Video Signal Generator

VG-819

OPERATION MANUAL

Ver. 1.0.1

October 23, 1995

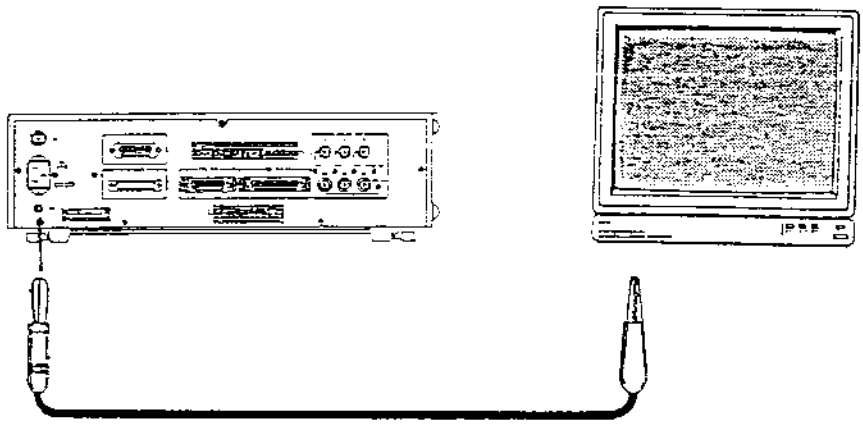
PRECAUTIONS TO BE TAKEN BEFORE USING THIS EQUIPMENT

1. Ventilation

   Choose a location for operating the unit where the air circulates as efficiently as possible.

2. Before connecting the VG-819 to a CRT display

   First connect the frame ground between the VG-819 and the CRT display, then connect the video signal cables. The accessory grounding cable assembly supplied with this unit is intended to be used for this purpose. Refer to the drawing shown below.



Insert the banana plug into the Frame ground receptacle

Connect the alligator clip to the CRT frame ground

   A common frame ground connection makes the output digital-to-analog converter, and other expensive parts, less susceptible to damage. This should be particularly kept in mind when the CRT is a new design.

3. Before disconnecting the VG-819 from the CRT display

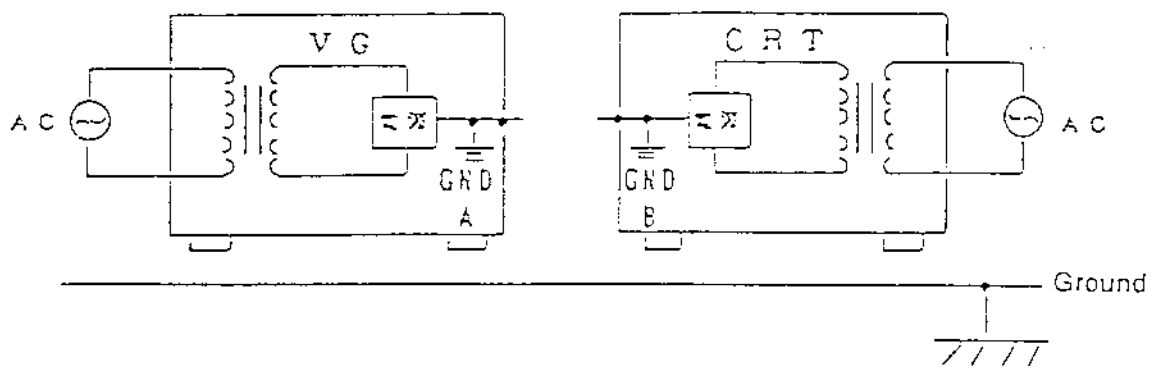
First disconnect the video signal cables and then, finally, disconnect the frame ground.

The following section explains why the VG-819 may be damaged if the frame grounds are not connected in common.

An indefinite ground potential will be produced if the frame grounds of the VG-819 and the CRT are not connected, and a BNC cable or equivalent connector is not connected between the two units. (This situation is likely to occur in some environments or countries more than others, but since the possibility exists, we STRONGLY recommend taking this simple precaution).

Even if GND A of the VG unit and GND B of the CRT in the figure below are the same, the voltage may be 100V at GND A and -100V at GND B, as seen in terms of ground potential. (A prickling sensation will be felt if the VG and CRT are touched at the same time).

It is now assumed that the VG unit and the CRT have been connected in this state.



It is further assumed that if the signal line has been connected before the ground line with a TTL monitor, a voltage level of several hundred volts will be applied to that line. The VG-819 employs a protection circuit, but this is not sufficient to withstand a voltage as high as this, and the TTL output section will be damaged. (The IC's are mounted in sockets, making them easier to replace if they are damaged).

Alternatively, it is assumed that the VG power supply circuit is subjected to a load, even when the protection circuit has been successful at protecting the output circuits. GND A and GND B will be placed at the same potential, but this will damage the other ICs between the output and the power supply, since GND A and GND B were originally at different potentials.

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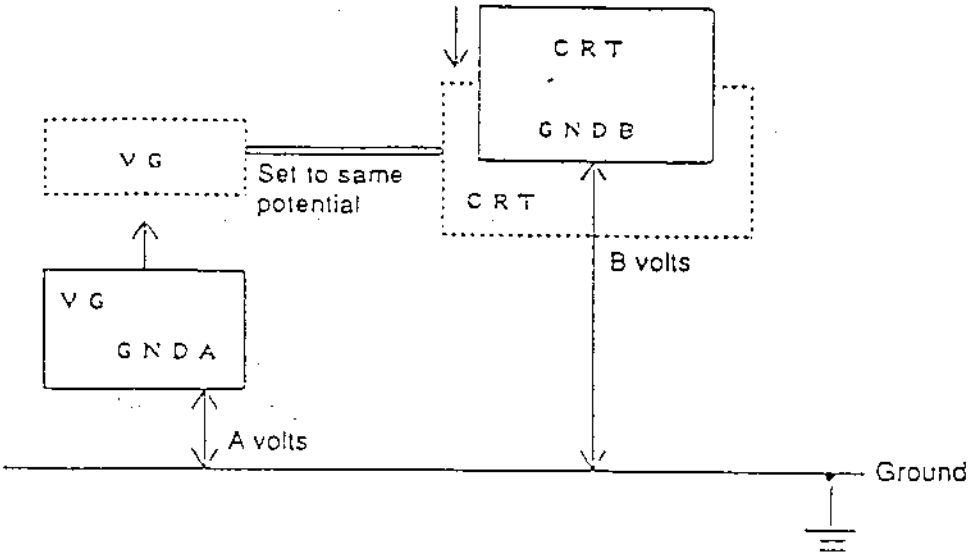
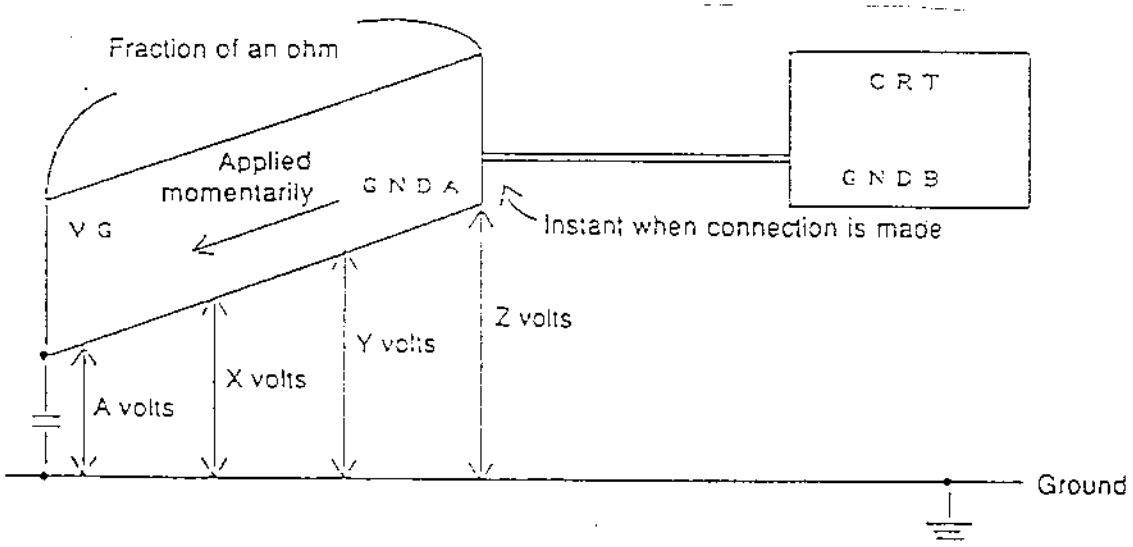
It is further assumed that GND A and GND B will be connected first (before the signal lines). (See figure below). In this case, when the BNC connectors are connected, a voltage of several hundred volts will be momentarily applied to the GND on the VG BNC connector side.



However, since the VG chassis has some capacitance, and since electrons move at a finite speed, this situation creates a potential difference inside the VG-819.



As a result, the internal ICs (particularly the ICs which act as an interface between the different circuit boards), will be damaged.

This means that before connecting the AC power, the frame

grounds of both the VG and the CRT must be connected. Particular care must be taken in locations where access to earth ground is difficult because of the physical form of the AC outlet.

Timing signals

2) TV monitors use a fixed timing frequency for both the vertical and horizontal sync signals. In the USA, the horizontal sync signal occurs about every 63.49 microseconds (or a frequency of 15.75 kHz). The vertical sync rate is about 60Hz. So, a new image is displayed every 1/60th of a second. The sync signals arrive at the TV monitor input on the same cable as the video information. Eventually, the TV circuits will separate the 2 sync signals in order to drive the CRT display's deflection circuits. The resulting display resolution is about 746(H) x 525(V)(FCC).

With RGB monitors, the "limits" of the TV system were eliminated. Display resolutions of between 640 x 200 to 1280 x 1024 are common. Some monitors even reach beyond 2000 x 2000. The sync frequencies required to achieve these resolutions are different than for TV displays. For a 1280 x 1024 monitor, the horizontal sync frequency is about 64kHz (instead of 15.75kHz for TV). The vertical frequency for most RGB monitors is usually between 60Hz and 70Hz. Each RGB monitor will have its own specification for the timing it was designed to use. Some RGB monitors accept a range of timing, to achieve a range of different resolutions.("multi-sync" monitors). The sync signals can be delivered in 3 different ways, depending on the monitor specification:

a) Sync on a video channel (usually green)
b) combined horizontal and vertical sync (1 cable)
c) separate horizontal and vertical sync (2 cables).

The "dot" or "pixel" Clock

3) The TV broadcast signal is a pure analog signal, originating at the TV recording camera. The resolution observed on the TV display is more a function of the TV circuitry and CRT display quality, than of the original broadcast signal. The video bandwidth of the TV signal is about 4.5MHz., so this places an upper limit on the amount of detail that can be seen. However, since the recording medium is either video tape or film, there are no finite "locations" for each resolvable picture element. The image is continuous, with no fixed edges to objects in the scene.

RGB monitors are usually driven by computers. The video information is stored in a digital format, in the graphic memory of the computer. The video information must be synchronously "clocked" into and out of the memory. The rate at which the information is clocked in/out is called the "pixel clock" or "dot clock". Each picture element occupies a particular location in the video memory, called a "pixel". (short for picture element). There are also a finite number of pixels based on the available graphic memory in the computer. This results in a fixed "displayed resolution", referring to the number of pixels in the horizontal

1.0 OUTLINE

The VG-819 generates a wide selection of video timing and test patterns quickly and easily. A 5 to 240 MHz wide dot clock range enables evaluation of CRT monitors up to 130 KHz horizontal scanning rate.

The VG-819 can also be used for production and R&D applications of flat panel displays including plasma displays, LCD etc.

2.0 FEATURES

* Dot (pixel) clock range is 5 to 240 MHz.
* Up to 30 different complex test patterns are built in, such as SMPTE, high voltage regulation test, paring, 256 colors simultaneous display, Ramp pattern etc.
* Very fast pattern display speed.
* Built in RS-232 and GPIB interfaces for compute control.
* Independent programming of horizontal/vertical and dot clock frequencies.
* Front panel EEPROM in ZIF socket for easy program storage and recall using front panel keys.
* Analog, TTL and ECL outputs.
* Panel ROM structure is compatible with the VG-814, VG-815, VG-829, VG-812 AND VG-813.

3.0 Abbreviations Used

3.1 Output Signals

* Hs .... horizontal sync
* Vs .... vertical sync
* Cs .... composite sync
* HT .... half-tone (intensity)
* CLK .... dot clock
* EQP .... equalizing pulse
* SERR .... serration
* CV .... sync signal on Video
* HD .... horizontal direct drive pulse
* VD .... vertical direct drive pulse

3.2 Operation

* PROG .... Program Key
* PAT SEL.... Pattern Select Key
* OUTPUT .... Output Condition Key
* PAT .... Pattern Key
* FUNC .... Function Key

3.3 Conventions Used in this Manual

1) Front panel keys are enclosed in quote marks and in capital letters.(i.e. "SET").

2) The term "front panel ROM" can mean either an EPROM (UV erasable) or an EEPROM (electrically erasable). The VG-819 can read both devices, but can only write to an EEPROM.

3) Cursor movement between pages and within the LCD display page is accomplished with the following keys. For the sake of clarity, these keystrokes have not been included in all the programming procedure text.

" ▶ " Moves the cursor within the current page.

" ▼ " Increment the display to the next page in the current parameter group.

" ▲ " Decrement the display to the previous page in the current parameter group.

4) The term "monitor" is used in reference to the device under test. It should be understood though that the VG-819 can be used to test other display devices as well, such as LCD panels, plasma displays, display interface circuitry etc.

4.0 New User Application Information

Though there is a wide selection of published information on Television receiver and display operation, there seems to be little if any covering the operation of RGB type monitors. This section is intended to provide some basic information on RGB display systems, and how the VG-819 is used to test them. Those users who are already familiar with these display systems may elect to skip this section.

4.1 RGB Monitor Basics

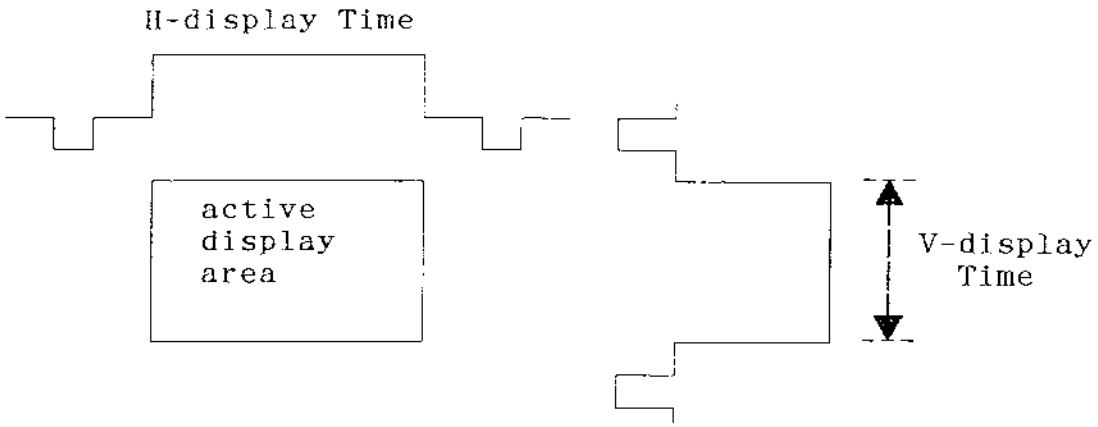
All deflection based CRT display systems require 3 types of signals to present the video information on the CRT display.

a) The Vertical signal is used to position the video beams at the top, left corner of the display, at the beginning of each frame.

b) The Horizontal signal is used to sweep the beams across the display, and then down one line on the display.

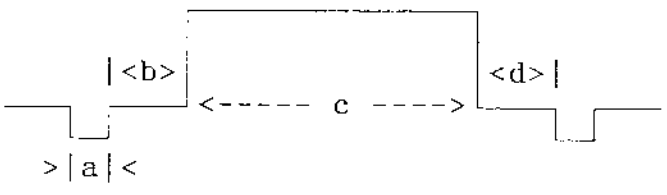
c) The RGB video signals provide an intensity level for each of the 3 beams, as they move across the screen.

The diagram below illustrates the basic relationship between sync signals and the video display area.



Both the horizontal and vertical signals are divided up into 4 segments of time. The total of these 4 segments add up to what is called the "H-period" (horizontal signal) or "V-period" (vertical signal).

a) Sync pulse width
b) Back porch time
c) Active display time
d) Front porch time



It is during the active display time that video information presented on the screen.

In the horizontal direction, the active display time is divided into pixels. The number of pixels that can be displayed on each line is determined by the active display time (in microseconds) divided by the dot clock period (in nanoseconds).

In the vertical direction, the active display time is divided into the number of H-Lines that can be displayed. The number of lines that can be displayed is determined by the vertical display time (in milliseconds) divided by the H-Period (in microseconds).

The sum of the back porch time + sync width + front porch time is refered to as "blanking". The blanking time is used to re-position the beams to the next display point.

4.2 RGB Video verses Television Video

Both RGB and Television display systems ultimately use the same 5 signals to drive the CRT display (R,G,B,H-sync,V-sync). The main difference is how the color and brightness information is fed into the signal inputs of the systems. Also, Television systems are based on a standard signal timing frequency, while RGB displays can be designed for any number of different display resolutions, and require different timing signal frequencies.

Color and Brightness

1) The color, brightness and sync timing signals for TV are fed into the TV monitor input on a single cable. Brightness is realized by increasing the level of the video signal (amplitude). Color information however, is "encoded" in a small signal that is present on each horizontal line of video information. Eventually, the TV circuits will decode the color information into seperate R,G,B signals, to drive the CRT display.

   For the RGB monitor, the RGB color information is seperated into 3 different signals, requiring 3 seperate cables at the monitor input. Brightness is realized by increasing the level of each signal independantly. The color produced is determined by the balance of the 3 signal levels, as they strike a dot on the screen.

Timing signals

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direction, and lines in the vertical direction. Therefore, to clock out a certain number of pixels in a certain amount of time, requires a "pixel clock" of a certain frequency.

Interlace/Non-Interlace

4) In TV video, the vertical signal is "interlaced". The image (frame) is divided into 2 "fields", that are displayed one after the other, at a 30Hz rate. The total frame (even and odd fields) is repeated at a 60 Hz rate.

Most RGB monitors are "non-interlaced". The total image is displayed sequentially.

4.3 LCD and Plasma Displays

Flat panel displays such as LCD and Plasma displays, also require the same 5 signals (if color) that the CRT display requires. The timing requirements are different though. Typicaly there is no Back or Front porch time, either in the horizontal or the vertical signal (since there is no "beam" to re-position). The displays usually have a setup and hold time requirement between the pixel clock and the video data. Also, in an effort to reduce the required pixel clock frequency, the higher resolution displays often multiplex the video information over 2 or more data inputs. Flat panel displays need an external pixel clock source to latch the video data into the panels' data buffers.

4.4 Video signal levels, Sync configurations

The video signal can be either analog or digital. Many of lower end computer monitors are driven with TTL signals for both video and sync. If the signal input is digital, it can be one of the types shown below.

a) TTL or ECL
b) R,G,B : 8 colors
c) R,G,B,I : 16 colors
d) R,G,B,RHT,GHT,BHT : 64 colors
e) 8 bits for each R,G,B : 16 million colors

I = intensity RHT = red half tone

Except for the 8 bit input systems, the remaining schemes are limited in the number of colors or gray scales that can be produced, since a digital signal can only be "on" or "off". Many of the lower resolution displays use either an intensity bit (I) or a Half Tone input. Both of these methods assign the primary color input to produce about 70% of the signal amplitude, and the secondary input makes up the remaining 30%.

In the higher resolution displays (VGA and higher), the video signal is usually analog. A typical level for the video signal is .70 volts. If the sync is analog, it is usually about 1.0 volts (seperate sync) or .30 volts (sync on video) . The polarity of the sync is changed in multi-sync monitors depending on the resolution that is being displayed.

4.5 Typical Formulas used with Video

$$\text{Horizontal Period } (\mu S) = \frac{1000}{\text{Horizontal Scan Rate (kHz)}}$$

$$\text{Horizontal Scan Rate (kHz)} = \frac{1000}{\text{Horizontal Period } (\mu S)}$$

$$\text{Vertical Period (mS)} = \frac{1000}{\text{Vertical Refresh Rate (Hz)}}$$

$$\text{Vertical Period (H-lines)} = \frac{\text{V-Total (mS) x 1000}}{\text{H-Period } (\mu S)}$$

$$\text{Vertical Refresh Rate (Hz)} = \frac{1000}{\text{Vertical Period (ms)}}$$

$$\text{Dot Clock Frequency (MHz)} = \frac{1000}{\text{Pixel Period}}$$

$$\text{Pixel Period (nS)} = \frac{\text{H-Display } (\mu S) \text{ x } 1000}{\text{Displayed Horizontal Dots}}$$

$$\text{Horizontal Displayed Dots} = \frac{\text{H-Display } (\mu S) \text{ x } 1000}{\text{Pixel Period (nS)}}$$

$$\text{Total Horizontal Dots} = \frac{\text{Horizontal Period}(\mu S) \text{ x } 1000}{\text{Pixel Period (nS)}}$$

4.6 "Standards", and Estimating Signal Timing

There are a few true standards in the RGB monitor industry, but unfortunately the number is quite limited. More attention is focused on "standard resolutions", instead of standard signal timing. At the low end, the standard usually used is "RS-170". But RS-170 does not specify a pixel clock, or what blanking time, or display time to use. The same horizontal resolution can be achieved in 2 different ways. With a fixed H-Display time, the pixel clock can be made faster or slower, increasing or decreasing the H-display resolution. With a fixed pixel clock, the H-display time can be increased to increase H-Display resolution.

In the higher resolution monitors, most of the differences are based on how much blanking time to use, and how to allocate it (between back porch, sync time, and front porch). Most 1280 x 1024 monitors run at about 64kHz(H) and 60Hz(V).

The table below covers the most common H-Scan rates used.

Display Type	Horizontal Scan Rate
CGA (640x200)	15.75kHz
EGA (640x350)	21.85kHz
VGA (640x350,400 or 480)	31.50kHz
1024x768	48.01kHz
1024x1024	63.69kHz
1280x1024	63.49kHz

If a monitors' timing requirements are not known, there are a few approaches that can be taken. Some monitors can be damaged if a signal too far away from the proper frequency is used. It is always best to get the required signal timing specifications if at all possible.

Sync: Check the number of signal inputs. If there are 3, then its "sync on Green". If there are 4, then it uses "Composite Sync"(usually negative polarity). If there are 5 inputs, it uses seperate R,G,B,H,V.

