

CONNECTING TO A MONITOR

All the signal parameters generated by the CM2125, such as sync frequency, pixel resolution and polarity, can be set by the user. This is what gives the CM2125 the versatility to match any computer monitor. Connecting the CM2125 to a monitor requires four steps: 1) Choosing the proper Interface Connector; 2) Setting the Signal Parameters; 3) Setting the Video Format; 4) Selecting the Video Pattern. This section of the manual explains each of these steps.

WARNING

Many computer monitors use a full-wave "hot chassis". Always use an isolation transformer when servicing any monitor chassis. Failure to use isolation will produce a dangerous shock hazard and may result in damage to the monitor or your test equipment.

Do not isolate your test instruments as this may recreate the unsafe conditions.

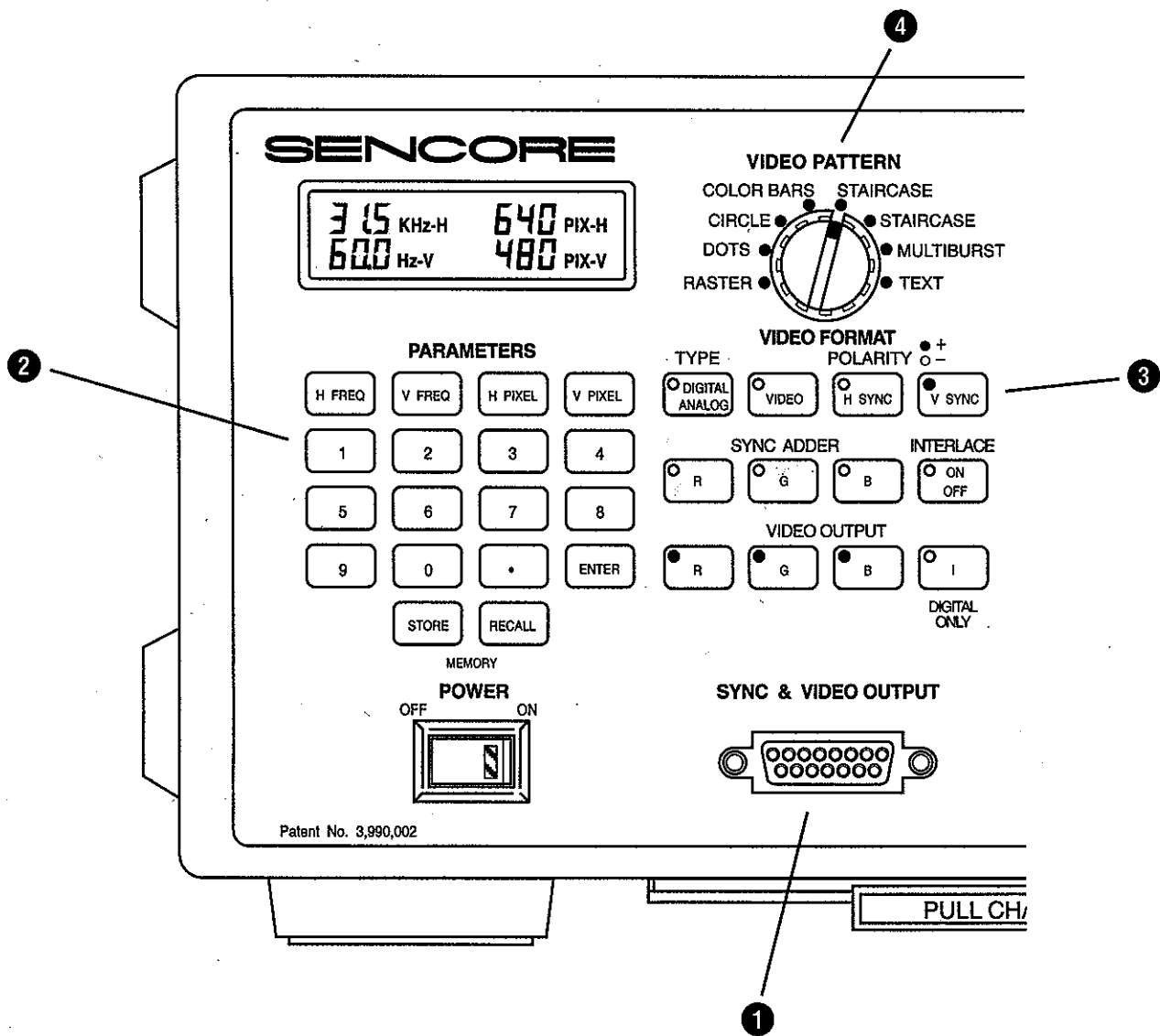


Fig. 2 Connecting the CM2125 to a monitor requires four steps: 1) Connect the proper Interface Connector; 2) Set the Signal Parameters, 3) Set the Video Format, and 4) Select the desired Video Pattern.

Choosing The Proper Interface Connector

Each type of computer monitor uses a unique "standard" connector. The connectors differ in size, shape, number of pins, and in electrical wiring. The (optional) Interface Connectors properly match the SYNC & VIDEO OUTPUT Jack to each monitor type. Table 1 lists the Interface Connector that is needed for each monitor type.

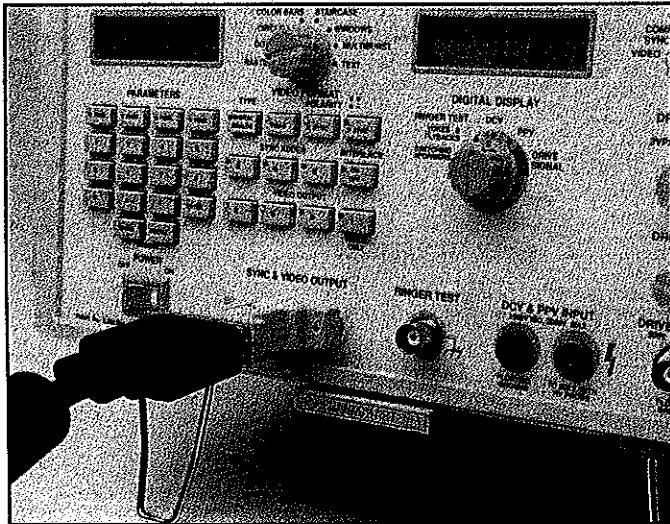


Fig. 3 Plug one end of the connector into the CM2125's SYNC & VIDEO OUTPUT Jack and the other end to the computer monitor's cable (or OUTPUT EXTENSION CABLE if the monitor does not have a cable).

