

**WVR8200 and WVR8300  
Waveform Rasterizers, and  
WVR8RFP Remote Front Panel  
Service Manual**



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**Tektronix**



**WVR8200 and WVR8300  
Waveform Rasterizers, and  
WVR8RFP Remote Front Panel  
Service Manual**

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# General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

*Only qualified personnel should perform service procedures.*

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

## To Avoid Fire or Personal Injury

**Use proper power cord.** Use only the power cord specified for this product and certified for the country of use.

**Ground the product.** This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

**Observe all terminal ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

**Power disconnect.** The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

**Do not operate without covers.** Do not operate this product with covers or panels removed.

**Do not operate with suspected failures.** If you suspect that there is damage to this product, have it inspected by qualified service personnel.

**Avoid exposed circuitry.** Do not touch exposed connections and components when power is present.

**Replace batteries properly.** Replace batteries only with the specified type and rating.

**Recharge batteries properly.** Recharge batteries for the recommended charge cycle only.

**Use proper fuse.** Use only the fuse type and rating specified for this product.

**Wear eye protection.** Wear eye protection if exposure to high-intensity rays or laser radiation exists.

**Do not operate in wet/damp conditions.**

**Do not operate in an explosive atmosphere.**

**Keep product surfaces clean and dry.**

**Provide proper ventilation.** Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

### Terms in This Manual

These terms may appear in this manual:



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**WARNING.** *Warning statements identify conditions or practices that could result in injury or loss of life.*

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**CAUTION.** *Caution statements identify conditions or practices that could result in damage to this product or other property.*

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### Symbols and Terms on the Product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbol(s) may appear on the product:



CAUTION  
Refer to Manual



WARNING  
High Voltage



Protective Ground  
(Earth) Terminal



Standby

## Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

**Do Not Service Alone.** Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

**Disconnect Power.** To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

**Use Care When Servicing With Power On.** Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.



# Preface

This manual supports servicing to the module level of the WVR8200 and WVR8300 Waveform Rasterizers, which rasterize video signals for XGA display. The rasterizer finds use as a monitor for broadcasting, production, and post-production environments.

This manual explains how to troubleshoot and service the rasterizer to the module level. The manual is divided into the following sections:

- *Introduction* provides a general product description and tells where to find product installation information.
- *Theory of Operation* provides descriptions of the rasterizer modules.
- *Maintenance* tells you how to troubleshoot the product to the module level and how to handle the modules.
- *Replaceable Parts* illustrates the replaceable modules and mechanical parts and provides replacement part numbers.

## Manual Conventions

The following terms and conventions are used throughout this manual:

- The terms "rasterizer" and "instrument" are used interchangeably to refer to the WVR8200 and WVR8300 Waveform Rasterizers.
- Where information is model-specific to either the WVR8200 or WVR8300 model, it is indicated as such. (See page 1-1, *Configurations*.)

## Related Manuals

This manual assumes you have access to the following manuals when servicing this product. These manuals ship with the product and are also downloadable from the Tektronix Web site.

**Table i: Related documentation**

| Item                                                                                                                         | Purpose                                            | Location                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <i>WVR8200 and WVR8300 Waveform Rasterizers User Manual</i>                                                                  | Operation instructions and explanation of features | Product Documentation CD<br><a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>                           |
| <i>WVR8200 and WVR8300 Waveform Rasterizers Installation and Safety Instructions</i> , English, Japanese, Simplified Chinese | Basic installation and safety information          | Printed manual Product<br>Product Documentation CD<br><a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a> |
| <i>Online Help</i>                                                                                                           | In depth operation and UI help                     | In the instrument: press the HELP button on the front panel                                                                    |

**Table i: Related documentation (cont.)**

| <b>Item</b>                                                                                 | <b>Purpose</b>                                                        | <b>Location</b>                                                                                      |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <i>WVR8200 and WVR8300 Waveform Rasterizers Specifications and Performance Verification</i> | Procedure for checking performance and list of specifications         | Product Documentation CD<br><a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a> |
| <i>WVR and WFM Series Master Information Base (MIB)</i>                                     | Programmers command reference for controlling the waveform rasterizer | Product Documentation CD<br><a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a> |



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# Introduction



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# Introduction

The WVR8200 and WVR8300 Waveform Rasterizers rasterize serial digital video and composite video signals (depending on installed options) for an DVI-I display, providing a new standard of display quality and flexibility.

## Service Strategy

These products are repaired to the module level at selected Tektronix service centers. Repair includes functional verification of the product.

## Specifications

The specifications for this product are found in the *WVR8200 and WVR8300 Waveform Rasterizers Specifications and Performance Verification Technical Reference* located on the Product Documentation CD that ships with the product and is published on the Tektronix Web site. (See page ix, *Related Manuals*.)

## Performance Verification

The performance verification procedures for this product are found in the *WVR8200 and WVR8300 Waveform Rasterizers Specifications and Performance Verification Technical Reference* located on the Product Documentation CD that ships with the product and is published on the Tektronix Web site. (See page ix, *Related Manuals*.)

## Options and Accessories

The lists of options and accessories for this product are found in the *WVR8200 and WVR8300 Waveform Rasterizers User Manual* located on the Product Documentation CD that ships with the product and is published on the Tektronix Web site. (See page ix, *Related Manuals*.)

## Configurations

The base instrument accepts an optional module for Analog Composite inputs (Option CPS). Other options add audio capability, Eye diagram and physical layer analysis, jitter analysis capability, and advanced gamut monitoring capability. For a complete list of options, refer to the *WVR8200 and WVR8300 Waveform Rasterizers User Manual*.

## WVR8RFP

A Remote Front Panel (WVR8RFP) is available as a companion product. When connected, both front panels are fully operational.

## Hardware Installation

This product is to be rack mounted. For installation instructions, refer to the *WVR8200 and WVR8300 Waveform Rasterizers Installation and Safety Instructions*.

## Product Upgrade

Hardware and software upgrades are available for all products, either as a field upgrade kit or as a free software download from the Tektronix Web site. The *WVR8200 and WVR8300 Waveform Rasterizers User Manual* includes instructions for updating product firmware.

## Operating Information

For basic operating instructions, refer to the *WVR8200 and WVR8300 Waveform Rasterizers User Manual*. For more detailed reference information, refer to the instrument Online help. (Press the **Help** button on the instrument front panel and then use the **General** knob, up/down arrow keys, and **SEL** button to navigate through the topics.)

### Power-On Procedure

1. Connect the supplied power cord to the rear-panel power connector.
2. Press the power button on the instrument front-panel and the instrument will turn on.
3. Wait for the system to complete its power-on self-tests.

---

**NOTE.** *The Standby button on the front-panel does not disconnect mains power. Only the power cord at the rear of the product can disconnect mains power.*

---

### Power-Down Procedure

1. Press the power button on the instrument front-panel to turn the instrument off.
2. To remove power completely, disconnect the power cord from the rear-panel of the instrument.

---

# Theory of Operation



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# Theory of Operation

The WVR8200 and WVR8300 are modular waveform rasterizers. They can be configured, with options, to accept Analog Composite inputs. Audio options can add inputs for digital only or analog audio capability.

All models use an external DVI-I monitor for the display. All models also have outputs to drive serial digital and analog picture monitors.

This theory of operation is mainly based on the High-level block diagram. (See Figure 2-1.) When necessary, other block diagrams may also be referenced.

The lower portion of the block diagram covers functions on the main board. The upper sections cover those of the optional video input and audio boards.

The primary functions on the main board are:

1. Serial digital input processing
2. Reference input
3. Waveform processing engine
4. Rasterizing, recursion, and picture processing engine
5. Control processor and its associated peripherals
6. Auxiliary and ancillary data processing
7. Secondary power distributions

There are also miscellaneous circuits, such as the thermal control system for the fan.

Power Distribution is not shown in the block diagram but is covered at the end of this section.

Power Distribution is not shown in the block diagram but is covered at the end of this section.

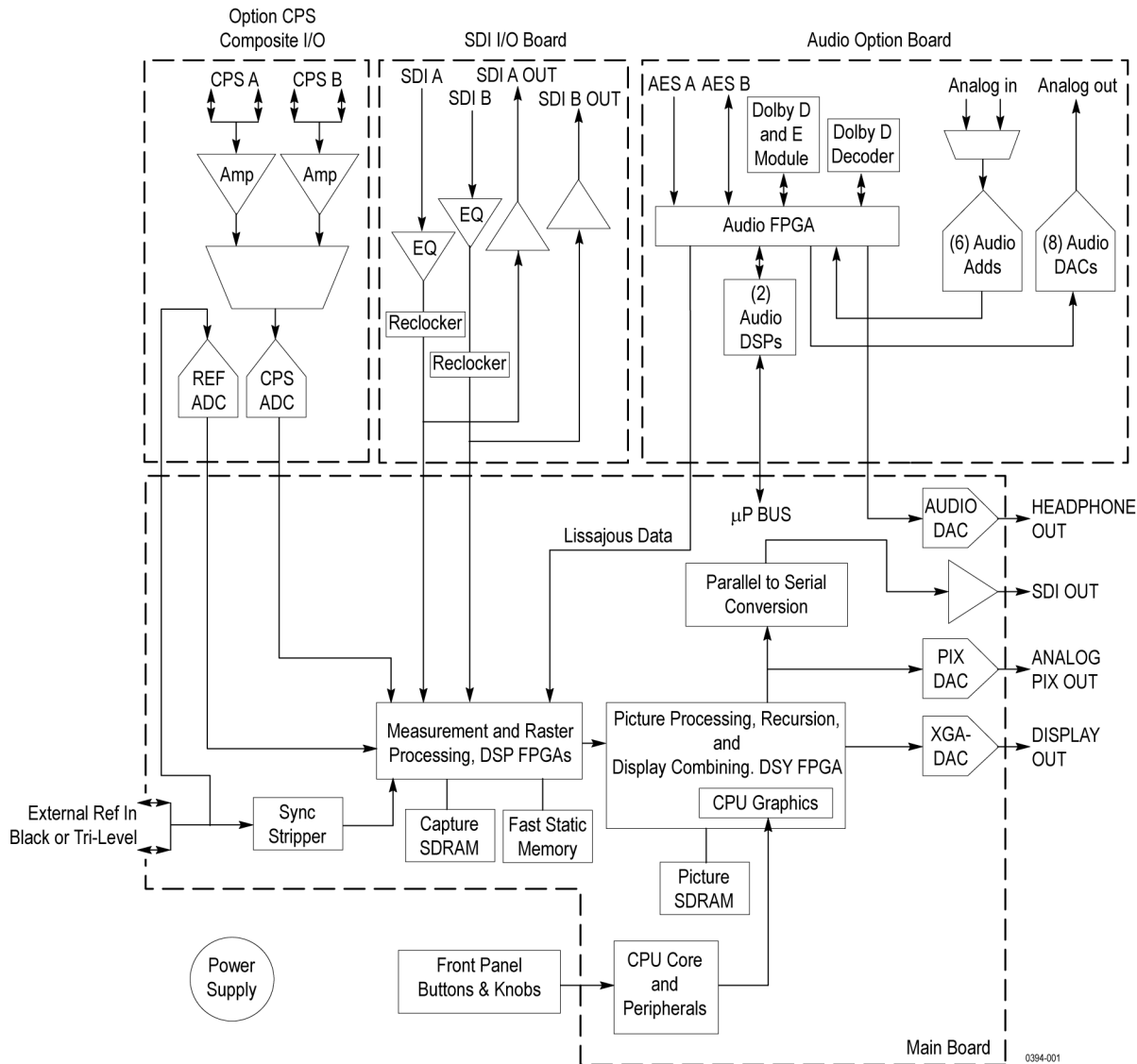


Figure 2-1: Main block diagram



## Main Board

### **Serial Digital Input Processing**

The serial digital circuitry receives the SDI input streams after they have been equalized, from either the SDI I/O board or the EYE/PHY board, depending on the installed options. The SDI streams are passed to the DSP FPGAs where they undergo measurement and raster processing. The signal information is then passed to the DSY FPGA for picture processing, recursion, and display combining. The result is shown on the external DVI-I connector.

### **Reference Input**

The Reference input is a passive loopthrough, which is AC coupled and buffered. Operation varies, depending on whether the instrument is operating in digital or composite input mode. For digital inputs the reference signal is applied to a sync separator whose output is supplied to the DSP FPGA, where the timing information is derived. For composite inputs, the reference signal is routed to the Option CPS composite input board, where a 10-bit ADC digitizes the signal. The digitized signal is then routed back to the DSP FPGA on the main board so the timing information can be derived, as with the digital process.

### **Digital Waveform Processing Engine**

The data streams from the Composite and SDI video inputs are applied to the waveform processing FPGA. This block deformats, up-samples, interpolates, demodulates, and otherwise processes the data to generate the signals needed to create the displays.

### **Rasterizing Engine**

The Rasterizer engine resides in the same DSP FPGA as the waveform processing engine. This block builds up the variable intensity images in the fast static RAM. For each pixel of the display, the Rasterizer Engine increments the intensity of that pixel every time the waveform hits its coordinates. As a result the waveform areas hit more frequently are brighter. For any given frame, the intensity map is built up in one memory chip and read out of the other. The functions swap on the next field.

### **Recursion and Picture Processing Engine**

The output of the rasterizer feeds the picture and recursive processing engine in the second large FPGA. This engine adds the previous frame to the present frame to reduce flicker and improve brightness. It also converts the picture and waveform signals from the input rate of 50 or 59.94 Hz to 60 Hz frame rate to work with the DVI-I monitor. The picture and waveform data combine with the graphics and audio bar information from the control processor, and then output to the XGA DAC to drive the external monitor. Note that the parallel data from the serial digital inputs connect directly to this FPGA to provide the picture functionality, bypassing the waveform processing engine.

### **Control Processor**

The control processor is in charge of all the operational modes in the instrument. It draws the audio bars, communicates with the front panel, and controls most other internal devices through either the SPI or the I<sup>2</sup>C bus. Audio data is input to the control processor via the 8 bit HPI bus.

The control processor interfaces to the Ethernet through a dual rate connection. This allows the network connection to run at 10 or 100 MBps.

**LTC** LTC inputs come from the remote connector. The LTC signal is applied to an A/D converter and then input to the waveform processing FPGA, which decodes the time code information.

---

**NOTE.** *The FPGAs decode VITC signals digitally.*

---

## Front Panel

The front panel contains a small processor which communicates with the control processor through RS232 signaling. Reprogramming can be done through the SPI if the front panel processor flash code must be updated.

## Composite Input Option CPS

The Composite inputs are also passive loop-throughs. If unterminated, the signal appears twice as large as it should. The inputs are either AC or DC coupled, depending on the DC Restore setting. The selected input signal is filtered and applied to an A-to-D converter to generate a 14-bit parallel signal, which is routed to the DSP FPGA on the Main board, where it is demodulated in the digital domain.

## Audio Options AD and DPE

The audio option (if installed) resides on the upper "mezzanine" board. There are two audio options available.

- Option AD adds Analog Audio Monitoring (2 sets of 6 channel Analog Audio inputs and 8 channels of Analog Audio outputs) and 16 channels Embedded and AES/EBU Digital Audio support (8 channels at a time). This option is available for all models.
- Option DPE adds Option AD capabilities plus support for decoding and monitoring Dolby E and Dolby D Audio. This option is available for all models.

### Audio Processing

Both audio versions have the same basic processing engine. This uses an FPGA to route the audio input into two DSP chips, whose main function is to calculate the peak values for the selected meter ballistics (response characteristics).

The audio data has two paths to the display. On one path, peak values are sent to the control processor which then plots the bar and surround displays. On the second path, raw data samples are sent to the waveform processing engine which interpolates and plots it to generate the lissajous, or “phase,” display.

### **Audio Inputs**

There are three basic audio input paths: AES, analog, and embedded. AES inputs are accepted at rates up to 192 kHz.

Analog inputs are digitized at 48 kHz and then go through the same path as the AES inputs.

The embedded audio path starts at the waveform processing engine. First the audio samples are extracted from the serial digital video data using a 12.288 MHz oscillator and sent to the audio board. At the audio board the streams are multiplexed into the AES decoders and then follow the same path as the AES data. The user can choose to have the de-embedded audio output on the AES B port.

