QUANTUM DATA®

Model 900 Series Video Signal Generators

Owner's Manual

Thank you for considering our product.

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Quantum Data products are warranted against defects in materials and workmanship. This warranty applies for one (1) year from the date of delivery. Quantum Data will, at its option, repair or replace equipment which proves to be defective during the warranty period. This warranty includes labor and parts. All repairs under this warranty must be performed by either Quantum Data or by an authorized service center. Equipment returned to either Quantum Data or to an authorized service center for repair must be shipped freight prepaid. Repairs necessitated by misuse of the equipment are not covered by this warranty.

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Chapter 1 gives an introduction to the Quantum Data 900 Series of video generators. It tells how to use this manual, discusses major components and options for the generator, and presents important safety information.

Chapter 1: Introduction

Introduction

Using this Manual

As you see, most pages in the manual are divided into two columns. The left-hand column serves as a quick reference. The right-hand column provides detailed information.

The manual is intended for use with any of the Quantum Data 900 Series Video Generators. It indicates those rare cases where information is unique to a given generator. Otherwise, the manual uses the phrase *900 Series* or the term *90X* to show that information is relevant to all models.

Occasionally, you'll find this symbol in the manual. It's used to point out especially important information.

The remainder of this first chapter gives you an overview of the 900 Series Generator, shows what items are included with your generator, discusses currently available options, and points out important safety considerations.

Chapter 2 - For Those Who Don't Like to Read Manuals

For those of you who don't like to read manuals, Chapter 2 is a *Quick Start* procedure. Reading this chapter gets you up and running in a hurry. However, for a full understanding of the power and flexibility of the 900 Series Generator you should read the entire manual.

Chapter 3 - Basic Operating Tasks

This chapter covers basic operations such as how to set up the generator and use the various front panel keys.

Chapter 4 - Typical Operating Tasks

Chapter 4 covers operations that are done on a regular basis. It includes such topics as manipulating disk files, connecting displays, configuring the generator, and drawing built-in test images.

Chapter 5 - Advanced Operating Tasks

The next chapter covers topics that are **not** performed on a regular basis. Topics include designing test images, defining a complete sequence of tests, and redefining how the generator behaves when it is first turned on.

Chapter 6 - Built-in Images

Chapter 6 discusses the images that are included with your generator when it is shipped. Included are such factors as how it is drawn, what it looks like, and the purpose of tests that might use the image.

Chapter 7 - Creating Custom Images

Chapter 7 shows you how to create customer images on your generator. Step-by-step instructions are given for two custom images.

Appendix

Appendix A discusses all the software commands used with the 900 Series Generators.

Appendix B

Appendix B gives the standard signal formats supplies with 900 Series Generators.

Appendix C

Appendix C provides additional sync option information.

Appendix D

Appendix D shows a sample test file.

Appendix E

Appendix E gives additional information regarding the generator's GPIB and RS-232 capabilities.

Overview of the 900 Series Generator

The 900 Series Generator has a bright seven-by-four inch built-in CRT. This makes it easy for you to select the Formats, Images, and Tests needed to adjust and evaluate almost any video display. All are supplied with industry standard display Formats such as CGA, EGA, VGA, 8514A, Mac, and HDTV. There are more than 50 test images included for making size, linearity, focus, and color adjustments.

Major Components

Following is a brief discussion of the major components of 900 Series Generators. Figure 1.1 shows the front panel.

Front of Generator

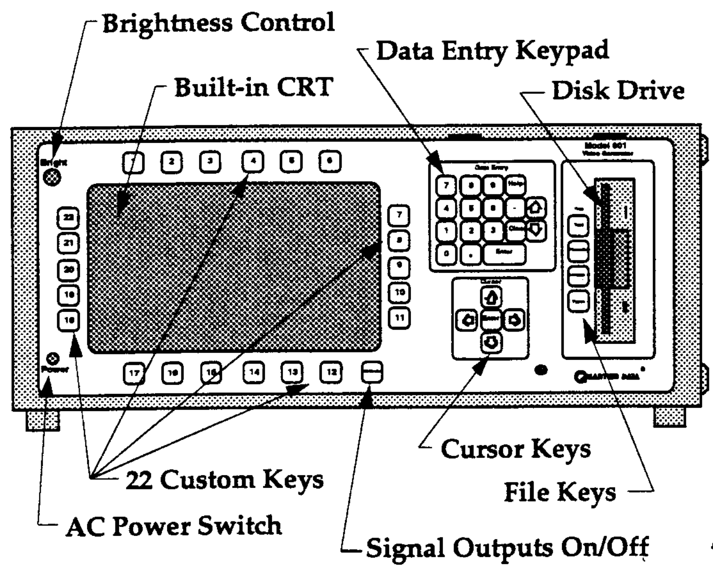


Figure 1.1 Generator Front Panel

Brightness Control

This knob controls the overall brightness of the generator's CRT.

Built-in CRT

The 900 Series has a bright seven-by-four inch built-in CRT. When you access MS-DOS®, this CRT functions as a standard PC display.

Data Entry Keypad

The data entry keypad lets you enter and change numeric data. The up and down arrows can be used to increase or decrease values. The **<Help>** key gives additional information.

Disk Drive

The generator uses $3^1/_2$" high density (1.44 MByte) disks. Insert disks with the label facing left. If you are using a generator without the internal hard drive, you must have a system disk in the drive.

AC Power Switch

This push-push switch controls the generator's AC power. When the button is in, power is on.

An internal battery maintains the system clock and configuration data while the unit is off.

Custom CRT Keys

There are 22 keys positioned around the CRT. These are used to select Formats, Images, and Tests and can be customized to fit your specific needs.

Signal Outputs On/Off

This key controls the on/off status of the generator's signal output. The current status is shown in the lower right-hand corner of directory and editor screens. This status can be added to user-created test screens.

Cursor Keys

The four keys with arrows let you move the cursor. The **<Enter>** key enters the selected item.

File Keys

The **<File>** keys give you quick access to all the directories on the system disk.

<Tests> displays all Test files in its directory. You can select any of them for loading or editing.

<Formats> displays a list of the Format files. They, too, can be selected for loading or editing.

<Images> displays the Images available on the system software. You can select any of them to be drawn on the display being tested.

<Types> displays a list of File Types supported by the operating system. You can select any Type file and get a directory listing of all files of that type that are on the system.

Rear of Generator

Figure 1.2 shows the major items on the rear panel. A 901 is shown. The rear panels on the 902 and 903 are identical except for the signal output connectors.

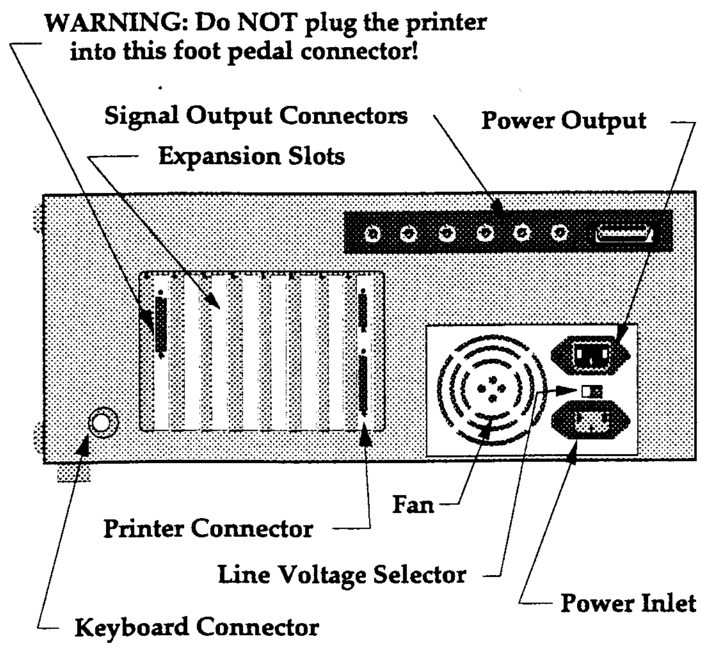


Figure 1.2 Rear Panel

Foot Pedal Connector

The connector on the left expansion port is for the optional foot pedal. **Never plug a printer into this connector!**

Expansion Slots

All 900 Series Generators include expansion slots for adding peripherals such as hard drives or modems.

We recommend that you add only approved items from Quantum Data to the expansion slots. Unauthorized additions may damage your generator. Users who add their own expansion cards, do so at their own risk.

Signal Output Connectors

The 901 and 902/903 Generators are capable of producing different types of signals. Figures 1.3 and 1.4 show the details of the signal output connectors.

901

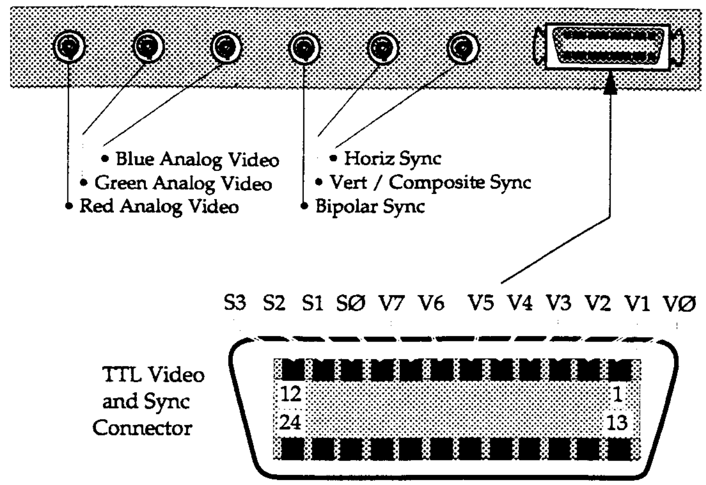


Figure 1.3 Model 901 Signal Outputs

The TTL digital video and digital sync output connector is a 24-position (57-Series) female receptacle with bail locks.

The analog video outputs all use female BNC receptacles. Two of the digital TTL sync outputs and the bipolar sync output also use BNC receptacles.

902/903

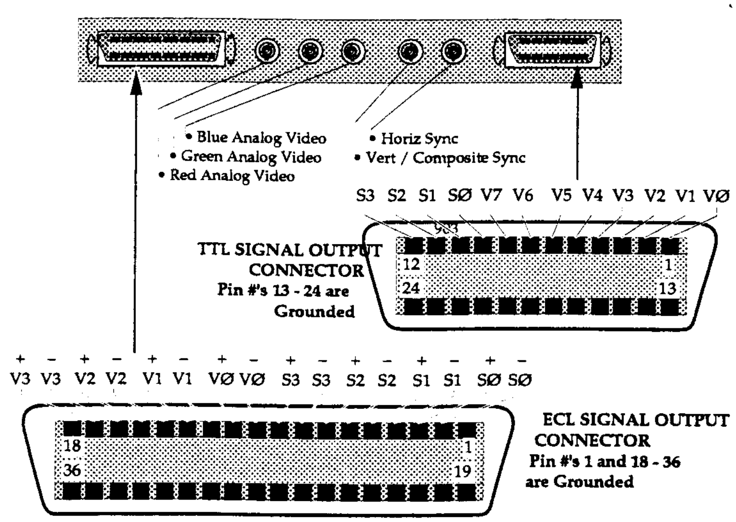


Figure 1.4 Models 902/903 Signal Outputs

The TTL digital video and digital sync output connector is a 24-position (57-Series) female receptacle with bail locks.

The ECL digital video and digital sync outputs use a 36-position (57-Series) female receptacle with bail locks. The analog video outputs all use female BNC receptacles.

Two of the digital TTL sync outputs and the bipolar sync output also use BNC receptacles.

Power Outlet

A recessed three prong female connector (international IEC320 style) is used as a power outlet. Currently there is no application or support for this connector.

Keyboard Connector

The external keyboard connector is recessed on the left side of the back panel. The cable's plug and this connector easily mate in only one orientation.

Printer Connector

The printer connector lets you use any parallel port printer to make hard copies of your test data.

Fan

The fan provides primary cooling for the generator. It pulls in air through slots in the side of the generator and exhausts it through the fan opening in the rear.

Models 902 and 903 have an additional fan on the right side of the chassis.

Line Voltage Selector

This switch sets the voltage that can be used by the generator. The currently selected voltage is visible on the switch. Generators are shipped configured for 115 Volt nominal (90 through 132 Volts) AC operation. A 230 Volt nominal (180 through 264 Volt range) can be selected.

☞ **Some power supplies used by Quantum Data automatically switch between 115 and 220 volts. In these cases, there is NOT a line voltage switch.**

Operating the generator with the wrong AC line voltage is considered abuse of the equipment.

Changing the position of the Line Voltage Selector Switch while the generator is connected to the power line may cause serious damage to the generator.

Damage caused by failure to adhere to these warnings is not covered under any warranty or service contract.

Power Inlet

A recessed three prong male connector (international IEC320 style) is used as the power inlet. A mating power cord for use in the United States with 120 Volt/15 amp grounded outlets is shipped with the unit. Any AC power cord used with the generator must maintain proper earth ground to the chassis.

External Keyboard

An external keyboard (Figure 1.5) is included to speed up data entry when you're creating Tests or editing Formats.

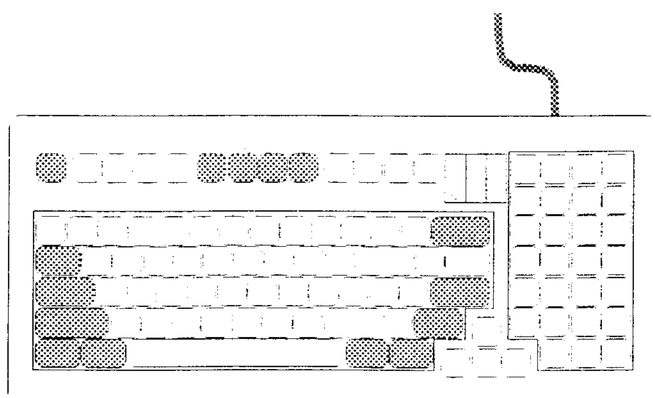


Figure 1.5 External Keyboard

Options

Following is a list of options available for 900 Series Generators.

Internal Hard Drive

An internal hard drive is standard on newer generators and is an option on older units. A hard disk drive lets the generator read and write files faster and decreases boot-up time. Also, you can store more than 25 times the information available on a 3 ½" floppy disk. The front panel disk drive is still available for use. Quantum Data's option number for the hard drive is 9016.

Convergence and Line Width Probes

The CP-1 and CP-2 Convergence and Line Width Probes (Figure 1.6) let first-time operators take fast and accurate convergence and line width measurements. Data can be viewed in real time, stored on the internal hard drive, or sent to a file server on a Novell network. The option numbers are 9018 and 9028 respectively.

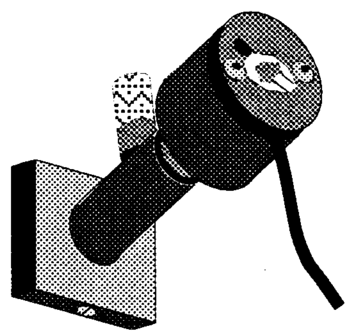


Figure 1.6 Convergence & Line Width Probe

RS-232 Port

An RS-232 serial port can be installed on any 900 Series Generator at the time of purchase or as either a factory- or user-installed option later. The option number is 9014.

IEEE-488 Port

An IEEE-488 port can be installed on any 900 Series Generator at the time of purchase or as either a factory- or user-installed option later. This lets you operate the generator as an instrument in a GPIB system. The option number is 9013.

Foot Pedal

The foot pedal lets you step through pre-programmed tests. This keeps your hands free for making adjustments. The option number is 9012.

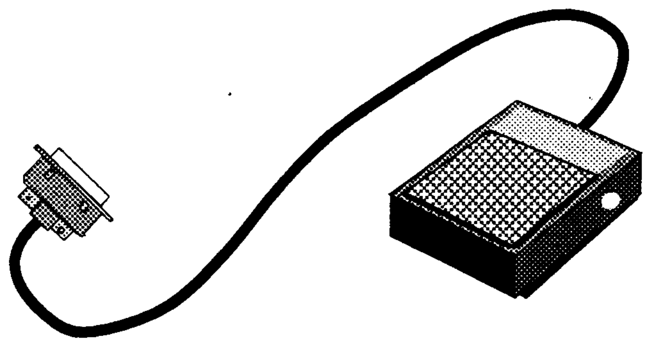


Figure 1.7 Foot Pedal

Rack Mount Kit

This user-installed option lets you mount the generator in a 7" high opening in a standard 19" wide equipment rack. The option number is 7000.

Service Contracts and Product Updates

Quantum Data strives to give its customers the highest quality service both before and after the sale. All our products are designed for years of dependable operation. However, like any piece of complex equipment, a scheduled plan of preventative maintenance and calibration ensures maximum performance.

Full Service Support Agreements are available. These cover repairs, calibrations, no-charge service loaners, software and hardware upgrades, and telephone support.

Please contact your Sales Representative or the Quantum Data Customer Service Department for information about any of the options or service contracts.

Product information and technical support also is available on Quantum Data's 24 hour electronic bulletin board or their fax service. The bulletin board's number is (708) 888-0115 and their fax number is (708) 888-2802.

Safety Precautions

Please read the following safety precautions before operating your 900 Series Generator.

Operating with the Cover Removed

☞ **Use extreme caution if you operate the generator with its cover removed. Doing so exposes you to very high voltage which may cause a serious or even fatal injury. Operating the 902 or 903 without a cover also exposes you to the spinning blades of the fan.**

Cooling Vents

The cooling fan inlets on the sides of the unit and the exhaust vents on the rear must not be blocked. The unit is designed to operate in a typical engineering lab environment or display production line. Never operate the generator while it is sitting on its side because this blocks air circulation and can damage the unit.

Line Voltages

The generator is designed to operate at the following range of power line voltages.

- 115 Volts AC nominal (90 through 132 Volt range)
- 230 Volts AC nominal (180 through 264 Volt range)

The unit is configured for 115 Volt operation when it leaves the factory.

☞ **Do not plug the generator into any AC power outlet without first making sure the generator is set for the correct voltage and the outlet provides earth grounding of the generator's chassis through the power cord.**

Fuses

There are no user-serviceable fuses in the generator. A unit that fails to power up must be returned to Quantum Data or to one of our authorized service centers.

Arcing in the Unit Under Test

A high-voltage arc in the CRT of most displays can generate a voltage spike at the display's input terminals. Also, a transient may be induced in nearby equipment not connected to the display.

Quantum Data's 900 Series Generators are designed to minimize effects of such transients. A low impedance path between the interconnecting cables' shields and the chassis of the display provides additional protection. Figure 1.8 shows one grounding strategy you can use. Connecting a ground plate as shown helps protect the generator from a display that accidentally develops an electrically *hot* chassis. Notice the three signal lines pass through grounded bulkhead connectors. All signal lines should have the same type of grounding applied.

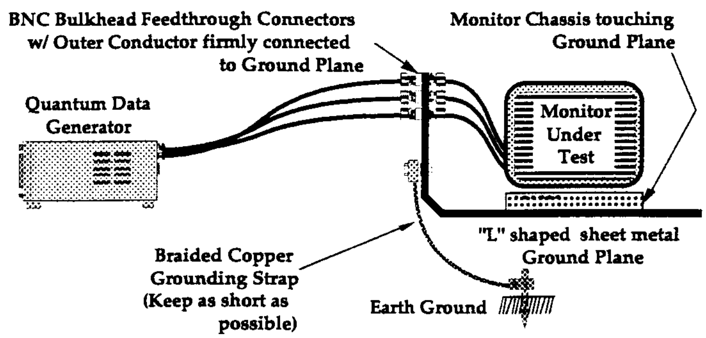


Figure 1.8 Proper Grounding Strategy

Be careful when connecting the generator to a CRT that has never been operated. New CRT's may have several internal arcs when they are first powered up. If possible, turn on the display and let it run for a few minutes before you connect the generator.

Chapter 2 gives a quick overview of how to get started with 900 Series Generators. Reading this and the preceding chapter get you up and running in a hurry, but for a full understanding of the generator's power you should read the entire manual.

Chapter 2: Quick Start

Quick Start

Help

This chapter helps you quickly get started using your 900 Series Generator. Much of the information presented here is explained in greater detail in later chapters of the manual. If you haven't already done so, you should read Chapter 1.

Also numerous *Help* screens are available. If you have a question or encounter an error message, just press the **<Help>** key on the front panel of the generator.

If you still have questions, please contact an applications engineer at Quantum Data.

Check Contents

Match the packing slip that's in each carton with the items received.

Save Packing Materials for Re-use

Do not dispose of the shipping cartons or packing materials until you are sure that no damage occurred during shipping and that you have everything on the packing list(s). Save the cartons and packing materials for use in sending a unit back for future calibration or repair. These materials are designed for limited re-use and should not be used to ship the equipment on a regular basis. Contact your sales representative or the customer service department for information about transport cases designed for the 900 Series.

Remove Cover Plate

The generator is shipped with a locking metal cover plate on the right side of the front panel. Use the key that's provided to turn the cover's locking screw counter-clockwise until the cover is free. Do **not** discard the plate or key.

Connect the Power Cord

Plug the generator into the correct line voltage outlet.

☞ **Make sure the voltage selector switch setting matches your AC line voltage BEFORE you connect the power cord or turn on the generator.**

The generator is shipped configured for 115 Volt (90 through 132 Volt range) AC operation.

The power cord is designed for use with 120 Volt\15 Amp grounded outlets in the United States. The outlet you use must provide for grounding the generator through its power cord.

Attach Keyboard

When an external keyboard is used, it must be connected **before** the generator is turned on. The keyboard is used to copy disks and edit or save file changes. Its connector is located in the lower left-hand corner on the back of the generator.

Insert Boot Disk (If needed)

If your generator does NOT have the hard drive installed, you must insert the boot floppy disk. The model number on this disk must match the model number of your generator. Make sure there is no other disk in the drive and then insert the boot disk with its label facing to the left.

Turn Unit On

The push-button power switch is located at the bottom left-hand corner of the front panel.

The cooling fan(s) starts and the unit goes through several different self tests. Messages regarding the hardware configuration and any options also are displayed. Then the following File Select screen appears.

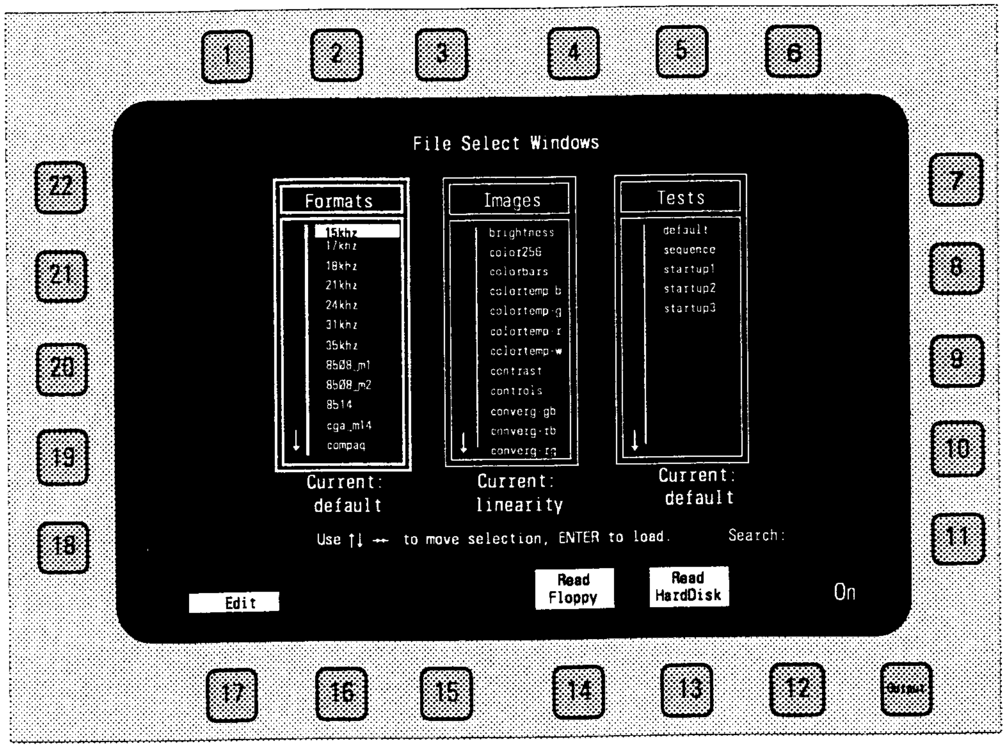


Figure 2.1. Default File Select Screen (Generators with Hard Drives)

Adjust Brightness

The brightness control is located at the upper left-hand corner of the front panel. Use it to adjust the CRT's brightness to a comfortable level.

Make Backup of Boot Disk

Make a backup copy of the original 3 1/2" system disk now! Changes, including creating and editing files, should **never** be made to your original system disk.

You'll need a 1.44 M Byte (HD) 3 1/2" floppy disk. Follow these steps.

- Eject the system disk, open the write protect window in the corner of the disk, and re-insert the disk in the drive.
- Press and hold the **<Alt>** key on the keyboard, press and release the **<Q>** key, then release the **<Alt>**. You're taken to the MS-DOS command level.

- If you do NOT have the hard drive, type **DISKCOPY** and press **<Enter>**.

  If you DO have the hard drive, type **DISKCOPY A: A:** and press **<Enter>**.

- The copying procedure starts. You are prompted when to swap the source (original) and target (backup) disks in the drive.

- When finished, place the original disk in a safe place.

- Return to normal operation by typing the word **GEN** and then pressing **<Enter>**.

Connect Target Display

The 15 pin mini D-Sub to five BNC connectors cable provided with your 900 Series Generator is used for connecting analog VGA displays to the generator. The display's cable plugs directly into this cable. The BNC connectors on the cable and the corresponding connectors on the back of the generator are clearly marked to make hook up easy.

Other types of displays require that you create your own cable. Quantum Data provides the 900-Series Generator Connector Kit to help you. Additional connector kits are available from Quantum. The part number is 99-00353.

Format the Generator

The System disk, or hard drive, includes Format files (timing set-ups) that emulate the outputs of a large number of computers and graphic cards. Use the cursor arrow keys to scroll through the Formats window to find the one that matches your display. Then press any of the **<Enter>** keys to load the Format.

If none of the Formats matches your target display, you can create a new Format by following these steps.

- Select an existing Format that is close to what you need. If you're not sure, select the ***default*** Format.
- Press **<Softkey 17>** (the one below the word *Edit*). The following Format editor screen appears.

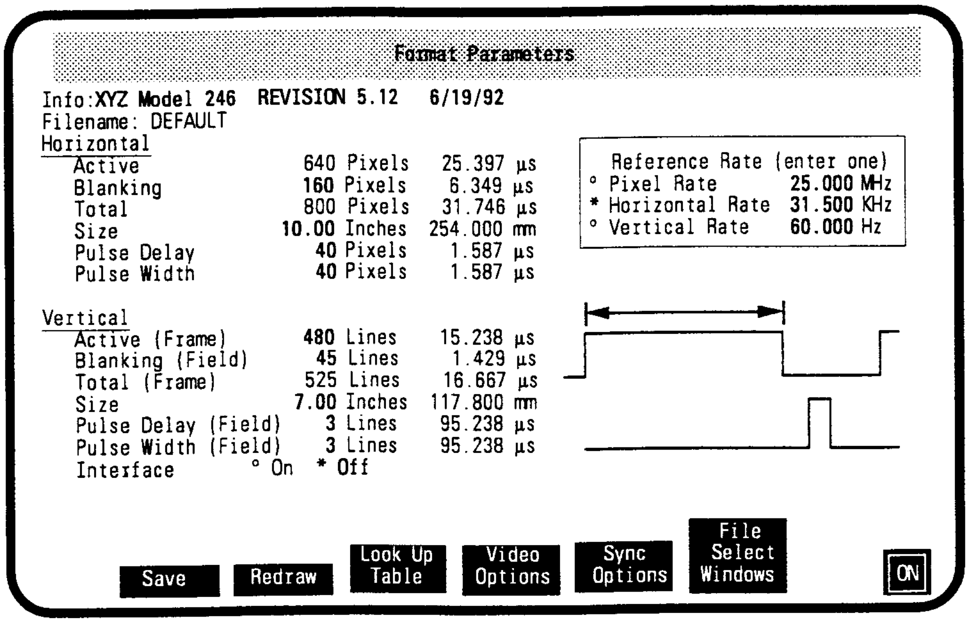


Figure 2.2 Format Editor Screen

- Change any of the *Reference Rate* and other highlighted parameters needed to match your target display's specifications.
- Press **<Softkey 13>** to move to the sync options screen. Make any necessary changes to match your display.

- Press **<Softkey 14>** to move to the video options screen. Make any necessary changes to match your display.

- If needed, press the **<Outputs>** Softkey to turn it On. If an error message appears, you must correct the error before outputs can be turned on.

- Press **<Softkey 17>** (*Save*) to save your work. A window showing the current file name appears.

- To overwrite the existing file with the new data, press **<Enter>**. To save the changes under a new name, backspace over the old name and enter the new one. NOTE: You cannot use *Default* as a new file name.

Draw a Test Image

Press the Softkey **<Images>** next to the disk drive. Use the arrow keys to move the cursor to the desired image and press **<Enter>**.

Problems

If you have questions or problems, press **<Help>**. Available on-line information is displayed. If you still have problems, check this manual's index or table of contents for more information.

This chapter shows how to perform basic tasks with 900 Series Generators.

Chapter 3: Basic Operating Tasks

Basic Operating Tasks

Introduction

This chapter covers Basic Operations such as how to set up the generator and use the various front panel keys.

If you are not familiar with the operating features of the 900 Series generators, you should read the opening paragraphs of each of the following sections in this chapter. They give you an overview of the unit's many capabilities and features.

Connecting to AC Power Line

Attempting to operate the unit with the wrong AC line voltage is considered abuse of the equipment. Any resulting damage is not covered by the warranty or service agreement.

Be sure the generator is configured to match the line voltage you will be using **before** you plug in the generator. Figure 3-1 shows the power supply module on the rear of the generator.

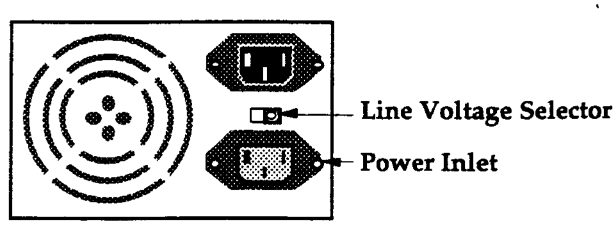


Figure 3-1. AC Power Panel Details

The unit is shipped configured for 115 Volts (90 through 132 Volts) AC operation. The line voltage selector can be moved to select 230 Volts (180 through 264). The currently selected line voltage range appears on the line voltage selector switch. Follow these steps to change the generator's line voltage range:

Make sure generator is off

1. Make sure the generator is turned off (front panel switch in the OUT position).

Disconnect power cord (If needed)

2. If needed, disconnect the power cord from the power inlet.

☞ **Changing the position of the line voltage selector while the generator is connected to the power line can cause serious damage to the generator.**

Move line voltage selector to desired range

3. Move the line voltage selector to the desired range. A small screwdriver or other blunt-tipped tool may be needed.

Connect power cord

4. Connect the power cord to the generator. The generator is shipped with a power cord for use in the United States with 120 Volt/15 amp grounded outlets. Any substituted cord must maintain proper earth ground to the chassis.

Connecting the Keyboard

The external keyboard is used to edit and save file changes. It is not, however, needed to load and run existing files or to change parameters in a Format file.

Follow these steps to install the keyboard.

Turn off generator (If needed)

1. Turn off the generator. The keyboard may not work correctly if it is plugged in **after** the generator is turned on.

Place keyboard

2. Place the keyboard in a convenient and stable position near the generator.

Plug in cable

3. Plug the keyboard cable's connector into the recessed receptacle on the rear of the generator (Figure 3-2). Make sure the plug is in fully.

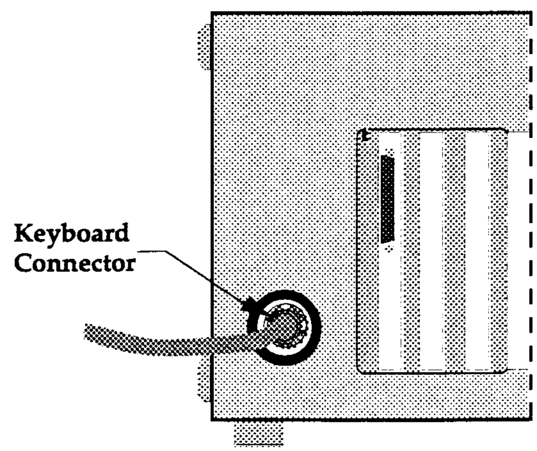


Figure 3-2. Keyboard Connection

Turn on generator

4. Turn on the generator. The *Num Lock, Caps Lock,* and *Scroll Lock* lights on the keyboard flash briefly when the unit is first turned on.

Special Considerations

- If the CMOS Set-up configuration shows that a keyboard is *Installed,* the keyboard must be connected when you turn on the generator. Otherwise the unit will fail its self test.

- If the CMOS Set-up configuration shows that a keyboard is *Not Installed* and the keyboard is connected, you will **not** get a self test failure message when you turn on the generator. The keyboard will be functional.

Ejecting and Inserting Disks

The generator has a built-in high density (1.44 MByte) 3-1/2 inch disk drive. The drive is located on the front panel of the generator as shown in Figure 3-3.

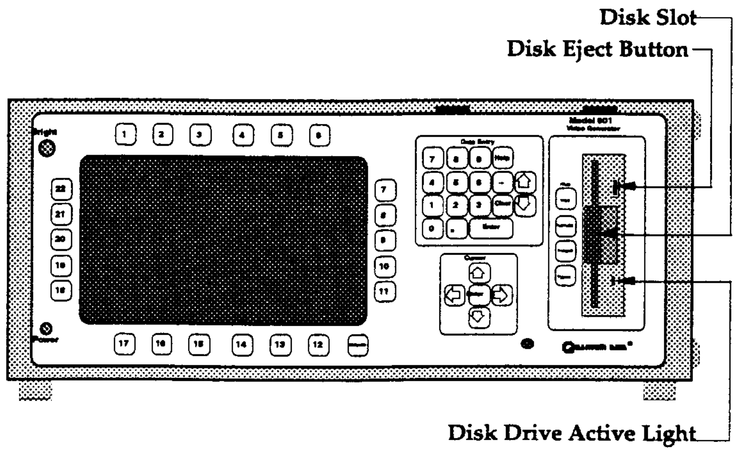


Figure 3-3. Disk Drive Details

Insertion Procedure

Follow these steps to insert a disk.

Make sure disk drive is empty

1. Make sure there is no disk in the drive. The door that covers the disk drive slot should be closed. Also, make sure the disk drive active light is not lit.

Orient disk

2. If you are inserting a disk, place the disk in front of the disk drive slot so the sliding cover on the disk faces toward the drive and the top of the disk (the side with the label) faces to the left.

Place disk against door

3. Gently push the disk against the door to open it.

Gently push disk into drive

4. Continue to gently push the disk into the drive until it is in completely. When the disk is fully inserted, it shifts to the right by about an eighth ($^1/_8$) of an inch.

Ejection Procedure

Follow these steps to eject a disk.

Make sure disk is in drive

1. Make sure there is a disk in the drive. The edge of a disk will be visible behind the partially opened door which covers the disk drive slot.

Make sure drive light is off

2. Make sure the disk drive active light is not lit.

Press eject button

3. Press the eject button on the front of the drive. This causes the disk to be partially ejected.

Pull disk out

4. Pull the disk completely out of the unit. The door on the drive will close.

Power-Up Procedure

This section shows the steps to follow to get the generator powered up and ready for use.

The generator should NOT be turned on with an active load connected to its outputs. Some displays have low impedance internal bias or pull-up voltages present on their input connectors. These bias voltages may prevent portions of the generator's circuitry from powering up correctly when the generator power is first turned on.

Disk (Floppy) Based

The disk should be inserted before turning on the generator. Here's how to power up the generator.

Make sure line voltage is correct

1. Make sure the generator is connected to the correct AC line voltage. The cooling fan opening(s) should not be obstructed.

Turn on generator

2. Turn on the generator. The power switch is located on the front panel (Figure 3-4). It is a 2-position push-button. It's on when the button is in the *In* position. The cooling fan(s) starts as soon as power is on.)

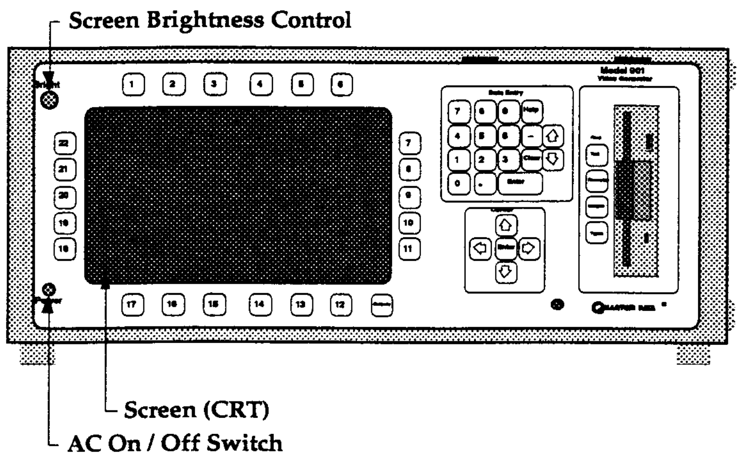


Figure 3-4. Power Switch and CRT Control Locations

Adjust brightness

3. Allow the generator to warm up a few seconds. Then use the *Bright* control to adjust the brightness of the text on the front panel CRT to a comfortable level.