The Interface Connectors may be ordered through Sencore Service Parts Department. Contact Service Department at:

**SENCORE SERVICE PARTS,
3200 Sencore Drive,
Sioux Falls, SD 57107
1-800-736-2673**

Note: Appendix C lists the wiring of the SY1 VIDEO OUTPUT Jack and Interface Connectors.

To connect the CM2125 to a monitor:

1. Turn "off" the Power Switch on both the CM2125 and the monitor.
2. Select the (optional) Interface Connector matches the monitor type you are servicing.
3. Plug the connector to the CM2125 SYNC VIDEO OUTPUT Jack.
4. Plug the monitor cable into the Interface Connector. Use the (optional) OUTPUT EXTENSION CABLE if the monitor does not have a cable, or if the cable is too short.
5. Turn "on" the Power Switch on both the CM2125 and the monitor.

CM2125 Connector Chart	
Connector	Computer Monitor Type
1	CGA, MDA, Hercules
2	EGA
3	PGC
4	VGA, PS/S, SVGA, XGA
5 & 5F*	Apple or Mac
6	BNC Input
ECL	ECL
Universal	Adapts to match any computer monitor type

TABLE 1 - Interface Connector applications

*Monitor with male Input connection

Setting The Signal Parameters

Each type of monitor (CGA, EGA, VGA etc.) operates at different horizontal and vertical scan frequencies and produces different amounts of horizontal and vertical resolution (pixels). Each of these monitor types has standard signal parameter values.

The parameter values for common monitors are summarized in Appendix D and on the Pull Chart. To make the monitor operate properly, you must enter the vertical and horizontal frequencies and pixel resolution shown. The PARAMETERS buttons select the frequencies and resolutions of the signals at the SYNC & VIDEO OUTPUT Jack and the frequencies of the DRIVE SIGNALS.