### **Audio Outputs**

There are two audio outputs: Analog and AES. Both outputs always follow the source that is currently selected for the audio bar display. The analog outputs can come from any input. The selected signal output from the FPGA is converted from digital to analog, and then sent as a balanced output to the 62-pin rear panel analog audio connector.

The AES B connectors can be configured as outputs for use with any input type. They can serve as an active loopthrough if the input is AES, a de-embedder if the input is embedded, or an A/D converter if the input is analog. Up to six decoded Dolby audio channels may be output if Option DPE is installed.

## **Option EYE/PHY**

Options EYE and PHY provide the following features:

- Eye pattern display
- Equalized Eye pattern display
- Jitter readout
- Jitter Meter
- Cable Loss readout
- Test Signal Output
- Approx Cable readout
- Source Level readout
- Jitter waveform display <sup>1</sup>
- Eye Amplitude readout <sup>1</sup>

- Eye Risettime readout <sup>1</sup>
- Eye Falltime readout <sup>1</sup>
- Eye Rise-Fall (difference) readout <sup>1</sup>

<sup>1</sup> Requires Option PHY.

---

**NOTE.** *SD, HD, and 3 Gb/s signals can be used with these features. All instrument models come standard with SD-SDI and HD-SDI. 3 Gb/s signals require Option 3G be installed.*

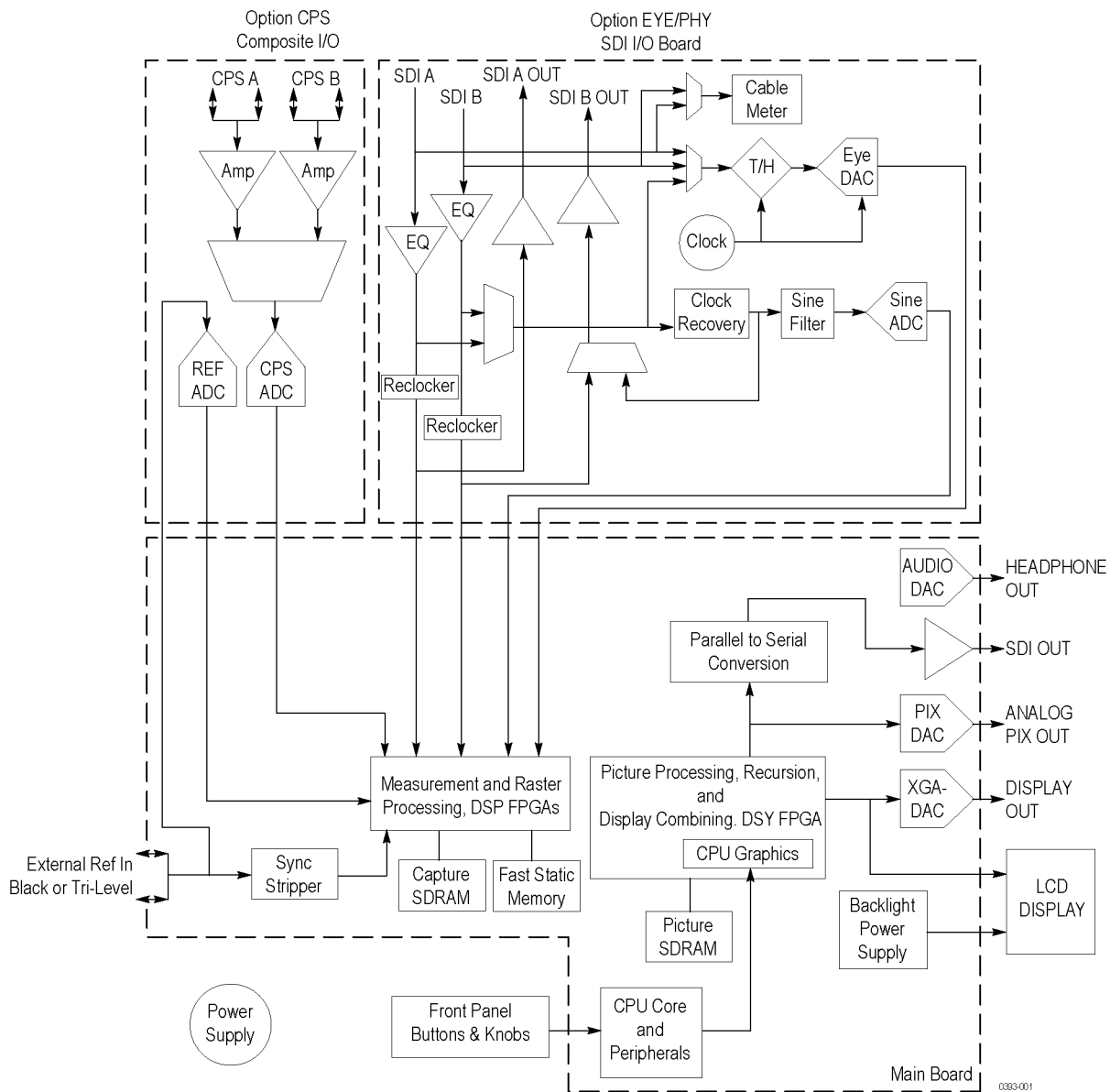
---

The hardware to support these features is contained on the EYE/PHY board. The Audio blocks are not shown in this block diagram but, if installed, still connect as shown in the Main Block diagram. (See Figure 2-1 on page 2-2.)

### Operation

Each SDI input signal is applied to a cable equalizer. The selected input signal is sampled by a wide-band track-and-hold circuit, and then digitized. The selected input is also applied to a clock recovery circuit. The recovered clock is divided by 10 for SD (by 20 for HD), filtered to form a sine wave, and then digitized. Both the SDI input and the recovered clock sine wave are sampled by the same asynchronous clock, and then both are passed to the main board for processing by FPGAs. These arrays produce the Eye Display, Jitter Display, Jitter Readout, and Jitter Thermometer. The Eye Display data is further processed to derive the Eye Amplitude, Eye Rise Time, and Eye Fall Time measurements, which are shown in the SDI Status Display.

The selected SDI input signal also drives the Cable Meter circuit, which measures signal energy at two frequencies. These measurements are read by the CPU on the Main board, which calculates Cable Loss, Approximate Cable Length, and Source Level for display in the SDI Status screen.



**Figure 2-2: Option EYE/PHY block diagram**

## Fan Control

There are multiple temperature sensors in different locations in the instrument, including some mounted on the option boards. The control processor reads the temperature sensors and sets a target speed for the fans. The fan circuit holds the fan speed at the target by measuring the fan tachometer output, allowing reliable operation at low speed. If a fan is not turning, the circuit senses the stall and turns on a red LED (DS11, DS12, DS22, or DS23 on the Main board). The fans are tested at power on. If a fan fails, a message is shown on screen and also entered into the diagnostic log.

## Power Supply and Distribution

The power supply has a universal AC input, enabling it to accommodate 90 to 264 VAC without any user range switching. The output is 5 VDC. Circuits convert this output to any other supply voltage that they require at the point of usage.

Fuses on the Primary supply 5 V output protect the main board.

The secondary supplies and their tolerances are specified in the troubleshooting section. The location of the supply test points is shown in the *Maintenance* section.

---

# Adjustment Procedures





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# Adjustments

The waveform rasterizer does not normally require any adjustments. The adjustments which can be made are semi-automated, and should only be made while performing a Performance Verification. Make the appropriate adjustment if the instrument fails one of these tests in the Performance Verification procedure:

- *Cable Meter (HD, SD, and 3G)* (Option EYE or PHY only)
- *Jitter Noise Floor* (Option EYE or PHY only)
- *Eye Gain* (Option EYE or PHY only)
- *PixMon Output*
- *Composite Analog Input DC Offset Restore Off* (Option CPS only)
- *Composite Analog Vertical Measurement Accuracy* (Option CPS only)
- *Composite Analog Frequency Response* (Option CPS only)
- *Analog Audio Level Meter Accuracy Over Frequency* (Options AD and DPE only)

After making the adjustment shown here, repeat the failed Performance Verification step.

## Required Equipment

These adjustment procedures require the same equipment as the Performance Verification procedure. For more details refer to *Specifications and Performance Verification*.

## Procedures

---

**NOTE.** *If you do not see the calibration case you are looking for, make sure to go to the next page using the up or down arrow key.*

---

**Cable Meter**

1. If any cable length reading is outside the specification, perform the following adjustment procedure. Perform both the Short and Long steps for any input (SDI A or SDI B) and any standard (HD, SD, and 3 Gb/s) that was found to be outside the specification.

---

**NOTE.** Be sure to use a generator with SDI output set as close as possible to 800 mV, since the Cable Meter adjustment establishes the Source Level and the Approx Cable (cable length) calibration.

---

2. Press **CONFIG**, select **Utilities > Calibration**, and then press **SEL** to start the calibration process.
3. Use the up and down arrow buttons to navigate to the Cable Meter calibration case you want.
4. Press **SEL** to start, and follow the on-screen instructions.
5. Follow the instructions at the bottom of the screen to Save and Exit Calibration mode.

**SD, HD, and 3G Clock  
Extractor (Jitter Noise  
Floor)**

If the Jitter Noise Floor is outside of the specification, perform the Eye CDR Null calibration, as described below.

1. Press the **CONFIG** button.
2. Select **Utilities > Calibration** and press **SEL** to enter the Calibration menu.
3. Use the arrow buttons to navigate to the appropriate Eye CDR Null calibration case.
4. Press **SEL** to start, and follow the on-screen instructions.
5. Follow the instructions at the bottom of the screen to Save and Exit Calibration mode.
6. Restart the Jitter Noise Floor test, and then record the new values in the test record provided in the Specifications and Performance Verification manual.

**Eye Gain**

If the Eye Gain is outside the specification, perform the following adjustment procedure for SDI A and SDI B inputs.

1. Connect a signal source, with an 800 mV, 1 MHz, square wave signal to the SDI A input. Make sure the source is calibrated and the signal amplitude is within a few millivolts of 800 mV.
2. Press the **CONFIG** button, and then select **Utilities > Calibration**. Press **SEL** to enter the calibration menu.
3. Use the up and down arrow buttons to navigate to the appropriate Eye Gain Adjust selection, and press **SEL** to start the calibration.

4. Follow the on screen instructions, using the General knob or the up and down arrow keys to adjust the displayed amplitude of the eye waveform until it is 800 mV.
5. Press and hold **STATUS**, and then select **SAVE** and press **SEL**.
6. Repeat for the SDI B input.
7. Follow the instructions at the bottom of the screen to Save and Exit Calibration mode.

### PixMon YPbPr Gain

1. Connect a signal with an identifiable 100% level, such as 100% Flat Field or 100% Color Bars, to the SDI A input.
2. Connect an XGA to 5x BNC adapter cable to the PixMon output.
3. Connect the Y/Green video signal to the oscilloscope input. (Use an oscilloscope with a 75  $\Omega$  input, or a 75  $\Omega$  feed through termination.)
4. Set the Oscilloscope:

| Control | Setting        |
|---------|----------------|
| Vert    | 200 mV/Div     |
| Horiz   | 20 $\mu$ s/Div |
| Trigger | Edge           |

5. Press the **Config** button.
6. Select **Utilities > Calibration**. Press **SEL** to enter the calibration menu.
7. Navigate to the **Pixmon YPbPr Gain** calibration case, and press **SEL** to start.
8. Adjust the oscilloscope trigger level for a stable display.
9. Use the General knob to adjust the signal amplitude (not including the sync pulse) to 700 mV on the oscilloscope.
10. Follow the instructions at the bottom of the calibration screen to Save and Exit Calibration mode.

### PixMon YRGB Black Level

1. Connect a signal with an identifiable black level, such as 0% Flat Field or 100% Color Bars, to the SDI A input.
2. Connect an XGA to 5x BNC adapter cable to the PixMon output.
3. Connect the Y/Green video signal to the oscilloscope input. (Use an oscilloscope with a 75  $\Omega$  input, or a 75  $\Omega$  feed through termination.)

**4. Set the Oscilloscope:**

| Control | Setting        |
|---------|----------------|
| Vert    | 200 mV/Div     |
| Horiz   | 20 $\mu$ s/Div |
| Trigger | Edge           |

5. Press the **Config** button.
6. Select **Utilities > Calibration**. Press **SEL** to enter the calibration menu.
7. Navigate to the **Pixmon YRGB black level** calibration case, and press **SEL** to start.
8. Adjust the oscilloscope trigger level for a stable display.
9. Use the General knob to adjust the signal black level to 0 V on the oscilloscope.
10. Follow the instructions at the bottom of the calibration screen to Save and Exit Calibration mode.

**PixMon PbPr Zero Level**

1. Connect a signal with an identifiable black level, such as 0% Flat Field or 100% Color Bars, to the SDI A input.
2. Connect an XGA to 5x BNC adapter cable to the PixMon output.
3. Connect the Pb/Blue video signal to the oscilloscope input. (Use an oscilloscope with a 75  $\Omega$  input, or a 75  $\Omega$  feed through termination.)
4. Set the Oscilloscope:

| Control | Setting        |
|---------|----------------|
| Vert    | 200 mV/Div     |
| Horiz   | 20 $\mu$ s/Div |
| Trigger | Edge           |

5. Press the **Config** button.
6. Select **Utilities > Calibration**. Press **SEL** to enter the calibration menu.
7. Navigate to the **Pixmon PbPr zero level** calibration case, and press **SEL** to start.
8. Adjust the oscilloscope trigger level for a stable display.
9. Use the General knob to adjust the signal zero level to 0 V on the oscilloscope.
10. Follow the instructions at the bottom of the calibration screen to Save and Exit Calibration mode.

**Composite Analog Input  
DC Offset Restore Off  
(Option CPS)**

Perform the following steps if the Offset is outside the specification.

1. Press the **Config** button.
2. Select **Utilities > Calibration**, and then press **SEL** to enter the calibration menu.
3. Navigate to **Composite DC Offset** and press **SEL** to automatically adjust the offset.
4. Follow the instructions at the bottom of the screen to Save and Exit Calibration mode.

**Composite Analog Vertical  
Measurement Accuracy  
(Option CPS)**

Perform the following steps if the Amplitude is outside the specification.

1. Connect a 100% color bar signal from the precision generator to the Composite A input. Terminate the loop through with a precision 75  $\Omega$  termination.
2. Press the **CONFIG** button.
3. Navigate to **Utilities > Calibration**, and then press **SEL**.
4. Select **Composite Waveform Gain**, and then press **SEL**.
5. Follow the on-screen instructions to adjust the gain.
6. Follow the instructions at the bottom of the screen to Save and Exit Calibration mode.

**Composite Analog  
Frequency Response  
(Option CPS)**

Perform the following steps if the Frequency Response is outside the specification.

1. Connect the precision video generator to one of the CMPST A input connectors and terminate the other connector with the precision terminator.
2. Set the precision generator for 700 mV Multiburst. The top packet must be 5.75 MHz.
3. Press the **CONFIG** button.
4. Navigate to **Utilities > Calibration**, and then press **SEL**.
5. Select **Composite Freq Peak** and then press **SEL**.
6. Follow the on-screen instructions to adjust the response.
7. Follow the instructions at the bottom of the screen to Save and Exit calibration mode.
8. Repeat the Composite Analog Frequency Response test in the Performance Verification procedure.

**Analog Audio Level Meter  
Accuracy Over Frequency**

If any of the Analog A Inputs failed to meet the specification, (or even if they are off by more than a few tenths of a dB) the following input adjustment can be performed.

1. Set the analog audio generator as follows:

| Control          | Setting           |
|------------------|-------------------|
| Frequency        | 1 kHz             |
| Output Level     | 18 dBu Audio Tone |
| Output Impedance | 10 $\Omega$       |

2. Connect the generator balanced (BAL) analog output to the Analog A input that requires adjustment.
3. Press the **CONFIG** button.
4. Navigate to **Utilities > Calibration**, and then press **SEL**.
5. Push the up or down arrow key until the desired Analog Audio input channel is highlighted, and then press **SEL**.
6. Follow the instructions at the bottom of the screen to Save and Exit calibration mode.
7. Check for an indication of 18 dBu in the newly adjusted audio bar.
8. If multiple inputs require adjustment, repeat this procedure for each input.
9. After all adjustments are made, you should perform a complete performance verification procedure.

