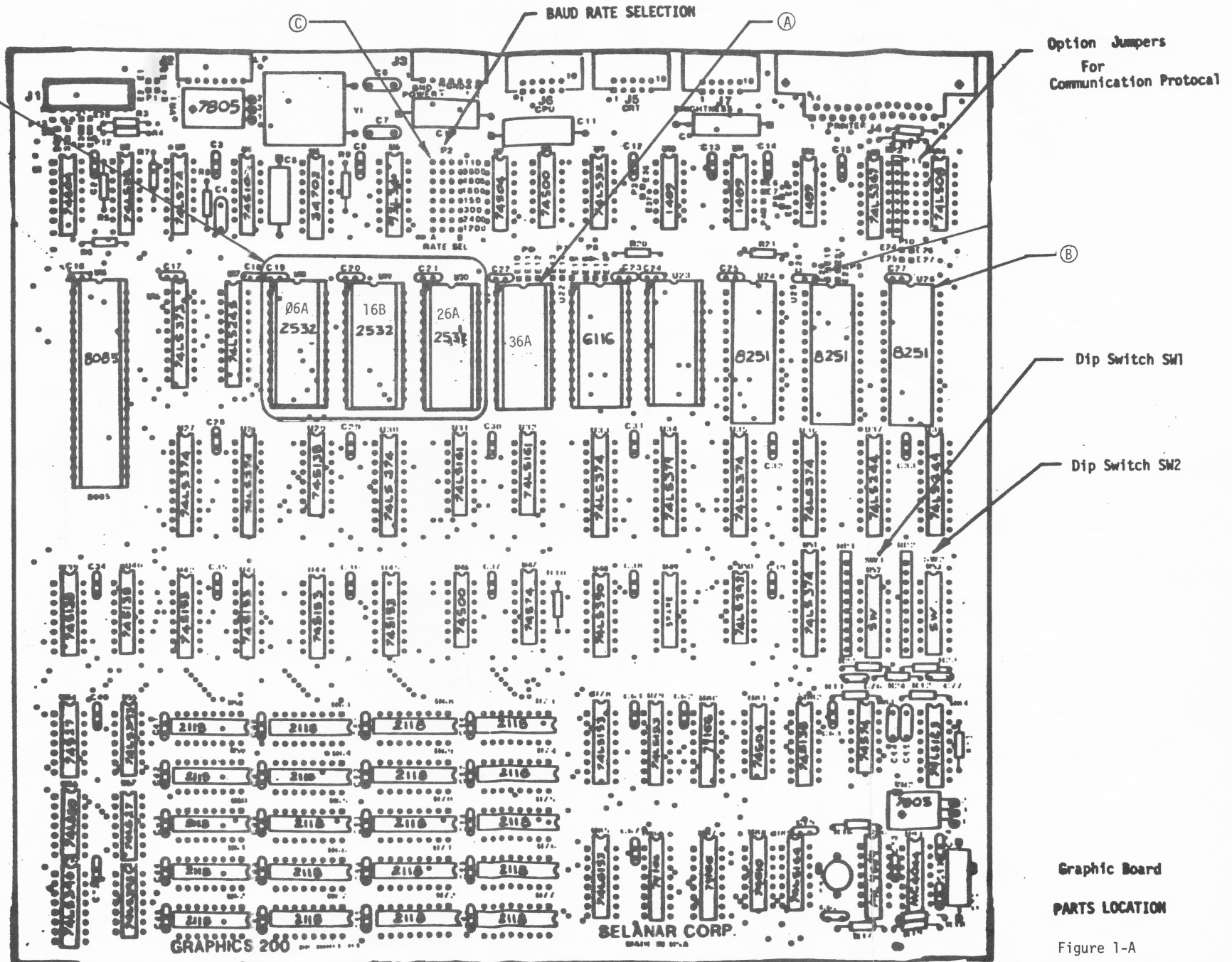
<u>Character</u>	<u>Function</u>
B	Y Botm = Acc (Acc AND 0FFh), Acc = 0
D	Exit printer set up mode and dump screen to printer
E	Exit printer set up mode
H	If Acc = 0, then Height = 1; otherwise Height = Acc (Acc AND 7Fh), Acc = 0
L	XLeft = Acch, Acc = 0
P	If Acc < 3, then port = Acc, Acc = 0; otherwise, port = 0, Acc = 0
R	XRight = Acc, Acc = 0
T	YTop = Acc (Acc AND 0FFh), Acc = 0
W	Width = Acc (Acc AND 7Fh), Acc = 0
Y	ExitCH = Acc (Acc AND 7Fh), Acc = 0
Z	TermCh = Acc (Acc AND 7Fh), Acc = 0

< Printer Transparent Mode

PRINTER OPTION

Proms U18, U19, U20 must be version 6 or later.

- A. Install printer prom.
- B. Install UART (8251)
- C. Set desired printer baud rate. (Column A)



Graphic Board
PARTS LOCATION

Figure 1-A