Some monitors are "multiscan" and can operate over a wide range of signal parameters. Test these monitors by selecting several different combinations of signal parameters that are within the monitor's operation range. Refer to the APPLICATION section entitled "Troubleshooting Multiscan Monitors" for more information.

PARAMETERS Readout - The LCD located directly above the PARAMETERS Buttons shows the current numerical value of each signal parameter. Figure 5 shows the information displayed by the Readout.

Monitor Type	H FREQ	V FREQ	H PIXEL	V PIXEL	DIGITAL ANALOG	H SYNC	V SYNC	Sync Adder	Interlace
CGA	15.7	60.0	640	200	DIGITAL	+	+	OFF	OFF
NEC DH	16.0	60.3	640	200	DIGITAL	+	-	OFF	OFF
HITACHI 2	17.3	62.4	512	512	ANALOG	+	-	OFF	ON
HERCULES	18.4	50.0	720	350	DIGITAL	+	-	OFF	OFF
MDA	18.4	50.0	720	350	DIGITAL	+	-	OFF	OFF
EGA	21.8	60.0	640	350	DIGITAL	+	-	OFF	OFF
NEC P2	24.8	56.4	640	400	DIGITAL	-	-	OFF	OFF
PGC	30.5	60.0	640	400	ANALOG	COMPOSITE SYNC		OFF	OFF
PGO	30.5	60.0	640	400	ANALOG	COMPOSITE SYNC		OFF	OFF

Fig. 4 Standard Monitor Formats (See Appendix D for a listing)

Note: The timing of the front porch, sync and back porch of the horizontal and vertical sync pulses match those of the standard computer monitor formats. As you are entering the parameters the CM2125 automatically checks to see if the format you've entered is a format it recognizes. If it is, the CM2125 automatically adjusts to the correct timing. If you deviate from any of the standard parameters, the blanking signal will default to 80% trace/20% retrace time. This may cause a noticeable change in the displayed raster size or position. To learn how to program the timing of the horizontal and vertical front porch back porch and sync signals, turn to page 14.

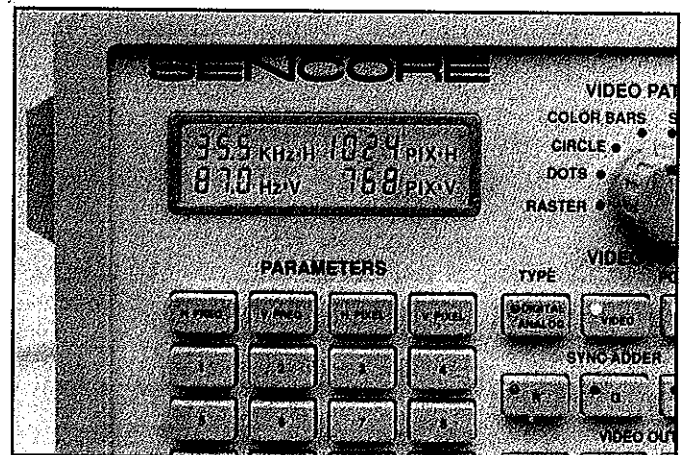


Fig. 5 The PARAMETERS READOUT shows the parameters of the output signals.

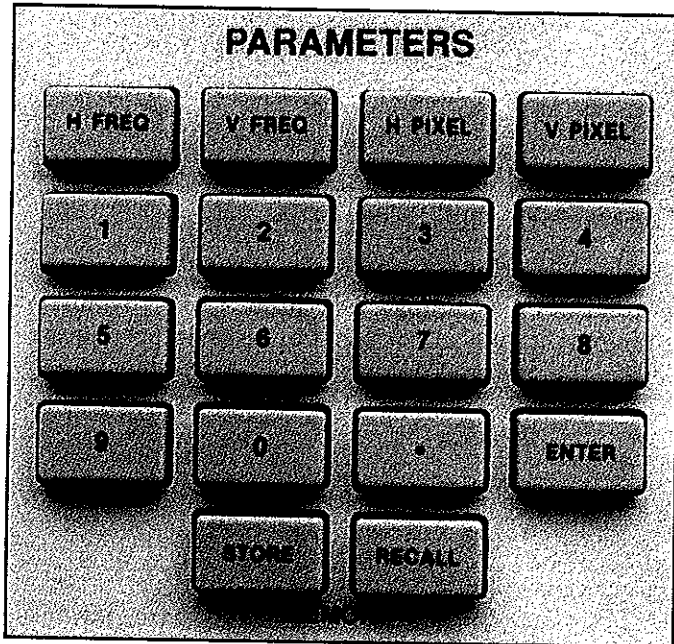


Fig. 6 The PARAMETERS buttons set the sync frequencies and pixels resolutions to match the monitor you are testing