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# Maintenance





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# General Maintenance

This section contains the information needed to perform periodic and corrective maintenance on the instrument. The following subsections are included:

- *Preventing ESD* – General information on preventing damage by electrostatic discharge.
- *Inspection and Cleaning* – Information and procedures for inspecting and cleaning the instrument.
- *Troubleshooting* – Information for isolating and troubleshooting failed modules. Included are instructions for operating the diagnostic routines and troubleshooting trees. Most of the trees make use of the internal diagnostic routines to speed fault isolation to a module.
- *Removal and Replacement Procedures* – Information and procedures for removing and replacing modules in the instrument.
- *Repackaging Instructions* – Information on returning a instrument for service.

## Preventing ESD

Before servicing this product, read the *Safety Summary* and *Introduction* at the front of the manual and the ESD information below.



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**CAUTION.** *Static discharge can damage any semiconductor component in the instrument.*

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When performing any service that requires internal access to the instrument, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge (ESD).

1. Minimize handling of static-sensitive circuit boards and components.
2. Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive boards.
3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules. Do service of static-sensitive modules only at a static-free work station.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Handle circuit boards by the edges when possible.

6. Do not slide the circuit boards over any surface.
7. Avoid handling circuit boards in areas that have a floor or work-surface covering capable of generating a static charge.

## Inspection and Cleaning

*Inspection and Cleaning* describes how to inspect for dirt and damage. It also describes how to clean the exterior and interior of the instrument. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent malfunction and enhance reliability.

Preventive maintenance consists of visually inspecting and cleaning the instrument and using general care when operating it.

How often maintenance should be performed depends on the severity of the environment in which the instrument is used. A proper time to perform preventive maintenance is just before any instrument adjustment.

**General Care** The cabinet helps keep dust out and should normally be in place during operation.



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**WARNING.** *To prevent injury or death, power off the instrument and disconnect it from line voltage before performing any procedure that follows.*

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**Interior Cleaning** Use a dry, low-velocity stream of air to clean the interior of the chassis. Use a soft-bristle, non-static-producing brush for cleaning around components. If you must use a liquid for minor interior cleaning, use a 75% isopropyl alcohol solution and rinse with deionized water.

**Exterior Cleaning** Clean the exterior surfaces of the chassis with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, use a cloth or swab dipped in a 75% isopropyl alcohol solution. Use a swab to clean narrow spaces around controls and connectors. Do not use abrasive compounds on any part of the instrument that may damage the chassis.



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**CAUTION.** *Avoid the use of chemical cleaning agents that might damage the plastics used in the instrument. Use only deionized water when cleaning the front-panel buttons. Use a 75% isopropyl alcohol solution as a cleaner and rinse with deionized water. Before using any other type of cleaner, consult your Tektronix Service Center or representative.*

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**Inspection — Exterior.** Inspect the outside of the instrument for damage, wear, and missing parts, using the following table as a guide. Immediately repair defects that could cause personal injury or lead to further damage to the instrument.

**Table 4-1: External inspection check list**

| Item                            | Inspect for                                                                                 | Repair action                                                                    |
|---------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Cabinet, front panel, and cover | Cracks, scratches, deformations, damaged hardware                                           | Repair or replace defective module                                               |
| Front-panel knobs               | Missing, damaged, or loose knobs                                                            | Repair or replace missing or defective knobs                                     |
| Connectors                      | Broken shells, cracked insulation, and deformed contacts. Dirt in connectors                | Repair or replace defective modules. Clear or wash out dirt                      |
| Rackmount slides                | Correct operation                                                                           | Repair or replace defective module                                               |
| Accessories                     | Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors | Repair or replace damaged or missing items, frayed cables, and defective modules |

**Inspection — Interior.** To access the inside of the instrument for inspection and cleaning, you will need to remove the top cover.

Inspect the internal portions of the instrument for damage and wear, using the following table as a guide. Defects found should be repaired immediately.

If any circuit board is repaired or replaced, check the following table to see if it is necessary to adjust the instrument.



**CAUTION.** To prevent damage from electrical arcing, ensure that circuit boards and components are dry before applying power to the instrument.

**Table 4-2: Internal inspection check list**

| Item               | Inspect for                                                                                                                 | Repair action                                    |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Circuit boards     | Loose, broken, or corroded solder connections.<br>Burned circuit boards.<br>Burned, broken, or cracked circuit-run plating. | Remove and replace damaged circuit board.        |
| Resistors          | Burned, cracked, broken, blistered condition.                                                                               | Remove and replace damaged circuit board.        |
| Solder connections | Cold solder or rosin joints.                                                                                                | Resolder joint and clean with isopropyl alcohol. |

**Table 4-2: Internal inspection check list (cont.)**

| Item              | Inspect for                                                         | Repair action                                                                        |
|-------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Capacitors        | Damaged or leaking cases.<br>Corroded solder on leads or terminals. | Remove and replace damaged circuit board.                                            |
| Wiring and cables | Loose plugs or connectors.<br>Burned, broken, or frayed wiring.     | Firmly seat connectors.<br>Repair or replace modules with defective wires or cables. |
| Chassis           | Dents, deformations, and damaged hardware.                          | Straighten, repair, or replace defective hardware.                                   |

**Cleaning Procedure – Interior.** To clean the instrument interior, perform the following steps:

1. Blow off dust with dry, low-pressure, deionized air (approximately 9 psi).
2. Remove any remaining dust with a lint-free cloth dampened in isopropyl alcohol (75% solution) and rinse with warm deionized water. (A cotton-tipped applicator is useful for cleaning in narrow spaces and on circuit boards.)

**STOP.** *If, after doing steps 1 and 2, a module is clean upon inspection, skip the remaining steps.*

3. If steps 1 and 2 do not remove all the dust or dirt, the instrument may be spray washed using a solution of 75% isopropyl alcohol by doing steps 4 through 6.
4. Gain access to the parts to be cleaned by removing easily accessible shields and panels.
5. Spray wash dirty parts with the isopropyl alcohol and wait 60 seconds for the majority of the alcohol to evaporate.
6. Dry all parts with low-pressure, deionized air.

**Lubrication.** There is no periodic lubrication required for the instrument.

## Troubleshooting

The procedures in this section will help you trace the root cause of a problem back to one of the replaceable parts. In general, this is a board-level replacement but there are a few components on some boards that are replaceable.



**WARNING.** *Before performing this or any other procedure in this manual, read the General Safety Summary and Service Safety Summary found at the beginning of this manual.*

*To prevent possible injury to service personnel or damage to electrical component, refer on how to prevent ESD. (See page 4-1.).*

## Getting Started

This procedure consists of two main sections: the first section contains the *Symptoms and Causes* table, and the second section contains a set of *Detailed Troubleshooting Procedures*. The table lists common problems and should help you identify the problem or it may direct you to one of the detailed troubleshooting procedures in the second section. If you do not find your instrument's problem in the table, or if no specific problem was reported by the user, then follow the steps in the *Unknown Problem* section in the Symptoms and Causes table.

The WVR8200 and WVR8300 Waveform Rasterizers are highly configurable and behavior is sometimes complex. Before troubleshooting in-depth, verify that:

- The installed options are as expected. See CONFIG > Utilities > View Instrument Options
- The current settings support the expected behavior. A good first step is to recall the Factory Presets. To do this, press PRESET > Recall Preset > Recall Factory Preset.

To properly test this instrument, you must have a known good XGA monitor and appropriate signal sources. Depending on what portion of the instrument you are testing, this might include Composite Video, Serial Digital Video, Analog Audio, or Digital Audio. In some cases, you may also need receivers or an oscilloscope to check outputs.

These instruments consist of several boards and major components. Some of these are optional, as shown below. The objective of this troubleshooting guide is to isolate a problem to a module or board so it can be replaced. This guide does not provide information to troubleshoot to the component level.

Standard boards and modules:

- Power Supply
- Front Panel board with buttons, LEDs, and knobs
- Main board

Optional boards:

- SDI input, for instruments without Option EYE or PHY
- Eye, for Option EYE or PHY
- Composite input, for Option CPS
- Audio, for Option AD and DPE
- Dolby Decoder module, for Option DPE

**Table 4-3: Required test equipment**

| Test equipment                                                                          | Requirements                                                                                                                                                                                                | Example                                                                        |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| XGA Monitor                                                                             | Computer monitor capable of 1024 x 768 x 60 Hz scan rate                                                                                                                                                    |                                                                                |
| SDI serial digital video test generator with embedded audio and composite signal source | 1080p 59.94 3 Gb/s HD signals required: <ul style="list-style-type: none"> <li>■ 100% color bars</li> <li>■ SDI Matrix Split Field Pathological Signal</li> </ul>                                           | Tektronix TG700 with an HD3G7 module (Embedded audio needed for audio options) |
| Varies with installed options:                                                          |                                                                                                                                                                                                             |                                                                                |
| SD - Need SD SDI source                                                                 |                                                                                                                                                                                                             |                                                                                |
| HD - Need HD SDI source                                                                 | 1080i 59.94 HD signals required:                                                                                                                                                                            | Tektronix TG700 with HDVG7 module (Embedded audio needed for audio options)    |
| 3 Gb/s - Need 3 Gb/s SDI source                                                         | <ul style="list-style-type: none"> <li>■ 100% color bars</li> <li>■ 10 bit shallow ramp</li> <li>■ SDI Matrix Split Field Pathological Signal</li> <li>■ 100% sweep</li> </ul>                              |                                                                                |
| CPS - Need composite SDI source                                                         | 525/270 SD signals required: <ul style="list-style-type: none"> <li>■ 100% color bars</li> <li>■ 10 bit shallow ramp</li> <li>■ SDI Matrix Split Field Pathological Signal</li> <li>■ 100% sweep</li> </ul> | Tektronix TG700 with DVG7 module (Embedded audio needed for audio options)     |
| AES Audio Signal Generator (If any audio option installed)                              | 48 kHz, 24 bit word length signals                                                                                                                                                                          | Rohde & Schwarz UPV, Tektronix AM700 and AM70.                                 |
| Analog Audio Signal Generator                                                           |                                                                                                                                                                                                             | Rohde & Schwarz UPV, Tektronix AM700 and AM70.                                 |
| Voltmeter                                                                               |                                                                                                                                                                                                             | Fluke 87 or equivalent                                                         |
| DC Ammeter with Clamp on pickup                                                         | 20 Amp DC capable                                                                                                                                                                                           | Fluke 336 or equivalent                                                        |
| Oscilloscope                                                                            | Video trigger capability                                                                                                                                                                                    | Tektronix TDS3000C Series, Tektronix DPO70404                                  |

**Table 4-4: Symptoms and causes**

| Symptom                                | Possible sources or recommended detailed troubleshooting procedure to follow                                                                                                                                                           |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No LEDs lit and XGA output not working | Perform general checks<br>Perform primary power supply checks<br>Perform secondary power supply checks<br>Perform Front Panel button Troubleshooting<br>Replace main circuit board or Front Panel assembly as indicated by above tests |

**Table 4-4: Symptoms and causes (cont.)**

| <b>Symptom</b>                                                                                                                                                                                                                                                                     | <b>Possible sources or recommended detailed troubleshooting procedure to follow</b>                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inconsistent or partial hardware failures                                                                                                                                                                                                                                          | Perform primary power supply checks<br>Perform secondary power supply checks<br>Examine Power-up Diagnostics results in the Diagnostic Log<br>Run Advanced Diagnostics<br>Replace Main circuit board        |
| Fails any of these Power On Diagnostics:<br>■ Main Board Option<br>■ Main Board Power Supplies<br>■ Main Board Sensor<br>■ Main Board Serial EEPROM<br>■ Main Board Serial FLASH<br>■ DSP FPGA A/B COMM<br>■ DSP FPGA A/B Program<br>■ Display FPGA COMM<br>■ Display FPGA Program | Review messages in diagnostic log<br>Perform primary power supply checks<br>Perform secondary power supply checks<br>Run Advanced Diagnostics and look for other information<br>Replace the main board      |
| Fails any of these Power On Diagnostics:<br>■ Composite DAC Comm:<br>■ Composite SPI Comm:<br>■ Front Panel Version Information                                                                                                                                                    | Review messages in diagnostic log<br>Perform primary power supply checks<br>Perform secondary power supply checks<br>Run Advanced Diagnostics and look for other information<br>Replace the Composite board |
| Fails any of these Power On Diagnostics:<br>■ Eye Hardware Revision<br>■ Eye Board Cable Version<br>■ Eye Register Readback<br>■ Eye Board Power Supply<br>■ Eye Board Cal EEPROM                                                                                                  | Review messages in diagnostic log<br>Perform primary power supply checks<br>Perform secondary power supply checks<br>Run Advanced Diagnostics and look for other information<br>Replace the EYE/PHY board   |

**Table 4-4: Symptoms and causes (cont.)**

| Symptom                                          | Possible sources or recommended detailed troubleshooting procedure to follow  |
|--------------------------------------------------|-------------------------------------------------------------------------------|
| Failures while running the advanced diagnostics: | Perform secondary power supply checks<br>Replace main board                   |
| ■ DSP1 QDR1 Memory 1                             |                                                                               |
| ■ DSP1 QDR2 Memory 2                             |                                                                               |
| ■ DSP2 QDR1 Memory 1                             |                                                                               |
| ■ DSP2 QDR2 Memory 2                             |                                                                               |
| ■ DSY DDR Buffer 1 Memory                        |                                                                               |
| ■ DSY DDR Buffer 2 Memory                        |                                                                               |
| ■ DSY DDR Trig Buffer Memory                     |                                                                               |
| ■ DSY SDRAM Buffer 1 Memory                      |                                                                               |
| ■ DSY SDRAM Buffer 2 Memory                      |                                                                               |
| Diagnostic Log Message:                          | Search for an intermittent problem in the audio board, cables, or main board. |
| ■ Fail AUDIO_DSP_HEARTBEAT                       |                                                                               |
| No text or traces on display                     | Replace Main board                                                            |



Table 4-4: Symptoms and causes (cont.)

| Symptom                                                                                                                                                                                           | Possible sources or recommended detailed troubleshooting procedure to follow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Functional Test Failures<br>Performance Verification Test Failures                                                                                                                                | <p>In case of failure on either Functional or the Performance tests, the board at fault is generally obvious. Before replacing a board:</p> <ol style="list-style-type: none"> <li>1. Perform the primary and secondary power supply checks.</li> <li>2. Run the advanced diagnostics and check the diagnostic log for help in isolating the fault.</li> </ol> <p>If this does not isolate the problem, then replace the main board if the test is in one of the following areas:</p> <ul style="list-style-type: none"> <li>■ SDI</li> <li>■ Composite</li> <li>■ Ref</li> <li>■ LTC</li> <li>■ XGA output</li> <li>■ Color Palette</li> <li>■ Remote I/O</li> <li>■ Ethernet</li> </ul> <p>If the problem is only the SDI input, first replace the SDI or Eye board (depending on option). If that does not fix the problem replace the main board.</p> <p>If the problem is Composite, replace the composite option board. If the problem persists then replace the main board.</p> <p>If the problem is in the audio board, first check the diagnostic log for audio power-up self test failures or audio DSP programming failures. If the problem persists, replace the audio board.</p> |
| Unknown Problems<br>An instrument may come into service with vague or intermittent symptoms. In a case like this, the following set of tests may help find the problem or the marginal condition. | <ol style="list-style-type: none"> <li>1. Check the diagnostic log. This log records a variety of problems and will enable you to see messages for an error that may not be currently happening.</li> <li>2. Check the power supplies by performing the Primary and Secondary Supply checks. A marginal supply can lead to intermittent operation if it is near the acceptable threshold. This includes the main supply and the secondary supplies on each board.</li> <li>3. Perform the incoming inspection tests. This will exercise a majority of the functions in the unit and includes the advanced diagnostics. Some parts of the test may not be necessary for all problem areas.</li> <li>4. If the unit has an audio board, remove it and recheck any problem areas in the video performance. The Audio board can place too much of a load on the supplies if they are marginal. If the performance changes with the audio board removed, then you should perform the primary and secondary power supply checks and look for an excess load on one of the supplies.</li> </ol>                                                                                                      |

## Detailed Troubleshooting Procedures

The following tests should be run as indicated in the *Symptom and Causes* table. (See Table 4-4 on page 4-6.). The procedures check for specific problems or will help you isolate a problem to a board. You can run them at any time for informational purposes but if you do not run the procedures in the correct context, then the final recommendation identifying a root cause might be suspect.