Observe self tests

4. The generator first goes through the following internal ROM (Read Only Memory) based self test and configuration procedure:

- The internal RAM (Random Access Memory) is tested. The amount of memory tested and the message ***Press <ESC> to bypass MEMORY test*** are displayed. Do not press any keys.

- The external keyboard, if connected, is tested and initialized. The *Num Lock, Caps Lock,* and *Scroll Lock* indicators on the keyboard briefly light .

- The generator gives you a chance to modify its internal configuration data and to perform some internal diagnostics. The message ***Press <DEL> if you want to run SETUP or DIAGS*** is displayed for a few seconds. Do not press any keys. The disk drive active light comes on for part of this period.

- The hardware configuration screen appears for a few seconds. Figure 3-5 is a typical configuration screen for a generator without an internal hard disk.

```
System Configuration (C) Copyright 1985-1990, American Megatrends Inc,.

Main Processor     : 80386             | Base Memory Size    : 512 KB
Numeric Processor: None                | Ext. Memory Size    : 0 KB
Floppy Drive A     : 1.44 MB, 3-1/2"   | Hard Disk C: Type   : None
Floppy Drive B     : None              | Hard Disk D: Type   : None
Display Type       : Monochrome        | Serial Port(s)      : 3F8
ROM-BIOS Date      : 08/30/90          | Parallel Port(s)    : 3BC
```

Figure 3-5. Floppy Based BIOS Configuration Screen

Disk is loaded

5. The front panel CRT is cleared. The generator then sees if a disk is in the disk drive. An error message appears if no disk is found and the hard disk drive is not installed. If the proper disk is in the drive, the generator starts to load the following required programs from disk.

   - The Disk Operating System (DOS) software is loaded first. The generator uses a version of DOS called MS-DOS. It is included on the boot-disk. The current version number of MS-DOS shows on the front panel CRT. An error message is displayed if the DOS files are not found.

Normally, the rest of the generator's operating system software is loaded next. If the system has a problem while loading, it may cause the unit to hang. Check the contents of the disk to see if all the required files are present. Turn the power off and make sure the external keyboard is plugged in. Turn the power back on and wait for the MS-DOS identification to appear. Immediately press and hold down the <Control> and <C> keys. An abort message and standard MS-DOS prompt appear. You can then examine the contents of the boot disk.

- The generator's operating system software then is loaded. The message ***Loading System ...*** appears on the front panel CRT while the software is loaded.
- The generator's software revision level then appears. The revision level shown should match the revision number shown in this manual.

6. This series of messages appears:

```
Checking ID's
Hardware Test Status
Drawing Image
GPIB Port Status
Serial Port Status
```

7. The front panel CRT again is cleared and the *File Select Windows* screen is loaded. Figure 3-6 shows this screen.

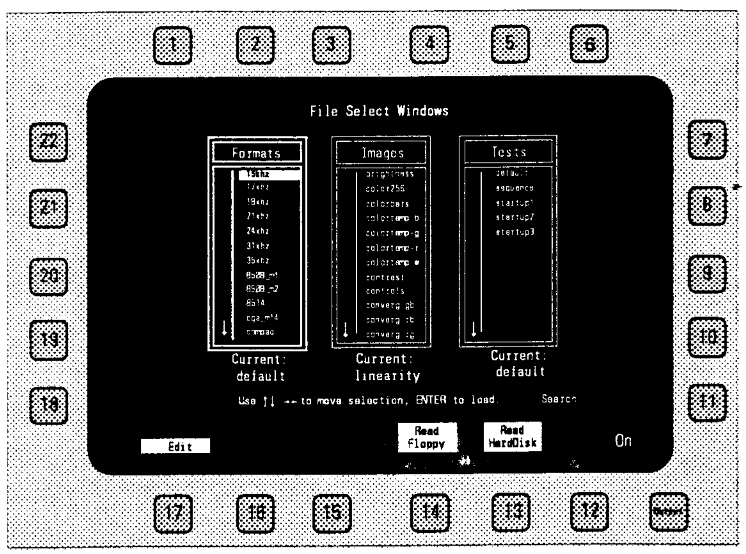


Figure 3-6. File Select Windows

If you are using an edited copy of the boot disk, you may get a different display. If you have problems using an edited disk, ask the person who edited the disk for assistance.

Hard Disk Based

The power-up procedure for the hard disk option is almost the same as the floppy version except for extra messages displayed right after the *Press <DEL> if you want to run SETUP or DIAGS* message. A properly installed hard drive reports that one (1) hard drive was found.

With the optional Ram Card, you can program the BIOS to boot off the hard drive. The program boots from the Ram Card when there is no hard drive.

If there is a floppy disk in the disk drive, the generator ignores the hard disk and tries to boot up from the floppy.

Selecting Softkey Functions

Softkeys are the 22 numbered keys that surround the front panel CRT. They are called softkeys because the action that occurs when the key is pressed is software controlled. Softkeys with functions have labels shown in boxes on the CRT.

Using the Front Panel Keys

Using the front panel keys is easy. You just press the numbered softkey next to the desired function.

Using the Keyboard

All softkeys have equivalent external keyboard operations. You either press one of the function keys at the top of the keyboard or use a combination of the **<Shift>** or **<Control>** key and a function key. Some other front panel key functions also can be done from the keyboard. For the double key operations, you must press and hold down either the **<Shift>** or **<Control>** key **before** pressing the function key. Figure 3-7 shows how the function keys are *mapped* to the front panel keys.

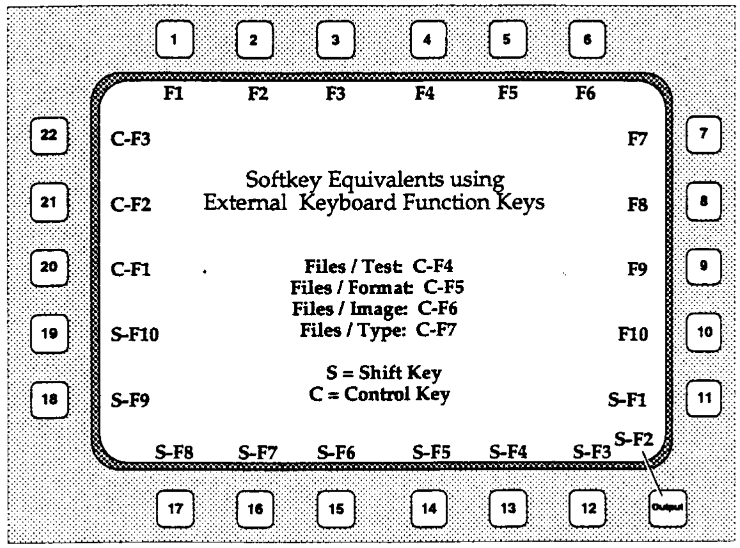


Figure 3-7. Keyboard Equivalents of Softkeys

Selecting Directory Types

A directory is a collection of similar files. The current operating system has four (4) directory types: Format, Image, Test, and Font.

Format Directory

A Format directory contains individual files that describe the timing and signal information for a particular type of display.

Image Directory

An Image directory contains a list of all pre-defined test images compiled into the operating system software file. The images are not separate files. Figure 3-8 shows a typical full screen image directory.

Test Directory

A Test directory contains individual Test files. The default start-up screen is one example of what a Test file can do.

Font Directory

A Font directory contains individual Font files with bit-mapped character fonts that can be used to draw text on the unit under test.

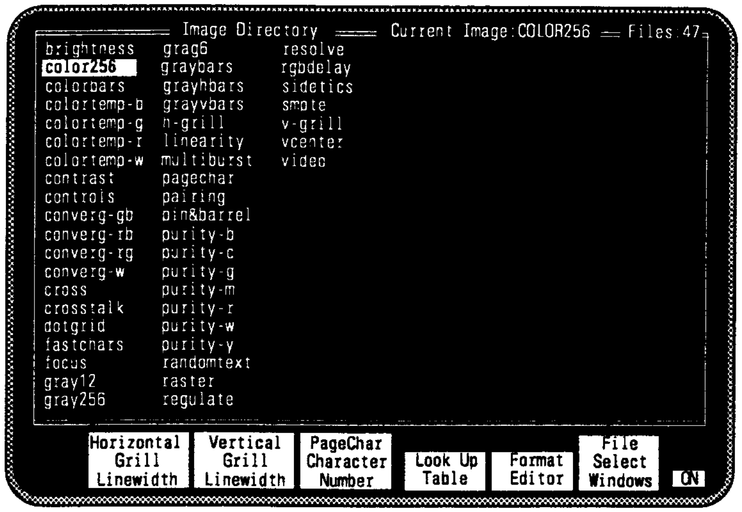


Figure 3-8. Typical Image Directory

Using the Front Panel Keys

The currently active file appears on the actual screen as intensified video. The name of this file also appears at the top of the directory screen.

The most direct way to view any directory is to use the **<Files>** keys. These are located just to the left of the disk drive slot. Pressing **<Test>**, **<Formats>**, or **<Images>** immediately displays the chosen directory. Pressing **<Types>** displays a directory of all directory types used by the system. You can then use the cursor keys to select the desired directory from the list.

Also, the softkeys can be programmed to call up any of the directories. The programming information is entered into Test files.

Using the Keyboard

There are two ways to use the keyboard to display a directory. The first method simulates the front panel keys. This requires that you first press and hold the **<Control>** key and then press and release one of the top row function keys.

Control-F4 simulates the **<Test>** key.

Control-F5 simulates the **<Format>** key.

Control-F6 simulates the **<Image>** key.

Control-F7 simulates the **<Type>** key.

The second method uses commands sent in the manual parser mode. When in the manual manual parser, you can type in the following commands to select any directory for display.

Manual parser commands

VIEW CONFIGDIR	Lists all Configuration files in the selected Configurations directory.
VIEW FONTDIR	Lists all Font files in the selected Fonts directory.
VIEW FORMATDIR	Lists all Format files in the selected Formats directory.
VIEW IMAGEDIR	Lists all Image files in the selected Images directory.
VIEW TESTDIR	Lists all Test files in the selected Tests directory.
VIEW TYPESDIR	Lists all directory types currently available.

The directory will not be shown until you return to the user interface mode by typing in the **UI** command.

It is possible to set up more than one directory on the disk for a given file type. The information presented in this section deals with displaying the currently active directories.

Selecting Items in a Directory

Directories show the currently active file as intensified (brighter) video. The name of the current file also appears at the top of the directory screen. The location of the selection cursor appears by the file name being in reverse video. (See Figure 3-9.)

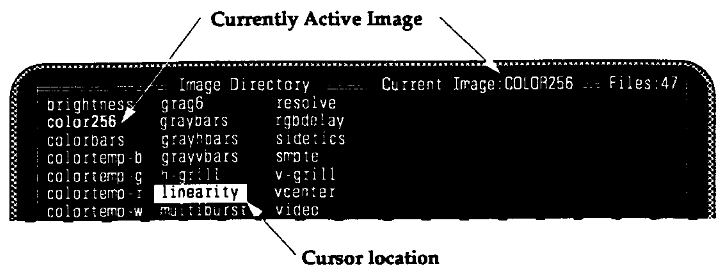


Figure 3-9. Cursor and Active Image

To select a different file, move the cursor to the desired file name in the directory. If a file is blinking, the cursor is on the currently active file. Moving the cursor alone does not automatically cause an action to be taken. A separate action is required.

Directories may also have one or more softkey functions set up along the bottom.

Using the Front Panel Keys or Keyboard

The selection cursor is moved by using the four *Cursor* arrow keys on either the front panel or the keyboard. See Figure 3-10.

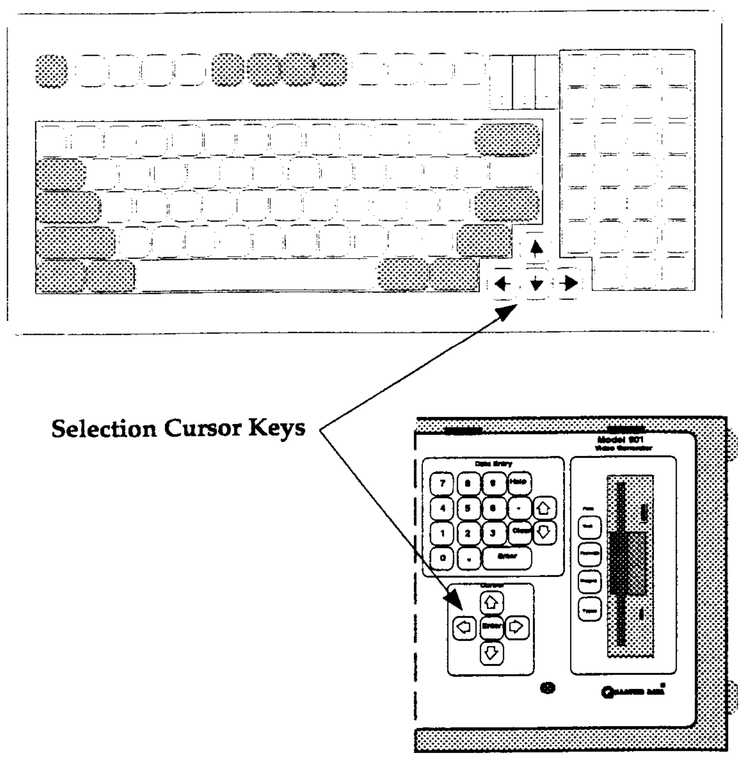


Figure 3-10. Section Cursor Keys

> **Be careful not to confuse these keys with the *Data Entry* <↑> (increase) and <↓> (decrease) keys.**

Press the appropriate arrow key(s) to move the cursor to the desired file. Press **<Enter>** to load the file.

Files that can be edited or deleted have those functions shown on the softkeys. Just press the appropriate softkey. (See Figure 3-7 for information on activating softkey functions from the keyboard.)

Selecting Items in a Spreadsheet

A spreadsheet presents information in a row and column format. Some of the information never changes. Other information can be directly or indirectly changed by the user. Figure 3-11 shows a typical spreadsheet used for editing a Format file.

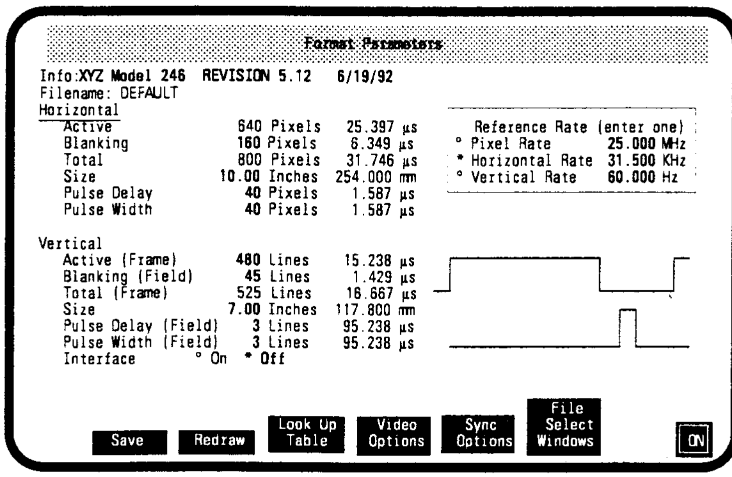


Figure 3-11. Typical Format Spreadsheet

Some information, such as *Horizontal Rate*, never changes. Typically, only those items shown in intensified brightness can be changed. Other items are calculated by the operating system based on user-entered parameters. Any exceptions are noted in the discussions on particular spreadsheets.

Editable parameters

There are two (2) types of editable parameters, numeric and non-numeric. Numeric parameters are numbers. Non-numeric parameters are not numbers. Selecting either Color or Monochrome in the *Video LookUp Table* spreadsheet is an example of a non-numeric parameter.

You can select only one parameter to edit at a time. Select the parameter by moving the cursor to the desired field. (The cursor stops only at parameters that can be edited.)

Selected parameter

The currently selected parameter shows as black text on a lighted background. Also, if the parameter is either a vertical or horizontal dimension, the lower right hand corner of the generator CRT shows an appropriate graphic or puts the portion of the curve into intensified video. For example, Figure 3-12 shows an example where horizontal pulse delay is selected.

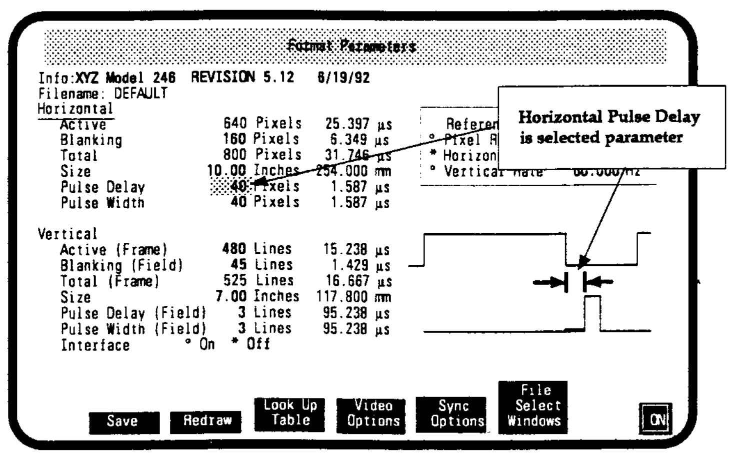


Figure 3-12. Sample Selected Parameter

Editing a Numeric Parameter

There are two ways to edit numeric parameters. You can either enter a new value or you can tweak the current value in small steps.

To enter a new value, type in the value on the generator's *Data Entry* numeric keypad or on either set of numbered keys on the keyboard. (See Figure 3-13.)

Keys to use to edit a numeric parameter

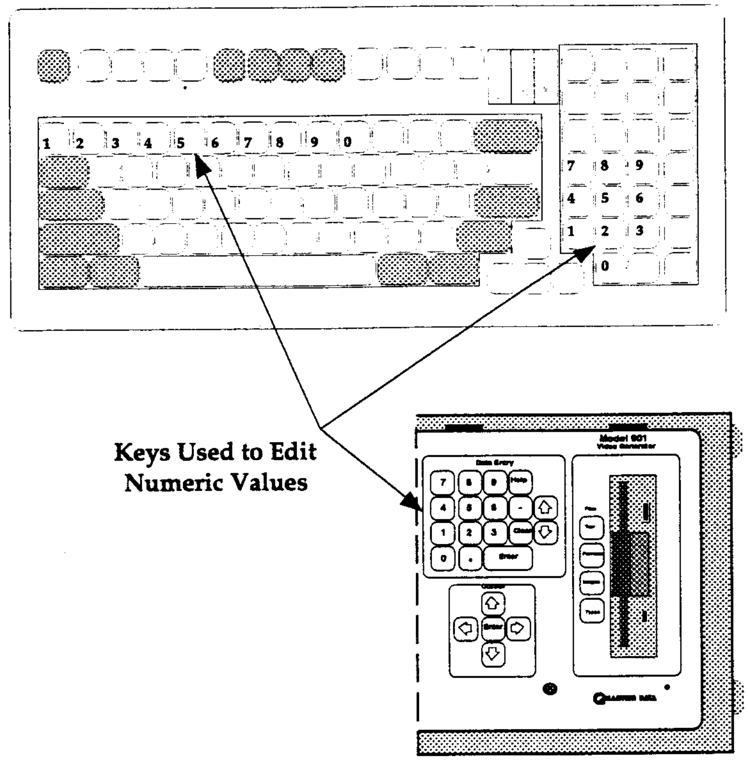


Figure 3-13. Keys Used to Edit Numeric Values

Keys to use to delete errors

If you press a wrong number, press the **<Clear>** or **<Delete>** key and start the entry over again. (See Figure 3-14.)

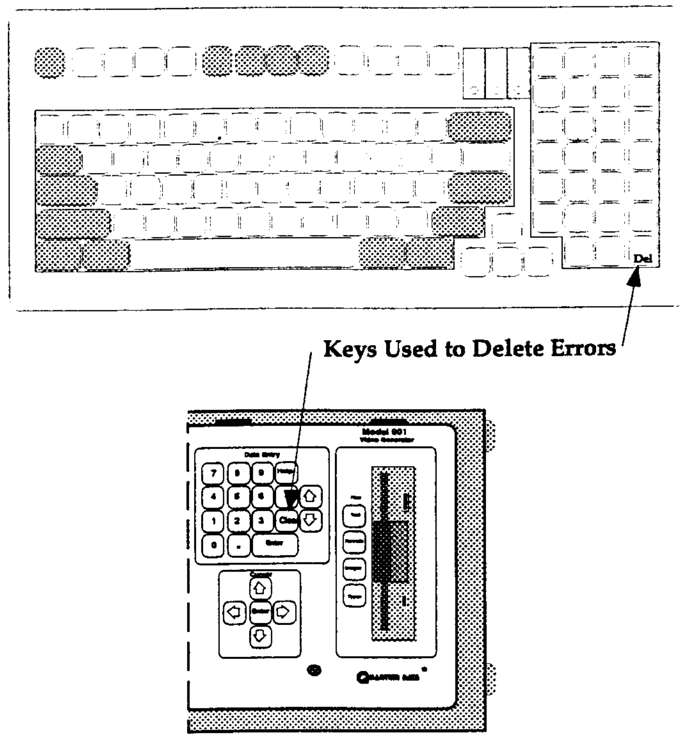


Figure 3-14. Keys Used to Delete Errors

Tweaking Numeric Data

You also can change the value of a parameter up or down in small steps by pressing the **<Data Entry ↑>** (increase) and <↓> (decrease) keys on the front panel or the <+> (plus) or <–> (minus) keys on the keyboard. You do NOT have to press **<Enter>** when you use these keys. (See Figure 3-15.)

Keys to use to *tweak* values

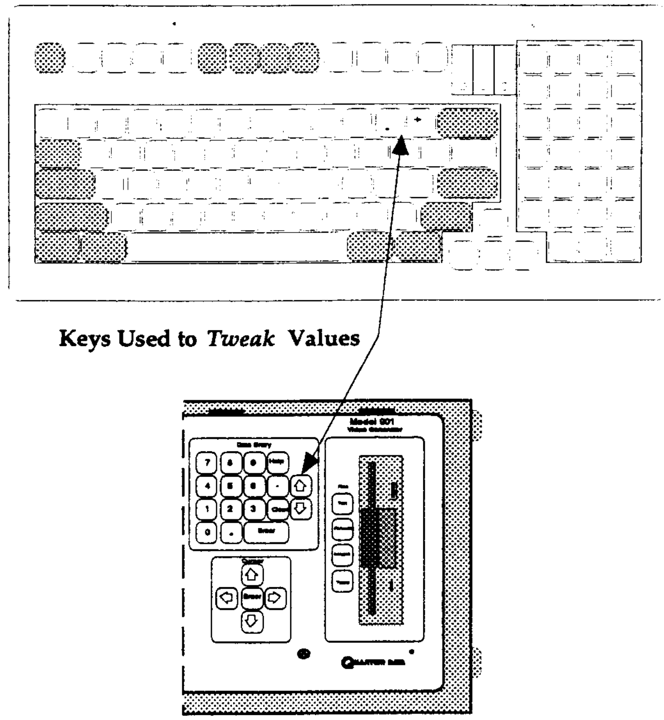


Figure 3-15. Keys Used to *Tweak* Numeric Values

Editing a Non-numeric Parameter

In Format files, non-numeric parameters include such things as determining video signal types (color or monochrome) and sync signal types (separate Horiz. & Vert., Composite or HDTV).

The software displays all the choices available. The current selection appears with a small starburst (☼) symbol in front of it. Other choices are shown with a small open circle (○) in front of them. A sample appears next.

```
o This is a non-selected parameter
☼ This is the current parameter setting
```

Use the front panel or keyboard cursor arrows to move the selection cursor to the desired setting. Then press **<Enter>**.

Some non-numeric parameters require that you make additional settings. The choices for these settings appear as a small sub-menu on the screen when the main parameter is chosen. The current settings in the sub-menu are shown in reverse video. Use the *Cursor* arrow and **<Enter>** keys to choose the desired sub-menu selection.

Switching Between the User Interface, Manual Parser and MS-DOS

The generator can be run in three basic operating modes:

1. the User Interface mode
2. the Manual Parser mode
3. the DOS mode.
4. the DOS shell (DOSS) mode.

Following is a brief explanation of these modes.

User Interface Mode

The User Interface mode is the default mode. When in this mode, you can use all the front panel keys and the external keyboard to edit and save Format files, draw test images by selecting them from directories displayed on the generator, select various operations using the front panel softkeys, etc.

Manual Parser Mode

The Manual Parser mode bypasses the front panel keys, and gives direct access to many functions within the generator's operating system. The functions are performed by issuing commands through the keyboard. A listing of the command set is included as Appendix A.

DOS Mode

The DOS (Disk Operating System) mode lets you use the generator as if it were an IBM-PC compatible computer with a monochrome display. It's used when you need to initialize disks, copy files, or set the time and date. You do NOT have access to any of the features and functions that are part of the generator's User Interface and Manual Parser modes. The status of the generator's outputs don't change when you go to the DOS mode.

Going from User Interface to Manual Parser

1. Make sure the generator is not *busy*.
2. Press and hold the **<Alt>** key on the keyboard. Press and release the **<F2>** key at the top of the keyboard. Then release the **<Alt>** key.
3. This prompt appears: **Command>**. You may now use the commands found in the command set.

Going from Manual Parser to User Interface

1. Enter the command **UI**. The front panel CRT returns to the display that was showing before you left the User Interface mode.

Going from the Manual Parser to DOS

If you have edited files open when you switch to DOS, you are prompted to save the files.

1. Enter the command **QUIT**. The front panel CRT shows a standard MS-DOS prompt. The default MS-DOS prompt for the original boot-disk shows the current disk drive and path for the operating system. The prompt looks like this:

```
A:\GEN>
```

If you are using the internal hard disk, the MS-DOS prompt looks like this:

```
C:\GEN>
```

Using the DOS Shell to go from Manual Parser to DOS

To use the DOS Shell to go from the Manual Parser simply enter **DOSS** and type **EXIT** to leave.

Going from DOS to Manual Parser

There is no direct way to go from DOS to the manual parser. You must run the generator's operating system software and then switch to the manual parser. Please see the instructions below on going from DOS to the user interface.

Going from User Interface to DOS

The generator should have been powered up with the external keyboard connected. All the front panel keys are inactive when the generator is in the DOS mode. Press and hold down the **<Alt>** key on the keyboard. Press and release the **<Q>** key at the top of the keyboard and then release the **<Alt>** key.

Going from DOS to User Interface

Set the directory path to lead to the top level subdirectory that contains the generator's operating system files. If you are using the front panel floppy disk, the default path for the original boot-disk looks like this:

```
A:\GEN
```

If you are running from the internal hard disk, the default path for the original factory configuration of the boot-disk looks like this:

```
C:\GEN>
```

Boot-up the generator's operating system software by entering the model number of the generator at the MS-DOS prompt. The entry is simply:

```
GEN
```

This chapter shows how to perform advanced tasks with 900 Series Generators.

Chapter 5: Advanced Operating Tasks

Advanced Operating Tasks

Introduction

This chapter covers topics that are not performed on a regular basis. If you are not familiar with the operating features of the 900 Series generators, you should read the opening paragraphs of each of the following sections in this chapter. They give you an overview of the unit's many capabilities and features.

Usually, you do not need to learn the tasks in this section to set up the generator or display any pre-programmed test images. However, you may want to learn some of these tasks so that you can optimize both your and the generator's operating performance.

Following is a list of the Advanced Operating Tasks presented.

- Manual Parser
- Operating with the Cover Plate in Place
- Working with Test Files
- User Programmable Softkeys
- Creating and Editing Font Files
- Creating and Editing Configuration Files
- Foot Pedal Operation

Manual Parser

The manual parser gives a direct way to communicate with the functions used by the generator's operating system software. Since the manual parser mode ignores all the front panel keys, you need to use the external keyboard to enter commands.

The external keyboard must be connected to the generator when the unit is first turned on or re-booted.

:When you first enter the manual parser, an identifying message appears on the screen. The manual parser then lets you know that it is ready with the following prompt:

```
Command>>_
```

The blinking underline shows the position of the cursor. As you type, the cursor moves. Everything typed in and any responses received have an intensified brightness level. Most of the commands work with both upper and lower case letters. Use the **<Backspace>** key to delete data. Press **<Enter>** to cause a command to be executed.

The manual parser executes each command as it is entered. Therefore, you **cannot** save a set of commands previously typed in. If you want to create a file containing a sequence of commands, you need to save them in a Test file. Loading the Test file causes the commands to be executed.

You may want to use the Manual Parser when first testing an idea for a custom image. Once you have decided on the correct commands and parameter values, you can type them into a Test file.

Note that this is a command language, not a programming language. The command language cannot do things like conditional branches. When a command expects one or more parameters, they must be entered in the same line as the command. The command and variables must be separated by spaces.

Types of Functions Available

The command language can be divided into 14 general categories. Some commands (or functions) fall under two or more categories. This section goes over the general categories. (See Appendix A for a complete list and explanation of all functions.)

To display a list of all available commands when in the manual parser mode press <H> while holding down the <Alt> key.

System & User Interface Functions

System & User Interface Functions determine how the generator's hardware and operating system software behave.

Disk File Functions

Disk File Functions let you create and edit certain types of disk files. You can also re-direct search paths if you are using multiple sub-directories for the same types of files.

Analog Look-Up Table Functions

Analog Look-Up Table Functions let you change the analog video colors or shades of gray used for the picture information in both the high resolution and the lower resolution planes. These functions apply to the analog video outputs only.

Digital Look-Up Table Functions

Digital Look-Up Table Functions let you change the digital video bit patterns used for the picture information in both the high resolution graphics plane and the lower resolution color plane. These functions apply to the digital video outputs only.

Drawing Window Functions

Drawing Window Functions determine how user-defined objects are drawn in the active video area. The size and position of these objects can be based on the absolute pixel coordinates for a particular Format or you can define your own coordinate system. The operating system then converts the user's coordinates to the nearest pixel location. You can switch between the two modes.

Graphics Plane Drawing Functions

Graphics Plane Drawing Functions let you place text and simple drawing primitives in the high resolution graphics plane. The drawing resolution is in one (1) pixel by one (1) pixel increments. The primitives include dots, lines, ovals and rectangles. Ovals and rectangles may be drawn as outlines or as filled solids. Only one color may be used for items in the graphics plane.

Color Plane Drawing Functions

Color Plane Drawing Functions let you place simple drawing primitives in the low resolution color plane. The drawing resolution is in eight (8) pixel by eight (8) pixel increments. The primitives include dots, lines, and rectangles. Rectangles may be drawn as outlines or as filled solids. Up to 256 different colors or shades of gray may be used for items in the color plane.

***Instant-Expert* Functions**

***Instant-Expert* Images** can be called directly from the manual parser. For most images, you control whether the previous image is cleared before the new image is drawn.

Format File Functions

Format File Functions allow you to review and change most individual parameter settings found in the main editor spreadsheet. You can also save the changes to a Format file.

Sync & Video Output Configuration Functions

Sync & Video Output Configuration Functions let you review and change most of the individual parameter settings found in the sub-menus in the Format editor.

Test File Functions

Test File Functions are commands that are normally in a Test file. Most of these commands should **not** be called while in the manual parser mode.

Configuration File Functions

Configuration File Functions let you review and change most of the individual parameter settings found in a Configuration file. You can also save the changes to a Configuration file. When loaded, a Configuration file determines how the generator's hardware and operating system software behave.

Font File Functions

Font File Functions let you select a new font file for placing text on your display. The font editor supplied on the disk can also be called.

Sync Memory Functions

Sync Memory Functions are special commands that let you program specialized waveforms into the generator's sync outputs.

Examples Using the Manual Parser

Following are two examples of what you can do in the manual parser. To best understand the examples, you need to have an operating display. A color display allows you to try both examples. Remember to press **<Enter>** when you are done typing in each line.

Turning Outputs On and Off

The first example checks the status of the signal outputs and turns them on and off. The command for controlling the outputs is **OUTS**. We can check the current status of the outputs by using this command as a query. This is done by entering the command with a question mark at the end. The command and the response looks like this:

```
Command>>OUTS?
Data: OFF
Command>>
```

... or like this:

Command>>**OUTS?**
Data: ON
Command>>

Let's assume the current status is ON. You can turn the outputs off with the following command line:

Command>>**OUTS OFF**

We can then turn the outputs back on with the following command line:

Command>>**OUTS ON**

You do not need to check the current status of the outputs before turning them on or off. Attempting to turn off outputs when they are already off causes no problems, nor does trying to turn on outputs that are already on.

Drawing an *Instant-Expert* Image

Next we will clear an existing image on the display and replace it with an *Instant-Expert* image. For this example, we will draw the linearity test image. The command for clearing the previous image and drawing any *Instant-Expert* image is IMGC. The command expects one parameter. The parameter is the name of the image as it appears in the Images directory. Chapter 6 gives these image names.

With the outputs turned on, enter the following command line:

Command>>**IMGC LINEARITY**

You can overlay one *Instant-Expert* image over an existing image. (To try this, you need a color display.) Enter the following lines to first draw the color bars test image and then add the linearity image.

Command>>**IMGC COLORBARS**
Command>>**IMAG LINEARITY**

You can overlay images as many times as you want.

☞ **Anything drawn in the high resolution graphics plane appears on top of anything drawn in the color plane.**

Not all *Instant-Expert* images can be combined with the desired results. The color settings for the last drawn image overrides any previous color settings.

Operating with the Cover Plate in Place

The cover plate lets you limit how someone can use the generator. With the plate on, only the power switch, brightness control, output key, and softkeys are accessible. By setting up your own Test files and Configuration file, you determine what the operator can and cannot do.

The following operations **cannot** be done with the cover in place.

- Files cannot be edited since the data entry and cursor keys are covered.
- You cannot select items from directories because there is no way of scrolling through them.
- Floppy disks cannot be swapped.

The first two restrictions do not apply if the external keyboard is used because the cover plate does not restrict its use.

The cover plate was originally designed for use when the generator was in a production test environment. You may also find it useful when the generator is used to demonstrate products at trade shows.

Installing and Removing the Cover Plate

The plate is held in place by two (2) locking tabs and a captive screw. The screw has a tamper-resistant head that uses a special key. One (1) key is supplied with each cover plate and additional ones may be purchased from Quantum Data. The part number of the key is 93-00074.

Installing Cover Plate

To install the cover plate:

1. Make sure the correct floppy disk, if used, is seated in the disk drive.
2. Hold the cover plate so the screw head is at the bottom and facing towards you.
3. Tilt the cover plate so the two tabs are facing towards the generator.
4. Insert the tabs into the two mating slots on the generator. One slot is located directly above the model number and the other is a little bit above the Data Entry keys.
5. Keep the tabs in the slots as you pivot the cover plate until the locking screw enters the hole on the front panel.
6. Use the key to turn the screw clockwise until the plate is firmly seated on the panel.

   Do not over torque the screw.
7. Return the key to a safe location.

Removing Cover Plate

To remove the cover plate:

1. Locate the screw near the bottom of the cover plate.
2. Use the key to turn the screw counter-clockwise until the screw is free of the front panel.
3. Tilt the cover plate up so it is perpendicular to the front panel.
4. Pull the cover plate away from the panel.
5. Place the cover plate and key in a safe location.

Working with Test Files

Test files are simple ASCII text files consisting of one or more of the 900 Series commands. The commands can do such things as load other files, draw images, label the softkeys around generator's screen, and control what happens when softkeys are pressed.

A sample test file is shown as Appendix D.

User Programmable Softkeys

This section shows how to define, group, and label the generator's 22 softkeys.

Defining Softkeys

Softkey operation and labeling can be specified with the KDEF, key definition, command. Once defined and labeled, the generator's CRT will display the new labels and subsequent key presses will execute the new command string. The KDFC command is used to undefine softkeys. Following is an explanation of these commands.

KDEF - Key DEFinition

Command Syntax: KDEF # "Label string; and more" Command and Args

= Key number 1 – 22 (The key that is affected by the following definition.)

Label string = 1 – 10 characters

KDEF defines the text that appears on the generator's CRT. It must be present and enclosed in quotes. To leave this field blank on the CRT, type quote space quote (" "). Multiple line labels can be formed by using a semicolon (;) as a new line symbol. Text in each line is centered. This includes spaces in order to off-set text if desired.

The remainder of the line is considered the command string and is executed with a button press. It must be present and contain the appropriate number of arguments specified by the command.

