User Manual

Tektronix

TTiP
TDS Telecommunication
Templates & i-Pattern Software

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Please check for change information at the rear of this manual.

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Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

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E200000	Tektronix United Kingdom, Ltd., London
J300000	Sony/Tektronix, Japan
H700000	Tektronix Holland, NV, Heerenveen, The Netherlands

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Preface

The TDS Telecommunication Templates & i-Pattern Software package consists of this User manual and two 3 1/2 inch disks (Disk 1 and Disk 2). The disks contain the templates & setups and i-Pattern software (with masks).

Disk 1 is to be used with a Tektronix TDS series oscilloscope with disk drive. This disk contains only telecommunication templates and setups.

Disk 2 is to be installed in your personal computer. This disk contains the telecommunication templates and setups plus the i-Pattern software with masks.

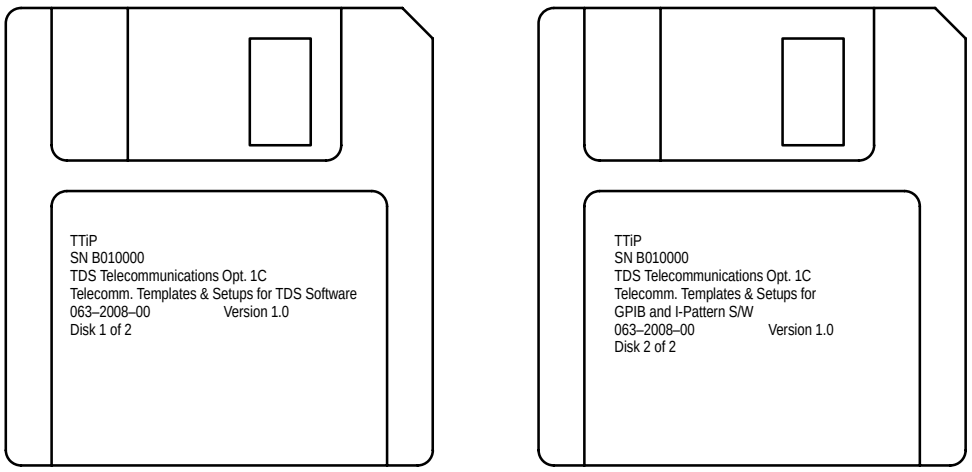

Figure i: Two 3 1/2 inch Disks are Included

This manual describes the use of both disks and the information contained on them.

Chapter 1, Getting Started, provides information about instrument requirements, personal computer requirements, and software installation.

Chapter 2, Operating Basics, provides information about using the templates and setups and the i-Pattern software.

Chapter 3, Reference, provides examples of the available telecommunication templates and i-Pattern masks.

The Appendices provide GPIB communication information. This includes GPIB configuration information, the template setup commands, and error messages that may be received.

Getting Started

Getting Started

The TDS Telecommunications package is a software application for use with a Tektronix TDS series oscilloscope and a personal computer.

The software package provides the user with the capability of comparing various telecommunication signals against telecommunication templates. Signals are acquired with the oscilloscope and compared against a selected template displayed on the oscilloscope. All templates provided conform to ANSI and CCITT standards.

In addition, the software package provides the user with the capability of displaying waveforms, acquired with the oscilloscope, on the screen of an IBM-PC/AT or compatible computer. The waveforms displayed on the PC can then be compared against i-Pattern masks.

Although related, these applications are separate in test objectives and operation and are discussed individually.

Two 3 1/2 inch floppy disks are provided with the TDS Telecommunications package to perform template comparison and i-Pattern comparison.

- Disk 1 is used with a TDS 500A or TDS 600A Series oscilloscope disk drive unit. This disk contains 27 template files and setup files (for control settings) for each template.
- Disk 2 is intended to be installed in an IBM-PC/AT or compatible computer. This disk contains the 27 templates and setup files, i-Pattern software, and nine i-Pattern masks.

  Your personal computer is connected to a TDS 400, TDS 500A, or TDS 600A Series oscilloscope via the GPIB interface.

System Requirements

The supplied software contains templates, setups, and utility programs that support both template and i-Pattern comparisons. The requirements for both types of testing is described here.

Template Testing

Template testing is performed by displaying a selected template on a TDS series oscilloscope screen, then acquiring the signal to be tested.

A TDS series oscilloscope with disk drive is all that is needed to perform Template Testing.

TDS series oscilloscopes without disk drive can also be used when connected to an IBM-PC/AT or compatible computer via the GPIB interface.

The computer requirements are:

- an IBM-PC/AT or compatible controller platform with a National Instruments GPIB interface card, PGIB-PC, GPIB-PC2, GPIB-PC2A, MC-GPIB, AT-GPIB, or GPIB PCIII installed
- a 3 1/2 inch high density floppy disk drive

i-Pattern Testing

i-Pattern testing is performed by displaying the i-Pattern mask on your personal computer, then acquiring the test signal with the oscilloscope and sending the acquired waveform to the computer via the GPIB interface.

The computer requirements are:

- an IBM-PC/AT or compatible controller platform with a National Instruments GPIB interface card, GPIB-PC, GPIB-PC2, GPIB-PC2A, MC-GPIB, AT-GPIB, or GPIB PCIII installed installed
- a 3 1/2 inch high density floppy disk drive

Software Installation

Software installation is dependant on what type of testing you want to perform and if your TDS series oscilloscope has disk drive. Both methods are discussed below.

Template Testing (Disk 1)

Disk 1 is intended for use with TDS series oscilloscopes with disk drive. Simply insert the Telecommunications Software disk into the disk drive. Once inserted, all waveform template files and instrument setup files are available. Refer to your instrument's User manual for instructions on accessing disk files.

Template Testing and i-Pattern Testing (Disk 2)

Disk 2 is intended for use with an IBM-PC/AT or compatible computer connected to your TDS series oscilloscope via the GPIB interface.

Installation of the templates and i-Pattern software is quick and easy. All the program files can be copied to a hard disk computer or a floppy disk computer with a few simple commands.

Hard Disk Computers: To install the templates and i-Pattern software onto a hard-disk:

1. After booting the PC, create a directory on the hard-disk for the telecommunication software by entering:

   ```
   MD TELECOMM
   ```

   You can use a different directory name if you wish.

2. Place the telecommunications software disk (Disk 2) into the A: drive. Then enter:

   ```
   XCOPY A:\ \TELECOMM /s
   ```

This command copies the files and directories for the templates and i-Pattern software.

Installation of the software is now complete.

Floppy Disk Computer: If you use a floppy-disk based system, you should make a copy of the Telecommunciations Software disk for normal use. This eliminates the possibility of damaging your master disk and allows the master disk to be a permanent back-up.

To copy the templates and i-Pattern software onto a floppy disk:

1. After booting the PC, insert a blank, formatted floppy disk into the B: drive.
2. Place the Telecommunications Software disk (Disk 2) in the A: drive and enter:

```
DISKCOPY A: B:
```

This copies the Templates and i-Pattern program and sample files onto the floppy disk in the B: drive.

Installation of the software is now complete.

Hardware Installation

Hardware installation is necessary for using the i-Pattern software or performing Template testing using a TDS series oscilloscope via the GPIB interface.

The TDS Telecommunications Software can communicate with TDS 400, TDS 500A, and TDS 600A Series oscilloscopes through a standard GPIB interface. Install the GPIB board in your computer according to the manufacturer's instructions and safety precautions.

Turn off your computer and the oscilloscope, then install the GPIB cable between the GPIB connector in your computer and the GPIB connector at the rear of the oscilloscope. For proper operation, the system requires the following conventions when you use the GPIB interface:

- Check the specification for the number of devices for your specific GPIB interface. If you have other GPIB-configured

devices connected to your system, do not exceed the recommended maximum number of devices on the bus.

- Assign a unique address to each device.
- Connect one device for each 2 meters (6 feet) of cable.
- Do not exceed 20 meters (65 feet) total cable length.
- Connect the network devices in a star or linear configuration rather than in a loop or parallel configuration.

Operating Basics

Operating Basics

This chapter includes discussions of using the telecommunication templates and the i-Pattern software with masks.

The 27 telecommunication templates represent CCITT and ANSI standards. An exact match is not guaranteed.

The 27 telecommunication setup files provide a base of instrument settings. Some adjustments may be necessary to match the acquired signal to the template.

***NOTE**. Sending a setup file to the oscilloscope replaces the existing control settings. Before sending any setup files, save your current instrument settings to a Setup memory location if you wish to recall it at a later time.*

Using the TDS Telecommunication Templates

This section provides procedures that describe how to use the TDS telecommunication templates. These include:

- Connecting the Signal
- Displaying the Template
- Adjusting the Control Settings

The procedures assume that you are familiar with the operation of your TDS oscilloscope and your personal computer if you are using one.

If communicating with a TDS series oscilloscope using your personal computer, read Chapter 1, Getting Started. Chapter 1 provides you with information for computer compatibility, how to install the software, and establish communication with the instrument via the GPIB interface.

Connecting the Signal

Telecommunication signals typically have three types of outputs that need to be connected to the input of the oscilloscope. The steps that follow provide you with examples of how to connect the three most common: coaxial, twisted pair, and optical.

Coaxial Some telecommunication signals use coaxial cables. These are easily connected to the BNC input connectors of the oscilloscope. Always use the proper termination between the input connector and the coaxial cable. The termination must match the impedance of the telecommunication signal line, such as 50 Ω, 75 Ω, or 110 Ω.

Twisted Pair

Some telecommunication signals use cables called a twisted pair. These are more difficult to connect to the input of the oscilloscope since they don't have an interface to a BNC connector.

Use the following steps to convert a twisted pair cable and connect it to the oscilloscope. Use Figure 2–1 as a guide while performing the following steps. This procedure uses the TEKTRONIX P6046 Differential Probe.

1. Obtain a twisted pair cable and cut the existing connector off if one exists.
2. Trim the outside cover back to expose the inner three wires.
3. Obtain a resistor of the proper value (signal line impedance) and solder it between the two signal conductors (not ground).

***NOTE**. The proper resistor value is one that matches the impedance of the telecommunication signal line.*

4. Connect the two output signal lines to a differential probe such as the TEKTRONIX P6046 Differential Probe (see Figure 2–1).
5. Connect the differential probe to CH 1 of the TDS series oscilloscope.

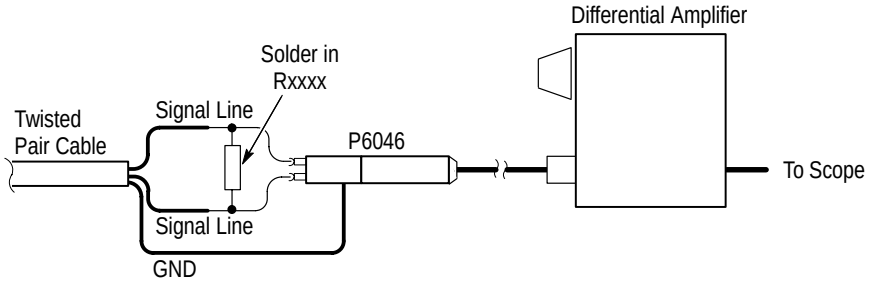

Figure 2–1: Twisted Pair Cable Connection with a P6046 Differential Probe

Optical

Some telecommunication signals use optical cables. These are easily connected to the BNC input connectors of the oscilloscope using a Tektronix optical-to-electrical converter, such as the TEKTRONIX P6703A.

Displaying the Template

Use the following procedures to display the desired template and use the supplied files to set the controls of the oscilloscope to a base starting point.

Two methods exist for using the templates and setup files: using Disk 1 in a TDS series oscilloscope disk drive or using Disk 2 in your PC and communicating with a TDS series oscilloscope via the GPIB.

Both methods provide you with the same templates and setups. The procedures only describe the use of the disks and the information contained on them.

TDS Series Oscilloscopes With Disk Drive

The following applies to TDS series oscilloscopes with disk drive. If your oscilloscope does not have a disk drive, skip to the "Oscilloscopes Using a Personal Computer" section beginning on page 2–8.

1. Insert the TDS Telecommunications disk (Disk 1) into the disk drive of the oscilloscope.
2. Press the Save/Recall Waveform button (TDS series oscilloscopes) to display the directories of available TDS series oscilloscopes as shown in Figure 2–2.

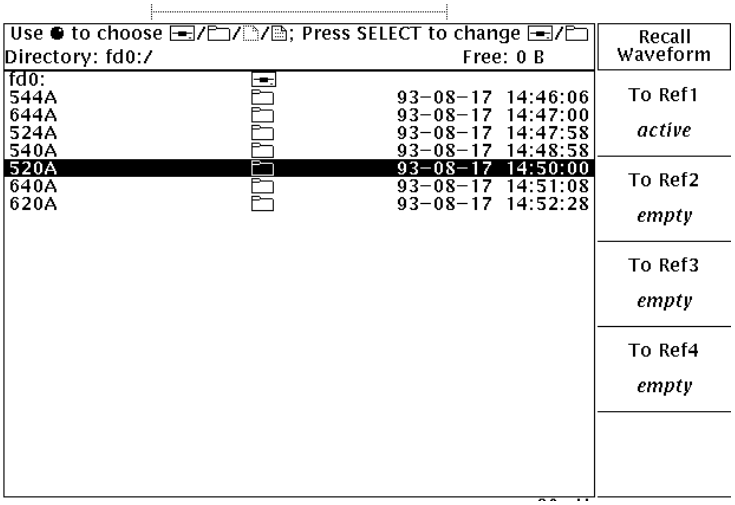

Figure 2–2: Disk 1 Instrument Directory

3. Select the instrument directory by scrolling through the selections using the general purpose knob. Press the Select button to display the contents of the instrument directory. Figure 2–3 shows a partial TDS 520 directory.
4. Scroll through the Template files using the general purpose knob and save the desired template to Reference memory location 1.

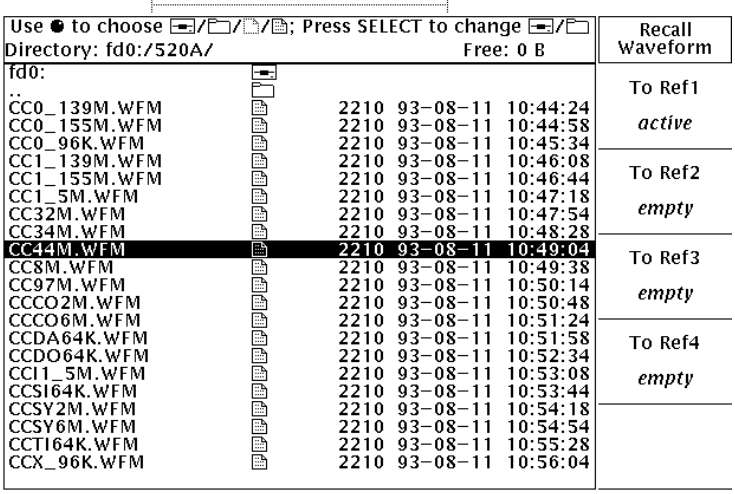

Figure 2–3: Template Directory (Partial)

5. Press the Save/Recall Setup button (TDS series oscilloscopes) to display the directories of TDS series oscilloscopes. See Figure 2–2.

***NOTE**. Sending a setup file to the oscilloscope replaces the existing control settings. Before sending any setup files, save your current instrument settings to a Setup memory location if you wish to recall it at a later time.*

6. Select the proper instrument directory. Then, select the setup file (matching the selected template file). See Figure 2–4 for an example of the TDS 520A Setup directory.
7. Load the setup file by pressing the Recall From Selected File menu button.

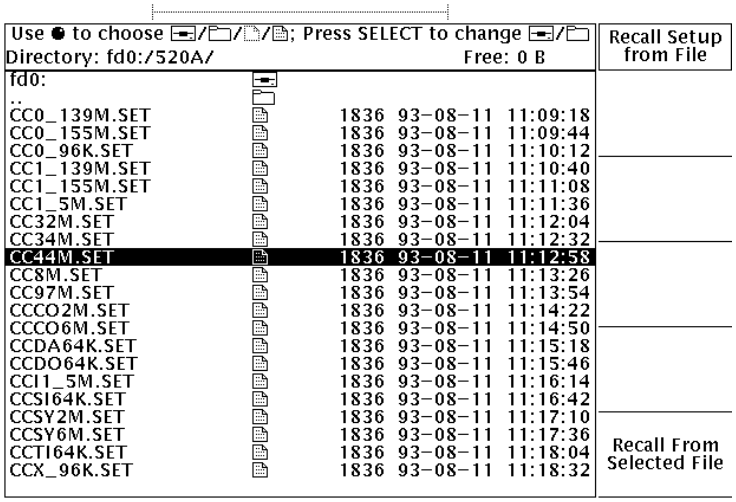

Figure 2–4: Instrument Setup Directory (Partial)

NOTE. *A setup file exists for each Template (waveform) file. Template files end with a .WFM to indicate these are templates. Setup files end with a .SET to indicate these files change the instrument control settings. Always use matching Template and Setup files.*

The oscilloscope now displays a template (REF1 displayed) and the instrument control settings have been modified.

If the signal and template do not align, see “Adjust the Control Settings” beginning on page 2–10.

Oscilloscopes Using a Personal Computer

Use the following steps for using the telecommunication templates with your personal computer. The TDS series oscilloscope is accessed via the GPIB interface.

1. Set the GPIB address of the oscilloscope to 1.

2. Insert the TDS Telecommunications disk (Disk 2) into the PC disk drive and copy all files to your hard disk as described in Chapter 1, Getting Started.
3. With your PC, access the Telecomm/Template directory and list its contents. A list of TDS series oscilloscopes is displayed.
4. Select the proper instrument directory and display its contents.
5. Download the desired template (filename.ENV) to the oscilloscope using the following syntax:

```
LOAD filename.ENV<enter>
```

NOTE. *The Load command is provided for your convenience and to be used with the recommended GPIB configuration. If you are using any other configuration, the Load command may not work.*

NOTE. *The next step sends new control settings to the oscilloscope. Sending a setup file replaces the existing control settings. Before sending any setup files, save your current instrument settings to a Setup memory location if you wish to recall it at a later time.*

6. Download the desired Setup (filename.SET) to the oscilloscope using the following syntax:

```
LOAD filename.SET<enter>
```

The oscilloscope now displays a template (REF1 displayed) and the instrument control settings have been modified.

Adjusting the Control Settings

Once you have displayed the template file and applied the setup file for that template, you need to further adjust the display. Depending on the type of signal interconnection, different control settings are necessary.

Use the following steps to help provide the best match of your signal to the supplied templates.

1. Align the rising edge of the acquired signal to the rising edge of the template.
2. Adjust the trigger position of the Main time base. On a TDS series oscilloscope, this menu item is displayed by pressing the Horizontal Menu front panel button. See Figure 2–5.

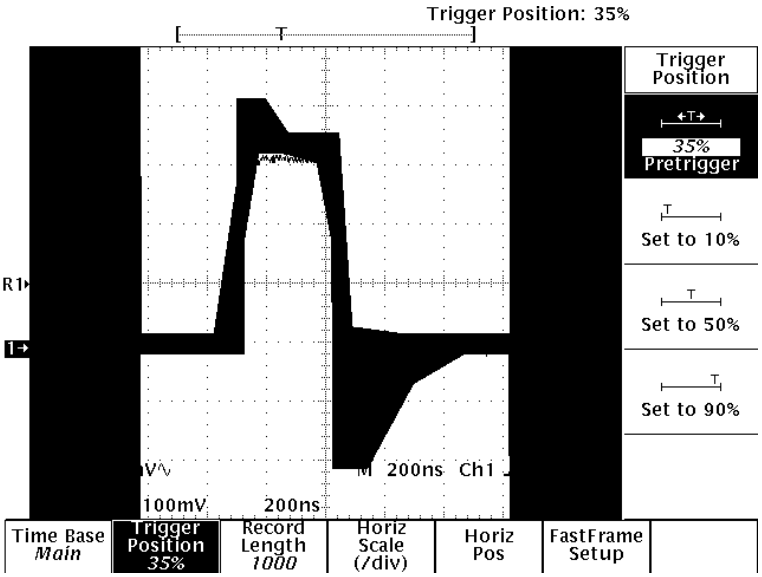

Figure 2–5: TDS Series Oscilloscope Trigger Position Menu

3. Adjust the Trigger Level to provide the best triggered display.
4. Adjust the Vertical Scale control and Position to obtain a close vertical match of the acquired signal to the template.
5. Adjust the Vertical Fine Scale to obtain the closest possible vertical match of the acquired signal to the template. On a TDS series oscilloscope, this menu item is displayed by pressing the Vertical Menu front panel button. See Figure 2–6.