### General Checks

Check that the power cord is installed.

1. Verify that the power cord is connected.
2. Check that the monitor cable is connected on both ends and that the screws are holding it securely.
3. Check that all internal cables are correctly connected and seated.
4. Check for any discolored or burned components.

### Fan Failures

This instrument contains four fans, They are controlled by both hardware and software. Hardware controls the fans to a certain speed, but software sets the speed target as a function of the temperature measured on a variety of temperature sensors.

If a fan fails, its corresponding LED on the Main board lights.

- Fan 1 fails: LED DS12 lights
- Fan 2 fails: LED DS11 lights
- Fan 3 fails: LED DS23 lights
- Fan 4 fails: LED DS22 lights

A fan failure is sensed through tachometer feedback; a fault will be asserted if the fan is not connected, is stalled, or if the tachometer feedback line is not working correctly.

If one fan fails, the control circuit will increase the voltage to the 13.5 V max level, causing the remaining fan to run at maximum speed.

The normal voltage to drive the fans (pin 1) varies from about 6 V to 13.5 V depending on temperature and the options installed on the instrument.

If a fan is not spinning, measure the voltage on pin 1 of the connector on that fan. If the voltage is near 13 V, then replace the fan. If the voltage is not above 10 V, then replace the main board.

If all fans are spinning, but any of the LEDs are lit, the problem is probably the tachometer feedback line on pin 3 of the fan. Inspect the wiring and resistors (R635 and R637), (R636 and R638), (R426 and R429), (R427 and R430) on the main board. Use the oscilloscope to look for a 3.3 V square wave on the tachometer feedback line. Replace the affected fan if resistors are intact but there is no signal on the tachometer line.

## Primary Power Supply Tests

This section describes methods for verifying the proper operation of the primary power supply.



**WARNING.** *Some parts of this test may require removing the insulating safety shield. To avoid personal injury, be careful not to contact the circuitry while the shield is removed. Be sure to replace the shield as soon as possible to prevent injury.*

The main power supply accepts 90 to 264 VAC and outputs 3 DC voltages: +5 V main, +5 V standby, and +12 V. The +5 V standby is always present and powers the on/off switch and the reverse voltage shutoff circuit. The +5 V main and +12 V supplies are turned on or off by the front panel power button.

There is a green LED, DS19, that will be lit if some 5 V power is present. This is a useful indicator, but does not insure that the voltage is within tolerance. There are also several red LEDs that provide information on the health of other supplies on the board. DS5 is a red LED that lights when the fused +5 V supply is low. DS6 lights when the +3.3 V supply is low, and DS7 indicates when the +1.5 V supply is low.

If the main power supply output is correct, between 4.80 V and 5.25 V (measured at connector J17), check the eight fuses in the 5 V system near the main board power connector J17. (See Figure 4-1 on page 4-19.) All should have 5 V on both sides. If not, replace the fuse.

If the main power supply output voltage is zero (measured at J17 pin 1), then check the AC input circuit. The AC voltage should be the same at the line cord, at the input to the power supply, and on both ends of the fuse on the input to the supply. If the input voltage is not correct at any point, replace the element in the chain that is not passing the AC input. If the input voltage is correct, check the +5 V standby supply at connector J25 pin 2. If the standby supply is zero, then replace the main power supply. If it is between +4.5 V and +5.5 V, check the power supply inhibit line at J25 pin 5. If the power supply inhibit line is low, then replace the main power supply. If the power supply inhibit line is high, and the unit does not respond to a front panel power button press, then try a new front panel. If that does not correct the problem, there may be a main board failure in the power switch circuit.

If the voltage at the output of the supply is not zero, but still not correct, check the input voltage. If the input voltage is in the correct range, then disconnect the cable at J17 from the main board and recheck the output voltage. If the voltage is still not correct then replace the power supply.

If the no-load output voltage is correct, then reattach the cable to the main board and measure the current by clamping the ammeter around the red wire. If the current is less than 20 Amps, and the voltage is still bad, then replace the power supply. If the current is more than 20 Amps, then remove module boards and recheck the current. If it is still high then replace the main board. If not then test with one option board at a time to find the one with excess current and replace that board.

## Secondary Power Supply Tests

There are multiple secondary supplies that are derived from the main 5 V supply. Be sure all eight 5 V fuses are good (as noted in *Primary Power Supply Tests*) before checking the secondary supplies.

First, check that the green LED DS19 is on which indicates there is some 5 V from the main supply.

Next, check if any of the three red LEDs (DS5, DS6, or DS7) are on. These indicate failures on the general 5 V, general 3.3 V, and processor 1.5 V supplies, respectively. If these are lit, the most likely causes are the fuses near J17, but if those are OK replace the main board.

Next, check the secondary supplies as shown in the table. (See Table 4-5.) Each supply has a test point on the Main board. (See Figure 4-1 on page 4-19.) If any supplies are out of range, replace the main board.

**Table 4-5: Main board secondary supplies**

| Nominal (+V) | Allowed range (+V) | Labeled as |
|--------------|--------------------|------------|
| 1.8          | 1.7 to 1.9         | + 1.8 V    |
| Fan          | 5 to 13.5          | FAN_PWR    |
| +5           | 4.75 to 5.25       | + 5 V      |
| 3.3          | 3.2 to 3.4         | + 3.3 V    |
| 2.5          | 2.4 to 2.6         | + 2.5 V    |
| 1.5          | 1.4 to 1.6         | + 1.5 V    |
| 1.0          | 0.95 to 1.05       | + 1.0 V    |
| +5A          | 4.75 to 5.25       | + 5 VA     |
| -5A          | -4.75 to -5.25     | - 5 VA     |
| 1.2          | 1.2 to 1.4         | + 1.2 V    |

Check the Audio supplies on the Audio board (if an Audio board is installed). (See Table 4-6 on page 4-13.). The test points are available, with the board installed. (See Figure 4-3 on page 4-21.).

**Table 4-6: Audio board secondary supplies**

| Supply name | Range          |
|-------------|----------------|
| +1.26 V     | 1.20 to 1.32   |
| +1.5 V      | 1.425 to 1.575 |
| +1.8 V      | 1.71 to 1.89   |
| +3.3 V      | 3.1 to 3.6     |
| +5 VA       | 4.8 to 5.2     |
| +5 V        | 4.75 to 5.2    |
| -5 V        | -4.5 to -5.5   |
| +15 V       | 14 to 15.5     |
| -15 V       | -14 to -15.5   |

The Eye board also has multiple secondary supplies. The Power-up Diagnostics measure these, so they are not included in this procedure. Note that some of these supplies are only active in either SD or HD mode, so it is normal for some of them to not be present in some operating modes.

### Front Panel Button Troubleshooting

Perform this test if the power supplies are good, but none of the buttons are lit or respond to presses.

1. Cycle the power to the unit. Immediately after power on, the buttons should be lit one at a time in a walking pattern.
2. If the buttons are not lit, check the 10 pin cable from the keypad to the main board J7. If the cable is connected and good then replace the front panel assembly.

### Display Troubleshooting

Perform this test if there is no display on the external monitor, but the power supplies test as nominal.

1. Connect an external XGA monitor to the DVI Primary output on the rear of the instrument.
2. Cycle the power and watch the external monitor. If the monitor does not display the boot up messages and normal operational screen, replace the main board.

## Audio Power-Up Diagnostic Failure

It is sometimes difficult to isolate the root cause of audio problems. Most audio problems are due to faults on the audio board, but the audio board communicates with the main board, so in some cases the problem may be there as well.

**Audio Power-up Diagnostic Detailed Information.** The Power-up Diagnostic does the following:

- Reads all of the AES decoder internal registers and verifies that what is read is correct
- Reads all of the D/A internal registers and verifies that what was read is correct
- Performs an active-bit test on the A/D output clocks
- Checks the serial EEPROM to see which of the analog inputs have been calibrated
- Tests the Audio DSP/FPGA interface
- The main CPU detects if the DSP heartbeat fails. This condition will be shown in the diagnostic log

For audio boards, not all errors are reported by the power on diagnostics. Therefore, if you are detecting a loss in audio functionality, check the diagnostic log for any reported audio errors. If any errors are found, perform the following procedure to narrow the problem to either the audio board, the main board, or the connection between them.

1. Prepare a test oscilloscope with the following settings:

| Control          | Setting          |
|------------------|------------------|
| Vertical Scale   | 2.00 V/div       |
| Horizontal Scale | 5.00 $\mu$ s/div |

2. If the diagnostic log contains an entry that reads **Fail Audio DSP Self Test fpga**, do the following substeps:
  - a. Check audio board DS0820, the FPGA programmed indicator in the Main board power supply test points and LEDs. (See Figure 4-1 on page 4-19.). If this LED is off, skip to step b; otherwise probe pin 34 of connector J26 of the Main board during the boot sequence. If the signal on the pin toggles, replace the main board; otherwise, probe pin 34 of J200 on the audio board. If the signal toggles on pin 34, replace the cable; otherwise, replace the audio board.
  - b. Probe pin 33 of J26 on the main board during the boot sequence. If the signal does not exhibit a low-to-high transition, replace the main board. If the signal does transition, check pin 33 of J200 on the audio board. If the signal does not toggle on pin 33, replace the cable.

- c. Probe pins 31 and 32 of connector J26 during the boot sequence. If the signal on either of these pins does not toggle, replace the main board. If both signals do toggle, probe pins 31 and 32 of J200 on the audio board. If the signal does not toggle on either pin, suspect the cable.
      - d. Probe pin 30 of J200 on the audio board during the boot sequence. If the signal does not exhibit a low-to-high transition, replace the audio board. If the signal does transition, check pin 30 of connector J26 on the main board. If the signal on pin 30 does not toggle, suspect the cable; if the signal on pin 30 does toggle, suspect the audio board.
      - e. If all signals in a through d are correct replace the audio board.
- 3. If the Diagnostic Log screen reports the failure **Audio DSP Self Test-dsp0**, perform the following procedure:
  - a. Check to see if the audio board is recognized by the main board by pressing the **Main** button, then **CONFIG** and selecting **Utilities > View HW/SW Version**.
  - b. If there is an audio option listed, suspect the audio board; otherwise, proceed to step c.
  - c. Probe pins 3 through 14 on the main board connector J26, and verify that the signals on all pins are toggling. If any signals are not toggling, replace the main board. If they all are toggling, check them again on the audio board J200. If any of the signals do not toggle on the audio board, replace the cable.
  - d. Probe pins 15 and 18 on connector J26 during boot-up and verify that the signals toggle. If they are not toggling, suspect the main board. If they are toggling, check them again on the audio board J200. If either of the signals on pins 15 and 18 do not toggle on the audio board, replace the cable.
  - e. Probe pin 25 on the audio board connector J200 during the boot sequence. If the signal does not toggle, replace the audio board; otherwise, check it again on the main board at connector J26. If the signal on pin 25 does not toggle on the main board, then replace the cable; otherwise, replace the main board.
  - f. If all of these steps pass, replace the audio board.

4. If the Diagnostics log reports **Audio DSP Self Test-dsp1**, perform the following procedure:
  - a. Check to see if surround display is functioning correctly by doing the following.
    - i. Press and hold the **Audio** button.
    - ii. In the audio menu, select **Aux Display > Surround Display**.
    - iii. Press the **Audio Input** Menu button, then select **Audio Input > AES A**.
    - iv. Connect an AES test tone generator to the AES A IN 1, 2 connector.
  - b. If there is nothing displayed on the surround display, proceed to step c ; otherwise, replace the audio board.
  - c. Probe pins 3 through 14 on the main board connector J26, and verify that the signals on all the pins are toggling. If any of the signals on pins 3 through 14 do not toggle, replace the main board. If they all do toggle, check them again on the audio board J200. If any of the signals on the pins do not toggle on the audio board, replace the cable.
  - d. Probe pins 15 and 20 on connector J26 during the boot sequence, and verify that the signals on the pins toggle. If they do not toggle, suspect the main board. If the signals do toggle, check them again on the audio board J200. If any of the signals on the pins do not toggle on the audio board, replace the cable.
  - e. Probe pin 27 on the audio board connector J200. If the signal on the pin does not toggle, replace the audio board; otherwise, check it again on the main board connector J26. If the signal on pin 27 does not toggle on the main board, then replace the cable; otherwise, replace the main board.
  - f. If all of these steps pass, replace the audio board.
5. If the Power-Up Diagnostics screen reports **Audio DSP Self Test - X**, where X is any other number or string, replace the audio board.

### Examine Power-Up Diagnostics Results in the Diagnostic Log

To examine the Power-up Diagnostics results, press the **CONFIG** button, then select **Utilities > View Diagnostic Log**.

Each power on is indicated by a boot time stamp, followed by a list of power on tests. If any failures are indicted then refer to the action as noted above.

### Run Advanced Diagnostics

To run the Advanced diagnostics, press the **CONFIG** button, then select **Utilities > Run Advanced Diags**.

Advanced Diagnostics includes tests that check interfaces between FPGAs and memory on the Main board. If any of these tests fails, replace the Main board.



## Isolating Lissajous Display Errors

The audio Lissajous phase display uses a serial data path between the audio and main boards. A failure in this data path can be due to a problem on either board.

Perform the following tests to isolate the problem to one board or the other.

1. Prepare a test oscilloscope with the following settings:

| Control          | Setting    |
|------------------|------------|
| Vertical Scale   | 2.00 V/div |
| Horizontal Scale | 200 ns/div |

2. Check the Lissajous bus clock by performing the following substeps:
  - a. Put the oscilloscope probe on pin 62 of connector J200 on the audio board. Verify the signal is  $\approx 3 V_{p-p}$  and is a continuous 50% duty-cycle squarewave.
  - b. If the signal at J200 is not as described in step a, the audio board most likely has a failure; otherwise, proceed to step c.
  - c. With the oscilloscope probe, verify the signal at J26 pin 62 of the main board is as described in step a. If it not as described, suspect the cable; if it is as described, replace the main board.
3. Check the Lissajous bus frame and data signals by performing these substeps:
  - a. Put the oscilloscope probe on connector J200 pin 61 of the audio board and verify the signal is  $\approx 3 V_{p-p}$  and toggles low at regular intervals.
  - b. If the signal on pin 61 looks OK, put the oscilloscope probe on pin 63. Pin 63 is the data line and the signal will have a somewhat random look depending on the audio source. Just verify that the signal is toggling and is  $\approx 3 V_{p-p}$ .
  - c. If either signal looks bad at J200, the audio board most likely has a failure, otherwise proceed to step d. With the oscilloscope probe, check the signal at pin 61 of J27 on the main board. Verify the signal is  $\approx 3 V_{p-p}$  and toggles low at regular intervals.
  - d. If the signal on pin 61 looks OK, put the oscilloscope probe on pin 63. Pin 63 is the data line and the signal will have a somewhat random look depending on the audio source. Verify that the signal is toggling and is  $\approx 3 V_{p-p}$ .
  - e. If either signal is bad, suspect the cable; otherwise replace the main board.

## Option EYE/PHY Troubleshooting

The EYE/PHY functions depend on the EYE and Main boards, and the interconnections between them.

**Major Operational or Diagnostic Failure.** Check that the 110 pin CPCI connector between the Eye and Main boards is correctly seated and secure.

**Eye Pattern or Jitter Waveform Display Problems.** Jitter waveform display is only available with Option PHY. The Eye Pattern and Jitter Waveform displays are formed from data sampled from the input signal and the recovered clock sine wave. Eye display bandwidth, rise and fall time, and transient response aberrations are controlled by circuits contained on the Eye board.

**Cable Loss, Approx Cable, and Source Level Readout Problems.** These measurements are made by a “cable meter” circuit. This circuit is located on the EYE board, but is largely independent from the Eye and Jitter display and measurement functions. If other EYE/PHY functions operate correctly, then a “cable meter” circuit problem is indicated. Replace the EYE/PHY board.