Examples:

KDEF 22 "CLEAR" CLRS

KDEF 6 "Test;— 3 —; Pattern" LTES test01

KDFC - Key DeFine Clear

Command Syntax: KDFC list

list = keys or groups to be undefined

KDFC undefines keys or groups. Items must be separated by commas. The keys are returned to an undefined state with no identifying labels or command string execution. KDFC is **not** needed to redefine keys since KDEF replaces old labels and command strings with the new ones. **All** keys can be undefined by using KDFC with no arguments.

Examples:

KDFC 1, 2, 3, 22

KDFC

Grouping

Grouping refers to the interaction between selected groups of softkeys. The default group (#0) has no interaction. When a key in this group is pressed, the key label blinks one time.

Groups #1 through #14 are interlocking. When a key in one of these groups is pressed, causes the key label to remain highlighted until another key in the same group is pressed.

The last group (#15) features bi-stable operation. When a key is first pressed, the key label is highlighted. Subsequent presses of this key toggles the highlight on and off. There is no interaction among keys in this group. There is no affect on the key's command line.

Keys can be assigned to any of the 15 groups with the KGRP command. Each key can be a member of only one group. When a key is included in a group, it is removed from its previous grouping. Command KUGP is used to ungroup keys.

KGRP - Key GRouP

Command Syntax: KGRP # list

= group number 1 – 15

List = keys to be included in the group. Items must be separated with commas.

A group number and at least key must be included for a change to occur. This command adds the listed keys to the group. Existing group members are not removed.

Example:

KGRP 1 22, 1, 2, 3, 4, 5, 6

KGRP 2 5, 6, 13, 14

KUGP - Key UnGrouP

Command Syntax: KUGP list

List = keys or groups to be ungrouped. Items must be separated with commas.

Keys = 1 – 22

Groups = #1 – #15

An entire groups may be *disbanded* by listing the group number as "@1, @2" etc. The @ symbol means that the following number represents a whole group. If no valid arguments are given, no action is taken. You do **not** need to use KUGP to reassign a key to a different group. KGRP removes a key from its current group and assigns it to the new group.

Examples:

KUGP 3, 4, 10

KUGP @2

Labels

There may be times when you want to turn the highlight on or off as a separate function rather than use the grouping commands. KYON and KOFF let you do this.

KYON- KeY ON

Command Syntax: KYON list

List = keys of keys to be highlighted. Items must be separated with commas.

Keys = 1 – 22

The listed keys are highlighted. Normal grouping operations are still performed. Therefore if Key 6 and Key 2 are in the same group and Key 6 is commanded KYON, a subsequent press of Key 2 turns highlighting off. For a key to be independent, it must be the only member in a group.

Example:

KYON 22, 1, 6

KOFF- Key OFF

Command Syntax: KOFF list

List = keys of keys to be highlighted. Items must be separated with commas.

Keys = 1 – 22

The listed keys are **not** highlighted. Normal grouping operations are still performed. Therefore if Key 6 is commanded KOFF and it is pressed, highlighting is still turned on.

Example:

KOFF 22, 1, 6

Selecting a Test File for Editing

Using the Front Panel Keys

1. Start at the File Select Windows screen.
2. Move the cursor to the right-hand directory (Tests). The directory lists all the Test files.
3. Scroll through the directory until you find the Test file you want to edit.
4. Press the **<Edit>** softkey. This loads the system text editor and then the selected Test file into the editor's buffer.

Using Manual Parser Commands

- If the test file you want to edit is in the current test file path, type in this command: **ETES filename** where *filename* is the name of the file you want. Do not use file extensions in the filename. The command searches for and edits files with an extension of **.tes** only.
- If the test file you want to edit is not in the current test file path, type in this command: **EDIT path\filename.tes** where *path* is the complete directory path from the root directory and *filename* is the name of the file you want. Use the file extension **.tes** as part of the filename.

Using DOS Commands

The current version of the text editor can only be used within the generator's operating environment. It is not available at the DOS level.

You do not have to use the text editor supplied with the generator. You can use almost any editor program that runs on an IBM-PC/AT and can handle MS-DOS type ASCII text files. You can add the editor program to your working copy of the system disk.

You also can create and edit Test files without using the generator. Any computer and text editor that can handle ASCII text stored in MS-DOS type files will work. You need a computer with a 1.44 MB (HD) 3 1/2 inch floppy disk drive.

Using the Text Editor

The built-in text editor has on-line help. Just press the <HELP> key on the front panel or <ALT-H> on the external keyboard.

Creating and Editing Font Files

A Font file determines how text is drawn on the unit under test. It is possible to display text using several different Fonts at the same time. The system disk comes with several Font files and you can create new fonts by editing existing ones.

This section first shows how to select an existing Font file for editing. Then it goes over individual items in the Font editor screen.

Selecting a Font File for Editing - Using the External Keyboard While in the User Interface Mode

The Font editor requires the external keyboard. An error message is displayed if you attempt to edit a Font file without the external keyboard connected. It must be connected before the unit is turned on or re-booted.

1. Make sure the generator is running in the User Interface mode (front panel keys are active).
2. Press the <Types> key next to the disk drive. The front panel screen lists all the directory types available.
3. Move the selection cursor to *Fonts*.
4. Press <Enter> and a directory of available Font files appears.

5. Move the selection cursor to the desired Font file.

6. Press the softkey labeled **<Edit>**. This loads the Font editor and the selected Font file into the editor.

7. The Font editor screen then appears. The screen for the supplied default Font file should look like Figure 5.1.

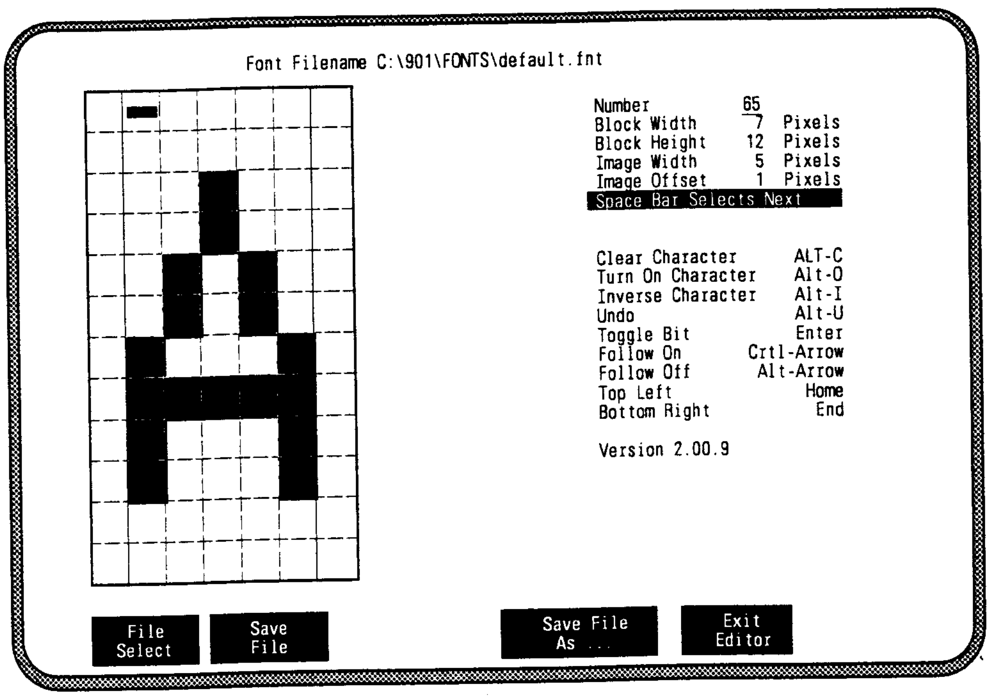


Figure 5-1. Font Editor Screen

Font Editor Parameters and Functions

The top line of the screen shows the name and path of the Font file. You cannot change this line directly. Other Font files may be selected for editing using the **<File Select>** softkey as described later in this section.

The five (5) numerical parameters below and to the right of the file name can be edited by either entering new values or by tweaking the current values with the keyboard <+> and <–> keys. The selected parameter has its numeric value underlined. Press the keyboard space bar to select different parameters. An explanation of each of the parameters follows.

Number

Number is the character code number for a specific character in a font. Usually the character code numbers follow standard ASCII codes. The valid range of code numbers is 0 through 255 (decimal).

Figure 5-2 on the following page shows the standard ASCII assignments for code numbers 0 through 127. The smaller number at the top of each box is the code number. Code numbers 0 through 31 are normally reserved for use as non-printing control codes to printers and terminals. Most of the supplied fonts use only code numbers 33 through 126. Code number 32 is used for a blank space. Some of the supplied fonts may have special characters, such as ®, ©, ™, and ¶, assigned to code numbers above 126.

00	16	32	48	64	80	96	112
NUL	*DLE*	Space	**0**	**@**	**P**	**`**	**p**
01	17	33	49	65	81	97	113
SOH	*DC1*	**!**	**1**	**A**	**Q**	**a**	**q**
02	18	34	50	66	82	98	114
STX	*DC2*	**"**	**2**	**B**	**R**	**b**	**r**
03	19	35	51	67	83	99	115
ETX	*DC3*	**#**	**3**	**C**	**S**	**c**	**s**
04	20	36	52	68	84	100	116
EOT	*DC4*	**$**	**4**	**D**	**T**	**d**	**t**
05	21	37	53	69	85	101	117
ENQ	*NAK*	**%**	**5**	**E**	**U**	**e**	**u**
06	22	38	54	70	86	102	118
ACK	*SYN*	**&**	**6**	**F**	**V**	**f**	**v**
07	23	39	55	71	87	103	119
BEL	*ETB*	**'**	**7**	**G**	**W**	**g**	**w**
08	24	40	56	72	88	104	120
BS	*CAN*	**(**	**8**	**H**	**X**	**h**	**x**
09	25	41	57	73	89	105	121
HT	*EM*	**)**	**9**	**I**	**Y**	**i**	**y**
10	26	42	58	74	90	106	122
LF	*SUB*	*	:	**J**	**Z**	**j**	**z**
11	27	43	59	75	91	107	123
VT	*ESC*	+	;	**K**	[	**k**	{
12	28	44	60	76	92	108	124
FF	*FS*	,	<	**L**	\	**l**	|
13	29	45	61	77	93	109	125
CR	*GS*	-	=	**M**	]	**m**	}
14	30	46	62	78	94	110	126
SO	*RS*	.	>	**N**	^	**n**	~
15	31	47	63	79	95	111	127
SI	*US*	/	?	**O**	_	**o**	*DEL*

Figure 5-2. ASCII Character Code Chart

Block Width

Block Width is the overall width of the character block for a particular character code number. This value includes any extra spacing added to the right of the character. Each character in a Font file can have its own unique block width (proportional spaced text) or all of the characters can have the same block width (mono-spaced text). The bitmap on the left side of the screen shows the block width for the selected character.

Block Height

Block Height is the overall height of all of the character blocks for a particular Font file. Changing this number for any character applies the change to all characters in the file. The bitmap on the left side of the screen shows the height for the selected Font file. The block height must include room for lower case descenders. Descenders are the portions of a letter that extend below a font's base line (usually found on the letters g, j, p, q and y). The dashed line extending from the left side of the displayed bitmap indicates the current font's base line.

Image Width

Image Width is the width of the actual character within the larger character block. Each character in a Font file can have its own unique image width. The bitmap on the left side of the screen indicates the image width with a solid vertical line within the character block. Pixels to the right of this line remain off and cannot be manipulated by the editor. These pixel locations are normally used for inter-character spacing.

Image Offset

Image Offset allows you to offset the position of the character relative to the character block. Each character in a Font file can have its own unique image offset. Typically, you want to leave the offset value at zero (0). Inter-character spacing is normally allocated on the right side of a character.

For a given character code number, the sum of the image width plus the image offset must not exceed the block width. Unexpected results, including loss of data in the Font file, may result if this rule is not followed.

As mentioned, the left side of the Font editor screen shows a magnified bitmapped image of the selected character. The amount of magnification is adjusted so the character fills the maximum usable area on the editor screen. The bitmapped image is divided into small boxes. Filled (lit) boxes indicate active pixels. Unfilled (unlit) boxes indicate inactive pixels. A small blinking rectangle also appears in one of the boxes. This rectangle is the edit cursor. Use the four (4) arrow keys on the external keyboard to move the cursor one block at a time. It can be moved directly to the top left corner of the block by pressing the **<Home>** key. The cursor also can be moved directly to the bottom right corner of the active area of the block by pressing the **<End>** key.

Font Data Manipulation

Data in the character block can be manipulated in seven (7) ways.

The **<Enter>** key toggles the status of the bit at the cursor location.

Holding down the **Control <(Ctl)>** key while pressing any of the arrow keys moves the cursor in the given direction, turning on all the pixels in its path. The starting pixel location is not changed.

Holding down the **Alternate <(Alt)>** key while pressing any of the arrow keys moves the cursor in the given direction, turning off all the pixels in its path. The starting pixel location is not changed.

The <**Alt-C**> key combination (press and hold down the <**Alt**> key and then press the <**C**> key) deactivates (turns off) all the pixels in the character area. This clears out any previous bitmap data stored in the block.

The <**Alt-O**> key combination activates (turns on) all the pixels in the character area. This overwrites any previous data stored in the block.

The <**Alt-I**> key combination inverts all the bitmap data in the character area. All active pixels are deactivated and all deactivated pixels are activated. Selecting this function a second time inverts the data to its original settings.

The <**Alt-U**> key combination reverts the bitmap to the last saved version. This undoes all changes made to the character since it was last saved.

A summary of these commands is displayed on the editor screen for easy reference. The version number of the Font editor also appears. It may be different from the generator's operating system software version number.

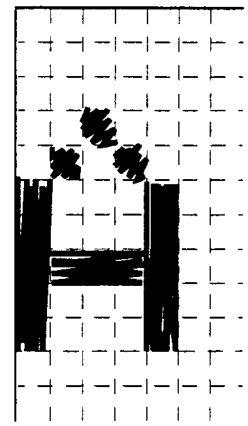
Saving an Edited Font File

Usually you want to save edited font files. To do this the font file editor must be showing. To save the file with a new name, press the <**Save As**> softkey. You are asked to enter a new file name. After you enter a valid file name (≤ 8 characters), the system saves your work under the new name. Other than *default*, you can save your work under the original file name by pressing the <**Save**> softkey. Saving in this manner causes the original data in the file to be lost.

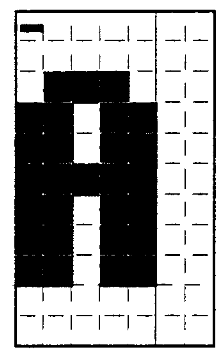
Example of Editing a Character

Let's look at a simple edit of a single character. We'll use the default font as the starting point. Only the bitmap data will be changed in this example. The overall size of the character and character block will not be changed.

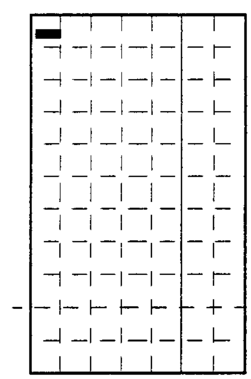
1. First sketch out the bitmaps for all of the characters you want to edit or create. Ordinary graph paper can be used. A sheet with four (4) squares to the inch is a good size for small fonts, while a sheet with eight (8) or ten (10) squares per inch works better for larger fonts. Remember that while each character block can have a different width, all of them must have the same block height. The sketch shows the bitmap for the letter **A**.



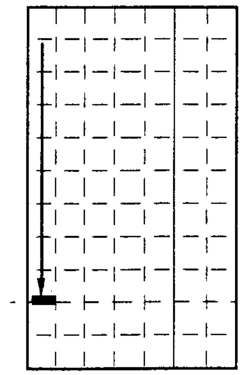
2. Get the Font editor up and running with the standard default font selected for editing. Enter 65 as the character number for A. The bitmap image that appears should match the one shown. If it does not match, it may mean that someone redefined the default font on the system disk.



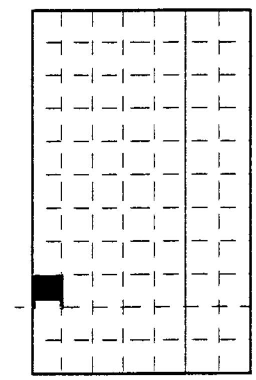
3. Comparing our sketch to the default bitmap, it appears that we may want to start with a blank character block instead of modifying the existing character. The **Alt-C** key combination clears the existing bitmap.



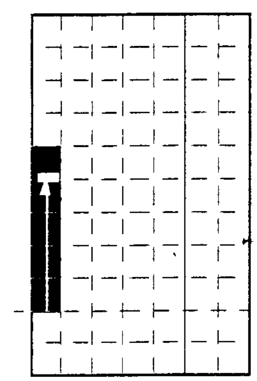
4. Next, move the cursor down to the base line at the left side of the character block. You can move the cursor by pressing the **down arrow** key eight (8) times or by holding the key down and letting the auto-repeat move the cursor for you.



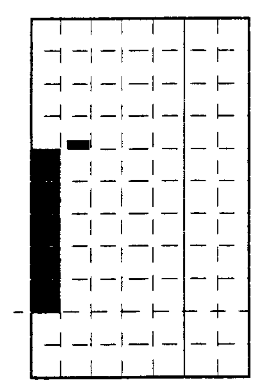
5. Now draw the vertical row of pixels at the left side of the character block. First, turn on the pixel at the current cursor location by pressing **<Enter>**.



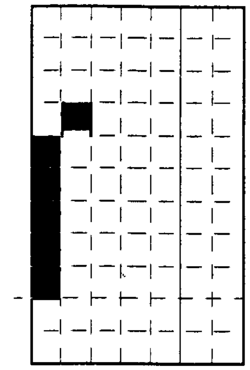
6. The easiest way to add the remaining pixels in the column is to hold down the **<Control> (Ctl)** key while pressing the **up arrow** key four (4) times. You should now have a vertical row of 5 active pixels.



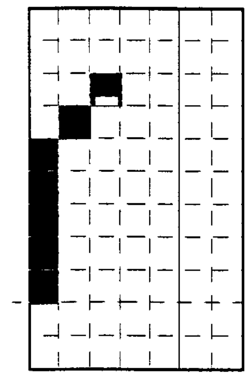
7. Use the **up arrow** to move the cursor up by one (1) pixel and the **right arrow** to move it right by one pixel. There is no direct way to move the cursor diagonally.



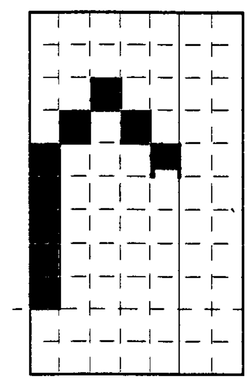
8. Press **<Enter>** to toggle the pixel on.



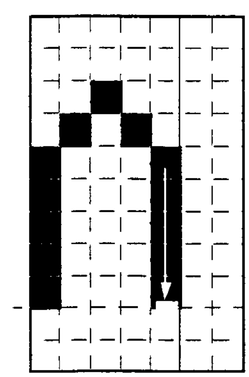
9. Repeat the last two (2) steps to light the next pixel as shown here.



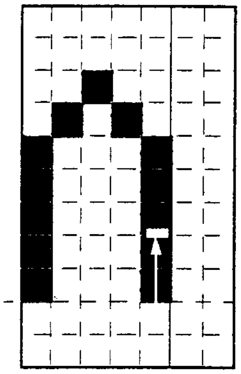
10. Now, use a similar sequence of **down arrow**, **right arrow** and **<Enter>** keys, to add the next two pixels.



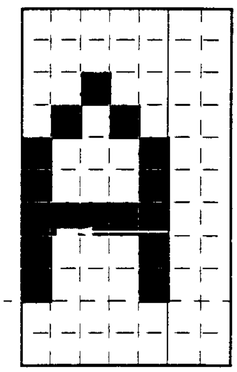
11. To add four more pixels on the right side hold down the **<Control> (Ctl)** key and press the **down arrow** key four (4) times.



12. All that remains is the horizontal cross bar. Move the cursor up two spaces with the **up arrow** key.



13. Hold down the **<Control> (Ctl)** key and press the **left arrow** three (3) times. The character is now complete.



This completes the example of using the Font editor. You may want to continue practicing by changing other characters in the font to match the style of the letter in the example.

Creating and Editing Configuration Files

Configuration files determine how the generator boots up and control how some software and hardware behaves during operation. This section reviews how to select a Configuration file for editing and the individual items in a file.

Selecting a Configuration File for Editing (Using the Front Panel Keys)

Although you select a Configuration file for editing with the front panel keys, most of the actual editing is done with the external keyboard. The keyboard must be connected to the generator before the unit is turned on.

1. Make sure the generator is running in the User Interface mode (Front panel keys are active).

2. Press the **<Types>** key next to the disk drive. The front panel screen lists all the available directory types.

3. Move the selection cursor to *Configurations*.

4. Press **<Enter>** and a directory of all available Configuration files appears.

5. Move the selection cursor to the desired Configuration file.

6. Press the **<Edit>** softkey. This loads the Configuration editor and the selected Configuration file into the editor.

7. The Configuration editor spreadsheet appears on the screen. The spreadsheet for the supplied default Configuration file should look like the Figure 5-3.

Editing the Current Configuration

1. Press the **<Types>** key next to the disk drive. The front panel screen lists all the available directory types.

2. Press the **<Configuration Edit>** softkey.

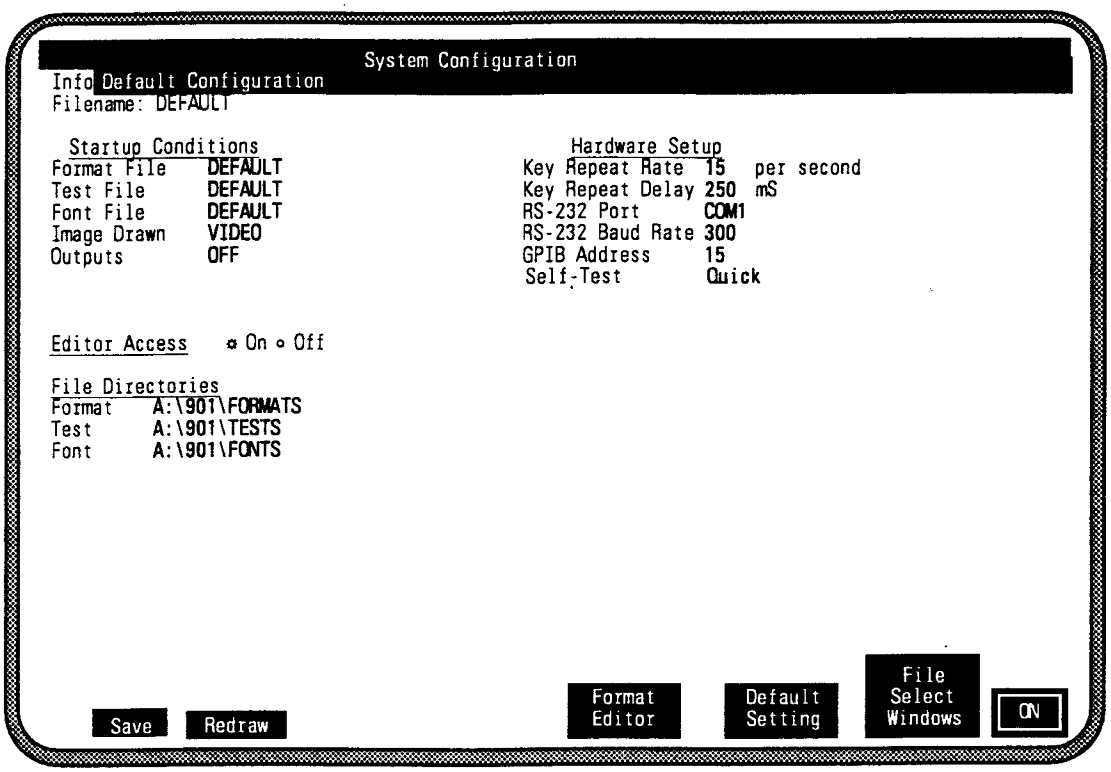


Figure 5-3. Configuration Editor Spreadsheet

Configuration File Editor Parameters and Functions

The top lines show the name of the Configuration file being edited. You cannot directly change this line. Parameters that can be edited appear as boldface. The line marked *Info:* is reserved for user comments.

Startup Conditions

The five (5) parameters under this heading define how some of the operating system software boots up and how the output hardware sets up when loading the file.

Format File

Format File is the name of the format file loaded when the Configuration file is loaded.

Test File

Test File is the name of the test file loaded when the Configuration file is loaded. It determines what appears on the generator's screen and the behavior of the softkeys.

Font File

Font File is the name of the font file loaded as part of the loading procedure when the Configuration file is loaded.

Image Drawn

Image Drawn is the name of the built-in image drawn when the Configuration file is loaded.

Outputs

Outputs determines whether the initial status of the signal outputs will be on, off or controlled by the contents of the Startup Format file (Auto setting).

Hardware Setup

Key Repeat Rate

Key Repeat Rate determines how fast a key repeats when it is held down on either the front panel or on the external keyboard. The key does not start to repeat until after a specified delay time.

Key Repeat Delay

Key Repeat Delay is the amount of time a key on either the front panel or on the external keyboard must be held down before it starts to auto repeat.

RS-232 Port

RS-232 Port determines how the optional RS-232 port is configured and identified (COM1 or COM2) by the operating system software.

RS-232 Baud Rate

RS-232 Baud Rate determines the Baud rate for the optional RS-232 port.

GPIB Address

GPIB Address determines the generator's bus address when it is connected to a GPIB (IEEE-488) bus using the optional GPIB port.

☞ **The settings for the RS232 and GPIB Address parameters are ignored by the operating system software if the optional ports are not installed.**

Self-Test

Self-Test determines what kind of hardware self tests, if any, are performed when the Configuration file is loaded.

Editor Access

This parameter controls access to all the editors in the operating system software except the Configuration editor. You get an error message if you try to run an editor with this parameter set to *Off*.

File Directories

Format

Format determines the subdirectory path used by the operating system software to look for Format files. Only Formats in a given path and subdirectory appear when you call up a list of all available Formats. (See the separate MS-DOS manuals for information on setting up and using sub-directories.)

Test

Test determines the subdirectory path used by the operating system software to look for Test files. Only Test files in a given path and subdirectory appear when you call up a list of all available Tests. (See the separate MS-DOS manuals for information on setting up and using sub-directories.)

Font

Font determines the subdirectory path used by the operating system software to look for Font files. Only Font files in a given path and subdirectory appear when you call up a list of all available Fonts. (See the separate MS-DOS manuals for information on setting up and using sub-directories.)

Saving an Edited Configuration File

Usually you want to save edited configuration files. To do so, the configuration file editor must be on the front panel screen. To save the edited configuration file with a new file name, press the **<Save>** softkey. You then are asked to enter a new file name. The original name of the file appears as the current choice. After you enter a valid file name (≤ 8 characters), the operating system saves your work. Typically, you can save revisions under the original file name by pressing **<Enter>** without typing in a new name. Saving like this causes the original data in the file to be lost.

You cannot save a configuration file, to a file named *default*.

Restoring a Configuration File to Default Condition

When editing a Configuration file, you may want to start with a known good file. The easiest way to do this is to press the **<Default Setting>** softkey. This restores parameters to a good condition.

Loading a Specific Configuration File on Power-Up

The operating system software on the original system disk tries to load a configuration file called **default.cfg** on power-up or re-boot. The loading of a specific configuration file is controlled by the contents of a file called **autoexec.bat**. This file can be viewed and edited with the text editor. The following steps describe the editing procedure using the supplied editor.

1. Place the generator in the Manual Parser mode.

2. If you are running from a disk in the front panel drive, type in:

   edit a:\autoexec.bat

   If you are running from an internal hard disk drive, type in:

   edit c:\autoexec.bat

3. The system text editor should be running and the **autoexec.bat** file should be in the editor. If you get an error message or are not in the correct file, the files or file structures on your disk have been edited or corrupted. Ask the person who did the editing for help or start with a copy of the original disk. **Do not make any changes to the original copy of the disk that came with the generator.**

4. Find the line in the file that starts with

   SET CFGFILE=

5. Replace the file name after the equal sign with the name of the configuration file you want the operating system to use. Do not include the file extension.

6. Press **<Esc>** to save the modified autoexec.bat file and exit the editor.

7. To re-boot the generator, momentarily hold down the **<Control>**, **<Alt>**, and **<Delete>** keys at the same time. The newly selected configuration file is used during the re-boot.

The operating system software first tries to load the configuration file specified in the autoexec.bat file. If the file cannot be found, the operating system software regenerates its own default configuration settings internally.

Troubleshooting Autoexec and Configuration File Problems

The operating system software may hang on power-up if the information in the **autoexec.bat** or power-up configuration file is corrupted. The system may also hang if any of the start-up files are corrupted or contain bugs. The following procedure lets you boot-up the generator into a good state. The instructions assume you are working from a floppy disk. If you are working from an internal hard disk drive, replace the **A:** drive designation in the instructions and listings with a **C:** drive designation.

1. Power-up or re-boot the generator.

2. Wait for the MS-DOS identification message to appear.

3. Immediately press and hold down the **<Control>** and **<C>** keys on the keyboard. An abort message and a standard MS-DOS prompt appear in a short time.

4. Type in the following command and press **<Enter>**.

   type autoexec.bat

5. The listing of the **autoexec.bat** appears on the front panel screen. The listing for the file should look like this.

```
@ECHO OFF
CLS
SET COMSPEC=A:\DOS\COMMAND.COM
VERIFY OFF
PATH=A:\;A:\DOS;A:\901;%PATH%
PROMPT $P$G
A:\DOS\GRAPHICS
VER

REM environment vars for generator
SET CFGPATH=A:\901\CONFIGS
SET CFGFILE=DEFAULT

ECHO Loading Generator System
CD \GEN
GEN.EXE
```

Here's how the file looks on the 902/903.

```
@ECHO OFF
CLS
SET COMSPEC=A:\DOS\COMMAND.COM
VERIFY OFF
PATH=A:\;A:\DOS;A:\901;A:\pclite;%PATH%
PROMPT $P$G
A:\DOS\GRAPHICS
VER

REM environment vars for generator
SET CFGPATH=A:\901\CONFIGS
SET CFGFILE=DEFAULT

ECHO Loading Generator System
CD \GEN
GEN.EXE
```

6. Make any needed corrections to the **autoexec.bat** so that it matches the listing. Use the EDITOR (EDIT.COM) supplied with MS-DOS. Save the changes with the **autoexec.bat** filename.

7. Delete the **default.cfg** file in the **A:\901\CONFIGS** (model 901) or **A:\90X\CONFIGS** (model 902/903) subdirectory. If needed, see the MS-DOS manuals for information on deleting files.

8. Delete the **default.fmt** file in the **A:\901\CONFIGS** (model 901) or **A:\90X\CONFIGS** (model 902/903) subdirectory.

9. Delete the **default.tes** file in the **A:\901\CONFIGS** (model 901) or **A:\90X\CONFIGS** (model 902/903) subdirectory.

10. Delete the **default.fnt** file in the **A:\901\CONFIGS** (model 901) or **A:\90X\CONFIGS** (model 902/903) subdirectory.

11. Cycle the power and check for normal boot-up and operation. The operating system software sets up its own internal buffers with good Configuration, Format, Test, and Font data.

12. If you still have problems, please contact Quantum Data and ask for an applications engineer.

Format File Conversion Utility (8700/8701 to 900)

Included with the 900 series software is a utility for converting Format files created on the 8700 or 8701 Imager to 900 Series-compatible Format files. (The utility does not convert 900 Series files to 8700/ 8701.)

The utility (FMTCNVRT.EXE) is a stand-alone program that must be run from the DOS command level. Additionally, it runs on an IBM-PC or compatible computer. The syntax follows.

FMTCNVRT (pathname)

Pathname is the file or directory name of the 8701 Format file you want to convert. Any extension other than .FMT is discarded. If a pathname is not given, you are prompted to enter one.

Press <ALT-Q> or type **DOSS** or **QUIT** at the Command> in the manual parser mode. When the DOS prompt, A:90X appears, type **FMTCNVRT [pathname]**.

The converted Format file does NOT overwrite the original file. Rather it is given the same name with a .90X file extension. It is placed in the same subdirectory as the original file. If desired, use the DOS COPY command to transfer files between disks and sub-directories. The 8701 uses 3 1/2" double-sided disks whereas the 900 Series typically uses 3 1/2" high-density disks. However, the disk drive on the 900 Series generator will read a model 8701 disk.

A converted file must have a .FMT file extension. Use the DOS REN command to do this. The DOS COPY command also can be used to rename the file as it is copied.

To get a brief description of the command syntax, enter a question mark (?) in place of the pathname.

Foot Pedal Operation

The foot pedal can be used in two ways. First, it can be connected in connected in parallel with one of the softkeys. This does not require any additional software but limits the use of the pedal. To use this method, connect the foot pedal across one of the overlay switches; e.g., CRT1 pins 1 and 15. Then use KDEF to define what will be executed when the pedal is pressed. In this example, the action of the pedal changes each time the key definition for Key 1 changes.

The second, and preferred, method is to connect the foot pedal to pins that are not used by the softkeys. This requires minimal software but makes use of the pedal very flexible and allows up to eight foot pedals to be connected to the same system. To use this method, connect the foot pedal across one of the unoccupied matrix locations; e.g., pins 6 and 14. Then use the PDSC command to tell the system which scan code the pedal returns when pressed. Use the PDEF command to define what will be executed when the pedal is pressed.

Following is an example of how the foot pedal could be used to draw the linearity pattern.

```
PDFC            ! Clear all pedal definitions
                  and scan codes

PDSC 1 0 9      ! Define which scan
                  code will be returned for
                  pedal 1

PDEF 1 IMGC LINEARITY ! Define text to be
                        executed by pedal 1
```

See Appendix A for more information about the above three pedal commands.

This chapter shows the built-in images currently provided with 900 Series Generators.

Chapter 6: Built-in Images

Built-In Images

Introduction

For most images presented in this chapter, we give

- the pattern name
- a description of how the image is drawn
- a black and white drawing of the image
- a notation of any parts of the image that can be changed by the user
- the name of the test that uses the image
- the purpose of the test
- a general guide on how to perform the test

In some cases, colors or gray percentages are shown in this section. These labels are not included on the actual images.