Signal Level: Use an ohmmeter to measure the input impedance of both the video and sync inputs. If its 75 ohms, then the level for video is usually .70 volts. If it uses sync on green, then the sync level is usually .30 volts. If the input impedance is about 1.5 Kohm, then the input is TTL. If the seperate sync input is 75 ohms, the sync level is usually 1 volt.

Sync Frequency: Vertical sync is usually around 60Hz, except 2 of the VGA modes, which run at 70Hz. Horizontal period is a bit more difficult, but if the display resolution is known, then a good guess can be made using the table above. Once the Horizontal period is determined, the number of V-Total line to obtain a 60Hz refresh rate can be calculated. V Total lines = 16.666 x 1000/ H-Period(μS).

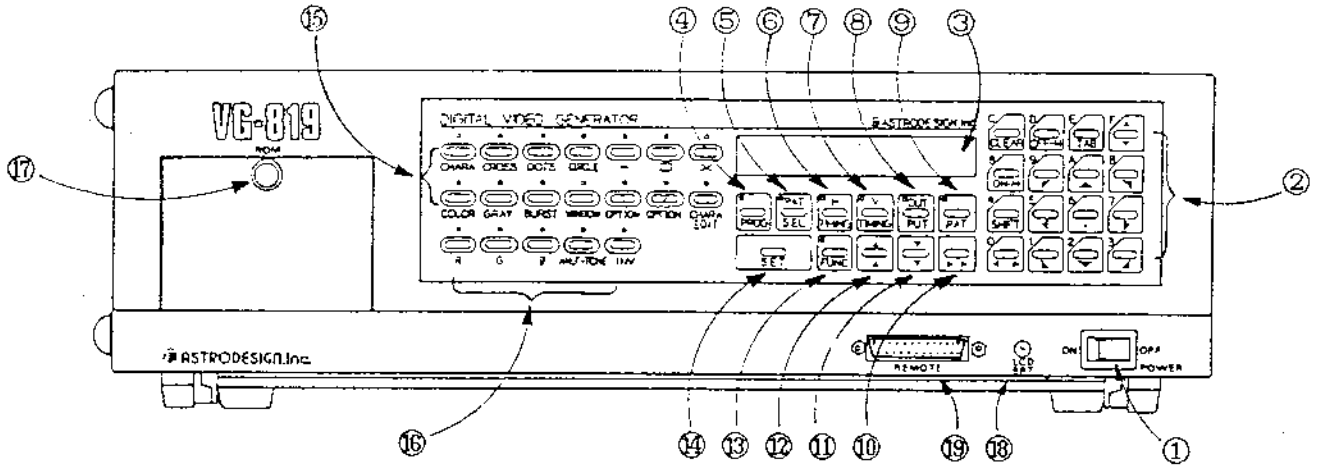
Display Area, Blanking: Enter the active display area (in dots and number of lines). Divide the remaining blanking time between the sync pulses and back porch times.

Final Adjustments: Once the basic timing has been established, turn on the "border" pattern. If the border is cut off at the top of the display, increase the value of the vertical back porch (the sync time may have to be reduced to do this). If it is cut off at the bottom, decrease the value of the vertical back porch. The same approach applies to the horizontal direction, where the left side of the display corresponds to the H-back porch.

Finally, turn on the circle pattern. If the circles are like "eggs standing up", then the pixel clock is too high. If the opposite case is true, then the pixel clock is too low.

5.0 Front and Rear Panel Description

5.1 Front Panel



1) Power Switch : On/Off of AC power

2) "0" to "F" keys : Data input keys

3) LCD Display : Display for parameter entry

4) "PROG" key : Program number selection

5) "PAT SEL" key : Selection of displayed patterns in Function 0 or 1.

6) "H TIMING" key : Program horizontal timing

7) "V TIMING" key : Program vertical timing

8) "OUTPUT" key : Program output signals

9) "PAT" key : Program pattern definitions

10) " ▣ " key : Cursor movement within LCD display page

11) " ▣ " key : Increment LCD display page (forward)

12) " ▣ " key : Decrement LCD display page (backward)

13) "FUNC" key : Select Function number (0 to 5)

14) "SET" key : Stores program data in the panel EEPROM or internal RAM. Enables video outputs.

15) Pattern keys : On/off of each display pattern

16) "R", "G", "B" keys : On/off of R, G, B

"HALF TONE" key : On/off of all RHT,GHT,BHT

17) Panel ROM socket : 64K bit ROM

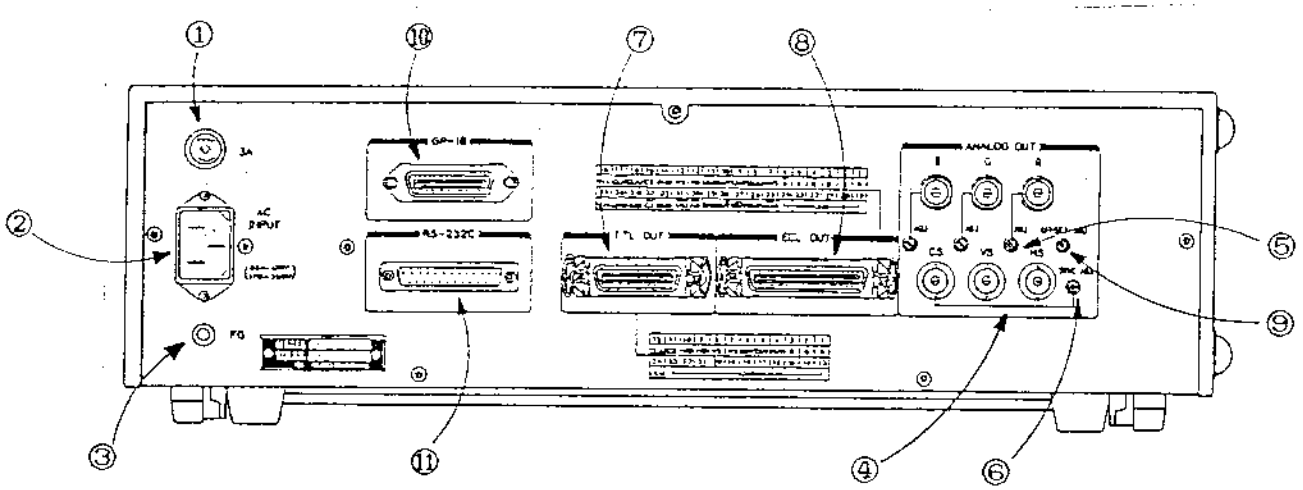
EEPROM : Hitachi HN58C65P-25 (Read/Write)

EPROM : 2764 (8KB, 250ns) (Read only)

18) LCD Brightness control

19) Connector for remote control box (see page 89)

5.2 Rear Panel



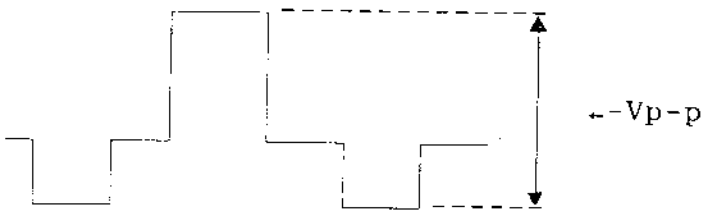
1) Fuse : 3.0 amp. slow-blow type

2) AC input : AC power input
(85-130 / 170-250 VAC)

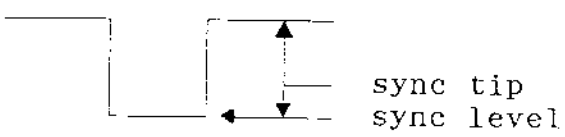
3) Frame ground

4) Analog Outputs (BNC) : Red, Green, Blue,
H-Sync, V-Sync and
Composite sync

5) Analog video level adjustment control : Total video level (Vp-p) adjustment



6) Analog sync level adjustment control : Hs, Vs and Cs level adjustment. DC reference of sync tip remains fixed



7) TTL Output (24 pin) : Pin assignment is as follows

Pin Number	Signal	Pin Number	Signal
1	Red	13	GND
2	Green	14	GND
3	Blue	15	GND
4	RHT	16	GND
5	GHT	17	GND
6	BHT	18	GND
7	Hs	19	GND
8	Vs	20	GND
9	HD	21	GND
10	VD	22	GND
11	Cs	23	GND
12	CLK	24	+5V

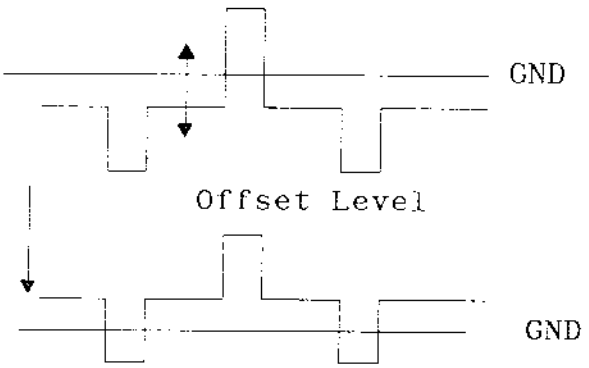
NOTES : 1) No current output is available from DC + 5 volt output. If current output is required, an internal jumper must be installed. Please contact your distributor or representative for more details.

2) TTL R,G,B,RHT,GHT,BHT and CLK are present up to 240 MHz, however the guaranteed range of the CLK signal is 120 MHz.

8) ECL output (36 pin) : Pin assignment is as follows

Pin Number	Signal	Pin Number	Signal
1	Red	19	GND
2	Red(bar)	20	GND
3	Green	21	GND
4	Green(bar)	22	GND
5	Blue	23	GND
6	Blue(bar)	24	GND
7	RHT	25	RHT(bar)
8	GND	26	GND
9	GHT	27	GHT(bar)
10	BHT	28	BHT(bar)
11	GND	29	GND
12	Hs	30	Hs(bar)
13	Vs	31	Vs(bar)
14	GND	32	GND
15	Cs	33	Cs(bar)
16	CLK	34	GND
17	CLK(bar)	35	GND
18	Vtt (-2V)	36	Vtt (-2V)

9) Offset level adjustment : Adjustment of analog offset level



10) GPIB Interface (24 pin)

11) RS-232C Interface (25 pin)

6.0 Basic Operations

6.1 Cable Connections

The following chart illustrates the most common video cable arrangements that are used in analog display testing. Be sure to connect the VG-819 video outputs to only one display device at a time, with proper termination, in order to assure good signal quality and protect the video output circuits.

Be sure and connect the Frame ground cable between the VG-819 and the monitor.

ANALOG VIDEO: Using Supplied BNC Cables (75 ohm)

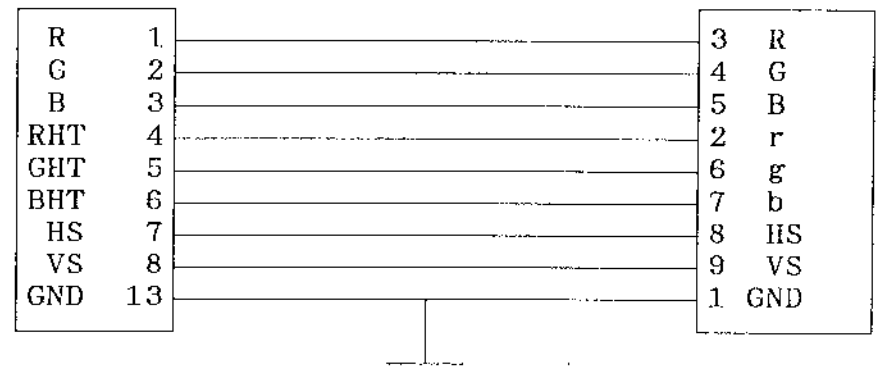
Signal Type	BNC Connections					
	R	G	B	H	V	CS
R+G+B (sync on green)	●	●	●	⊙	⊙	⊙
R+G+B + composite sync	●	●	●	⊙	⊙	●
R+G+B + seperate sync	●	●	●	●	●	⊙
Monocrome (sync on green)	⊙	●	⊙	⊙	⊙	⊙

● = connection
⊙ = no connection

TTL/ECL VIDEO: Using Customer Cables

There are so many possible cable arrangements (pin assignments) that they cannot all be illustrated here. However, the following examples show the basic method to use.

EGA 64 color cable



VG-819 TTL Connector | Shield | EGA 9 pin Connector

NOTE: If the monitor displays only (16 colors), use one of the Half Tone outputs to drive the "i" input.

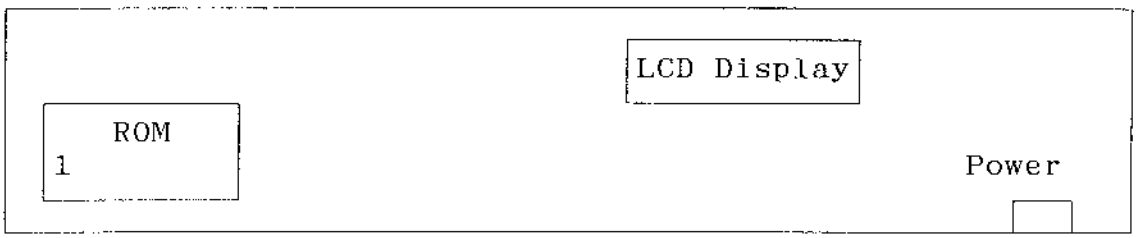
6.2 Caution before Powering On

1. Make sure that the cables are correctly connected between the VG-819 and the monitor. (see section 6.0).

2. Make sure that the correct type of panel ROM is installed. For read AND write operations, an EEPROM is required (Using Function 3, 5, or as the destination ROM in Function 4). For read ONLY operations, an EPROM can be used instead (Function 0, 1, 2, or as the source ROM in Function 4).

3. Make sure that the panel ROM is installed in the correct direction (pin 1 orientation). If it is installed incorrectly, the device may be destroyed. See the figure below.

   Front Panel View:



Pin 1, located at lower left.

6.3 Program Construction

Up to 40 different Programs (number 01 to 40) can be stored in one panel ROM. One program consists of five parameter groups, and each group is selected by the front panel keys, as explained below.

1) Pattern select "PAT SEL" key : Selection of which patterns are automatically displayed during Function 0 and 1 operation.

2) Horizontal timing "H TIMING" key : Selection of the dot (pixel) clock and the horizontal timing values.

3) Vertical timing "V TIMING" key : Selection of the vertical scan mode and the vertical timing values.

4) Output conditions "OUTPUT" key : Selection of sync on video
polarity of video (TTL, ECL)
polarity of sync(TTL,ECL,ANA)
analog voltage and set up levels
Selection of output mode: (Analog, TTL/ECL)
Selection of RZ or NRZ modes

5) Pattern definitions "PAT" key : character
cross hatch
dot
circle
color bar
gray scale
multi burst
window
option pattern selection

Each program is completely independent from the other programs. Timing can be duplicated in several programs to create multiple tests for a single monitor. Changes to any of these parameters can be made easily using Function 3 (see description in the next section).

6.4 Outline of Basic Operation

Operation of the VG-819 is separated into 5 "Functions". Functions 0 and 1 are two different ways to run the Programs and display the patterns that have been created. Function 2 is used to make temporary changes to these programs. Function 3 is used to save the changes made to the programs in the panel EEPROM. Function 4 provides various methods to duplicate programs and panel ROMS. Function 5 is used only to select the GPIB address for the VG-819.

Entry into each Function is accomplished by pressing the "FUNC" key, and entering a function number. An overview of each Function is provided below. Full detailed operation is covered in the "Detailed Operation" section.

6.4.1 Description of Functions

1) Function 0 : Direct Display

This is the default mode of operation at power up. The LCD screen prompts the user to enter a program number, or press the " ▼ " key or " ▲ "key. After a program is selected, the video timing, pattern definitions, and pattern "on" selections are executed based on the parameters stored in the Panel ROM. The selected program remains active until a new program number, or the " ▼ " key or " ▲ " key is pressed. Escape this Function by pressing the "FUNC" key.

2) Function 1 : Auto Display

Operation of this function is the same as Function 0, except the programs are incremented automatically. The range of programs to use, and the delay time between each program, is selected by the user when entering this Function. Escape this Function by pressing the "FUNC" key.

3) Function 2 : Program Edit

Function 2 is used to make temporary changes to programs stored in the panel ROM. The operation of Function 2, and Function 3 are exactly the same, except for the method of storing the program changes. Use Function 2 to make TEMPORARY changes to programs, or when the panel ROM is an EPROM (read only). All the changes made are written to a buffer area in the VG-819, instead of to the panel ROM. The changes become active on the video outputs of the VG-819, each time the "SET" key is pressed. The changes are lost when a new program number is selected, or when the power is turned off. Escape this Function by pressing the "FUNC" key.

4) Function 3 : Panel EEPROM Program Edit

Operation of Function 3 is exactly the same as Function 2, except that the changes made are stored in the panel ROM (EEPROM only), each time the "SET" key is pressed. Also, pattern "on" status for Function 0 and 1, editing of user characters, and editing of each Program name is done in Function 3. Program parameters can be changed repeatedly using this Function, so the final parameter values do not need to be known before starting. The only restriction is that an EEPROM must be used as the panel ROM when using this Function. Escape this Function by pressing the "FUNC" key.

5) Function 4 : Panel ROM copy

Function 4 is used to copy all or part of a panel ROM, to another EEPROM. Also, individual programs, or blocks of programs, can be copied within the same EEPROM. (This is useful for creating multiple tests for the same monitor). As well, all the EEPROM's contents can be erased. Escape this Function by pressing the "FUNC" key.

6) Function 5 : GPIB Address Selection

The GPIB address of the VG-819 is programmed using this Function. The address is stored in the panel ROM, so only an EEPROM can be used. Escape this Function by pressing the "FUNC" key.

Notes:

1) Astrodesign, Inc. has approved EEPROM type HN58C65P-25, made by Hitachi. Other EEPROM manufacturers may offer direct replacements.

2) To prevent users from altering the contents of the EEPROM, use a separate prom programmer to copy the EEPROM to an EPROM, then use the EPROM for the panel ROM for normal monitor test operations. Any 2764-25 type EPROM may be used as a panel ROM (read only).

6.5 Quick Start Procedure

This procedure is provided for new users of the VG-819, in order to get a test pattern on the monitor under test as soon as possible. This step-by-step procedure relies on the selection of a program from the "Standard Timings" EPROM (No. 6335), that matches the signal requirements of the monitor under test. This procedure does not cover making any changes to the Standard programs.

PLEASE read from the beginning of Section 6.0 for basic precautions and information, before using this procedure.

PROCEDURE:

1) Determine the Timing and signal requirements of the monitor to be used with this procedure.

2) Determine the program number that matches the monitor Timing and Signal requirements, from the list on page 80 and 81 of this manual. Make note of the program number.

3) Install the EPROM labeled 6335 (Standard Timings) in the panel ROM socket.

4) Connect the required cables as described on page 15.

5) Turn on the Monitor. Turn on the VG-819.

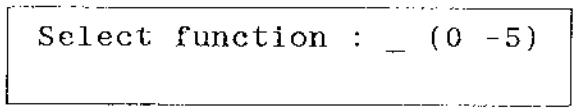
6) On the VG-819 Front panel, press the following keys;

   a) "FUNC"
   b) "2"
   c) "SET"
   d) (enter the 2 digit program number to use)
   e) "SET"
   f) "COLOR"
   g) "CROSS"

7) Color bars and a white cross hatch pattern should be displayed on the monitor. If the monitor is not in sync, turn off the VG-819 and follow the instructions for Function 2 on page 28, instead of step 6 in this procedure. If no display is obtained (blank screen), refer to the Troubleshooting section on page 92, before proceeding to the Function 2 instructions.

6.6 Selection of Functions

1) The Function selection screen can be obtained at any time by pressing the "FUNC" key. The following is displayed on the LCD panel.



FUNCTION SELECT SCREEN

2) Enter a Function number (0 to 5), and press the "SET" key.

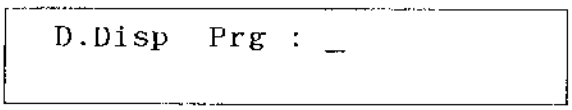
6.7 Selection of Programs

Individual programs can be selected for display or editing in 3 ways:

a) Function 0 : Display only, no editing.
b) Function 2 : Display and editing, temporary.
c) Function 3 : Display and Panel EEPROM editing.

6.7.1 Function 0 Program Selection

1) After selecting Function 0, the following is displayed on the LCD panel;

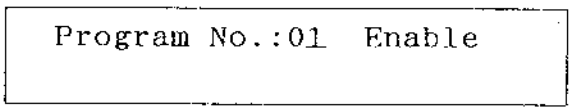


FUNCTION 0 SCREEN 1

2) Enter a program number. Patterns can be turned on/off by pressing the pattern keys. No changes to Timing or pattern definitions can be made.

6.7.2 Function 2 Program Selection

1) After selecting Function 2, the following is displayed on the LCD panel;

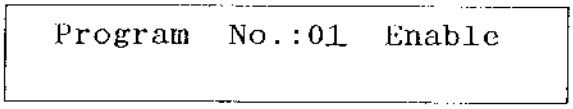


PROGRAM SELECT SCREEN

2) Enter a program number (if other than 01). Temporary changes can be made to Timing and Pattern definitions. (see Detailed Operation section). After making any desired changes, press the "SET" key. Patterns can be turned on/off by pressing the Pattern keys. (initial state is off).

6.7.3 Function 3 Program Selection

1) After selecting Function 3, the following is displayed on the LCD panel.



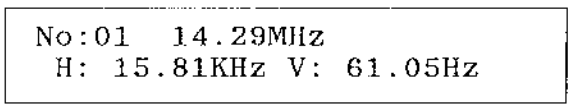
PROGRAM SELECT SCREEN

2) Enter a program number (if other than 01). Changes to Timing and Pattern definitions can be made and saved in the panel EEPROM (see Detailed Operation section). After making any desired changes, press the "SET" key. Patterns can be turned on/off by pressing the Pattern keys. (initial state is off).

6.8 Selection of Patterns

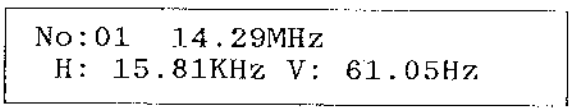
After selecting a Program number while using Function 0, 2, or 3, patterns may be turned on or off (toggle) by simply pressing the desired pattern key.

1) After selecting a Program number using one of the 3 procedures in section 6.7, one of the 2 screens shown below will be displayed.(The program number and timing information displayed will depend on the Program selected).