**Jitter Readout and Jitter Meter Problems.** These measurements are derived from sampled recovered clock sine wave data. Operation is unlikely to fail if the basic Eye pattern display works correctly. Measurement accuracy is not adjustable, but jitter noise floor depends on adjustment of Eye HD CDR calibration items.

**Eye Amplitude, Eye Risettime, Eye Falltime, and Eye Rise-Fall (difference) Readout Problems.** These readouts are only available with Option PHY. These readouts are derived from the Eye pattern display. Measurement accuracy depends on the Eye Gain calibration items, and on front-end bandwidth and transient response, which are not adjustable. Operation is unlikely to fail if the basic Eye pattern display works correctly.

It is normal for these measurements to stop or become intermittent if there is excessive waveform noise, aberrations, jitter, or cable loss.

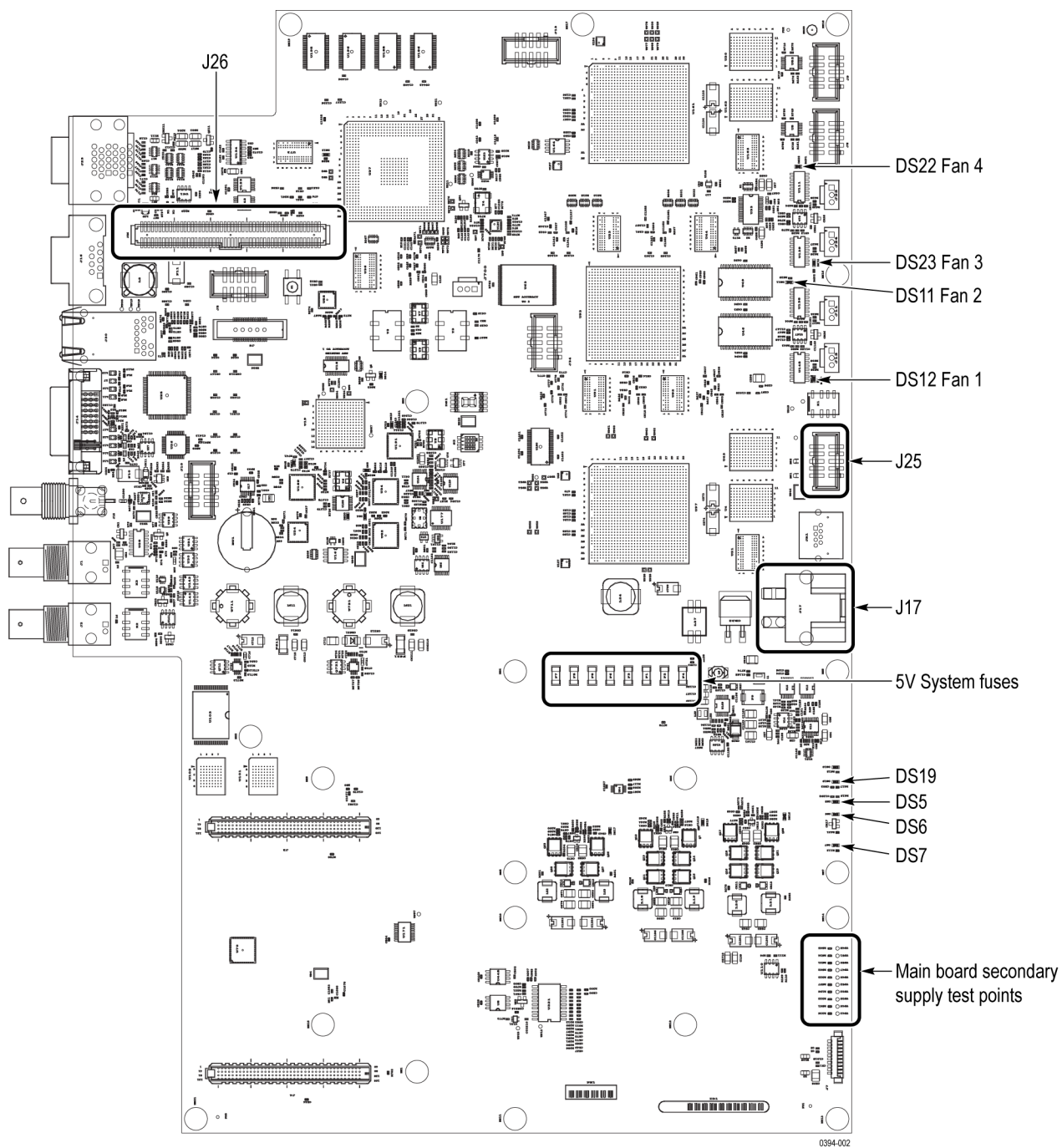


Figure 4-1: Main board indicator LED, connector, and test point locations

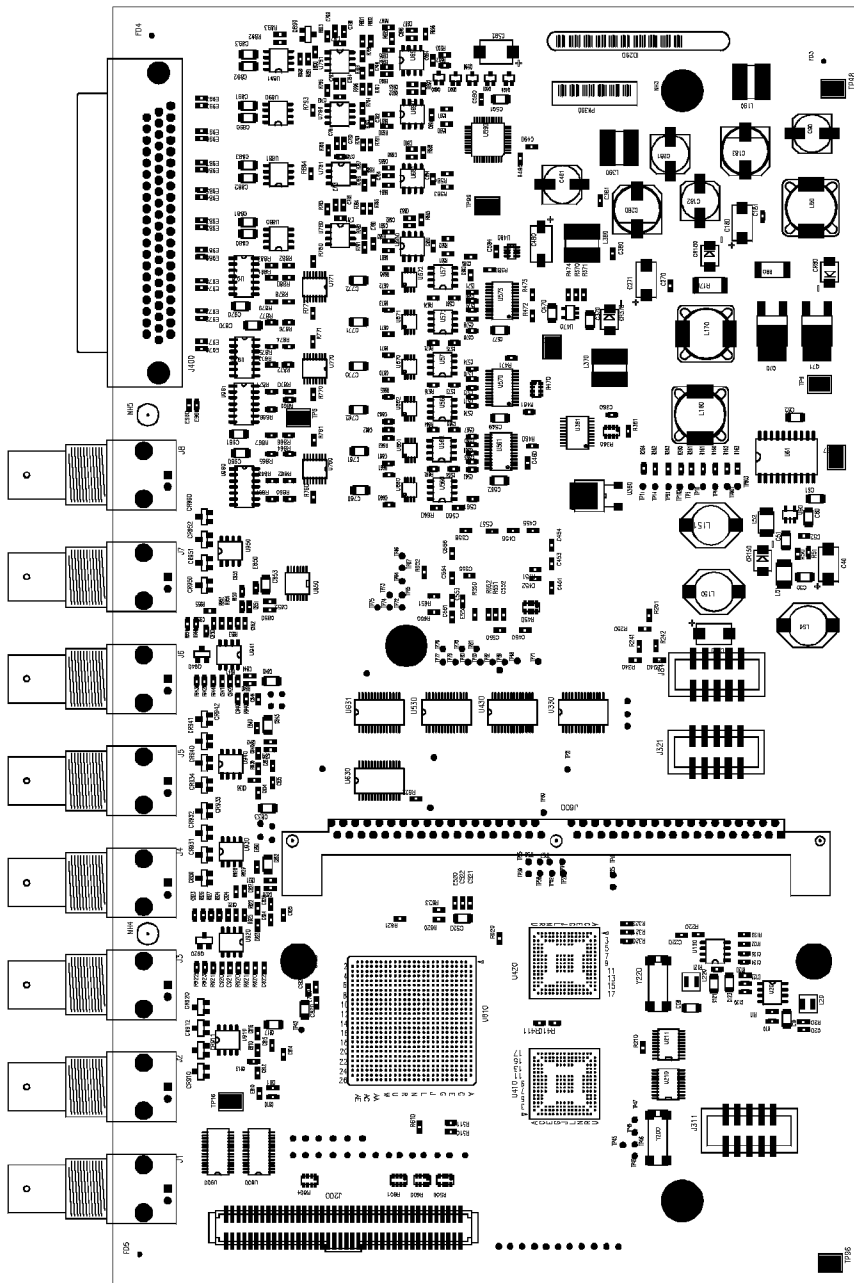


Figure 4-2: Options AD and DPE Audio board, component side

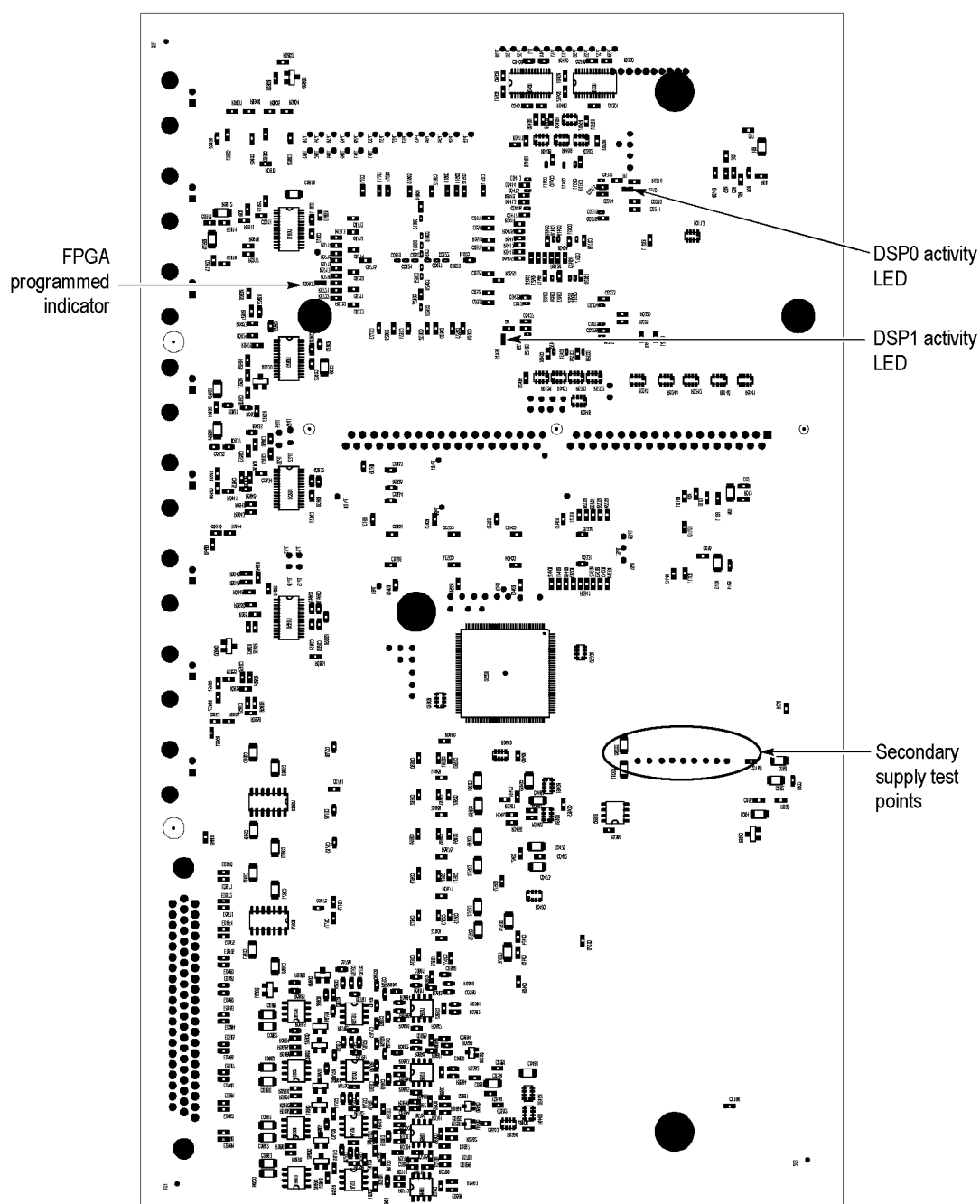


Figure 4-3: Options AD and DPE Audio board back side indicator LED and test point locations

## Repackaging Instructions

This section contains the information needed to repack the instrument for shipment or storage.

### Packaging

When repacking the instrument for shipment, use the original packaging. If the packaging is unavailable or unfit for use, contact your local Tektronix representative to obtain new packaging. Refer to *Contacting Tektronix*, following the copyright statement, for the mailing address, the email address, and phone number.

Seal the shipping carton with an industrial stapler or strapping tape.

### Shipping to the Service Center

Contact the Service Center to get an RMA (Return Material Authorization) number, and any return or shipping information you may need.

If the instrument is being shipped to a Tektronix Service Center, enclose the following information:

- The RMA number.
- The owner's address.
- Name and phone number of a contact person.
- Type and serial number of the instrument.
- Reason for returning.
- A complete description of the service required.

Mark the address of the Tektronix Service Center and the return address on the shipping carton in two prominent locations.

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# Replaceable Parts





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# Replaceable Parts

This section contains a list of the replaceable modules for your instrument. Use this list to identify and order replacement parts. Note that not all parts listed in this section are present on every model. The parts present will depend on the model and options installed.

## Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

## Module Servicing

Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

**Module Exchange.** In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-833-9200. Outside North America, contact a Tektronix sales office or distributor; see the Tektronix Web site for a list of offices: [www.tektronix.com](http://www.tektronix.com).

**Module Repair and Return.** You may ship your module to us for repair, after which we will return it to you.

**New Modules.** You may purchase replacement modules in the same way as other replacement parts.

## Using the Replaceable Parts Lists

This section contains lists of the mechanical and/or electrical components that are replaceable for your instrument. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

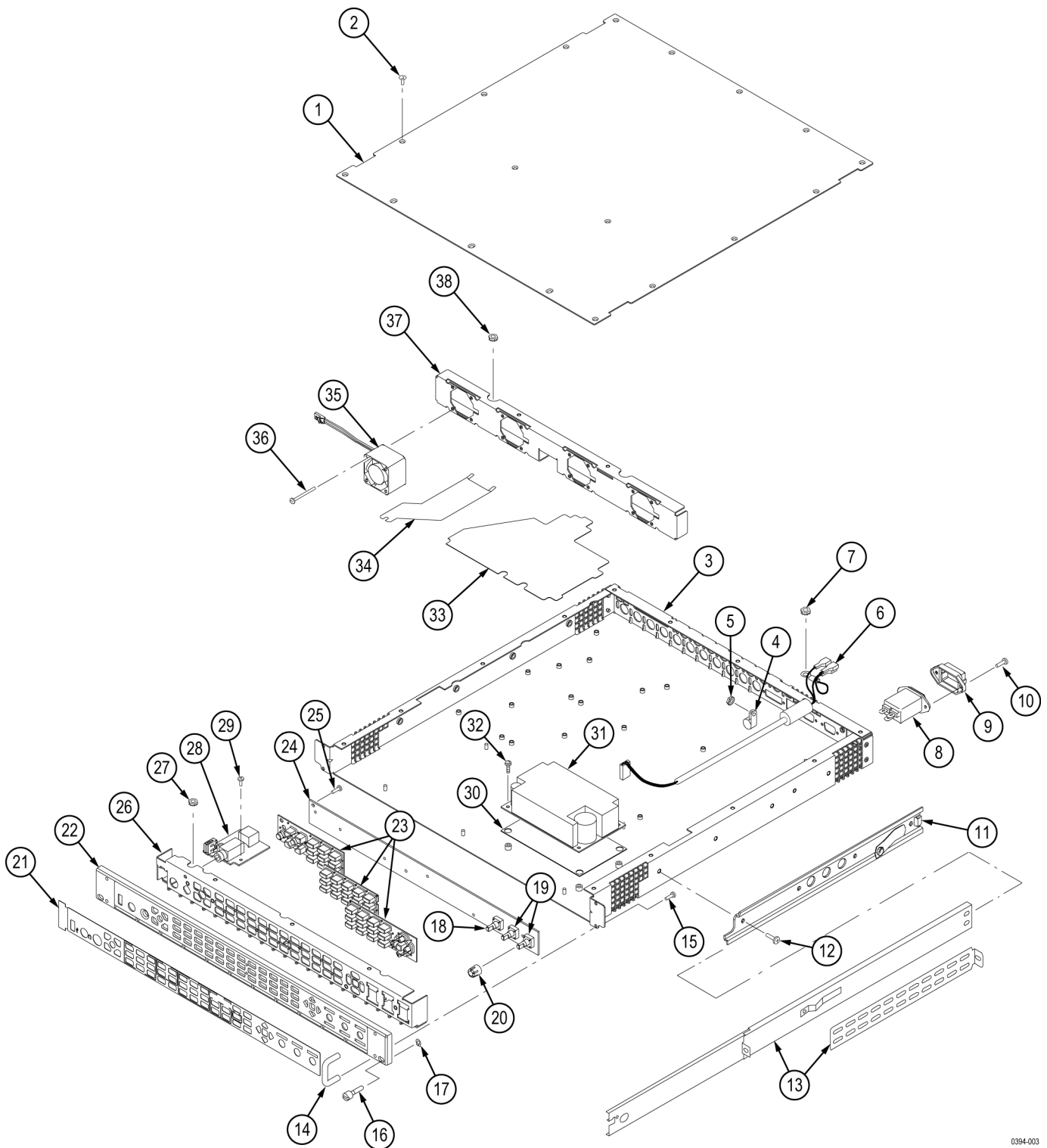
| Column  | Column name           | Description                                                                                                                                                                                                                    |
|---------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Figure & index number | Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow. Orderable modules show the figure number without an index number.                                             |
| 2       | Tektronix part number | Use this part number when ordering replacement parts from Tektronix.                                                                                                                                                           |
| 3 and 4 | Serial number         | Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entry indicates the part is good for all serial numbers.        |
| 5       | Qty                   | This indicates the quantity of parts used.                                                                                                                                                                                     |
| 6       | Name & description    | An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification. |