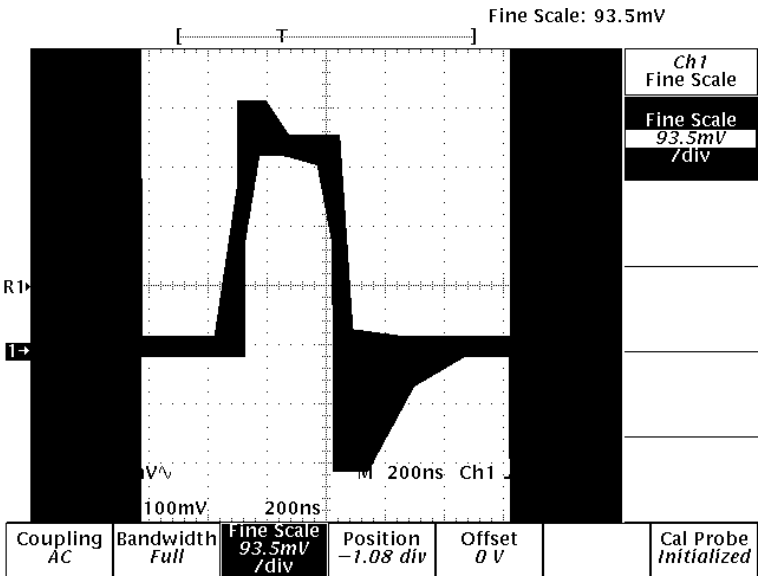

Figure 2–6: TDS Series Oscilloscope Vertical Fine Scale Menu

Limit Testing

At this time, you may want to use the Limit Test feature of TDS series oscilloscopes. The template command files initially turns the Limit Test feature off. Figure 2–7 shows the TDS series Limit Test Setup menu.

As shown in Figure 2–7, when the acquired signal first falls outside the template, that portion is horizontally positioned to center screen.

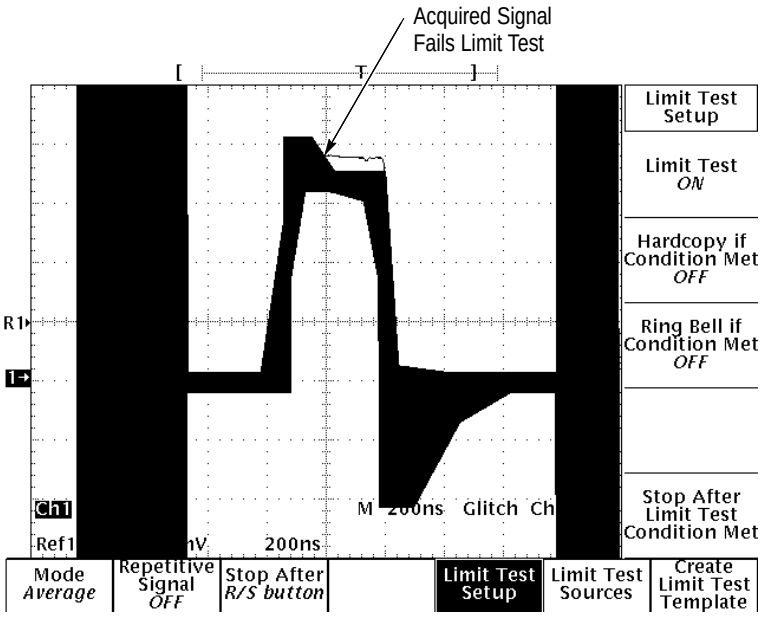

Figure 2–7: TDS Series Oscilloscope Limit Test Menu

Using the i-Pattern Software

The i-Pattern software enables you to display waveforms acquired from Tektronix Digitizing Oscilloscopes on the screen of your IBM PC or PS/2, or compatible computer.

The i-Pattern software combines the power of your oscilloscope with the flexibility of your personal computer, giving you an even more powerful and productive tool. The program's features include:

- two methods of displaying live waveforms: a "live" mode that shows waveforms exactly as they are acquired from the oscilloscope, and a 2D Spectral mode that accumulates a number of waveforms and presents them in a computer-enhanced, six-color display.
- two three-dimensional, six-color perspective views of accumulated waveforms: the Waterfall and Forestview displays.
- the ability to save accumulated waveforms to disk for later retrieval. Files are saved using a "packed" format, greatly reducing the amount of disk space needed to save a waveform file.
- on-screen statistical analysis of the voltage and time values of displayed waveforms and the ability to save the data to disk.
- an on-screen "mask" test that enables you to measure how many waveform data points fall within a selected area.
- front-panel setup files that enable you to save your oscilloscope configuration to disk.
- user control of display settings such as colors, type of monitor used, and other configuration parameters.
- a detailed help menu, and an on-screen help function for specific program commands.

In addition, drop-down menus simplify access to the program functions, eliminating the need to type commands. The available functions are always shown across the top of the screen. This enables you to concentrate on the tasks you need to perform, rather than on how to get them done.

Configuring the GPIB.COM File

For the i-Pattern program to run properly, it may be necessary for you to configure the GPIB.COM file. You can do this by using the configuration program IBCONF.EXE, which also came with your GPIB card. The i-Pattern software also contains a program called TESTBUS.EXE that can be used to perform GPIB diagnostics.

GPIB configuration information is contained in Appendix C. If the i-Pattern program does not run with your current GPIB set-up, use the information in Appendix C along with the IBCONF.EXE program to change your GPIB configuration.

Running the i-Pattern Program

The i-Pattern program is menu-driven and easy to use. This section describes how to start and end the program, and how to run the demonstration option that is included with the i-Pattern software.

If you have a Hercules graphics display card, you will have to run the MSHERC.COM program included with your software before you can run the i-Pattern program. This is done from DOS by simply typing MSHERC and pressing [Enter].

Starting the Program

Starting and ending the program is quick and easy.

From a Hard Disk. :To start the i-Pattern program from a hard disk:

1. Change to the directory containing the i-Pattern program by entering:

```
CD TELECOMM\IPATTERN
```

***NOTE**. If you chose a different name for the directory, use that name instead.*

2. Start the program (and display the Main menu) by entering:

```
IPATTERN
```

From a Floppy Disk. :To start the i-Pattern program from a floppy disk:

1. Place a bootable disk into your computer's A: drive.
2. Place the Telecommunication disk (Disk 2) in the B: drive.
3. Turn on the computer or press the [Ctrl]-[Alt]-[Del] keys simultaneously to reboot the PC.
4. Change to the B: drive by entering:

```
B:
```

5. Change to the i-pattern directory by entering:

```
CD IPATTERN
```

6. Start the program (and display the Main menu) by entering:

```
IPATTERN
```

Ending the Program

To end the i-Pattern program:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Quit command by pressing [Q], or use the up and down cursor keys to highlight `Quit` and press [Enter]. The following prompt appears:

   ```
   Are you sure?(Y)
   ```

3. Press [Y] or [Enter] to end the program. Pressing any other key aborts the Quit command.

The Demonstration Option

The i-Pattern software contains an option that gives a quick demonstration of the software's display capabilities. This demonstration loads sample waveform and mask files, and presents in succession an example 2D Spectral display (with time and voltage histograms and a mask test), three-dimensional Waterfall and Forestview displays, and a sample mask.

You can choose to run the demonstration option once, or you can make it loop indefinitely.

To run the demonstration from DOS:

1. If you're using a hard disk based computer, change to the directory containing the i-Pattern software by entering:

   ```
   CD TELECOMM\IPATTERN
   ```

NOTE. *If you chose a different name for the directory, use that name instead.*

---

2. Run the demonstration once by entering:

   ```
   IPATTERN DEMO {n}
   ```

   where {n} is the number of seconds the completed graphic displays will remain on the screen during the demonstration.

(The default value is three.) For example, if you want the completed displays to remain on the screen for 8 seconds, enter:

```
IPATTERN DEMO 8
```

***NOTE**. The first time you run the demonstration, you may want to set (n) to at least ten seconds to give you enough time to thoroughly examine each display before the next one begins.*

The computer returns to DOS when the demonstration is finished. You can pause the demonstration by pressing the left [Shift] key, and restart it by pressing the right [Shift] key. The demonstration can be exited before it finishes by pressing [Alt]-[Shift].

3. Run the demonstration indefinitely by entering:

```
IPATTERN DEMOLOOP {n}
```

The demonstration will run continuously until you stop it by pressing [Alt]-[Shift].

The HELP.BAT File

The i-Pattern software contains a short help file called HELP.BAT. This gives a short listing of the commands used to access the i-Pattern program and demonstration options. You can access this file from DOS as follows:

1. If you're using a hard disk based computer, change to the directory containing the i-Pattern software by entering:

```
CD TELECOMM\IPATTERN
```

***NOTE**. If you chose a different name for the directory, use that name instead.*

2. Print the file on your monitor by entering:

```
Help
```

You may wish to include the line HELP.BAT in your AUTOEXEC.BAT file, so that this file will automatically appear on your screen each time you boot up.

The Program Display

When the i-Pattern program starts, the Main menu is displayed (see Figure 2–8).

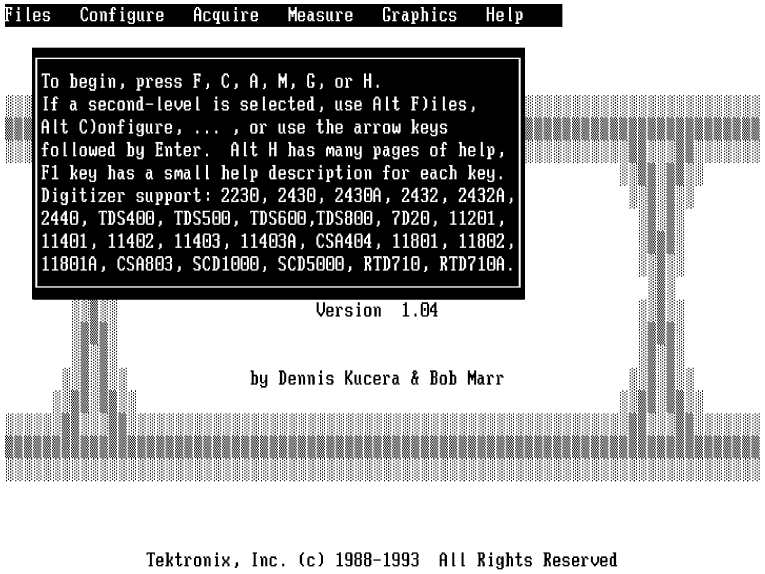

Figure 2–8: The i-Pattern Program Main Menu

The i-Pattern program uses drop-down menus to display commands. As shown in Figure 2–8, the menu names appear across the

top of the PC display. Select menus by using the cursor keys or pressing the first letter of the menu name.

Selecting Menus and Functions

When the Main menu is first displayed on starting the program, you must “drop-down” a menu by pressing the first letter of the menu name. You can then move between menus using the left and right cursor keys or by holding down [Alt] and pressing the first letter of the desired menu name.

Functions within a drop-down menu are selected by pressing the first letter or number of the function name or by highlighting the function using the cursor keys and pressing [Enter].

You can exit any menu or cancel any command simply by pressing [Esc].

The Help Menu

The i-Pattern program contains an on-line help function, as well as a detailed help menu. Both types of help are available through the Main menu.

The on-line help gives a brief explanation of specific menu commands and shows the keys used to select that command from the Main menu.

To get help on a specific command, use the cursor keys to highlight the command you want help on and press [F1].

The second kind of help consists of nine screens of explanations of the commands used in the program and is located under the Help menu.

To get the general help:

1. From the Main menu, select the Help menu by pressing [Alt]-[H] or by using the left and right cursor keys.
2. Display the first help screen by pressing [H] or [Enter].
3. Move through the help screens by pressing the space bar or by pressing the number of the page you want to move to.

4. Exit the help screens by pressing [Esc].

Making Printouts

The i-Pattern program enables you to make black and white "screen dumps" of waveforms displayed on your computer monitor. You can print any graphic waveform display.

To print a displayed waveform:

Press [Alt] -[P].

The waveform is transmitted to the printer connected to the default printer port (e.g. LPT1).

How to Configure the Program

The i-Pattern program allows you to set many program parameters to suit your preferences and achieve the best program performance with your hardware. You can select the colors used in the waveform display, how different displays are presented, how often the screen display is updated, what type of video display to use, and many other parameters.

This section explains how to set up the program using the Configure menu.

The Configure Menu

The i-Pattern program parameters are set or changed using the Configure menu, accessed from the Main menu. See Figure 2–9.

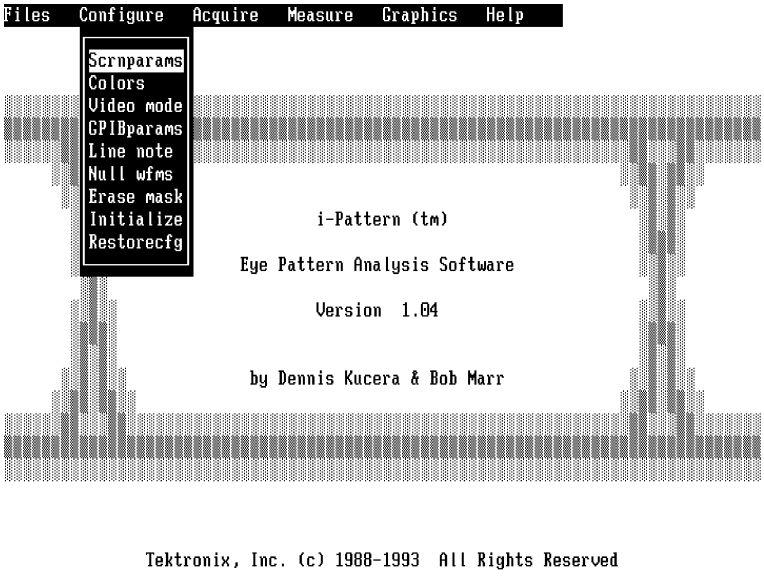

Figure 2–9: The Configure menu

To access the Configure menu from the Main menu, select the Configure menu by pressing [Alt]-[C], or by using the left and right cursor keys.

Setting the Display Parameters

The i-Pattern program has several options that enable you to control how information is displayed. For example, you can specify whether to display histograms, how often the screen is updated, and how many waveforms accumulate before stopping acquisition.

The Scrnparams Menu

Make changes to the i-Pattern program display parameters with the Screen parameters (Scrnparams) menu (Figure 2–10). Using the Scrnparams menu, you can specify:

- whether the waveform memory map is erased each time you start acquiring a waveform.
- the number of live waveforms displayed at once (variable persistence), or whether point-accumulate mode is used.
- how often the screen is updated when using the 2D Spectral display.
- the number of acquisitions.
- whether a histogram of accumulated data is displayed, and whether voltage, timing, or mask test statistics are used.
- set how often the statistics are updated
- whether a grid is shown on the waveform display.
- how a Waterfall display is presented.

To display the Scrnparams menu, enter the the Configure menu, press [S], or use the up and down cursor keys to highlight `Scrnparams` and press [Enter].

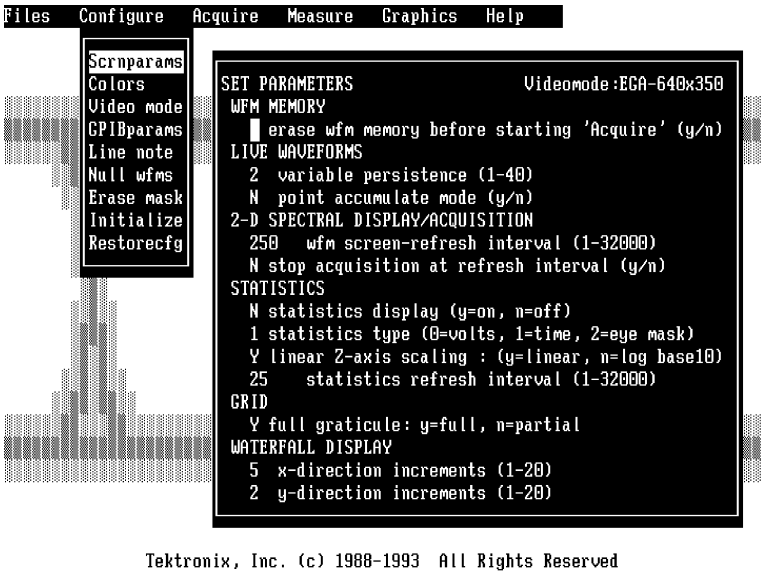

Figure 2–10: The Scrnparams menu

Changing the Waveform Memory Parameter

For the i-Pattern program to display a history of waveform acquisitions, it must store the waveforms in memory. Waveform data is accumulated in the memory as long as the waveform is being displayed acquired, either live or using the 2D Spectral format, and stops when you exit the display. Waveform data is accumulated again when live display is resumed.

The waveform memory can be cleared at any time. You can set the program so that the waveform memory is cleared whenever you begin to acquire waveforms, or only when you specifically request it.

CAUTION. *If the waveform memory is not cleared between accumulating waveforms, the new data is simply added to the old. This can enable you to gather more data on a specific waveform, but it can also lead to waveform data being accidentally "contaminated" by data from a different waveform.*

To change the memory parameter:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   N erase wfm memory before starting 'Acquire'
   (y/n)
   ```

2. Type either [Y] or [N] and press [Enter].
3. When you've made the change, press [Esc]. The following prompt will appear:

   ```
   EXIT - Save Changes?

   Yes  No  Cancel
   ```

NOTE. *Notice that **Yes** in the prompt is blinking. This indicates it is the selected response. If you press [Enter] or [Y], Yes will be taken as your response. You can select either **No** or **Cancel** by using the left and right cursor keys and pressing [Enter], or by typing the first letter of the option you want. Whichever response is blinking will be the response accepted when you press [Enter].*

4. To save the change you've made, press [Enter] or [Y]. If you don't want to save the change, press [N]. Press [C] to cancel the command and return to the Scrnparams menu.

Changing the Live Display Parameters

The i-Pattern program can display waveforms live, that is, as they are acquired. The display on your PC monitor looks like the display on the oscilloscope. See Figure 2–11.

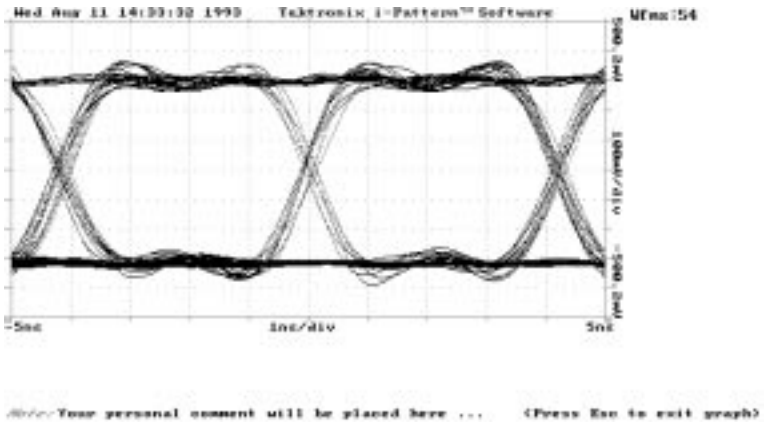

Figure 2–11: A Live Waveform Display

Changing the Number of Live Waveforms Displayed. The i-Pattern program enables you to use the live mode to observe the evolution of a waveform. You can display up to 40 sequential waveform acquisitions simultaneously. If, for example, you choose to display 15 acquisitions, the 15 most recently acquired waveforms are displayed. The "oldest" waveform is erased as each new one is acquired.

To change the number of waveforms displayed:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   2  variable persistence (1-40)
   ```

2. Type the number of waveforms you want to display (up to 40) and press [Enter].

3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

You can now view live waveforms with the new parameter in effect.