Screen 1 : Function 0

Some pattern keys may be on already, so press them to turn them off. Press others to turn them on.



Screen 2 : Function 2 or 3

No pattern keys will be on initially. Press them to turn them on, press again to turn them off.

7.0 Detailed Operation

This section covers the complete operation of each function in detail, and some of the information presented in Chapter 6 will be repeated.

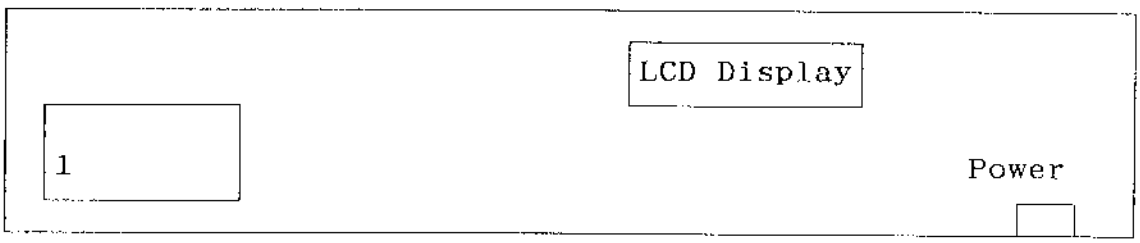
Please observe the following precautions before proceeding:

1. Make sure that the cables are correctly connected between the VG-819 and the monitor. (see section 6.0).

2. Make sure that the correct type of panel ROM is installed. For read AND write operations, an EEPROM is required (Using Function 3, 5, or as the destination ROM in Function 4) . For read ONLY operations, an EPROM can be used instead (Function 0, 1, 2, or as the source ROM in Function 4).

3. Make sure that the panel ROM is installed in the correct direction (pin 1 orientation). If it is installed incorrectly, the device may be destroyed. See the figure below.

   Front Panel View:



Pin 1, located at lower left.

7.1 Function 0 : Direct Display

This is the default mode of operation at power up. The LCD screen prompts the user to enter a program number, or press the " ▼ " or " ▲ " key. After a program is selected, the video timing, pattern definitions, and pattern "on" selections are executed based on the parameters stored in the Panel ROM. The selected program remains active until a new program number, or the " ▼ " or " ▲ " key is pressed. Escape this Function by pressing the "FUNC" key.

1) When the power is turned on without pressing any keys, the start-up screen for Function 0 is displayed automatically. Alternately, Function 0 can be selected at any time by pressing the "FUNC" key; then the following will be displayed on the LCD panel.

```
Select function : _ (0 -5)
```

Function Select Screen

2) Enter "0" and press the "SET" key.

3) After selecting Function 0, or directly after power-up, the following is displayed on the LCD panel;

```
D.Disp  Prg : _
```

Function 0 - Screen 1

4) Enter a two digit program number, and the signal timing and patterns defined in the panel ROM, will be active on the video outputs of the VG-819. A sample LCD screen is shown below.

```
No:01  14.29MHz
 H: 15.75KHz V: 60.11Hz
```

Function 0 - Screen 2

The selected program number is 01.
The dot clock frequency is 14.29 MHz.
The Horizontal scan rate (frequency) is 15.75 kHz.
The Vertical refresh rate (frequency) is 60.11 Hz.

5) The program number can be changed directly by entering a new two digit number. Alternatively, the program number can be incremented with the " ▲ " key, or decremented with the " ▼ " key.

6) Selected patterns are turned on automatically, based on the selections made with the "PAT SEL" key, during Function 3 programming. The operator can toggle the patterns on/off, by pressing the desired pattern key. The operator cannot change timing or pattern definitions while using this Function.

7) Escape from this Function by pressing the "FUNC" key.

7.2 Function 1 : Auto Display

Operation of this function is similar to Function 0, except the programs are incremented automatically. The range of programs to use, and the delay time between each program, is selected by the user when entering this Function. Escape this Function by pressing the "FUNC" key.

1) When the power is turned on without pressing any keys, the start-up screen for Function 0 is displayed automatically. Alternatively, Function 1 can be selected at any time by

   pressing the "FUNC" key; then the following screen will be displayed:

```
Select function : _ (0 -5)
```

Function Select Screen

2) Enter "1" and press the "SET" key. The cursor is positioned under the delay value that is currently set. This value determines the number of seconds a display program will remain on the monitor, before automatically changing to the next display program number. Enter a new value (0 to 999 seconds) if desired, and press the " ▩ " key to move the cursor to the next parameter.

```
A.Disp      Delay:   10 sec
 Prog -- 01-05 08-15 20-40
```

Auto Display - Screen 1

3) The cursor is now positioned under the starting program number of the first of 3 block ranges. From the 40 programs that may be programmed in the panel ROM, certain programs can be skipped by excluding them from between the 3 blocks of programs.

```
A.Disp      Delay:   10 sec
 Prog -> 01-05 08-15 20-40
```

4) Enter the first program number to display. Press the " ▶▶ " key and enter the end number of the first block.(If no programs are to be skipped, just enter the highest program number to use). Enter "00" as an end number for any block that is not to be used. The example below will display programs 01 to 05 continuously, with 10 seconds delay between each program. The remaining programs are not used.

```
A.Disp      Delay:   10 sec
 Prog -- 01-05 08-00 20-00
```

NOTES:

* If a program number greater than 40 is entered, an error will result.

* If the end number is larger than the start number, auto display will start from program 01.

5) To start auto display operation, press the "SET" key.

6) Press the " ▶▶ " key, and the auto display will stop; then Auto Display - Screen 1 will be displayed again.

7) Press the "FUNC" key to escape this Function and return to the Function Selection Screen.

7.3 Function 2 : Program Edit

7.3.1 Outline of Program Edit

Function 2 is used to make temporary changes to programs stored in the panel ROM. The operation of Function 2, and Function 3 is exactly the same, except for the method of storing the program changes. Use Function 2 to make TEMPORARY changes to programs, or when the panel ROM is an EPROM (read only). All the changes made are written to a buffer area in the VG-819, instead of to the panel ROM. The changes become active on the video outputs of the VG-819, each time the "SET" key is pressed. The changes are lost when a new program number is selected, or when the power is turned off. Escape this Function by pressing the "FUNC" key.

Up to 40 different Programs (number 01 to 40) can be stored in one panel ROM. One program consists of five parameter groups, and each group is selected by the front panel keys, as explained below.

1) Pattern select "PAT SEL" key : Selection of which patterns are automatically displayed during Function 0 and 1 operation.

2) Horizontal timing "H TIMING" key : Selection of the dot (pixel) clock and the horizontal timing values.

3) Vertical timing "V TIMING" key : Selection of the vertical scan mode and the vertical timing values.

4) Output conditions "OUTPUT" key : Selection of sync on video
polarity of video(TTL, ECL)
polarity of sync(TTL,ECL,ANA)
analog voltage/set up levels
Output mode:Analog/TTL,ECL
Selection of RZ or NRZ modes

5) Pattern definitions "PAT" key : character
cross hatch
dot
circle
color bar
gray scale
multi burst
window
option patterns selection

Cursor movement

Each of the five parameter groups are divided into several pages of the LCD panel. The following panel keys are used for cursor and page movement.

" ▣ " Moves the cursor within the current page.

" ▣ " Increment the display to the next page in the current parameter group.

" ▣ " Decrement the display to the previous page in the current parameter group.

ERROR MESSAGES

The VG-819 performs an error check on the parameters that are changed, every time the "SET" key is pressed. If an error is detected, the LCD will display an error message, including an error number, and the beeper will sound.

By pressing the " ▣ " key, the cursor will return to the starting position for the parameter block. Enter the correction and press the "SET" key again. If the correction is accepted, the cursor will remain in the position where the correction was entered.

If you are not sure how to correct the error, refer to the error code listing on page 100, and the trouble shooting chapter starting on page 92.

7.3.2 Select Program Number for Edit

1) When the power is turned on without pressing any keys, the start-up screen for Function 0 is displayed automatically. Alternatively, Function 2 can be selected at any time by pressing the "FUNC" key; then the following will be displayed on the LCD panel.

```
Select function : _ (0 -5)
```

Function Select Screen

2) Enter "2" at the Function Select Screen, and press the "SET key to obtain the following display.

```
Program  No.:01  Enable
```

Program Select Screen

NOTE: At any point after the above step, the Program Select Screen can be obtained by pressing the "PROG" key. (Even in the middle of editing a program parameter group).

3) As each Program number is selected, the words "Enable" or "Disable" will be displayed. Even if all 40 programs have valid parameters entered, some may be "disabled" to prevent their use. If a Programs' status is "Disable", it cannot be used by Function 0 or Function 1.

```
Program  No.:01  Disable
```

Program Select Screen

4) To change the status of "Enable" or "Disable", press the "E" or "D" keys as required.

"E" key ..... Enable
"D" key ..... Disable

After the Program number has been selected, and the Enable status is set, editing of each parameter group in the program can begin.

5) After editing the program using the procedures that follow, be sure and press the "SET" key, to retain the changes in the program buffer, and make the signals available at the video outputs.

7.3.3 Programming Horizontal Timing

The following horizontal timing diagram references the H-Timing parameters used in the VG-819.

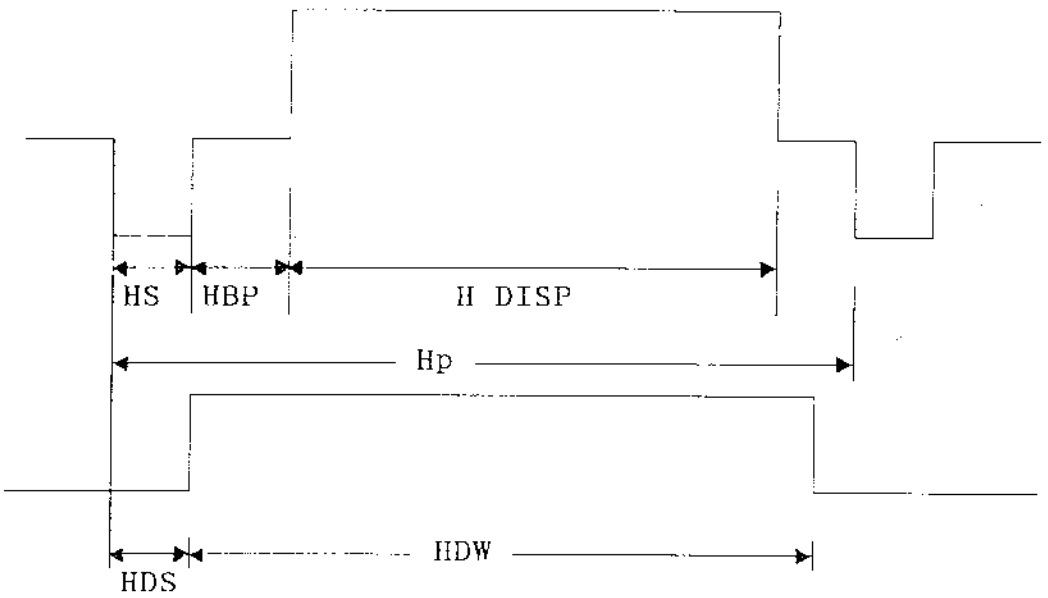


Diagram Term	Full Parameter Name	LCD Display
Hp	.... Horizontal Period (total scan time)	(Hperiod)
Hs	.... Horizontal sync pulse width	(Hdisp)
Hbp	.... horizontal pack porch	(Hsync)
Hdisp	.... horizontal display time (active area)	(Hbackp)
HDs	.... horizontal drive pulse start	(HDstart)
HDw	.... Horizontal drive pulse width	(HDwidth)

Press the "H TIMING" key after selecting the program number to edit. The H-Timing parameters occupy the following four screens.

1) Select the programming units (microseconds or dots) to use for the horizontal timing parameters. Enter the Dot Clock value (see note at the end of this section).

```
Input Mode (0,1)  : µS
Dot  Clock  :   14.29 MHz
```

H-TIMING SCREEN 1

Ranges

"0" key ... microseconds
"1" key ... number of dots
Dot Clock ... 5.00 to 240 MHz in 10 kHz steps

2) Enter the horizontal period and display time.

```
Hperiod : 63.50 µS  908 dot
Hdisp   : 44.70 µS  639 dot
```

H-TIMING SCREEN 2

Ranges

H-Period ... 7.69 to 99.99 microseconds (0.1 µS steps)
38 to 4096 dots

H-Display ... 0.20 to 99.00 microseconds (0.1 µS steps)
16 to 4000 dots

3) Enter the horizontal sync period and back-porch time.

```
Hsync   :  4.45 µS   64 dot
Hbackp  :  7.20 µS  103 dot
```

H-TIMING Screen 3

Ranges

H-Sync ... 0.40 to 40.00 microseconds (0.01 µS steps)
16 to 2000 dots

H-back-porch 0.00 to 99.00 microseconds (0.01 µS steps)
0 to 4076 dots

4) Enter the horizontal drive start time and width.

```
HDstart :  0.00 μS     0 dot
HDwidth :  0.00 μS     0 dot
```

H-TIMING Screen 4

Ranges

HD-start ... 0.00 to 99.00 microseconds (0.01 μS steps)
0 to 4090 dots

HD-width ... 0.00 to 99.00 microseconds (0.01 μS steps)
0 to 4090 dots (2 dot step)

NOTE : The "HD" signal is mostly used for special TTL monitors requiring a very wide sync pulse, that is active into the display area. This signal is available as a separate TTL output only, and the values programmed for "HD-start" and "HD-width" do not affect the other video output signals. They can be set to "0" if desired.

NOTES ON PARAMETER ADJUSTMENTS DUE TO DOT CLOCK RESOLUTION

1) When the horizontal timing parameters are programmed in "Microseconds", the Dot Clock Frequency (in MHz) may be adjusted by the VG-819, based on the step resolution available. The amount of adjustment (if any), is based on the Dot Clock frequency selected.

   Since the entry mode is "Microseconds", the microsecond values remain as entered. The "dot" values however will be adjusted to the closest even number, based on the step resolution range.

   The VG-819 has three ranges of step resolution for the H-Timing parameters. The amount of any adjustment will be based on the resolution of each range. At 1 dot resolution, no adjustment is necessary.

   a) From 5.00 to 60.00 MHz : 1 dot resolution
   b) From 60.01 to 120.00 MHz : 2 dot resolution
   c) From 120.01 to 240.00 MHz : 4 dot resolution

   The adjustment made depends on the parameter type.

   Dot Clock Frequency

$$\text{Adjusted clock frequency (MHz)} = \frac{\text{Adjusted H-Period (dots)}}{\text{Selected H-Period } (\mu\text{Sec})}$$

   H-Timing parameters

$$\text{parameter (dots)} = \text{Adjusted clock (MHz)} \times \text{parameter } (\mu\text{Sec})$$

2) When the horizontal timing parameters are programmed in "dots", the microsecond value for each parameter is adjusted, while the Dot Clock frequency and Dot values for each parameter remain as entered. The amount of adjustment is based on the dot clock frequency selected, just as explained under the "microsecond" entry mode.

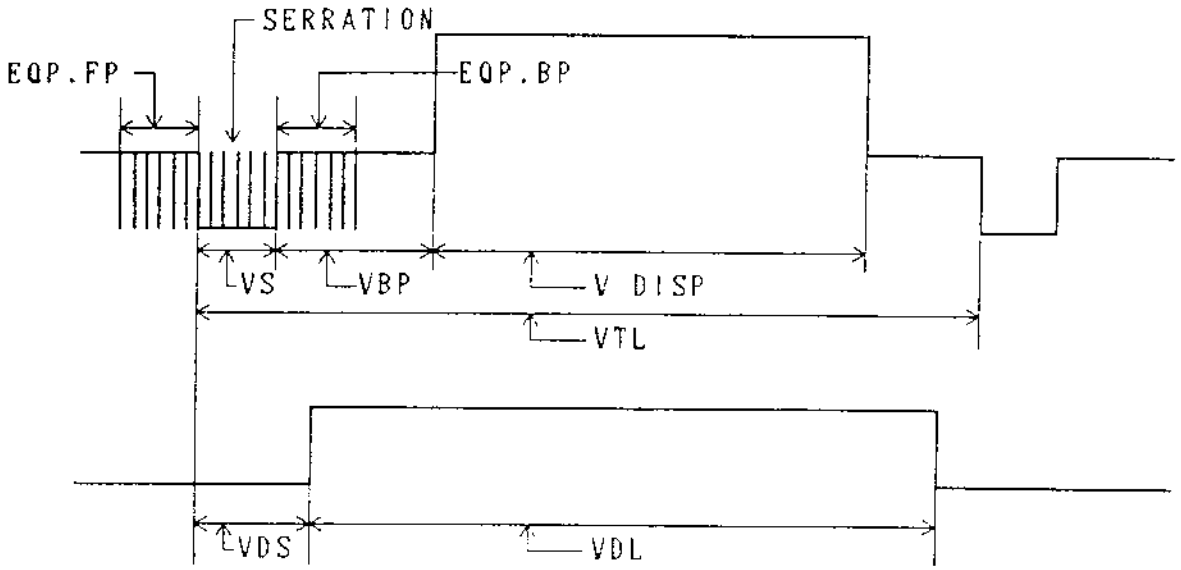
The method of adjustment is the same for all H-Timing parameters.

$$\text{adjusted parameter } (\mu\text{Sec}) = \frac{\text{parameter (dots)}}{\text{Selected dot clock (MHz)}}$$

7.3.4 Programming Vertical Timing

The following vertical timing diagrams reference the vertical parameters used in the VG-819.

non-interlace



interlace

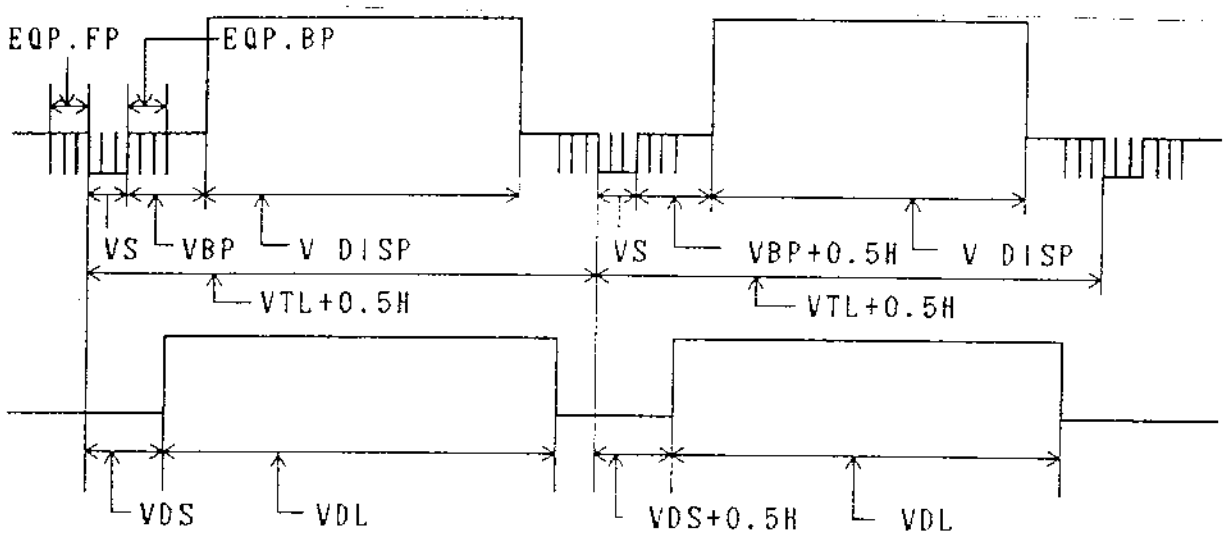


Diagram term	Full parameter name	LCD display
VTL	... vertical total line number	(Vtotal)
VS	... vertical sync pulse width	(Vsync)
VBP	... vertical back porch	(Vbackp)
EQP.FP	... equalizing pulses, front porch	(EQP.fp)
EQP.BP	... equalizing pulses, back porch	(EQP.bp)
VDISP	... vertical displayed line number (active area)	(Vdisp)
VDS	... vertical drive pulse start	(VDs)
VDW	... vertical drive pulse width	(VDl)

Press the "V-TIMING" key. The V-Timing parameters occupy the following six screens.

1) Select the input mode and the scan method.

```
Input  Mode (0,1) : H
Scan : Non Interlace
```

V-TIMING SCREEN 1

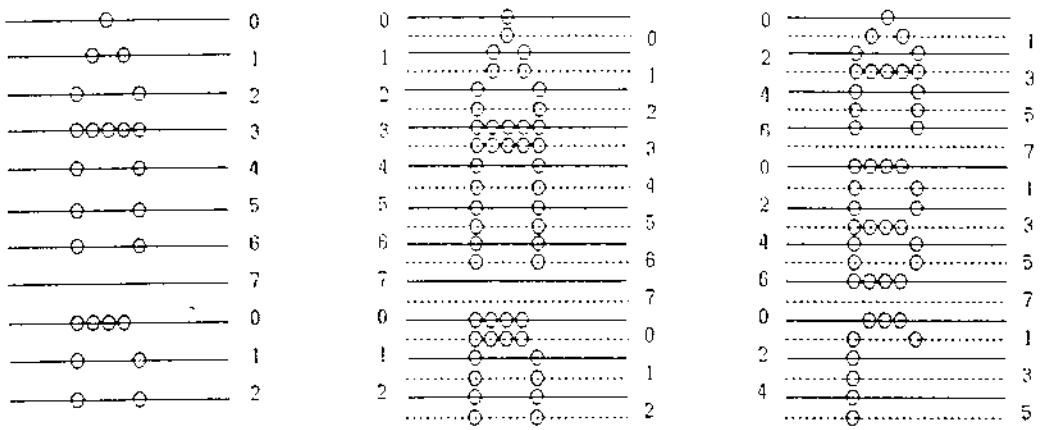
Ranges

```
   Input Mode  : "0" key .... line (H) input
               : "1" key .... millisecond input

   Scan Mode   : "0" key .... non interlace
               : "1" key .... interlace & sync
               : "2" key .... interlace & video
```

NOTE : Interlace & video is the most common method.

Scan examples:



non interlace interlace & sync interlace & video

2) Enter the total vertical lines and the number of displayed lines.

```
Vtotal  : 16.637 msec  262H
Vdisp   : 12.700 msec  200H
```

V-TIMING SCREEN 2

Ranges

V-Total(non interlace)	:	7.96 to 99.99 mS (0.01 mS steps)
	:	100 to 4096 lines (1H steps)
V-Total(interlace)	:	7.96 to 99.99 mS (0.01 mS steps)
	:	100 to 2048 lines (1H steps)
V-Display	:	1.27 to 99.99 mS (0.01 mS steps)
	:	16 to 4000 lines (1H steps)

NOTE : When using the interlace & video scan method, "V-Total" and "V-Display" values are entered at 1/2 their Frame value. For V-Total, the even field value is used (262). For V-disp, one field value is used (200). All other vertical parameters retain their "full" value. The example used in this section is for a 525 total line, 400 displayed line monitor.