**Abbreviations**      Abbreviations conform to American National Standard ANSI Y1.1-1972.

| Fig. & index number | Tektronix part number | Serial no. effective | Serial no. discont'd | Qty | Name & description                                                                                                                                                                |
|---------------------|-----------------------|----------------------|----------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5-1                 |                       |                      |                      |     |                                                                                                                                                                                   |
| -1                  | 211-0734-00           |                      |                      | 18  | SCREW,MACHINE; 6-32 X 0.250,FLH100,STL,CDPL,T-10 TORX DR                                                                                                                          |
| -2                  | 200-4873-00           |                      |                      | 1   | COVER; TOP,STANDARD INSTRUMENT,0.050 AL,SAFETY CONTROLLED                                                                                                                         |
| -3                  | 441-2576-00           |                      |                      | 1   | CHASSIS, MAIN; 0.050 AL, SAFETY CONTROLLED, WVR8200, WVR8300                                                                                                                      |
| -4                  | 343-0003-00           |                      |                      | 1   | CLAMP, LOOP; 0.25 ID, PLASTIC                                                                                                                                                     |
| -5                  | 210-0457-00           |                      |                      | 1   | NUT, PL, ASSEM WA; 6-32 X 0.312, W/LOCKWASHER, STEEL, ZINC FINISH                                                                                                                 |
| -6                  | 174-5848-00           |                      |                      | 1   | CA ASSY, SP; HV, BR, A 16 IN. LONG;CONN EACH END;LINE FILTER TO PWR SUPPLY, SAFETY CONTROLLED                                                                                     |
| -7                  | 210-0457-00           |                      |                      | 1   | NUT, PL, ASSEM WA; 6-32 X 0.312, W/LOCKWASHER, STEEL, ZINC FINISH                                                                                                                 |
| -8                  | 119-7086-00           |                      |                      | 1   | FILTER,EMI; AC LINE CONNECTOR/INPUT<br>FILTER;6.0A,120-250VAC,DC-400 HZ,2.2 NF CY,100 NF CX,IEC<br>INPUT,FAST-ON/SOLDER LUG OUTPUT,CHASSIS MOUNT,SAFETY<br>CONTROLLED;FN9222-6/06 |
| -9                  | 131-4131-00           |                      |                      | 1   | CONN,PLUG,ELEC; MALE W/LOCKING ADPTR,EXT MTG,SAFETY<br>CONTROLLED                                                                                                                 |
| -10                 | 211-0410-00           |                      |                      | 2   | SCR,ASSEM WSHR; 4-40 X 0.437,PNH,STL,CDPL,T-10 TORX DR                                                                                                                            |
| -11                 | 351-0104-03           |                      |                      | 1   | SL SECT,DWR EXT; 12.625 L,W/O HARDWARE SAFETY CONTROLLED                                                                                                                          |
| -12                 | 212-0158-00           |                      |                      | 8   | SCREW,MACHINE; 8-32 X 0.375,PNH,STL,CDPL,T-20 TORX DR                                                                                                                             |
| -13                 | 351-0751-01           |                      |                      | 1   | TRK,SL OUT SECT; STATIONARY & INTERMEDIATE SAFETY<br>CONTROLLED                                                                                                                   |
| -14                 | 367-0530-00           |                      |                      | 2   | HANDLE,BOW; AL,1.0 X 1.25,STAIN FINISH,SAFETY CONTROLLED                                                                                                                          |
| -15                 | 211-0721-00           |                      |                      | 4   | SCREW,MACHINE; 6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR                                                                                                                             |
| -16                 | 213-0216-00           |                      |                      | 2   | THUMBSCREW; 10-32 X 0.85,0.375 OD HD,SST W/SLOT                                                                                                                                   |
| -17                 | 354-0025-00           |                      |                      | 1   | RING,RETAINING; EXTERNAL,U/O 0.187 DIA SFT                                                                                                                                        |
| -18                 | 311-2607-00           |                      |                      | 1   | ENCODER; DIGITAL CONTACTING ENCODER, 24 CPR, 24 DETENTS,<br>6 MM DIA SHAFT, 17.5 MM LENGTH SHAFT, 12 MM BODY SIZE, TOP<br>MOUNT; RE0123                                           |
| -19                 | 311-2580-00           |                      |                      | 2   | ENCODER; DIGITAL CONTACTING ENCODER, 24 CPR, NON-DETENTED,<br>6 MM DIA SHAFT, 17.5 MM LENGTH SHAFT, 12 MM BODY SIZE, TOP<br>MOUNT; RE0123                                         |
| -20                 | 366-0859-01           |                      |                      | 3   | ASSEMBLY, KNOB; .470 DIAMETER, SOFT TOUCH                                                                                                                                         |
| -21                 | 335-2118-00           |                      |                      | 1   | LABEL, FRONT PANEL, LEXAN, ID WVR8200, SAFETY CONTROLLED                                                                                                                          |
|                     | 335-2115-00           |                      |                      | 1   | LABEL, FRONT PANEL, LEXAN, ID WVR8300, SAFETY CONTROLLED                                                                                                                          |
| -22                 | 101-0179-00           |                      |                      | 1   | TRIM, FRONT PANEL, WVR, SAFETY CONTROLLED                                                                                                                                         |
| -23                 | 260-2890-00           |                      |                      | 1   | SWITCH, KEYPAD, ELASTOMERIC                                                                                                                                                       |
| -24                 | 863-0259-01           |                      |                      | 1   | CIRCUIT BOARD SUBASSY;WVR FP<br>(Includes 18 and 19)                                                                                                                              |
| -25                 | 211-0372-00           |                      |                      | 6   | SCREW, MACHINE; 4-40 X 0.312, PNH, STEEL, ZINC FINISH, TORX T10                                                                                                                   |
| -26                 | 426-2635-00           |                      |                      | 1   | FRONT FRAME; ALUMINIUM, SAFETY CONTROLLED                                                                                                                                         |
| -27                 | 210-0457-00           |                      |                      | 3   | NUT, PL, ASSEM WA; 6-32 X 0.312, W/LOCKWASHER, STEEL, ZINC FINISH                                                                                                                 |
| -28                 | 878-0197-00           |                      |                      | 1   | CIRCUIT BOARD SUBASSY;WVR USB HEADPHONE<br>(Includes USB port, Headphone connector, RJ45 connector)                                                                               |
| -29                 | 211-0372-00           |                      |                      | 2   | SCREW, MACHINE; 4-40 X 0.312, PNH, STEEL, ZINC FINISH, TORX T10                                                                                                                   |
| -30                 | 337-4466-00           |                      |                      | 1   | SHIELD; POWER SUPPLY BOTTOM, 0.030 POLYCARBONATE, SAFETY<br>CONTROLLED                                                                                                            |

## Replaceable Parts

| Fig. & index number | Tektronix part number | Serial no. effective | Serial no. discount'd | Qty | Name & description                                                                                                                                                                                            |
|---------------------|-----------------------|----------------------|-----------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -31                 | 119-7522-00           |                      |                       | 1   | POWER SUPPLY; 130W, AC-DC;90-264VAC 47-440HZ IN, DC-DC 117-300VDC IN, OUTPUTS +5V@26A, +12V@0.5A, +5V@0.50A STANDBY, REMOTE INHIBIT:ACTIVE PFC;OPEN FRAME, 5X 3.0 X 1.3;UL, CSA, TUV, ROHS, SAFETY CONTROLLED |
| -32                 | 211-0722-00           |                      |                       | 4   | SCREW,MACHINE; 6-32 X 0.250,PNH,STL,CDPL,T-15 TORX DR                                                                                                                                                         |
| -33                 | 337-4469-00           |                      |                       | 1   | SHIELD; POWER SUPPLY TOP, 0.030 POLYCARBONATE, SAFETY CONTROLLED                                                                                                                                              |
| -34                 | 407-5545-00           |                      |                       | 1   | BRACKET, CABLE RETAINER                                                                                                                                                                                       |
| -35                 | 119-7441-00           |                      |                       | 4   | FAN ASSEMBLY; DC, 12V;0.105A, 8.6 CFM, 30DBA, 3 LEAD, TACH OUTPUT, WITH CONN & HOUSING, SAFETY CONTROLLED                                                                                                     |
| -36                 | 211-1161-00           |                      |                       | 8   | SCREW,MACHINE; 4-40 X 1.500,PAN HEAD,T-10 TORX,ZINC PL                                                                                                                                                        |
| -37                 | 407-5375-00           |                      |                       | 1   | BRACKET; FAN MOUNTING, 0.050 AL, SAFETY CONTROLLED                                                                                                                                                            |
| -38                 | 210-0457-00           |                      |                       | 2   | NUT, PL, ASSEM WA; 6-32 X 0.312, W/LOCKWASHER, STEEL, ZINC FINISH                                                                                                                                             |



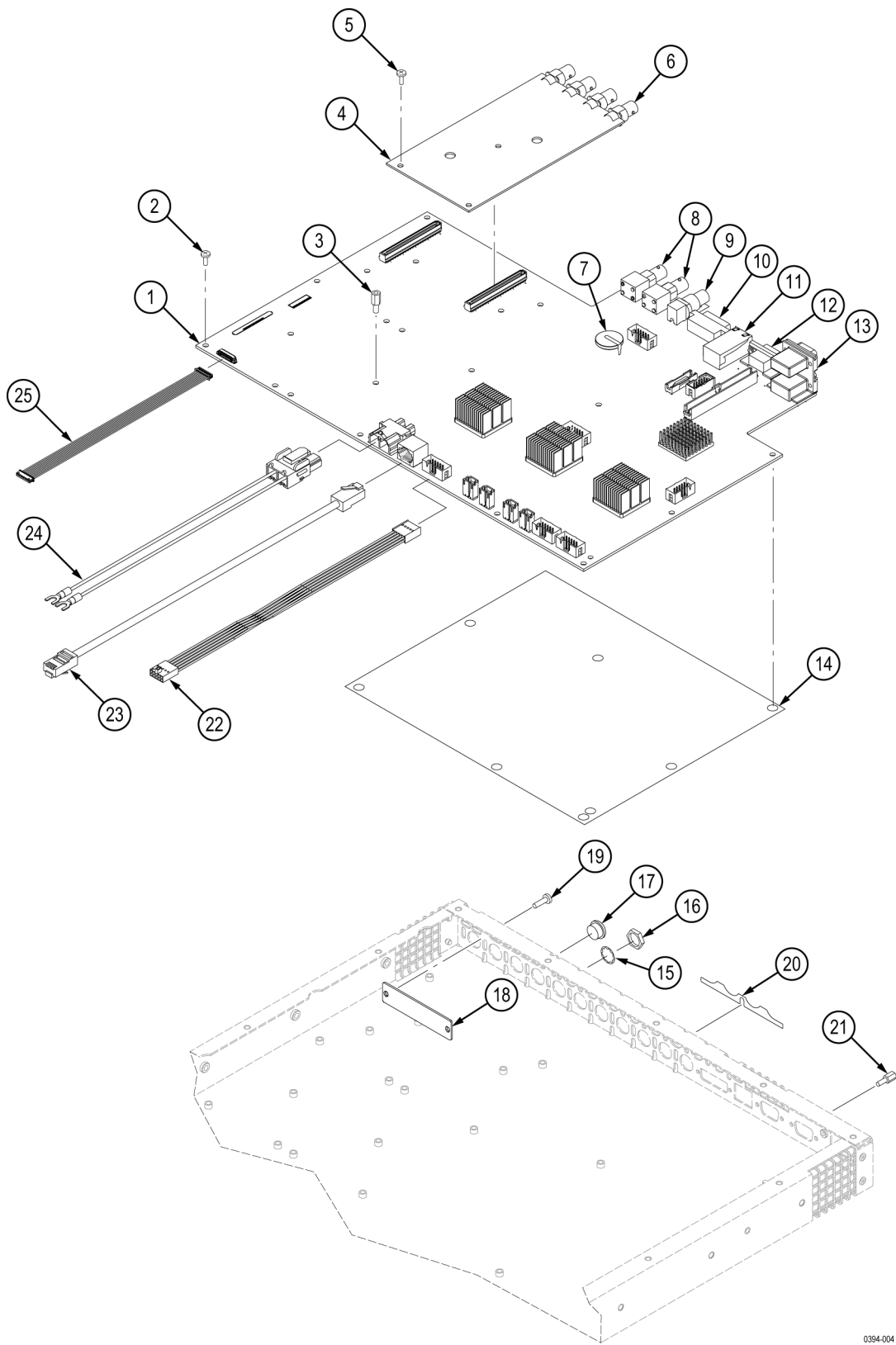
0394-003

Figure 5-1: Replaceable parts (standard)