Turning the Point Accumulate Mode On or Off. The point accumulate mode enables you to see a "history" of the acquired waveforms by placing a dot at every point where a waveform point has been acquired. Data from previous acquisitions are not erased. All waveform data is stored in memory whether point accumulate is on or off.

To turn the point accumulate mode on or off:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   N point accumulate mode (y/n)
   ```

2. Type either [Y] or [N] and press [Enter].
3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

For more information on live waveforms, see "How to Acquire Waveforms" beginning on page 2–41.

Changing the 2D Spectral Display/Acquisition Parameters

In addition to displaying waveforms live, the i-Pattern program can also display accumulated waveforms in a two-dimensional color format, called the 2D Spectral display.

Changing the Screen-Refresh Interval. While the live display is constantly regenerated, the 2D Spectral display is static, and is periodically updated when a specified number of waveforms have been acquired.

The screen-refresh interval allows you to control how many waveforms (up to 32000) are accumulated before the screen is updated. Waveform acquisition is halted while the screen is being updated.

Though the 2D Spectral display is updated less often than the live display, it acquires waveforms much more rapidly.

To change the screen-refresh interval:

4. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

```
250  wfm screen-refresh interval (1-32000)
```

5. Type in the number of waveforms (up to 32000) you want accumulated before the screen display is updated, and press [Enter].

6. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

Stopping Waveform Acquisition at Screen-Refresh. In the 2D Spectral display, you can choose to stop acquisition of new waveforms when the screen-refresh interval is reached. This enables you, for example, to accumulate a predetermined number of waveforms for analysis. When the interval is reached, the computer automatically exits the 2D Spectral display and returns to the Acquire menu. This option is not available for live displays.

To specify whether waveform acquisition is halted when the screen-refresh interval is reached:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

```
N stop acquisition at refresh-interval (y/n)
```

2. Type either [Y] or [N] and press [Enter].

3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

Changing the Statistics Parameters

If you choose, the acquired waveform display can include statistical information about the waveform. This information includes a histogram of the quantity (either voltage, time, or mask test) being measured, and the mean and standard deviations of the quantity being measured. For more information on statistics

displays, see “How to Acquire Waveforms” beginning on page 2–41.

Turning the Statistics Display On and Off. To turn the statistics display on or off:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   N statistics display (y=on, n=off)
   ```

2. Type either [Y] or [N] and press [Enter].
3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you’ve made.

Changing the Type of Statistics. The i-Pattern program can generate statistical information for either the voltage or time characteristics of the acquired waveform being displayed. It can also show the number of data points that fall within any masked area of the display you specify.

To change the type of statistics generated:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   1 statistics type (0=volts, 1=time, 2=eye mask)
   ```

2. Type in the number of the kind of statistics you want, and press [Enter].
3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you’ve made.

Changing the Statistics Refresh Interval. The statistics refresh interval allows you to control how often the statistics display is updated. This is done by choosing the number of waveforms that accumulates (up to 32000) between each update.

The statistics are cumulative; that is, they are calculated for the total number of waveforms that have been accumulated, and not just for those most recently acquired. For example, if you choose a statistics refresh interval of 250, and you have accumulated 5000 waveforms, the statistics will be calculated for all 5000 waveforms, not just for the 250 last acquired.

The statistics display does not initially appear until the number of waveforms you specify have been accumulated. As with the screen-refresh, waveform acquisition is halted while the statistics display is being updated.

To set the statistics refresh interval:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   25  statistics refresh interval (1-32000)
   ```

2. Type in the number of waveforms (up to 32000) you want accumulated before the statistics display is updated, and press [Enter].

3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

The waveform memory is **not** erased after the statistics refresh interval is reached.

Choosing the Graticule Type

The i-Pattern program allows you to display waveforms with either a full or partial graticule.

To select the type of graticule:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   Y full graticule: y=full, n=partial
   ```

2. Type either [Y] or [N] and press [Enter].

3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

Choosing Scaling for the Z-Axis

The z-axis is used in timing and voltage histograms and on the three-dimensional Waterfall and Forestview displays. You can set this axis for either linear or base 10 logarithmic scaling.

To set the z-axis scale:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   Y linear Z-axis scaling: (y=linear, n=log base 10)
   ```

2. Type either [Y] or [N] and press [Enter].

3. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the change you've made.

Setting the Waterfall Display Pixel Increments

The i-Pattern program allows you to choose the number of pixels used to draw the Waterfall display. This enables you to control the resolution of the display and the speed at which it is drawn. More detailed information on the Waterfall display is given in "How to Display and Measure Stored Waveforms" beginning on page 2–41.

To change the Waterfall display pixel increments:

1. From the Scrnparams menu, use the cursor keys to move the cursor to the line:

   ```
   2 x-direction increments (1-20)
   ```

2. or

   ```
   2 y-direction increments (1-20)
   ```

3. Type in the increment value you want (up to 20), and press [Enter].

4. Press [Esc] to exit the Scrnparams menu. When the prompt appears, press [Enter] or [Y] to save the changes you've made.

Changing the Display Colors

The i-Pattern program lets you choose the colors used to display information on the screen. You can choose the colors used in 3-D shading, live waveform color, graticule and text color, histogram colors, and the colors used to distinguish between the data and the background in the Waterfall view.

Black and white shadings are preselected by the program for CGA and Hercules displays. Changing these colors is not recommended.

The Colors Menu

Use the Colors menu (located under the Configure menu) to change the display colors. See Figure 2–12.

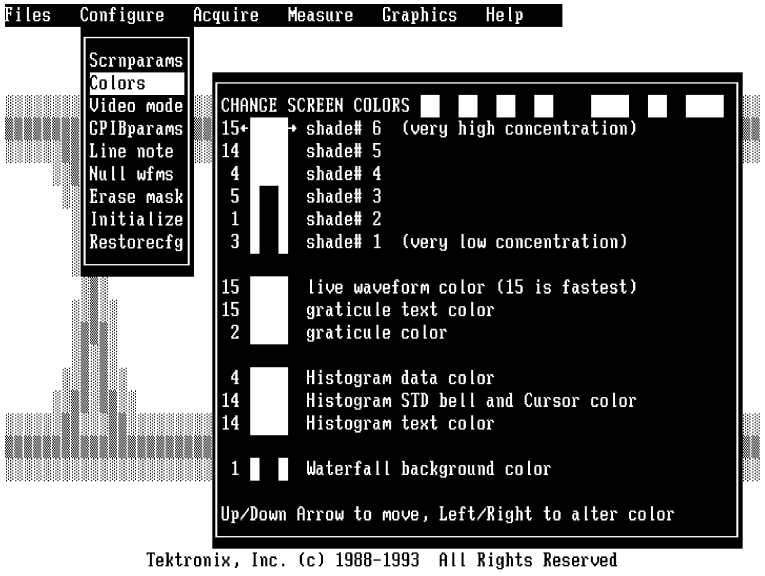

Figure 2–12: The Colors menu

The colors of the following items can be changed.

- Display shades 1-6 — These are the colors used in the 2D Spectral, Waterfall, and Forestview displays to indicate the number of times a waveform has “hit” a particular point.
- Live waveform color — The color of the waveform in live displays. The display is updated quickest if white is used.
- Graticule text color — The color of the text, next to the graticule, which displays the time per division, the relative times at the edges of the display, volts per division, and voltage levels at the top and bottom of the display.
- Graticule color — The color of the graticule itself.

- Histogram data color — The color of the histogram curve itself. The histogram, either voltage or time, appears only if turned on from the Scrnparams menu.
- Histogram standard Bell curve and cursor color — The color of the standard Bell curve distribution shown for comparison purposes, and of the histogram cursors.
- Histogram text color — The color of the histogram text.
- Waterfall background color — When a Waterfall display is presented, this color represents the data points that have a value of zero (that is, where no waveform points have fallen).

To change the colors of the display:

1. From the Configure menu, select the Colors menu by pressing [C], or use the up and down cursor keys to highlight `Colors` and press [Enter].
2. Use the up and down cursor keys to select the color item you want to change.
3. Press the left or right cursor keys to change the color of the item. The available colors are displayed immediately after the title CHANGE SCREEN COLORS, across the top of the menu.
4. When you've finished changing colors, press [Esc] to exit. When the prompt appears, press [Enter] to save the changes you've made.

Selecting the Display Driver

The i-Pattern program supports the following graphics display adapters:

- Enhanced Graphics Adapter (EGA)
- Color Graphics Adapter (CGA)
- Hercules graphics display card

In addition, most VGA adapters will support the EGA display mode.

When you first start the i-Pattern program, it determines what display adapter you're using and configures itself for that adapter. However, you can change the type of display if you wish.

The Video Mode Menu

The type of display is selected using the Video mode menu, located under the Configure menu. You can choose from the following:

- EGA 640 x 350 — the highest resolution available. Up to 16 colors can be displayed with the 256K bytes option, or up to 4 colors with the 64K bytes option.
- EGA 640 x 200 — a medium resolution color display, with 16 colors available.
- CGA 640 x 200 — a medium resolution black and white display.
- Hercules Graphics Display 720 x 348 — a high-resolution black and white display for the Hercules Display Adapter.
- EGA 640 x 350 — a high resolution monochrome display.

To select the display adapter:

1. From the Configure menu, select the Video mode menu by pressing [V], or use the up and down cursor keys to highlight `Video mode` and press [Enter].
2. Use the up and down cursor keys to select the desired display adapter, and press [Enter]. A note will appear confirming the choice you've made.

Setting the GPIB Parameters

The i-Pattern program enables you to change the addresses of the instrument controller and the oscilloscope from within the program.

The GPIBparams Menu

Changing the address of the instrument controller or the oscilloscope is performed from the GPIB parameters, or GPIBparams menu.

You can also select fast transfer mode from the GPIBparams menu.

To access the GPIBparams menu:

1. From the Configure menu, select the GPIBparams menu by pressing [G], or use the cursor keys to highlight `GPIBparams` and press [Enter].
2. Use the up and down cursor keys to select the controller, scope address, or fast transfer line.
3. Type the new address for the controller or scope, or select the fast transfer option you want.

   Entering [Y] for the fast transfer mode invokes a special transmission mode. Entering [N] causes the program to use the CURVE? query. (The 11800 scope always uses the CURVE? query.)
4. After entering the new address, press [Esc] to exit the GPIBparams menu. When the prompt appears, press [Enter] to save the changes you've made.

The Line Note

At the bottom of all waveform displays there is a comment line that you can change for documentation purposes. The text of the line is changed with the Line note command.

To change the text of the comment line:

1. From the Configure menu, select the Line note command by pressing [L], or use the up and down cursor keys to highlight `Line note` and press [Enter]. The following prompt appears:

```
Your personal comment will be placed here.
(Press Esc to exit graph)
```

2. Type in your comment.

   Initially, what you type will write over the text already in the prompt. To insert new text without typing over existing text, press [Ins]. The cursor changes color to indicate the different editing mode. In addition to the left and right cursor keys, the following keys can be used to edit the text:

   - [Home] — moves the cursor to the left end of the line
   - [End] — moves the cursor to the right end of the line
   - [Ins] — toggles between overstrike and insert mode
   - [Del] — removes the character under the cursor
   - [*f*] — removes the character immediately to the left of the cursor
   - [Ctrl]-[End] — removes all characters from the cursor to the end of the line

3. When you've finished typing your comment, press [Enter] to save your note. Pressing [Esc] ignores all changes to the note and exits the Line note command.

Clearing the Waveform Memory

Sometimes you may wish to clear the data used in the waveform memory so that all measurements are based on new data. The i-Pattern program enables you to do this without restarting the program.

CAUTION. *Once the waveform memory has been cleared, the data cannot be recovered. Be sure you are finished with the waveform data before you clear the memory.*

To clear the waveform memory:

1. From the Configure menu, select the Null waveforms command by pressing [N], or use the up and down cursor keys to highlight `Null wfms` and press [Enter]. The following prompt will appear:

   ```
   Are you sure? Y/N
   ```

2. Clear all waveforms from memory by typing [Y]. A note appears when the memory has been cleared.

Pressing any other key aborts the command, and a prompt appears stating that the memory was not cleared.

The i-Pattern program can be set to automatically erase the waveform memory whenever waveform acquisition begins. This is done using the Scrnparams menu, located under the Configure menu.

Clearing the Mask Memory

You may also wish to clear from memory all waveform masks that you generated or loaded from a file. More information on masks is found in "How to Display and Measure Stored Waveforms" beginning on page 2–41.

CAUTION. *As with the waveform memory, once the mask memory has been cleared, the masks stored in it cannot be recovered.*

To clear the mask memory:

1. From the Configure menu, select the Erase mask command by pressing [E], or use the up and down cursor keys to highlight `Erase mask` and press [Enter]. The following prompt appears:

   ```
   Are you sure? Y/N
   ```

2. Clear all masks from memory by typing [Y]. The following note appears:

```
All masks erased.
```

Pressing [Esc] or [N] aborts the command, and a note appears stating that the memory was not cleared.

Resetting Your Program Configuration

The i-Pattern program allows you to reset your entire program configuration at once using either the Initialize or the Restorecfg command.

The Initialize Command

The Initialize command automatically resets the program configuration to factory default settings. It also clears all waveforms and masks from memory.

CAUTION. *Any waveforms or masks stored in memory, or configuration changes made since starting the program are permanently erased by the Initialize command.*

To initialize your program:

1. From the Configure menu, select the Initialize command by pressing [I], or use the up and down cursor keys to highlight `Initialize` and press [Enter]. The following prompt appears:

```
Are you sure? Y/N
```

2. Initialize your program by typing [Y]. The following note appears:

```
Factory initialization complete (use Restorecfg
to undo).
```

Pressing any other key aborts the command, and a note appears stating that the program was not initialized.

After initializing the program, you can restore it to the configuration it had when you started IPATTERN.EXE by using the Restorecfg command.

The Restorecfg Command

The Restorecfg command returns your program to the configuration it had when you started IPATTERN.EXE. This allows you to undo any changes you may have made since you started the program.

To restore your program configuration, select the Restorecfg command from the Configure menu by pressing [R], or use the up and down cursor keys to highlight `Restorecfg` and press [Enter]. The following note appears:

```
Previous configuration (iPattern.CFG) is
restored.
```

CAUTION. *This command does not ask for confirmation before executing. Be sure you want to restore your configuration before you select the command. Any recent configuration changes you have made will be lost.*

Saving Your Program Configuration

The i-Pattern program enables you to automatically save your custom configuration to disk when you exit the program. This saves you from having to re-configure every time you use the program. You can also choose not to automatically save your configurations.

To choose whether the program will save your configuration:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.

2. Select the Configflag menu by pressing [C], or use the up and down cursor keys to highlight `Configflag` and press [Enter].
3. Use the up and down cursor keys to select whether your configurations will be automatically saved when you exit the program, and press [Enter]. A note appears confirming your selection.

Saving Your Oscilloscope Configuration

In viewing a waveform, you will probably adjust your oscilloscope settings to achieve the best results for that particular waveform. When you wish to view that waveform again, you may not remember exactly which oscilloscope settings you previously used. The i-Pattern program can save the front-panel configuration of your oscilloscope to a file, enabling you to easily reconstruct a particular oscilloscope set-up.

To save your oscilloscope configuration:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Write file option by pressing [W], or use the up and down cursor keys to highlight `Write file` and press [Enter].
3. Select the Front panel option by pressing [F], or use the up and down cursor keys to highlight `Frontpanel` and press [Enter]. The following prompt appears:

   ```
   Write: Enter file name
   ```

4. Type in the name you wish to give your front-panel settings file, and press [Enter]. Do not use an extension on the file name (for example, .WFM) or an error will occur. A note will appear when the file has been written to disk.

For more information about saving files, see “How To Save and Retrieve Waveforms” beginning on page 2–47.

Retrieving an Oscilloscope Configuration

To retrieve an oscilloscope settings file, your oscilloscope must be turned on.

To retrieve an oscilloscope settings file from disk:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Read file menu by pressing [R], or use the up and down cursor keys to highlight `Read file` and press [Enter].
3. Select the Front panel menu by pressing [F], or use the up and down cursor keys to highlight `Frontpanel` and press [Enter].

   The i-Pattern software includes three sample front-panel settings files. These files are named 11400SET.SET, 2432SET.SET, and FG5010A.SET, and appear under the Frontpanel menu.
4. Use the up and down cursor keys to select the front-panel settings file you want, and press [Enter]. A note appears when the file has been loaded.

Your oscilloscope is now configured according to the front-panel settings file specifications.

How to Acquire Waveforms

The i-Pattern program enables you to display live waveforms on your PC screen in one of two ways. You can display waveforms live, as they occur, or you can acquire a number of waveforms and show the resulting accumulated waveform using a 2D Spectral display.

Waveform data is added to the waveform memory only while the waveform is being displayed, either live or with the 2D Spectral display. As soon as you press [Esc] to exit the display, data

accumulation stops, and the accumulated waveform memory is "frozen" at that point.

The i-Pattern program also enables you to show statistical information along with the live waveform being displayed. This is done by turning the statistics display on using the Scrnparams menu, located under the Configure menu, or by using "hot" function keys as described below.

The statistical information is presented as a histogram of the quantity (either voltage or time) being measured. For comparison, the histogram also contains a standardized Bell curve showing the quantity mean and standard deviations.

If base 10 logarithmic scaling is used for the z-axis, the Bell curve is omitted. Also, if the mean value of the histogram data curve is not within 20% of the histogram curve's peak value, no Bell curve is shown.

The statistics display also includes text specifying the mean, peak-to-peak, and standard deviation values of the histogram curve, the current coordinates of the histogram cursors, and the total number of waveform data point hits within the rectangle defined by the histogram cursors.

In addition, masks can be displayed against the live waveform, and the number of data points falling within the masked areas displayed.

Displaying Live Waveforms

The i-Pattern program enables you to use your computer screen to display live waveforms exactly as they are acquired from the oscilloscope. This single-color display uses your computer monitor much as if it were an oscilloscope screen, but with several added functions. An example of this type of display is shown in Figure 2–11 on page 2–25.

You can also take statistical measurements of the waveform in this mode.

To display a live waveform:

1. From the Main menu, select the Acquire menu by pressing [Alt]-[A], or by using the left and right cursor keys. The Acquire menu appears with `Live wfms` highlighted.
2. Display a live waveform by pressing [L] or [Enter].

***NOTE**. Your computer screen now shows a live waveform exactly as it is acquired.*

3. Exit the display by pressing [Esc]. When you do this, waveform data is no longer accumulated, and the waveform memory is frozen at this instant.

Exiting the display returns you to the Acquire menu.

Displaying Accumulated Waveforms

The i-Pattern program also enables you to accumulate waveforms and display them in a 2D Spectral format. This format provides you with a computer-enhanced image of the waveform, and uses different colors to show the varying time and voltage values of the waveform. Each pixel of the computer-generated image is colored according to the number of times a waveform has hit that particular pixel. See Figure 2–13.