3) Enter the V-sync pulse width and V-back-porch time.

```
Vsync   : 0.190 msec   3.0H
Vbackp  : 2.095 msec    33H
```

V-TIMING SCREEN 3

Ranges

V-sync		0.07 to 99.99 mS (0.01 mS steps)
		1.0 to 99.0 (0.5H steps)
V-back-porch		0.00 to 99.99 mS (0.01 mS steps)
		000 to 2046 lines (1H steps)

4) Enter the number of equalizing pulses in the vertical front and back porch (if used).

```
EQP fp :   0.000 msec   0.0H
EQP bp :   0.000 msec   0.0H
```

V-TIMING SCREEN 4

Ranges

equalizing pulses ...		0.00 to 99.99 mS (0.01 mS steps)
		0.0 to 99.0 lines (0.5H steps)

5) Select the type of serration and the on/off status of the equalizing pulses.

```
Serration      :  OFF
EQP (on/off)   :  OFF
```

V-TIMING SCREEN 5

Ranges

```
equalizing pulse : "0" key .... OFF
                 : "1" key .... ON

Serration        : "0" key .... OFF
                 : "1" key .... 0.5H
                 : "2" key .... 1H
                 : "3" key .... XOR
```

6) Enter the VD-Start lines and VD-Line number.

```
VDs : 0.000 msec    0.0H
VD1 : 0.000 msec    0.0H
```

V-TIMING SCREEN 6

Ranges

```
VD-Start  .... 0.00 to 99.99 mS (0.01 mS steps)
               0 to 4096 lines (0.5H steps)

VD-Lines  .... 0.00 to 99.99 mS (0.01 mS steps)
               0 to 4096 lines (0.5H steps)
```

NOTE : The "VD" signal is mostly used for special TTL monitors requiring a very wide sync pulse, that is active into the display area. This signal is available as a separate TTL output only, and the values programmed for "VD-start" and "VD-lines" do not affect the other video output signals. They can be set to "0" if desired.

GENERAL NOTES ON VERTICAL PARAMETER PROGRAMMING

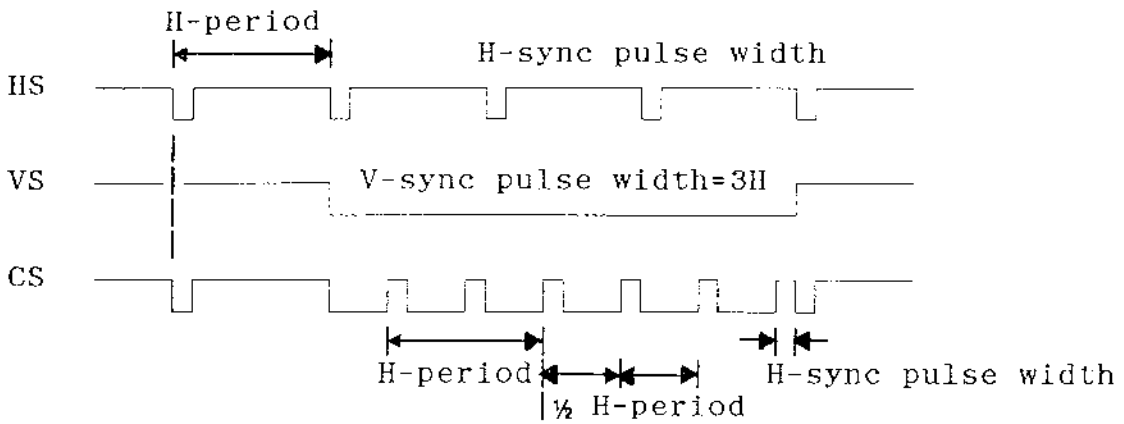
1) When the Vertical timing parameters are entered in "lines" (H), the millisecond value for each vertical parameter is adjusted according to the following formula.

$$* \text{ V-parameter(msec)} = \frac{\text{V-parameter(H)} \times \text{H-period } (\mu\text{sec})}{1000}$$

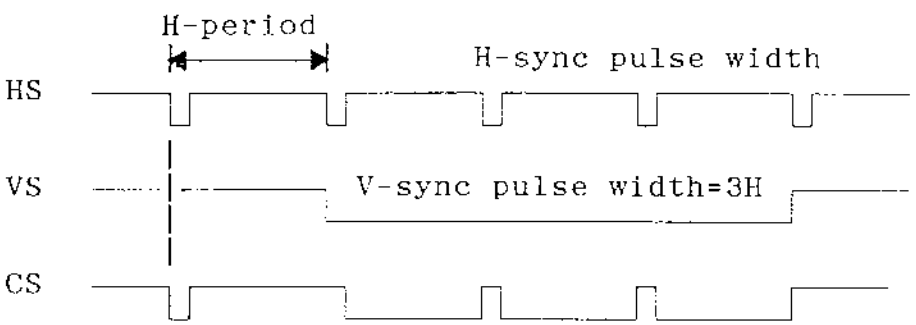
2) When the Vertical timing parameters are entered in "msec", the line value (H) for each vertical parameter is adjusted according to the following formula.

$$* \text{ V-parameter(H)} = \frac{\text{V-parameter(msec)} \times 1000}{\text{H-period } (\mu\text{sec})}$$

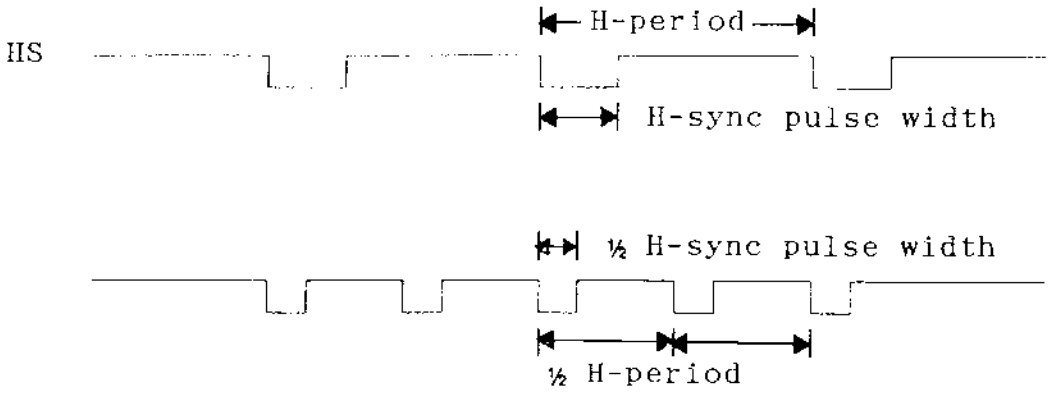
3) The following timing diagram shows the phase relationship between H-sync and the 0.5H serration in V-sync.



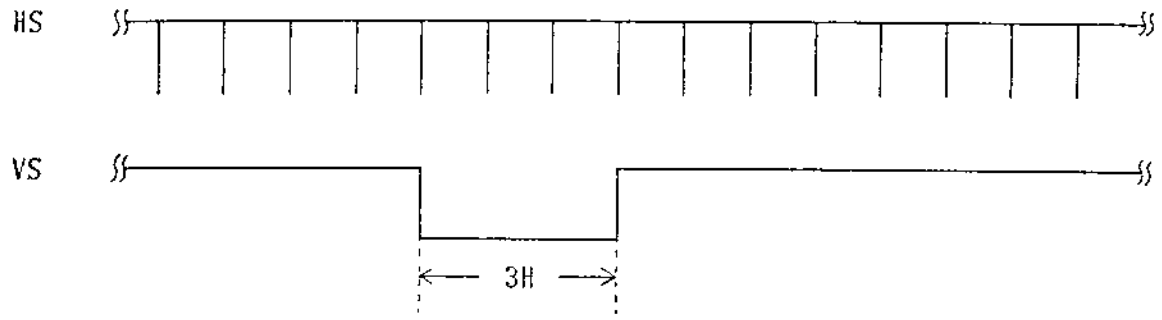
4) The Following timing diagram shows the phase relationship between H-Sync and the "XOR" (exclusive-or) serration in V-Sync.



5) The following timing diagram shows the phase relationship between H-sync and the equalizing pulses in V-sync.

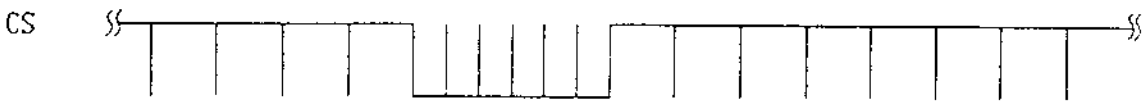


6) The following diagrams show several examples of equalizing pulse programming. The first two diagrams below are the H-sync and V-sync timing reference for the remaining examples.

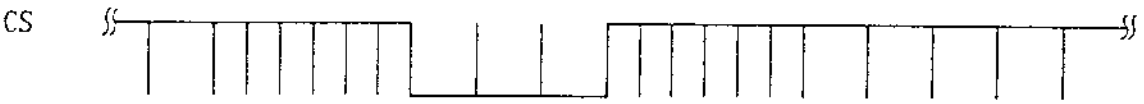


EQ.P-FP → 0H
EQ.P-BP → 0H
EQ.P → OFF
SERRATION → OFF

EQ.P-FP → 0H
EQ.P-BP → 0H
EQ.P → OFF
SERRATION → 0.5H



EQ.P-FP → 3H
EQ.P-BP → 3H
EQ.P → ON
SERRATION → 1H



EQ.P-FP → 3H
EQ.P-BP → 0H
EQ.P → OFF
SERRATION → OFF

7.3.5 Programming Output Conditions

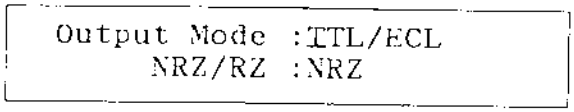
Press the "OUTPUT" key. The Output parameters occupy the following 3 screens.

1) Select the Output Mode, and the use of NRZ(no return to 0) or RZ(return to 0).

   When the output mode is Analog, gray scale levels are obtained and programmed with the "GRAY" key.

   When the output mode is TTL/ECL, the half tone color bars are obtained and programmed with the "GRAY" key. The color settings of the graphic patterns are also affected.

   NRZ is the normal display mode. See the note at the end of this section.

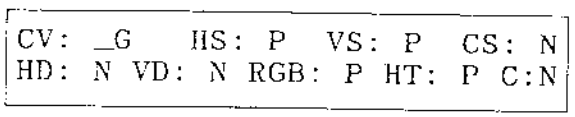


OUTPUT SCREEN 1

Ranges

Output Mode	: "0"	... ANALOG
	: "1"	... TTL/ECL
NRZ/RZ	: "0"	... NRZ (normal display)
	: "1"	... RZ (return to zero)

2) Select the RGB combination for sync on video (analog), and the polarity of the TTL/ECL video signals and the seperate sync signals. (Analog video polarity is always positive).



OUTPUT SCREEN 2

Ranges

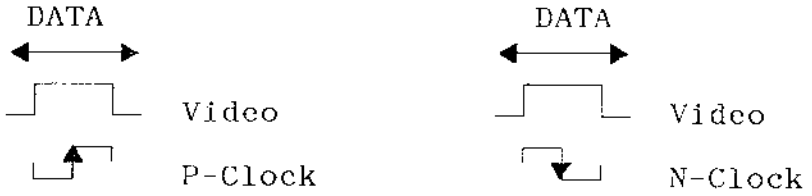
Sync on Video	: "0" key	... Off
	: "1" key	... on Red
	: "2" key	... on Green
	: "3" key	... on Red and Green
	: "4" key	... on Blue
	: "5" key	... on Red and Blue
	: "6" key	... on Green and Blue
	: "7" key	... on Red, Green, and Blue.

Polarities : "0" key ... Negative (N)
: "1" key ... Positive (P)

Abbreviations

HS	... H-Sync
VS	... V-Sync
CS	... Composite sync
HD	... Horizontal direct drive
VD	... Vertical direct drive
RGB	... Video signal (TTL/ECL)
HT	... Half Tone video signal (TTL)
C	... Dot Clock output

Phase relationship between video and clock



3) Enter the Analog RGB Video, Sync and Set-up levels.

```
Video : 0.70V Set-up: 0.00V
 Sync : 0.30V
```

OUTPUT SCREEN 3

Ranges

Analog video level ... 0.30 to 1.2 volts (0.01 volt steps)

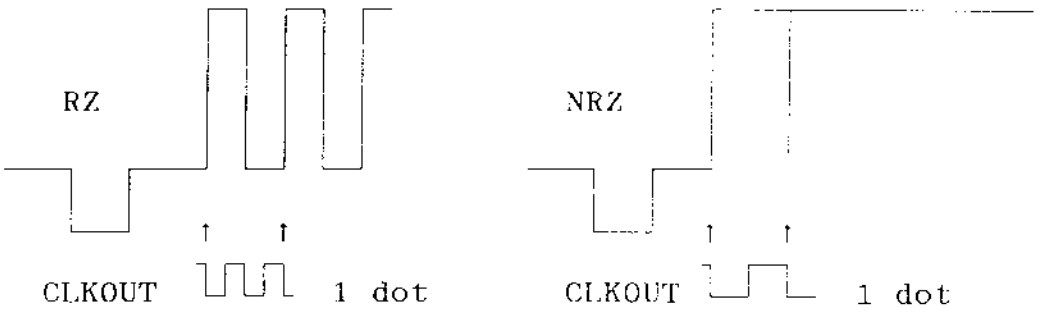
Set-up level ... 0.00 to .25 volts (0.01 volt steps)

Sync level ... 0.00 to 0.60 volts (0.01 volt steps)

NOTE : Sync level + Set-up Level $\leq$ Video level

NOTE on NRZ/RZ Programming:

"RZ" video mode is a special method of forcing the video output to the 0% level every other clock cycle. It is used primarily for testing video printers. The usual format for video monitor testing is "NRZ". The drawing below illustrates the difference between the two modes. The Dot Clock limit is 120.00 MHz when "RZ" mode is selected.

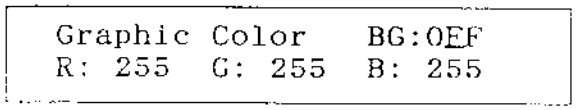


7.3.6 Programming Pattern Definitions

Press the "PAT" key. There are a total of 20 screens covering the 10 patterns that can be programmed. (The center, edge and diagonal patterns are fixed). As well, the color of the graphic patterns can be programmed (one color for all the graphic patterns). Graphic patterns include Character, cross hatch, dot, circle, multiburst, center, edge, and diagonal.

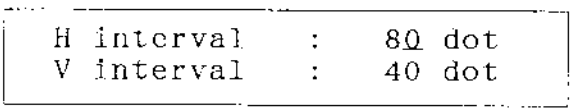
Once the "PAT" led is on, each pattern is selected for programming by pressing the desired pattern key. When pattern programming is complete, the "SET" key must be pressed to retain the changes made. To escape pattern programming, press the "PAT" key again. The following sequence illustrates the process.

a) Press the "PAT" key and enter the graphics color.



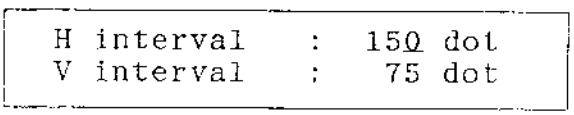
PATTERN SCREEN 1

b) Press a "pattern" key and enter the definition. (i.e. "DOT").



PATTERN SCREEN "DOT"

c) Press another "pattern" key and enter the definition. (i.e. "CROSS").



PATTERN SCREEN "CROSS"

d) Press the "SET" key to save the changes.

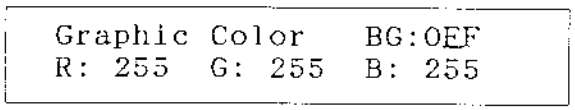
e) Press the "PAT" key to escape pattern programming.

7.3.6.1 Graphic Color

Press the "PAT" key. Enter the desired graphics color. If "analog" output mode was selected in the "OUTPUT" parameter group, then R,G,B can be set individually, from 0 to 255. If TTL/ECL was selected, then the Video and Half Tone Graphics color is selected using a combination of RGB.

"Back-ground" is set to on or off. The "normal" mode is off, where the graphic pattern color is determined by the above settings. If set to "on", the graphic patterns will only be visible when superimposed over color bars, gray scales and/or windows. The graphic patterns will then be displayed in the color(s) of the immediate "background". (i.e. color bar, gray scale, window).

Analog Signal :



PATTERN SCREEN 1

Ranges

Graphic Color : "0" ... 0% of video level
:"255"... 100% of video level

Background : "0" ... OFF
: "1" ... ON

TTL/ECL Signal :

PATTERN SCREEN 1

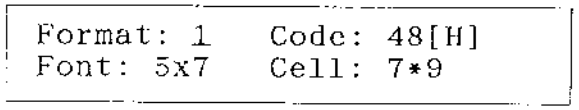
Ranges

VIDEO/HT : Combination of R,G and B

BackGround : "0" ... OFF
: "1" ... ON

7.3.6.2 Character Pattern

Press the "CHARA" key, when the "PAT" LED is on.

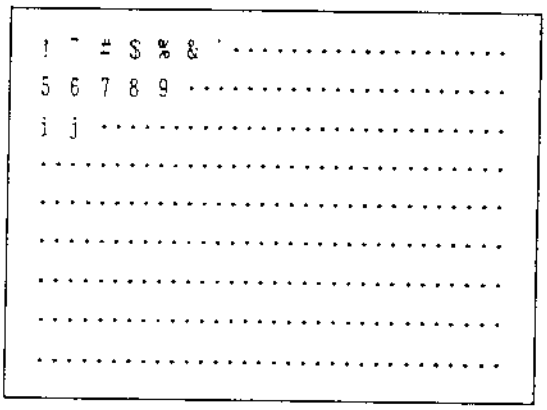


PATTERN SCREEN "CHARA"

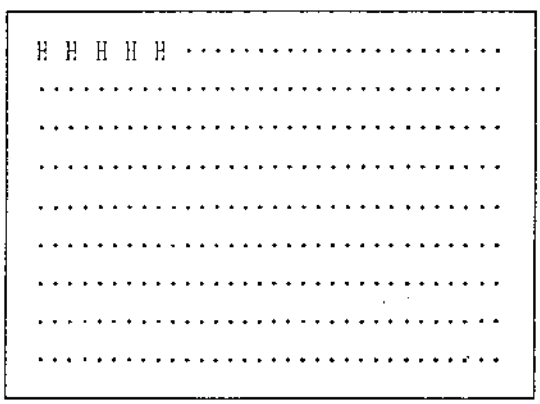
Display formats are as follows:

a) Format : "0" key .... Character List
: "1" key .... Character on entire screen
: "2" key .... Four corners and center

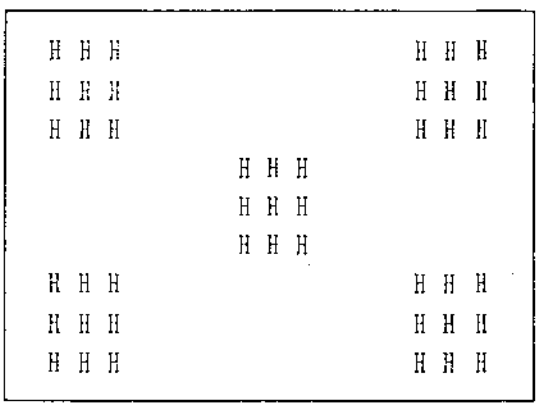
* Character List



* Characters on entire screen



* Four corners & center



b) Character code selection.

The characters that are displayed in Format 1 and 2, are selected by entering the Hex number for the Ascii Code of that character. The available characters depend on the font size selected, and their codes are shown in the tables beginning on page 82.

Ranges

Ascii Characters : 20 to DF .... Fixed characters

Programmable Characters : E0 to E3 (see page 69)

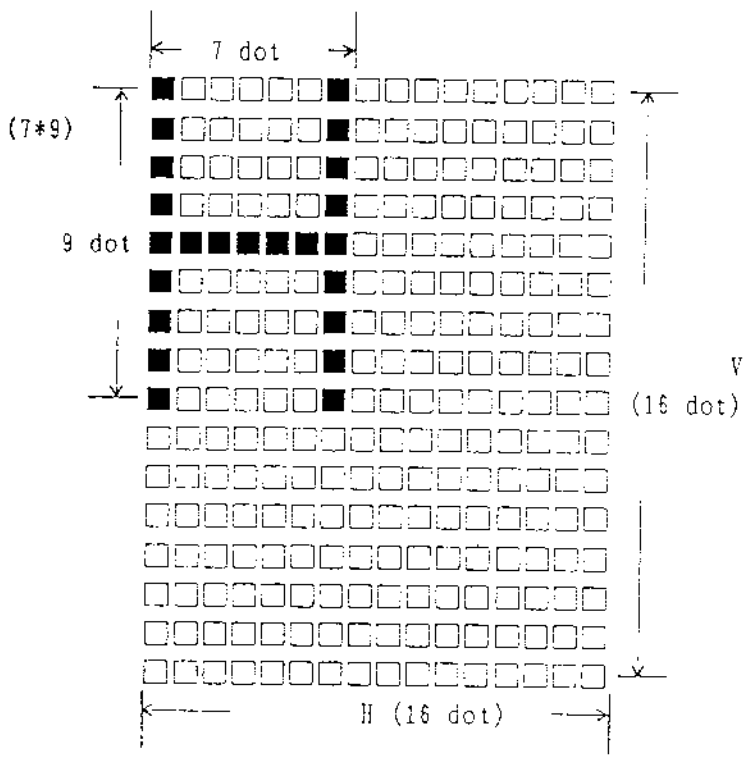
c) Character font selection.

"0" key .... 5 x 7 dots
"1" key .... 7 x 9 dots
"2" key ....16 x 16 dots

Character E0 - E3 .... same as above or 64 x 64 dots (changes automatically when these characters are selected)

d) Cell size is entered directly using the number keys. The range is up from 1 to 64 dots.

The following illustration shows the relationship between the font size and the cell size.



