

**WVR7200, WVR8200, and WVR8300**  
**Waveform Rasterizers**  
**System Integration**  
**Technical Reference**



077-0392-02



**WVR7200, WVR8200, and WVR8300  
Waveform Rasterizers  
System Integration  
Technical Reference**

**Warning**

The service instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

[www.tektronix.com](http://www.tektronix.com)

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- In North America, call 1-800-833-9200.
- Worldwide, visit [www.tektronix.com](http://www.tektronix.com) to find contacts in your area.

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## Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, additional information is provided at the end of this section. (See page iv, *Service safety summary*.)

### General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

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.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of 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.

Do not use the provided power cord for other products.

**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, make sure that the product is properly grounded.

**Power disconnect.** The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to operate the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

**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.

**Do not operate without covers.** Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

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

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

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

**Do not operate in wet/damp conditions.** Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

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

**Keep product surfaces clean and dry.** Remove the input signals before you clean the product.

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

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

**Provide a safe working environment.** Always place the product in a location convenient for viewing the display and indicators.

Avoid improper or prolonged use of keyboards, pointers, and button pads.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Use care when lifting and carrying the product.

Use only the Tektronix rackmount hardware specified for this product.

## Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

**To avoid electric shock.** Do not touch exposed connections.

**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 product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

**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.

**Verify safety after repair.** Always recheck ground continuity and mains dielectric strength after performing a repair.

## Terms in this manual

These terms may appear in this manual:



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



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

## 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.



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

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



CAUTION  
Refer to Manual



Protective Ground  
(Earth) Terminal



Standby



# Preface

This document provides information for system integrators who are designing systems for high-definition (HD), standard-definition (SD), and 3 Gb/s, UHDTV1/4K SDI digital video content where the Tektronix WVR7200, WVR8200, and WVR8300 Waveform Rasterizers are to be deployed.

## Where to find more information

The following tables list the documentation that is available for the product and shows where you can find it: in a printed manual, on the product documentation CD-ROM, or on the Tektronix Web site.

**Table i: Product documentation**

<b>Item</b>	<b>Purpose</b>	<b>Location</b>
Installation and Safety Instructions	Provides safety and compliance information along with hardware installation instructions to present the associated safety warnings. This manual is available in English, Japanese, and Simplified Chinese.	Printed manual and also available in electronic format at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
User Manual	Provides operation and application information.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
Online Help	In-depth instrument operation and UI help.	On the instrument
Specifications and Performance Verification Technical Reference	Specifications and procedures for checking instrument performance.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
WFM and WVR Series Management Information Database (MIB) Programmer Manual	SNMP command reference for remotely controlling the instrument.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
Service Manual	Provides information about adjustments, repair, and replaceable parts.	Available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>

**Table ii: Related reference documents**

<b>Item</b>	<b>Purpose</b>	<b>Location</b>
Top 10 Application-Based Presets	Describes useful presets and how to set them up.	Product Documentation CD and available at <a href="http://www.tektronix.com">www.tektronix.com</a>
Preventing Illegal Colors (application note)	Describes how the Diamond, Arrowhead, and Lightning displays can be used to help prevent the undesired impact of color gamut violations and to simplify the assessment of proper gamut compliance.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
Understanding Colors and Gamut (poster)	Provides a large visual display of how the Diamond, Arrowhead, and Lightning displays can be used to help prevent the undesired impact of color gamut violations.	Available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>