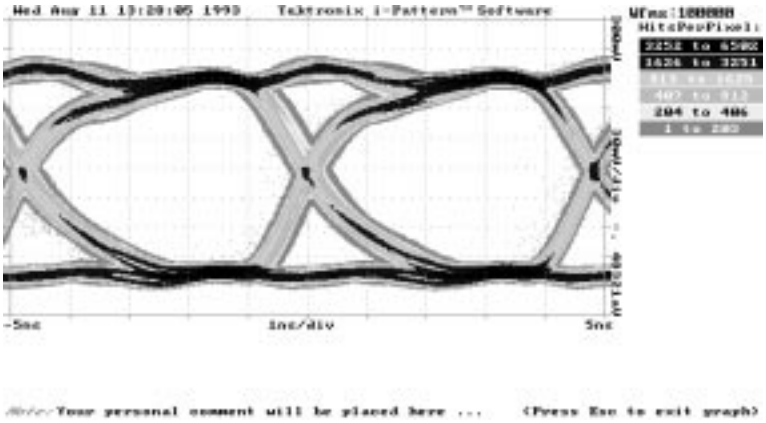

Figure 2–13: A 2D Spectral Display

The color bars on the right side of the display show the number of hits that correspond to each display color. These numbers are determined by the maximum number of hits that any pixel in the display receives.

The values on the uppermost bar cover the range from the maximum number of hits received by any pixel to one-half of this maximum value (rounded to the nearest integer). Thus, any pixel having received more than half the maximum number of hits will be assigned the color of the top bar.

The range of each lower bar is half that of the bar directly above it. The color of the second bar would therefore be given to the pixels having received from one-fourth to one-half the maximum number of hits; the third bar would cover the pixels having received from one-fourth to one-eighth of the maximum, and so forth.

If any bar has one or zero as its lowest value, then no additional bars will be displayed below it.

Using the Colors menu, located under the Configure menu, you can set the display colors to augment the image, and emphasize or

de-emphasize selected aspects of it. You can, for example, filter noise from the image by giving the lowest concentration areas a dark color, or use bright colors to enhance the areas receiving the most hits.

To display an accumulated waveform in 2D Spectral mode:

1. From the Main menu, select the Acquire menu by pressing [Alt]-[A], or by using the left and right cursor keys.
2. Press [2], or use the up and down cursor keys to highlight `2D spectrl` and press [Enter].

***NOTE**. Your screen won't show a waveform at first, but will generate one when the number of waveforms have been accumulated that you specified in the screen-refresh parameter. The display is updated every time this additional number of waveforms has been accumulated.*

3. Exit the display by pressing [Esc]. When you do this, waveform data is no longer accumulated, and the waveform memory is frozen at this instant.

Exiting the display returns you to the Acquire menu.

Changing the Waveform Display

The appearance of the waveform display can be altered in a number of ways using the Scrnparams and Colors menus, located under the Configure menu. Using these menus requires you to exit the waveform display and return to the Main menu. However, you can also make certain changes quickly by using "hot" function keys.

Using "Hot" Function Keys

The i-Pattern program enables you to use "hot" function keys to make certain quick changes to the waveform display. These keys

are activated only during waveform acquisition. The following keys are available:

[Alt]-[C] — Erases the screen and redraws the graticule

[Alt]-[T] — Turns on statistics functions and sets statistics type to time

[Alt]-[V] — Turns on statistics functions and sets statistics type to voltage

[Alt]-[Z] — Clears the waveform memory, erases the screen, and redraws the graticule

In addition, there are three function keys available in EGA mode only:

[F1] — Selects the live waveform display, with waveform displayed in white, number of waveforms displayed set at 2, and statistics function and graticule turned off

[F2] — Same as F1 but with number of waveforms displayed set at 15 and graticule turned on

[F3] — Selects the 2D Spectral display, turns on the graticule, statistics, and time histogram, sets the screen-refresh interval at 250 acquisitions, and clears the waveform memory before continuing

The Histogram Cursors

When you display statistics of your live waveform, you'll notice two pairs of dashed bars across the display, one pair vertical and one horizontal. These are the histogram cursors. These cursors define the area from which the displayed statistical information is taken.

To change the position of the cursors:

1. Move the upper horizontal cursor (Hbar1) by holding [Shift] and using the up and down cursor keys.

2. Move the lower horizontal cursor (Hbar2) using the up and down cursor keys.
3. Move the left vertical cursor (Vbar1) using the left and right cursor keys. Notice that the coordinate listed on the right side of the screen is updated as you move.
4. Move the right vertical cursor (Vbar2) by holding [Shift] and using the left and right cursor keys.

Notice that the cursor coordinates shown on the right side of the screen are updated as the cursors move. Also notice that the cursors move faster when you hold down the cursor key.

How to Save and Retrieve Waveforms

In addition to displaying waveforms as they are acquired, the i-Pattern program allows you to store live or accumulated waveforms in disk files for later use.

This section explains how to save and retrieve displayed waveforms using the Read file and Write file menus, located under the Files menu, and how to change the directory your files are stored to and retrieved from.

Saving Displayed Waveforms to Files

Any displayed waveform, whether accumulated or live, can be saved to a disk. It can then be recalled later and displayed using the Measure and Graph menu options.

To save a waveform to disk:

1. From the Main menu, drop-down the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Write File menu by pressing [W], or use the up and down cursor keys to highlight `Write file` and press [Enter]. The Write file menu appears with `Wfm packed` highlighted.

3. Save the waveform by pressing [W] or [Enter]. The following prompt appears:

   ```
   Write: Enter file name
   ```

4. Type in the name you wish to give your waveform file, and press [Enter]. Do not use an extension on the file name, or an error will occur. A note appears when the file has been written to disk.

Once you've finished saving your file, you can clear the memory and begin acquiring a new waveform, retrieve another waveform from a file, exit the program, or perform any other program function.

Retrieving Waveforms from Files

To retrieve a waveform file from disk:

1. From the Main menu, drop-down the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Read file menu by pressing [R], or use the up and down cursor keys to highlight `Read file` and press [Enter]. The Read file menu appears with `Wfm packed` highlighted.
3. Select the waveform menu by pressing [W] or [Enter].

   The i-Pattern software includes two sample waveform files. These files are named 50OHMEYE.BIN and CLOCK.BIN, and appear in the Wfm packed menu.

4. Load the waveform file you want by highlighting it with the up and down cursor keys and pressing [Enter]. An arrow display will appear, and move across the screen while the file loads. A note will appear when loading is complete.

You can now view the newly-loaded waveform using any of the options under the Measure and Graphics menus. For more details on these menus and their functions, see "How to Display and Measure Stored Waveforms" beginning on page 2–41.

Changing Directories

The i-Pattern program enables you to change the directory your files are saved to and retrieved from without having to exit the program.

To change the file directory:

1. From the Main menu, drop-down the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys. The Files menu appears with `Directory` highlighted.
2. Press [D] or [Enter]. A prompt will appear giving the current directory (or none if one has not been selected), and reading:

   ```
   Enter directory:
   ```

3. Type in the directory you want, and press [Enter]. A note appears confirming your selection.

If you set the program to automatically save its configuration when you quit, the directory selection is also saved, and becomes the default directory when the program is run again.

How to Display and Measure Stored Waveforms

The i-Pattern program enables you to use computer-enhanced two and three-dimensional graphic displays and three statistical measurement applications to extract more information from waveforms than is possible with an oscilloscope alone.

To use any of the functions described in this section, you must have a waveform currently stored in the waveform memory. This is done by loading a waveform file, or by accumulating a waveform using one of the Acquire menu options.

The Graphics Functions

The i-Pattern program gives you the option of displaying accumulated waveforms using the 2D Spectral display, or one of two three-dimensional perspective views (the Waterfall and Forestview displays). You can set the colors of these three graphics

displays by using the Colors menu, located under the Configure menu.

The color bars that appear on the displays show the number of hits that correspond to each display color. The values within these bars are determined as described in "How to Acquire Waveforms" beginning on page 2–41.

Statistics displays are not available in the three-dimensional display modes.

The 2D Spectral Display. The 2D Spectral display option is essentially the same as that used to display live waveforms, with the difference that, under the Graphics menu, additional waveforms are no longer acquired, and the display is not updated.

To display an accumulated waveform in 2D Spectral mode:

1. From the Main menu, select the Graphics menu by pressing [Alt]-[G], or by using the left and right cursor keys. The Graphics menu appears with `2D spectrl` highlighted.
2. Select the 2D Spectral display by pressing [2] or [Enter].
3. Exit the display by pressing [Esc]. This returns you to the Graphics menu.

The Waterfall Display. The Waterfall is a three-dimensional, perspective display that produces a contour map of the accumulated waveform. The height of a contour at any point is directly proportional to the number of data hits that point has received. High, narrow peaks show where the waveform is well-defined. See Figure 2–14.

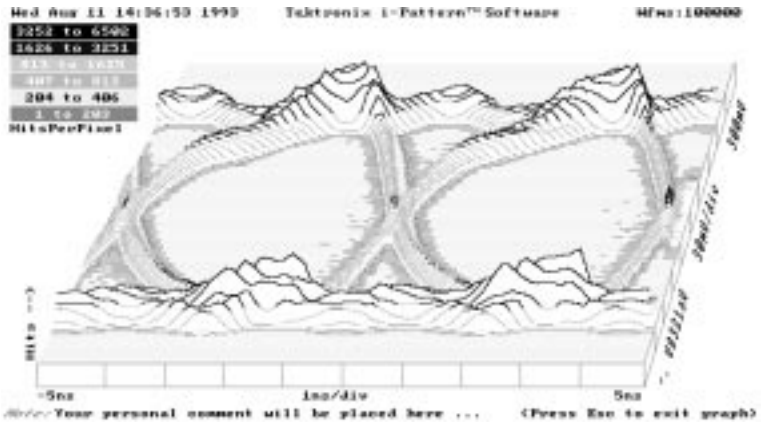

Figure 2–14: A Waterfall Display

The spacing of the pixels used to draw the image on the computer display can be controlled in both the x and y-directions using the Scrnparams menu, located under the Configure menu.

Increments in the y-direction determine the spacing along the y-axis of the contour lines running horizontally across the display. Increments in the x-direction control the length of the line segments used in making the contours.

Using small increments in both the x and y-directions gives a more complete and detailed Waterfall display, but also increases the time it takes the computer to draw the image.

You can select either linear or base 10 logarithmic scaling for the z-axis of the display by using the Scrnparams menu, located under the Configure menu.

To display a Waterfall image:

1. From the Main menu, select the Graphics menu by pressing [Alt]-[G], or by using the left and right cursor keys.

2. Select the Waterfall display by pressing [W], or use the up and down cursor keys to highlight `Waterfall` and press [Enter].
3. Exit the Waterfall display by pressing [Esc]. This returns you to the Graphics menu

The Forestview Display. The Forestview is also a three-dimensional perspective display of the accumulated waveform. It differs from the Waterfall in that the Forestview uses vertical (z-axis) pixels to show how many hits a given point has received. The "height" of each pixel along the z-axis is proportional to the number of hits. See Figure 2–15.

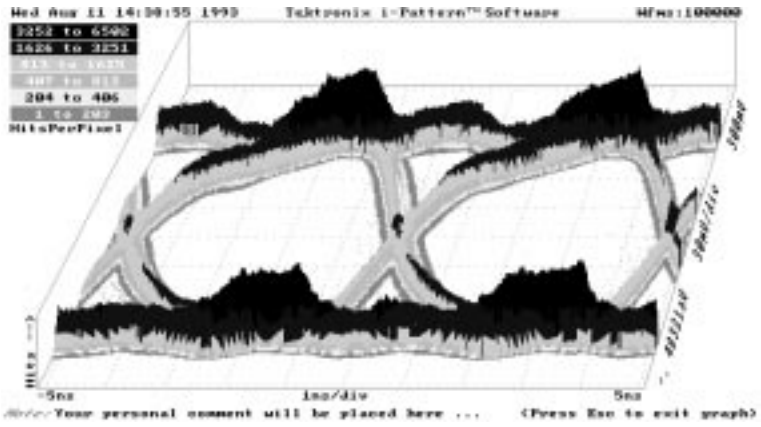

Figure 2–15: A Forestview Display

As with the Waterfall display, you can set the z-axis of the Forestview display to either linear or base 10 logarithmic scaling with the Scrnparams menu, located under the Configure menu.

To display a Forestview image:

1. From the Main menu, select the Graphics menu by pressing [Alt]-[G], or by using the left and right cursor keys.
2. Select the Forestview display by pressing [F], or use the up and down cursor keys to highlight `Forestview` and press [Enter].
3. Exit the Forestview display by pressing [Esc]. This returns you to the Graphics menu.

The Histogram Functions

The i-Pattern program enables you to take statistical measurements of the waveforms stored in memory. 2D Spectral displays are used, along with histograms identical to those available when displaying live waveforms. A time histogram is shown in Figure 2–16.

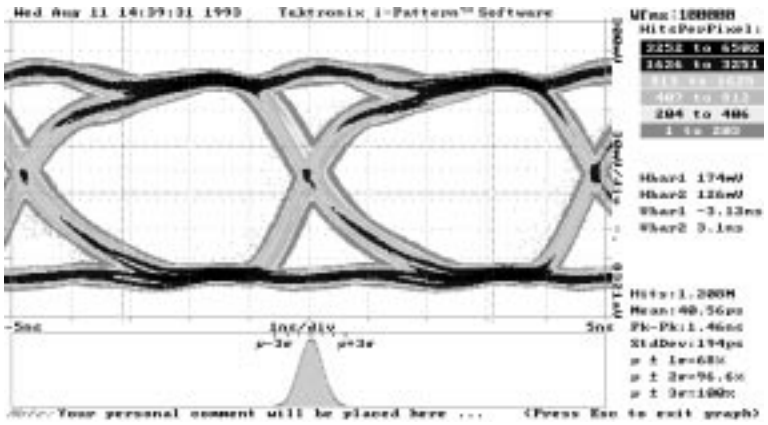

Figure 2–16: A Time Histogram

The Time Histogram

To display a time histogram of a stored waveform:

1. From the Main menu, select the Measure menu by pressing [Alt]-[M], or by using the left and right cursor keys. The Measure menu appears with `Time hist` highlighted.
2. Select the time histogram by pressing [T] or [Enter].

   The waveform is now displayed in the 2D Spectral format, with the time histogram across the bottom of the screen. You can move the histogram cursors as described in "How to Acquire Waveforms" beginning on page 2–41.
3. Exit the time histogram display by pressing [Esc]. This returns you to the Measure menu.

The Voltage Histogram

To display a voltage histogram of a stored waveform:

1. From the Main menu, select the Measure menu by pressing [Alt]-[M], or by using the left and right cursor keys.
2. Select the voltage histogram by pressing [V], or use the up and down cursor keys to highlight `Volts hist` and press [Enter].

   The waveform is now displayed in the 2D Spectral format, with the voltage histogram along the right side of the screen. You can move the histogram cursors as described in "How to Acquire Waveforms" beginning on page 2–41.
3. Exit the voltage histogram display by pressing [Esc]. This returns you to the Measure menu.

Saving Histograms to Files

The i-Pattern program allows you to save the statistical data from any histogram to a .PRN file that can be printed out, or read using a spreadsheet program such as LOTUS® 1-2-3®.

The i-Pattern software includes two sample .PRN histogram data files. These files are named JITTER.PRN and NOISE.PRN. You can examine these files from DOS using the TYPE command, or by using LOTUS 1-2-3.

To save histogram data to a file:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Write file menu by pressing [W], or use the up and down cursor keys to highlight `Write file` and press [Enter].
3. Select the time or voltage histogram option by pressing [T] or [V], respectively, or use the up and down cursor keys to highlight `Thistogram` (for the time histogram) or `Vhistogram` (for the voltage histogram) and press [Enter]. The following prompt appears:

   ```
   Write: Enter file name:
   ```

4. Type in the name you wish to give your histogram .PRN file, and press [Enter]. Do not use an extension on the file name (for example, .WFM), or an error will occur. A note appears when the file has been written to disk.

The Mask Test

The i-Pattern program enables you to define a "masked" area anywhere on an accumulated waveform pattern. You can then use the mask test to determine how many waveform data points fall within this area.

Creating and Editing Masks

A mask is created using a movable cursor on a 2D Spectral image of the waveform and adding or deleting points as required. The mask is created by connecting the points together, independent of the order entered.

The points are connected by sorting the points into left-to-right order and top or bottom groups. The top and bottom groups are defined by an imaginary line between the left- and right-most points. Figure 2–17 shows how the points are categorized.

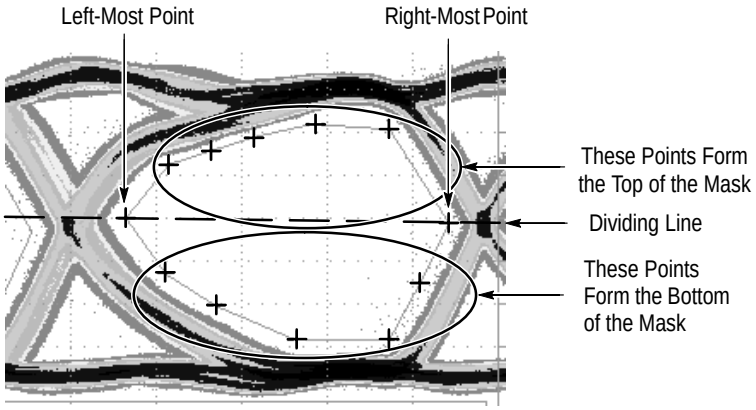

Figure 2–17: How Points of a Mask are Divided

You can edit or view these masks at any time. The masks remain in memory until you clear them using the Erase mask or Initialize command under the Configure menu.

You can only create or edit one mask each time you enter the mask editing mode. You must exit and re-enter for each additional mask you want to edit or create.

Creating Masks. Use the following procedure to create a mask.

1. From the Main menu, select the Graphics menu by pressing [Alt]-[G], or by using the left and right cursor keys.
2. Select the mask editing function by pressing [E], or use the up and down cursor keys to highlight `Edit mask` and press [Enter].

***NOTE**. The screen now shows the 2D Spectral waveform display, along with a blinking cross-shaped cursor in the center of the screen.*

3. Define the mask by marking its edges using the blinking cursor. Move the cursor using the cursor keys, and press [Enter] to fix a point. The cursor will change color when a point has been fixed. You can use up to 50 points to define a single mask. See Figure 2–18.

***NOTE**. If you want to create a mask with a concave area, create several masks to cover the same area. Data falling into two overlapping masks in counted only once as part of the total.*

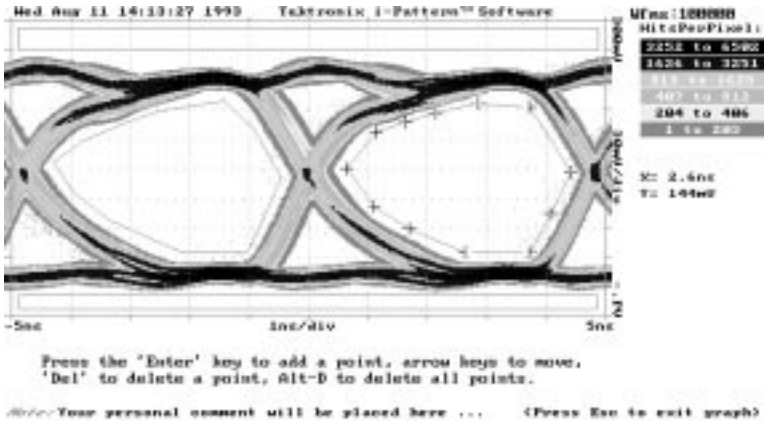

Figure 2–18: Mask Boundary Points

If you wish to delete a point, move the cursor until it contacts that point and press [Del]. Pressing [Alt]-[D] will delete all points on the mask.

4. When you have finished masking off the area you want, press [Esc] to return to the Graphics menu.

Editing Masks. You can edit existing masks by adding or deleting points. You can also add entire new masks. A maximum of ten masks can be defined on a single waveform.

Use the following procedure to edit a mask.