7.3.6.3 Cross Hatch Pattern

Press the "CROSS" key while the "PAT" LED is on. Enter the horizontal and vertical interval.

```
H interval   :  150 dot
V interval   :   75 dot
```

PATTERN SCREEN "CROSS"

Range

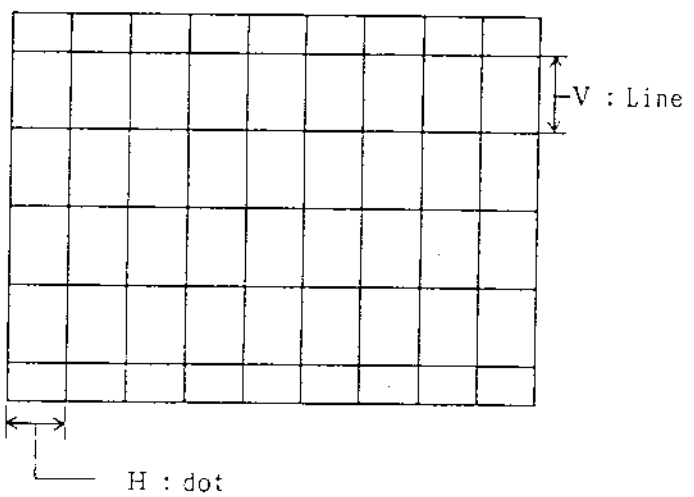
..... 0 to 9999 dots

NOTE : Only H or V can be set to "0", otherwise an error occurs.

a) When the displayed dots and displayed lines are an odd numbered value, and a "1" is programmed for both horizontal and vertical, a single cross is formed in the physical center of the screen. It is from this center location that other selected values for the cross hatch are based. If however the displayed dots and displayed lines are an even number, the center lines are drawn one dot right in the horizontal direction, and one line down in the vertical direction.

b) When H is "2" and V is "0", vertical lines (top to bottom of the display) are drawn at an interval of one dot "off" and one dot "on".

When H is "0" and V is "2", horizontal lines (left to right of the display) are drawn at an interval of one dot "off" and one dot "on".



7.3.6.4 Dot Pattern

Press the "DOT" key while the "PAT" LED in on. Enter the horizontal and vertical interval.

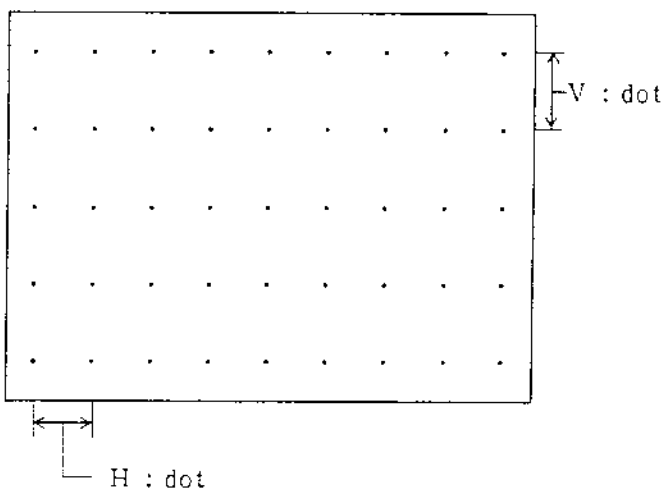
```
H interval   :   80 dot
V interval   :   40 dot
```

PATTERN SCREEN "DOT"

Range

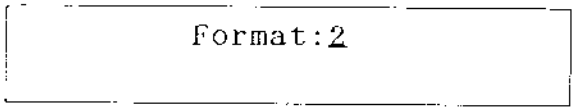
..... 1 to 9999 dots

a) When the displayed dots and displayed line are an odd numbered value, and a "1" is programmed for both horizontal and vertical interval, a single dot is placed at the physical center of the screen. The dot is placed one dot to the right and one line below the physical center, when the displayed dots and lines are an even value.



7.3.6.5 Circle Pattern

Press the "CIRCLE" key while the "PAT" LED is on. Select one of the 5 circle formats.

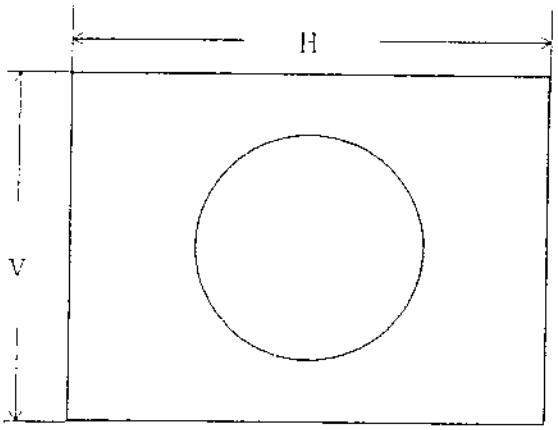


PATTERN SCREEN "CIRCLE"

Note: H/2, V/2 means center point is located at ½ H, V display area. Radius figures are 1/x of the display area.

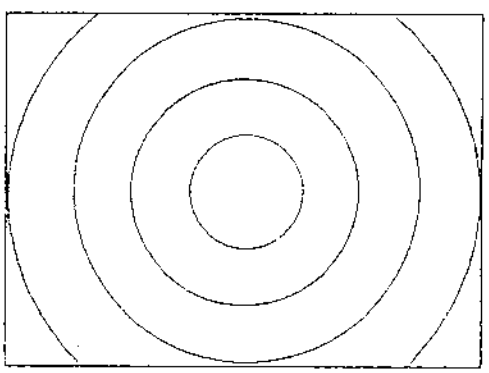
a) Circle format No. 0 (single circle)

center : H/2, V/2
radius : V/3



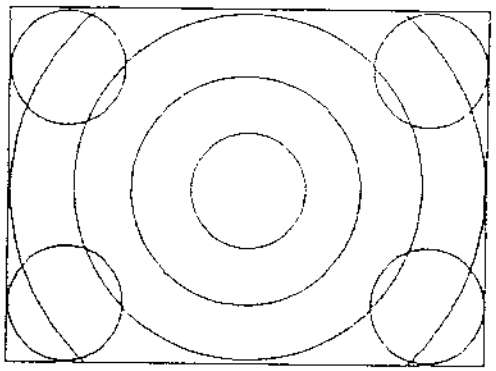
b) Circle format No. 1 (concentric circle I)

center : H/2, V,2
Radius : V/6, V/3
V/2, H/2

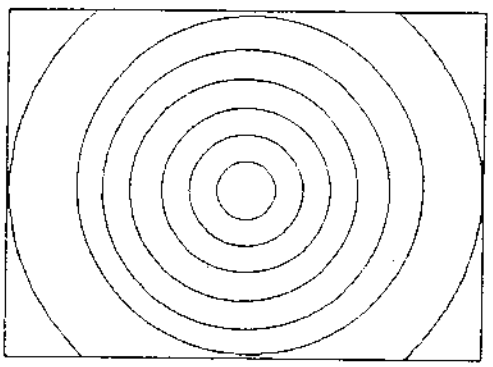


c) Circle format No. 2 (concentric circle II)

radius : V/6
(corner circle)

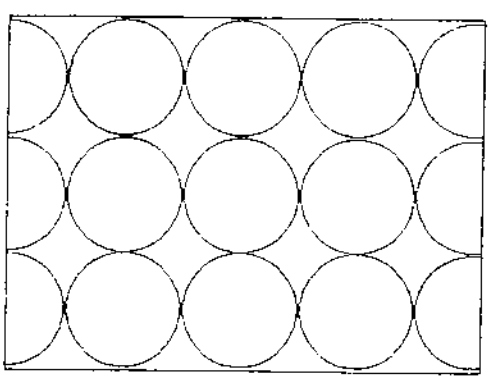


d) Circle format No. 3 (concentric circle III)



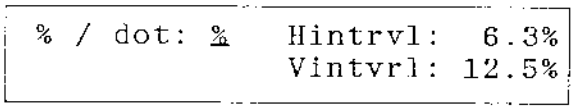
e) Circle format No. 4 (small circles)

radius : V/6



7.3.6.6 Color Bar Pattern

a) Press the "COLOR" key while the "PAT" LED is on. Select percent or dot entry mode. Enter the horizontal and vertical interval (width and height of each color bar).



PATTERN SCREEN "COLOR" 1

Ranges

% or dot : "0" key .... percent of display area
: "1" key .... number of dots/lines

H interval : 1 to 9999 dots, or 0.1 to 100% at a dot clock rate of 5.00 to 60.00 MHz. 1 dot steps.

: 2 to 9998 dots, or 0.1 to 100% at a dot clock rate of 60.01 to 120.00 MHz. 2 dot steps.

: 4 to 9996 dots, or 0.1 to 100% at a dot clock rate of 120.01 to 240.00 MHz. 4 dot steps.

V interval : 1 to 9999 dots, or 0.1 to 100%. 1 dot steps.

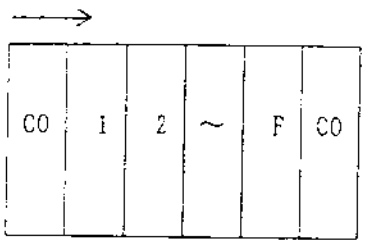
Important : The intervals programmed here will also control the intervals for the Gray Scale pattern.

b) There are four display formats to select from, using the keys "0" to "3".

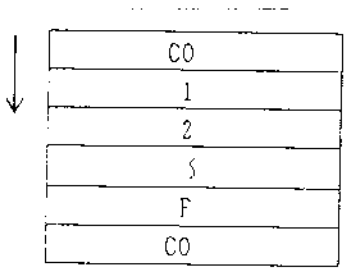
```
Direction: 0
(0 - 3)
```

PATTERN SCREEN "COLOR" 2

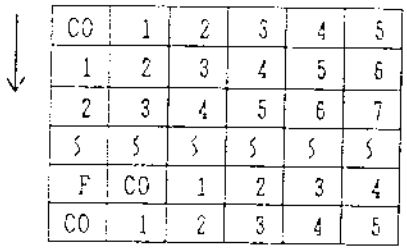
* "0" key .... horizontal bar



* "1" key .... vertical bar

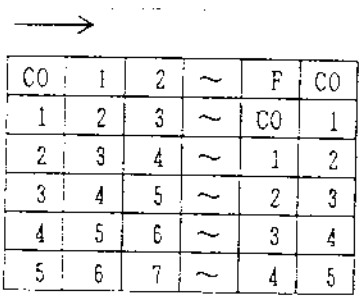


* "2" key .... horizontal bar with vertical direction



CO	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
5	5	5	5	5	5
F	CO	1	2	3	4
CO	1	2	3	4	5

* "3" key .... vertical bar with horizontal direction



CO	1	2	~	F	CO
1	2	3	~	CO	1
2	3	4	~	1	2
3	4	5	~	2	3
4	5	6	~	3	4
5	6	7	~	4	5

c) A total of 16 color blocks can be programmed, using a combination of R, G, B. (maximum of 8 different colors). The first color programmed "C0" will be located at the left side or top of the display (depending on the format selected).

```
C0: RGB 1: R    2: G  3:  B
C4:  GB 5:      6:R B 7:RG
```

PATTERN SCREEN "COLOR" 3

```
C8: _G  9:  GB A: R  B:R  B
CC:R    D:     E:    F:RGB
```

PATTERN SCREEN "COLOR" 4

Ranges

"0" key ... Black
"1" key ... Red
"2" key ... Green
"3" key ... Red/Green (yellow)
"4" key ... Blue
"5" key ... Red/Blue (magenta)
"6" key ... Green/Blue (cyan)
"7" key ... Red/Green/Blue (white)

7.3.6.7 Gray Scale Pattern

Press the "GRAY" key while the "PAT" LED is on. When the output mode has been set to Analog, gray scale levels from 0 to 255 are programmed and are present on the Analog outputs when the "GRAY" key is on. When the output mode has been set to TTL/ECL, Half Tone colors are programmed instead, and will be present on the TTL/ECL Half Tone outputs when this key is active.

The size of each block (interval) is determined by the Color Bar "interval" parameter definition.

Analog Output Mode (Gray Scale)

a) Select the direction (horizontal or vertical display format) using the "0" or "1" keys.

```
Direction : 0
(0: H, 1: V)
```

PATTERN SCREEN "GRAY" 1

Ranges

"0" key .... horizontal display format (same as Color bar display format No. 2).

"1" key .... vertical display format (same as Color bar display format No. 3).

C0	1	2	~	F	C0
1	2	3	~	C0	1
2	3	4	~	1	2
3	4	5	~	2	3
4	5	6	~	3	4
5	6	7	~	4	5

horizontal display format

C0	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
↓	↓	↓	↓	↓	↓
F	C0	1	2	3	4
C0	1	2	3	4	5

vertical display format

b) There are 16 blocks in which to program random gray levels. Values are between 0 (black) and 255 (white).

```
L0:   0 1:  10 2: 20 3: 30
L4:  40 5:  50 6: 60 7: 70
```

PATTERN SCREEN "GRAY" 2

```
L8:  80 9:  90 A:160 B:120
LC: 140 D: 160 E:180 F:255
```

PATTERN SCREEN "GRAY" 3

TTL Output Mode

The size of each block (interval) is determined by the Color Bar "interval" parameter definition.

a) Select the direction (horizontal or vertical display format) using the "0" or "1" keys.

```
Direction : 0
(0: H, 1: V)
```

PATTERN SCREEN "HALF TONE" 1

Ranges

"0" key .... horizontal display format (same as Color bar display format No. 2).

"1" key .... vertical display format (same as Color bar display format No. 3).

→

C0	1	2	~	F	C0
1	2	3	~	C0	1
2	3	4	~	1	2
3	4	5	~	2	3
4	5	6	~	3	4
5	6	7	~	4	5

horizontal display format

↓

C0	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
⌇	⌇	⌇	⌇	⌇	⌇
F	C0	1	2	3	4
C0	1	2	3	4	5

vertical display format

c) A total of 16 color blocks can be programmed, using a combination of R, G, B. (maximum of 8 different colors). The first color programmed "H0" will be located at the left side or top of the display (depending on the format selected).

```
H0: RGB 1: R    2: G  3:  B
H4:  GB 5:      6:R B 7:RG
```

PATTERN SCREEN "HALF TONE" 2

```
H8: _G  9:  GB A: R  B:R  B
HC:R    D:     E:    F:RGB
```

PATTERN SCREEN "HALF TONE" 3

Ranges

"0" key ... Black
"1" key ... Red
"2" key ... Green
"3" key ... Red/Green (yellow)
"4" key ... Blue
"5" key ... Red/Blue (magenta)
"6" key ... Green/Blue (cyan)
"7" key ... Red/Green/Blue (white)

7.3.6.8 Multi Burst Pattern

Press the "BURST" key while the "PAT" LED is on. Select the format, and enter the Step and Interval.

```
Format: 0      Step: 1 dot
             Interval: 3 dot
```

PATTERN SCREEN "BURST"

Ranges

a) There are four different display formats, which are selected using the "0" to "3" keys.

"0" key .... lines get wider from the left
"1" key .... lines get wider from the right
"2" key .... lines get wider from the center to both edges.
"3" key .... lines get wider from both edges to the center.

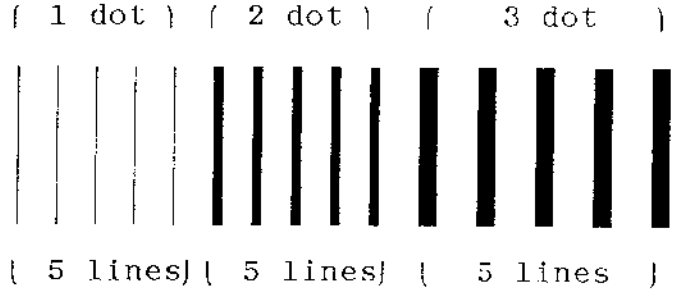
b) The parameter "STEP" defines the width of the lines. The line width of the first Interval Block is fixed to one dot on/off. The lines will increase in width by the number of dots specified in "STEP", as each new Interval Block begins.

Range ... 1 to 99 dots

c) The parameter "INTERVAL" defines how many lines are repeated for each STEP, before using the next STEP value.

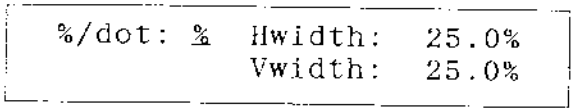
Range ... 1 to 99 dots

Programming Example ... Format : 1
Step : 1
Interval : 5



7.3.6.9 Window Pattern

a) Press the "WINDOW" key while the "PAT" LED is on. Select the entry method, % or dots, and enter the width and height of the window(s). All Window patterns are centered within the active display area.



PATTERN SCREEN "WINDOW" 1

Ranges

%/dot : "0" key ... percent of display area
: "1" key ... number of dots/lines

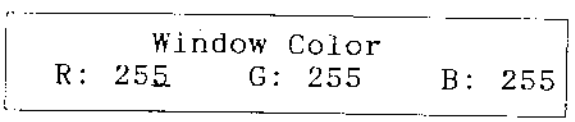
Hwidth : 1 to 9999 dots (1 dot steps),
or 0.1 to 100% at 5.00 to 60.00 MHz

: 2 to 9998 dots (2 dot steps),
or 0.1 to 100% at 60.01 to 120.00 MHz

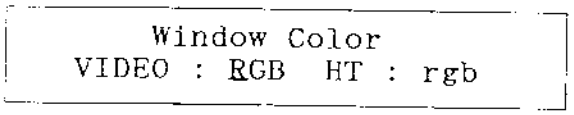
: 4 to 9996 dots (4 dot steps),
or 0.1 to 100% at 120.01 to 240.00 MHz

Vwidth : 1 to 9999 dots (1 dot steps)
or 0.1 to 100%

b) The window color can be selected using a combination of R, G, and B. The available format depends on the output mode that is selected. One of the two screens below will be displayed on the LCD panel.



PATTERN SCREEN "WINDOW" 2a



PATTERN SCREEN "WINDOW" 2b

c) Program the "window format" and the "flicker interval". One of eight different Window Formats can be used, and are selected with the "0" to "7" keys. The Flicker Interval selected determines the frequency at which the window pattern is inverted, referenced to the vertical sync rate.

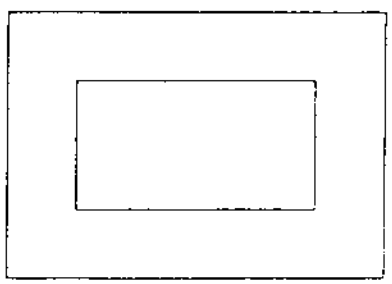
```
Window Format     : 0
Window interval   : 0
```

PATTERN SCREEN "WINDOW" 3

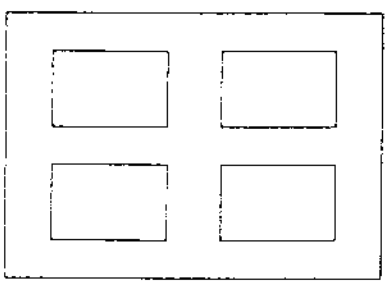
Ranges

Window Formats are illustrated below.

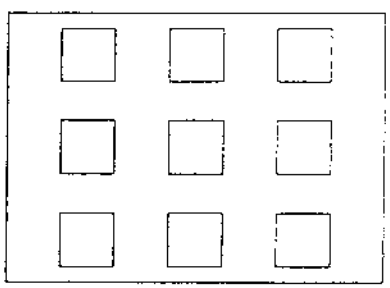
"0" key ...



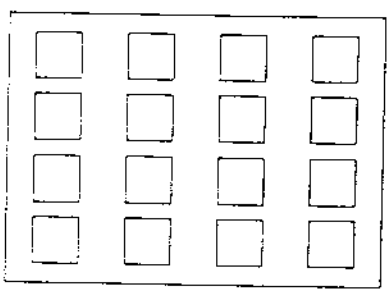
"1" key ...



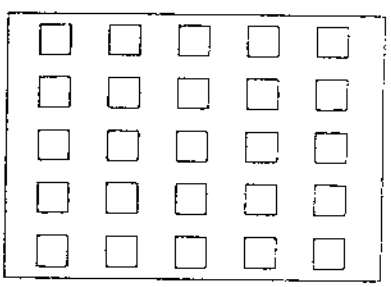
"2" key ...



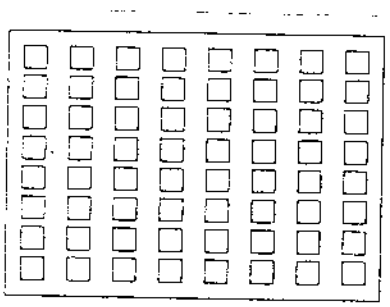
"3" key ...



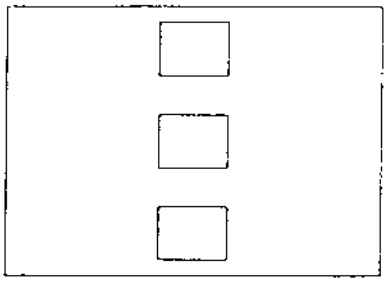
"4" key ...



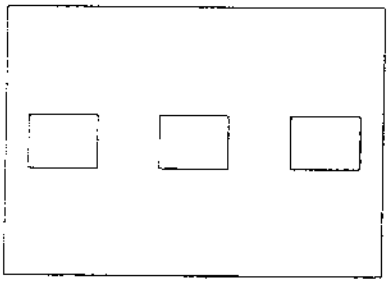
"5" key ...



"6" key ...



"7" key ...



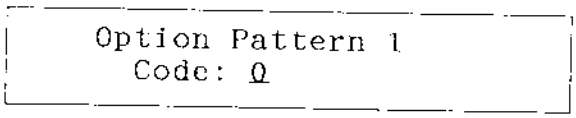
Flicker intervals:

"0" key ... no flickering
"1" key ... 1 times the V-Sync period
"2" key ... 2 " " "
"3" key ... 4 " " "
"4" key ... 8 " " "
"5" key ... 16 " " "
"6" key ... 32 " " "
"7" key ... 64 " " "

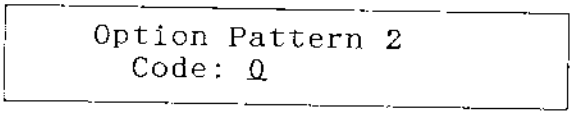
Example: If the "5" key is pressed, then the windows will turn on to off every 266.56 milliseconds. (16.66mS x 16).

7.3.6.10 Option Pattern Selection

Press "OPTION 1" or "OPTION 2" while the "PAT" LED is on. Select the option code (0 to F) to use. The Option Patterns cannot be superimposed with any other pattern (i.e. circle, character, etc.). If it is selected for display with other patterns, only the Option pattern will be displayed.