SIGNAL PARAMETERS Buttons - Use the PARAMETERS Buttons to set the proper horizontal and vertical sync frequency and the number of horizontal and vertical pixels to match the monitor you are servicing. The PARAMETERS Buttons include:

- H FREQ** - horizontal sync frequency
- V FREQ** - vertical sync frequency
- H PIXEL** - horizontal pixel resolution
- V PIXEL** - vertical pixel resolution
- Digits 0-9** - numerical values

The "Store" and "Recall" Buttons are used with the memory functions. These are discussed later in the section entitled "Using The Memory Functions."

Entering a signal parameter requires three steps: 1) Push the desired parameter button, 2) Enter the numerical value, and 3) Press "Enter" to complete the entry. Watch the readings in the PARAMETERS Readout as you make the entry. When you push a PARAMETERS Button, the number portion of the corresponding display will blank and show each digit as you enter it. The parameter portion of the display will blink until you complete the entry by pressing "Enter." If you make a mistake while entering a number, simply press the previously selected parameter button and begin again.

The Parameter range limits that the CM2125 generate are:

- Vertical frequency - 10 Hz to 250 Hz
- Horizontal frequency - 10 kHz to 250 kHz
- Vertical Pixels - 80 to 2048
- Horizontal Pixels - 80 to 2048

To change a signal parameter:

1. Find the parameter values in the monitor service literature or in Appendix D.
2. Press the PARAMETER Button of the unit you wish to change. The corresponding PARAMETERS Readout display will blink.
3. Enter the numerical value using the DIGIT Buttons. Make sure that each number appears in the PARAMETER Readout.
4. Press "Enter" to complete the entry.

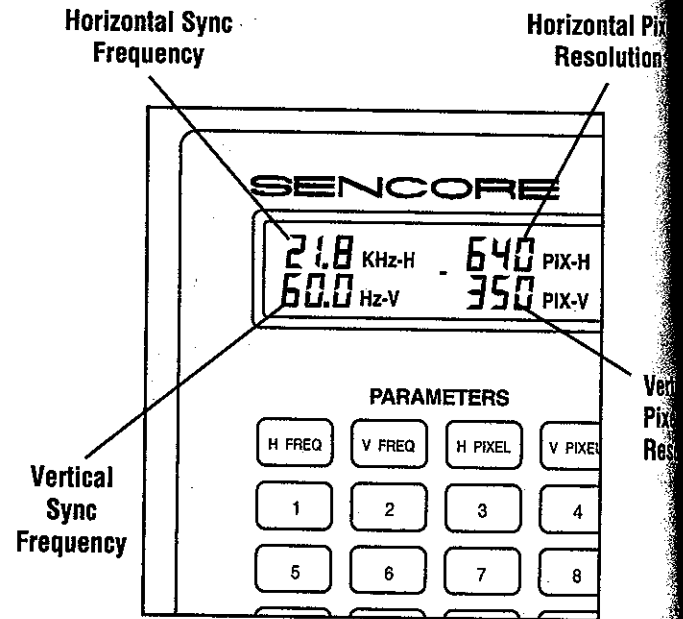


Fig. 7 Setting the CM2125 to generate the signals for an EGA monitor.

Example: programming the CM2125 to generate the correct signals for an EGA computer monitor.

1. Find the monitor's parameters in the service literature or in Appendix D.
2. Press

H FREQ	2	1	.	8
--------	---	---	---	---
3. Press

V FREQ	6	0	ENTER
--------	---	---	-------
4. Press

H PIXEL	6	4	0	ENTER
---------	---	---	---	-------
5. Press

V PIXEL	3	5	0	ENTER
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Notes: (1) If you attempt to exceed either the frequency or pixel range limits, the entry will default back to the original value, (2) If you make an entry error, press the previously selected parameter button and repeat steps 3 and 4, (3) The CM2125 will return to the PARAMETERS settings last used before it was turned "Off" whenever you turn "On" the AC Power.