1. From the Main menu, select the Graphics menu by pressing [Alt]-[G], or by using the left and right cursor keys.
2. Select the mask editing function by pressing [E], or use the up and down cursor keys to highlight `Edit mask` and press [Enter].

NOTE. *The screen now shows the waveform, along with the boundary points of the last mask entered. You can edit other previously entered masks by selecting them using the left and right cursor keys.*

---

3. Press [Enter] to begin editing the mask. The blinking cursor will appear. Move the cursor using the cursor keys, and press [Enter] to fix a point. Remove single points by selecting with the cursor and pressing [Del]. Press [Alt]-[D] to eliminate all points.
4. To define a completely new mask, press [Ins], and edit as described above.
5. When you have finished editing the mask, press [Esc] to return to the Graphics menu.

Testing Masks

Once the masks have been created, they can be tested to determine how many waveform data points fall within them. See Figure 2–19.

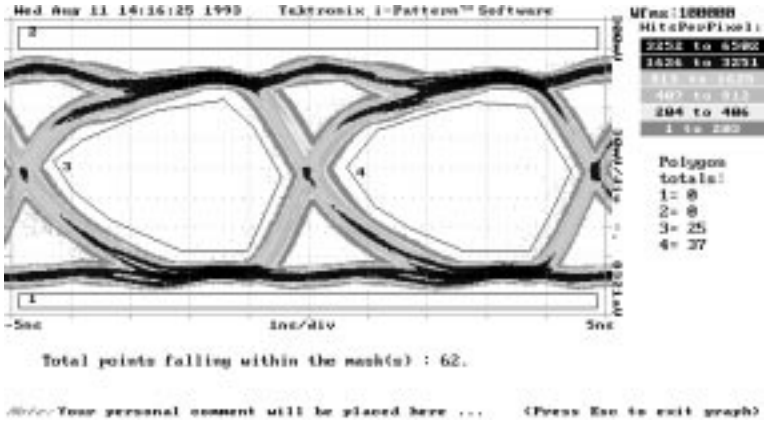

Figure 2–19: A Mask Test

To perform a mask test:

1. From the Main menu, select the Measure menu by pressing [Alt]-[M], or by using the left and right cursor keys.
2. Select mask testing function by pressing [M], or use the up and down cursor keys to highlight `Mask test` and press [Enter].

   The screen now shows the 2D Spectral waveform display, along with all the masks you have defined.

   The numbers of data points falling within each individual mask are given on the right of the display. The masks are numbered in the order created.

   A note beneath the display gives the total number of data points falling within all masks, This number is simply the arithmetic sum of the number of points falling within each individual mask. Thus, if masks overlap, or if one mask lies within the boundaries of another, the points falling in the intersecting areas will be counted more than once in this total.

3. Exit the display by pressing [Esc]. This returns you to the Measure menu.

Saving and Retrieving Masks

As with waveforms, the masks you define can be saved to disk and retrieved when needed.

Saving Masks to Files

When you save a mask to a file, **only the mask itself** is saved. The waveform must be saved separately, in a packed waveform file (see "How To Save and Retrieve Waveforms" beginning on page 2–47). Similarly, saving the waveform does not save the masks you have defined for it.

To save a waveform mask:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.
2. Select the Write file menu by pressing [W], or use the up and down cursor keys to highlight `Write file` and press [Enter].
3. Select the Mask(s) option by pressing [M], or use the up and down cursor keys to highlight `Mask(s)` and press [Enter]. The following prompt appears:

   ```
   Write: Enter file name:
   ```

4. Type in the name you wish to give your mask file, and press [Enter]. Do not use an extension on the file name (for example, .WFM), or an error will occur. A note appears when the file has been written to disk.

Retrieving Masks from Files

To retrieve a mask file from disk:

1. From the Main menu, select the Files menu by pressing [Alt]-[F], or by using the left and right cursor keys.

2. Select the Read file menu by pressing [R], or use the up and down cursor keys to highlight `Read file` and press [Enter].
3. Select the Mask(s) menu by pressing [M], or use the up and down cursor keys to highlight `Mask(s)` and press [Enter].

***NOTE**. The i-Pattern software includes two sample mask files. These files are named 50OHMEYE.MSK and TWOEYES.MSK, and appear in the Mask(s) menu.*

4. Load the mask file you want by highlighting it using the up and down cursor keys and pressing [Enter]. A note appears when the file has been written to disk.

Once the mask file is loaded, it can be used to perform a mask test on an accumulated waveform as described above.

Reference

Preface

This chapter is divided into two sections: Telecommunication Templates and i-Pattern Masks.

The Telecommunication Templates section provides examples of each template contained on both of the TDS Telecommunication disks.

The i-Pattern Masks section provides examples of each i-Pattern mask provided with the TDS Telecommunication Disk 2.

The templates and i-Pattern masks provided are listed in Tables 3–1 and 3–2.

Table 3–1: Templates

Standard	Name	Bit Rate	File Name[1]
CCITT G.703	Data Pulse	64 Kb/S	CCDA64K.XXX
CCITT G.703	Double Data Pulse	64 Kb/S	CCDO64K.XXX
CCITT G.703	Single Pulse	64 Kb/S	CCSI64K.XXX
CCITT G.703	Timing Pulse	64 Kb/S	CCTI64K.XXX
CCITT I.430	Zero Pulse (50 Ohm)	95.97 Kb/S	CC0_96K.XXX
CCITT I.430	Zero Pulse (400 Ohm)	95.97 Kb/S	CCX_96K.XXX
CCITT G.703	Pulse	1.544 Mb/S	CC1_5M.XXX
CCITT I.431	Pulse	1.544 Mb/S	CCI1_5M.XXX
ANSI T1.102	DS1	1.544 Mb/S	DS1.XXX
ANSI T1.102	DS1(old)	1.544 Mb/S	DS1OLD.XXX
CCITT G.703	Coax Pair	2.048 Mb/S	CCCO2M.XXX
CCITT G.703	Symmetrical Pair	2.048 Mb/S	CCSY2M.XXX
ANSI T1.102	DS1C	3.152 Mb/S	DS1C.XXX
CCITT G.703	Coax Pair	6.312 Mb/S	CCCO6M.XXX

Table 3–1: Templates (Cont.)

Standard	Name	Bit Rate	File Name[1]
CCITT G.703	Symmetrical Pair	6.312 Mb/S	CCSY6M.XXX
ANSI T1.102	DS2	6.312 Mb/S	DS2.XXX
CCITT G.703	Pulse	8.488 Mb/S	CC8M.XXX
CCITT G.703	Pulse	32.064 Mb/S	CC32M.XXX
CCITT G.703	Pulse	34.368 Mb/S	CC34M.XXX
CCITT G.703	Pulse	44.736 Mb/S	CC44M.XXX
ANSI T1.102	DS3	44.736 Mb/S	DS3.XXX
CCITT G.703	Pulse	97.728 Mb/S	CC97M.XXX
ANSI X3.166	FDDI Halt	125 Mb/S	FDDI.XXX
CCITT G.703	Zero Pulse	139.26 Mb/S	CC0_139M.XXX
CCITT G.703	One Pulse	139.26 Mb/S	CC1_139M.XXX
CCITT G.703	Zero Pulse	155.52 Mb/S	CC0_155M.XXX
CCITT G.703	One Pulse	155.52 Mb/S	CC1_155M.XXX

1 Where: XXX is an extension determining the type of file; SET is the extension used for setup files, ENV is the extension used for GPIB waveform envelope files, and WFM is the extension used for waveforms used by TDS oscilloscopes with disk drives.

Table 3–2: i-Pattern Masks

Standard	Name	Bit Rate	File Name[1]
ANSI T1.102	STS1	51.84 Mb/S	STS1.ZZZ
ANSI T1X1.4/93–014	STS1NEW	51.84 Mb/S	STS1NEW.ZZZ
ANSI SONET/CCITT SDH	OC1	51.84 Mb/S	OC1.ZZZ
ANSI T1.102	DS4N	139.264 Mb/S	DS4N.ZZZ
ANSI T1.102	DS4XN	139.264 Mb/S	DS4XN.ZZZ
ANSI SONET/CCITT SDH	OC3	155.52 Mb/S	OC3.ZZZ
ANSI SONET/CCITT SDH	STM1	155.52 Mb/S	STM1.ZZZ
ANSI T1.102	STS3	155.52 Mb/S	STS3.ZZZ
ANSI T1.102	STSX3	155.52 Mb/S	STSX3.ZZZ

1 Where: ZZZ is an extension determining the type of file; SET is the extension used for setup files, and MSK is the extension used for i-Pattern mask files.

Telecommunication Templates

This section contains examples of each telecommunication template provided. Each template is preceded with instrument setups used to display the template and to acquire the waveform to be tested.

GPIB instrument setup commands sent to the oscilloscope when using a personal computer to send the setup files can be found in Appendix B.

***NOTE**. The setup files provided aid in the proper setup of your oscilloscope. They do not guarantee a match of your test signal to the template. Some additional adjustment of the vertical controls (scale and position) and trigger position may be necessary.*

Prerequisites

Before using the templates, note the following conditions:

- Save the template waveform to waveform reference memory location 1 when using a TDS series oscilloscope with disk drive
- Apply the test signals to channel 1

***NOTE**. Sending a setup file to the oscilloscope replaces the existing control settings. Before sending any setup files, save your current instrument settings to a Setup memory location if you wish to recall it at a later time.*

95.97 kbps: CC0_96K Zero Pulse Template (Coaxial)

Figure 3–1 shows the template used to limit a zero pulse telecommunication signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC0_96K.ENV.

The signal requirements are as follows:

- Data Rate equals 95.97 kbps
- The input and trigger signals are 50 Ω, CMI, all zeros
- The signal must be applied to channel 1 and terminated with 50 Ω

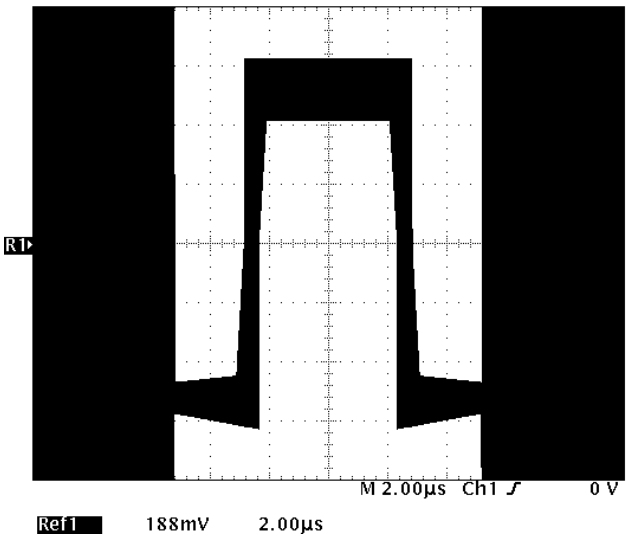

Figure 3–1: Zero Pulse Template CC0_96K

2.048 Mbps: CCCO2M Pulse Template (Coaxial)

Figure 3–2 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCCO2M.ENV.

The signal requirements are as follows:

- Data Rate equals 2.048 Mbps
- The input and trigger signals are 75 Ω, AIS, any pattern
- The signal must be applied to channel 1 and terminated with 75 Ω

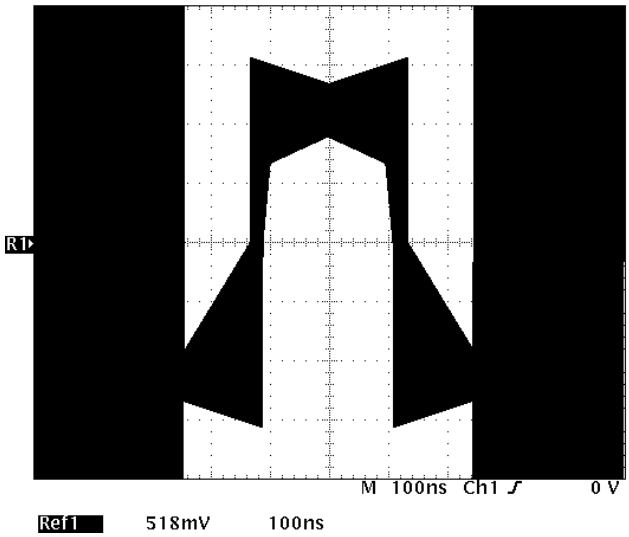

Figure 3–2: Pulse Template CCCO2M

6.312 Mbps: CCCO6M Pulse Template (Coaxial)

Figure 3–3 shows the template used to test a telecommunication Coax Pair signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCCO6M.ENV.

The signal requirements are as follows:

- Data Rate equals 6.312 Mbps
- The input and trigger signals are 75 Ω, B8ZS, 1000000010000000010000000...
- The signal must be applied to channel 1 and terminated with 75 Ω

Figure 3–3: Pulse Template CCCO6M

6.312 Mbps: CCSY6M Pulse Template (Coaxial)

Figure 3–4 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCSY6M.ENV.

The signal requirements are as follows:

- Data Rate equals 6.312 Mbps
- The input and trigger signals are 110 Ω, B6ZS, 1000001000001000000100000...
- The signal must be applied to channel 1 and terminated with 110 Ω

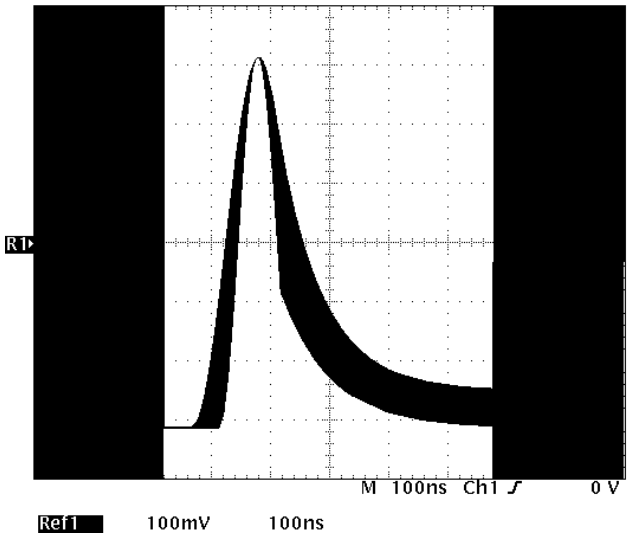

Figure 3–4: Pulse Template CCSY6M

8.448 Mbps: CC8M Pulse Template (Coaxial)

Figure 3–5 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CC8M.ENV.

The signal requirements are as follows:

- Data Rate equals 8.448 Mbps
- The input and trigger signals are 75 Ω, AIS, any pattern
- The signal must be applied to channel 1 and terminated with 75 Ω

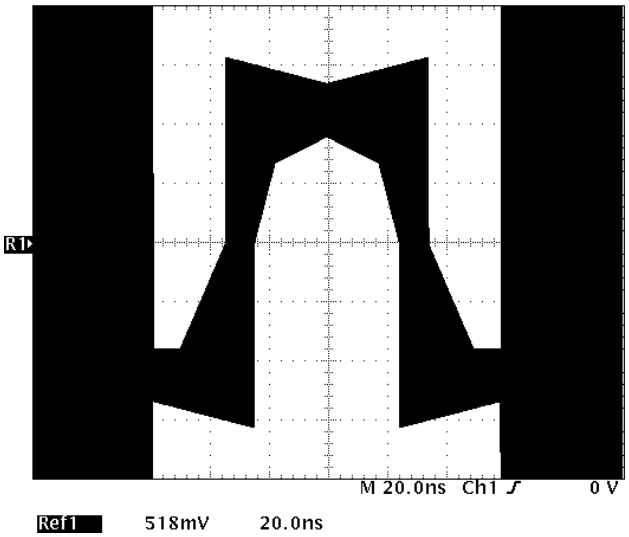

Figure 3–5: Pulse Template CC8M

32.064 Mbps: CC32M Pulse Template (Coaxial)

Figure 3–6 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC32M.ENV.

The signal requirements are as follows:

- Data Rate equals 32.064 Mbps
- The input and trigger signals are 75 Ω, B3ZS, 100100100100...
- The signal must be applied to channel 1 and terminated with 75 Ω

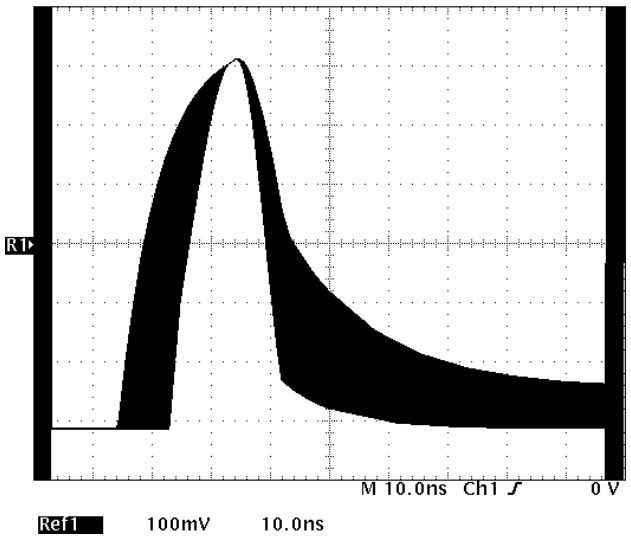

Figure 3–6: Pulse Template CC32M

34.368 Mbps: CC34M Pulse Template (Coaxial)

Figure 3–7 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CC34M.ENV.

The signal requirements are as follows:

- Data Rate equals 34.368 Mbps
- The input and trigger signals are 75 Ω, AIS, all ones
- The signal must be applied to channel 1 and terminated with 75 Ω

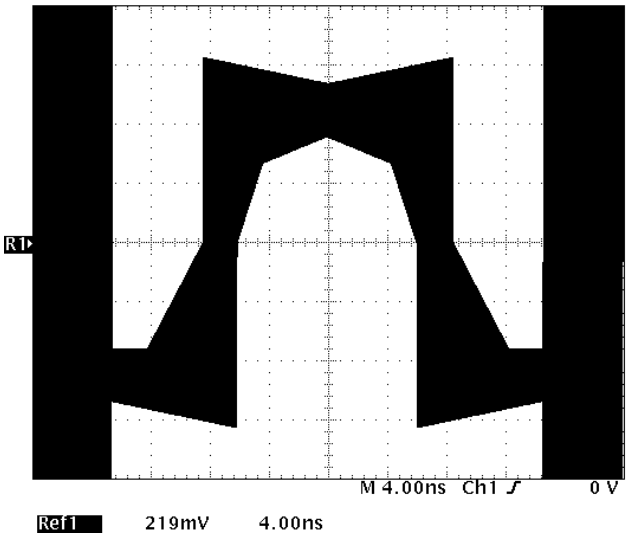

Figure 3–7: Pulse Template CC34M

44.736 Mbps: CC34M Pulse Template (Coaxial)

Figure 3–8 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CC34M.ENV.

The signal requirements are as follows:

- Data Rate equals 44.736 Mbps
- The input and trigger signals are 75 Ω, B3ZS, 100100100100...
- The signal must be applied to channel 1 and terminated with 75 Ω

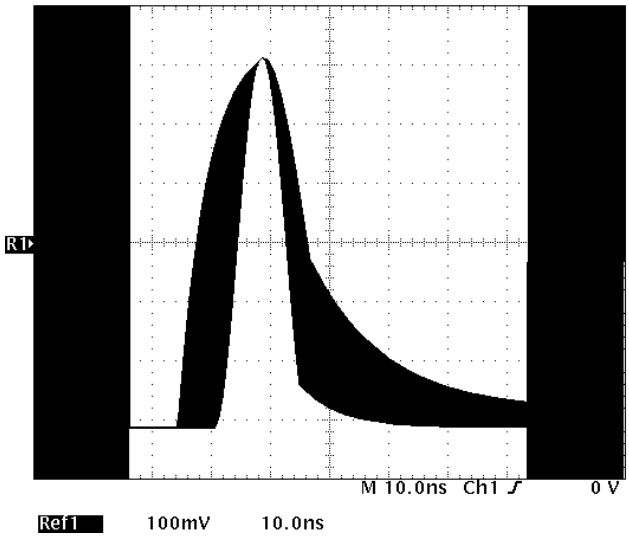

Figure 3–8: Pulse Template CC44M

44.736 Mbps: DS3 Template (Coaxial)

Figure 3–9 shows the template used to test a telecommunication DS3 signal. This template tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS3.ENV.