The following images are included:

Table 6-1. Test/Built-In Images

Test/Purpose You Want	Image(s) to Use (page #) (Preferred images shown in **bold**)
Brightness adjustment Incorrect brightness settings may cause other tests (e.g., *Contrast, Focus,* or *Beam Size*) to be invalid. An accurate brightness setting helps you get repeatable measurements throughout other tests.	**brightness** (6-12) **colortemp-w** (6-16)
Brightness uniformity The light output of most picture tubes varies slightly when measured across the CRT face. This test can be used to verify that the light output variation is within spec limits.	**brightness** (6-12) **colortemp-w** (6-16) purity-w (6-45)
Color uniformity Used to verify that the color of the light produced by the phosphor(s) is the same in all areas of the tube.	**colortemp** (6-16) **purity-w** (6-45)
Color verification Used to verify that all color channels are properly functioning.	**colorbars** (6-15) **color256** (6-13) smpte (6-54) controls (6-19)
Contrast checking Used to verify the contrast range of the monitor. A monitor should show a linear response to all video intensity levels and not show signs of clipping at either extreme.	**contrast** (6-18) smpte (6-54)

Test/Purpose You Want	Image(s) to Use (page #)
Control setup/functionality Early in testing you should verify whether the monitor's pots, coils, etc. can be adjusted. If a control is defective, you can reject the monitor for repair before wasting adjustment time. A single image is often used to get controls in a *ball park* range before making precision adjustments.	**controls** (6-19) smpte (6-54)
Convergence adjustment (color monitors) To accurately produce an image on a color monitor, the three electron beams in the CRT must meet (converge) at an exact location. Lines displayed on a mis-converged monitor appear as several multicolored lines and the transitions between different colored areas contain *fringes* of other colors.	**converg** (6-21) dotgrid (6-24)
Crosstalk Used to determine if the monitor has a crosstalk problem between the video and sync circuits. Excessive crosstalk can make vertical lines appear bent at one or more places.	**crosstalk** (6-23)
Display size adjustment Most display specifications call for the active video to fill a specific sized area on the CRT.	**vcenter** (6-59) video (6-60) controls (6-19)
Focus adjustment An out-of-focus monitor displays fuzzy images, and poorly formed, hard to read characters.	**focus** (6-27) **fastchars** (6-26) dotgrid (6-24) randomtext (6-47)

Test/Purpose You Want	Image(s) to Use (page #)
High voltage regulation The size of an image should not change as you vary the amount of displayed video. You can measure the size change to determine the high voltage regulation performance.	**regulate** (6-49)
Interlace Flicker Used to test for flicker caused by the combination of the display's CRT persistence and frame scan rate being below the persistence time of the human eye.	**smpte** (6-54)
Interlace pairing To optimize an image on an interlaced monitor, the lines of one field should be equally spaced between the lines of the alternate field. A small error may not be noticeable or objectionable to an observer. However, worse errors cause the appearance of light and dark stripes over an area. In a worst-case condition, the lines in each field completely overlap (pair). This causes the displayed vertical resolution to be cut in half.	**pairing** (6-41)
Linearity adjustment To present an undistorted display, horizontal and vertical sweeps of the electron beam across the face of the CRT should be at uniform speeds. Any non-uniformity in the sweep causes portions of an image to stretch while other portions are compressed. Non-linearity in monitors can show up in several ways. It may be present across the entire screen, a large portion of the screen, or it may be localized in a very small area.	**linearity** (6-36)

Test/Purpose You Want	Image(s) to Use (page #)
Orthogonality The horizontal and vertical axes of an image should line up with the horizontal and vertical axis of the monitor.	**cross** (6-22)
Overscan Overscan on computer CRT's can lead to loss of data. This test verifies that the CRT is not overscanning.	**smpte** (6-54) **video** (6-60)
Phosphor color temperature Phosphor(s) in a picture tube should emit the correct color (or hue) light when energized. This is especially important when an image will be photographed and the output of the monitor must match the response of the film being used. In color pictures of *real* objects, the color temperature of each phosphor type must be correct to reproduce true-to-life pictures.	**colortemp** (6-16) **purity** (6-45)
Pin and barrel Correction Even if you send perfectly linear sweep signals to a perfectly wound deflection yoke that is mounted on a perfect CRT, you may not get a perfectly formed raster. The corners of the raster may be stretched away from the center so that it resembles a pincushion. This distortion occurs because the geometry of the deflected electron beam does not match the geometry of the tube faceplate. Also, any imperfection in the yoke or CRT may add to this problem. In some cases, one or more corners may be pulled in towards the center of the raster causing it to look like a barrel. Any uncorrected raster distortion carries over as image distortion.	**pin&barrel** (6-43) video (6-60)

Test/Purpose You Want	Image(s) to Use (page #)
Purity adjustment To produce correct image colors, the electron beams from each of the three (3) guns in the CRT should only strike their matching phosphors. Monitors with bad purity show patches of various colors. Purity adjustment(s) should be performed before doing any brightness or color tests. In some cases, purity adjustments involve loosening and repositioning the yoke. In this case purity should be adjusted prior to doing any geometry tests.	**purity** (6-45)
Raster centering Some monitor applications require that the displayed image or text fit completely within a bezel that surrounds the CRT. This requires that you first center the raster on the face of the CRT. Use this image for centering the raster on the CRT.	**raster** (6-48)
Resolution Used to verify the monitor's resolution.	**resolve** (6-50) **smpte** (6-54) h-grill (6-35) v-grill (6-58) multiburst (6-38)
Shadow mask warping The purity characteristics of a CRT can change over time. This may be due to the CRT's electron beams striking its shadow mask with enough energy to cause the mask to heat. This internal heating may be enough to cause the shadow mask to warp and give bad purity.	**purity** (6-45)

Test/Purpose You Want	Image(s) to Use (page #)
Text Reproduction If the monitor is used in word processor work stations, data entry terminals or other text applications, text must be well-formed and in focus.	**randomtext** (6-47) **fastchars** (6-26) **pagechar** (6-40)
Video Amplifier Response/Bandwidth/Rise and Fall Times The monitor's amplifier circuits should show no signs of mid-band streaking (poor low frequency response), ringing, or overshoot. In a color monitor, it is important that all three video channels respond to the same signal in the same way. If the rise and fall times of the three channels are not the same, transitions between different colors will not be sharp and may contain false colors.	**smpte** (6-54) **multiburst** (6-38) **rgbdelay** (6-52) v-grill (6-58) resolve (6-50)
Video centering Used to center the video within the raster.	**vcenter** (6-59) **video** (6-60) sidetics (6-53)
Video gain linearity For the monitor to accurately produce the correct contrast range of an image, the video channel must have linear gain characteristics.	**gray6/gray12** (6-28) **gray256** (6-30) **graybars** (6-32) **grayvbars** (6-34) smpte (6-54) controls (6-19)

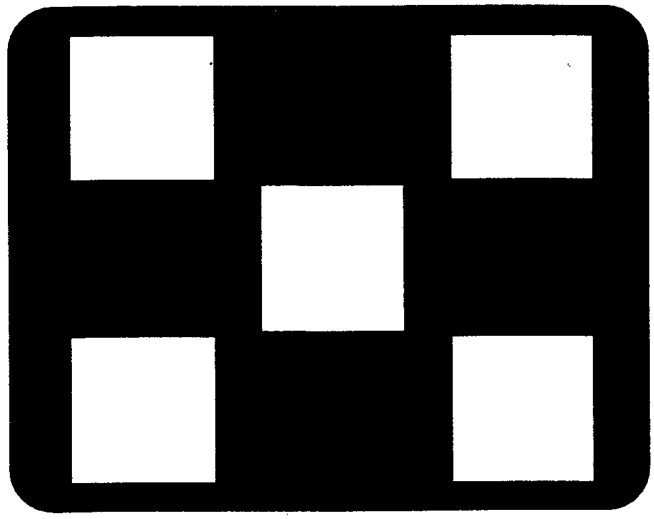
Test/Purpose You Want	Image(s) to Use (page #)
White balance/temperature adjustment Perceptions of *white* produced on color monitors may differ from person to person. Some people prefer a warm or reddish white, while others prefer a cooler or bluish white. Operator preferences should be eliminated to insure a consistent product. Use these images to **set** white balance.	**gray6/gray12** (6-28) **gray256** (6-30) **graybars** (6-32) **smpte** (6-54)
For the color monitor to accurately produce correct colors at all intensities, all three (3) video channels need the same gain characteristics. Use this test to **check** white balance.	**colortemp-w** (6-16)
Yoke tilt adjustment The horizontal and vertical axes of an image should line up with the horizontal and vertical axis of the monitor. Any tilt is probably due to the yoke being twisted on the neck of the CRT.	**cross** (6-22)

Image

Description

brightness

Five (5) white squares (100% video level) on a black background. A square is in each corner and the center of the display.



Test

Brightness Adjustment

Method

Center a light meter probe within the center square and adjust the monitor's brightness control to obtain the required light meter reading.

Test

Brightness Uniformity

Method

Perform the *Brightness Control Adjustment* test first. Then center the light meter probe in each of the corner squares and note the readings. Compare the readings with the spec limits. Next measure the center square. The deviation between each of the corner readings and the center reading should also be within the spec limits.

Image

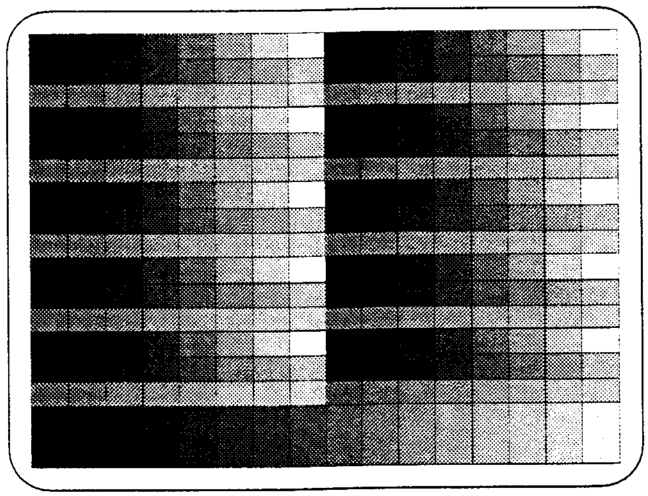
Description

color256

There are 256 boxes (240 colors and 16 shades of gray). The image has 16 rows of boxes with 16 boxes per row.

The top 15 rows are divided into colors consisting of all possible combinations of eight (8) equally stepped levels of red, six (6) equally stepped levels of green and five (5) equally stepped levels of blue.

The bottom row has 16 stepped levels of gray. It does not include full black or white.



Test

Color Performance
(Color Monitors Only)

Method

Compare the sequence of color boxes to that of a known good monitor. Missing bars may indicate a dead or unconnected channel. Transitions between the bars should be sharp and distinct. Individual boxes should be uniform in color and intensity. Non-uniformity may indicate problems with the frequency response of the video amplifiers. If the bars are in the wrong order, inputs may be connected wrong.

Gray boxes across should have uniform steps and not show any color shifts.

Test

Method

Color Verification

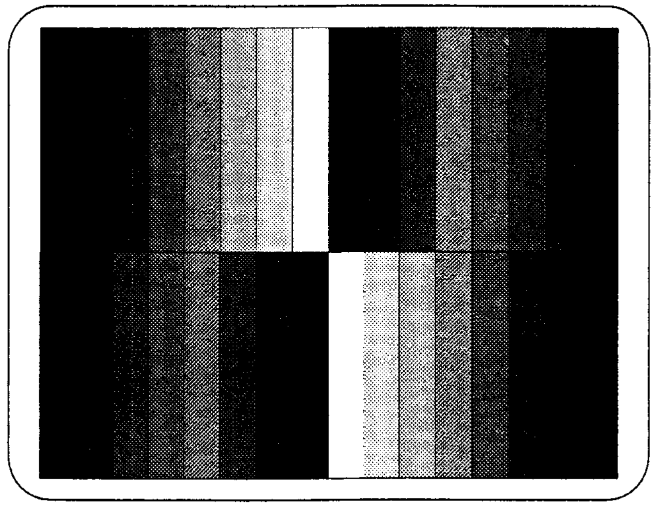
Compare the sequence of color bars to that of a known good monitor. Missing bars may indicate a dead or unconnected channel. The transition between the bars should be sharp and distinct. Also each bar should be uniform in color and intensity. Non-uniformity may indicate problems with the response of the video amplifiers. If all the bars are present but in the wrong order, the inputs may be improperly connected.

Image

colorbars

Description

Two (2) rows of color bars fill the screen, with up to sixteen (16) bars per row. The top and bottom rows are in reverse sequences. The exact sequence of colors depends on the type of monitor you're testing and how it is connected.



Test

Color Verification

Method

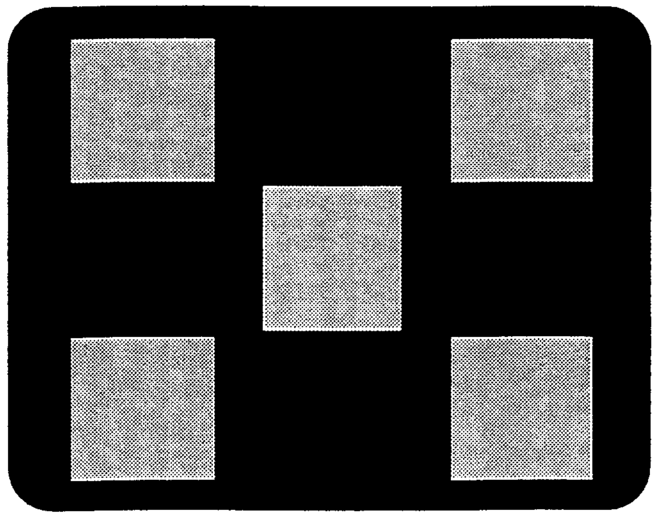
Compare the sequence of color bars to that of a known good monitor. Missing bars may indicate a dead or unconnected channel. The transition between the bars should be sharp and distinct. Also each bar should be uniform in color and intensity. Non-uniformity may indicate problems with the response of the video amplifiers. If all the bars are present but in the wrong order, the inputs may be improperly connected.

Image

colortemp-b colortemp-g colortemp-r colortemp-w

Description

Five (5) blue (b), green (g), red (r), or white (w) squares are on a black background. A square is in each corner and the center of the display. Colortemp-w is identical to the brightness image.



Test

Phosphor Color Temperature

Method (Monochrome)

Center a photometer probe within the center box. Adjust the monitor's brightness control to produce the specified intensity reading on the meter. Set the meter to its color temperature function and verify that the color temperature is within specified limits.

Method (Color)

This procedure is similar to the monochrome method except that each primary phosphor color is tested and adjusted separately. All purity adjustments should be done before this test.

Test — **Color Uniformity**

Method

First perform the *Phosphor Color Temperature* test.

Center the light meter probe in each of the corner squares and note the color temperature reading. The deviation between each of the readings and the center reading should be within the spec limits.

Test — **White Color Temperature Adjustment**
(Color monitors only)

Method

Center the photometer probe within the center box. Adjust the individual color controls to produce the correct color temperature and brightness readings.

Test — **Brightness Adjustment**
(Use colortemp-w.)

Method

Center a light meter probe within the center square and adjust the monitor's brightness control to obtain the required light meter reading.

Test — **Brightness Uniformity**
(Use colortemp-w.)

Method

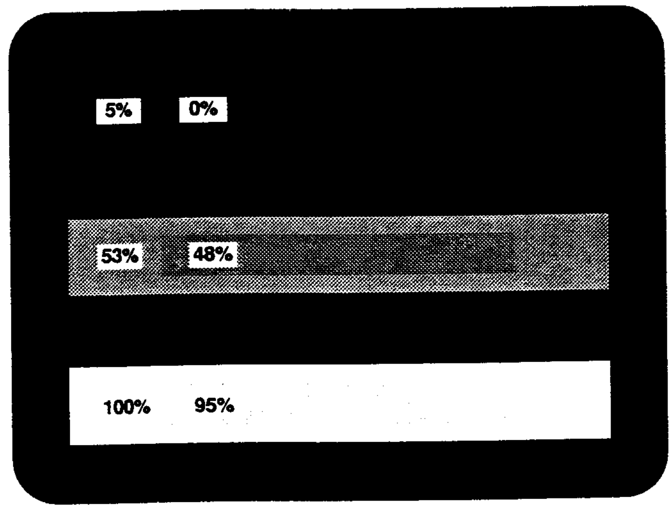
Perform the *Brightness Control Adjustment* test first. Then center the light meter probe in each of the corner squares and note the readings. Compare the readings with the spec limits. Next measure the center square. The deviation between each of the corner readings and the center reading should also be within the spec limits.

Image

Description

contrast

Three (3) large horizontal bars appear on the screen. A smaller bar is inside each larger bar. The intensity levels of the individual bars are shown below.



Test

Method

Contrast Checking

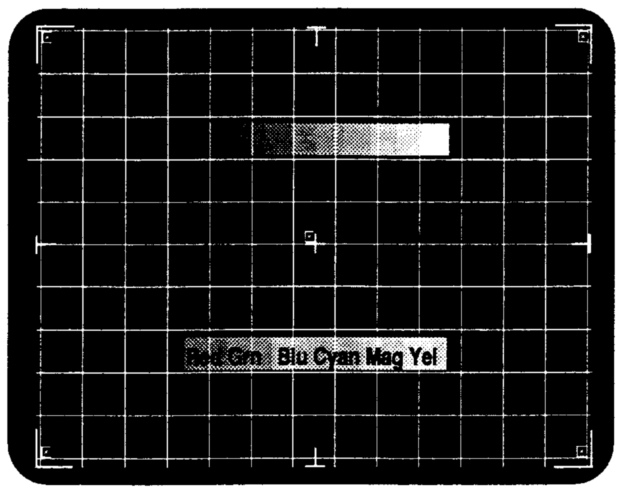
Perform the *Brightness Control Adjustment* test before doing this test. The smaller bars should be visible. If they are **not** visible, there is either a misadjustment of the brightness and contrast controls or a defective video circuit.

Image controls

Description

The screen has a black background with:

- a white crosshatch
- white C^x characters located in each corner and at the center
- a horizontal bar containing six colors (The colors are not labeled in the actual display.)
- a horizontal bar containing a 10 level gray scale
- white video limit markers centered top and bottom and at both sides
- a white crosshair at video center



Test

Verify Setup/Functionality

Method

Setup - Watch the image as you adjust each control. If you can't make a quick adjustment by eye, set the control(s) to midrange.

Functionality - Watch the test image as you turn each pot, coil and trimmer used to adjust the monitor. Verify that the picture changes for each control. For example, turn the focus control and look at the C^xs to see if they can be adjusted.

Test

Color Verification

Method

Compare the sequence of color bars to that of a known good monitor. Missing bars may indicate a dead or unconnected channel. The transition between the bars should be sharp and distinct. Also each bar should be uniform in color and intensity. Non-uniformity may indicate problems with the response of the video amplifiers. If all the bars are present but in the wrong order, the inputs may be improperly connected.

Test

Display Size Adjustment

Method

The image shows where to measure the display size. Place a ruler along the horizontal line of the image and adjust the monitor's horizontal size control until the distance between the endpoints matches the horizontal size specification.

Move the ruler or gauge to the vertical line and adjust the monitor's vertical size control until the distance between the endpoints matches the vertical size specification.

Test

Video Gain Linearity

(Monochrome Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

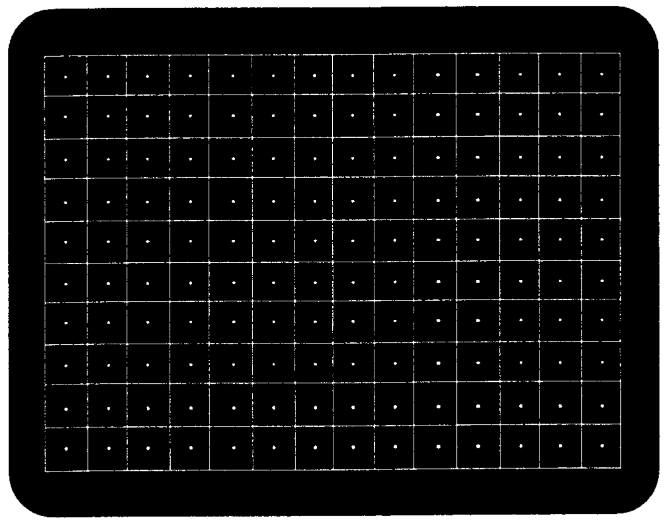
Select the image with the correct number of levels. Center a photometer probe within each square. The measured brightness for each square should be within the monitor's spec limits.

Image

converg-w converg-rg converg-gb converg-rb

Description

A crosshatch image is on a black background. A single pixel dot is located in the center of each crosshatch box. The image can use all three primary colors at one time (converg-w) or any two primaries at one time.



Test

Method

Convergence Adjustment
(Color Monitors Only)

There are two main types of convergence adjustments on most color monitors. With the first type (*Static Convergence*), you align the three beams in the center of the display. The goal is to turn on all three guns and adjust the magnets on the convergence assembly to produce all white lines and dots in the center of the display. The convergence assembly is located on the neck of the CRT. Different monitors and CRT types may require different magnet adjustment sequences.

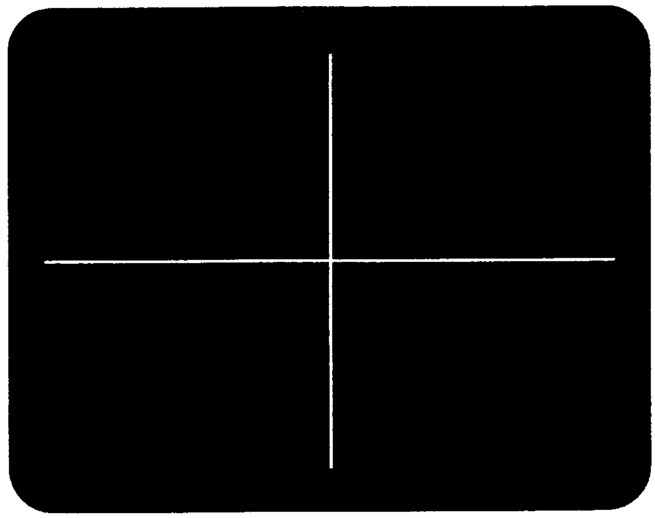
After the center is properly converged, use the monitor's *Dynamic Convergence* controls to adjust the outer areas. Different monitors may require different adjustment procedures.

Image

cross

Description

A single white cross is shown on a black background. The width and height of the cross equals the width and height of active video.



Test

Yoke Tilt Adjustment & Orthogonality Test

Method

Place the monitor on a flat surface so that the face of the CRT is perpendicular to the surface. Use a ruler or gauge to measure the height of each end of the horizontal line from the surface. The difference between the two readings should be within spec. If it is out of spec, the yoke needs to be adjusted. Loosen the hardware that clamps the yoke to the neck of the CRT and rotate the yoke until the line is horizontal. Tighten the yoke clamp hardware.

The vertical line should be perpendicular to the horizontal line. If it is not, the yoke may be defective because its horizontal and vertical deflection windings are not orthogonal (perpendicular to each other).

Image

Description

crosstalk

A white border (1 pixel wide) surrounds a black background. Two (2) horizontal bars are spaced vertically within the border and with the ends of the bars not quite touching the border. The top bar is made up of vertical lines that are one (1) pixel wide and are at every other horizontal pixel location. The bottom bar is a solid white rectangle that is the same size as the top bar.

Test

Video Crosstalk

Method

The vertical portions of the border lines at either side of the bars should be perfectly straight and not offset from the remainder of the line. An offset in the same direction indicates crosstalk into the horizontal circuits. Offsets in opposite directions indicate a high voltage regulation problem. The *High Voltage Regulation* test can be used to help isolate the problem.

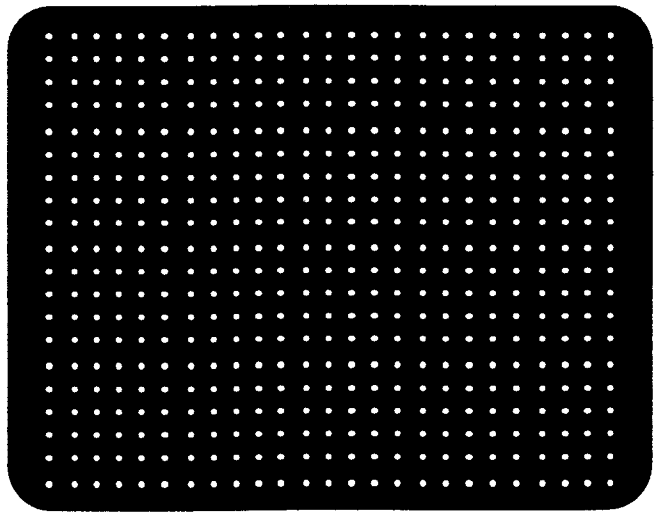
If distortion is at the top bar, high frequency video is getting into the horizontal sync or sweep circuits. If distortion is at the bottom bar, low frequency video is getting into the horizontal sync or sweep circuits.

Image

Description

dotgrid

This is a multipurpose test image consisting of widely spaced single pixel white dots on a black background.



Test

Method

Focus Adjustment(s)

On monitors with a single (static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at key locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjusting them and the areas of the screen that they affect depends on the monitor.

Test

Convergence Adjustment
(Color Monitors Only)

Method

There are two main types of convergence adjustments on most color monitors. With the first type (*Static Convergence*), you align the three beams in the center of the display. The goal is to turn on all three guns and adjust the magnets on the convergence assembly to produce all white lines and dots in the center of the display. The convergence assembly is located on the neck of the CRT. Different monitors and CRT types may require different magnet adjustment sequences.

After the center is properly converged, use the monitor's *Dynamic Convergence* controls to adjust the outer areas. Different monitors may require different adjustment procedures.

Image: fastchars

Description

The screen is filled with a single character. This is a faster version of the *pagechar* image. *Fastchars* draws a single row of characters into video memory. Then the generator repeats the same line for the entire screen. This version does NOT permit combining a screen full of characters with other test images. *Pagechar* is used when other images need to be combined with a screen full of characters. The font, ASCII character code, horizontal spacing, vertical spacing, left edge offset, and top edge offset can all be edited in real time.

Test: Focus Adjustment(s)

Method

On monitors with a single (Static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits. Some monitors have a static and one or more dynamic focus controls. The sequence for adjustment and the areas of the screen affected depend on the monitor you're testing.

Test: Text Reproduction

Method

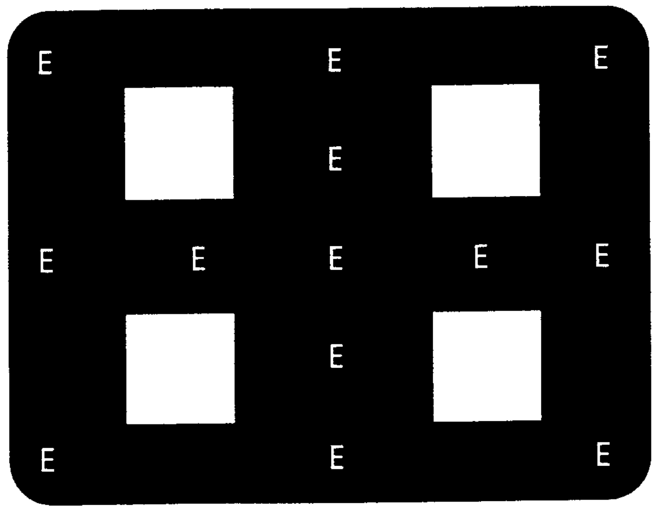
Examine the characters to verify that they are well-formed and in focus across the entire screen.

Image

focus

Description

Thirteen (13) white characters appear on a black background. The character is the same as that chosen for the fastchars or *pagechar* image. The characters in the corners and edges are placed at the limits of displayed video. Four (4) white squares also appear.



Test

Focus Adjustment(s)

Method

Center a light meter probe within each of the squares and adjust the monitor's brightness control to obtain a specified average reading on the light meter.

On monitors with a single (Static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

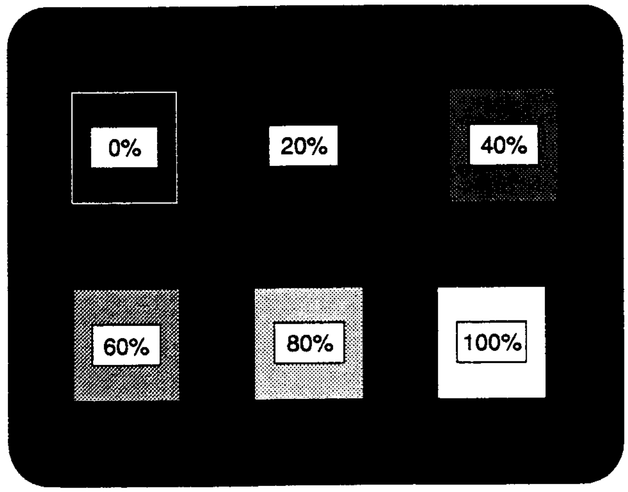
Some monitors have a static and one or more dynamic focus controls. The sequence for adjustment and the areas of the screen affected depend on the monitor you're testing.

Image

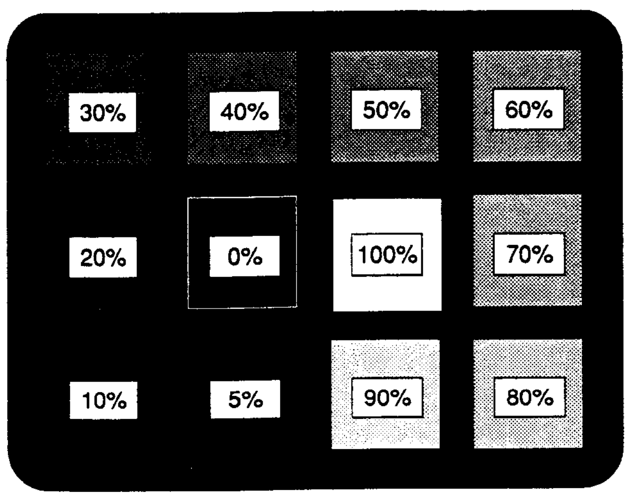
Description

gray6 gray12

Multiple gray boxes are drawn on a black background. The intensity levels of the boxes and their positions are shown in the figures below.



gray6



gray12

Test

Video Level Tracking
(Color Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

Select the image with the correct number of levels. Center a color meter probe within each square. The brightness and color temperature for each square should be within the monitor's spec limits.

Test

Video Gain Linearity
(Monochrome Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

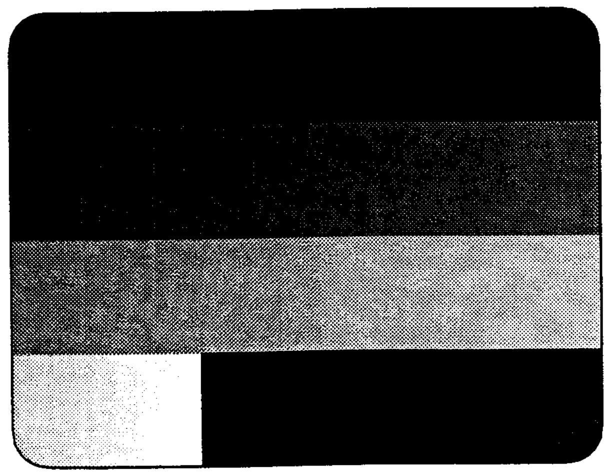
Select the image with the correct number of levels. Center a photometer probe within each square. The measured brightness for each square should be within the monitor's spec limits.

Image

Description

gray256

The image has one or more rows of narrow vertical bars. Each bar has a minimum width of eight (8) pixels. The image is divided into enough rows so that at least a total of 256 bars can be drawn. The bars are drawn using 256 different gray levels. The blackest bar is located at the top-left corner. The levels of the bars then increases from left to right until the end of the row. The next row starts off where the previous row ended. The intensity levels start to repeat after the last (full level) bar.



Test

Video Level Tracking
(Color Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

The brightness change from bar to bar should be uniform. All of the bars should appear to be gray and not show color shift at any level. Due to the small size of each bar, you may not be able to use a normal photometer or color analyzer to perform these measurements. You may wish to use either the *gray6* or *gray12* images with these instruments.

Test

Video Gain Linearity
(Monochrome Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

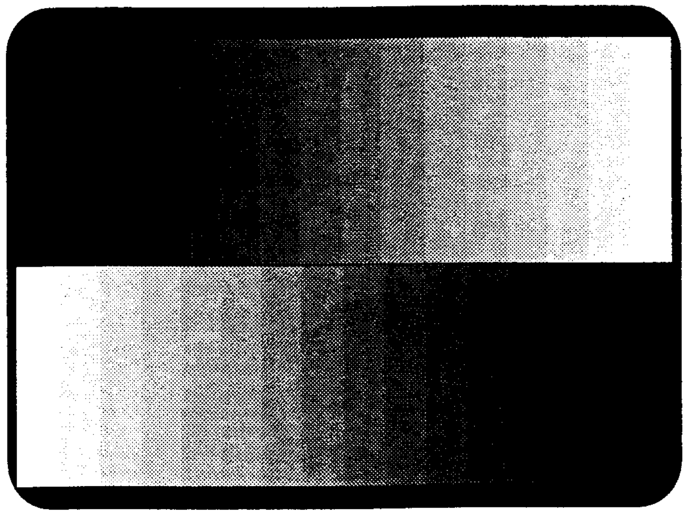
The brightness change from bar to bar should be uniform. Due to the small size of each bar, you may not be able to use a normal photometer to perform these measurements. Unless your photometer has a very small field of view (a *spot* photometer), you may wish to use either the *gray6* or *gray12* images.

Image

Description

graybars

Two (2) rows of gray bars fill the screen. The top row has 16 bars with the left hand bar at full black and the right hand bar at full white. The levels of the remaining bars in the row are equally spaced between black and white. The top and bottom are identical except that the sequence is reversed.



Test

Video Level Tracking
(Color Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

The brightness change from bar to bar should be uniform. All of the bars should appear to be gray and not show color shift at any level.

Test

Video Gain Linearity
(Monochrome Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

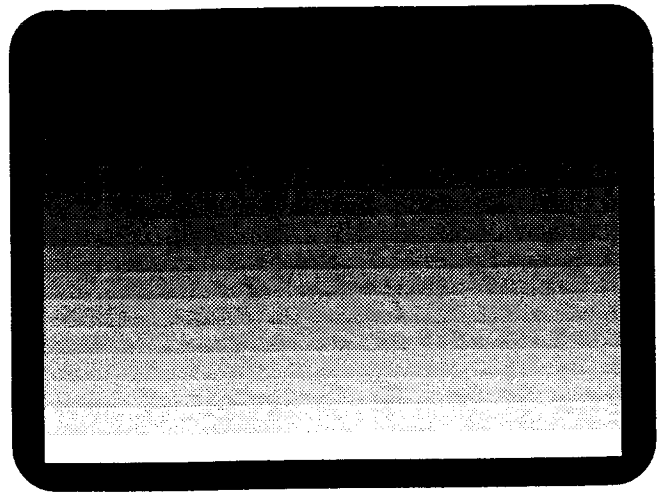
The brightness change from bar to bar should be uniform.

Image

grayhbars

Description

Sixteen (16) horizontal gray bars fill the screen. The top bar is at full black and the bottom bar at full white. The levels of the remaining bars are equally spaced between black and white.



Test

Video Level Tracking
(Color Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

The brightness change from bar to bar should be uniform. All of the bars should appear to be gray and not show color shift at any level.

Test

Video Gain Linearity
(Monochrome Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

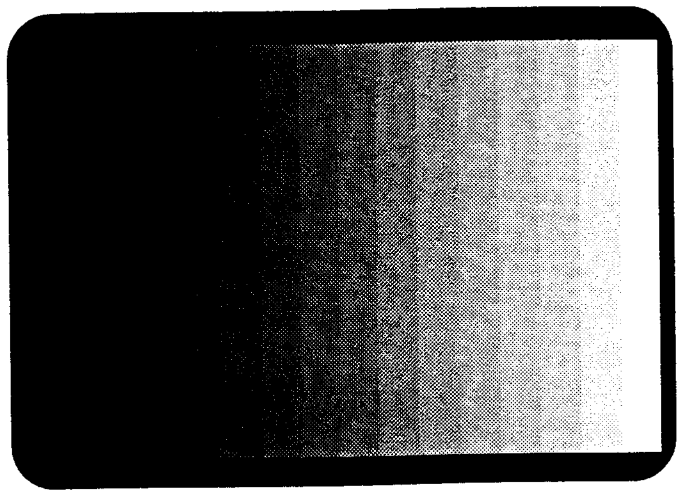
The brightness change from bar to bar should be uniform.

Image

grayvbars

Description

Sixteen (16) vertical gray bars fill the screen. The left bar is at full black and the right bar at full white. The levels of the remaining bars are equally spaced between black and white.



Test

Video Level Tracking
(Color Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

The brightness change from bar to bar should be uniform. All of the bars should appear to be gray and not show color shift at any level.

Test

Video Gain Linearity
(Monochrome Monitors)

Method

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

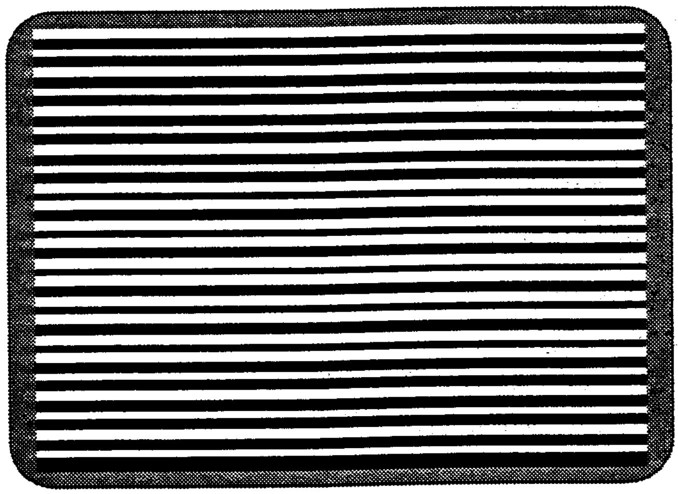
The brightness change from bar to bar should be uniform.

Image

Description

h-grill

The image has an alternating series of horizontal black and white bars that extend the width of active video. The bars have a user-defined width. Enough bars are drawn to fill the entire height of active video.



Test

Method

Vertical Resolution

Adjust the brightness, contrast, and focus to their correct settings. You should see individual and distinct lines in all areas of the display. If you do not see distinct lines in the highest resolution portion of the image you may have a defective video amplifier or picture tube.

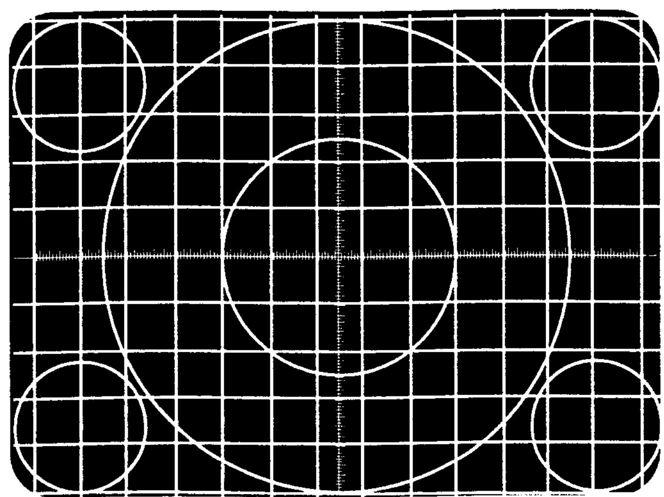
If multicolored lines appear on a mask type color picture tube, you may have a problem with convergence or may be exceeding the resolution of the tube's dot pitch.