## Replaceable Parts

| Fig. & index number | Tektronix part number | Serial no. effective | Serial no. discont'd | Qty             | Name & description                                                                                                                                                                            |
|---------------------|-----------------------|----------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5-2                 |                       |                      |                      |                 |                                                                                                                                                                                               |
| -1                  | 863-0193-01           |                      |                      | 1               | CIRCUIT BOARD SUBASSY;MAIN                                                                                                                                                                    |
| -2                  | 211-0722-00           |                      |                      | 10              | SCREW, MACHINE; 6-32 X 0.250, PNH, STEEL, ZINC FINISH, T-15 TORX DR                                                                                                                           |
| -3                  | 129-0208-00           |                      |                      | 9               | SPACER, POST; 0.312 L, 6-32 STUD, BRS, ELECTROLESS NICKEL, 0.25 HEX                                                                                                                           |
| -4                  | 878-0195-00           |                      |                      | 1               | CIRCUIT BOARD ASSY;UNTESTED, WVR SDI                                                                                                                                                          |
| -5                  | 211-0722-00           |                      |                      | 3               | SCREW, MACHINE; 6-32 X 0.250, PNH, STEEL, ZINC FINISH, T-15 TORX DR                                                                                                                           |
| -6                  | 131-M057-00           |                      |                      | 4               | CONN, RF:PCB, FEMALE, BNC, 75OHM, EDGE LAUNCH TYPE                                                                                                                                            |
| -7                  | 146-0109-00           |                      |                      | 1               | BATTERY, DRY; 3.0V, LITHIUM MANGANESE DIOXIDE, 210MAH, 20 X 3.22MM COIN CELL WITH SOLDER TABS, CR2032-1HF1; SAFETY CONTROLLED                                                                 |
| -8                  | 131-7270-00           |                      |                      | 2               | CONN, RF, PLUG; BNC, PCB, PNL MNT, FEMALE, RTANG, 75 OHM, 0.510 H X 0.169 TAIL, LOW PROFILE ZINC DIE CAST HOUSING                                                                             |
| -9                  | 131-8271-00           |                      |                      | 1               | CONN, RF, PLUG, BNC, FEMALE, RTANG, 75 OHM, SMT CENTER PIN, HIGH BW AND RETURN LOSS, LOW PROFILE, 0.515 TALL, 0.275 CENTER OFFSET, 30 GOLD                                                    |
| -10                 | 131-8098-00           |                      |                      | 1               | CONN, DVI-I, FEMALE, RTANG, PANEL MOUNT                                                                                                                                                       |
| -11                 | 131-7721-01           |                      |                      | 1               | CONN, JACK; PCB/PNL, RJ45, CAT5E, W/LEDS YELLOW & GREEN/ORANGE, FEMALE, RTANG, 8 POS, 0.100 CTR, 0.517 H X 0.13 TAIL, 10/100/1000 BASE TX AND RX MAGNETICS MODULE, 30 GOLD, SAFETY CONTROLLED |
| -12                 | 131-3925-00           |                      |                      | 1               | CONN, DSUB; PCB, FEMALE, RTANG, 9 POS, 0.112 CTR, 0.318 MLG X 0.125 TAIL, 4-40 THD INSERT, BD RETENTION, 30 GOLD                                                                              |
| -13                 | 131-8276-00           |                      |                      | 1               | CONN, DSUB; PCB, FEMALE, RTANG, DUAL STACKED, 15 POS HD LOWER, 15 POS HD UPPER                                                                                                                |
| -14                 | 337-4510-00           |                      |                      | 1               | SHIELD, INSULATOR, MAIN                                                                                                                                                                       |
| -15                 | 210-1039-00           |                      |                      | 7               | WASHER, LOCK; 0.521 ID, INT, 0.025 THK, STEEL, ZINC FINISH                                                                                                                                    |
| -16                 | 220-0497-00           |                      |                      | 7               | NUT, PLAIN, HEX; .5-28 X .562 HEX, BRS, NI (NICKEL) PLATED                                                                                                                                    |
| -17                 | 134-0246-01           |                      |                      | 12 <sup>1</sup> | PLUG, HOLE COVER; BUTTON PLUG, .0578 HEAD DIA X 0.406 THK, ACCOM 0.5 DIA HOLE, 0.015-0.125 THK PNL, NYLON, BLACK, 94V-2;                                                                      |
| -18                 | 200-4800-00           |                      |                      | 1               | COVER, MINI; 2X FEX-440, SAFETY CONTROLLED                                                                                                                                                    |
| -19                 | 211-0410-00           |                      |                      | 2               | SCR, ASSEM WSHR; 4-40 X 0.437, PNH, STEEL, ZINC FINISH, T-10 TORX DR                                                                                                                          |
| -20                 | 335-2393-00           |                      |                      | 1               | LABEL REAR PANEL, SDI, SAFETY CONTROLLED                                                                                                                                                      |
| -21                 | 214-3903-00           |                      |                      | 8               | SCREW, JACK; 4-40 X 0.312 LONG, 0.188 H HEX HEAD STAND OFF, 4-40 INT THD, X 0.312 THD EXT 4-40, STEEL, ZINC PLATED                                                                            |
| -22                 | 174-5652-00           |                      |                      | 1               | CABLE ASSEMBLY; POWER SUPPLY, 10 PIN, SAFETY CONTROLLED                                                                                                                                       |
| -23                 | 174-5683-00           |                      |                      | 1               | CABLE ASSEMBLY, CAT5E, MALE TO MALE, ETHERNET                                                                                                                                                 |
| -24                 | 174-5653-00           |                      |                      | 1               | CABLE ASSEMBLY; POWER SUPPLY, HIGH CURRENT; SAFETY CONTROLLED                                                                                                                                 |
| -25                 | 174-5682-00           |                      |                      | 1               | CABLE ASSEMBLY, FRONT PANEL, 10 PIN                                                                                                                                                           |

<sup>1</sup> Quantity varies with instrument options.

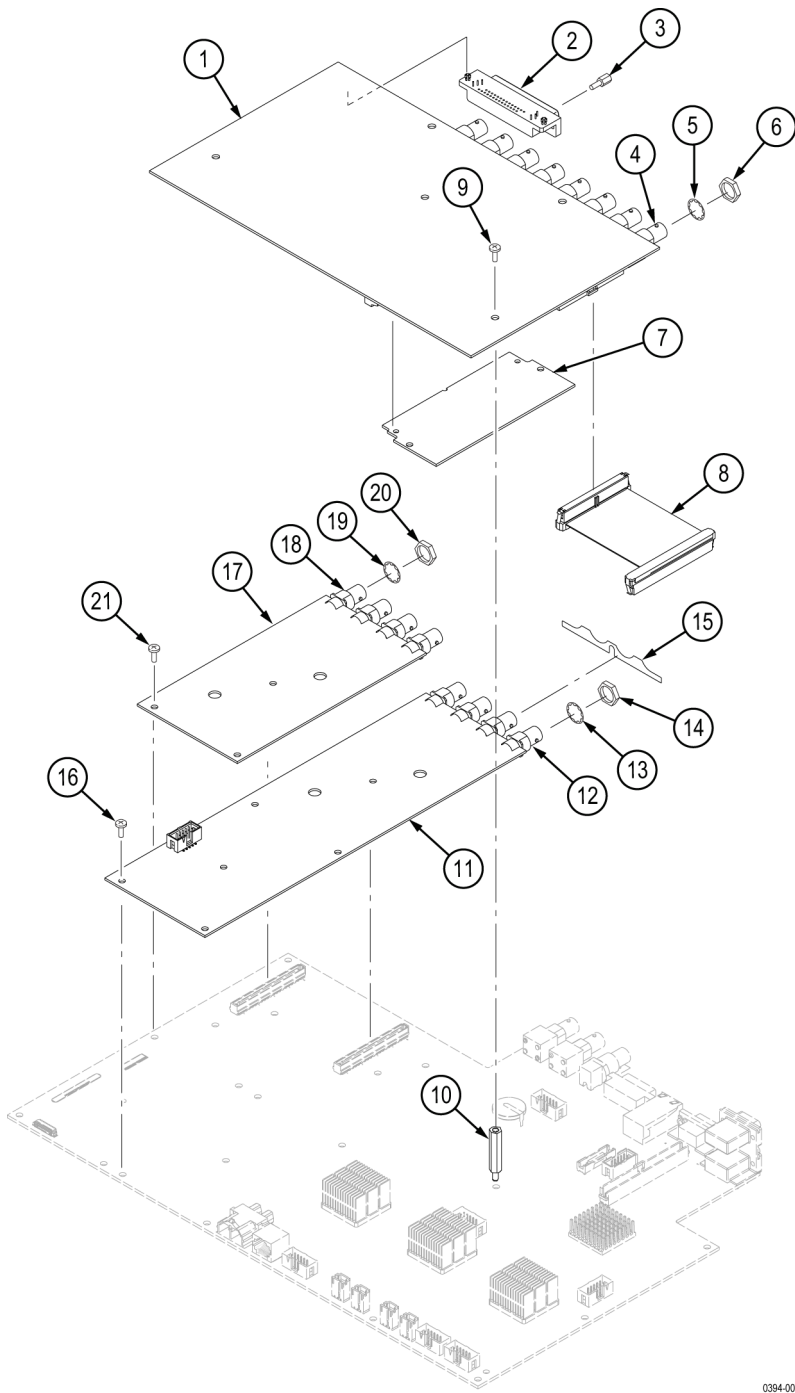


0394-004

Figure 5-2: Replaceable parts (standard)

| Fig. & index number | Tektronix part number | Serial no. effective | Serial no. discount'd | Qty | Name & description                                                                                                 |
|---------------------|-----------------------|----------------------|-----------------------|-----|--------------------------------------------------------------------------------------------------------------------|
| 5-3                 |                       |                      |                       |     | <b>OPTIONS</b>                                                                                                     |
|                     |                       |                      |                       |     | <b>Options AD and DPE</b>                                                                                          |
| -1                  | 671-9938-04           |                      |                       | 1   | CIRCUIT BD ASSY; DIGITAL ANALOG AUDIO, 389357500 WIRED, UNTESTED; SAFETY CONTROLLED                                |
| -2                  | 131-7430-00           |                      |                       | 1   | CONN, DSUB; SLDR CUP, MALE, STR, 62 POS, 0.100 CTR, 30 GOLD                                                        |
| -3                  | 214-3903-00           |                      |                       | 2   | SCREW, JACK; 4-40 X 0.312 LONG, 0.188 H HEX HEAD STAND OFF, 4-40 INT THD, X 0.312 THD EXT 4-40, STEEL, ZINC PLATED |
| -4                  | 131-7270-00           |                      |                       | 8   | CONN, RF, PLUG; BNC, PCB, PNL MNT, FEMALE, RTANG, 75 OHM, 0.510 H X 0.169 TAIL, LOW PROFILE ZINC DIE CAST HOUSING  |
| -5                  | 210-1039-00           |                      |                       | 8   | WASHER, LOCK; 0.521 ID, INT, 0.025 THK, STEEL, ZINC FINISH                                                         |
| -6                  | 220-0497-00           |                      |                       | 8   | NUT, PLAIN, HEX; .5-28 X .562 HEX, BRS, NI (NICKEL) PLATED                                                         |
| -7                  | 119-7167-00           |                      |                       | 1   | CIRCUIT BD ASSY; CAT552 DOLBY E/DIGITAL DECODER MODULE; 72 PIN SIMM; SAFETY CONTROLLED<br>(Option DPE only)        |
| -8                  | 174-5696-00           |                      |                       | 1   | CABLE ASSEMBLY, 100 TO 80 POSITION, MAIN TO AUDIO PCB                                                              |
| -9                  | 211-0722-00           |                      |                       | 3   | SCREW, MACHINE; 6-32 X 0.250, PNH, STEEL, ZINC FINISH, T-15 TORX DR                                                |
| -10                 | 129-1570-00           |                      |                       | 3   | POST, SPACER; 1.385 X 0.250 X 0.375 DEEP                                                                           |
|                     |                       |                      |                       |     | <b>Options EYE and PHY</b>                                                                                         |
| -11                 | 863-0321-01           |                      |                       | 1   | CIRCUIT BD SUBASSY; WVR EYE; 389423100, TESTED, ROHS COMPLIANT                                                     |
| -12                 | 131-M057-00           |                      |                       | 4   | CONN, RF:PCB, FEMALE, BNC, 75OHM, EDGE LAUNCH TYPE                                                                 |
| -13                 | 210-1039-00           |                      |                       | 4   | WASHER, LOCK; 0.521 ID, INT, 0.025 THK, STEEL, ZINC FINISH                                                         |
| -14                 | 220-0497-00           |                      |                       | 4   | NUT, PLAIN, HEX; .5-28 X .562 HEX, BRS, NI (NICKEL) PLATED                                                         |
| -15                 | 335-2394-00           |                      |                       | 1   | LABEL REAR PANEL, EYE, SDI CLOCK OUT, SAFETY CONTROLLED                                                            |
| -16                 | 211-0722-00           |                      |                       | 6   | SCREW, MACHINE; 6-32 X 0.250, PNH, STEEL, ZINC FINISH, T-15 TORX DR                                                |
|                     |                       |                      |                       |     | <b>Option CPS</b>                                                                                                  |
| -17                 | 878-0194-00           |                      |                       | 1   | CIRCUIT BOARD ASSY; UNTESTED, WVR COMPOSITE                                                                        |
| -18                 | 131-M057-00           |                      |                       | 4   | CONN, RF:PCB, FEMALE, BNC, 75OHM, EDGE LAUNCH TYPE                                                                 |
| -19                 | 210-1039-00           |                      |                       | 4   | WASHER, LOCK; 0.521 ID, INT, 0.025 THK, STEEL, ZINC FINISH                                                         |
| -20                 | 220-0497-00           |                      |                       | 4   | NUT, PLAIN, HEX; .5-28 X .562 HEX, BRS, NI (NICKEL) PLATED                                                         |
| -21                 | 211-0722-00           |                      |                       | 3   | SCREW, MACHINE; 6-32 X 0.250, PNH, STEEL, ZINC FINISH, T-15 TORX DR                                                |