The signal requirements are as follows:

- Data Rate equals 44.736 Mbps
- The input and trigger signals are 75 Ω, B3ZS, 100100100100...
- The signal must be applied to channel 1 and terminated with 75 Ω

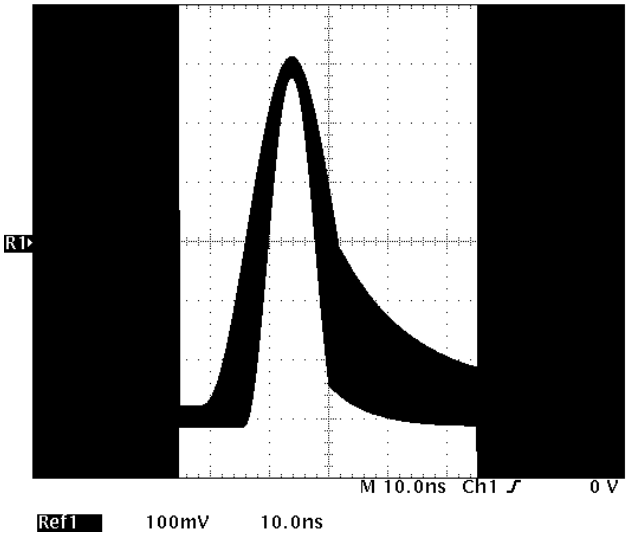

Figure 3–9: DS3 Template

97.728 Mbps: CC97M Pulse Template (Coaxial)

Figure 3–10 shows the template used to test a telecommunication pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CC97M.ENV.

The signal requirements are as follows:

- Data Rate equals 97.728 Mbps
- The input and trigger signals are 75 Ω, AIS, any pattern
- The signal must be applied to channel 1 and terminated with 75 Ω

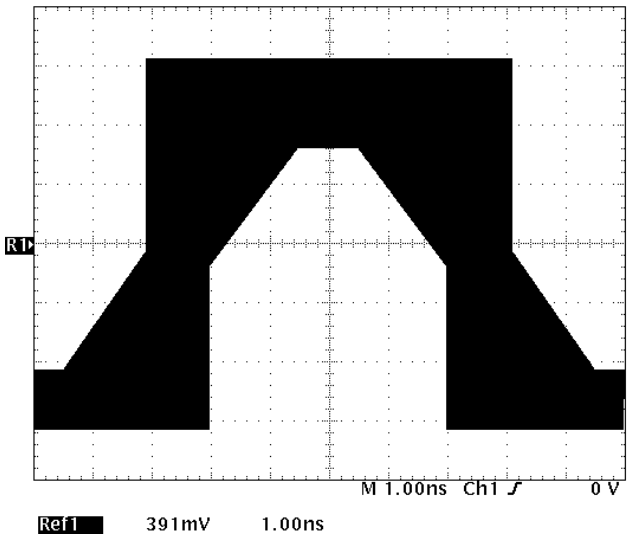

Figure 3–10: Pulse Template CC97M

139.26 Mbps: CC0_139M Zero Pulse Template (Coaxial)

Figure 3–11 shows the template used to test a zero pulse telecommunication signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC0_139M.ENV.

The signal requirements are as follows:

- Data Rate equals 139.26 Mbps
- The input and trigger signals are 75 Ω, CMI, all zeros
- The signal must be applied to channel 1 and terminated with 75 Ω

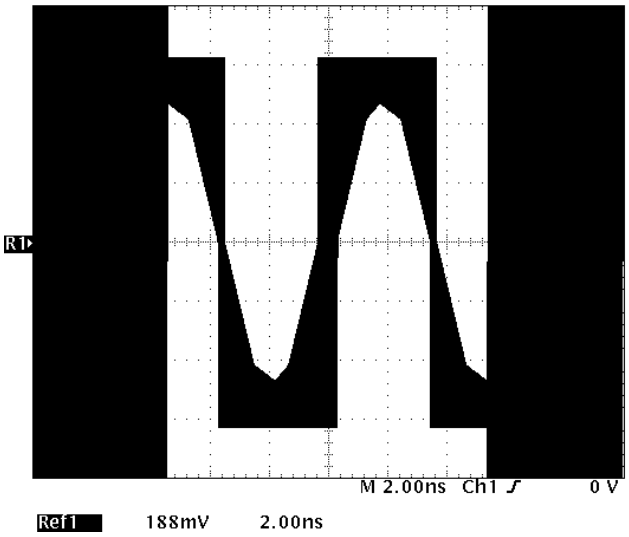

Figure 3–11: Zero Pulse Template CC0_139M

139.26 Mbps: CC1_139M One Pulse Template (Coaxial)

Figure 3–12 shows the template used to test a one pulse telecommunication signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC1_139M.ENV.

The signal requirements are as follows:

- Data Rate equals 139.26 Mbps
- The input and trigger signals are 75 Ω, CMI, all ones
- The signal must be applied to channel 1 and terminated with 75 Ω

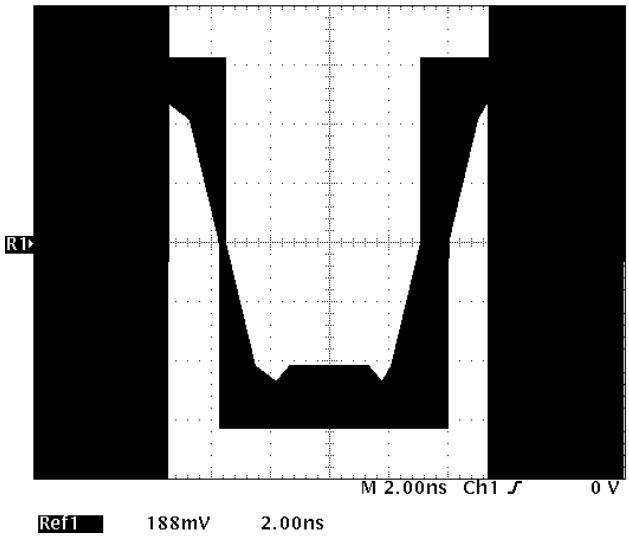

Figure 3–12: One Pulse Template CC1_139M

155.52 Mbps: CC0_155M Zero Pulse Template (Coaxial)

Figure 3–13 shows the template used to test a zero pulse telecommunication signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC0_155M.ENV.

The signal requirements are as follows:

- Data Rate equals 155.520 Mbps
- The input and trigger signals are 75 Ω, CMI, all zeros
- The signal must be applied to channel 1 and terminated with 75 Ω

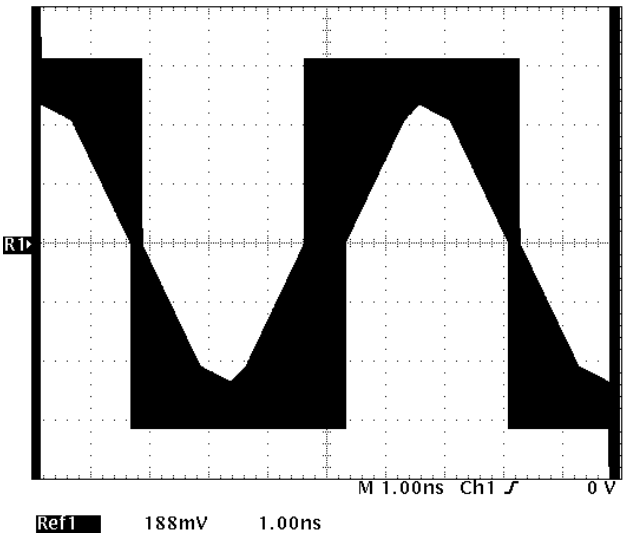

Figure 3–13: Zero Pulse Template CC0_155M

155.52 Mbps: CC1_155M One Pulse Template (Coaxial)

Figure 3–14 shows the template used to test a one pulse telecommunication signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC1_155M.ENV.

The signal requirements are as follows:

- Data Rate equals 155.520 Mbps
- The input and trigger signals are 75 Ω, CMI, all ones
- The signal must be applied to channel 1 and terminated with 75 Ω

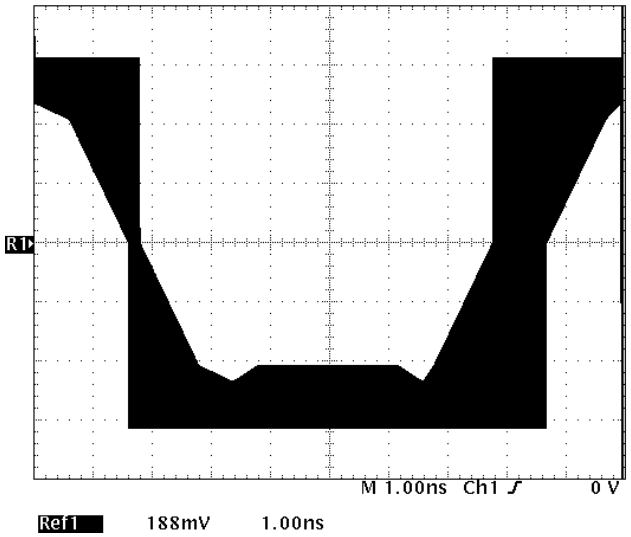

Figure 3–14: One Pulse Template CC1_155M

64 kbps: CCDA64K Data Pulse Template (Twisted Pair)

Figure 3–15 shows the template used to test a telecommunication data pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCDA64K.ENV.

The signal requirements are as follows:

- Data Rate equals 64 kbps
- The input and trigger signals are 110 Ω, AIS, all ones
- The signal must be terminated with 110 Ω and applied to channel 1 with a differential probe

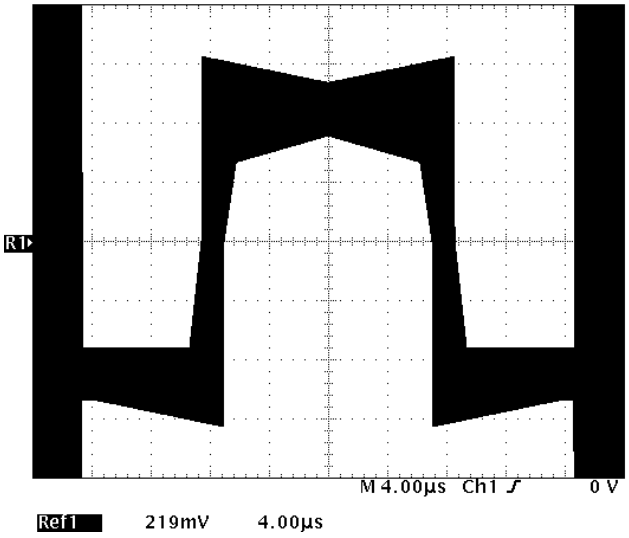

Figure 3–15: Data Pulse Template CCDA64K

64 kbps: CCDO64K Double Pulse Template (Twisted Pair)

Figure 3–16 shows the template used to test a telecommunication double pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCDO64K.ENV.

The signal requirements are as follows:

- Data Rate equals 64 kbps
- The input and trigger signals are 110 Ω, AIS, all ones
- The signal must be terminated with 110 Ω and applied to channel 1 with a differential probe

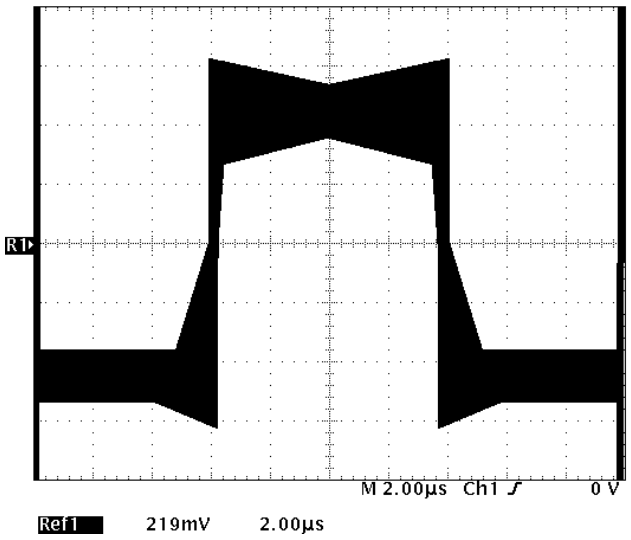

Figure 3–16: Double Pulse Template CCDO64K

64 kbps: CCSI64K Zero Pulse Template (Twisted Pair)

Figure 3–17 shows the template used to test a telecommunication zero pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCSI64K.ENV.

The signal requirements are as follows:

- Data Rate equals 64 kbps
- The input and trigger signals are 110 Ω, AIS, all ones
- The signal must be terminated with 110 Ω and applied to channel 1 with a differential probe

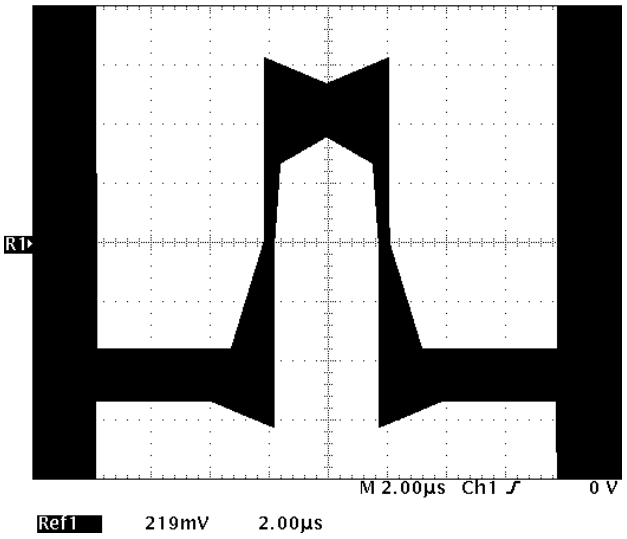

Figure 3–17: Zero Pulse Template CCSI64K

64 kbps: CCTI64K Timing Pulse Template (Twisted Pair)

Figure 3–18 shows the template used to test a telecommunication timing pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCTI64K.ENV.

The signal requirements are as follows:

- Data Rate equals 64 kbps
- The input and trigger signals are 110 Ω, AIS, all ones
- The signal must be terminated with 110 Ω and applied to channel 1 with a differential probe

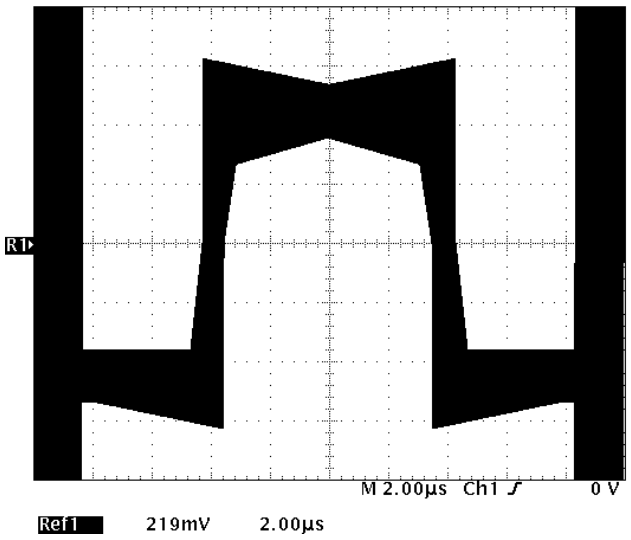

Figure 3–18: Timing Pulse Template CCTI64K

95.97 kbps: CCX_96K Zero Pulse Template (Twisted Pair)

Figure 3–19 shows the template used to test a telecommunication zero pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCX_96K.ENV.

The signal requirements are as follows:

- Data Rate equals 95.97 kbps
- The input and trigger signals are 400 Ω, CMI, any pattern
- The signal must be terminated with 400 Ω and applied to channel 1 with a differential probe

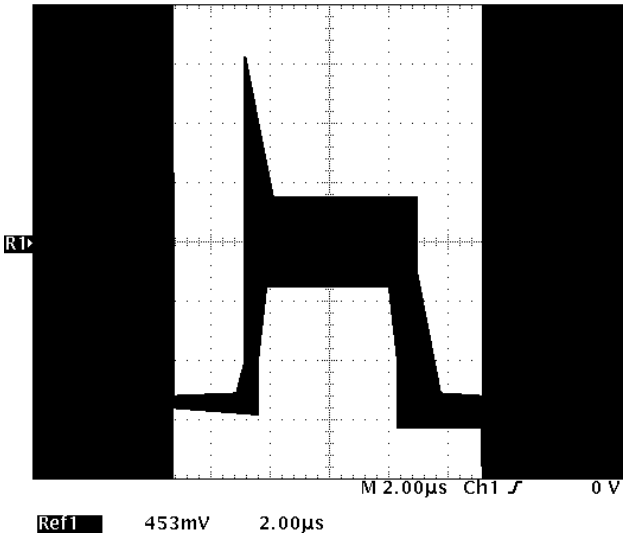

Figure 3–19: Zero Pulse Template CCX_96K

1.544 Mbps: DS1 Template (Twisted Pair)

Figure 3–20 shows the template used to test a telecommunication DS1 signal. This template tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS1.ENV.

The signal requirements are as follows:

- Data Rate equals 1.544 Mbits/s
- The input and trigger signals are 100 Ω, B8ZS, 10000000100000001000000 0...
- The signal must be terminated with 100 Ω and applied to channel 1 with a differential probe

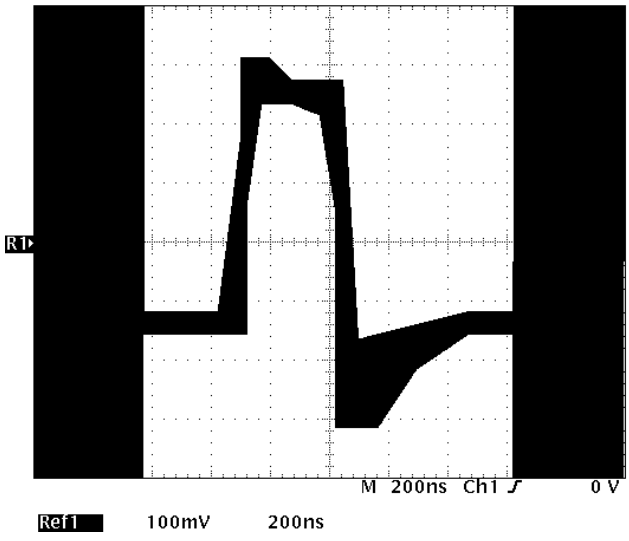

Figure 3–20: DS1 Template

1.544 Mbps: DS1 Template: Old Signal Version (Twisted Pair)

Figure 3–21 shows the template used to test an old telecommunication DS1 signal. This template tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS1OLD.ENV.

The signal requirements are as follows:

- Data Rate equals 1.544 Mbps
- The input and trigger signals are 100 Ω, B8ZS, 1000000010000000010000000... or 100010001000...
- The signal must be terminated with 100 Ω and applied to channel 1 with a differential probe

Figure 3–21: DS1 (Old) Template

1.544 Mbps: CC1_5M Pulse Template (Twisted Pair)

Figure 3–22 shows the template used to test a one pulse telecommunication signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file named CC1_5M.ENV.