Monitor Format

The left LCD display on the CM2125 shows the computer monitor's format (horizontal and vertical pixels and scan frequencies). The CM2125 delivers as many pixels to the monitor as its bandwidth allows. For example, when the CM2125 is connected to a monitor with specifications of 2048 horizontal pixels and a horizontal scan frequency of 125 KHz, the CM2125 sends 936 pixels.

Note: See Appendix I for an explanation of the relationship between pixels, scan frequency, and dot clock frequency.

To determine the number of horizontal pixels generated by the CM2125:

1. Press

The number of horizontal pixels actually being generated by the CM2125 will appear for five seconds in the left LCD display.

Programming Sync Timing Parameters Into The CM2125

Importance of Proper Timing

The horizontal and vertical sync signals fed to a monitor are responsible for synchronizing the horizontal and vertical oscillators to the incoming video signals. The oscillators in turn feed the driver and output stages which move the electron beam up and down and back and forth across the face of the CRT.

The timing of the sync signals in relationship to the video establishes the position of the picture that is displayed on the CRT. If the sync and video timings are incorrect the displayed picture will be the wrong size, will be shifted up or down, or will be shifted to the left or right.

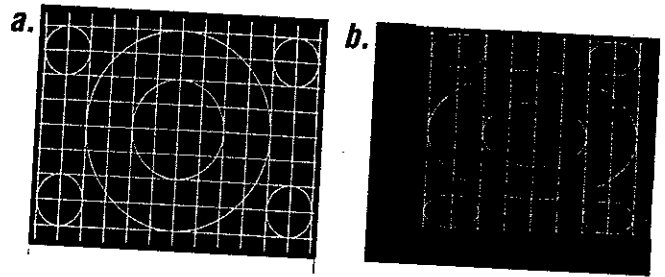


Fig. 9: (a) The display is properly sized and centered. (b) Display is crunched and shifted because of incorrect timing between the sync signals and video.

Four Sync Parameters

The horizontal and vertical sync signals each have four parameters: front porch time, sync time, back porch time, and active video time. The combination of front porch, back porch, and sync times make up blanking time. Blanking time plus active video time equals the total scan time.

When To Program Sync Parameters

Memory locations 0-42 in the CM2125 contain the setups for the most common computer monitor formats. These setups contain the correct horizontal and vertical sync frequencies and pixel counts, as well as the timing parameters for vertical and horizontal front porch, sync, and back porch.

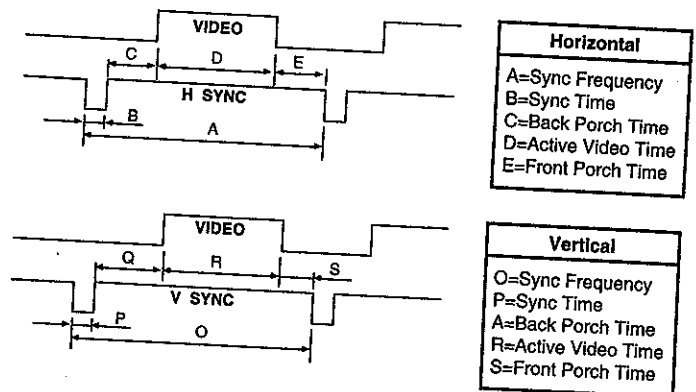


Fig. 10: Four timing parameters: front porch, sync, back porch, and active video, establish the size and centering of the raster on the CRT.

If you enter the scanning frequencies and pixel rates for a computer monitor format the CM2125 does not

recognize, the scan and sync parameters will automatically default to 80% displayed video and 20% blanking. The blanking pulse time will be divided evenly between the front porch, sync, and back porch. If the computer monitor does not use a 80% video 20% blanking timing format (with blanking divided into thirds), a locked in pattern will appear on the display, but it will not be centered.

You can center the pattern on the display by changing the timing of the vertical and horizontal front porch, back porch, and sync to the values the computer monitor has been designed to receive. You can change the timing of these parameters from the front panel of the CM2125.