**Table ii: Related reference documents (cont.)**

<b>Item</b>	<b>Purpose</b>	<b>Location</b>
A Guide to Standard and High Definition Digital Video Measurements (primer)	This book explains the basics of making standard and high-definition, digital-video measurements.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
Analog and Digital Audio Monitoring (application note)	Describes how to monitor analog and digital audio signals. Also discussed are specific differences in the methods used to monitor analog audio versus digital audio, and how to plan the transition from monitoring analog audio to monitoring digital audio.	Available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
Audio Monitoring (application note)	Describes balanced and unbalanced audio signals, and explains the physical and electrical characteristics and the specific strength and weaknesses of the different digital audio signal formats.	Available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
Monitoring Surround Sound Audio (application note)	Describes the basics of 5.1-channel surround sound audio and tells how to use the Surround Sound display to visualize key audio-level and phase relationships in this audio format.	Available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
NTSC Video Measurements (primer)	This book explains the basics of making NTSC video measurements.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>
PAL Systems Television Measurements (primer)	This book explains the basics of making PAL video measurements.	Product Documentation CD and available at <a href="http://www.tektronix.com/manuals">www.tektronix.com/manuals</a>

**Table iii: Graphics and photos for system integrators**

<b>Item</b>	<b>Purpose</b>	<b>Location</b>
Front and rear panel photos of the instruments	These photos might be useful if you need to present information to your customer	Product Documentation CD
Front and rear panel CAD file images of various Tektronix video products in .dwg format	These images can be used in Visio and AutoCAD system drawings	Attached to the PDF of this manual and Product Documentation CD

# Physical, environmental, and power specifications

The physical, environmental, and power specifications apply to all instrument models. Use this information to ensure proper ventilation and clearance when installing an instrument into a rack.

**Table 1: Physical specifications**

Characteristic	Description	
Dimensions	Height	1.72 in (4.37 cm)
	Width	19 in (48.26 cm)
	Depth (front to back including handles and BNCs)	20.25 in (51.44 cm) (Not including cables)
Weight	Net	9.5 lbs (4.31 kg), maximum
	Shipping	19 lbs (8.62 kg), approximately
Required Clearances	Top	None
	Bottom	None
	Left side	1 in (25.4 mm)
	Right side	1 in (25.4 mm)
	Front	None
	Rear	1 in (25.4 mm)

**Table 2: Power specifications**

Characteristic	Description	
Power	Input Voltage	100 to 240 VAC
	Input Power Frequency	50 or 60 Hz
	Power Consumption, typical	50 to 110 VA at 110 or 240 VAC

**NOTE.** More information about the power connector is available in this document. (See page 10, Power connector.) You can also read about the power-on and power-off procedures. (See page 26.)

**Table 3: Environmental specifications**

<b>Characteristic</b>		<b>Description</b>
Temperature	Operating	0 °C to +40 °C
	Non-operating	-40 °C to +75 °C
Humidity	Operating	20% to 80% relative humidity (% RH) at up to +40 °C, non-condensing
	Non Operating	5% to 90% RH (relative humidity) at up to +60 °C, non-condensing
Altitude	Operating	9,842 ft (3,000 m )
	Non-operating	40,000 ft (12,192 m)
Cooling		The variable fans provide forced air circulation. Do not block ventilation openings.  The intake air vents in the front of the instrument must not be blocked and the rear exhaust vents requires at least 1 inch of clearance. No clearance is required above or below the instrument.
Pollution Degree		2, Indoor use only

## Rack installation

Install your instrument into a standard instrumentation rack and is shipped with a rackmount kit.

This section provides instructions for doing the following:

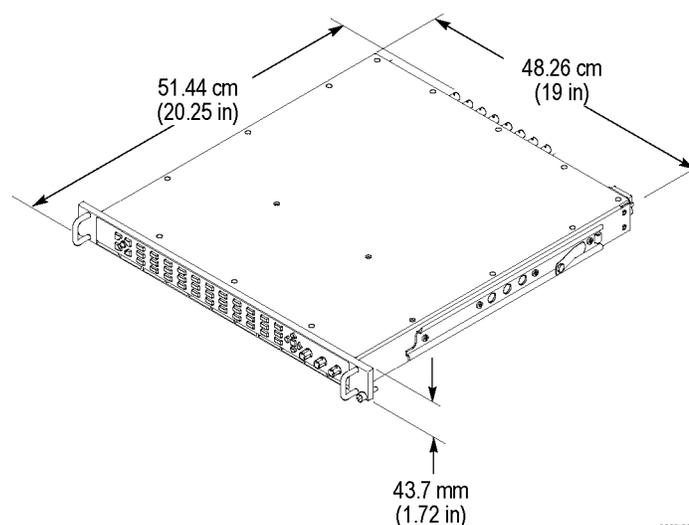
- Installing the slides onto your product if they are not already installed
- Installing the rails into a standard 19-inch equipment rack
- Installing the instrument into the rails in the rack