PATTERN SCREEN "OPTION 1"



PATTERN SCREEN "OPTION 2"

Notes:

1) SMPTE (Option 1, code 5) and Ramp patterns (Option 2, codes B & C), cannot be displayed when the dot clock is set beyond 120.00 MHz.

2) The Option Patterns listed on the following 2 pages are standard in the VG-819. Some customers may have ordered additional Option patterns, that may be selected in addition to this list.

VG-819 OPTION PATTERN LIST

OPTION # CODE	PATTERN	APPLICATION
OPTION 1-0	256 COLOR	* LINEARITY INSPECTION FOR COLOR
1-1	64 LEVEL GRAY	* LINEARITY INSPECTION FOR GRAY
1-2	64 LEVEL GRAY	* LINEARITY INSPECTION FOR GRAY
1-3	8 COLOR & 16 GRAY	* ADJUSTMENT FOR R,G,B * LINEARITY INSPECTION FOR GRAY
1-4	8X8 BOX CROSS & 16 GRAY	* DISTORTION INSPECTION * INSPECTION FOR GRAY
1-5	8X8 BOX CROSS & 8 COLOR	* DISTORTION INSPECTION * INSPECTION FOR COLOR
1-6	COLOR TEMPARATURE	* COLOR INSPECTION
1-7	PAIRING	* INSPECTION FOR PAIRING OF INTERLACE SCANNING
1-8	16X16 BOX & 16 GRAY & CIRCLE	* LINEARITY & GRAY INSPECTION
1-9	TEST CHART	* GENERAL INSPECTION
1-A	LINEARITY	* LINEARITY INSPECTION
1-B	"H" CHARACTER	* FOCUS INSPECTION
1-C	"O" CHARACTOR	* FOCUS INSPECTION
1-D	CROSS TALK	*INSPECTION FOR FREQUENCY CROSS TALK

1-E BLOCK DIAGRAM OF THE VG-819

OPTION # CODE	PATTERN	APPLICATION
OPTION 2-0	EDGE MARKER	* INSPECTION FOR D/Y
2-1	CROSS TALK	* INSPECTION FOR FREQUENCY CROSS TALK
2-2	HIGH VOLTAGE REGULATION	* INSPECTION FOR HIGH VOLTAGE REGULATION
2-3	8X8 BOX CROSS	* LINEARITY INSPECTION
2-4	ACTIVE AREA	* MEASUREMENT FOR ACTIVE AREA
2-5	SMPTE	* GENERAL INSPECTION
2-6	SMPTE (COLOR)	* GENERAL INSPECTION
2-7	TEXT	* SIMULATION OF WORDPROCESSER DISPLAY
2-8	TIMING CHART	* CURRENT PROGRAM SIGNAL TIMING
2-9	CROSS HATCH & EDGE MARKER	* INSPECTION FOR LINEARITY & CONVERGENCE.
2-A	COLOR PATTERN	* DEMONSTRATION
2-B	RAMP (HORIZONTAL)	* GRAY LINEARITY INSPECTION
2-C	RAMP (VERTICAL)	* GRAY LINEARITY INSPECTION
2-D	256 COLOR	* ADJUSTMENT FOR VIDEO PRINTER

7.4 Function 3 : Panel EEPROM Program Edit

Outline of Panel EEPROM Edit

Function 3 is used to make changes to programs and store those changes in the panel EPPROM. The operation of Function 3 and Function 2 is exactly the same, except for the method of storing the program changes. However, three additional features are available when using Function 3. The changes are stored in the panel EEPROM, and become active on the video outputs of the VG-819, each time the "SET" key is pressed. Escape this Function by pressing the "FUNC" key.

Since the operation of Function 3 is the same as Function 2, the complete procedure will not be repeated here. Only the three procedures that are exclusive to Function 3 are presented in this section. Please refer to the operation of Function 2 for details on programming the other parameters.

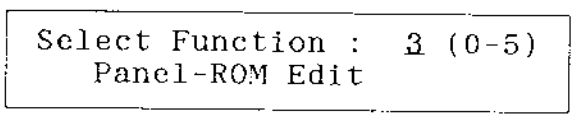
7.4.1 Programming Procedures

Three additional procedures are available when using Function 3.

a) The Selection of patterns that will be turned on while in Function 0 or 1 can be defined.

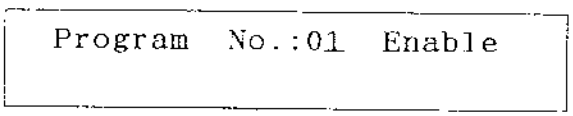
b) 64 x 64 dot user characters can be created.

c) Each program can be assigned an 8 character name. The name is displayed in the upper right hand corner of the LCD display during operation of Functions 0, 1, 2 and 3.



FUNCTION 3 SCREEN

Enter "3" at the Function Select Screen, and press the "SET key to obtain the following display.



Program Select Screen

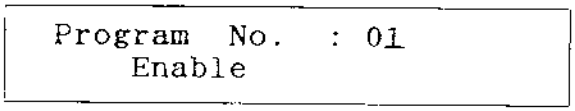
Enter the program number to edit.

7.4.2 Display Pattern Selection

While using Function 0 or Function 1, for each program, certain patterns are turned on automatically.

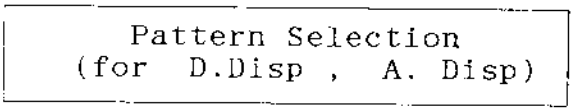
This pattern "on" status is determined for each program while in Function 3.

After selecting Function 3, press the "PROG" key, and enter a program number to program the pattern selection status.



Program Select Screen

Then press the "PAT SEL" key, and the "PAT SEL" LED will be turned on.



PATTERN SELECT SCREEN

To program a pattern to be "on", press the desired pattern key(s), so that the patterns' LED is on. After selecting the patterns to display, press the "SET" key.

Continue to select the patterns for the remaining Programs by repeating the sequence below.

a) "PROG" key, program number
b) "PAT SEL" key
c) Desired pattern key(s)
d) "SET" key

The on/off status of patterns is controlled with the following keys.

"CHARA"	key ...	Character
"CROSS"	key ...	Cross hatch
"DOTS"	key ...	Dot
"CIRCLE"	key ...	Circle
" + "	key ...	Center marker
" □ "	key ...	Edge marker
" ✕ "	key ...	Diagonal
"COLOR"	key ...	Color bar
"GRAY"	key ...	Gray scale (half tone)
"BURST"	key ...	Multi burst
"WINDOW"	key ...	Window
"R"	key ...	Red signal
"G"	key ...	Green signal
"B"	key ...	Blue signal
"HT"	key ...	Half-tone signal
"INV"	key ...	Inverse of graphic pattern

7.4.3 Editing User Characters

Space is available in the Panel EEPROM to store four User characters, E0 to E3. The font size can be up to 64 x 64. The front panel keys are used for cursor movement and data entry, while the character is presented on the monitor in a large format. Be sure to connect a monitor to the VG-819, and to install a EEPROM as the panel ROM before proceeding.

1) Press the "PAT" key and confirm the "PAT" LED is on. Press the "CHARA" key, and select the character to edit, the format, and the font size.

```
Format: 1     Code: E0 [ ]
Font: 64*64   Cell: 64*64
```

CHARACTER SELECT SCREEN

Ranges

Format ... "1" or "2"

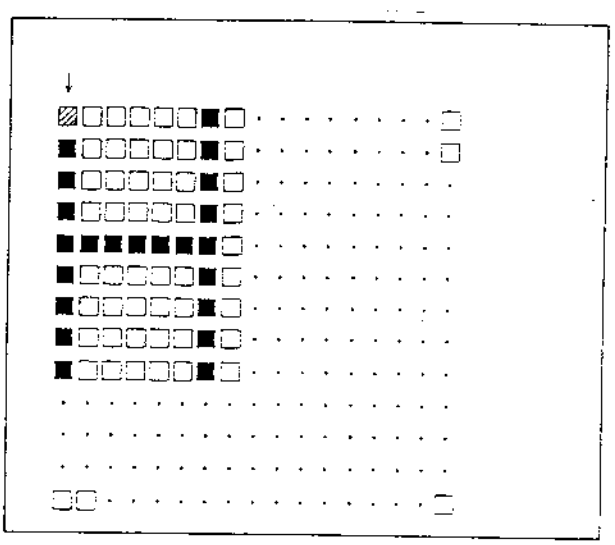
Font ... 5x7, 7x9, 16x16, or 64x64

Cell ... 1 to 64 dots

Code ... E0 to E3

2) Press the "CHARA EDIT" key, and a large (blank) cell will be displayed on the monitor. The size of the cell will be determined by the size selected on the Character Select Screen above. There will be a blinking cursor positioned in the top, left corner of the cell, indicating the current cursor position.

3) Edit the character using the front panel keys as explained on the next few pages.



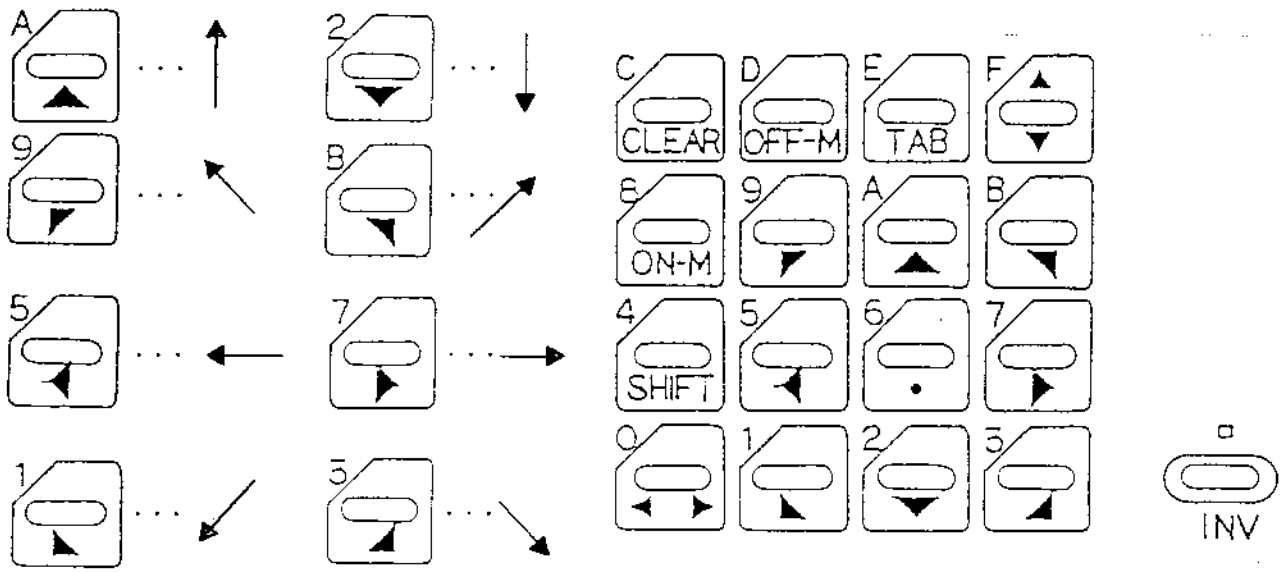
4) When editing is complete, press the "SET" to save the character in the panel EEPROM.

5) To escape the editing mode, press the "CHARA EDIT" key.

NOTE: The cell may not be blank at first, depending on what was previously programmed in the selected character. The cell can be cleared by pressing the "C" (CLEAR) key.

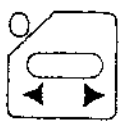
6) The cursor is moved and each pixel is turned on or off using the following keys.

a) Vector keys : The cursor moves one dot position in the direction of the vector key that is pressed.



b)  key

The pixel at the cursor position is set on or off (toggle).

c)  key

The cursor jumps to the left or right edge of the cell (toggle).

d)  key

The cursor jumps to the top or bottom of the cell (toggle).

e) 

key

All cells are cleared.

The following keys require a vector key to be pressed first, to set the direction of the key's movement.

f) 

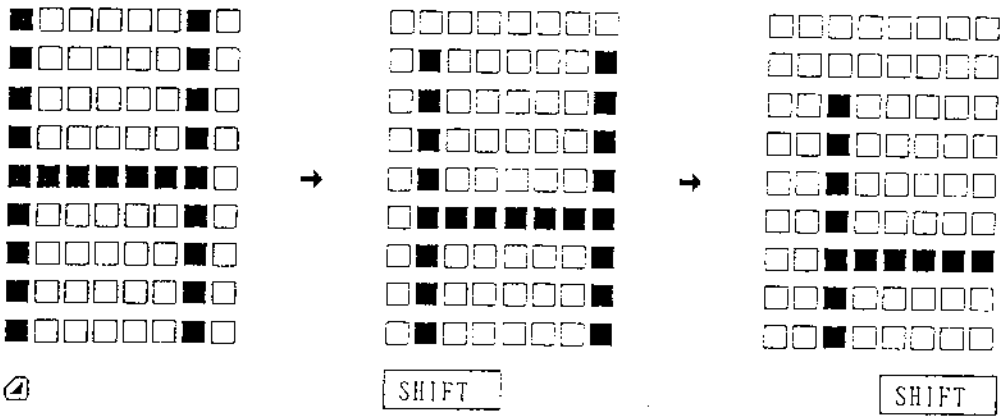
key

The cursor jumps 8 pixels in the preset vector direction.

g) 

key

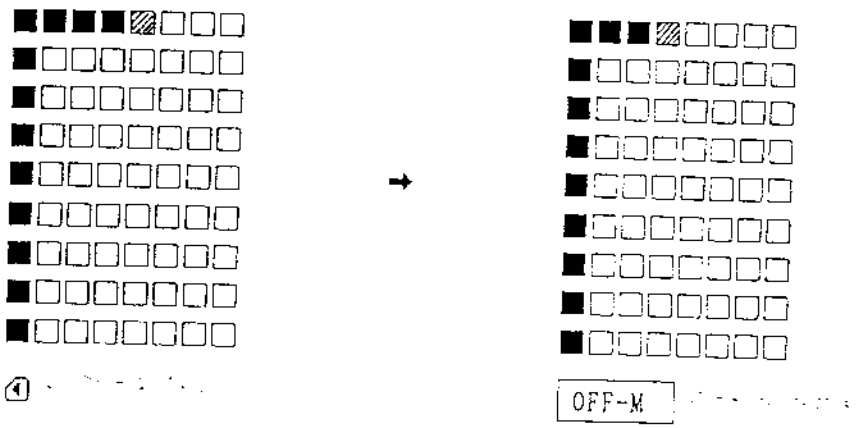
All painted pixels move one dot position in the preset vector direction.



h) 

key

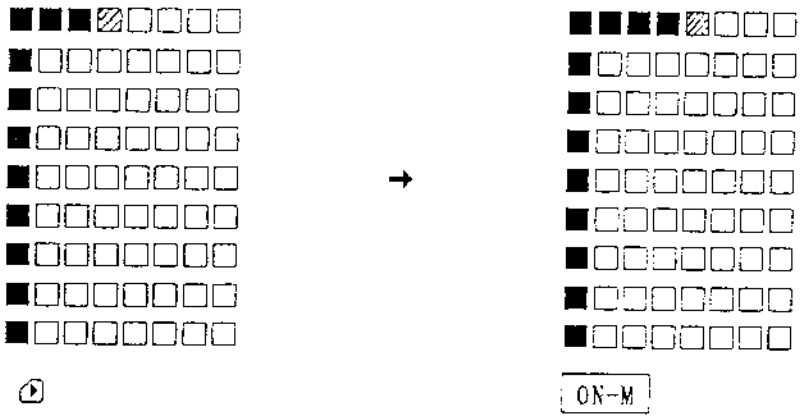
After clearing the pixel at the cursor position, the cursor moves one pixel in the preset vector direction.



i) 

key

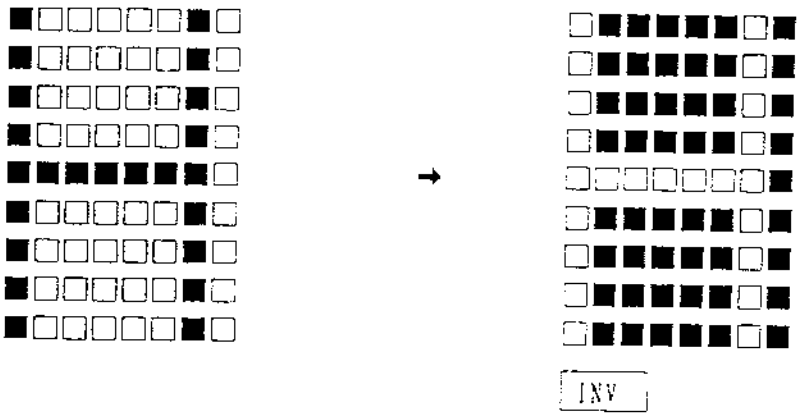
After painting the cell at the cursor position, the cursor moves one pixel in the preset vector direction.



j) 

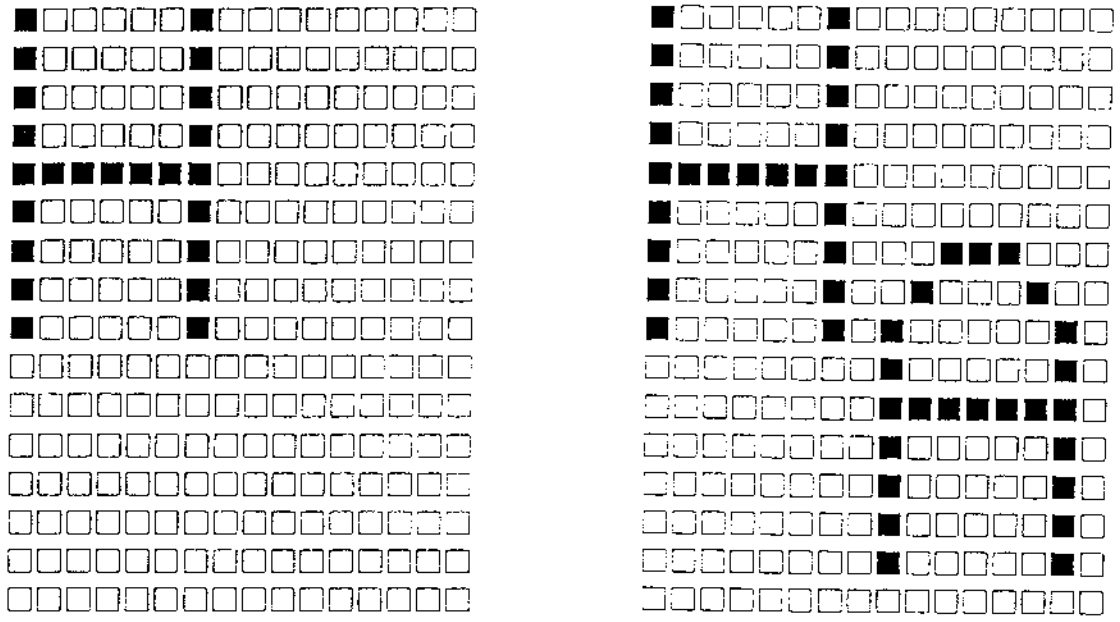
key

The on/off status of all pixels in the cell is inverted.



k) CHARA key and character No. (20 to E3)

While editing a user character cell, Ascii characters can be brought into the cell at the cursor position, by pressing the "CHARA" key followed by a two digit character code from the character chart on page 82.



CHARA + 4 1

Example : Press "CHARA" and code No. "41" ("A").

7.4.4 Editing Program Name

1) After selecting Function 3 and pressing the "SET" key, enter the program number to assign a name to. Press the " ▩ " key. The cursor will be positioned as shown below.

```
Program No.:01  Enable
        _
```

2) There is space for 8 ascii characters in the name field. To program the first character, enter the 2 digit ascii code (in Hex) for that character. Use the character code chart on page 82 for a list of available characters.

```
Program No.:01  Enable
        T_
```

3) After entering the first character code, the cursor will automatically move to the next character position. At the end of the name field, the cursor will move back to the program number field (or press the " ▩ " key to move there). Press the "SET" key to store the changes in the panel EEPROM.

   Continue to name the remaining programs if desired by following the sequence below.

   a) "PROG" key
   b) enter program number
   c) " ▩ " key
   d) enter name
   e) "SET" key

7.5 Function 4 : Panel ROM copy

7.5.1 Outline of Panel ROM copy

Panel ROM copy offers a number of different ways to duplicate the programs in a panel ROM.

a) The entire ROM may be copied to a blank EEPROM.

b) A single program can be copied to another program number.

c) A block of programs copied to another block range.

d) Timing data can be copied without changing pattern data.

e) User Characters can be copied.

Except for the complete duplication selection (a), all of the above operations can be used within a single EEPROM, as well as between 2 different devices. The "Source" ROM can be an EPROM or EEPROM, but the "Destination" device must be an EEPROM.

The different copy operations are selected using the following keys.

"0" key : "ALL" ... Copy all Panel ROM contents

"1" key : "PRG" ... Copy one program to another program

"2" key : "BLK" ... Copy a range of programs to another range of programs.

"3" key : "CHR" ... Copy a User Character (E0 to E3)

"E" key : "ERA" ... Erase the entire EEPROM

" ▒ " key : "TIMING DATA COPY"
... Copy Timing information only, not patterns. (ALL, PRG, or BLK)

Press the "FUNC" key at any time to exit this Function.

7.5.2 Copy Menu Selection

After selecting Function 4, press the "SET" key.
Select the desired operation as described below.

```
P.ROM  Copy Select    E:ERA
0:ALL  1:PRG  2:BLK   3:CHR
```

FUNCTION 4 SCREEN 1

7.5.3 Copy All ROM Contents

To copy all of one ROM to an EEPROM, press "0" for "ALL".

```
  Insert Source ROM
        & Push SET
```

Insert the Source ROM, and press the "SET" key.

```
  Insert Destination ROM
        & Push SET
```

Remove the Source ROM and Insert the Destination EEPROM.

Then press the "SET" key. While the data is being copied, a "*" will mark the progress of the copy process.

```
  Writing to PANEL-ROM
   [***              ]
```

7.5.4 Copy Individual Programs

To copy a program to another program number, press the "1" key (PRG).

```
Source          Prog: 01
Destination     Prog: 02
```

Insert the Source ROM in the Panel ROM socket. Enter the Program number to be copied. Press the "SET" key.

```
Source          Prog: 01
Destination     Prog: 02
```

Insert the destination EEPROM (if different) and Press the "SET" key. During the brief period that the writing is in progress, the following will be displayed on the LCD panel.

```
Source          Prog: 01
 Writing        Prog: 02
```

7.5.5 Copy Block of Programs

To copy a range of programs, press the "2" key (BLK). The example used below will create 39 copies of Program 01.