Programming The Sync Time Parameters

In order to change any of the timing parameters, you must enter a series of keystrokes that puts the CM2125 into the "programming" mode. This is completed by pressing STORE, 8, 0, and then ENTER.


Press: 

Fig. 11: Keystrokes to place the CM2125 into the program mode.

When the CM2125 is in the "Program" mode, a small dot appears in the upper right hand corner of the left display. The dot remains in the display until RECALL, 8, 0, and ENTER are pressed again or until a setup from memory location 0-42 is recalled.

The dot also appears in the display when you recall a setup that you've previously programmed the timing parameters for and stored into the user memory locations. The dot reminds you the timing parameters have been programmed and that the CM2125 is generating these timing parameters.

To take the CM2125 out of the "Program" mode press RECALL, 8, 0, and then ENTER. The dot in the left hand display will disappear.


Press: 

Fig. 12: Keystrokes to take the CM2125 out of the program mode.

Once the CM2125 is in the program mode, you can start entering the timing values for the horizontal and vertical front porch, sync, and back porch parameters. The values you enter will appear in the right hand display located above the DIGITAL DISPLAY switch. The following key sequences are used to program vertical and horizontal sync time.

Programming Vertical Blanking Parameters:







Front Porch Time Press  "front porch time" (msec) 
 Back Porch Time Press  "back porch time" (msec) 
 Sync Time Press  "sync time" (msec) 

Fig. 13: Keystrokes for programming vertical timing parameters.

In the program mode, the vertical sync frequency is automatically calculated from the horizontal sync frequency, vertical pixel number, and sync time parameters you enter. If you attempt to set the vertical sync frequency while in the programming mode, the error code "E4" will appear in the right hand display.

Programming Horizontal Blanking Parameters:







Front Porch Time Press  "front porch time" (μsec) 
 Back Porch Time Press  "back porch time" (μsec) 
 Sync Time Press  "sync time" (μsec) 

Fig. 14: Keystrokes for programming horizontal timing parameters.

You must enter all three parameters (front porch, sync, and back porch) as a group for either vertical or horizontal sync timing before those parameters take effect. Once you have entered values for all three, you can go back and modify any of the three parameters individually.

If an "E 9" appears in the right hand display when you attempt to store a timing parameter, the "sync time" programming mode has not been enabled. Press: STORE, 8, 0, and then ENTER and begin again.

Storing The New Format

Once you have entered the timing parameters for the new setup, you can store them for future use. Storage locations 43-69 are available for user setups. All six timing parameters will be stored in the same memory location. The CM2125's memory is nonvolatile so the setup will not be lost when the unit is shut off or unplugged. To store the setup in the CM2125, enter the keystrokes shown below:

Press "memory location"
(43-69)

Fig. 15: Keystrokes for storing a programmed setup.

Checking A Timing Parameter

You may want to check the time you've entered for one of the parameters. This can be done by recalling the location where the parameter is stored. The value will appear in the right hand display. You cannot recall the timing values of the setups stored in memory locations 0-42. If you attempt to do this, three 8's will appear in the right hand display.

Press "location 81-86"

Fig. 16a: Keystrokes for recalling a stored timing parameter.

Press

Fig. 16b: Keystrokes to check the front porch time of the vertical blanking pulse.

Programming Example

The following chart contains the timing parameters for a computer monitor. Follow steps 1-9 to program this information into the CM2125. In this example, the setup is stored in memory location 49. When RECALL, 4, 9, and ENTER are pressed, the CM2125 will generate signals with the timing values you've programmed.

Parameter	Horizontal	Vertical
Frequency	65.2 kHz	61.7 kHz
Resolution	1024 Pixels	1024 Pixels
Front Porch	.360 μ Sec	.300 μ Sec
Sync	.770 μ Sec	.114 μ Sec
Back Porch	.770 μ Sec	.114 μ Sec
Polarity	+	+

1. Set to 65.2 kHz to 1024 to 61.7 Hz to 1024
2. Press ("scan time" program mode)
3. Press (vertical front porch)
4. Press (vertical back porch)
5. Press (vertical sync)
6. Press (horizontal front porch)
7. Press (horizontal back porch)
8. Press (horizontal sync)
9. Press (Store in Memory Location 49)

Setting The Video Format

Besides scan frequency differences, monitors vary in the makeup of the input signal, such as polarity, level and how the sync is applied. Additionally, many monitors can operate in several modes and use the polarity of the sync signals to figure out their operating mode. (Refer to the APPLICATION section entitled "Testing Mode Select Circuits" for details on multimode monitors).