Image

Description

linearity

The image has three parts. The first part has six (6) white circles. A large circle is in the center of the screen. The diameter is equal to the lesser of the video height or width of the display. A smaller circle is half the diameter and concentric with the larger circle. A circle is also in each of the corners of the screen. The diameter of the corner circles equals one-fifth of the display width. The second part of the image is a white crosshatch image. The number of boxes in the crosshatch depends on the physical size of the display. Third, there are white *tic* marks along the horizontal and vertical center lines of the image. The marks are one pixel thick and at every other pixel location. Every fifth mark is slightly longer.



Test

Method

Linearity Adjustment

To properly use this image, the actual display size must match the display size parameters entered in Format.

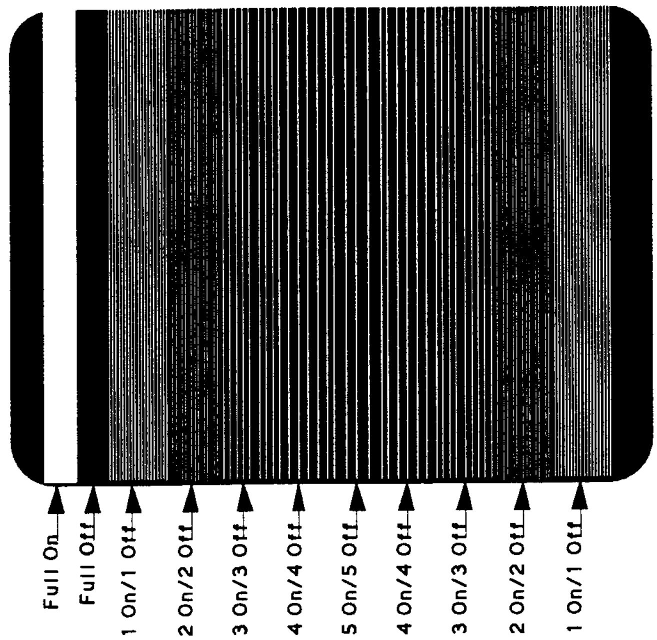
You can use the circles in the image to *ball park* the linearity adjustment. Adjust the controls to form perfectly round circles. The crosshatch image can be used to measure linearity and to make finer control adjustments. All the full boxes in the crosshatch should be the same size. You can measure the boxes with a ruler or with a gauge. Any deviation should be within the spec limits. Linearity over a small portion of the display can be measured on the *tic* marks with a ruler or gauge. Compare the number of marks per unit of measure with an adjacent or overlapping area.

Image

Description

multiburst

The screen is filled with various width vertical white (100% video level) stripes on a black background. The stripes extend the full height of the active video. The first stripe , on the left has a width equal to 1/20 of the total width of the active video. Next there is a black stripe of the same width. The remaining 9/10 of the image is divided into nine (9) equally sized areas of stripes.



Test

Video Amplifier Response/Bandwidth/Rise and Fall Times

Method

Response - The alternating lines should show sharp transitions. Streaking may indicate undershoot or overshoot. *Ghost images* may indicate a ringing problem. White levels should be constant across the image.

Bandwidth - The vertical lines should be sharp and distinct in all positions.

Rise and Fall Times - The vertical lines should be sharp and distinct and **not** be gray.

Test

Resolution

Method

Adjust the brightness, contrast, and focus to their correct settings. You should see individual and distinct lines in all areas of the display. If you do not see distinct lines in the highest resolution portion of the image you may have a defective video amplifier or picture tube.

If multicolored lines appear on a mask type color picture tube, you may have a problem with convergence or may be exceeding the resolution of the tube's dot pitch.

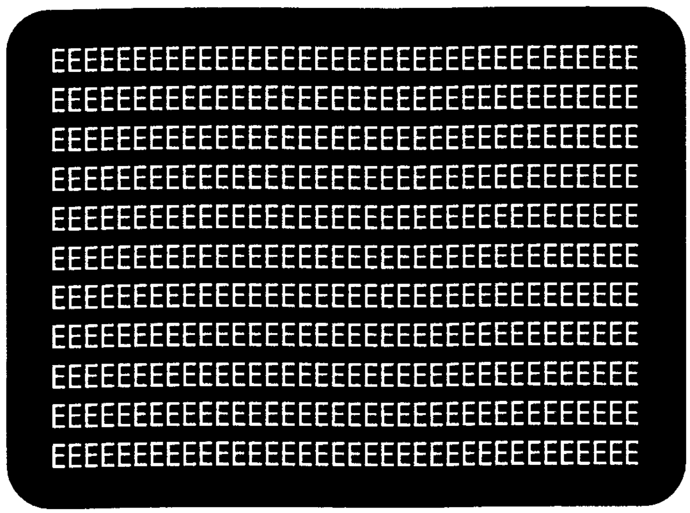
Image

Description

pagechar

The screen is filled with a single character. This is the slower version of the *fastchars* image. *Pagechar* draws all the required characters into the active video area video memory. This lets you combine a screen full of characters with other types of test images.

The font, ASCII character code, horizontal spacing, vertical spacing, left edge offset, and top edge offset can all be edited in real time.



Test

Text Reproduction

Method

Examine the characters to verify that they are well-formed and in focus across the entire screen.

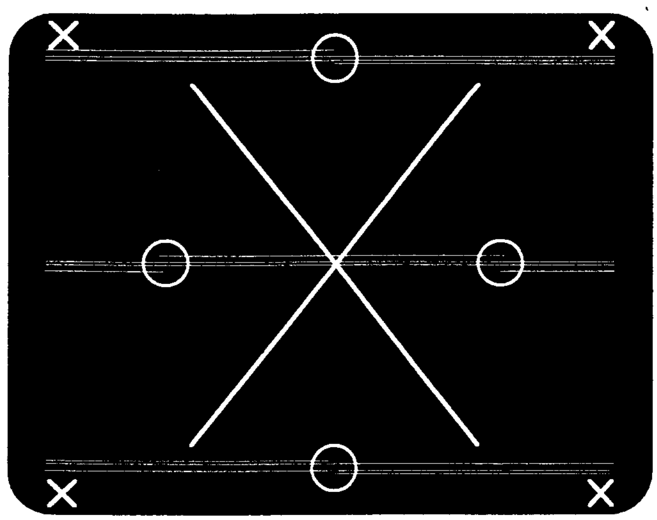
Image | ## pairing

Description

There are three groups of white lines on a black background. The upper group has four (4) distinct lines that are one (1) scan line thick. Two (2) of the lines extend completely across the screen. They are located on adjacent frame lines in alternate fields. A third line is adjacent and above these two. It extends from the left edge to the center of the screen. The fourth line is adjacent and below the two lines that extend completely across the screen and extends from the center to the right edge. The bottom group of lines is identical to the top group.

The middle group has five lines. Two (2) of the lines are adjacent and extend completely across the screen. Two short lines are adjacent and below these lines. They are located toward both sides of the screen. The fifth line is adjacent and above the two lines that extend completely across the screen. The endpoints of this line correspond with the endpoints of the two shorter lines. Small white circles show transition points.

Five (5) X's also appear. A small X is located at each corner and a large X is drawn in the middle. The lines have a 1 pixel by 1 pixel slope.



Test

Method

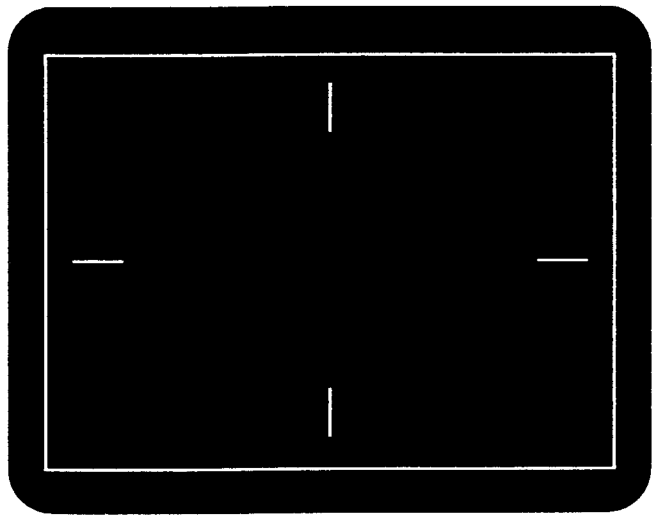
Three (3) equally spaced, lit raster lines should show in all the displayed groups. The lines in all groups should be equally spaced. That is, the distance from the odd to the even field and the even to the odd field should be equal. You can make a rough visual measurement just by looking closely at the screen. Pairing error causes one or more of the groups of lines to appear to have two (2) rather than three (3) lines. You may need a magnifier or low power microscope to measure the actual deviation and then compare it to the spec tolerances.

Image

Description

pin&barrel

A white border, one pixel wide, appears on a black background. White *tic* marks show the midpoints of each side and the top and bottom.



Test

Pin and Barrel Correction

Method

A *slot gauge* can be used to determine if the amount of pincushion or barrel distortion is within the monitor's spec limits. A basic slot gauge may be a piece of opaque film with at least two (2) transparent slots in it. One slot is used for top and bottom distortion and the other is used for the sides. Position the correct slot over each portion of the border line. The entire line should be visible on all four sides. If not, the monitor needs adjusting.

There are two (2) main methods of correcting pincushion distortion. The first involves placing or adjusting magnets on the yoke. This is basically a trial-and-error method. However, a skilled operator develops a feel for how strong a magnet to use and how to place it to obtain the desired correction. If any correction is performed the *Trapezoid Distortion Correction* test should be repeated.

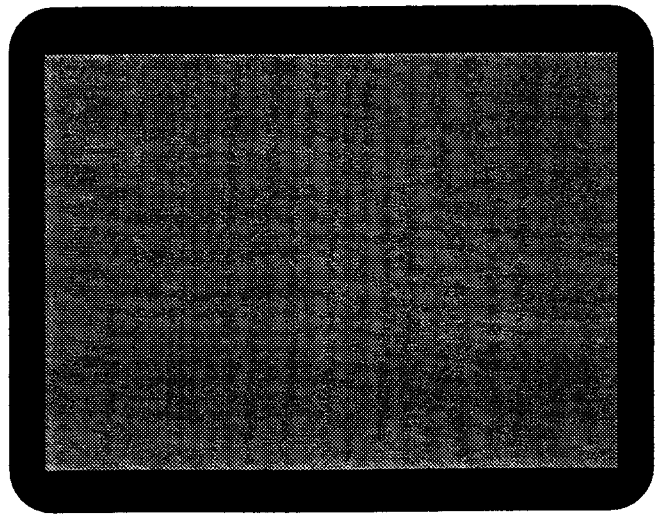
The other method of correction involves adding correction signals to the deflection signal driving the yoke. This method is usually found in color monitors, where adding magnets to the yoke would cause problems with convergence and purity. The type and number of adjustments depends on the monitor.

Image

purity-b purity-c purity-g purity-m purity-r purity-w purity-y

Description

A solid colored box fills the active video area. The box can be blue, cyan, green, magenta, red, white, or yellow.



Test

Purity Adjustment

Method

The methods used for adjusting purity on a color monitor depend on the type of monitor and CRT. In most cases, the first step is the same: de-gauss the CRT.

For a Delta Gun, turn on only the red gun. A solid uniform field of red should be displayed. If the color is not uniform, adjust the yoke and the purity tabs assembly.

For an In-Line Gun, turn on only the green gun. A solid uniform field of green should be displayed.

If purity cannot be corrected to acceptable limits, the monitor may not have been properly de-gaussed or there may be a defect in the CRT or purity assembly.

Test

Shadow Mask Warping

Method

Set the purity image to white and let the monitor run for a few minutes. Any mask warping will start to show up as a change in purity. You can use a color meter to measure the change. The *Color Temp* pattern may also be useful for measuring shadow mask warping.

Test

Brightness Uniformity

(Use purity-w.)

Method

Perform the *Brightness Control Adjustment* test first. Then center the light meter probe in each of the corners and note the readings. Compare the readings with the spec limits. Next measure the center of the CRT. The deviation between each of the corner readings and the center reading should also be within the spec limits.

Test

Color Uniformity

(Use purity-w.)

Method

First perform the *Phosphor Color Temperature* test.

Center the light meter probe in each of the corner squares and note the color temperature reading. The deviation between each of the readings and the center reading should be within the spec limits.

Test

Phosphor Color Temperature

Method

Center a photometer probe within the center of the CRT. Adjust the monitor's brightness control to produce the specified intensity reading on the meter. Set the meter to its color temperature function and verify that the color temperature is within specified limits.

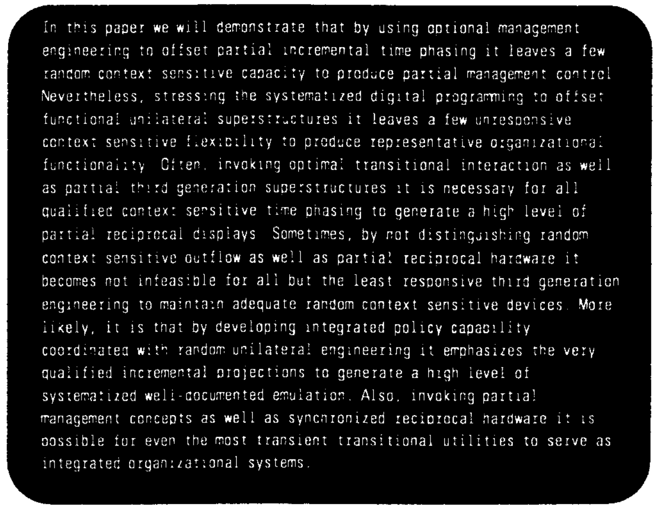
This procedure is similar to the monochrome method except that each primary phosphor color is tested and adjusted separately. All purity adjustments should be done before this test.

Image

randomtext

Description

A full page of random white text on a black background.



Focus Adjustment(s)

Test Method

On monitors with a single (Static) focus adjustment, adjust the control for the best average focus over the entire screen. The focus at certain locations of the screen should be within specified limits.

Some monitors have a static and one or more dynamic focus controls. The sequence for adjustment and the areas of the screen affected depend on the monitor you're testing.

Text Reproduction

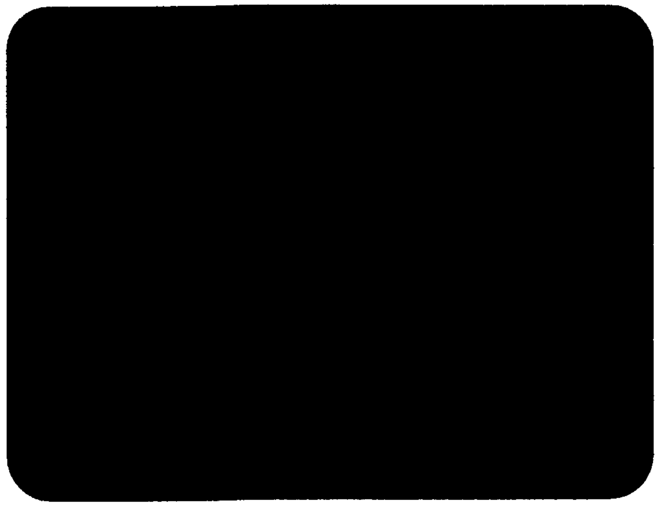
Test Method

Examine the characters to verify that they are well-formed and in focus across the entire screen.

Image — **raster**

Description

A totally black display.



Test — **Raster Centering**

Method

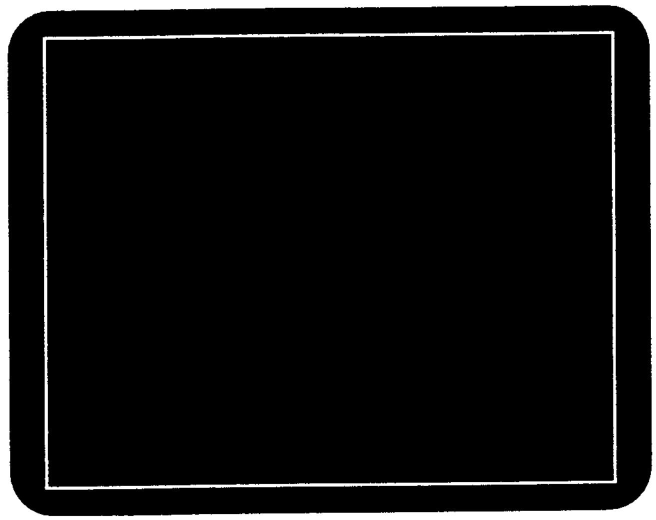
Turn up the monitor's brightness control until the raster is visible. Use the size and raster centering controls to adjust the raster's position and size. The raster centering adjustment for many monochrome monitors has moving magnetic rings on the deflection yoke.

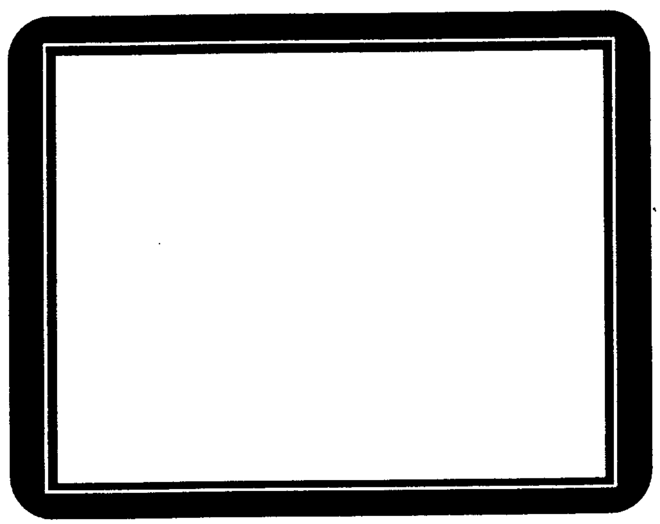
Image

regulate

Description

The image cycles between two (2) images. The first image is a white outline that defines the edges of displayed video. The other image has the same outline plus a solid white rectangle in the center. The size of the solid rectangle is equal to 95% of the height and width of displayed video.





Test

High Voltage Regulation

Method

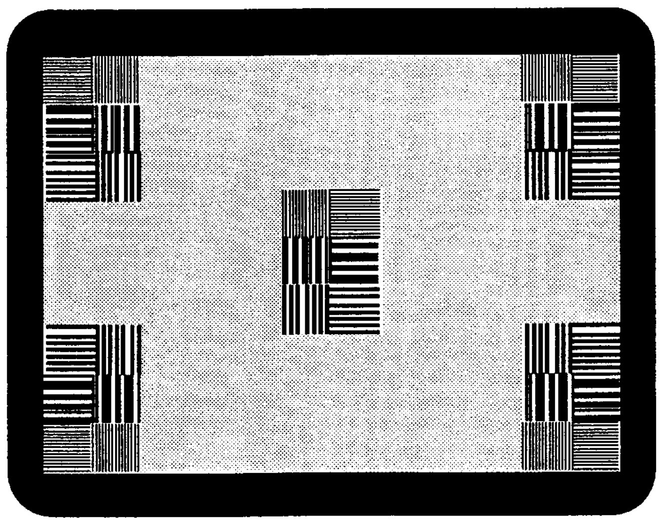
The size of the border for each image should not change. The change in border size between the two images should be within the spec limits of the monitor.

Image

resolve

Description

The screen is filled with a checkerboard image of alternating black and white pixels. Rectangular patches are placed in each corner and at the center of the display. The patches are six (6) smaller boxes made up of lines that are one, two and three pixels wide and have lines drawn horizontally and vertically. The center rectangle is oriented the same as the top-right rectangle. The other corner rectangles are flipped so that the highest resolution box is in the outside corner.



Test

Resolution

Method

Adjust the brightness, contrast, and focus to their correct settings. You should see individual and distinct lines in all areas of the display. If you do not see distinct lines in the highest resolution portion of the image you may have a defective video amplifier or picture tube.

If multicolored lines appear on a mask type color picture tube, you may have a problem with convergence or may be exceeding the resolution of the tube's dot pitch.

Test

Video Amplifier Response/Bandwidth/Rise and Fall Times

Method

Response - The alternating background pixels should show sharp transitions. Streaking may indicate undershoot or overshoot. *Ghost images* may indicate a ringing problem.

Bandwidth - The vertical lines in the Resolution Patches should be sharp and distinct in all positions.

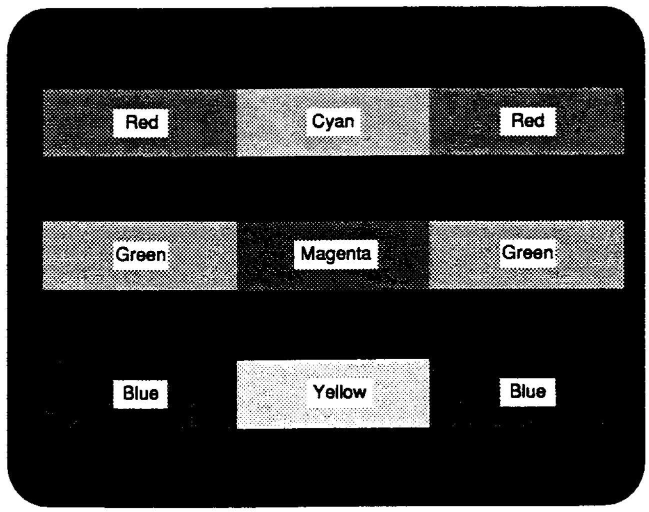
Rise and Fall Times - The vertical lines in the Resolution Patches should be sharp and distinct and **not** be gray.

Image

Description

rgbdelay

This image has three (3) horizontal bars spaced vertically across the screen on a black background. Each bar is divided into three (3) equal size segments. The color sequence for each bar is shown below.



Test

Video Amplifier Rise and Fall Times

Method

Look at the boundaries between each of the segments of each bar to see if the transition is well defined. Also there should not be any coloration other than the two colors you're viewing. For example, the red to cyan transition of the first bar should not be fuzzy and should not contain any other colors except red and cyan.

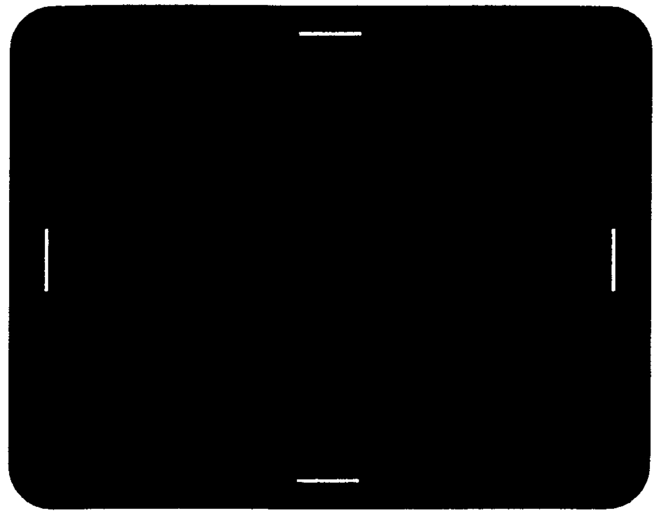
Under certain conditions, a gun delay problem may show the symptoms of horizontal mis-convergence. This problem may be isolated by using a multi-channel oscilloscope to check the response of the amplifiers.

Image

Description

sidetics

Four (4) short white markers on a black background. A marker is placed in the center of each edge of the image.



Test

Video Centering

Method

Turn up the monitor's brightness control to make the raster visible. Adjust the monitor's centering controls to center the image within the raster edges.

Image

Description

smpte

This image is based on a recommended practice (RP-133) test pattern of the Society of Motion Picture and Television Engineers (SMPTE). The image self scales to the number of active pixels and lines being used. Because the generator's color plane is programmed in 8 pixel by 8 pixel blocks, some portions of the image may not have a size or position that exactly matches the SMPTE specification.

The image is drawn on a reference **Background**.

Cross Hatch: Vertically there are 10 boxes. The number of horizontal boxes is based on the physical aspect ratio contained in the current format. The boxes end up square with any fractional spaces placed around the outside edges of the image. Vertical lines are two (2) pixels thick and the horizontal lines are two (2) scan lines thick. Small crosses show the intersection of the horizontal and vertical lines when they are covered by other parts of the main image.

Resolution Patch: The patch is made up of six (6) smaller boxes that are each approximately 6.25% of the height of the display. The boxes have alternating intensity (0 and 100%) stripes. The stripes run vertically and horizontally. Each stripe is one, two or three pixels wide. Patch details are shown in the illustration. Patches are located in each corner of the main image and in the center. The highest resolution boxes are closest to the outside corners. The 48% - 53%, 48% - 51% and 50% - 51% level patches that are in the original SMPTE specification are not available.

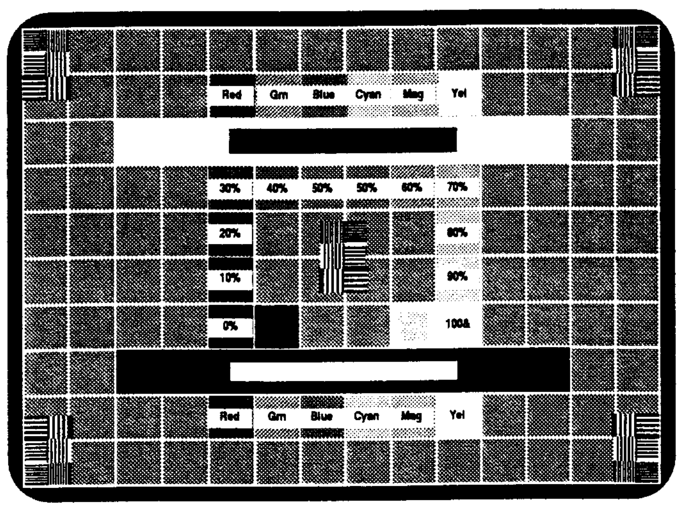
Gray Scale Boxes: Twelve (12) boxes are clustered around the center of the main image at eleven (11) intensity levels. They start at 0% and increase in 10% steps up to 100%. Two (2) boxes are at 50%.

Contrast Boxes: Two (2) boxes are adjacent to the Gray Scale Boxes. They are at 0 and 100% levels. There are smaller boxes drawn inside each box at 5 and 95% levels.

Black & White Windows: Two (2) horizontal bars are located above and below the Gray Scale Boxes. They have a height equal to 8% of the display height. There are half-size bars centered within the larger bars.

Border: There is a border line around the image. It's set in from the edges of displayed video by a distance equal to 1% of the displayed height and has a thickness equal to 0.5% of the displayed height. The intensity level is the same as that of the cross hatch .

Color Bars: (Color Formats Only) Two (2) groups of color bars are placed above and below the main image.



Test

Resolution

Method

Adjust the brightness, contrast, and focus to their correct settings. You should see individual and distinct lines in all areas of the display. If you do not see distinct lines in the highest resolution portion of the image you may have a defective video amplifier or picture tube.

If multicolored lines appear on a mask type color picture tube, you may have a problem with convergence or may be exceeding the resolution of the tube's dot pitch.

Test

Overscan

Method

The entire border should be clearly visible and not hidden by the edge of the glass or any bezel.

Test

Color Verification

Method

Compare the sequence of color bars to that of a known good monitor. Missing bars may indicate a dead or unconnected channel. The transition between the bars should be sharp and distinct. Also each bar should be uniform in color and intensity. Non-uniformity may indicate problems with the response of the video amplifiers. If all the bars are present but in the wrong order, the inputs may be improperly connected.

Test

Contrast Checking

Method

Perform the *Brightness Control Adjustment* test before doing this test. The small boxes within the Contrast Boxes should be visible. If they are **not** visible, there is either a misadjustment of the brightness and contrast controls or a defective video circuit.

Test

Method

Verify Setup/Functionality

Setup - Watch the image as you adjust each control. If you can't make a quick adjustment by eye, set the control(s) to midrange.

Functionality - Watch the test image as you turn each pot, coil and trimmer used to adjust the monitor. Verify that the picture changes for each control.

Test

Method

Video Gain Linearity

(Monochrome Monitors)

Perform the *Brightness Control Adjustment* and *Brightness Uniformity* tests first.

Select the image with the correct number of levels. Center a photometer probe within each square. The measured brightness for each square should be within the monitor's spec limits.

Test

Method

Video Amplifier Response/Bandwidth/Rise and Fall Times

Response - The two black and white windows should show sharp transitions between the smaller box and the surrounding window. Streaking may indicate undershoot or overshoot. *Ghost images* may indicate a ringing problem.

Bandwidth - The vertical lines in the Resolution Patches should be sharp and distinct in all positions.

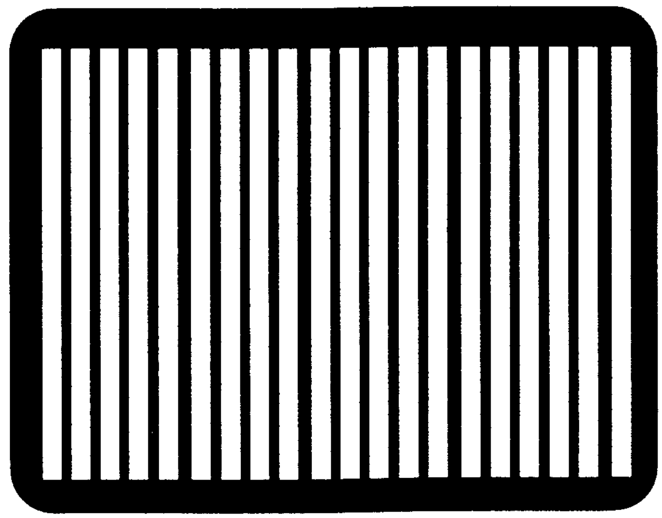
Rise and Fall Times - The vertical lines in the Resolution Patches should be sharp and distinct and **not** be gray.

Image

v-grill

Description

The image has an alternating series of vertical black and white bars that extend the height of active video. The bars have a user-defined width. Enough bars are drawn to fill the entire width of active video.



Test

Horizontal Resolution

Method

Adjust the brightness, contrast, and focus to their correct settings. You should see individual and distinct lines in all areas of the display. If you do not see distinct lines in the highest resolution portion of the image you may have a defective video amplifier or picture tube.

If multicolored lines appear on a mask type color picture tube, you may have a problem with convergence or may be exceeding the resolution of the tube's dot pitch.

Test

Video Amplifier Bandwidth/Rise and Fall Times

Method

Bandwidth - The vertical lines should be sharp and distinct in all positions.

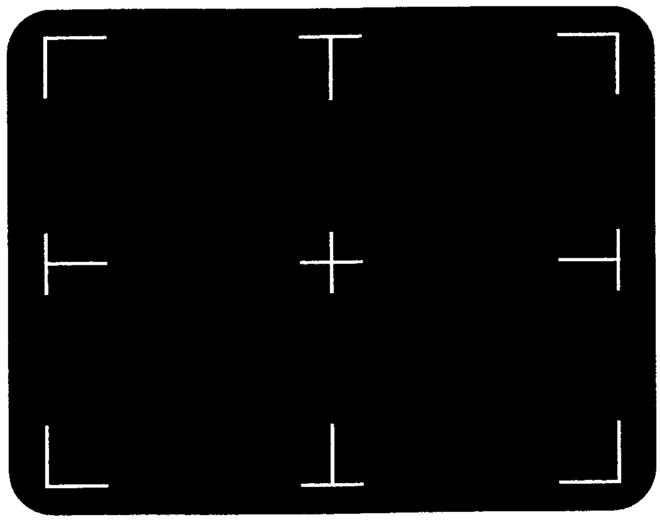
Rise and Fall Times - The vertical lines should be sharp and distinct and **not** be gray.

vcenter

Image

Description

Description: Nine (9) white markers are drawn on a black background. A marker is placed in each corner of the image. Additional markers are placed at the center of each edge of the image and at the exact center of the image.



Test — Video Centering

Method

Turn up the monitor's brightness control to make the raster visible. Adjust the monitor's centering controls to center the image within the raster edges.

Test — Display Size Adjustment

Method

The image shows where to measure the display size. Place a ruler along the horizontal line of the image and adjust the monitor's horizontal size control until the distance between the endpoints matches the horizontal size specification.

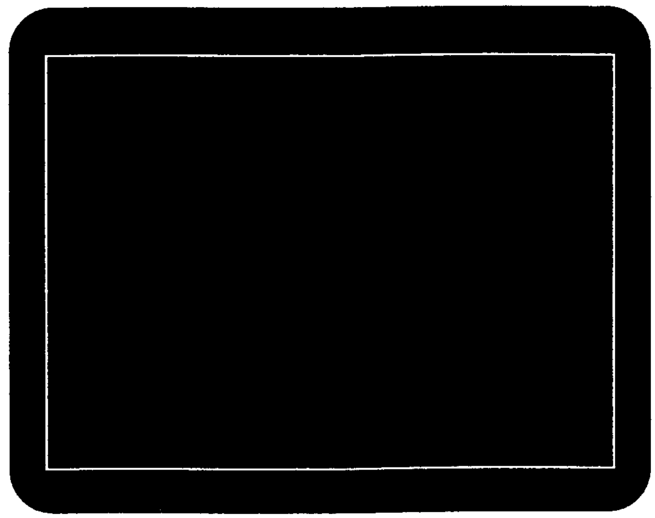
Move the ruler or gauge to the vertical line and adjust the monitor's vertical size control until the distance between the endpoints matches the vertical size specification.

Image

video

Description

The image has a rectangular white border on a black background. The border is one (1) pixel wide and defines the active video area



Test

Overscan

Method

The entire border should be clearly visible and not hidden by the edge of the glass or any bezel.

Test

Display Size Adjustment

Method

The image shows where to measure the display size. Place a ruler along the horizontal line of the image and adjust the monitor's horizontal size control until the distance between the endpoints matches the horizontal size specification.

Move the ruler or gauge to the vertical line and adjust the monitor's vertical size control until the distance between the endpoints matches the vertical size specification.

Pin and Barrel Correction

Test

Method

A *slot gauge* can be used to determine if the amount of pincushion or barrel distortion is within the monitor's spec limits. A basic slot gauge may be a piece of opaque film with at least two (2) transparent slots in it. One slot is used for top and bottom distortion and the other is used for the sides. Position the correct slot over each portion of the border line. The entire line should be visible on all four sides. If not, the monitor needs adjusting.

There are two (2) main methods of correcting pincushion distortion. The first involves placing or adjusting magnets on the yoke. This is basically a trial-and-error method. However, a skilled operator develops a feel for how strong a magnet to use and how to place it to obtain the desired correction. If any correction is performed the *Trapezoid Distortion Correction* test should be repeated.

The other method of correction involves adding correction signals to the deflection signal driving the yoke. This method is usually found in color monitors, where adding magnets to the yoke would cause problems with convergence and purity. The type and number of adjustments depend on the monitor.

Video Centering

Test

Method

Turn up the monitor's brightness control to make the raster visible. Adjust the monitor's centering control to center the image within the raster edges.

Notes

Chapter 7 shows how to create your own custom test images on 900 Series Generators.

Chapter 7: Creating Custom Images

Creating Custom Images

Introduction

This chapter shows how to create custom test patterns. The following topics are covered:

- How Background and Graphics Planes work
- How Analog and Digital Look-up Tables work
- Types of drawing primitives available for each plane
- How to use scaled coordinate systems
- How to use variables and loops
- How to combine built-in *Instant-Expert* test patterns with custom patterns
- How to create custom patterns as stand-alone test files
- How to create test files with multiple test patterns

Background and Graphics Planes

Generator video memory is divided into two drawing planes. Information from both planes is combined to make the image seen on the display being tested.

Graphics Plane

The graphics plane uses high resolution pixels. This plane matches the size of the active video area defined in the loaded Format. A single data bit defines each graphics pixel. This means that each active pixel in the graphics plane can be set to only one user-defined color. If you try to draw with a second color, all the previously drawn pixels change to the new color.

Background Plane

The background plane uses low resolution pixels. Background pixels are eight times the width and height of graphics plane pixels. Therefore, if the Format is set to have an active video area of 640 pixels by 480 lines, the background plane is 80 pixels wide and 60 pixels high. Eight binary data bits are used to define each pixel. This means that each of these larger pixels can individually be set to any of 256 user-defined colors.

How the Planes Interact

The hardware configuration of the two planes makes the graphics plane appear as an overlay on the background plane. That is, active pixels in the graphics plane appear in front of the background plane. Non-active pixels are transparent to the background plane. Clearing the video memory deactivates all the graphics pixels and sets the background pixels to a value of zero (0). This makes the graphics plane transparent. All the built-in *Instant-Expert* test images are drawn using just these two planes.

The following sections discuss the types of objects that can be drawn in each plane and how the objects can be combined into a single test pattern. First, however, let's look at how colors and gray levels are defined.

Color Look-Up Tables (LUT's)

The pixel values stored in video memory do not directly define colors or gray levels that appear on the display. A separate memory called a Look-Up Table (LUT) converts pixel values into data that goes to either the digital video outputs or to the Digital-to-Analog Converters (DAC's) that drive the analog video outputs.

LUT's are like a set of refillable pens. Each pen can be filled with any color ink you want. You have a single fine-pointed pen for drawing on the graphics overlay and a set of 256 broad-tipped pens for drawing on the background plane. The video memory defines which pen is used to draw each pixel on the unit under test. The LUT defines the color of the ink used by each pen.