The signal requirements are as follows:

- Data Rate equals 1.544 Mbps
- The input and trigger signals are 100 Ω, B8ZS, 1000000010000000010000000... or 1000100010001....
- The signal must be terminated with 100 Ω and applied to channel 1 with a differential probe

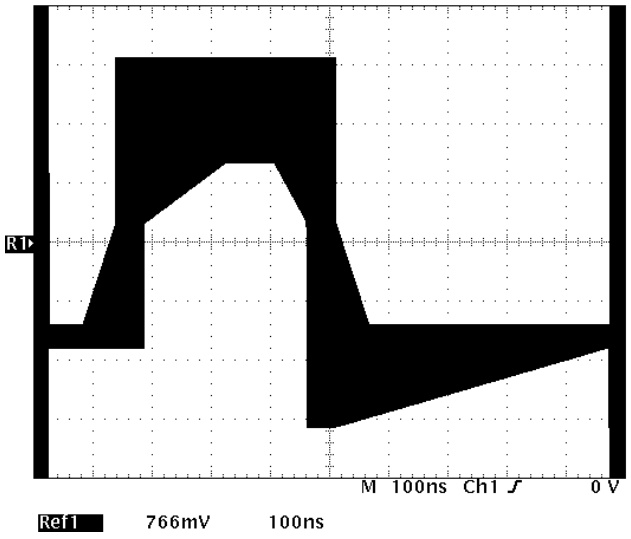

Figure 3–22: One Pulse Template CC1_5M

1.544 Mbps: CCI1_5M Zero Pulse Template (Twisted Pair)

Figure 3–23 shows the template used to test a telecommunication zero pulse signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCI1_5M.ENV.

The signal requirements are as follows:

- Data Rate equals 1.544 Mbps
- The input and trigger signals are 100 Ω, AIS, B8ZS, 10000000100000010000000...
- The signal must be terminated with 100 Ω and applied to channel 1 with a differential probe

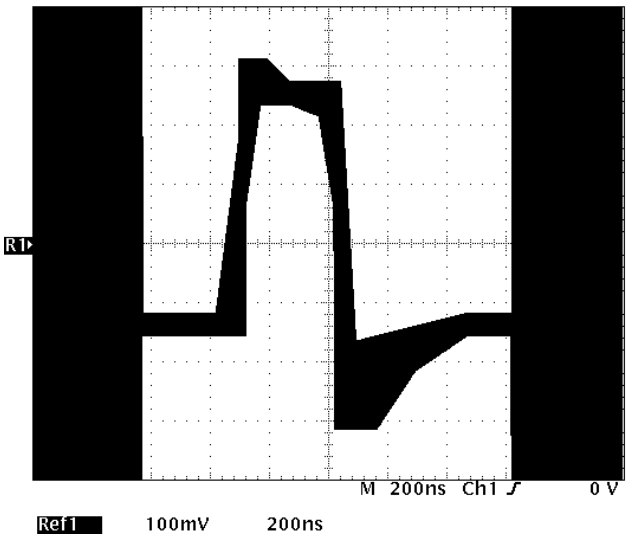

Figure 3–23: Zero Pulse Template CCI1_5M

2.048 Mbps: CCSY2M Symmetrical Pair Template (Twisted Pair)

Figure 3–24 shows the template used to test a telecommunication symmetrical pair signal. This template tests signals to the standard:

CCITT G.703 Electrical Standards

Use the disk waveform template file CCSY2M.ENV.

The signal requirements are as follows:

- Data Rate equals 2.048 Mbps
- The input and trigger signals are 120 Ω, AIS, all ones
- The signal must be terminated with 120 Ω and applied to channel 1 with a differential probe

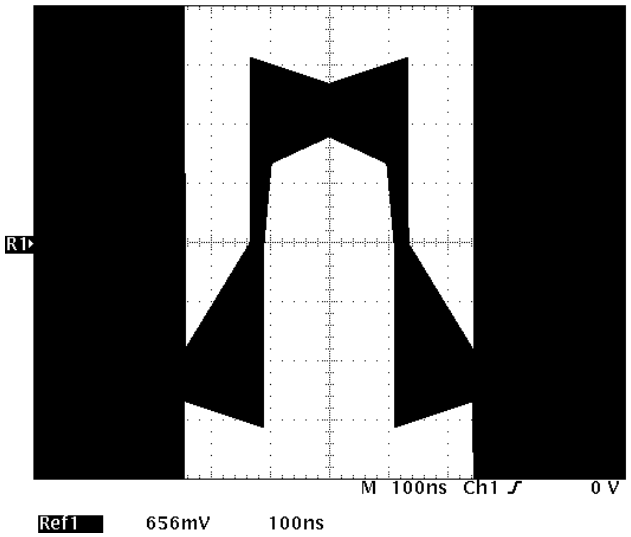

Figure 3–24: Symmetrical Pair Template CCSY2M

3.152 Mbps: DS1C Template (Twisted Pair)

Figure 3–25 shows the template used to test a telecommunication DS1C signal. This template tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS1C.ENV.

The signal requirements are as follows:

- Data Rate equals 3.152 Mbps
- The input and trigger signals are 100 Ω, B8ZS, 10000000100000010000000...
- The signal must be terminated with 100 Ω and applied to channel 1 with a differential probe

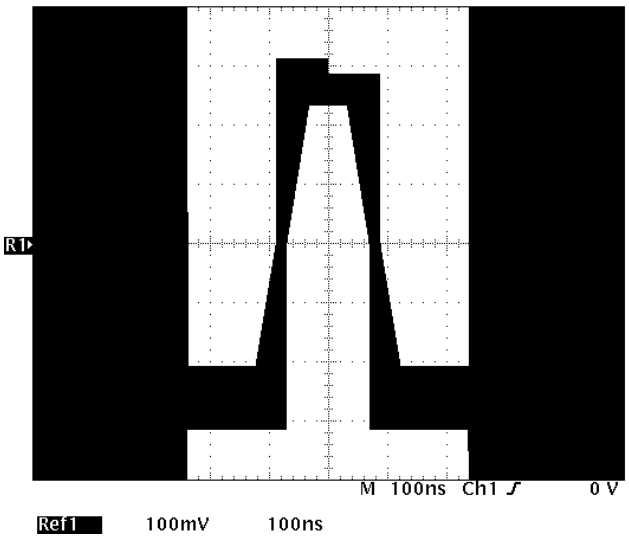

Figure 3–25: DS1C Template

6.312 Mbps: DS2 Template (Twisted Pair)

Figure 3–26 shows the template used to test a telecommunication DS2 signal. This template tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS2.ENV.

The signal requirements are as follows:

- Data Rate equals 6.312 Mbps
- The input and trigger signals are 110 Ω, B8ZS, 10000000100000001000000000... or 100010001000...
- The signal must be terminated with 110 Ω and applied to channel 1 with a differential probe

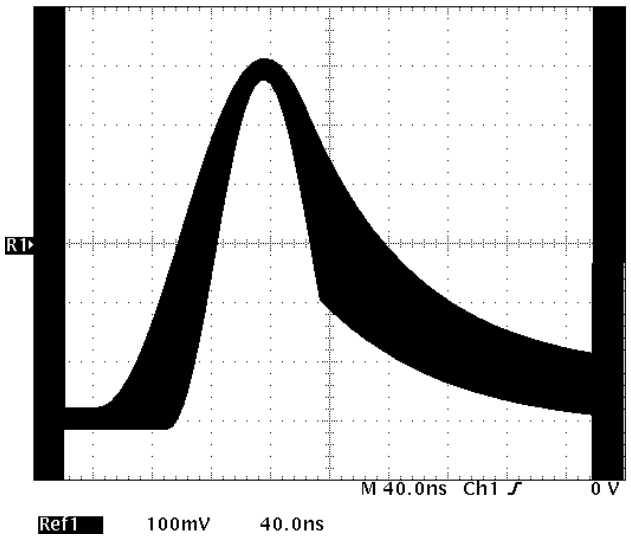

Figure 3–26: DS2 Template

125 Mbps: FDDI Halt Template (Optical)

Figure 3–27 shows the template used to test a telecommunication FDDI halt signal. This template tests signals to the standard:

Miscellaneous Standards (ANSI X3.166)

Use the disk waveform template file FDDI.ENV.

The signal requirements are as follows:

- Data Rate equals 125 Mbps
- The input signal must be 11111000001111100000...
- The trigger signal can be either a clock or the same as the input signal
- The signal must be converted from optical data to electrical data and applied to channel 1

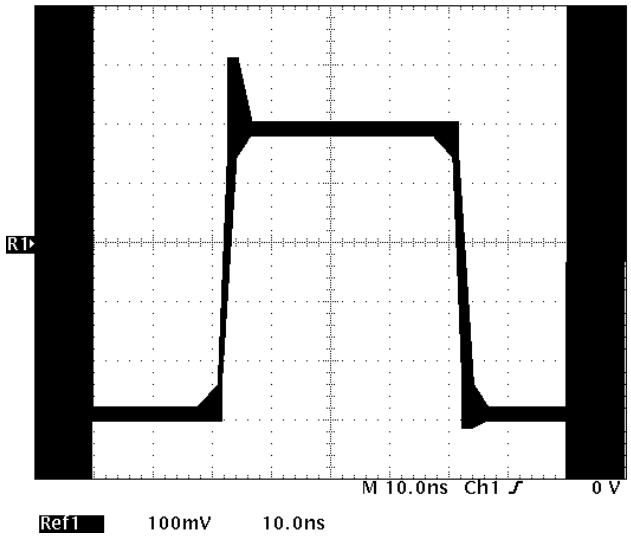

Figure 3–27: FDDI Halt Template

i-Pattern Masks

This section contains examples of each telecommunication i-Pattern mask provided. Each mask is preceded with signal requirements and instrument setups needed to properly acquire the test signal.

GPIB instrument setup commands sent to the oscilloscope when using a personal computer to perform i-Pattern testing are be found in Appendix B.

***NOTE**. Sending a setup file to the oscilloscope replaces the existing control settings. Before sending any setup files, save your current instrument settings to a Setup memory location if you wish to recall it at a later time.*

***NOTE**. The setup files provided aid in the proper setup of your oscilloscope. They do not guarantee a match of your test signal to the mask. Some additional adjustment of vertical and trigger position may be necessary.*

DS4NA Mask

Figure 3–28 shows the i-Pattern mask used to test a DS4NA telecommunication signal. This mask tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS4NA.MSK.

The signal requirements are as follows:

- Data Rate equals 139.26 Mbits/s
- The input and trigger signals are 75 Ω, CMI, all ones
- The input signal must be applied to channel 1 and terminated with 75 Ω
- The trigger signal must be applied to channel 2

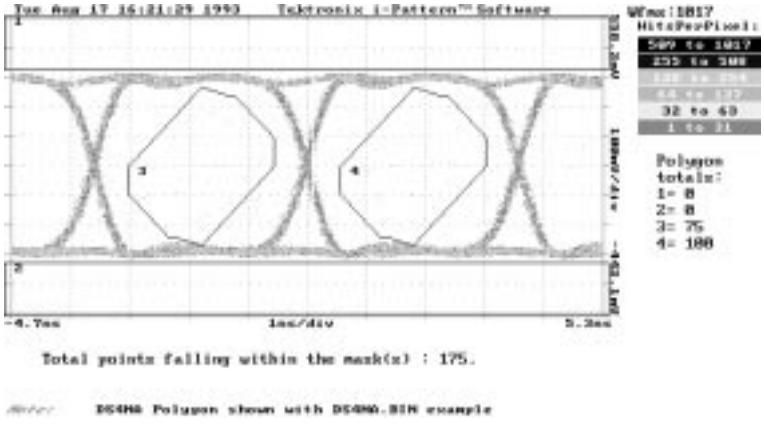

Figure 3–28: DS4NA i-Pattern Mask

DS4XNA Mask

Figure 3–29 shows the i-Pattern mask used to test a DS4XNA telecommunication signal. This mask tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file DS4XNA.MSK.

The signal requirements are as follows:

- Data Rate equals 139.26 Mbits/s
- The input and trigger signals are 75 Ω, PRBS or Live Data
- The input signal must be applied to channel 1 and terminated with 75 Ω
- The trigger signal must be applied to channel 2

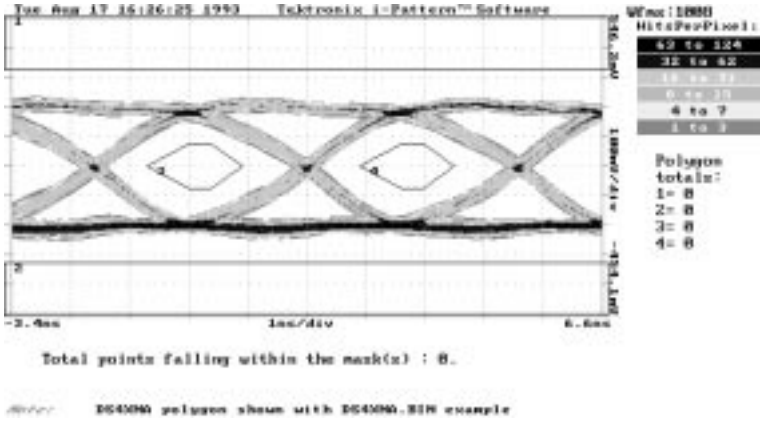

Figure 3–29: DS4XNA i-Pattern Mask

STM1 Mask

Figure 3–30 shows the i-Pattern mask used to test a STM1 telecommunication signal. This mask tests signals to the standard:

ANSI SONET / CCITT SDH Optical Standards

Use the disk waveform template file STM1.MSK.

The signal requirements are as follows:

- Data Rate equals 155.52 Mbits/s
- The input signal is NRZ; PRBS, SDH/SONET Frame, or Live Data
- The trigger signal is Clock, Recovered Clock, or Data Signal
- The input signal must be applied to channel 1 using an O/E converter that complies with ANSI/CCITT specifications
- The trigger signal must be applied to channel 2

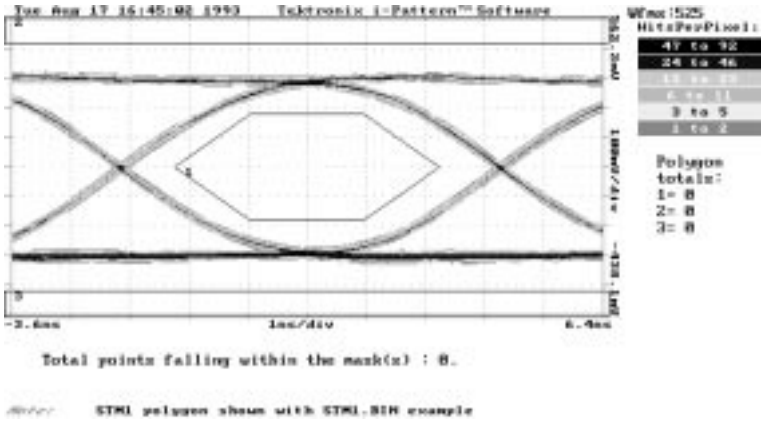

Figure 3–30: STM1 i-Pattern Mask

STS1 Mask

Figure 3–31 shows the i-Pattern mask used to test a STS1 telecommunication signal. This mask tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file STS1.MSK.

The signal requirements are as follows:

- Data Rate equals 51.84 Mbits/s
- The input signal is 75 Ω, PRBS or Live Data
- The trigger signal is either clock or input signal
- The input signal must be applied to channel 1 and terminated with 75 Ω
- The trigger signal must be applied to channel 2

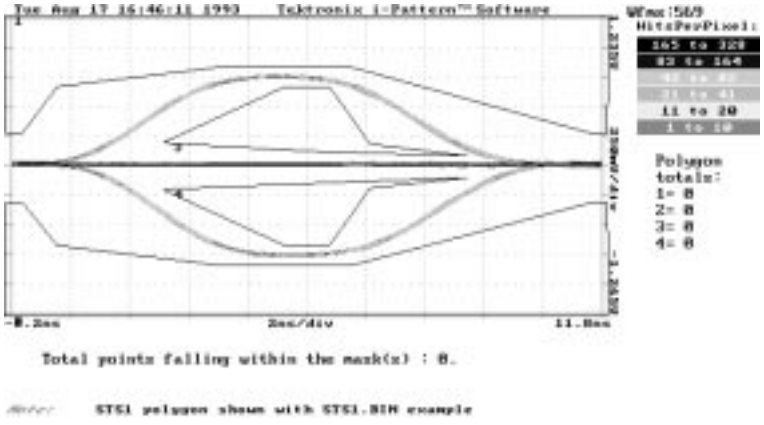

Figure 3–31: STS1 i-Pattern Mask

STS1 Mask (New)

Figure 3–32 shows the i-Pattern mask used to test a STS1 (new) telecommunication signal. This mask tests signals to the standard:

ANSI T1X1.4/93–014 Electrical Standard (proposed)

Use the disk waveform template file STS1NEW.MSK.

The signal requirements are as follows:

- Data Rate equals 51.84 Mbits/s
- The input signal is 75 Ω, PRBS or Live Data
- The trigger signal is either clock or input signal
- The input signal must be applied to channel 1 and terminated with 75 Ω
- The trigger signal must be applied to channel 2

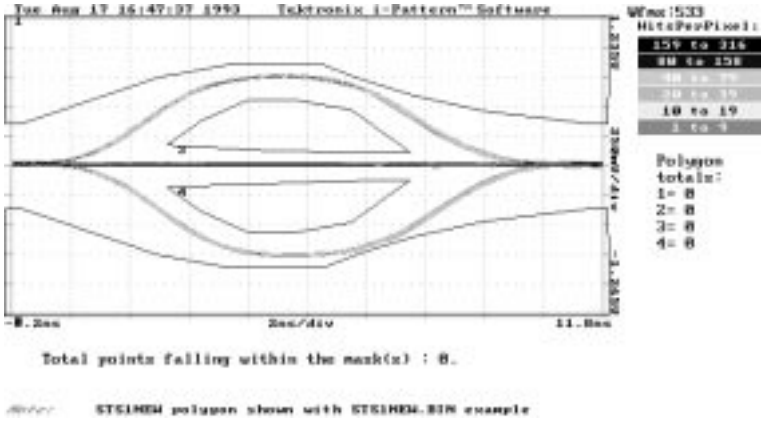

Figure 3–32: STS1 (New) i-Pattern Mask

STS3 Mask

Figure 3–33 shows the i-Pattern mask used to test a STS3 telecommunication signal. This mask tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file STS3.MSK.

The signal requirements are as follows:

- Data Rate equals 155.52 Mbits/s
- The input signal is 75 Ω, CMI PRBS or Live Data
- The trigger signal is either clock or input signal
- The input signal must be applied to channel 1 and terminated with 75 Ω
- The trigger signal must be applied to channel 2

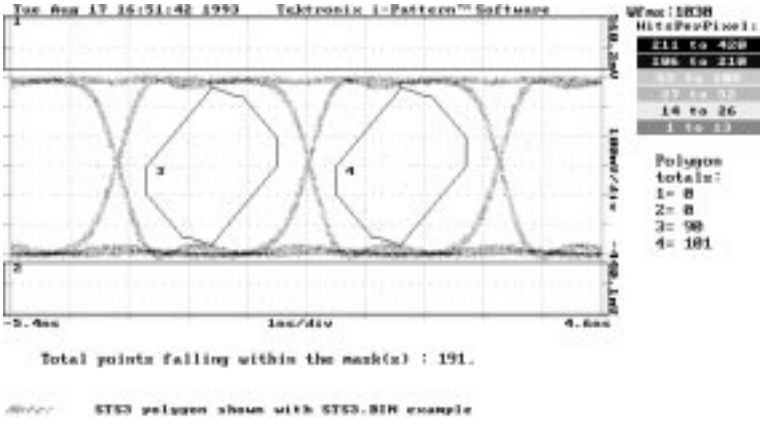

Figure 3–33: STS3 i-Pattern Mask

STSX3 Mask

Figure 3–34 shows the i-Pattern mask used to test a STSX3 telecommunication signal. This mask tests signals to the standard:

ANSI T1.102 Electrical Standards

Use the disk waveform template file STSX3.MSK.