The signal formats used by common monitors are shown in Appendix D and on the Pull Chart. The VIDEO FORMAT Buttons select the makeup of the signal at the SYNC & VIDEO OUTPUT Jack to allow the CM2125 to duplicate all monitor input requirements. The Formats can be changed using the front panel buttons, by recalling a stored setup from memory, or via the Computer Interface Bus. Following is a further explanation of each VIDEO FORMAT Button:

OUTPUT signals to digital levels (LED "on" analog levels (LED "off"). If you select the wrong TYPE, the monitor will display the video pattern incorrectly. (Refer to the section entitled "Video Patterns" on page 20).

A small percentage of high resolution computer monitors on the market require an ECL (emitter coupled logic) input. The CM2125 provides the ECL signal when used with the optional ECL adapter (39G346). The ECL adapter connects to the SYNC & VIDEO OUTPUT of the CM2125 and converts digital signal levels to ECL signal levels.

To order the ECL adapter contact the Service Department at:

SENCORE SERVICE PARTS
3200 Sencore Drive
Sioux Falls, SD 57107
1-800-736-2673



Type - Monitors require either digital, analog or ECL input signals. This switch sets all the SYNC & VIDEO

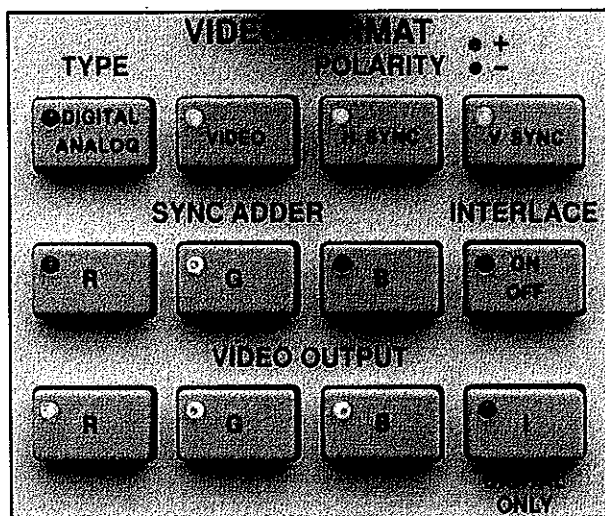
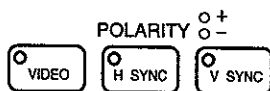


Fig. 8 The VIDEO FORMAT buttons control the makeup of the signals coming out of the SYNC & VIDEO OUTPUT Jack.



Polarity - The "Polarity" Format Buttons establish the polarity of the **VIDEO** (R, G, B & I), **H SYNC** (horizontal sync) and **V SYNC** (vertical sync) signals at the SYNC & VIDEO OUTPUT Jack. The LED Indicator lights for "+" polarity and is unlit for "-" polarity. The "Polarity" Button also changes the polarity of the "Video" DRIVE SIGNAL.

Most monitors require "+" Video polarity. Choosing the wrong polarity will produce a negative picture image on the monitor. Incorrect sync polarities may have no effect on some monitors and may cause loss of sync in others. Some monitors use different sync polarity combinations to select operating modes.

Video Polarity

The vast majority of the computer monitors on the market require a positive going video signal (white video level positive relative to blanking). A few computer monitor types require a negative going a video signal (white video level negative relative to blanking).

The CM2125 generates both the positive and negative polarity video signals

Example: programming the CM2125 to generate a negative polarity video signal.

1. Press

The LED on the DIGITAL/ANALOG button flashes when the CM2125 is generating a negative polarity video signal. If the CM2125 is generating a negative polarity video signal and you want to go back to a positive polarity video signal:

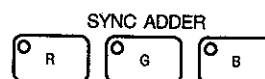
2. Press

3. Or recall a stored monitor format than doesn't require a positive polarity video signal.

The CM2125 stays in the negative polarity video signal mode when the unit is turned off and back on again. Also, if a monitor format is stored in one of the memory locations in the negative polarity mode, it will be in the same mode when the format is recalled.