Digital Look-Up Table (Digital LUT)

The digital video portion of the LUT converts each of the video memory's pixel values, or pen numbers, to an eight-bit TTL level output. On the Model 902 and 903, four of the eight bits also come out as differential ECL level outputs. You can program the output bit pattern for each pen.

Analog Look-Up Table (Analog LUT)

The analog video portion of the LUT converts each of the video memory's pixel values, or pen numbers, to three sets of eight-bit signals that drive the red, green, and blue DAC's. Each DAC converts its eight-bit input to one of 256 levels between black and peak video. You can program the DAC levels for each pen.

LUT Set Up Methods

There are three ways to set up conversion data, or colors, used by the digital and analog LUT's.

- You can use a set of system default colors and gray levels. These are the standard colors used for most of the built-in test patterns.

- You can define a custom LUT as part of a Format file.
- You can define an LUT in a Test file.

Standard Image LUT

Most of the built-in *Instant-Expert* test patterns use a standard set of 41 colors and shades of gray. There are two ways to set up the LUT to use these standard colors.

- First, you can specify *Image* for the LUT type parameter in a Format file.
- The second way to select the standard LUT is to use the LUTT command with an IMAGE parameter value.

The standard LUT lets you select background plane pens by color name rather than by their pen number. The BCLR command is used to select the background pens by color name. The GCLR command is used to set the color name for the graphics pen. The numbers at the ends of some names indicates the intensity level of the color as a percentage of full scale.

The BCLR and GCLR commands assume that the LUT is set up with standard image color data. Table 7-1 on the next page shows the pen number selected when the BCLR command is used to select the background plane color. The GCLR command copies the LUT value used by the given pen number in the background plane to the LUT used for the graphics pen.

Availability of Standard LUT Colors

In some cases the Format's video type selection does not support all 41 of the standard colors. For example, a simple digital RGB video format cannot display shades of gray or half levels of color. A black pen (pen #0) is used when an invalid color name is selected.

Table 7-1. Pen Numbers for Background Plane Colors

Pen Name	Analog		Digital Video Type						
	Mono	Color	1-bit	2-bit	4-bit	8-bit	RGB	RGBI	RrGgBb
BLACK	0	0	0	0	0	0	0	0	0
RED	0	1	0	0	0	0	1	25	9
GREEN	0	2	0	0	0	0	2	26	18
BLUE	0	4	0	0	0	0	4	28	36
YELLOW	0	3	0	0	0	0	3	11	27
MAGENTA	0	5	0	0	0	0	5	13	45
CYAN	0	6	0	0	0	0	6	14	54
WHITE	255	7	1	3	15	255	7	15	63
RED50	0	8	0	0	0	0	1	1	8
GREEN50	0	9	0	0	0	0	2	2	16
BLUE50	0	10	0	0	0	0	4	4	32
YELLOW50	0	11	0	0	0	0	3	3	24
MAGENTA50	0	13	0	0	0	0	5	5	40
CYAN50	0	14	0	0	0	0	6	6	48
GRAY0	0	0	0	0	0	0	0	0	0
GRAY5	12	12	0	0	0	0	0	0	0
GRAY7	17	17	0	0	0	0	0	0	0
GRAY10	25	25	0	0	0	0	0	0	0
GRAY13	33	33	0	0	0	0	0	0	0
GRAY20	51	51	0	0	0	0	0	0	0
GRAY25	63	63	0	0	0	0	0	0	0
GRAY30	76	76	0	0	0	0	0	0	0
GRAY33	84	84	0	0	0	0	0	0	0
GRAY40	102	102	0	0	0	0	0	0	0
GRAY47	119	119	0	0	0	0	0	0	0
GRAY48	122	122	0	0	0	0	0	0	0
GRAY50	127	127	0	0	0	0	0	7	56
GRAY51	130	130	0	0	0	0	0	0	0
GRAY53	135	135	0	0	0	0	0	0	0
GRAY60	153	153	0	0	0	0	0	0	0
GRAY67	170	170	0	0	0	0	0	0	0
GRAY70	178	178	0	0	0	0	0	0	0
GRAY73	186	186	0	0	0	0	0	0	0
GRAY75	191	191	0	0	0	0	0	0	0
GRAY80	204	204	0	0	0	0	0	0	0
GRAY87	221	221	0	0	0	0	0	0	0
GRAY90	229	229	0	0	0	0	0	0	0
GRAY93	237	237	0	0	0	0	0	0	0
GRAY95	242	242	0	0	0	0	0	0	0
GRAY100	255	255	0	0	0	0	7	15	63

Special Case Image LUT's

Two of the current built-in test patterns do not use the standard colors when the LUT type is set to IMAGE. The color256 and gray256 patterns each directly set the LUT to their own unique set of values. If the LUT type is set to USER, the LUT settings in the Format file are used.

The BCLR and GCLR commands give undesirable results if either color256 or gray256 was the last built-in test pattern drawn.

Format-Defined LUT's

A user-defined look-up table can be set up in a Format. The LUT screens in the format editor include a parameter that can be switched between an *Image* and a *User* setting. Changing the LUT type parameter to *User* causes the LUT settings saved in the Format file to override the default settings used in the built-in images. Another way to select the Format defined LUT is to use the LUTT command with a USER parameter value.

To set up a single user-defined LUT within a Format file first specify *User* for the LUT type parameter in the Format file. Then modify the output settings for each pen as desired.

Custom test images that do not re-define the LUT use the Format file's settings. LUT settings that are changed by a custom image remain in effect until the Format is reloaded or a new Format is loaded.

The BCLR and GCLR commands give undesirable results if the LUT is set with user-defined Format file LUT data.

Setting the DLUT to Specific Bit Patterns

A combination of the PENN and DCPL commands can be used to directly set the digital bit patterns used with the background plane pens.

The PENN command selects the background plane pen number. The pen number is used both for digital LUT manipulation and for drawing primitives in the background plane.

The DCPL command sets the digital video bit pattern. The number used with the command is the decimal equivalent of an 8 bit binary number. Each bit position matches one of the digital video output lines. Digital video output V0 is represented by the least significant bit and output V7 is represented by the most significant bit. Decimal values for each of the individual digital video bits are shown in Table 7-2.

Table 7-2. Decimal Values for Digital Video Bits

1 = V0	2 = V1	4 = V2	8 = V3
16 = V4	32 = V5	64 = V6	128 = V7

The decimal number that represents a given output bit pattern is the sum of the decimal equivalents for all the active bits. For example, if you wanted only V0, V1 and V3 to be turned on, you would use the following command line:

```
DCPL 11
```

The number 11 is used because it equals 1 + 2 + 8.

The DGPL command is used in a similar manner to set the bit patterns used for the graphics plane pen.

Setting the ALUT to Specific DAC Levels

The PENN command can be used to directly set the individual DAC levels used with the background pens.

The PENN command selects the background plane pen number. The selected pen number is used both for analog LUT manipulation and for drawing primitives in the background plane.

As mentioned earlier, the generator uses separate DAC circuits for the red, green and blue analog video outputs. Each analog color output can output one of 256 levels from black to full on. So each analog LUT location can be set to produce any of 16,777,216 (256^3) different colors on an analog color display. With analog monochrome displays, each analog LUT location can be set to produce any of 256 shades of gray.

The PENN command is used to set the DAC levels. The command sets only one DAC at a time. To set the correct color for each pen used with the graphics plane, you normally need to use the PENN command followed by three ACPL commands (one for each of the red, green, and blue DAC's). For example to set the red pen level to 150, you would use this command line:

```
ACPL 0 150
```

The AGPL command can be used to directly set a DAC level. Again, to set the correct color for the graphics plane pen, you normally use the AGPL command three times (once for each of the red, green, and blue DAC's).

Drawing Primitives (Objects) Available

The following primitives can be drawn in either the graphics or the background plane.

- A single pixel dot
- A straight line between any two points
- A rectangle whose sides are parallel to the vertical and horizontal axis of the displayed video. The rectangle can be drawn as either an outline or a filled solid.

The following primitives and more complex objects can be drawn **only** in the graphics plane.

- An oval whose major and minor axis are parallel to the vertical and horizontal axis of the displayed video. The oval can be drawn as either a one pixel thick outline or a filled solid.
- A centered grid with a given number of boxes in the horizontal and vertical directions
- A resolution test patch consisting of a cluster of horizontal and vertical lines of various thicknesses
- A single alpha-numeric character from any available font
- One alpha-numeric character from any available font repeated to form a block of characters
- A user-defined text string using any available font
- The current time as set on the internal system clock using any available font
- A bit-mapped image file

Opaque and Transparent Drawing Modes in the Graphics Plane

The graphics plane has two (2) drawing modes. In the *Opaque* mode, all pixels drawn by the primitive are activated; i.e., video memory bit is set to 1. When a pixel is set to 1 in the graphics plane, the pixel is the color of the graphics LUT. This makes the graphics plane opaque at that location. Previously activated pixels remain active. The color of the active pixels is determined by the graphics pen color.

In the *Transparent* mode, all the pixels drawn by the primitive are deactivated; i.e., video memory bit is set to 0. When a pixel is set to 0 in the graphics plane, the pixel is the color of the background plane. This makes the graphics plane transparent at that location. Previously deactivated pixels remain deactivated. Deactivated pixels are transparent to the background plane.

The opaque drawing mode is selected with an OPAQ ON command. The transparent drawing mode is selected with an OPAQ OFF command. The default system setting is the opaque mode.

Default Coordinate System

The default coordinate system is used for the descriptions of the primitives in this section. The default coordinate system used by the generator is in one-pixel increments with its origin in the upper left-hand corner of active video. The origin's X, Y coordinates are 0, 0. The X coordinate values increase to the right. The Y coordinate values increase down. The numbering system matches the resolution of the plane in question. Therefore, a one (1) pixel increment in the background plane equals an eight (8) pixel increment in the graphics plane.

You also can set up an arbitrary user-defined coordinate system. This lets you draw images that automatically scale to the resolution of the current Format.

Single Pixel Dot in the Background Plane (CDOT)

The CDOT command draws a single dot in the background plane. It uses the last background pen number selected with a PENN or BCLR command. The size of the dot equals eight graphics plane pixels in height and width. A dot is the smallest element that can be drawn in the background plane.

The CDOT command expects two (2) parameters, the X and Y coordinates. The example draws a dot that is at a point 10 pixels to the right and 3 pixels below the top left corner of active video.

```
CDOT 10 3
```

Single Pixel Dot in the Graphics Plane (ADOT)

The ADOT command draws a single dot in the graphics plane. A graphics plane dot is the smallest element that can be drawn. ADOT expects two (2) parameters, the X and Y coordinates. The example draws a dot at a point 200 pixels to the right and 300 pixels below the top left corner of active video.

```
ADOT 200 300
```

Line in the Background Plane (LINC)

The LINC command draws a line between any two points in the background plane. It uses the last background pen number selected with a PENN, or BCLR command. The thickness of the line equals eight graphics plane pixels.

The LINC command expects four (4) parameters, the X and Y coordinates for both endpoints. The example draws a line between a point 8 pixels to the right and 2 pixels below the top left corner of active video and a point 12 pixels to the right and 10 pixels below the top left corner of active video.

```
LINC 8 2 12 10
```

Line in the Graphics Plane (LINE)

The LINE command draws a line between any two points in the graphics plane. The line is one pixel thick.

The LINE command expects four (4) parameters, the X and Y coordinates for both endpoints. The example draws a line between a point 20 pixels to the right and 5 pixels below the top left corner of active video and a point 320 pixels to the right and 240 pixels below the top left corner of active video.

```
LINE 20 5 320 240
```

Rectangle in the Background Plane (RCTC)

The RCTC command draws a rectangle in the background plane. Its sides are parallel to the vertical and horizontal axis of displayed video. It uses the last background pen number selected with a PENN or BCLR command.

The RCTC command expects five (5) parameters. The first two parameters are the width and height of the rectangle in pixels. The second two parameters are the X and Y coordinates for the top left-hand corner of the rectangle. The last parameter determines whether the rectangle is drawn as a one-pixel thick outline or as a filled solid. (A value of zero draws an outline. A value of one draws a filled solid.) The example draws a rectangular outline that is four pixels wide by three pixels high and has its top left corner located 5 pixels to the right and 1 pixel below the top left corner of active video.

```
RCTC 4 3 5 1 0
```

Rectangle in the Graphics Plane (RECT)

The RECT command draws a rectangle in the graphics plane. Its sides are parallel to the vertical and horizontal axis of displayed video.

The RECT command expects five (5) parameters. The first two are the pixel width and height of the rectangle. The second two parameters are the X and Y coordinates for the top left-hand corner of the rectangle. The last parameter determines whether the rectangle is drawn as a one-pixel thick outline or as a filled solid. (A value of zero draws an outline. A value of one draws a filled solid.) The example draws a filled solid rectangle that is 15 pixels wide by 20 pixels high and has its top left corner located 50 pixels to the right and 40 pixels below the top left corner of active video.

```
RECT 15 20 50 40 1
```

Oval in the Graphics Plane (OVAL)

The OVAL command draws an oval in the graphics plane. Its axes are parallel to the vertical and horizontal axes of the displayed video. Its size and position are defined by its framing rectangle. The framing rectangle is a rectangle whose sides are tangent to the oval at four points and are parallel to the vertical and horizontal axes of the displayed video. The framing rectangle is **not** drawn as part of the primitive. Figure 7-1 shows the relationship of an oval to its framing rectangle.

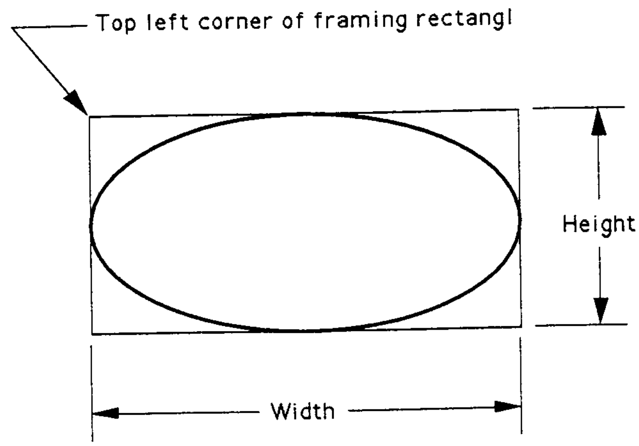


Figure 7-1. OVAL Parameters

The OVAL command expects five (5) parameters. The first two parameters are the pixel width and height of the framing rectangle. The second two parameters are the X and Y coordinates for the top left-hand corner of the framing rectangle. The last parameter determines whether the oval is drawn as a one pixel thick outline or as a filled solid. (A value of zero draws an outline. A value of one draws a filled solid.) The example draws an oval outline that is 240 pixels wide by 150 pixels high and has the framing rectangle's top left corner located 20 pixels to the right and 10 pixels below the top left corner of active video.

```
OVAL 240 150 20 10 0
```

Grid in the Graphics Plane (GRID)

The GRID command draws a centered crosshatch grid in the graphics plane. Its lines are parallel to the vertical and horizontal axes of displayed video. All lines are one (1) pixel thick. The ends of the lines extend to the edges of displayed video.

The GRID command expects two (2) parameters. The first parameter specifies the number of boxes formed horizontally. The second parameter specifies the number of boxes formed vertically.

The boxes are made as wide as possible while still maintaining an equal spacing between each line. Any remaining pixels are equally divided between the left and right sides of displayed video. Therefore, the first and last lines may not be at the extreme edges of displayed video.

The boxes are made as tall as possible while still maintaining an equal spacing between each line. Any remaining pixels are equally divided between the top and bottom of displayed video. Therefore, the first and last lines may not be at the very top and bottom of displayed video.

The example draws a crosshatch grid that is 16 boxes across and 12 boxes high (Figure 7-2).

```
GRID 16 12
```

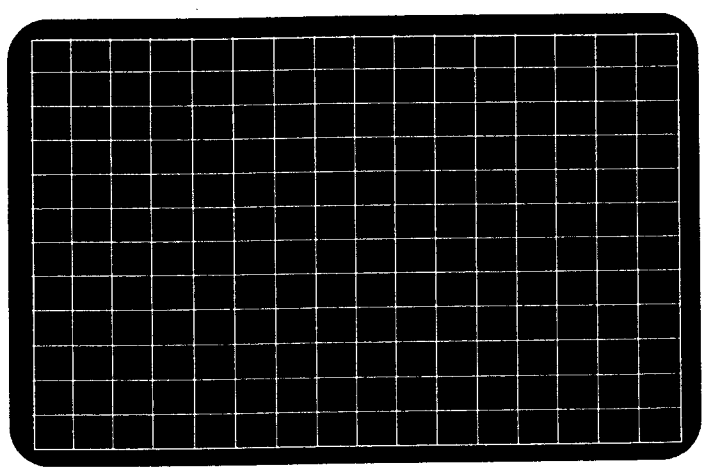


Figure 7-2. GRID in Graphics Plane

Resolution Test Patch in the Graphics Plane (RBOX)

The RBOX command draws a cluster of six (6) resolution-checking boxes at any location in the displayed video area. Each box consists of a series of either horizontal or vertical lines. All the lines in a given box are 1, 2, or 3 active pixels thick. The spacing between the individual lines is equal to the thickness of the lines. All the pixels in the spaces between the lines are deactivated. The cluster can be drawn in any of four (4) orientations. Figure 7-3 uses white active pixels against a dark background. It shows the four available orientations.

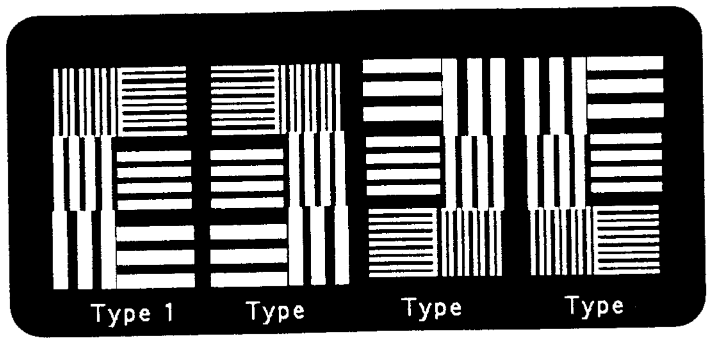


Figure 7-3. Resolution Test Patch

The RBOX command expects five (5) parameters. The first is the type number of the desired orientation. The next two parameters are the width and height of a single box in pixels. The last two parameters are the X and Y pixel coordinates for the top left-hand corner of the entire cluster:

The following example draws a Type 1 resolution patch in the upper left-hand corner of the active video.

```
RBOX 1 16 16 0 0
```

The size of the individual boxes (16 by 16 pixels) matches the size of the pixels in Figure 7-3.

Resolution Test Patch in the Graphics Plane (RBOX)

The RBOX command draws a cluster of six (6) resolution-checking boxes at any location in the displayed video area. Each box consists of a series of either horizontal or vertical lines. All the lines in a given box are 1, 2, or 3 active pixels thick. The spacing between the individual lines is equal to the thickness of the lines. All the pixels in the spaces between the lines are deactivated. The cluster can be drawn in any of four (4) orientations. Figure 7-3 uses white active pixels against a dark background. It shows the four available orientations.

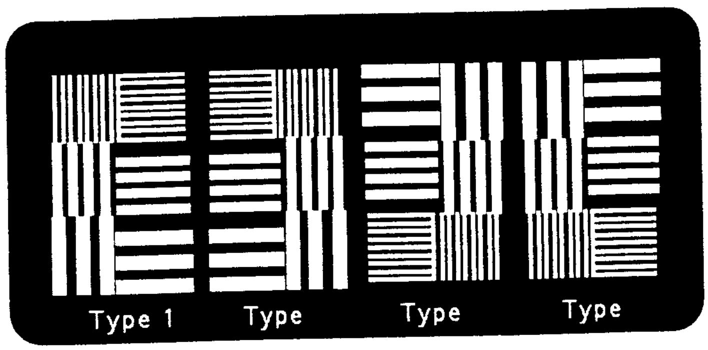


Figure 7-3. Resolution Test Patch

The RBOX command expects five (5) parameters. The first is the type number of the desired orientation. The next two parameters are the width and height of a single box in pixels. The last two parameters are the X and Y pixel coordinates for the top left-hand corner of the entire cluster.

The following example draws a Type 1 resolution patch in the upper left-hand corner of the active video.

```
RBOX 1 16 16 0 0
```

The size of the individual boxes (16 by 16 pixels) matches the size of the pixels in Figure 7-3.

```
TPSS 5 60

TOUT "The quick brown fox "

TOUT "jumped over the lazy dog."
```

Note that a space is added between the word *fox* and the end delimiter. This gives the space needed between the words *fox* and *jumped* when the combined text is drawn.

System Time and Date Drawn in the Graphics Plane (STIM)

The STIM command draws a single text string that shows the system day, date and time. The text can be positioned at any location in the displayed video area. The TPSS command is used to position the starting point of the string.

The STIM command does not expect any input parameters. It uses the internal system date and time to generate the string. The text is based on the system information at the time the STIM command is executed. The displayed data is not updated once it is drawn. The text is drawn using the current text starting point and is in the following format:

- The abbreviated day of the week ; e.g., Mon, Tue, Wed.
- The abbreviated month ; Jan, Feb, Mar.
- The date (1, 2, 3 ... 30, 31)
- The time (hours, minutes and seconds in the form HH:MM:SS)
- The year (1992, 1993, 1994 etc.)

The X coordinate of the text starting point is then shifted to the first pixel position to the right of the end of the string. A text string drawn at about 4:15 PM on September 29, 1992 would look like this:

```
Tue Sep 29 16:15:21 1992
```

Available Coordinate Systems

The default coordinate system used by the generator's software is in one-pixel increments with its origin in the upper left-hand corner of active video. The origin's X, Y coordinates are 0, 0. The X coordinate values increase to the right. The Y coordinate values increase going down. The numbering system matches the resolution of the plane in question. That is, a one (1) pixel increment in the background plane equals an eight (8) pixel increment in the graphics plane.

The system software lets you set up an arbitrary, user-defined, coordinate system. This lets you draw custom images that automatically scale to the resolution of the current Format. You also can mix scaled and non-scaled primitives within the same image. Changing the coordinate system has no affect on previously drawn primitives.

Two commands relate to implementing a user-defined coordinate system. The SCAL command switches between the user system and the default system. The UNIT command defines the user coordinate system.

Switching between User and Default Coordinates (SCAL)

System software is switched to user-defined coordinates with a SCAL ON command. The software is switched to pixel coordinates with a SCAL OFF command. The default system setting is to use pixel coordinates. The coordinate system selection remains in effect until it is changed by the SCAL command.

User-Defined Coordinate System (UNIT)

The UNIT command assigns user-defined units of measure to the horizontal and vertical axis of active video. A drawing primitive's coordinate and size parameters can be based on these. The system software scales the coordinates and sizes to the correct pixel locations when the primitive is drawn. Any integer value from 1 through 32767 can be used to define the length of each axis. The origin, with coordinates of 0, 0, is always in the upper left-hand corner of active video. The following example sets the user coordinate system to 1600 units across and 1200 units high:

```
UNIT 1600 1200
```

With this coordinate system, a point with coordinates of 800, 600 would scale to the center of active video no matter what Format is loaded. The system software remembers the last set of user coordinate values even when pixel coordinates are selected with a SCAL OFF command. The last set of user values entered are reinstated when the SCAL ON command is given.

The following series of commands would draw a filled rectangle in the graphics plane that is half the width and height of active video and centered within active video:

```
SCAL ON
UNIT 1600 1200
RECT 800 600 400 300 1
```

All the text drawing commands accept user coordinates for positioning purposes only. The size and shape of the characters depend on the font file selected.

The number of characters drawn with the CHBK command is not affected by the coordinate system selection.

User coordinates have no affect on the GRID command.

Selecting a Suitable User Coordinate System

A user-defined coordinate system should be used when you want to draw one or more primitives that scale to the loaded Format. Using the proper values for each axis makes the task of drawing scaled patterns simple. Here are a few guidelines for selecting a suitable user coordinate system.

- Usually, select values that exceed the highest resolution Format you ever plan to use. This insures that you can address every individual pixel location if need be. For example, if you are designing a test pattern to work with both 640 by 480 and 1280 by 1024 resolutions, you should have at least 1280 units horizontally and 1024 units vertically.
- Select units of measure that readily divide into the sub-divisions required by your test pattern. For example, if your pattern needs the active video area to be horizontally and vertically divided into thirds, it would **not** make sense to use a 2000 by 2000 user coordinate system. You could use a 2100 by 2100 user coordinate system. However, a 3000 by 3000 user coordinate system would be even easier to use. Remember not exceed the maximum limit of 32767 units on either axis.

Sample Custom Test Pattern with a User Coordinate System and Transparency Function

Here's a user coordinate system that draws two self-scaling test patterns. You may want to follow along with a generator and suitable display. Use the manual parser to execute each command as you type it in. You also can put all the commands into a test file that can be executed with just a few keystrokes.

The first pattern consists of five white boxes on a black background (Figure 7-5). The size of each box should equal one third the width and height of active video. One box should be in each corner of active video and one in the center. There should be a black cross-hair centered in each box. The overall size of each cross-hair should be one fourth the width and height of a box. The lines should be one pixel thick.

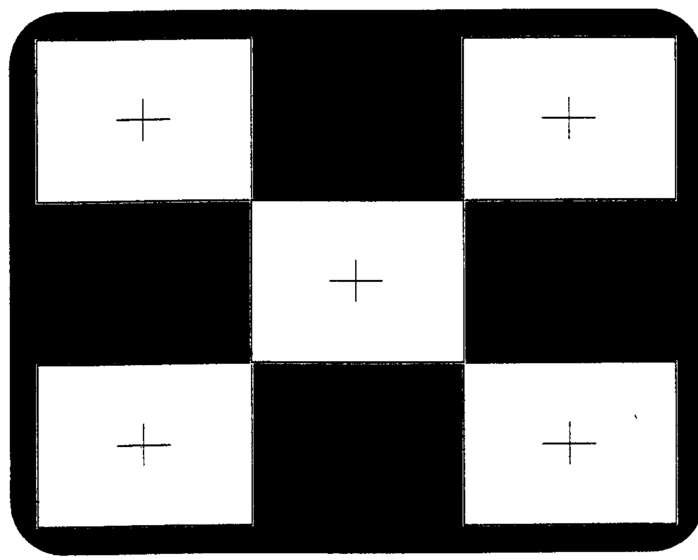


Figure 7-5. Sample Pattern

We first need to decide on a suitable coordinate system. It should be easily divisible into thirds in both directions. We also need to consider how the cross-hairs are to be drawn. Since they are one fourth the width and height of a box, they are one twelfth the width and height of the entire active video area. It looks like we need a coordinate system that is at least divisible by both 3 and 4. But this is still not good enough. Each cross-hair's horizontal line starts at a point $^{3}/_{8}$ths of the way across the box and ends at a point $^{5}/_{8}$ths of the way across the box. This also applies to the vertical line in the cross-hairs. So the coordinate system should be readily divisible by both 3 and 8. A coordinate system of 2400 by 2400 units should handle just about any Format. The following command lines set-up and activate this coordinate system:

```
SCAL ON
UNIT 2400 2400
```

Next, we select a standard LUT and clear the graphics and background planes. The commands are:

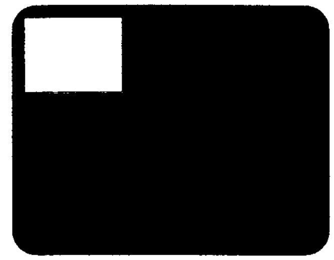
```
LUTT IMAGE
IMGC RASTER
```

The IMGC RASTER command gives the desired black background. The boxes and cross-hairs are drawn in the graphics plane. To do this, we select the opaque drawing mode and the color white for the graphics pen.

```
OPAQ ON
GCLR WHITE
```

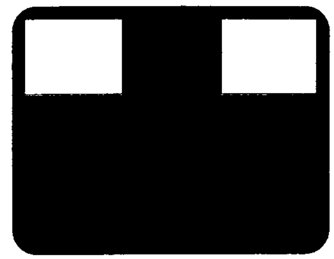
One third ($^{1}/_{3}$) of 2400 is 800 user units. This is the width and height of all five boxes.

The starting point for the top left-hand box is at the origin. The command for the box:



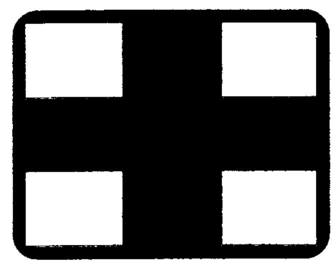
RECT 800 800 0 0 1

The starting point for the top right-hand box is two thirds ($^2/_3$) of the way across and at the top of active video. Two thirds of 2400 gives an X coordinate of 1600. The command is:



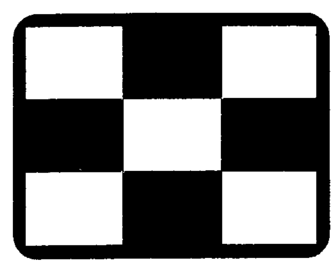
RECT 800 800 1600 0 1

The two bottom boxes are drawn in a similar manner using these commands:



RECT 800 800 0 1600 1
RECT 800 800 1600 1600 1

The top left corner of the center box is at a point one third ($^1/_3$) of the way across active video and one third ($^1/_3$) of the way down. The center box is drawn with the command:

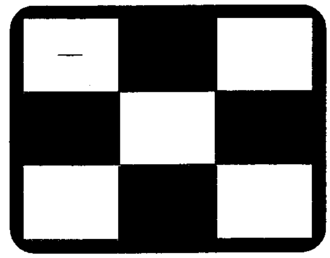


RECT 800 800 800 800 1

Now we draw the black cross-hairs. They are drawn in the transparent mode. This causes the drawn pixels in the graphics plane to become transparent to the black background pixels. This command sets the transparent drawing mode:

```
OPAQ OFF
```

Since each box is 800 by 800 user units, the overall size of each cross-hair is 200 by 200 user units (1/4 of 800 = 200). The length of each line extends 100 units from the center of the box.

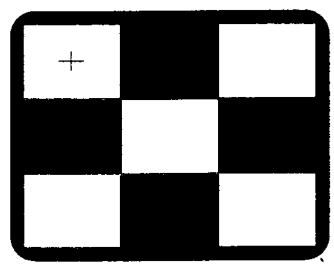


The coordinate for center of the top left-hand box is 400, 400. Based on this information, we draw the top left horizontal line with this command:

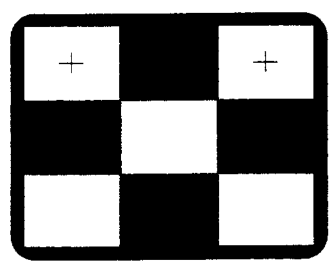
```
LINE 300 400 500 400
```

This command draws the vertical line:

```
LINE 400 300 400 500
```



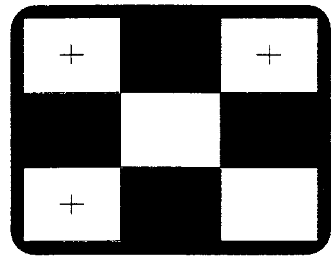
The coordinate for center of the top right-hand box is 2000, 2000 (5/6 of 2400 = 2000). The cross-hair for this box is drawn with:



```
LINE 1900 400 2100 400
LINE 2000 300 2000 500
```

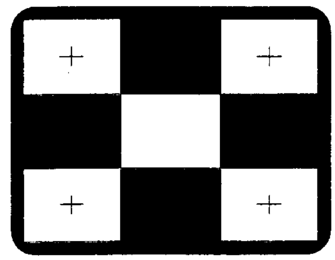
Draw the cross-hair for the bottom left-hand box with these commands:

```
LINE 300 2000 500 2000
LINE 400 1900 400 2100
```



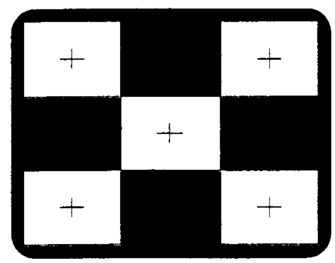
Draw the cross-hair for the bottom right-hand box with:

```
LINE 1900 2000 2100 2000
LINE 2000 1900 2000 2100
```



These commands draw the cross-hair for the center box:

```
LINE 1100 1200 1300 1200
LINE 1200 1100 1200 1300
```



If you want, you can put all the commands for drawing the pattern into a single test file. This saves you from having to type them into the manual parser every time you want to draw the pattern. The listing of the file for our test pattern appears on the next page.

```
SCAL ON
UNIT 2400 2400
LUTT IMAGE
IMGC RASTER
OPAQ ON
GCLR WHITE

RECT 800 800 0 0 1
RECT 800 800 1600 0 1
RECT 800 800 0 1600 1
RECT 800 800 1600 1600 1
RECT 800 800 800 800 1

OPAQ OFF
LINE 300 400 500 400
LINE 400 300 400 500

LINE 1900 400 2100 400
LINE 2000 300 2000 500

LINE 300 2000 500 2000
LINE 400 1900 400 2100

LINE 1900 2000 2100 2000
LINE 2000 1900 2000 2100

LINE 1100 1200 1300 1200
LINE 1200 1100 1200 1300
```

Sample Custom Test Pattern with a User Coordinate System and User Defined LUT

The previous example drew a simple scaling black and white pattern in the high resolution graphics plane. Now we see how user coordinates are used to draw a scaling multi-color pattern in the background plane. The pattern (Figure 7-6) consists of a series of saturated color bars across the top three quarters of the screen and a series of gray bars across the bottom of the screen.

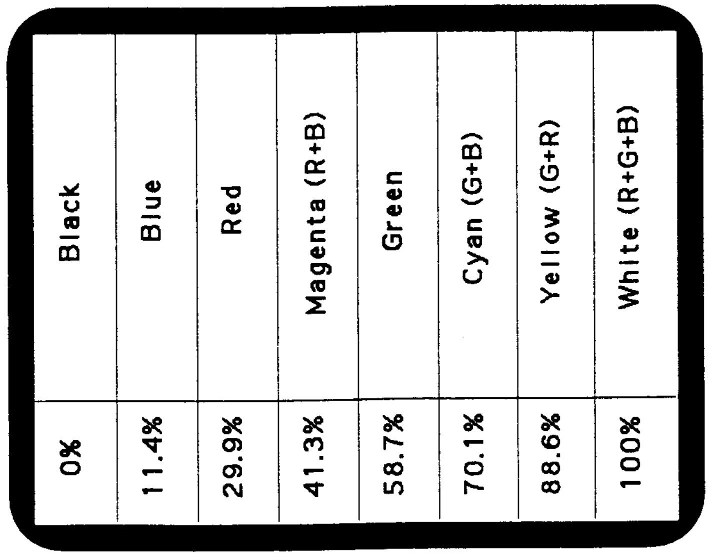
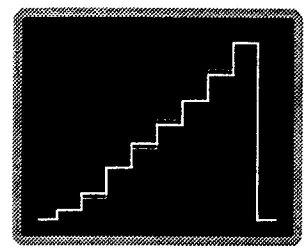


Figure 7-6. Sample Color Pattern

The order of the colors is in increasing perceived brightness from left to right. The gray levels are based on an FCC specification for the luminance signal (Y) level used in color television broadcasts in the U.S.A. The level of each gray bar matches (± 0.2%) the FCC luminance level for the color above it. The luminance signal consists of non-equal mixing of the three primary colors as shown in the following formula:

Luminance = 0.299 Red + 0.587 Green + 0.114 Blue

This pattern could help when using an oscilloscope to check the operation of a television color encoder system. The sync, red, green and blue video outputs of the generator connect to the encoder's inputs. The oscilloscope's input connects to the encoder's luminance signal output. The oscilloscope's sweep and trigger circuits are set to display a single video horizontal scan period. If the encoder is working properly, you should see only a single stairstep pattern on the scope screen. The size of each step will not be the same. One or more double steps indicates a possible problem with the luminance encoding.



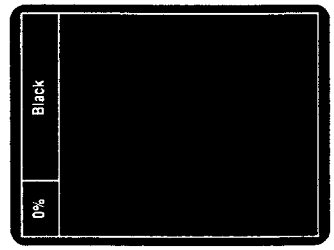
The figure shows an oscilloscope waveform for a malfunctioning video encoder. A blanking pedestal is included in the signal. The brighter trace shows the output levels for the color bars. The double steps indicate that the levels are too high blue and magenta and too low for green and yellow. The encoder is using too much blue and not enough green signals to make the luminance output.

Here's how to draw the pattern. First decide on the coordinate system. There are eight (8) sets of bars horizontally, so 8000 user units for the horizontal axis makes for easy calculations. The pattern is split three fourths (3/4) of the way down the screen, so 4000 user units for the vertical axis is good.

The colors in the top portion of the pattern are found in the standard image defined Look-Up Table (LUT). The gray levels in the bottom portion are **not** in the standard LUT. We start with an image defined LUT and modify some of the predefined gray levels. The command lines on the next page handle our initial set-up for the pattern.

```
SCAL ON
UNIT 8000 4000
LUTT IMAGE
IMGC RASTER
```

The last command line clears the active video area to a black level. This matches the left-hand color and gray level bars. We do not need to specifically draw them.