**WARNING.** To avoid personal injury and instrument damage, do not mix parts from different rackmount kits. The locking feature might not function, resulting in product falling out of the rack when it is removed from the rack.

Your instrument ships with hardware for rackmounting and fits in a standard 19-inch rack. Requirements of the rack follow:

- Spacing between the front rails must be at least 17- $\frac{3}{4}$  inches.
- Front-to-rear rail spacing must be between 15- $\frac{1}{2}$  and 28 inches.
- Six inches of clearance between the instrument rear panel and any rear cabinet panel for connector space and to provide adequate air circulation.

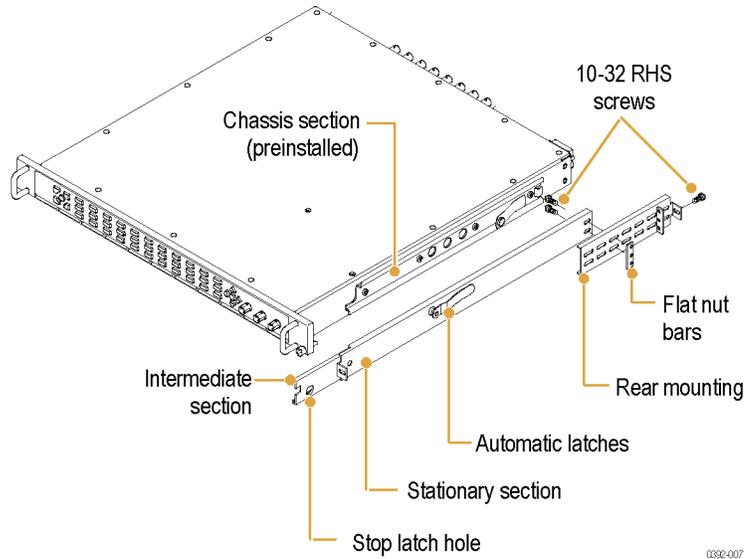


### Mounting the slide tracks

This procedure covers rear rail mounting details for both deep and shallow racks.

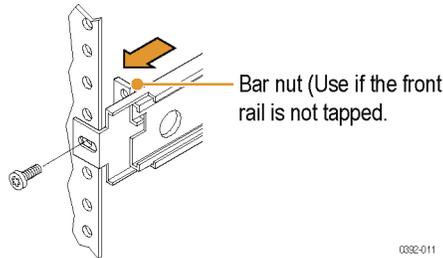
1. Mount the rails using the enclosed hardware as shown below.

**NOTE.** Right hand and left hand stationary section is designated by the RH and the LH marked on the rails. Stop latch holes should be towards the bottom when slides are in place. (The right hand rail is shown.)



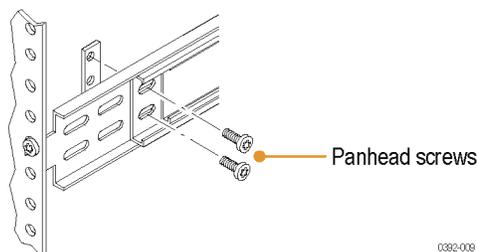
2. Screw-mount to the front rail.

If the front rail mounting hole is not tapped, use a bar nut as shown.