Sync Adder - The sync adder buttons select to which video line the sync information is added. Selecting R, G, or B adds both the vertical and horizontal sync to that signal line. Sync is added to a line when the corresponding LED Indicator is lit. Sync can only be added to "Analog" type monitors.

Adding sync to a video line when it is not needed may change the background color or cause the picture to distort. Not adding sync to a video line that requires it will result in a raster that is out of sync.



Interlace - This button switches the vertical sync between interlaced scan (LED "on") and progressive scan. Set it to match the monitor type you are servicing. Most monitor types use progressive scan (Interlace "off").

In non-interlace, all the vertical pixels are displayed each field. In the interlace mode, one half the vertical pixels are displayed each field. If the "Interlace" setting does not match the monitor type, the display will loose vertical sync or will have vertical raster distortion.



Video Output - Use these buttons to make the R, G, B, and I output lines active (LED "on") or inactive. Some digital monitors use the "I" (intensity) line to provide an additional signal level step between on and off. The "I" output can only be selected for "Digital" Type monitors. To produce normal B&W and color operation, all Video Outputs (R, G, and B) must be "on."



Using The Memory Functions

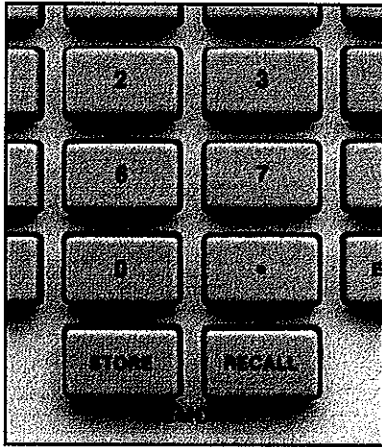


Fig. 17 - 70 Memory locations hold the most common monitor setups.

The CM2125's memory functions allow you to quickly recall a complete monitor setup, including the "Parameters" and "Video Format" settings, by entering the number of the desired setup. The memory presets consist of three groups: 1) Standard Setups, 2) User Setups, and 3) Computer Interface Setups. All the setups can be recalled from the front panel keypad, but only the "User Setups" can be programmed from the front panel.

Standard Setups (0-42) - Presets 0 through 42 are the setups for the most common monitor types. They are listed in Appendix E and in the pull chart beneath the unit. These setups are pre-programmed into permanent memory and cannot be erased or changed by the user.

User Setups (43-69) - Presets 43 through 69 can be programmed from the front panel keypad using the "Store" button. Use these presets to store special setups used in your servicing. The Pull Chart provides a place for you to write what you've stored under each number. The setups are stored in an EPROM and will not be lost when power is turned off.

To recall a setup:

1. Press the "Recall" button. The PARAMETERS Readout annunciators will flash and the DIGITAL DISPLAY Readout will blank.

2. Enter the desired preset number. The will appear in the DIGITAL DISPLAY Readout.
3. Press the "Enter" button.

The CM2125 output signals are now set indicated parameters and format. Any of the may be altered using the front panel PARAM and VIDEO FORMAT Buttons.

Example: recalling the setup for an MDA monitor.

1. Find the setup storage location of an M monitor in Appendix E or the pull char
2. Press

The CM2125 is now generating the signals r by an MDA monitor.

To store a setup:

1. Set the "Parameters" and "Video Form the desired settings.
2. Press the "Store" button. The numbers PARAMETERS Readout will flash and DIGITAL DISPLAY Readout will blan
3. Enter the desired preset between 20 a The number will appear in the DIGITL DISPLAY Readout.

Note: Error "E 5" will appear in the D. DISPLAY Readout if you enter a number not between 43 and 69.

4. Press the "Enter" button.

The setup will overwrite the setup th previously stored in the memory location a stay in memory until you change it.

Example: storing a setup you've just progr into the CM2125.

1. Choose an unused memory location (43 Let's say location "45".
2. Press

All of the settings in the PARAMETE VIDEO FORMAT sections have been st memory location "45". To recall these setti

3. Press