The signal requirements are as follows:

- Data Rate equals 155.52 Mbits/s
- The input signal is 75 Ω, CMI PRBS or Live Data
- The trigger signal is either clock or input signal
- The input signal must be applied to channel 1 and terminated with 75 Ω
- The trigger signal must be applied to channel 2

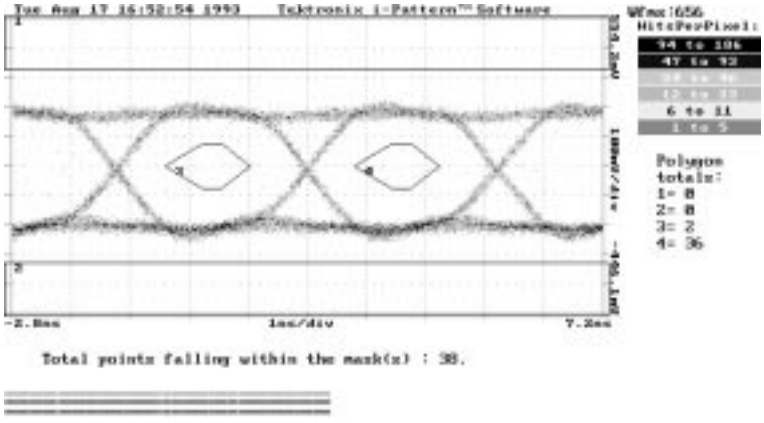

Figure 3–34: STSX3 i-Pattern Mask

OC1 Mask

Figure 3–35 shows the i-Pattern mask used to test a OC1 telecommunication signal. This mask tests signals to the standard:

ANSI SONET / CCITT SDH Optical Standards

Use the disk waveform template file OC1.MSK.

The signal requirements are as follows:

- Data Rate equals 51.84 Mbits/s
- The input signal is NRZ; PRBS, SDH/SONET Frame, or Live Data
- The trigger signal is Clock, Recovered Clock, or Data Signal
- The input signal must be applied to channel 1 using an O/E converter that complies with ANSI/CCITT specifications
- The trigger signal must be applied to channel 2

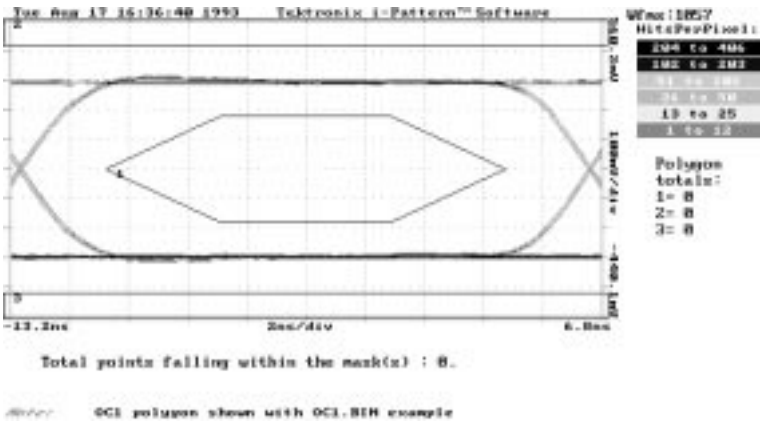

Figure 3–35: OC1 i-Pattern Mask

OC3 Mask

Figure 3–36 shows the i-Pattern mask used to test a OC3 telecommunication signal. This mask tests signals to the standard:

ANSI SONET / CCITT SDH Optical Standards

Use the disk waveform template file OC3.MSK

The signal requirements are as follows:

- Data Rate equals 155.52 Mbits/s
- The input signal is NRZ; PRBS, SDH/SONET Frame, or Live Data
- The trigger signal is Clock, Recovered Clock, or Data Signal
- The input signal must be applied to channel 1 using an O/E converter that complies with ANSI/CCITT specifications
- The trigger signal must be applied to channel 2

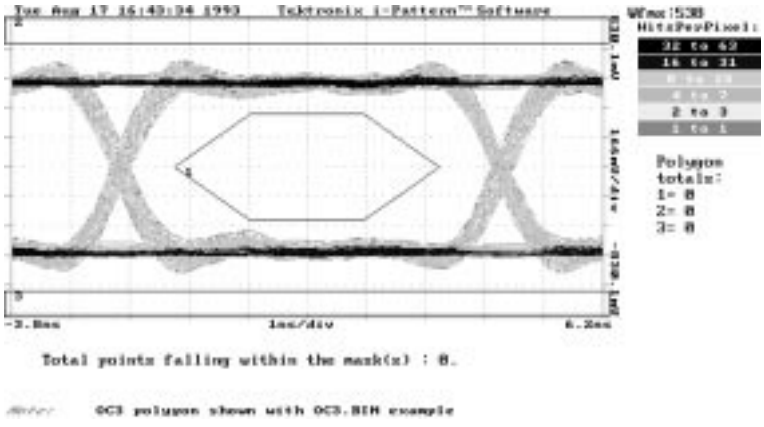

Figure 3–36: OC3 i-Pattern Mask

Appendices

Appendix A: GPIB Configuration

This appendix contains information you may use to configure your GPIB.COM file.

Below is shown the display given by IBCONF.EXE for a typical GPIB0 board. This configuration will run the i-Pattern program.

Primary GPIB Address	0
Secondary GPIB Address	NONE
Timeout setting	T3s
EOS byte	00H
Terminate Read on EOS	no
Set EOI with EOS on Write	no
Type of compare on EOS	7-bit
Set EOI w/last byte of Write	yes
GPIB-PC model	PC2A
Board is System Controller	yes
Local Lockout on all devices	no
Disable Auto Serial Polling	yes
High-speed timing	yes
Interrupt jumper setting	7
Base I/O Address	02E1H
DMA channel	1
Internal Clock Freq (in MHz)	8

Appendix B: Setup Commands

This appendix contains lists of the setup commands sent to the oscilloscope via the GPIB when loading a setup file from a personal computer.

The appendix is divided into two sections:

- Commands for each of the template setups
- Commands for each of the i-Pattern mask setups

***NOTE**. The commands listed in this appendix list the commands that directly affect waveform acquisition and template or mask comparison. They do not constitute a complete list of setups.*

Template Setups

There are 27 setup files, one for each template supplied. The commands sent to the oscilloscope via the GPIB for each setup file are listed here.

CC0_139M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  1.875e–01;POSITION 0;OFFSET 0
:REM ”Vertical scale is specified by this standard, but not offset.”
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 34
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE FALL
:LIMIT:COMPARE:CH1 REF1
```

CC0_155M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  1.875e–01;POSITION 0;OFFSET 0
:REM ”Vertical scale is specified by this standard, but not offset.”
:HORIZONTAL:MAIN:SECDIV  5.0e–10
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 20
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE FALL
:LIMIT:COMPARE:CH1 REF1
```

CC0_96K Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  1.875e–01;POSITION 0;OFFSET 0
:REM ”Vertical scale is specified by this standard, but not offset.”
:HORIZONTAL:MAIN:SECDIV  1.0e–06
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 37
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CC1_139M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  1.875e–01;POSITION 0;OFFSET 0
:REM ”Vertical scale is specified by this standard, but not offset.”
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 34
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE FALL
:LIMIT:COMPARE:CH1 REF1
```

CC1_155M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  1.875e–01;POSITION 0;OFFSET 0
:REM ”Vertical scale is specified by this standard, but not offset.”
:HORIZONTAL:MAIN:SECDIV  5.0e–10
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 20
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE FALL
:LIMIT:COMPARE:CH1 REF1
```

CC1_5M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  7.65625e–01;POSITION 0;OFFSET  1.25e+0
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 16
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CC32M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 23
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CC34M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  2.18750e–01;POSITION 0;OFFSET  5.0e–01
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  2.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 33
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CC44M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 31
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CC8M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  5.18438e–01;POSITION 0;OFFSET  1.185e+00
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 35
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CC97M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  3.90625e–01;POSITION 0;OFFSET  1.05e+00
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–10
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 27
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCCO2M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  5.18438e–01;POSITION 0;OFFSET  1.185e+00
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 38
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCCO6M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 27
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCDA64K Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  2.18750e–01;POSITION 0;OFFSET  5.0e–01
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  2.0e–06
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 30
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCDO64K Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  2.18750e–01;POSITION 0;OFFSET  5.0e–01
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–06
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 30
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCI1_5M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–07
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 35
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCSI64K Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  2.18750e–01;POSITION 0;OFFSET  5.0e–01
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–06
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 40
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCSY2M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  6.56250e–01;POSITION 0;OFFSET  1.5e+00
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 38
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCSY6M Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 34
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCTI64K Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  2.18750e–01;POSITION 0;OFFSET  5.0e–01
:REM ”Vertical offset and scale are both specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–06
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 30
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

CCX_96K Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE  4.53125e–01;POSITION 0;OFFSET 0
:REM ”Vertical scale is specified by this standard, but not offset.”
:HORIZONTAL:MAIN:SECDIV  1.0e–06
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 37
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

DS1 Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–07
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 35
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

DS1C Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 42
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

DS1 (Old) Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  1.0e–07
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 35
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

DS2 Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  2.0e–08
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 28
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

DS3 Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 38
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

FDDI Halt Setup Commands

When using the GPIB interface, the following setup commands are sent to the oscilloscope:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:REM ”Neither vertical scale nor offset are specified by this
standard.”
:HORIZONTAL:MAIN:SECDIV  5.0e–09
:HORIZONTAL:RECORDLENGTH 1000
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 33
:TRIG:MAIN:MODE AUTO;TYPE EDGE;LEV 0;HOL:VAL 0
:TRIG:MAIN:EDGE:SOU CH1;COUPLING AC;SLOPE RISE
:LIMIT:COMPARE:CH1 REF1
```

i-Pattern Mask Setups

There are nine i-Pattern Setup files, one for each i-Pattern mask supplied. The commands sent to the oscilloscope via the GPIB for each Setup file are listed here.

DS4NA Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV 1.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 49
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL 0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING AC;SLOPE RISE

DS4XNA Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 49
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

STM1 Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 70
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

STS1 Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  2.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 56
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

STS1 (New) Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  2.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 56
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

STS3 Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 37
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

STSX3 Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 37
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

OC1 Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  2.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 28
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

OC3 Setup Commands

The following setup commands are sent to the oscilloscope for proper signal acquisistion:

```
:CH1:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH1:SCALE 1.0e–1;POSITION 0;OFFSET 0
:CH2:COUPLING AC;IMPEDANCE MEG;BANDWIDTH FULL
:CH2:SCALE 1.0e–1;POSITION 0;OFFSET 0
:DISPLAY:STYLE DOTS
:HORIZONTAL:MAIN:SECDIV  1.0e–09
:HORIZONTAL:RECORDLENGTH 500
:HORIZONTAL:POSITION 50
:HORIZONTAL:TRIGGER:POSITION 70
:TRIGGER:MAIN:MODE AUTO;TYPE EDGE;LEVEL
0;HOLDOFF:VALUE 0
:TRIGGER:MAIN:EDGE:SOURCE CH2;COUPLING
AC;SLOPE RISE
```

Appendix C: Error Messages

This appendix explains the error messages you may encounter in using the i-Pattern program, and tells you what to do in response.

Returns Error, Board name GPIB0 not found. Check DEVICE=GPIB.COM in CONFIG.SYS

Cause The CONFIG.SYS on your boot disk is either missing or does not contain the line DEVICE=GPIB.COM. Check your boot disk to make sure the CONFIG.SYS file is present, and that the file contains the line DEVICE=GPIB.COM.

Returns Error, CH1 record must be 512 or 1024.

Cause This message appears for the 2230 scope when the record length is set at a value other than 512 or 1024. Reset the scope's record length to one of these values.

Returns Error, driver not available for this device.

Cause The device found at this GPIB address is not an oscilloscope or digitizer supported by the i-Pattern program. If necessary, use the GPIBparams menu to change the device address.

Returns Error, GPIB board configuration, check GPIB.COM

Cause Your GPIB board is not configured properly. Use IBCONF.EXE and GPIB configuration information contained in Appendix C to check and reconfigure the GPIB.COM file if necessary. Make sure that the GPIB-PC model setting is correct. Also check your board type.

Returns Error, Graphics adapter not found

Cause A graphics adapter other than CGA, EGA, VGA, or Hercules is connected to your computer system. The i-Pattern program requires one of these four types of graphics adapters. If you are using the Hercules adapter, you must run MSHERC.COM before you can use the i-Pattern program.

Returns Error, incorrect video mode selected.

Cause The video adapter you have selected is different than that connected to your system. Use the Video mode menu to select the correct video adapter. If you are using the Hercules adapter, you must run MSHERC.COM before you can use the i-Pattern program.

Returns Error, low memory - check CONFIG.SYS/AUTOEXEC.BAT (1.x)

Cause Your computer does not have enough free memory to run the i-Pattern program. Check your CONFIG.SYS and AUTOEX-EC.BAT files to see if any programs are being loaded that require large amounts of memory. Remove any such programs from these files and reboot the computer.

Returns Error, no masks found in PC.
Error, no masks to save.

Cause No masks are currently stored in program memory. Load a mask from disk, or create one using the Edit mask function.

Returns Error, No selected trace found on the CRT of the scope.

Cause This message appears for the 11000 series scopes if no waveform trace has yet been selected. Select the trace you want the program to display.

Returns Error, no waveforms in memory.
Error, no waveforms to display yet.

Cause No waveforms are currently stored in program memory. Load a waveform from disk, or acquire from the scope.

Returns Error, Open failed for file

Cause The file you specified cannot be opened. Check the program's default directory setting. Also, check the disk itself for write-protect or damage.

Returns Error, Read file error

Cause The program cannot read the file you've selected. Check the program's default directory setting. Also, check the disk itself for damage.

Returns Error, Write file error

Cause The program cannot write your file to disk. Check the program's default directory setting. Also, check the disk itself for write-protect or damage.

Returns Warning, DMA not enabled, check GPIB.COM

Cause Your GPIB.COM is configured with the DMA option set to NONE. The i-Pattern program will run, but will acquire waveforms at a greatly decreased speed. Use IBCONF.EXE to reset the DMA channel.

Glossary and Index

Glossary

Glossary
Use this component for glossary entries.

2D Spectral Display
A computer-enhanced image of accumulated waveforms that uses different colors to show the varying time and voltage values of the waveform. 2D Spectral displays can be used to show either live or stored waveforms, and can also display statistical information.

Acquired Waveform Display
A means of displaying waveforms as they are acquired from the oscilloscope. This can be done using either a live or a 2D Spectral display.

Bell Curve
A bell-shaped curve representing a statistical probability density function that approximates an ideal distribution of a large number of random variables about the mean value. The Bell curve is also known as the normal curve.

CMI
Code Mark Inversion

Demonstration Option
A program option that demonstrates the software's display capabilities. This demonstration loads sample waveform and mask files, and presents in succession an example 2D Spectral display (with time and voltage histograms and a mask test), three-dimensional Waterfall and Forestview displays, and a sample mask. The demonstration can be run once, or made to loop indefinitely.

Display Shades #1 – 6
The colors used in the 2D Spectral, Waterfall, and Forestview

displays to indicate the number of times a waveform has “hit” a particular point.

Fast Transfer Mode
A manner of rapidly transmitting data from the oscilloscope to the computer.

Forestview
A color, three-dimensional, perspective display of an accumulated waveform that uses vertical (z-axis) pixels to show how many waveform data hits a given point has received.

GPIB Parameters
User-controlled variables that determine the addresses of the oscilloscope and of the instrument controller, and whether or not fast transfer mode is used.

Graticule
An optional grid shown with the live and 2D Spectral displays.

Graticule Color
The color of the graticule used in the live and 2D Spectral displays.

Graticule Text Color
The color of the text, next to the graticule, which displays the time per division, the relative times at the edges of the display, volts per division, and voltage levels at the top and bottom of the display.

Grey Scale Shading
A method of printing graphics displays which uses various tones of grey in place of colors.

HELP.BAT
A short text file, run from DOS, that gives brief descriptions of the commands used to run the i-Pattern program and the demonstration options.

Histogram Cursor Color
The color of the user-controlled cursors that appear on the time and voltage histogram displays.

Histogram Cursors
Two pairs of dashed bars, one horizontal and one vertical, that appear on time and voltage histograms, and define the area from which the displayed statistical information is taken.

Histogram Data Color
The color of the data curve in the time and voltage histograms.

Histogram Standard Bell Curve Color
The color of the standard Bell curve distribution shown for comparison purposes in the time and voltage histogram displays.

Histogram Text Color
The color of the text in the histogram displays.

"Hot" Function Keys
Keys active only during waveform acquisition that allow the display to be changed quickly, without returning to the menus.

Line Note
A Comment line that appears across the bottom of the waveform displays. This line can be changed using the Line note command, located under the Configure menu.

Live Display
A means of displaying waveforms exactly as they are acquired from the oscilloscope. This display uses the computer monitor much as if it were an oscilloscope screen. Statistics displays are available with live displays.

Live Waveform Color
The color of the waveform in live displays.

Mask
A user-defined area of an accumulated waveform. This "masked" area can be tested to determine the number of waveform data points that fall within it.

Mask Memory
The portion of the program memory used to store mask data. This memory can be cleared at any time.

Mask Test
A function that determines the number of waveform data points falling within the boundaries of the mask(s) on an accumulated waveform.

MSHERC.COM
A program, run from DOS, that configures the computer for the Hercules graphics adapter. This program must be run before the i-Pattern program can be used with a Hercules adapter.

Packed Format
A method of saving waveforms that stores only non-zero data points, thus reducing the amount of space needed to save the file.

Point Accumulate Mode
A manner of displaying live waveforms that keeps all acquired waveform data points on the screen.

Screen Parameters
User-controlled variables that control aspects of the program displays, such as whether or not histograms are displayed, type of statistics displayed, and how often the screen and statistics are updated.

Screen-Refresh Interval
A user-controlled variable that controls the number of waveforms that are acquired before the 2D Spectral display is updated.

Statistics Display
Statistical information that can be shown along with the live and 2D Spectral displays. Statistics display options include time and voltage histograms, and mask tests.

Statistics-Refresh Interval
A user-controlled variable that controls the number of waveforms that are acquired before the statistics displays are updated.

TESTBUS.EXE
A program run from DOS that can be used to check communications between the computer and the oscilloscope.

Time Histogram
A diagram showing the time values of the waveform being displayed. The histogram includes a standardized Bell curve showing the mean and standard deviation values of the waveform timing. The display also contains text specifying the mean, peak-to-peak, and standard deviation values of the histogram curve, the current coordinates of the histogram cursors, and the total number of waveform data point hits within the rectangle defined by the histogram cursors.

Voltage Histogram
A diagram showing the voltage values of the waveform being displayed. The histogram includes a standardized Bell curve showing the mean and standard deviation values of the waveform voltage. The display also contains text specifying the mean, peak-to-peak, and standard deviation values of the histogram curve, the current coordinates of the histogram cursors, and the total number of waveform data point hits within the rectangle defined by the histogram cursors.

Waterfall Background Color
The color used in Waterfall displays to represent the data points that have a value of zero (that is, where no waveform points have fallen).

Waterfall

A color, three-dimensional, perspective display that produces a "contour map" of an acquired waveform, with the height of the contours at a given point proportional to the number of waveform data hits at that point.

Waveform Memory

The portion of the program memory used to store waveform data. This memory can be cleared at any time. The program can also be set to automatically clear the waveform memory whenever acquisition of a new waveform begins.

Waveform Memory Parameter

A user-controlled variable that controls whether or not the waveform memory is automatically erased whenever new waveform acquisition begins.

Z-Axis

The "vertical" axis in the Waterfall and Forestview displays, and in the time and voltage histograms. The axis can be set for either linear or base 10 logarithmic scaling.

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