The color bars needs to be 1000 units wide and 3000 units high. The gray bars need to be 1000 units wide and 1000 units high. To insure that the internal scaling calculations do not leave any black gaps between the bars, we draw each bar a bit oversized. Overlapping the edges gives the correct sizes. The color bars are drawn 1100 units wide and 3100 units high. The gray bars are drawn 1100 units wide and 1100 units high.

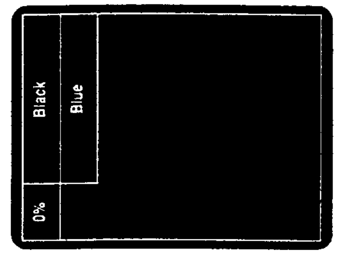
The blue bar starts at a point 1000 units from the left edge of video. Since the patterns consist of multiple colors , we draw all the bars in the background plane. These commands draw the blue bar:

```
BCLR BLUE
RCTC 1100 3100 1000 0 1
```

An 11.4% gray level is not a standard color. The LUT Color Names table shows a 10% gray level for color pen number 25. We tweak the gray level to 11.4% for this pen. First select the pen with this command:

```
PENN 25
```

We need to calculate the DAC setting that comes closest the desired 11.4% intensity level. Multiplying the maximum DAC setting of 255 by .114 gives us a value of. 29.070.

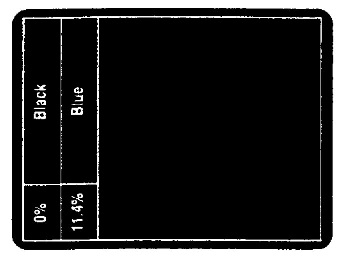


Rounding to the nearest integer value gives a DAC setting of 29. These commands set the DAC levels for all three color outputs to the desired value:

```
ACPL 0 29
ACPL 1 29
ACPL 2 29
```

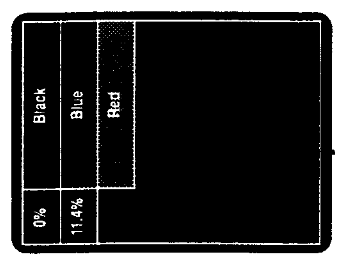
Now use this command to draw the lower bar:

```
RCTC 1100 1100 1000 3000 1
```

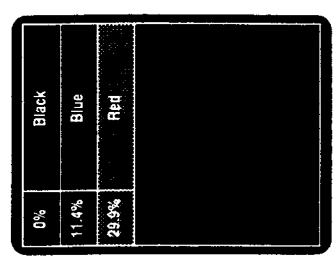


The red bar is drawn with these commands:

```
BCLR RED
RCTC 1100 3100 2000 0 1
```

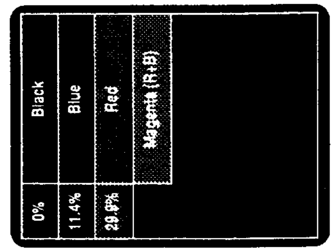


The standard GRAY30 color is as close as the DACs can get to the 29.9% level. These commands select the gray level and draw the bar:



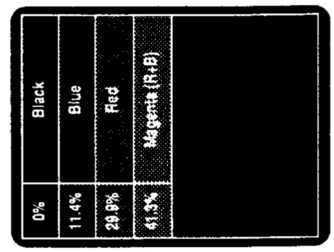

```
BCLR GRAY30
RCTC 1100 1100 2000 3000 1
```

The magenta bar is drawn with these commands:



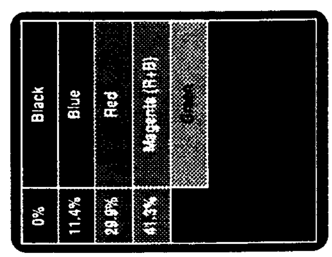
BCLR MAGENTA
RCTC 1100 3100 3000 0 1

Pen number 102 is tweaked to a gray level of 41.3% (DAC level = 105) and the next gray bar is drawn with the following commands:



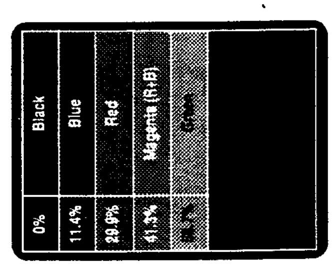
PENN 102
ACPL 0 105
ACPL 1 105
ACPL 2 105
RCTC 1100 1100 3000 3000 1

These commands draw the green bar:



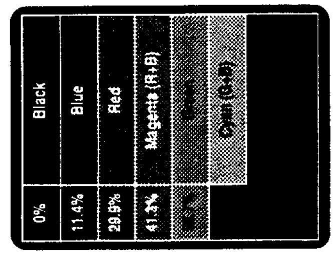
BCLR GREEN
RCTC 1100 3100 4000 0 1

Pen number 153 is tweaked to a gray level of 58.7% (DAC level = 150) and the next gray bar is drawn with the following commands:



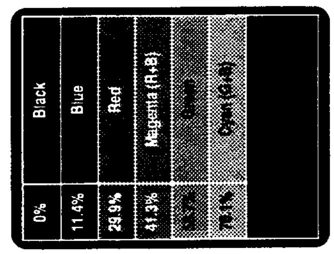
PENN 153
ACPL 0 150
ACPL 1 150
ACPL 2 150
RCTC 1100 1100 4000 3000 1

The cyan bar is drawn with these commands:



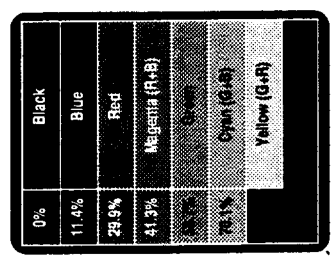
BCLR CYAN
RCTC 1100 3100 5000 0 1

Pen number 178 is tweaked to a gray level of 70.1 % (DAC level = 179) and the next gray bar is drawn with:



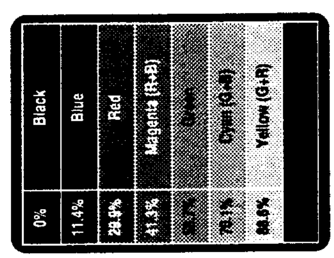
PENN 178
ACPL 0 179
ACPL 1 179
ACPL 2 179
RCTC 1100 1100 5000 3000 1

The yellow bar is drawn with these commands:



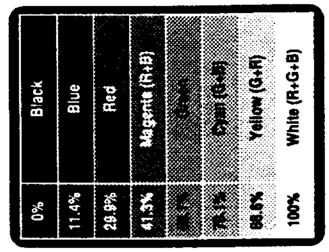
BCLR YELLOW
RCTC 1100 3100 6000 0 1

Pen number 229 is tweaked to a gray level of 88.6 % (DAC level = 226) and the next gray bar is drawn with the following commands:



PENN 229
ACPL 0 226
ACPL 1 226
ACPL 2 226
RCTC 1100 1100 6000 3000 1

A 100% gray level bar has the same levels as the white bar. They can be drawn as a single white bar using the following commands:




```
BCLR WHITE
RCTC 1100 4100 7000 0 1
```

All the commands for the pattern can be put into a single test file. This saves you from typing them into the manual parser every time you want to draw the pattern. The listing of the file for our test pattern looks like this:

```
SCAL ON
UNIT 8000 4000
LUTT IMAGE
IMGC RASTER

BCLR BLUE
RCTC 1100 3100 1000 0 1

PENN 25
ACPL 0 29
ACPL 1 29
ACPL 2 29
RCTC 1100 1100 1000 3000 1

BCLR RED
RCTC 1100 3100 2000 0 1

BCLR GRAY30
RCTC 1100 1100 2000 3000 1

BCLR MAGENTA
RCTC 1100 3100 3000 0 1
```

Continued

Continued

```
PENN 102
ACPL 0 105
ACPL 1 105
ACPL 2 105
RCTC 1100 1100 3000 3000 1

BCLR GREEN
RCTC 1100 3100 4000 0 1

PENN 153
ACPL 0 150
ACPL 1 150
ACPL 2 150
RCTC 1100 1100 4000 3000 1

BCLR CYAN
RCTC 1100 3100 5000 0 1

PENN 178
ACPL 0 179
ACPL 1 179
ACPL 2 179
RCTC 1100 1100 5000 3000 1

BCLR YELLOW
RCTC 1100 3100 6000 0 1

PENN 229
ACPL 0 226
ACPL 1 226
ACPL 2 226
RCTC 1100 1100 6000 3000 1

BCLR WHITE
RCTC 1100 4100 7000 0 1
```

Variables and Looping Functions

The generator's command language includes user variables and looping functions. User variables let you create named variables and do simple arithmetic. Looping functions can be used to perform repetitive operations in a test file.

User Variable Commands

There are ten commands related to user variables. A list of these and a brief description are given below.

DVAR	Creates a named user variable and, optionally, sets it to an initial value. A user variable is limited to an integer value between -2147483648 and +2147483647. The name can be up to eight (8) characters long. Up to twenty user variables can be active at a time.
RVAR	Removes a variable definition. It can also be used to remove all definitions at one time.
UVAR	Stores and retrieves user variable values.
UADD	Adds a given number to a user variable. The number can be another user variable.
USUB	Subtracts a given number from a user variable. The number can be another user variable.
UMUL	Multiplies a given number by a user variable. The number can be another user variable.
UDIV	Divides a given number by a user variable. The number can be another user variable.
PVAR	Prompts the operator to enter a user variable value. The prompt can be displayed on the generator's screen.

DSPV Displays a user variable value on the generator screen.

SVAR Shows a user variable value on the display being tested.

User variable commands can be used both in the manual parser mode and in test files.

The values of user variables can be used as input parameters for other functions.

Looping Function Commands

The following two commands relate to the use of looping functions.

LOOP Defines the start of a loop. The definition includes the initial value of the loop index, the terminal value, and the incremental value added to the index each time the loop is cycled.

LEND Marks the end of a loop definition. The command increases the loop index and checks to see if the loop should be terminated.

Loops can be set up in a test file. Loops **cannot** be set up in the manual parser mode. Limited loop nesting also is possible. You can nest one (1) inner loop within another loop.

Any number of command lines can be placed in a loop. Also the current value of the loop index can be used as an input parameter by the commands in the loop. (An example is shown in Appendix A.)

You can use user variables as one or more input parameters for the LOOP command. The command uses the variable values at the time the LOOP command is executed. Changing the values from within the loop does not affect the loop's parameters.

GCLR

Graphics CoLoR

Command Syntax

GCLR <color>

Description

Sets the graphics plane color. See the table below for valid color names. All pixels in the graphics plane will be displayed in the given color. The numbers following most colors refers to the intensity level percent.

Valid Color Names

BLACK	GRAY0	GRAY51
WHITE	GRAY5	GRAY53
RED	GRAY7	GRAY60
RED50	GRAY10	GRAY67
GREEN	GRAY13	GRAY70
GREEN50	GRAY20	GRAY73
BLUE	GRAY25	GRAY75
BLUE50	GRAY27	GRAY80
CYAN	GRAY30	GRAY87
CYAN50	GRAY33	GRAY90
MAGENTA	GRAY40	GRAY93
MAGENTA50	GRAY47	GRAY95
YELLOW	GRAY48	GRAY100
YELLOW50	GRAY50	

Example

```
GCRL GREEN50
```

GMCR

GaMma CoRrection

Command Syntax

GMCR ON or OFF

Query Syntax

GMCR?

Query Response

ON or OFF

Description

Determines whether the gamma correction value is applied to the analog Look-up table values.

Example

```
GMCR OFF
```

GMVL

GaMma correction VaLue

Command Syntax GMVL <value>

Limits <value> = 0.1 – 10.0

Query Syntax GMVL?

Query Response <value>

Description Determines what gamma correction value to apply to the analog Look-up table values.

Example `GMVL 5.5`

GPIB

GPIB address

Command Syntax GPIB <address>

Limits <address> = 0 – 30

Query Syntax GPIB?

Query Response <address>

Description Determines the GPIB address of the optional GPIB interface adapter card.

Example `GPIB 20`

GRID

draw a centered GRID

Command Syntax GRID <x-boxes> <y-boxes>

Description Draws a centered grid in the graphics plane with a given number of boxes in horizontal (X) and vertical (Y) directions. (See sample figure on 7-16.)

Example `GRID 16 12`

HDTY — HDtv TYpe

Command Syntax HDTY<type>

Limits <type> = 0 or SMPTE240M, 1 or SC-HDTV, or 2 or EUREKA

Query Syntax HDTY?

Query Response <type>

Description Sets the type of HDTV sync when HDTV composite is selected for sync type.

Example `HDTY 2`

HGLW — Horizontal Grill Line Width

Command Syntax HGLW <width>

Limits <width> > 0

Description Specifies the width in number of scan lines for each bar of the *h-grill* image. The number of scan lines between bars is the same as the bar width.

Example `HGLW 10`

HTVL — HdTV Level (model 901 only)

Command Syntax HTVL <level>

Limits 500 – 2000 mV

Query Syntax HTVL?

Query Response <level>

Description Sets the HDTV sync swing for bipolar output.

IMAG

draw instant-expert IMAGe

Command Syntax

IMAG <image name>

The image name must match one of the image names in the current Images directory. Using **redraw** as the image name causes the last selected image to be redrawn.

Description

Draws an instant expert image without clearing the screen.

Example

```
IMAG SMPTE
```

IMGC

draw instant-expert IMaGe after first Clearing screen

Command Syntax

IMGC <image name>

The image name must match one of the built-in image names. Using **redraw** as the image name causes the last selected image to be redrawn.

Description

Draws an instant expert image after clearing the screen.

Example

```
IMGC LINEARITY
```

KDEF

Key DEFinition

Command Syntax

KDEF <key number> <label> [<key command>]

Limits

<key number> = 1-22

<label> ≤ 10 characters

Description

Defines softkey operation and label. The label is correctly formatted and the command string is executed when the key is pressed.

The label appears on the CRT. It must be present; however, if you want the label to be blank, use quote-space-quote (" "). The field is parsed to 10-character lines. Characters beyond this limit are truncated. Multiple line labels are specified with semicolon delimiters (;) which serve as new line symbols. Text is centered in the label box.

The <key number> and <label> fields must be present. They remain in effect until changed or removed with the KDFC command.

Example

```
KDEF 1 "SMPTE" IMGC SMPTE
```

KDFC

Key DeFinition Clear

Command Syntax

KDFC [<key1>, <key2>...<keyn>]

Limits

<key number> = 1 – 22

Description

Returns softkeys to their undefined state with no labels or command string execution. It is NOT necessary to use this command when redefining keys. KDEF replaces old labels and commands with the new ones.

KDFC with no arguments undefines all keys.

Example

```
KDFC 2
```

KGRP

Key GRouP

Command Syntax

KGRP <group num> <key1>, <key2>...<keyn>

Limits

<group num> = 1 – 15

Description

Grouping refers to the interaction among softkeys. The default group (#0) has no interaction. If a key is pressed,the key's highlight blinks once.

Groups #1 through #14 are interlocking. If a key in the group is pressed, the key label remains highlighted until another key in the group is pressed.

Group #15 features bi-stable operation. Pressing a key the first time causes the label to be highlighted. Subsequent presses toggle the highlight off and on. There is no interaction amoung the keys in this group.

Keys may be assigned to any of the 15 groups; however, a key can NOT be a member of more than one group. When a key is made a member of a group, it is removed from any previous group.

Grouping does NOT change the key function. It only changes the highlighting function.

Example

```
KGRP 1 2,3,4
```

KOFF

Key OFF

Command Syntax

KOFF <key1>, <key2>,...<keyn>

Description

Turns keys to normal intensity; i.e., un-highlighted. KOFF has no effect on the key function.

Example

```
KOFF 2,3
```

KUGP — Key UnGrouP

Command Syntax

KUGP <key1>, <key2>,...<keyn>

Description

Removes listed keys from their groups and defaults them to group 0. It is NOT necessary to use this command when reassigning keys. KGRP removes them from previous groups and places them in the new ones.

Entire groups can be ungrouped by listing the group number as @1, @2, etc. The @ symbol indicates that the next number is an entire group.

Example

```
KUGP @1
```

KYDO — KeY DO

Command Syntax

KYDO <key number>

Description

Emulates a key stroke

Example

```
KYDO 10
```

KYON — KeY ON

Command Syntax

KYON <key1>, <key2>,...<keyn>

Description

Highlights listed keys. Normal grouping functions are still performed. For example, if Keys 2 and 6 are in the same group and Key 6 is commanded KYON, a subsequent press of Key 2 turns the highlighting off. A key must be the only one in a group to be independent.

Example

```
KYON 6
```

LAST

execute LAST (previous) subroutine

Command Syntax

LAST

Description

Executes the previous subroutine. If no subroutine has been executed or if there are no subroutines defined in the current test file, no action is taken. Also sets the subroutine counter to the previous subroutine.

LCFG

Load ConFiGuration file

Command Syntax

LCFG <filename>

Description

Attempts to load the configuration file given in <filename> from the disk.

Example

```
LCFG DEFAULT
```

LEND

Loop END

Command Syntax

LEND

Description

Marks the end of a loop that was started with the **LOOP** command. The number of LOOP's and LEND's must be equal in a test file.

LFMT

Load ForMaT file

Command Syntax

LFMT <filename>

Description

Attempts to load the format file given in <filename> from the disk.

Example

```
LFMT DEFAULT
```

LFNT

Load FoNT file

Command Syntax

LFNT <filename>

Description

Attempts to load the font file given in <filename> from the disk.

Example

```
LFNT DEFAULT
```

LINC — draw a LINe in Color plane

Command Syntax
LINC <x1> <y1> <x2> <y2>

Description
Draws a line in the low-resolution color plane from x1,y1 to x2,y2 with the current color pen. The size and position parameters are in blocks **not** pixels.

Example
`LINC 8 2 12 10`

LINE — draw a LINE in graphics plane

Command Syntax
LINE <x1> <y1> <x2> <y2>

Description
Draws a line in the graphics plane from x1,y1 to x2,y2.

Example
`LINE 20 5 320 240`

LNAP — LiNe Active Pixels

Command Syntax
LNAP <pixels>

Limits
0 – 2048

Query Syntax
LNAP?

Query Response
<pixels>

Description
Determines the number of displayed pixels per line.

Example
`LNAP 640`

LNBP — LiNe Blanking Pixels

Command Syntax
LNBP <pixels>

Limits
112 – 4096

Query Syntax
LNBP?

Query Response
<pixels>

Description
Determines the number of blanked pixels per line.

Example
`LNBP 160`

LNPP

LiNe Period Pixels

Query Syntax LNPP?

Query Response <pixels>

Description Returns the total number of active and blanked pixels on a line.

LNRT

LiNe RaTe

Command Syntax LNRT <frequency>

Limits 1 KHz – 250 KHz

Query Syntax LNRT?

Query Response <frequency>

Description Determines the rate at which lines are refreshed.

Example `LNRT 31.5`

LOOP

begin LOOP

Command Syntax LOOP <start> <end> <increment>

Limits

<start> = -32768 - 32767

<end> = -32768 - 32767

<increment> = -32768 - 32767

Description

Marks the beginning of a loop. A loop allows images to be drawn algorithmically instead of using in-line code. This greatly decreases the size of a test file.

The loop starts out at the value given as <start>, increment by <increment> when a LEND command is encountered until the value is equal to or greater than <end>.

The current value of the loop variable can be substituted for a parameter by placing the loop number between $ characters (e.g. 1).

Loops can be nested (i.e., one loop inside of another). Loop numbers start at 1 for the outermost loop and increase by 1 to a maximum of 2.

Example

Example: Draw a 5x5 grid on a 640x480 screen.

```
! Draw vertical lines
LOOP 128 512 128
LINE $1$ Ø $1$ 479
LEND

! Draw horizontal lines
LOOP 96 384 96
LINE Ø $1$ 639 $1$
LEND
```

LTES

Load TESt file

Command Syntax

LTES <filename>

Description

Attempts to load the test file given in <filename> from the disk. This replaces any previously loaded test file.

Can NOT be used inside a subroutine definition

Example

```
LTES DEFAULT
```

LUTT

Look-up table Type

Command Syntax

LUTT <LUT type>

Limits

<LUT type> = IMAGE or USER

Query Syntax

LUTT?

Query Response

<LUT type>

Description

Defines what type of look-up table (LUT) is used. If the type is specified as IMAGE, the current LUT is set up automatically based on the image being drawn. If the type is specified as USER, the current LUT is specified by user input.

Example

```
LUTT IMAGE
```

MANL — enter MANuaL parser mode

Command Syntax MANL

Description Enter the manual parser mode. This mode allows entry of any command in this list.

MINV — Monochrome image INVert

Command Syntax MINV <inversion>

Limits <inversion> = ON or OFF

Query Syntax MINV?

Query Response inversion

Description Determines whether monochrome images are drawn whit-on-black (MINV OFF) or black-on-white (MINV ON). The MINV command does not affect any image already displayed.

Example `MINV ON`

NEXT — execute NEXT subroutine

Command Syntax NEXT

Description Executes the next subroutine in the current test file. Also increments the subroutine number.

OPAQ — set the OPAQue flag

Command Syntax OPAQ ON or OFF

Query Syntax OPAQ?

Query Response ON or OFF

Description Specifies whether subsequent drawing done in the graphics plane will be opaque or transparent. When the opaque flag is ON, graphics will overlay the background plane.

When the opaque flag is OFF, graphics will be transparent and allow the background plane to show through. This in effect selectively erases portions of the graphics plane.

Example `OPAQ ON`

ORIG

scaled image ORIGin

Command Syntax ORIG <x unit> <y unit>

Limits <unit> = 0 - 32767

Query Syntax ORIG?

Query Response <x unit> <y unit>

Description Sets the image scaling origin coordinate.

Example `ORIG 50 50`

OUTS

OUTput Status

Command Syntax OUTS ON or OFF

Query Syntax OUTS?

Query Response ON or OFF

Description Determines if the signal outputs are on or off. If the outputs are on and there is an error in the format, the outputs are turned off.

Example `OUTS OFF`

OVAL

draw an OVAL in graphics plane

Command Syntax OVAL <width> <height> <xcenter> <ycenter> <fill>

Description Draws an oval in the graphics plane. If <fill> is a 0, only the outline is drawn. If <fill> is a 1, the oval is filled. (See sample figure on 7-15.)

Example `OVAL 240 150 20 10 0`

PDEF

Pedal DEFinition

Command Syntax PDEF <pedal number> <text>

Limits <pedal number> = 1-8

Description Defines text to be executed when foot pedal <pedal number> is pressed.

Example `PDEF 1 NEXT`

PDFC

Pedal DeFinition Clear

Command Syntax
PDFC [<pedal number>,<pedal number>...]

Limits
<pedal number> = 1-8

Description
Clears pedal definitions and scans codes for the foot pedals listed. If no pedals are listed, clears all foot pedal text and scan codes.

Example
```
PDFC 2
```

PDSC

PeDal Scan Codes

Command Syntax
PDSC <pedal number> <S code> <D code>

Limits
<pedal number> = 1-8 <S code> = 0-7 <D code> = 0-15

Description
Defines which scan codes a foot pedal returns. See the following chart for scan code-to-pin number conversion.

Example
```
PDSC 1 S4 DØ
```

S Code

D Code		SØ pin 14	S1 pin 15	S2 pin 16	S3 pin 17	S4 pin 18	S5 pin 19	S6 pin 20	S7 pin 21
DØ	pin 25	Outputs	CRT 19	CRT 5	Data 8	Data 1	Cursor ≠	Types	
D1	pin 24	CRT 12	CRT 20	CRT 6	Data 9	Data 2	Cursor "		
D2	pin 23	CRT 13	CRT 21	CRT 7	Help	Data 3	Enter		
D3	pin 22	CRT 14	CRT 22	CRT 8	Data 4	Clear	Cursor **Æ**		
D4	pin 1	CRT 15	CRT 1	CRT 9	Data 5	Data **Ø**	Cursor **Ø**		
D5	pin 2	CRT 16	CRT 2	CRT 10	Data 6	Data Ø	Test		
D6	pin 3	CRT 17	CRT 3	CRT 11	–	•	Format		
D7	pin 4	CRT 18	CRT 4	Data 7	Data ≠	Enter	Image		
D8	pin 5								
D9	pin 6								
D1Ø	pin 7								
D11	pin 8								
D12	pin 9								
D13	pin 10								
D14	pin 11								
D15	pin 12								

Pin 13 = Ground

PENN

PEN Number

Command Syntax	PENN <pen number>
Limits	<pen number> = 0-255
Query Syntax	PENN?
Query Response	<pen number>
Description	Sets the current color pen for the outputs to <pen number>
Example	`PENN 60`

PFMT

Path for ForMaT files

Command Syntax	PFMT <pathname>
Query Syntax	PFMT?
Query Response	<pathname>
Description	Determines the MS-DOS directory which contains format files.
Example	`PFMT FORMATS`

PFNT

Path for FoNT files

Command Syntax	PFNT <pathname>
Query Syntax	PFNT?
Query Response	<pathname>
Description	Determines the MS-DOS directory which contains font files.
Example	`PFNT FONTS`

PORT

rs-232 PORT number

Command Syntax PORT <port number>

Limits <port number> = 0-1

Query Syntax PORT?

Query Response <port number>

Description Determines which RS-232 port (0 = COM1 or 1 = COM2) the generator uses.

Example `PORT 1`

PTES

Path for TESt files

Command Syntax PTES <pathname>

Query Syntax PTES?

Query Response <pathname>

Description Determines the MS-DOS directory which contains test files.

Example `PTES TESTS`

PVAR

Prompt for user VARiable value

Command Syntax PVAR <name> "<prompt string"

Description Prompts the user for the value of a user variable. The digits entered are shown on the generator's CRT.

Example `PVAR XPOS "Enter X position: "`

PXRT

PiXel RaTe

Command Syntax PXRT <frequency> in MHz

Limits
901: 1.360 – 87 MHz
902: 1.953 – 135 MHz
903: 1.953 – 250 MHz

Query Syntax PXRT?

Query Response <frequency> in MHz

Description Determines the rate at which pixels are refreshed.

Example `PXRT 25.2`

QUIT

QUIT program, return to MS-DOS

Command Syntax QUIT

Description Exits the generator application program and returns control to MS-DOS.

Example `QUIT`

RBOX

Resolution BOX

Command Syntax RBOX <type> <width> <height> <left> <top>

Limits <type> = 1-4

Description Draws a resolution box (of the kind in the *resolve* image) of the given type, with the given width and height, and at the given left and top position in the graphics plane. Each resolution box consists of six separate boxes in differing directions and frequencies. The box width and height are for one of the six boxes. (See sample figure on 7-17.)

Example `RBOX 1 16 16 0 0`

RCTC

draw a ReCTangle in Color plane

Command Syntax

RCTC <width> <height> <xleft> <ytop> <fill>

Limits

Normally within active video area

Description

Draws a rectangle in the low-res color plane with the current color pen. If <fill> is a 0, only the outline is drawn. If <fill> is a 1, then the rectangle is filled with the current color pen. The size and position parameters are in blocks **not** pixels.

Example

```
RCTC 4 3 5 1 0
```

RECT

draw a RECTangle in graphics plane

Command Syntax

RECT <width> <height> <xleft> <ytop> <fill>

Limits

Normally within active video area

Description

Draws a rectangle in the graphics plane. If <fill> is a 0, only the outline is drawn. If <fill> is a 1, then the rectangle is filled.

Example

```
RECT 15 20 50 40 1
```

RIFT

Regulate Image Frame Time

Command Syntax

RIFT <frame> <time>

Limits

<frame> = 1 or 2
<time> = 1 – 1000 seconds

Query Syntax

RIFT? <frame>

Query Response

<time>

Description

Sets the time each frame remains on the screen for regulate images.

Example

```
RIFT 2 5
```

RVAR

Remove user VARiable

Command Syntax

RVAR [<name>]

Description

Removes a previously defined user variable. If a variable name is given, that user variable is removed from memory. If no name is given, all defined user variables are removed.

Example

```
RVAR V1
```

SART

Sync equalizer After vertical RaTe

Command Syntax

SART <rate>

Limits

<rate> = 1 or 2

Query Syntax

SART?

Query Response

<rate>

Description

Determines the rate of the composite sync post-equalization pulses. The rate can be either 1X or 2X the horizontal rate. The SART command does **not** affect the width of the equalizer pulses.

Example

```
SART 1
```

SBRT

Sync equalizer Before vertical RaTe

Command Syntax

SBRT <rate>

Limits

<rate> = 1 or 2

Query Syntax

SBRT?

Query Response

<rate>

Description

Determines the rate of the composite sync pre-equalization pulses. The rate can be either 1X or 2X the horizontal rate. The SART command does **not** affect the width of the equalizer pulses.

Example

```
SBRT 1
```

SCAL

image SCALing

Command Syntax	SCAL ON or OFF
Query Syntax	SCAL?
Query Response	ON or OFF
Description	Enables or disables the image drawing primitives scaling mode.
Example	`SCAL ON`

SCSG

SynC channel Signal Gate

Command Syntax	SCSG <channel> <gate>
Limits	<channel> = 0-4 <gate> = 0-1
Query Syntax	SCSG? <channel>
Query Response	<gate>
Description	Turns sync channels 0 – 4 on or off.
Example	`SCSG 0 1`

SCSP

SynC Signal Polarity

Command Syntax	SCSP <channel> <polarity>
Limits	<channel> = 0-4 <polarity> = 0 (POS. TRUE) or 1 (NEG. TRUE)
Query Syntax	SCSP? <channel>
Query Response	Positive or Negative
Description	Switches polarity of channels 0 – 4.
Example	`SCSP 2 0`

SCSV

SCreen SaVer time

Command Syntax
SCSV <delay> <rate>

Limits
<delay> = 0 – 32767 seconds
<rate> = 0 – 32767 seconds

Query Syntax
SCSV?

Query Response
<delay> <rate>

Description
Sets up the built-in screen saver time parameters. The <delay> parameter detemines how long after a key is pressed before the screen saver starts. The <rate> parameter determines how long to wait before moving the screen saver picture. If either <delay> or <rate> is 0, the screen saver is disabled.

Example
`SCSP 2 0`

SCTP

SynC TyPe

Command Syntax
SCTP <type>

Limits
<type> = 0 (Separate), 1 (Composite ORed), 2 (Composite Custom) or 3 (HDTV).

Query Syntax
SCTP?

Query Response
Separate, Composite ORed, Composite Custom or HDTV.

Description
Changes sync type.

Example
`SCTP 1`

SHDP

Sync Horizontal Delay in Pixels

Command Syntax
SHDP <pixels>

Limits
0 – 4093

Query Syntax
SHDP?

Query Response
<pixels>

Description
Determines the horizontal sync delay (front porch).

Example
`SHDP 20`

SHWP — Sync Horizontal Width in Pixels

Command Syntax	SHWP <pixels>
Limits	1 – 4093
Query Syntax	SHWP?
Query Response	<pixels>
Description	Determines the width of the horizontal sync pulse.
Example	`SHWP 80`

SPON — Sync POst-eq. Number

Command Syntax	SPON <pulses>
Limits	0 – Total back porch
Query Syntax	SPON?
Query Response	<pulses>
Description	Determines the number of post-equalization pulses.
Example	`SPON 3`

SPRN — Sync PRe-eq Number

Command Syntax	SPRN <pulses>
Limits	0 – Sync delay
Query Syntax	SPRN?
Query Response	<pulses>
Description	Determines the number of pre-equalization pulses.
Example	`SPRN 3`

SSEG — Sync SErration Gate

Command Syntax	SSEG ON or OFF
Query Syntax	SSEG?
Query Response	ON or OFF
Description	Determines whether separate pulses are added to the composite sync signal.
Example	`SSEG OFF`

SSRT — Sync Serration RaTe

Command Syntax
SSRT <rate>

Limits
<rate> = 1 or 2

Query Syntax
SSRT?

Query Response
<rate>

Description
Determines the rate of the composite sync serration pulses. The rate can be either 1X or 2X the horizontal rate. The SSRT command does **not** affect the width of the serration pulses.

Example
```
SSRT 1
```

STIM — Screen TIMe

Command Syntax
STIM

Description
Puts the current system time on the unit under test's screen at the current text cursor position. The text position can be set with the TPSS Command. The time appears as:

DAY MONTH DATE TIME YEAR

The displayed information does not change once the information is drawn on the screen. The displayed time reflects the correct time at the moment the function is called.

SUB — start of SUBroutine

Command Syntax

SUB "subroutine name"

Limits

The subroutine name must be contained in quotation marks and must be unique to the test file.

Description

Indicates the start of named subroutine. All following command lines up to the command **SUBEND** are not actually executed until the subroutine is **CALL**ed by its name. Subroutines can be defined anywhere within a test file and in any order. The order in which they are defined does affect the way in which the FRST, LAST and NEXT commands behave.

Almost all 900 Series commands may be used within a subroutine. There are three limitations in setting up and using subroutines:

1) You can not start a new **SUB**routine definition within a subroutine.

2) You can however **CALL** another subroutine from within a subroutine. The total number of CALLs within other CALLs (within other CALLs etc.) that can be stacked is ten (10).

3) You can not load (**LTES**) another test file from within a subroutine. Attempting to do so may produce unexpected results, including crashing the system.

Example

```
SUB SUB_1
```

SUBEND — SUBroutine END

Command Syntax

SUBEND

Limits

Does not expect any parameters.

Description

Indicates the end of named subroutine that was started with the **SUB** command. The number of SUB's and SUBEND's must be the same in a test file.

Example

```
SUBEND
```

SVAR — Show user VAR on screen

Command Syntax	SVAR <name>
Description	Displays the current value of a user variable on the unit under test's screen at the current text position.
Example	`SVAR LINERATE`

SVDL — Sync Vertical Delay in Lines

Command Syntax	SVDL <lines>
Limits	0 – 2047
Query Syntax	SVDL?
Query Response	<lines>
Description	Determines the vertical sync delay (front porch).
Example	`SVDL 3`

SVWL — Sync Vertical Width in Lines

Command Syntax	SVWL <lines>
Limits	1 – 2047
Query Syntax	SVWL?
Query Response	<lines>
Description	Determines the width of the vertical sync pulse.
Example	`SVWL 3`

SYMD — SYnc channel MoDe

Command Syntax	SYMD <channel><mode>
Query Syntax	SYMD? <channel>
Query Response	<mode>
Description	Sets the mode for sync channel 1 or 2. Valid modes are VOID (no output), HSYNC (horizontal sync output), VSYNC (vertical sync output), and CSYNC (composite sync output).
Example	`SYMD 1 CSYNC`

TOUT

Command Syntax

Description

Example

Text OUTput

TOUT <text>

Outputs the given text string to the UUT starting at the current text cursor position. The current text cursor position is moved to a point immediately to the right of the text drawn.

```
TOUT "HELLO"
```

TPSM

Command Syntax

Limits

Query Syntax

Query Response

Description

Example

Text PoSition for 901 Monitor

TPSM <x position> <y position>

<x position> = 1-80, <y position> = 1-25

TPSM?

<x position> <y position>

Determines where text is placed on the generator's front panel CRT when the DSPT command is used.

```
TPSM 10 10
```

TPSS

Command Syntax

Query Syntax

Query Response

Description

Example

Text PoSition for UUT Screen

TPSS <x position> <y position>

TPSS?

<x position> <y position>

Determines where text is placed on the UUT's screen when the TOUT command is used.

```
TPSS 10 10
```

UADD

Command Syntax

Limits

Description

Example

User variable ADD

UADD <name> <value>

-2147483648 – 2147483647

Adds a number to a user variable and stores the result back in the variable. The <value> parameter can be the contents of another variable as shown in the example.

```
UADD TOTAL (V1)
```

UAND

User variable logic AND

Command Syntax

UAND <name> <value>

Limits

<name> = valid user variable name
<value> = -2147483648 through +2147483647

Description

Initiates a logical AND between a user variable and a value and stores the result back in the user variable. The <value> parameter can be the contents of another user variable by enclosing the second user variable in parentheses.

Example

```
UAND INCREMENT 255
```

UDIV

User variable DIVide

Command Syntax

UDIV <name> <value>

Limits

-2147483648 – 2147483647

Description

Divides a number to a user variable and stores the result back in the variable. The <value> parameter can be the contents of another variable as shown in the example.

Example

```
UDIV TOTAL (PARTS)
```

UI

return to User Interface

Command Syntax

UI

Description

Exits the manual parser mode and re-enter the user interface.

UMUL

User variable MULtiply

Command Syntax

UMUL <name> <value>

Limits

-2147483648 – 2147483647

Description

Multiplies a number to a user variable and stores the result back in the variable. The <value> parameter can be the contents of another variable as shown in the example.

Example

```
UMUL LEFT (TOTAL)
```

UNIT

scaled image UNITs

Command Syntax UNIT <x units> <y units>

Limits <units> = 0 - 32767

Query Syntax UNIT?

Query Response <x units> <y units>

Description Sets the image scaling coordinate system units.

Example `UNIT 88 500`

UORR

User variable logic OR

Command Syntax UORR <name> <value>

Limits <name> = valid user variable name
<value> = -2147483648 through +2147483647

Description Initiates a logical OR between a user variable and a value and stores the result back in the user variable. The <value> parameter can be the contents of another user variable by enclosing the second user variable in parentheses.