0394-005

**Figure 5-3: Replaceable parts (options)**

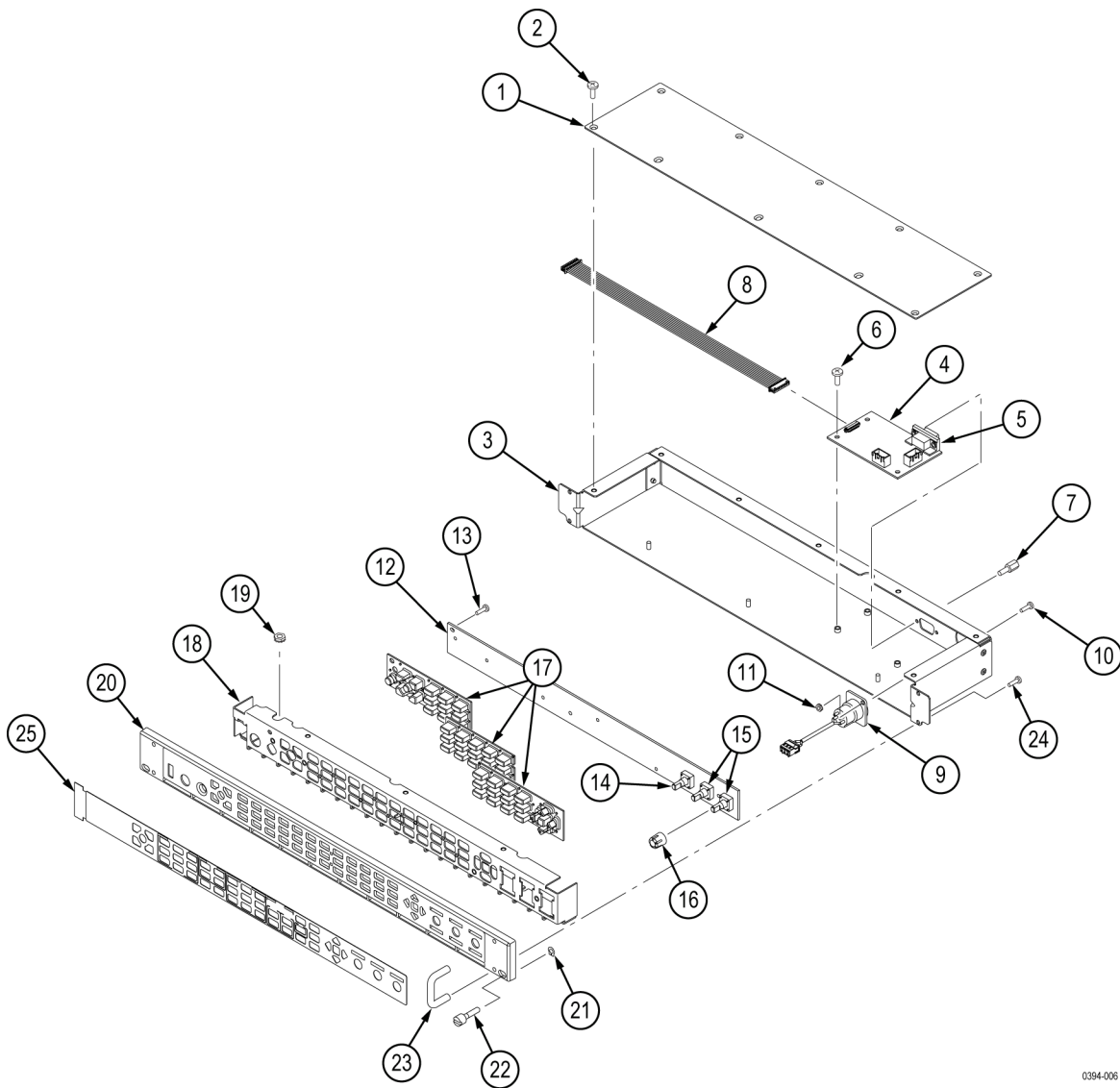
## Replaceable Parts

| Tektronix part number                    | Serial no.<br>effective | Serial no.<br>discont'd | Qty | Name & description                                                                                          |                |             |
|------------------------------------------|-------------------------|-------------------------|-----|-------------------------------------------------------------------------------------------------------------|----------------|-------------|
| WVR8200 and WVR8300 Standard Accessories |                         |                         |     |                                                                                                             |                |             |
| 071-2640-xx                              |                         |                         | 1   | SAFETY AND INSTALLATION INSTRUCTIONS (EN, JA, ZH), WVR8200, WVR8300                                         |                |             |
| 063-4218-xx                              |                         |                         | 1   | DOCUMENTATION CD, WVR8200, WVR8300                                                                          |                |             |
| 071-2589-xx                              |                         |                         | 1   | MANUAL, TECH; ND-NC; TEKTRONIX SUPPLEMENTAL INFORMATION SHEET FOR THE PEOPLES REPUBLIC OF CHINA; CHINA ROHS |                |             |
| 071-2589-xx                              |                         |                         | 1   | MANUAL, TECH;A PRINTED SHEET WITH MULTILANGUAGE POINTERS TO THE TEKTRONIX WEBSITE FOR ONLINE RELEASE NOTES  |                |             |
| 011-0163-00                              |                         |                         | 2   | TERM, COAXIAL; BNC, TERMINATION SINGLR ENDED;75 OHM, 26DB TO 2GHZ, 50 OHM INTERMATABLE                      |                |             |
| 013-0347-00                              |                         |                         | 1   | ADAPTER, CONN; VGA FEMALE TO DVI MALE DISPLAY                                                               |                |             |
| See Description                          |                         |                         | 1   | CABLE ASSY, POWER:                                                                                          |                |             |
|                                          |                         |                         |     | <u>OPTION</u>                                                                                               | <u>COUNTRY</u> | <u>P/N</u>  |
|                                          |                         |                         |     | A0                                                                                                          | N. AMERICA     | 161-0216-00 |
|                                          |                         |                         |     | A1                                                                                                          | UNIV EURO      | 161-0215-00 |
|                                          |                         |                         |     | A2                                                                                                          | UK             | 161-0066-10 |
|                                          |                         |                         |     | A3                                                                                                          | AUSTRALIA      | 161-0066-13 |
|                                          |                         |                         |     | A5                                                                                                          | SWITZERLAND    | 161-0154-00 |
|                                          |                         |                         |     | A6                                                                                                          | JAPAN          | 161-A008-00 |
|                                          |                         |                         |     | A10                                                                                                         | CHINA          | 161-0304-00 |
|                                          |                         |                         |     | A11                                                                                                         | INDIA          | 161-0400-00 |

| Fig. & index number         | Tektronix part number                                | Serial no. effective | Serial no. discont'd | Qty | Name & description                                                                                                                  |
|-----------------------------|------------------------------------------------------|----------------------|----------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|
| 5-4                         | <b>WVR8RFP Remote Front Panel Optional Accessory</b> |                      |                      |     |                                                                                                                                     |
| -1                          | 200516100                                            |                      |                      | 1   | COVER; TOP TO REMOTE FRONT PANEL, 0.050 AL, SAFETY CONTROLLED                                                                       |
| -2                          | 211073400                                            |                      |                      | 10  | SCREW, MACHINE; 6-32 X 0.250, FLH100, STEEL, ZINC FINISH, T-10 TORX DR                                                              |
| -3                          | 441263500                                            |                      |                      | 1   | CHASSIS, REMOTE FRONT PANEL; 0.050 AL, SAFETY CONTROLLED, WVR8RFP                                                                   |
| -4                          | 878035000                                            |                      |                      | 1   | CIRCUIT BOARD SUBASSY;WVR8200, WVR8300, REMOTE KEYBOARD REGULATOR, UNTESTED 389426700                                               |
| -5                          | 131392500                                            |                      |                      | 1   | CONN, DSUB; PCB, FEMALE, RTANG, 9 POS, 0.112 CTR, 0.318 MLG X 0.125 TAIL, 4-40 THD INSERT, BD RETENTION, 30 GOLD                    |
| -6                          | 211072200                                            |                      |                      | 3   | SCREW, MACHINE; 6-32 X 0.250, PNH, STEEL, ZINC FINISH, T-15 TORX DR                                                                 |
| -7                          | 214390300                                            |                      |                      | 2   | SCREW, JACK; 4-40 X 0.312 LONG, 0.188 H HEX HEAD STAND OFF, 4-40 INT THD, X 0.312 THD EXT 4-40, STEEL, ZINC PLATED                  |
| -8                          | 174568200                                            |                      |                      | 1   | CABLE ASSEMBLY, FRONT PANEL, 10 PIN                                                                                                 |
| -9                          | 174544500                                            |                      |                      | 1   | CABLE ASSEMBLY;POWER 2 PIN, CABLE, PWR XLR RPAN TO BP PCB 2PIN WFM 2.5, J5; SAFETY CONTROLLED                                       |
| -10                         | 211037200                                            |                      |                      | 2   | SCREW, MACHINE; 4-40 X 0.312, PNH, STEEL, ZINC FINISH, TORX T10                                                                     |
| -11                         | 210058600                                            |                      |                      | 2   | NUT, PL, ASSY WA; 4-40 X 0.25, ZINC PLATED STEEL                                                                                    |
| -12                         | 863025901                                            |                      |                      | 1   | CIRCUIT BOARD SUBASSY;WVR FP, TESTED 389415900                                                                                      |
| -13                         | 211037200                                            |                      |                      | 6   | SCREW, MACHINE; 4-40 X 0.312, PNH, STEEL, ZINC FINISH, TORX T10                                                                     |
| -14                         | 311-2607-00                                          |                      |                      | 1   | ENCODER; DIGITAL CONTACTING ENCODER, 24 CPR, 24 DETENTS, 6 MM DIA SHAFT, 17.5 MM LENGTH SHAFT, 12 MM BODY SIZE, TOP MOUNT; RE0123   |
| -15                         | 311-2580-00                                          |                      |                      | 2   | ENCODER; DIGITAL CONTACTING ENCODER, 24 CPR, NON-DETENTED, 6 MM DIA SHAFT, 17.5 MM LENGTH SHAFT, 12 MM BODY SIZE, TOP MOUNT; RE0123 |
| -16                         | 366085901                                            |                      |                      | 3   | ASSEMBLY, KNOB; .470 DIAMETER, SOFT TOUCH                                                                                           |
| -17                         | 260289000                                            |                      |                      | 1   | SWITCH, KEYPAD, ELASTOMERIC, WVR                                                                                                    |
| -18                         | 426263500                                            |                      |                      | 1   | FRONT FRAME; ALUMINIUM, SAFETY CONTROLLED, WVR8200/WVR8300                                                                          |
| -19                         | 210045700                                            |                      |                      | 3   | NUT, PL, ASSEM WA; 6-32 X 0.312, W/LOCKWASHER, STEEL, ZINC FINISH                                                                   |
| -20                         | 101017900                                            |                      |                      | 1   | TRIM, FRONT PANEL, WVR, SAFETY CONTROLLED                                                                                           |
| -21                         | 354-0025-00                                          |                      |                      | 1   | RING,RETAINING; EXTERNAL,U/O 0.187 DIA SFT                                                                                          |
| -22                         | 213021600                                            |                      |                      | 2   | THUMBSCREW; 10-32 X 0.85, 0.375 OD HD, ZINC PLATED STEEL, W/SLOT                                                                    |
| -23                         | 367053000                                            |                      |                      | 2   | HANDLE, BOW; AL, 1.0 X 1.25, STAIN FINISH, SAFETY CONTROLLED                                                                        |
| -24                         | 211072100                                            |                      |                      | 4   | SCREW, MACHINE; 6-32 X 0.375, PNH, STEEL, ZINC FINISH WITH NYLOC PATCH, T-15 TORX DR                                                |
| -25                         | 335211600                                            |                      |                      | 1   | REMOTE FRONT PANEL LABEL, WVR, SAFETY CONTROLLED                                                                                    |
| <b>Standard Accessories</b> |                                                      |                      |                      |     |                                                                                                                                     |
|                             | 071-2804-xx                                          |                      |                      | 1   | WVR8RFP REMOTE FRONT PANEL INSTRUCTIONS                                                                                             |
|                             | 071-2181-xx                                          |                      |                      | 1   | MANUAL, TECH; ND-NC; TEKTRONIX SUPPLEMENTAL INFORMATION SHEET FOR THE PEOPLES REPUBLIC OF CHINA; CHINA ROHS                         |
|                             | 012-1721-00                                          |                      |                      | 1   | CABLE ASSY;25 FT.,W/CONNECTOR,D-SUB,9 PIN MALE                                                                                      |
| <b>Optional Accessories</b> |                                                      |                      |                      |     |                                                                                                                                     |
|                             | 012-1720-00                                          |                      |                      |     | CABLE ASSY;100 FT., W/CONNECTOR, D-SUB, 9 PIN MALE                                                                                  |

## Replaceable Parts

| Fig. & index number | Tektronix part number | Serial no. effective | Serial no. discount'd | Qty | Name & description                                                                                                                                                          |
|---------------------|-----------------------|----------------------|-----------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     | 119-7532-00           |                      |                       |     | POWER SUPPLY: AC-DC, 55W, DESKTOP;90 - 264VAC 47 - 63 HZ, IEC320-C14 IN;12VDC 4.6A, CABLE WITH 4 PIN XLR CONNECTOR OUT;SAFETY CONTROLLED<br>(Requires AC Power Cords Below) |
|                     | 161-0066-00           |                      |                       |     | Option A0 North America<br>CABLE ASSY, PWR; 3, 18 AWG, 250V/10A, 98.0 L, STR, IEC320, RCPT X NEMA 5-15P, US, SAFETY CONTROLLED                                              |
|                     | 161-0066-09           |                      |                       |     | Option A1 Universal EURO<br>CABLE ASSY, PWR; 3, 0.75MM SQ, 250V/10A, 99.0 L, STR, IEC320, RCPT, EUROPEAN, SAFETY CONTROLLED                                                 |
|                     | 161-0066-10           |                      |                       |     | Option A2 United Kingdom<br>CABLE ASSY, PWR; 3, 1.0 MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT X 13A, FUSED UK PLUG(13A FUSE), UNITED KINGDOM, SAFETY CONTROLLED         |
|                     | 161-0066-13           |                      |                       |     | Option A3 Australia<br>CABLE ASSY, PWR; 3, 1.0 MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT, AUSTRALIA, SAFETY CONTROLLED, INSULATED PINS                                  |
|                     | 161-0154-00           |                      |                       |     | Option A5 Switzerland<br>CA ASSY, PWR; 3, 1.0MM SQ, 250V/10A, 2.5 METER, STR, IEC320, RCPT, SWISS, SAFETY CONTROLLED                                                        |
|                     | 161-0298-00           |                      |                       |     | Option A6 Japan<br>CABLE ASSY, PWR; 3, 125V/7A, JAPAN, 98 LONG, STR, NEMA 5-15P PLUG X IEC320/C-13 RECEPTACLE, SAFETY CONTROLLED                                            |
|                     | 161-0304-00           |                      |                       |     | Option A10 China<br>CABLE ASSY, PWR; 3, 1.0MM SQ, 250V/10A, 2.5 METER, STR, IEC320, 3C CERTIFICATION, RCPT, CHINA, SAFETY CONTROLLED                                        |
|                     | 161-0400-00           |                      |                       |     | Option A11 India<br>CABLE ASSY, PWR; 3, 1.0MM SQ, 250V/6A, 2.5 METER, STR, IEC320/C13, RCPT, PLUG, INDIA                                                                    |



0394-006

Figure 5-4: Replaceable parts (WVR8RFP Remote Front Panel)

| Fig. & index number | Tektronix part number                          | Serial no. effective | Serial no. discont'd | Qty | Name & description                                                                         |
|---------------------|------------------------------------------------|----------------------|----------------------|-----|--------------------------------------------------------------------------------------------|
| 5-5                 | Analog Audio Breakout Cable Optional Accessory |                      |                      |     |                                                                                            |
| -1                  | 012-1688-00                                    |                      |                      | 1   | CABLE ASSEMBLY; ANALOG/AUDIO BREAKOUT                                                      |
| -2                  | 200-4804-00                                    |                      |                      | 1   | COVER; SHIELD,ELEC CONN,37 POS DSUB,ZINC                                                   |
| -3                  | 131-0422-00                                    |                      |                      | 1   | CONN,DSUB; SLDR CUP/PNL,;MALE,STR,37 POS,0.112 CTR,0.186 H X 0.126 TAIL,0.125 DIA THRU MTG |

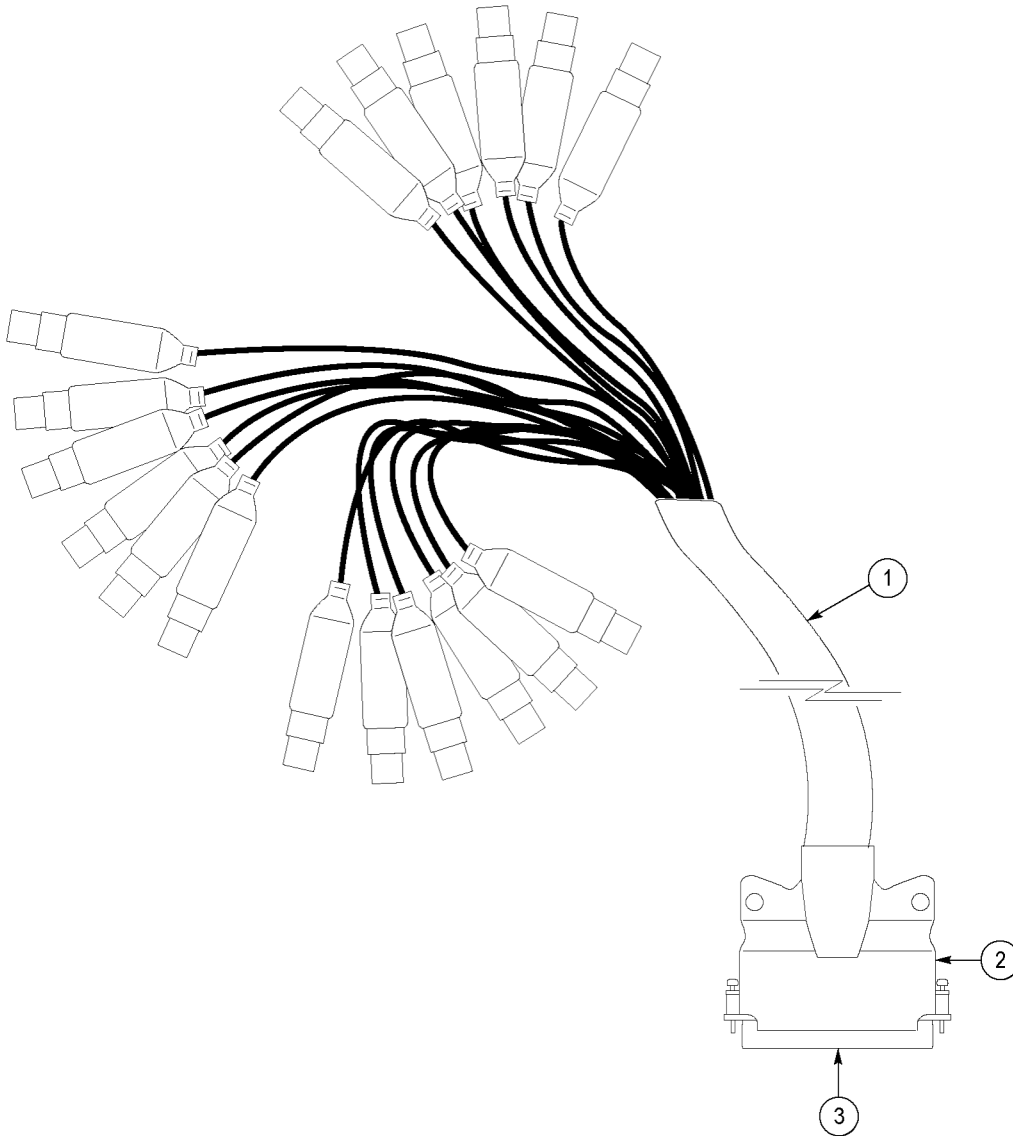


Figure 5-5: Analog audio breakout cable assembly