The patterns in these programs can then be edited to create multiple tests for the same monitor.

```
Source       Prog: 01 - 01
Destination  Prog: 02 - 40
```

Install the Source ROM. Enter the start and end number for the Source program(s). If both the start and end number are the same, only the one program will be used as the source.

Press the "SET" key.

```
Source       Prog: 01 - 01
Destination  Prog: 02 - 40
```

Install the Destination EEPROM (if different), and enter the starting and ending numbers for the Destination programs.

Press the "SET" key.

During the copy process the LCD will indicate as shown below.

```
Source        Prog: 01 - 01
 Writing      Prog: 02 - 40
```

Note that the beginning and ending numbers for the Source were the same in the above example. Alternatively they could reflect a range of programs, as in the screen below.

```
Source        Prog: 01 - 20
Destination   Prog: 21 - 40
```

7.5.6 Copy User Character (E0 to E3)

To copy a User Character (E0 to E3), press the "3" key (CHR).

```
Source        Character: E0
Destination   Character: E1
```

Insert the Source ROM in the Panel ROM socket. Enter the Character code number to copy from (Source).

Press the "SET" key.

```
Source        Character: E0
Destination   Character: E1
```

Insert the Destination EEPROM in the panel ROM socket. Enter the Character code number to copy to (Destination).

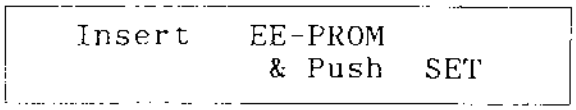
Press the "SET" key.

During the writing process the following will be displayed on the LCD panel.

```
Source        Character: E0
Writing       Character: E1
```

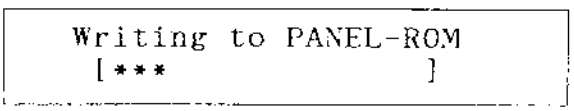
7.5.7 Erase Panel EEPROM

To erase the contents of an EEPROM, press the "E" key (ERA).



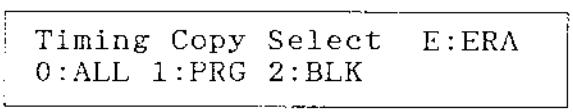
Insert the EEPROM to be erased and press the "SET" key.

During the erase process the following will be displayed on the LCD panel.



7.5.8 Copy Timing Only

To copy timing information only (no pattern definitions), press the " " key. This selection is intended to be used make duplicate copies of one or more timing definitions without changing existing pattern definitions. Every program in the Panel ROM MUST have a valid definition for each pattern. Please read the warning on page 85 concerning the use of Blank EEPROMS.

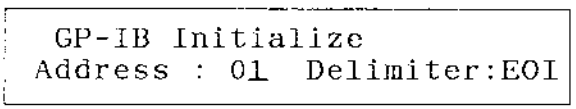


Select the copy method to use. The copy procedures are the same as described before for "ALL", "PRG", "BLK" and "ERA".

7.6 Function 5 : GPIB Address Selection

The GPIB address of each VG-819 is determined by the address programmed into the panel ROM. Since the VG-819 can only write to an EEPROM, an EEPROM is required as the panel ROM in order to use Function 5.

1) Press the "FUNC" key and then the "5" key. Enter the desired GPIB address using the "0" to "F" keys. The Delimiter, EOI, is not programmable.



GPIB INITIALIZE SCREEN

Range

Address : 01 to 1F

2) When complete, press the "SET" key to store the address in the panel EEPROM.

3) The VG-819 must be powered up with the EEPROM (or copied EPROM) installed in the front panel ROM socket in order to read the GPIB address.

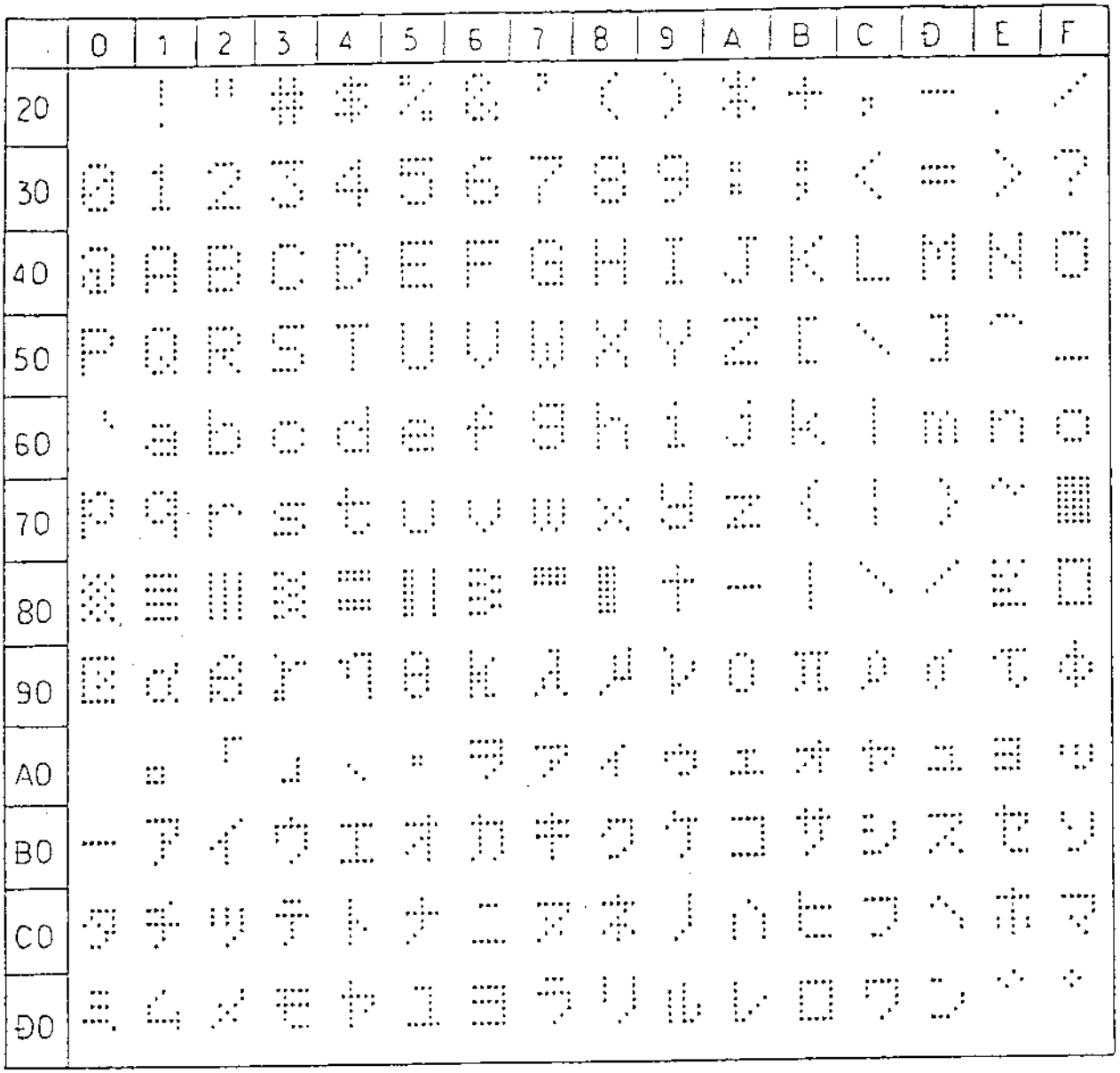
8.0 Sample Timing Data

	CGA	EGA	TTL	TTL	TTL	800X600	MONO
program No.	01/02	03/04	05/06	07/08	09/10	11/12	13/14
resolution	640X200	640X350	640X400	640X800	800X550	800X600	720X348
H.TIMING							
dot ckock	14.29	16.26	19.75	25.00	35.51	35.51	16.83
H.period	63.50	45.75	39.70	31.75	28.55	28.55	54.30
H.display	44.78	39.35	32.40	25.60	22.53	22.53	42.80
H.sync	4.45	4.75	3.50	4.80	3.60	3.60	8.25
H.backp	7.10	1.60	2.80	0.65	1.80	1.80	1.45
HD start	0	0	0	0	0	0	0
HD time	0	0	0	0	0	0	0
H scan rate	15.75	21.86	25.19	31.50	35.03	35.03	18.42
V.TIMING							
scan mode	nonint	nonint	nonint	nonint	nonint	nonint	nonint
V.total	262	366	420	525	583	636	369
V.sync	3	13	3	16	4	3	16
serration	off	off	off	off	off	off	off
Eq.frontp	0	0	0	0	0	0	0
Eq.backp	0	0	0	0	0	0	0
V. backp	33	2	17	16	20	20	2
V.display	200	350	400	480	550	600	348
VD start	0	0	0	0	0	0	0
VD line	0	0	0	0	0	0	0
V refresh r.	60.11	59.72	59.97	59.99	60.08	55.07	49.91
OUTPUT							
signal mode	TTL	TTL	TTL	TTL	TTL	TTL	TTL
sync on V	G	G	G	G	G	G	G
Hs	posi	posi	posi	posi	posi	posi	posi
Vs	posi	posi	nega	nega	nega	nega	posi
Cs	nega	nega	nega	nega	nega	nega	nega
HD	nega	nega	nega	nega	nega	nega	nega
VD	nega	nega	nega	nega	nega	nega	nega
RGB	posi	posi	posi	posi	posi	posi	posi
RGBHT	posi	posi	posi	posi	posi	posi	posi
VIDEO LEVEL							
video	0.7	0.7	0.7	0.7	0.7	0.7	0.7
sync	0.3	0.3	0.3	0.3	0.3	0.3	0.3
setup	off	off	off	off	off	off	off

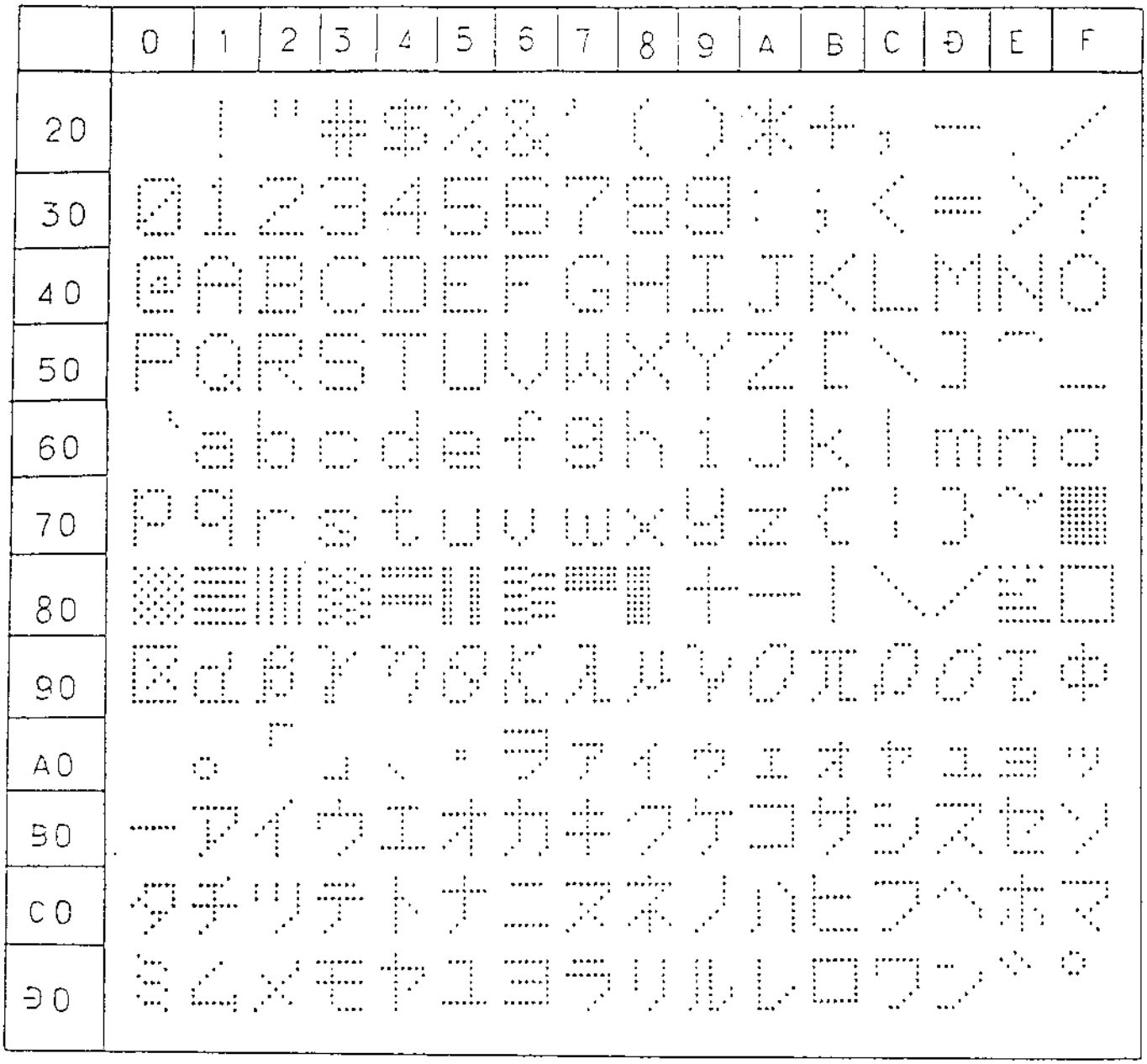
	PGC	VGA 480	VGA 400	VGA 350	1024X 768	1024X 800	1024X 1024	1280X 1024
program No.	15/16	17/18	19/20	21/22	23/24	25/26	27/28	29/30
resolution	640X480	640X480	640X400	640X350	1024X 768	1024X 800	1024X 1024	1280X 1024
H.TIMING								
dot ckock	25.09	25.19	25.19	25.19	67.88	67.91	107.00	109.96
H.period	32.80	31.75	31.75	31.75	20.83	19.79	15.75	15.75
H.display	25.50	25.41	25.41	25.41	15.08	15.08	9.58	11.64
H.sync	4.45	3.80	3.80	3.80	2.50	2.83	1.60	1.60
H.backp	2.80	1.60	1.60	1.60	1.50	0.94	2.00	2.00
HD start	0	0	0	0	0	0	0	0
HD time	0	0	0	0	0	0	0	0
H scan rate	30.49	31.50	31.50	31.50	48.01	50.53	63.69	63.49
V.TIMING								
scan mode	nonint	nonint	nonint	nonint	nonint	nonint	nonint	nonint
V.total	508	525	449	449	800	842	1061	1061
V.sync	2	2	2	2	16	16	3	3
serration	off	off	off	off	off	off	off	off
Eq.frontp	0	0	0	0	0	0	0	0
Eq.backp	0	0	0	0	0	0	0	0
V. backp	26	25	33	54	16	18	32	32
V.display	480	480	400	350	768	800	1024	1024
VD start	0	0	0	0	0	0	0	0
VD line	0	0	0	0	0	0	0	0
V refresh r.	60.02	59.99	70.15	70.15	60.01	60.01	60.03	60.03
OUTPUT								
signal mode	Anlg	Anlg	Anlg	Anlg	Anlg	Anlg	Anlg	Anlg
sync on V	G	G	non	G	G	G	G	G
Hs	nega	nega	nega	posi	nega	nega	nega	nega
Vs	nega	nega	posi	posi	nega	nega	nega	nega
Cs	nega	nega	nega	posi	nega	nega	nega	nega
HD	nega	nega	posi	posi	nega	nega	nega	nega
VD	nega	nega	posi	posi	nega	nega	nega	nega
RGB	posi	posi	posi	posi	posi	posi	posi	posi
RGBHT	posi	posi	posi	posi	posi	posi	posi	posi
VIDEO LEVEL								
video	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
sync	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
setup	off	off	off	off	off	off	off	off

9.0 Character Code List

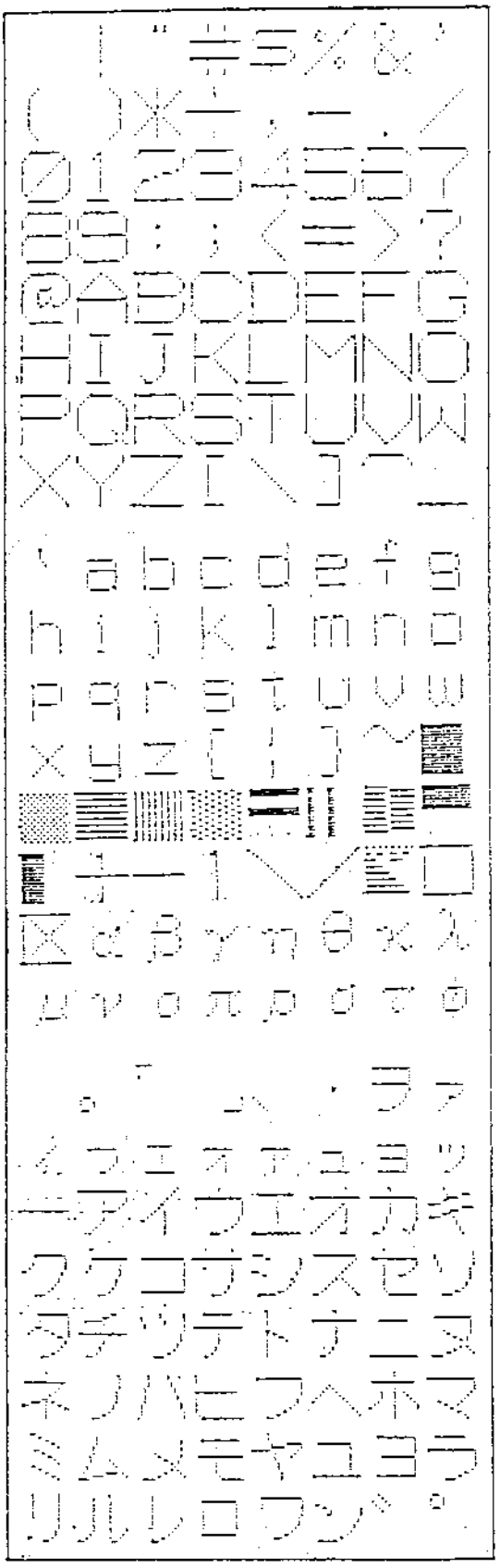
9.1 5 x 7 font characters



9.2 7 x 9 font characters



9.3 16 x 16 font characters



10.0 Using Blank EEPROMS in the VG-819

The VG-819 requires that a special header be written into each panel ROM. This header is automatically added when using Function 4. If an EEPROM does not have this header, the VG-819 will signal an error. Also, each program that is "enabled" must have EVERY parameter filled with valid definitions (timing and patterns).

Therefore, before trying to create programs on a blank EEPROM, first copy the contents of a previously programmed panel ROM (i.e. the Standard Timing EPROM No. 6335) onto the blank EEPROM. Then use Function 3 to make any changes that are needed. The procedure below can be used for this purpose.

1) Press the "FUNC" key, then the "4" key, then the "SET" key.

```
P.ROM  Copy Select    E:ERA
0:ALL  1:PRG  2:BLK   3:CHR
```

FUNCTION 4 SCREEN 1

2) Press "0" (ALL).

3) Install a ROM that has some programs on it already.

4) Press the "SET" key.

5) Install the Blank EEPROM.

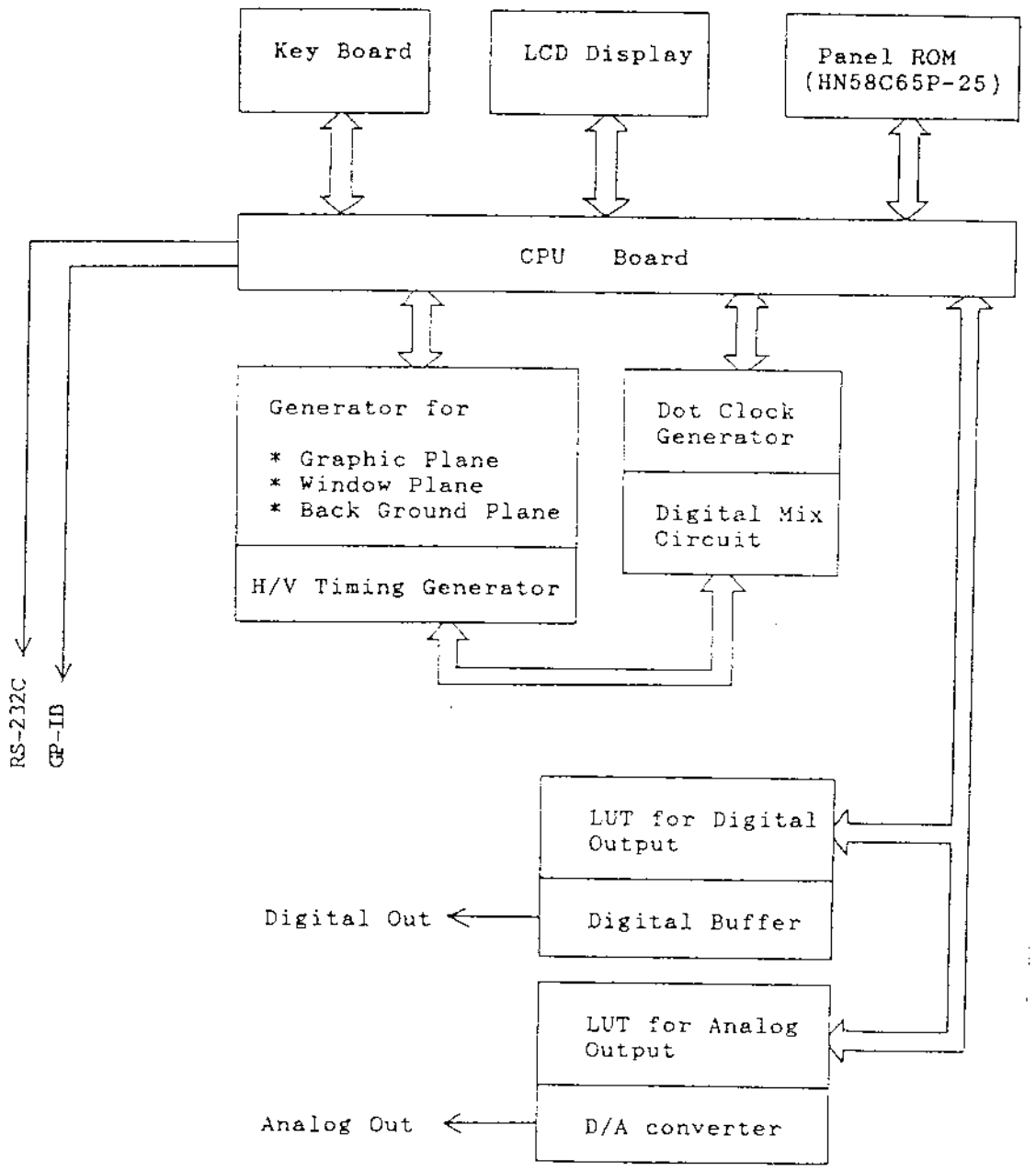
6) Press the "SET" key.