Example `UORR BITS 128`

USUB

User variable SUBtract

Command Syntax USUB <name> <value>

Limits -2147483648 – 2147483647

Description Subtracts a number to a user variable and stores the result back in the variable. The <value> parameter can be the contents of another variable as shown in the example.

Example `USUB WIDTH (RECTWIDTH)`

UVAR — User VARiable value

Command Syntax UVAR <name> <value>

Limits -2147483648 – 2147483647

Query Syntax UVAR? <name>

Query Response <value>

Description Assigns a value to, or retrives a value from, a user variable.

Example `UVAR RON 54`

VERS — 90X software VERSion

Query Syntax VERS?

Query Response <current software version number>

Description Returns the revision number of the generator's operating system software.

VGLW — Vertical Grill Line Width

Command Syntax VGLW <width>

Limits <width> > 0

Description Specifies the width (in number of pixels) for each bar of the *v-grill* image. The number of pixels between bars is the same as the bar width.

Example `VGLW 10`

VIEW

screen VIEW select

Command Syntax

VIEW <screen type>

Limits

See following list

Query Syntax

VIEW?

Description

Selects which screen is to be viewed on the 90X's monitor. Valid Screen Types and their descriptions are:

APALETTE	Shows the Format editor analog LUT sub-screen for the loaded Format.
CONFIGDIR	Lists Configuration files in the selected Configurations directory. You can load Configurations directly from this screen.
CONFIGSCREEN	Shows the current Configuration file screen and lets you make changes to it.
DPALLETTE	Shows the Format editor digital LUT sub-screen for the loaded Format.
DVOPTIONS	Shows the Format editor digital video options sub-screen for the loaded Format.
FILESELECT	Shows the files selection window. This window shows all accessible Formats, Images and Test files.
FONTDIR	Lists Font files in the selected Font directory. You can load Fonts directly from this screen.
FORMATDIR	Lists Format files in the selected Formats directory. You can load Formats directly from this screen.
FORMATEDIT	Shows the main Format editor screen for the loaded Format.

FORMATSYNC	Shows the Format editor sync options sub-screen for the loaded Format.
FORMATVIDEO	Shows the Format editor video options sub-screen for the loaded Format.
IMAGEDIR	Lists Image files in the selected Images directory. You can load Images directly from this screen.
TESTDIR	Lists Test files in the selected Tests directory. You can load Tests directly from this screen.
TESTSCREEN	Shows the test screen defined by the current test file. This includes the labels for all defined softkeys in the file.
TYPESDIR	Lists directory types available.

Example

```
VIEW FORMATDIR
```

WCFG

Write ConFiGuration file

Command Syntax

WCFG <filename>

Description

Writes the current configuration settings to the given file.

Example

```
WCFG DEFAULT2
```

WFMT

Write ForMaT file

Command Syntax

WFMT <filename>

Description

Writes the current format settings to the given file.

Example

```
WFMT DEFAULT2
```

Notes

This appendix gives the 57 standard signal formats supplied with 900 Series Generators.

Appendix B: Formats

900 Series Formats

Introduction

The following charts give a general description of each format. More detailed information can be obtained by calling up the Format of interest and pressing the **<Edit>** Softkey.

File Name	Common Name	Horiz Rate khz	Field Rate Hz	Video Type	H x V Active	Sync Type & Polarity
15.75khz		15.750	30.000	RGB Analog	640 x 480	SOG & Comp
17khz		17.281	31.250	RGB Analog	512 x 512	+H +V
18khz		18.431	50.084	B/W Dig 2 Bit	720 x 350	+H -V
21khz		21.850	60.027	RrGgBb Digital	640 x 350	+H -V
24khz		24.828	56.427	RGBI Digital	640 x 400	-H -V
31khz		31.500	60.115	RGB Analog	640 x 480	SOG & Comp
35khz		35.000	66.667	RGB Analog	640 x 480	SOG & Comp
8508_m1	IBM Model 8508	70.696	93.513	Mono Analog	736 x 736	+H -V
8508_m2	IBM Model 8508	70.696	82.205	Mono Analog	736 x 828	-H +V
8514a	IBM Model 8508	35.522	43.479	Mono Analog	1024 x 768	+H +V
cga_m14	IBM-PC CGA mode 14	15.700	59.924	RGBI TTL	640 X 200	+H +V

File Name	Common Name	Horiz Rate khz	Field Rate Hz	Video Type	H x V Active	Sync Type & Polarity
default	None	31.500	60.000	RGB Analog	640 x 480	SOG & Dig Comp
ega_m2	IBM-PC EGA mode 2	21.851	59.702	RrGgBb TTL	640 x 350	+H -V
hgcgraph	Hercules Graphics Mode	18.519	50.051	BW-TTL 2 Bit	720 x 348	+H -V
hgctext	Hercules Text Mode	18.141	49.030	BW-TTL 2 Bit	720 x 350	+H -V
hitachi_1		32.467	29.979	RGB Analog	1024 x 1024	+H +V
hitachi_2		17.281	31.250	RGB Analog	512 x 512	+H +V
ibm_5272	IBM Model 5272 Display	23.608	62.954	RGB Analog	720 x 350	-H -V
mac_12c	Apple Mac LC 12" Color	24.480	60.147	RGB Analog	512 x 384	-H -V
mac_12ce	Apple Mac IIe 12" Color	24.480	60.147	RGB Analog	560 x 384	-H -V
mac_12m	Apple Mac LC 12" B&W	24.480	60.147	Mono Analog	512 x 384	-H -V
mac_13c	Apple Mac II 13" Hi-Res Color	35.000	66.667	RGB Analog	640 x 480	-Comp & SOG
mac_13m	Apple Mac II 13" Hi-Res B&W	35.000	66.667	Mono Analog	640 x 480	-Comp & Com Vid
mac_15m	Apple Mac II 15" Portrait B&W	68.846	75.077	Mono Analog	640 x 870	-Comp & Com Vid
mac_21m	Apple Mac II 21" Two Page B&W	68.681	75.061	Mono Analog	1152 x 870	-Comp & Com Vid
mac_tvos	Apple Mac II TV overscan mode	15.734	59.94 Int'lace	Mono Analog	512 x 384	Comp Video

File Name	Common Name	Horiz Rate khz	Field Rate Hz	Video Type	H x V Active	Sync Type & Polarity
mac_tvus	Apple Mac II TV underscan mode	15.734	59.94 Int'lace	Mono Analog	640 x 480	Comp Video
mda_m7	IBM-PC MDA mode 7	18.432	49.816	BW-TTL 2 Bit	720 x 350	+H -V
nec_3d	NEC Model 3D Compatible	31.500	60.115	RGB Analog	640 x 480	+ Dig Comp
nec_dh		15.979	60.298	RGBI TTL	640 x 200	+H -V
nec_p1		31.499	59.432	RGB Analog	720 x 480	-H -V
nec_p2		24.828	56.427	RGBI TTL	640 x 400	-H -V
opix_1	Quantum Data OPIX Format #1	15.750	30.000	RGB Analog	640 x 480	SOG & + Dig Comp
opix_2	Quantum Data OPIX Format #2	31.500	60.000	RGB Analog	640 x 480	SOG & + Dig Comp
pga_400	IBM-PC PGC 400 line	30.296	59.638	RGB Analog	640 x 400	-Comp ORed
pga_480	IBM-PC PGC 480 line	30.296	59.638	RGB Analog	640 x 480	-Comp ORed
rs170a_c	EIA TV w/Rect. Pixels	15.734	59.486 Int'lace	RGB Analog	754 x 484	Comp Video
rs170a_m	EIA TV w/Rect. Pixels	15.734	59.486 Int'lace	Mono Analog	754 x 484	Comp Video
rs170b_c	EIA TV Underscan w/Rect. Pixels	15.734	59.94 Int'lace	RGB Analog	640 x 480	Comp Video
rs170b_m	EIA TV Underscan w/Rect. Pixels	15.734	59.94 Int'lace	Mono Analog	640 x 480	Comp Video
rs170c_c	EIA TV Overscan w/Rect. Pixels	15.734	59.94 Int'lace	RGB Analog	512 x 384	Comp Video

File Name	Common Name	Horiz Rate khz	Field Rate Hz	Video Type	H x V Active	Sync Type & Polarity
rs170c_m	EIA TV Overscan w/Rect. Pixels	15.734	59.94 Int'lace	Mono Analog	512 x 384	Comp Video
smpte240	SMPTE HDTV Std.	33.750	30.000	RGB Analog	1920 x 1035	Bipolar SOG
sun1024c	Sun Workstation 1024 x 1024	65.267	61.399	RGB Analog	1024 x 1024	- Dig Comp
sun1152c	Sun Workstation 1152 x 900 Color	61.796	65.951	RGB Analog	1152 x 900	- Dig Comp
sun1152m	Sun Workstation 1152 x 900 B&W	62.500	66.702	Mono Anaog	1152 x 900	+H +V
sun1600c	Sun Workstation 1600 x 1280 Color	89.286	66.931	RGB Analog	1600 x 1280	- Comp Custom
sun1600m	Sun Workstation 1600 x 1280 B&W	89.286	66.931	Mono 1-bit	1600 x 1280	+H +V
sup_mac2	Super Mac Technology	48.780	60.000	RGB Analog	1024 x 768	+H +V
VG900601	VESA June 2, 1990 Mfg. Guideline #1	35.156	56.250	RGB Analog	800 x 600	+H +V
VG900602	VESA June 2, 1990 Mfg. Guideline #2	37.879	60.317	RGB Analog	800 x 600	+H +V
VS900603	VESA June 2, 1990 SVGA Standard	48.077	72.19	RGB Analog	800 x 600	+H +V
VS901101	VESA Nov. 11, 1990 VGA (72Hz) Standard	37.861	72.81	RGB Analog	640 x 480	-H -V
VG901101	VESA Nov. 11, 1990 Mfg. Guideline #1	48.363	60.004	RGB Analog	1024 x 768	-H -V
VS910801	VESA Aug. 9, 1991 EVGA Standard	56.476	69.965	RGB Analog	1024 x 768	-H -V
vga_m18	IBM-PS/2 VGA mode 18	31.469	59.941	RGB Analog	640 x 480	-H -V

File Name	Common Name	Horiz Rate khz	Field Rate Hz	Video Type	H x V Active	Sync Type & Polarity
vga_m7	IBM-PS/2 VGA mode 7	31.469	70.087	RGB Analog	720 x 350	+H -V
vga_m7+	IBM-PS/2 VGA mode 7+	31.469	70.087	Mono Analog	720 x 400	-H +V

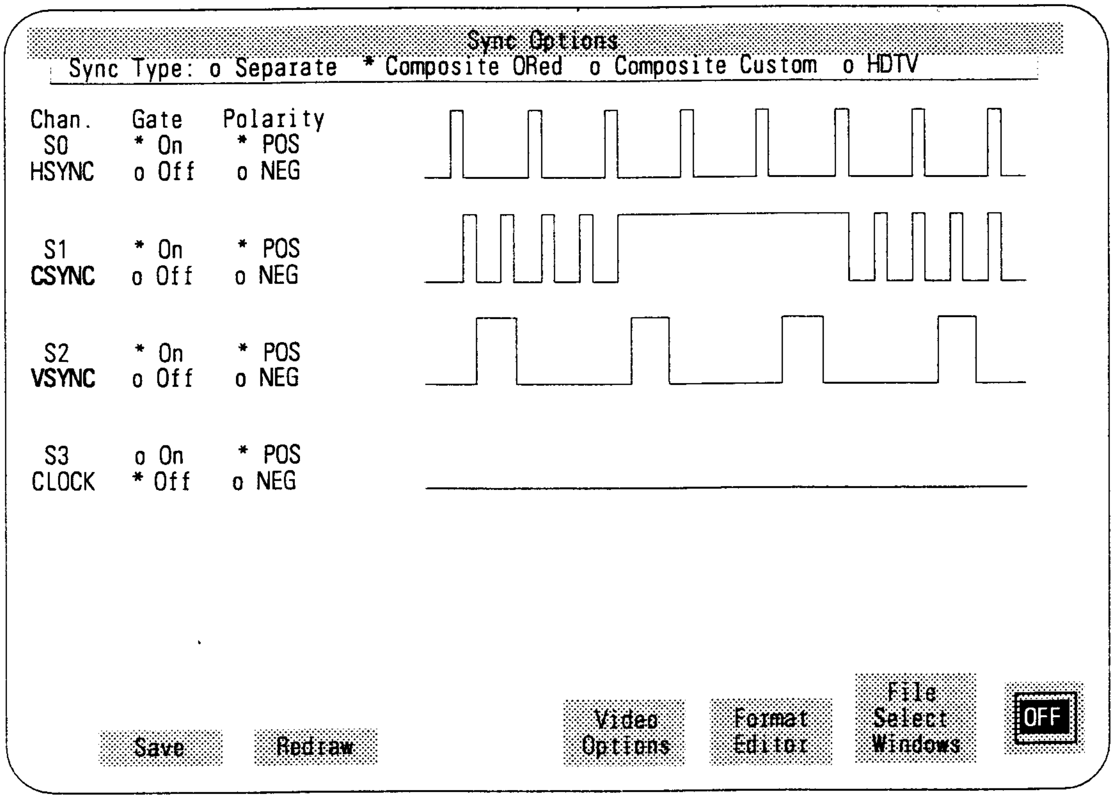
Notes

Appendix C gives additional information about sync options on the 900 Series Generator

Appendix C: Sync Options

Sync Options

The Quantum 900 Series Generator offers lots sync flexibility. It allows composite sync on either vertical or horizontal output. The figure below shows the Sync Options screen.



When either `Composite ORed` or `Composite Custom` is selected as the Sync Type, the following options are available for Channels S1 and S2. (S0 will always be horizontal sync and S3 is dependent on the model of generator. These channels can not be changed.)

S1 and S2 Options for Composite Sync Types				
Channel	**Options**			
S1	**CSYNC**	**VSYNC**	**HSYNC**	**VOID**
S2*	**CSYNC**	**VSYNC**	**HSYNC**	**VOID**

* S2 Outputs are ONLY available on the TTL connector.

When Separate is selected as the Sync Type, the following options are available for Channels S1 and S2. (S0 will always be horizontal sync and S3 is dependent on the model of generator. These channels can not be changed.)

S1 and S2 Options for Separate Sync Type			
Channel	Options		
S1	VSYNC	HSYNC	VOID
S2*	VSYNC	HSYNC	VOID

* S2 Outputs are ONLY available on the TTL connector.

To access these options for both composite and separate sync types, move the cursor to either the Gate or Polarity column. Use the arrow keys to move down to the channel you want to change and then use the LEFT arrow to move to the Channel column. Now use either the up and down arrows in the Data Entry section of the generator or the plus (+) and minus (-) keys on the keyboard to toggle to the desired option. After making the selections, press Softkey 17 to save your work.

NOTE: The SYMD command shown on the next page also can be used to select channel 1 and 2 sync options.

This appendix gives a sample test file for the 900 Series Generator

Appendix D: Sample Test File

Sample Test File

```
! Custom Test Patterns
! Created by: Quantum Data
! Released on: 03-May-93

RVAR ! Clear out any previous variables

CLRM
VIEW TESTSCREEN\
DSPT "Running Test File: " 24 12
DSPT "SAMPLEØ1.TES" R
DSPT "Custom patterns created by Quantum Data" 21 14

KDFC
KUGP
KGRP 1 22,21,20,19,18,7,8

KDEF 22 "64 Step; R G B & W;Color Bars"  CALL MULTI_BARS
KDEF 21 "4 Color;Cross;Hatch"            CALL COLOR_GRID
KDEF 20 "Solid;Red;Screen"               IMGC PURITY-R
KDEF 19 "Solid;Green;Screen"             IMGC PURITY-G
KDEF 18 "Solid;Blue;Screen"              IMGC PURITY-B
KDEF  7 "1 On 1 Off;Blk & Wht;V Stripes" CALL VERT_STRIPES
KDEF  8 "1 On 1 Off;Blk & Wht;Check'brd" CALL CHECKER
KDEF 13 "File;Select;Windows"            VIEW FILESELECT
KDEF 14 "Built-In;Standard;Patterns"     VIEW IMAGEDIR
KDEF 16 "Format;Editor"                  VIEW FORMATEDIT

SUB VERT_STRIPES ! 1 On -1 Off Vertical B&W Stripes
LUTT IMAGE
VGLW 1
IMGC V-GRILL
SUBEND
```

Continued

```
SUB CHECKER ! On - 1 Off Black and White Checkerboard
LUTT IMAGE
GCLR WHITE
LFNT MINISTIP
CHRN 65
IMGC PAGECHAR
LFNT DEFAULT
SUBEND

DVAR PENVAL Ø ! Used by DAC scaling subroutine below

SUB NUM>VAL   ! Scale a number from Ø to 63 to DAC value
UMUL PENVAL 255   ! Used by 4 x 64 bars test pattern
UADD PENVAL 32
UDIV PENVAL 63
SUBEND

DVAR PENNUM Ø ! Current pen # for LUT set-up & drawing

SUB MULTI_BARS ! 64 Bars each of Red, Green, Blue & Gray
IMGC RASTER
LUTT IMAGE
SCAL ON
UNIT 64

LOOP Ø 63 1 ! Set-up and draw Red Level Bars
UVAR PENNUM $1$
UVAL PENVAL $1$
CALL NUM>VAL
PENN (PENNUM)
ACPL Ø (PENVAL) ! Red DAC
ACPL 1 Ø        ! Green DAC
ACPL 2 Ø        ! Blue DAC
RCTC 2 1 $1$ Ø 1
LEND

LOOP Ø 63 1 ! Set-up and Green Level Bars
UVAR PENNUM $1$
UADD PENNUM 64
```

Continued

```
UVAR PENVAL $1$
CALL NUM>VAL
PENN (PENNUM)
ACPL Ø Ø          ! Red DAC
ACPL 1 Ø          ! Green DAC
ACPL 2 (PENVAL) ! Blue DAC
RCTC 2 1 $1$ 2 1
LEND

LOOP Ø 63 1 ! Set-up and draw Gray Level Bars
UVAR PENNUM $1$
UADD PENNUM 192
UVAR PENVAL $1$
CALL NUM>VAL
PENN (PENNUM)
ACPL Ø (PENVAL) ! Red DAC
ACPL 1 (PENVAL) ! Green DAC
ACPL 2 (PENVAL) ! Blue DAC
RCTC 2 1 $1$ 3 1
LEND

SCAL OFF
SUBEND

SUB COLOR_GRID  ! Multi-colored Grid
IMGC RASTER
LUTT IMAGE
OPAQ ON
SCAL ON
UNIT 4 4

BCLR WHITE
RCTC 1 1 1 1 1
RCTC 1 1 3 1 1
RCTC 1 1 1 3 1
RCTC 1 1 3 3 1
```

Continued

```
BCLR RED
RCTC 1 1 Ø Ø 1
RCTC 1 1 2 Ø 1
RCTC 1 1 Ø 2 1
RCTC 1 1 2 2 1

BCLR GREEN
RCTC 1 1 Ø 1 1
RCTC 1 1 2 1 1
RCTC 1 1 Ø 3 1
RCTC 1 1 2 3 1

BCLR BLUE
RCTC 1 1 1 Ø 1
RCTC 1 1 3 Ø 1
RCTC 1 1 1 2 1
RCTC 1 1 3 2 1

UNIT 2Ø 16
GCLR BLACK
RECT 2Ø 16 Ø Ø 1
OPAQ OFF
RECT 2Ø 16 Ø Ø Ø      ! Border
LOOP 1 19 1           ! Vert lines
LINE $1$ Ø $1$ 16
LEND
LOOP 1 15  1          ! Horiz lines
LINE Ø $1$ 2Ø $1$

LEND
SCAL OFF
OPAQ ON
SUBEND

DOUT ON ! Show outputs ON/OFF status
```

Appendix E gives information for using the GPIB (IEEE-488) option (#9013) on the 900 Series Video Generator

Appendix E: GPIB (IEEE-488)

GPIB Option (IEEE-488)

Programming the 900 Series through GPIB

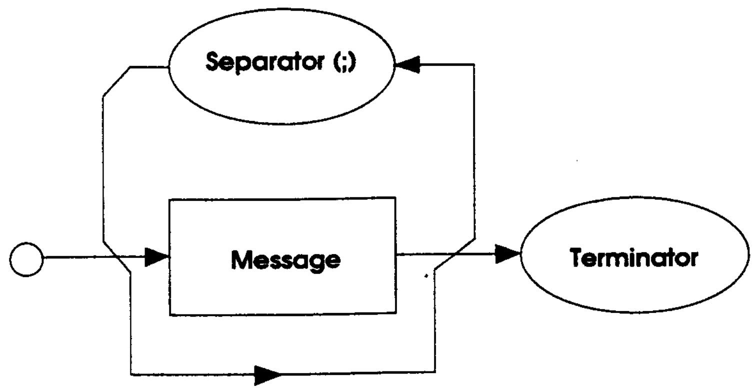
Commands are sent to the 900-series (90x) in *program messages*. A program message; consists of one or more commands separated by semicolons (;) and followed by a *program message terminator*. A program message terminator is the NL character (ASCII 10), or EOI sent with the last byte of the program message. The 90x will not parse any command until a program message terminator is received. Therefore, a program message cannot be longer than 255 characters including terminator.

Input Buffer

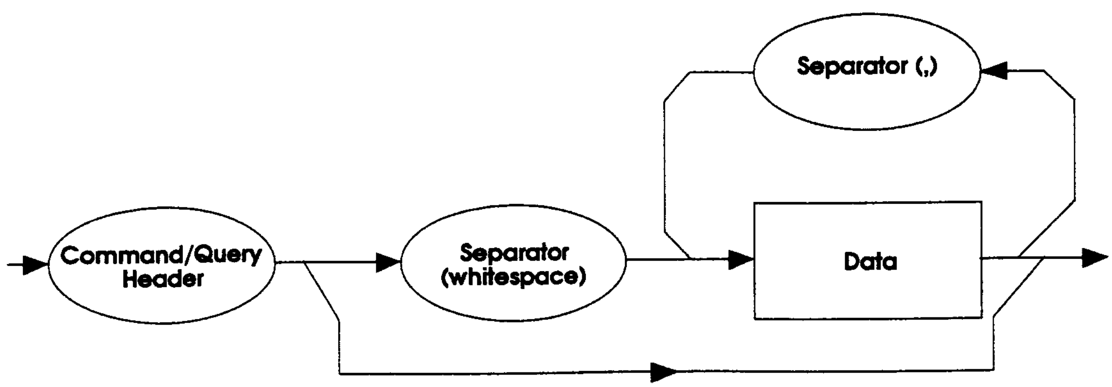
All commands are executed sequentially; i.e., when a command is parsed it is allowed to finish execution before the next command is parsed. Since some commands take longer than others to execute, the 90x has an input buffer. This input buffer is 255 characters long and can be written to by the controller while the 90x is busy with previous messages. If the input buffer becomes full, the 90x holds off the controller until there is room in the buffer.

Message Syntax

Program messages are sent to the 90x using four-character ASCII upper/lower case headers. These headers can be either commands or queries. Commands are messages which do not require a response from the 90x. Queries are messages which cause the 90x to respond with the required data.



Program Message Syntax



Message Unit Syntax

Commands

Command headers instruct the 90x to set a parameter to the value given or to perform some function not requiring additional data. Commands which have an asterisk (*) as their first character are *common commands;* as defined by the 488.2 standard and generally operate the same in all instruments. (See the command glossary for descriptions of each common command.)

Command headers which do **not** require any additional data from the controller are self-contained and should be followed by either a message separator (;) or a message terminator. Any other characters (except whitespace characters) causes a command error.

Command headers which require numeric data should be followed by at least one separator character (whitespace) before the data. Numeric data sent with a command is in decimal format. Numeric data can be represented in one of three formats; integer, floating point, or scaled floating point. The three formats shown below all represent the number 42.

```
Integer               42
Floating Point        42.00
Scaled Floating Point 4.200E+01
```

Queries

Queries are comprised of a header followed immediately by a question mark (?). A command error results if there are any characters between the query header and the question mark (including a whitespace). On completion, queries return a response message. This message is comprised of the requested data terminated with an NL (ASCII 10) character. For example, the following text would be returned in response to the LNRT? (line rate query) message:

```
3.1500E+04<NL>
```

Note that the LNRT? query returns its parameter in exponential form. Possible returned parameter forms are integer, exponential, and string. The response form of each message that can be queried is shown in the command glossary.

```
Integer form:        3965
Exponential form:    +3.965E+03
String form:         "A string"
```

Output Queue

When a query is executed, the resulting response message is placed in an *output queue* where it can be read by the controller. The 90x has an output queue that is 255 bytes long. When a message is present in the output buffer, the MAV (message available) bit in the Status Byte register is set. This varies slightly from the 488.2 standard in that the MAV bit only is set when at least one complete response message is present in the output queue. A complete response message consists of response message text and a message terminator (NL).

Buffer Deadlock

Buffer deadlock occurs when the 90x tries to put a response message in the output queue when the output queue is full. Then the controller is held off while sending a new message because the input buffer is full. If deadlock occurs, the 90x will clear its output queue, set the query error (QYE) bit in the Event Status register, and proceed to parse incoming messages. If additional queries are requested while in deadlock, those response messages will be discarded.

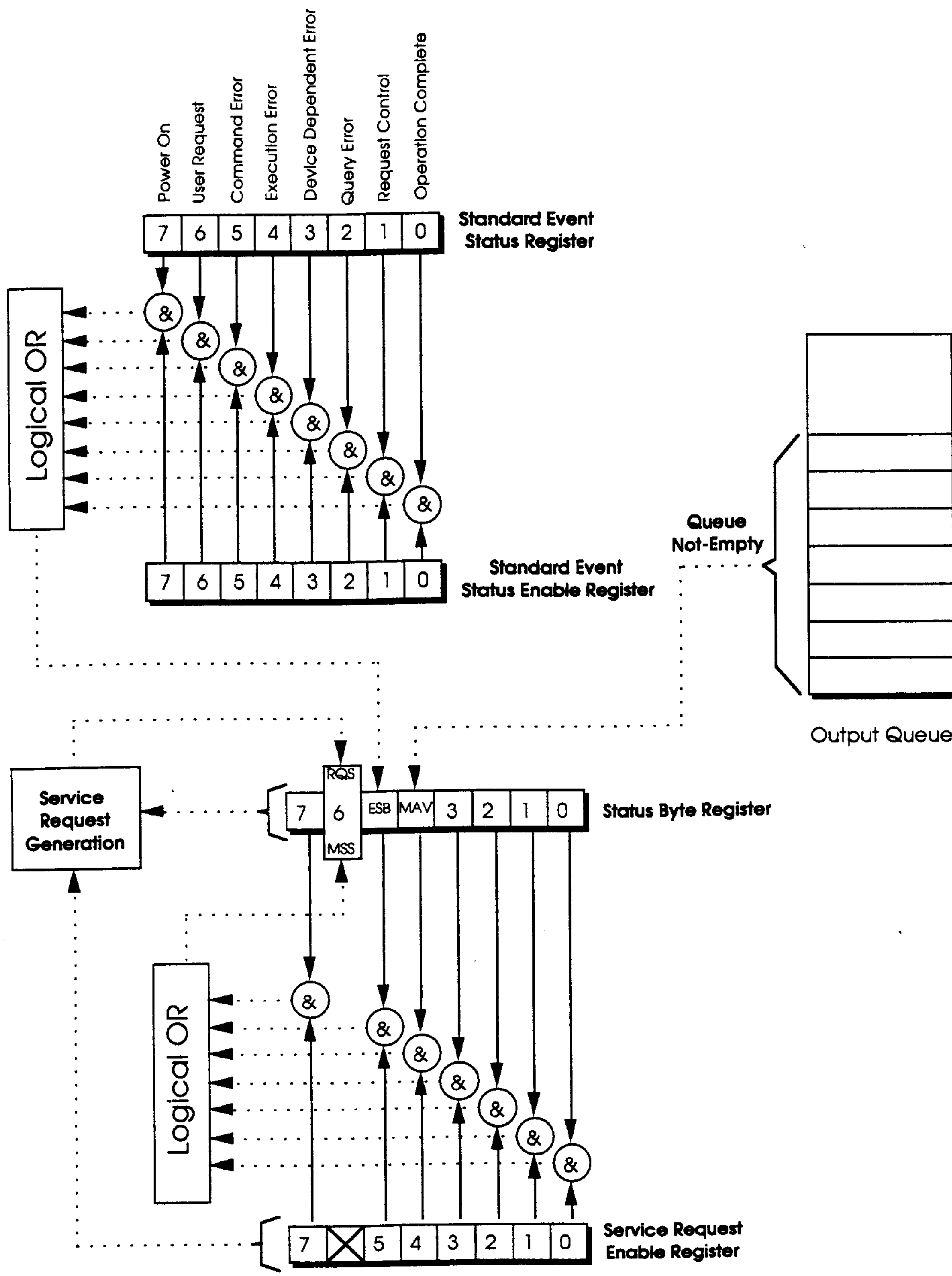
The 90x clears the buffer deadlock when it finishes parsing the current command/query. The QYE bit remains set until read with the *ESR? query or cleared with the *CLS common command.

The Status Byte

The Status Byte used by the 90x is the same as that defined by the 488.2 standard and does not use any other bits of the Status Byte. The Status Byte is one part of a complete status reporting system shown in the figure on the next page. The Status Byte is read by using the serial poll feature of your controller.

Requesting Service

The GPIB gives a method for any device to interrupt the controller-in-charge and request servicing of a condition. This service request function is handled with the Status Byte. When the RQS bit of the Status Byte is true, the 90x is requesting service from the controller. There are many conditions which may cause the 90x to induce a service request. For more information about setting up these conditions, see the *SRE common command description.



Status Reporting

Status Byte Bit Definitions

MAV Message available. Indicates that at least one complete response is present in the output buffer.

ESB Event status bit. Indicates that one of the enabled conditions in the Standard Event Status register is set.

MSS Master summary status. Indicates that the 90x has a reason for requesting service.

RQS Request service. This bit is read only by executing a serial poll of the 90x.

Event Status Bit Definitions

OPC Operation complete. Indicates that all operations have been completed.

RQC Request control. Indicates that a device is requesting control. The 90x never requests control, so this bit is always 0.

QYE Query error. Indicates that a query request was made while the 90x was in deadlock.

DDE Device dependent error. Indicates that the 90x encountered an error executing a command.

EXE Execution error. Indicates that there was an error parsing a parameter.

CME Command error. Indicates that there was an unrecognizable command.

URQ User request. Indicates that a front panel button has been pressed or that the front panel knob has been turned.

PON Power on. Indicates that power has been turned off-and-on. This bit is always 0 in the 90x.

Remote/Local Operation

The 90x has complete remote/local operation as defined by the 488.1 standard. All four remote/local states REMS, LOCS, RWLS and LWLS are supported.

In the remote state (REMS), the 90x is under remote control and messages are processed as received. The remote with lockout state (RWLS) is entered when the controller issues the LLO (local lock out) message to the 90x. The local state (LOCS) is entered when the REN line goes false or the controller issues the GTL (go to local) message to the 90x or a front panel control is actuated.

In the remote with lockout state (RWLS), the 90x is under complete remote control and front panel controls are disabled. The RWLS state is entered when the controller issues the LLO (local lockout) message to the 90x. Front panel access is re-enabled when the controller issues the GTL (go to local) message to the 90x.

In the local state (LOCS), the 90x is under local control and all front panel controls are enabled. Any remote messages received are stored for processing when the 90x enters the remote state again. The remote state (REMS) is entered if the REN line is true and the 90x is addressed to listen.

In the local with lockout state (LWLS), the 90x is under local control and all front panel controls are enabled. Any remote messages received are stored for processing when the 90x enters the remote state again. The remote with lockout state (RWLS) is entered if the 90x is addressed to listen.

Bus Commands

Bus commands ... commands which are sent to the 90x with ATN true ... are defined in the 488.1 standard. The details of operation of these commands are defined in the 488.1 and 488.2 standards. The following bus commands are supported by the 90x:

DCL Device Clear; - Clears the input buffer and output queue, and stops parsing any commands.

SDC Selected Device Clear; - Same as Device Clear.

GTL Go To Local; - Enters the local state. See the Remote/Local section.

LLO Local Lockout; - Enters the lockout state. See the Remote/Local section.

SPE Serial Poll Enable; - Enables transmission of the Status Byte.

SPD Serial Poll Disable; - Exits the serial poll state.

Common Commands

This section describes the common commands used by the 90x. Common commands are commands which begin with an asterisk (*). These commands are defined by the 488.2 standard and operate the same from instrument to instrument. The 90x supports all required common commands plus one additional command (*OPT?). Listed below are the common commands used in the 90x. (Each is discussed separately in the next section.)

*CLS
*ESE(?)
*ESR?
*IDN?
*OPC(?)
*OPT?
*RST
*SRE(?)
*STB?
*TST?
*WAI

*CLS — Clear Status

***CLS** Clear Status

The *CLS command clears the Event Status Register, the Status Byte, and the output buffer.

Command Syntax *CLS

Example *CLS

Related Commands *ESR?
*STB

*ESE — Event Status Enable

***ESE** Event Status Enable

The *ESE command sets the Event Status Enable register to the given mask value. The bits in the Event Status Enable register function as enable bits for each corresponding bit in the Event Status register. That is, when a bit in the Event Status register goes high, and the corresponding bit in the Event Status Enable register is a 1, it is enabled and will cause the ESB bit in the Status Byte register to go high.

The *ESE query returns the current value of the Event Status Enable register.

Command Syntax *ESE <mask>
<mask> = 0 - 255

Example *ESE 8

Query Syntax *ESE? Returns: <mask><NL><mask> is in integer NR1 form

Example *ESE?

Related Commands *CLS
*ESR?

*ESR? Event Status Register

***ESR?** Event Status Register

The *ESR? query returns the current value of the Event Status register. After this command is executed, the Event Status register is cleared. This is the only way of clearing any bit in the Event Status register except by the *CLS command.

Query Syntax *ESR? Returns: <register value><NL> <register value> is in integer NR1 form

Example *ESR?

Related Commands *CLS
*ESE

*IDN? Identification

***IDN?** Identification

The *IDN query returns an identification string. The string will always be:

Quantum Data Inc.,<generator>,0,<version>"

Where: <generator> is 901, 902 or 903

<version> is the software version number

Query Syntax *IDN?

Returns: <string><NL>

<string> is shown above

Example *IDN?

*OPC — Operation Complete

***OPC** — Operation Complete

The *OPC command will cause the 90x to set the OPC bit in the Event Status register when all operations have been completed. Since there are no overlapping commands, the *OPC command will set the OPC bit immediately when executed.

The *OPC query will put a "1" in the output buffer when all operations are complete.

Command Syntax — *OPC

Example — *OPC

Query Syntax — *OPC?
Returns: 1<NL>

Example — *OPC?

*OPT? — Options

***OPT?** — Options

Query Syntax — The *OPT query returns a list of options installed in the 90x. The returned option string can contain any of the following:

GPIB
NARD DISK
SERIAL
CP

Query Syntax — *OPT?
Returns: <option string><NL>
<option string> is shown above

Example — *OPT

*RST Reset

***RST**

Reset The *RST command performs a device reset. This places the 90x into a known condition. These conditions are shown below.

*Status Byte cleared
*Input queue empty
*Output queue empty

Command Syntax *RST

Example *RST

Related Commands *CLS

*SRE Service Request Enable

***SRE** Service Request Enable

The *SRE command sets the Service Request Enable register to the mask value given. The bits in the Service Request Enable register function as enable bits for each corresponding bit in the Status Byte register to enable a condition to request service from the system controller. That is, when a bit in the Status Byte register goes true, and the corresponding bit in the Service Request Enable register is also true, the 90x will request service through the GPIB.

The *SRE query returns the current value of the Service Request Enable register.

Command Syntax *SRE <mask>
<mask> = 0 - 255

Example *SRE 16

Query Syntax *SRE?

Returns: <mask><NL>
<mask> is in integer NR1 form

Example *SRE?

Related Commands *STB
*ESE

*STB? Status Byte

***STB?** Status Byte

The *STB query returns the current value of the Status Byte register. The value stored in the Status Byte register is not affected by reading it.

Query Syntax *STB?

Returns: <Status Byte><NL>
<status byte> is in integer NR1 form

Example *STB?

Related Commands *SRE
*ESR
*CLS

*TST? Self-Test

***TST?** Self-Test

The *TST query causes the 90x to perform a self-test and report the results in a response message. If the self-test fails an ASCII "1" is placed in the output buffer, otherwise an ASCII "0" is placed in the output buffer.

Query Syntax *TST?

Returns: <result><NL>
<result> is in integer NR1 form

Example *TST?

*WAI Wait

***WAI** Wait

The *WAI command is used to synchronize the controller with a device using overlapping commands. Since the 90x executes commands sequentially, the *WAI command has no effect.

Command Syntax *WAI

Example *WAI

Related Commands *OPC

Notes

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