7) Press the "FUNC" key and then the "3" key.

Follow the instructions under "Detailed Operation" for Function 2 to make any required changes.

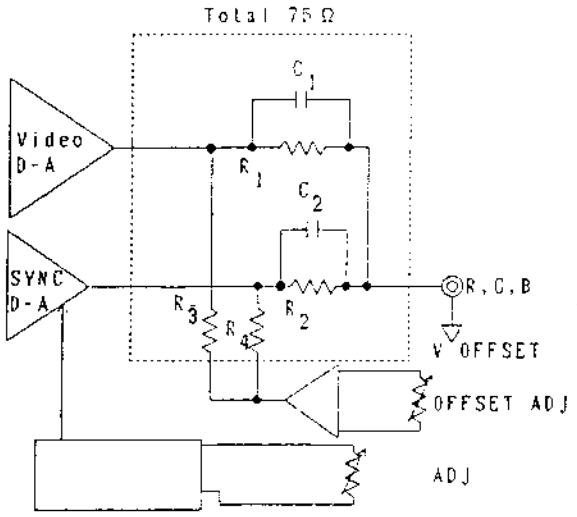
11.0 System Hardware Description

11.1 Hardware Block Diagram

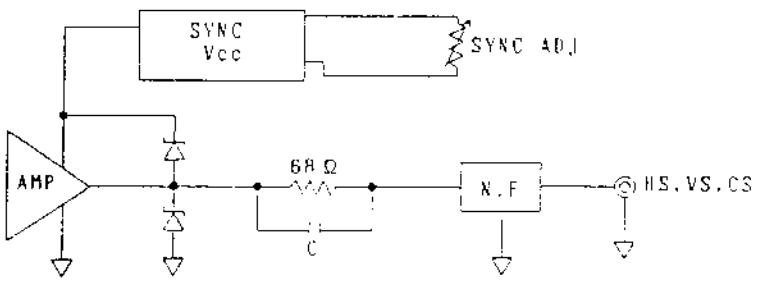


11.2 Output Circuits

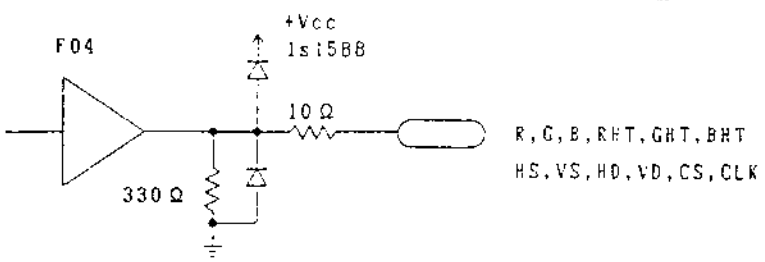
* Analog R,G,B



* Analog Sync

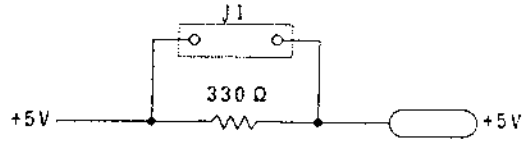


* TTL output

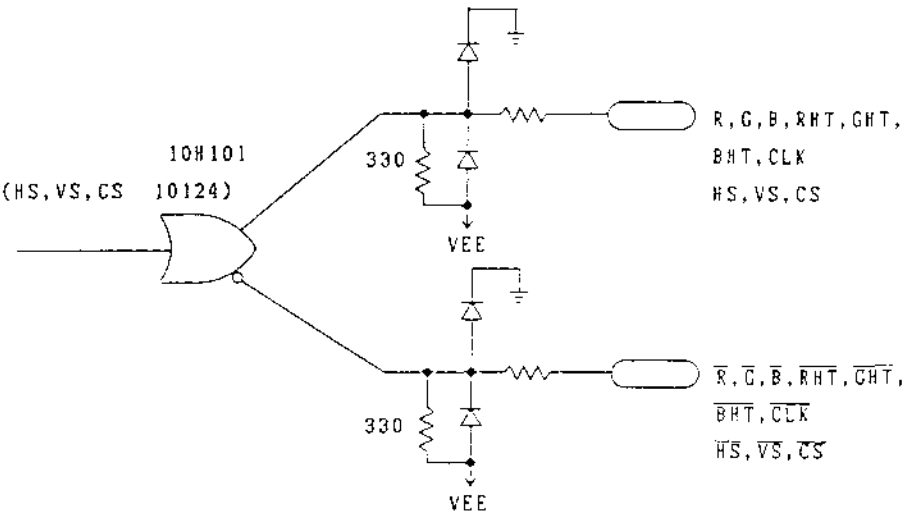


Protection circuit is a molded assembly

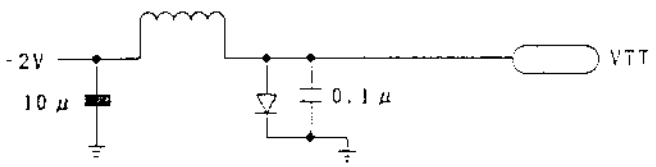
* DC +5 volt output



* ECL Output



* Vtt



* Vtt is the voltage source for the ECL-OUT termination.
  Please do not let it contact ground.

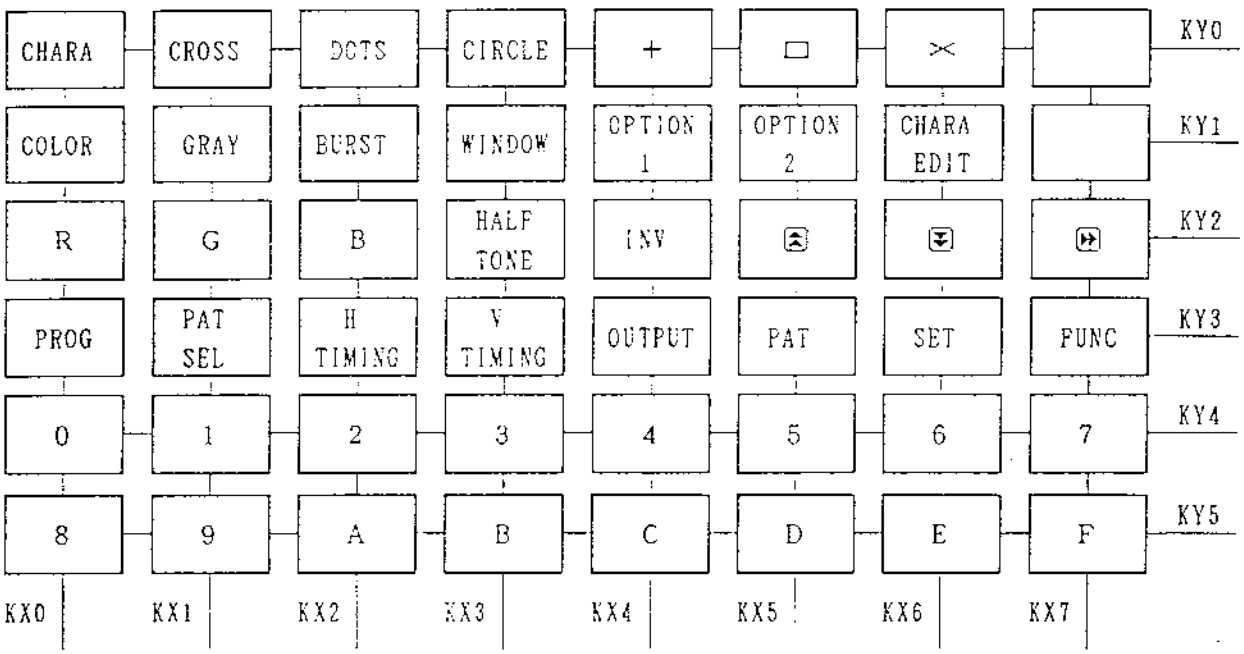
11.3 Remote Connector Pin Configuration

The pin assignment and keyboard matrix for the remote connector are shown below.

Pin Assignment

Pin Number	1	....	KX7	14	.... KX6
	2	....	KY2	15	.... KY3
	3	....	KY4	16	.... KY1
	4	....	KY5	17	.... KX4
	5	....	KX5	18	.... KY0
	6	....	KX3	19	.... KX2
	7	....	KX1	20	.... KX0

Key Matrix



12.0 Ratings and Accessories

12.1 Feature Specification

1) Dot (pixel) frequency : 5 MHz to 240.00 MHz

2) Horizontal scan frequency : 10 KHz to 130 KHz

3) Number of vertical lines : maximum 4096 lines

4) Graphics video memory : 2048 x 2048 dots

5) Analog video output level : 0.30 to 1.20 volts (75 ohms)

6) Sync output level (Hs/Vs/Cs): 1.50 to 2.20 volts (75 ohms)
(factory adjustment 2.0 volts)

7) Equalizing pulse : On/Off selection

8) Serration : On/Off selection

9) Sync on video signal : On/Off on R,G,B selection

10) Scanning mode : non-interlace
interlace & sync
interlace & video

11) Analog output : R,G,B,Hs,Vs,Cs

12) TTL output :R,G,B,RHT,GHT,BHT,Hs,Vs,Cs,
CLK,HD,VD,+5 volt, GND

* TTL video outputs are specified up to 120 MHz

13) ECL output :R,G,B,RHT,GHT,BHT,Hs,Vs,Cs,
CLK,Vtt,GND(plus the
complementary outputs of each)

14) Output patterns : character
cross hatch
dot
circle
color bar
gray scale
multi burst
window
corner marker
edge marker
diagonal
option patterns

15) Output control using front panel keys : On/Off of R,G,B and
RHT, GHT, BHT

12.2 Other Specifications

1) Power Source

* Input voltage	: 85 to 130 volts AC 170 to 250 volts AC
* Frequency	: 50 to 60 Hz
* Power consumption	: 250 VA max.

2) Dimensions & weight

* Dimensions	: 430(w) x 120(h) x 395(d) mm
* Weight	: 9.0 Kg

3) Environmental conditions

* Operating temperature	: +5 to +40 deg. C
* Storage temperature	: -10 to +60 deg. C
* humidity	: 20% to 90% (non condensing)

12.3 Standard Accessories

1) Operation Manual	: 1 set
2) AC Power cable	: 1 pce
3) BNC cable (3C2W, black)	: 5 pcs
4) 3.0A fuse (slow blow type)	: 2 pcs
5) EPROM (# 6335, Std. Timings)	: 1 pce
6) EEPROM (blank)	: 1 pce
7) Frame ground cable	: 1 pce
8) 24 pin connector (TTL)	: 1 pce
9) 36 pin connector (ECL)	: 1 pce

13.0 Trouble Shooting

The most common problems that may be experienced are presented in the table below. If other problems are encountered, consult the Self Check procedure or the Error Message listing on the following pages.

Symptom	Possible Cause	Possible Solution
No Power	Defective Fuse Defective AC Cord	Replace Fuse Replace AC Cord
No display of	a) "Background"	a) Set"background"
No Half Tones	a) Half Tone key b) Output mode c) "Gray" key	a) Set to ON b) Set to TTL/ECL c) Set to ON
No display at all	a) R,G,B keys b) Pattern Keys c) Program not active d) Defective cables e) Defective display f) Video outputs g) Sync level	a) Set to ON b) Turn several on c) Press "SET" key d) Replace e) exchange f) Check with scope g) Confirm proper level/polarity
Constant "Error 0"	Defective Panel ROM (EEPROM or EPROM)	Exchange

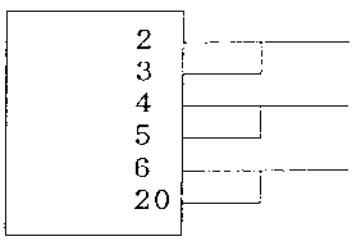
13.1 Self-Check

The Self-Check mode of the VG-819 checks the majority of the circuits in the unit. In the event of a failure of one or more of these tests, please contact a qualified service representative for assistance.

13.2 Equipment Required

1) For the RS-232C interface test to pass, a wrap-back connector must be connected to the RS-232C connector on the rear panel of the VG-819. If the connector is not available, this portion of the Self-Check can be skipped.

RS-232C Wrap-Back Connector



Connect:

Pin 2 to 3

Pin 4 to 5

Pin 6 to 20

All other pins : No connection

D-Sub 25 pin

13.3 Operation of Self-Check

1) To begin Self-Check operation, turn the Power Switch to the "ON" position while pressing the "B" key.

2) After the beeper sounds, all the front panel LEDs are turned on, and the LCD displays "▒▒▒" over the entire display for five seconds.

3) After five seconds, the beeper will sound again. Then the LCD display will indicate the start of the Key Check test. The installed firmware revision level is indicated.

```
 Ver 1.8  6614 6615
KEY CHECK:
```

13.3.1 Key Check

As each key is pressed, the LCD should display the key indications as shown below. To exit to the next test, press the " ▒ " key.

KEY	INDICATION
CHARA	CHAR
CROSS	CROS
DOTS	DOTS
CIRCLE	CIRC
+	+
□	EDGE
×	×
COLOR	COLR
GRAY	GRAY
BURST	BRST
WINDOW	WNDW
OPTION 1	OPT1
OPTION 2	OPT2
CHARA EDIT	CHRE
R	RED
G	GREN
B	BLUE
HALF TONE	HALF
INV	INV
PROG	PROG
PAT SEL	PSEL
H TIMING	HTIM
V TIMING	VTIM

KEY	INDICATION
OUTPUT	OUTP
PAT	PAT
SET	SET
FUNC	FUNC
⏫	
⏬	3-2.
⏭	→
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	A
B	B
C	C
D	D
E	E
F	F

13.3.2 Test Number Selections

After exiting the key check mode, the menu for the remaining tests is displayed. Select each test using the "0" to "3" keys.

NOTE: Test 3, VRAM, should be done last, since the exit method from this test is to turn the power off.

```
Select No. (0-3)   0:RAM
1:PROM 2:RS232C    3:VRAM
```

Test Selection	Description
0: RAM	Checks work-RAM, sync-RAM, and pattern-RAM.
1: PROM	Check the panel EEPROM (not EPROM)
2: RS232C	Checks the RS-232C interface. (Requires wrap-back connector).
3: VRAM	Checks the Video-RAM

13.3.3 KEY "0" : RAM Check

Select "0", RAM Check. Until the test is complete, the LCD will indicate as shown below, as long as no errors are detected.

```
WORK-RAM CHECK
```

If no errors were detected, then the display will momentarily indicate as shown below, then return to the test selection screen.

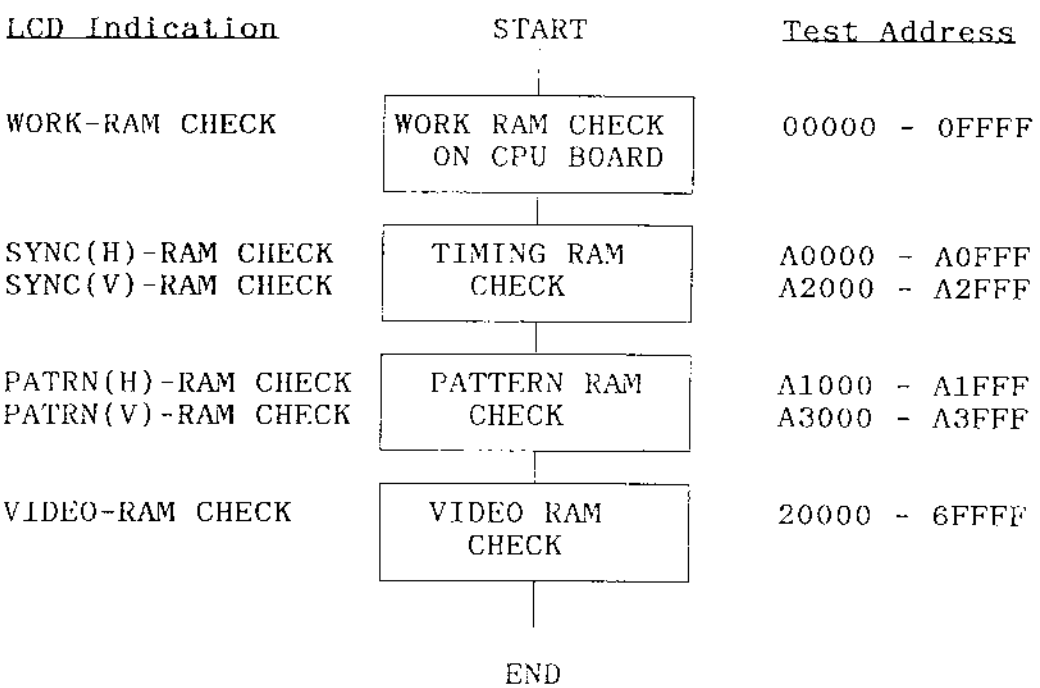
```
RAM-CHECK OK ! !
```

If any errors were detected, the error beeper will sound and the error address, read, and write data, will be displayed as shown in the example below.

```
WORK-RAM CHECK ERROR ! !
ADRS:00100 WD:55  RD:54
```

When an error screen is displayed, press the " ▣ " key to continue the test, or press the " ▣ " key to return to the test selection screen.

Flow Chart of RAM Test



13.3.4 KEY "1" : Panel Rom Check

After selecting "1", Panel Rom Check, the LCD will indicate as shown below. Insert an EEPROM and press the "SET" key.

```
Insert EEPROM ! !
    & SET
```

All the contents of the EEPROM are saved into a buffer first. As the write test begins, the LCD indication changes as shown below.

```
Writing Check Data
 [**                ]
```

After the write process is complete, the read portion of the test begins.

```
PANEL-ROM CHECK ! !
```

If no errors were detected, the LCD indication is as shown below.

```
PANEL-ROM CHECK OK ! !
```

If an error is detected, the error beeper will sound and the address, write data, and read data will be displayed as shown in the example below.

```
PANEL-ROM CHECK ERROR ! !
ADRS:D0105 WD:F5  RD:E5
```

If an error is indicated, press the " ▩ " key to continue the ROM test, or press the " ▩ " key to return to the test selection screen.

13.3.5 Key "2" : RS-232C Check

Before selecting the RS-232C test, make sure the Wrap-back connector is installed on the rear panel RS-232C connector. Press the "2" key to begin the test.

```
RS232C CHECK !!
```

If there is no error, the screen below is displayed momentarily, then the display returns to the test selection screen.

```
RS232C CHECK !!
END OF TRANSMISSION
```

If no wrap-back cable is detected, the following indication will be displayed.

```
RS232C NO CONNECT
```

When a data error is detected, the following indication is displayed momentarily, then the display returns to the test selection screen.

```
RS232C DATA ERROR !!
```

13.3.6 Key "3" : VRAM Check

The VRAM Check requires that a panel ROM with a valid program be installed in the panel ROM socket of the VG-819. The Standard Timing EPROM (No. 6335) can be used for this purpose. The test checks the video RAM for defects, as well as providing a "loop on error" feature for Service Personnel. This section will provide enough instruction to properly detect any defects in the video RAM. The test will run continuously, until the Power switch if turned off.

Dis-connect any video or sync cables that may be connected to the rear panel of the VG-819.

Install the panel ROM and press the "3" key. Enter the program number, write data, and the R/W parameter.

```
PROGRAM NO. : 01
WRITE DATA: 0000  R/W: 0
```

1) PROGRAM No. : Enter program number "01".

2) WRITE DATA : Using the "0" to "F" keys, enter 4 hex values for the video write pattern.

3) R/W : Enter "0" for the Loop on error value.

Press the "SET" key. If an error is detected, the LCD screen will indicate the address, write data, and read data, as shown in the example below.

```
VRAM ADDRESS : 34EEA
WRITE : FFFF  READ : 4EFF
```

To exit the Self Check Mode, turn the VG-819 power switch off.

13.4 Error Messages

The VG-819 can indicate 19 different error messages, to assist the user in isolating the cause of a problem. The error messages fall into four groups.

a) Error 0,1 : Panel ROM or Program status errors.

b) Error 2-14 : Timing restrictions exceeded in a program. (formulas provided)

c) Error 16 : Output parameters missing or invalid.

d) Error 17-23: Pattern parameters missing or invalid.

The error code descriptions are listed below.

1) Error = 0 ... During a write to Panel EEPROM, either no device was detected or an EPROM was installed.

2) Error = 1 ... The program number selected for display in Function 0 is set to "DISABLE". Must be set to "ENABLE".

3) Error = 2 ... When programming Horizontal Timing, the following formula was not met:

5.000 MHz < Dot-Clock < 240.00 MHz

4) Error = 3 ... When programming Horizontal Timing, the following formula was not met:

H-Period > H-Sync + H-Backp + H-Disp (dot programming)

5) Error = 4 ... When programming Horizontal Timing, the following formula was not met:

H-Period > H-Sync + H-Backp + H-Disp (μs programming)

6) Error = 5 ... When programming Horizontal Timing, the following formula was not met:

H-Period > HD-Start + HD-Width (dot programming)

7) Error = 6 ... When Programming Horizontal Timing, the following formula was not met:

H-Period > HD-Start + HD-Width (μs programming)

8) Error = 11 ... When programming Vertical Timing, the following formula was not met:

V-Total > V-Sync + V-Backp + V-Disp

9) Error = 12 ... When programming Vertical Timing, the following formula was not met:

V-Total > VDs + VD1

10) Error = 13 ... When programming Vertical Timing, the following formula was not met:

EQPfp $\leq$ Vfp
(Vfp = Vtotal-Vsync-Vbp-Vdisp)

11) Error = 14 ... When programming Vertical Timing, the following formula was not met:

EQPbp $\leq$ Vbackp

12) Error = 16 ... Output signal definition is missing or invalid.

13) Error = 17 ... Character pattern definition is missing or invalid.

14) Error = 18 ... Cross hatch pattern definition is missing or invalid.

15) Error = 19 ... Dot pattern definition is missing or invalid.

16) Error = 20 ... Circle pattern definition is missing or invalid.

17) Error = 21 ... Multi burst pattern definition is missing or invalid.

18) Error = 22 ... Window pattern definition is missing or invalid.

19) Error = 23 ... Color bar pattern definition is missing or invalid.

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