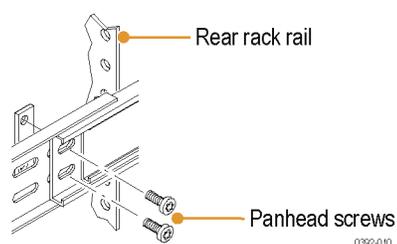


3. Rear mount the rails. Make sure that the stationary sections are horizontally aligned, level, and parallel.

For a deep configuration, rear mount as shown.



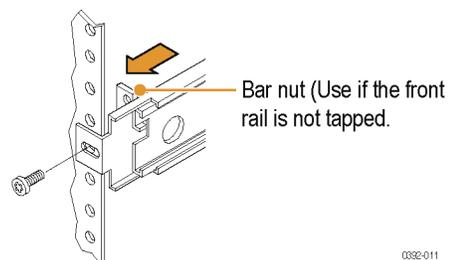
For a shallow configuration, rear mount as shown.



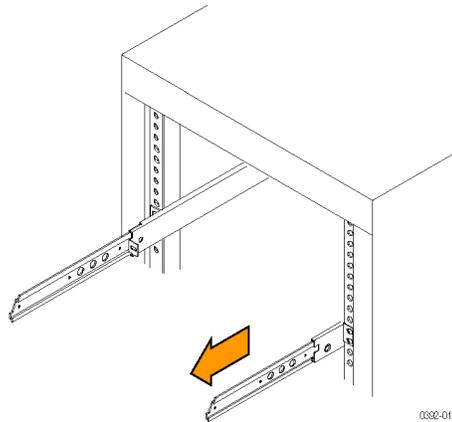
## Rack adjustments

If, after installation, the slide tracks bind, adjust the tracks as follows.

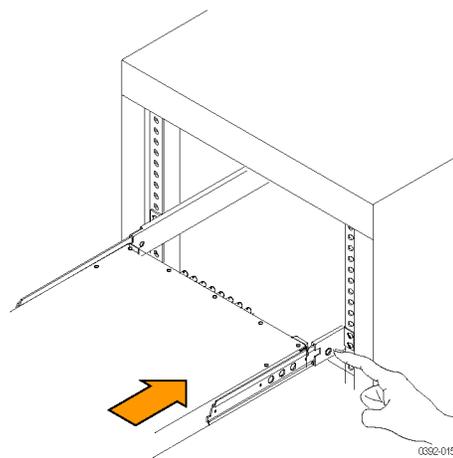
1. Slide the instrument out about 10 inches, slightly loosen the screws holding the tracks to the front rails, and allow the tracks to seek an unbound position.
2. Retighten the screws and check the tracks for smooth operation by sliding the instrument in and out of the rack several times.



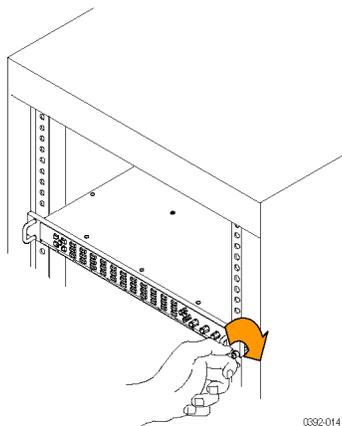
- To install the instrument**
1. Pull the slide-out track section to the fully extended position.



2. Insert the instrument chassis sections into the slide-out.
3. Press the stop latches, and push the instrument toward the rack until the latches snap into their holes.
4. Press the stop latches again, and push the instrument fully into the rack.

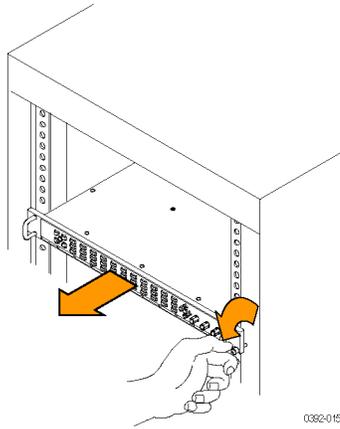


5. Tighten the front-panel retaining screws.

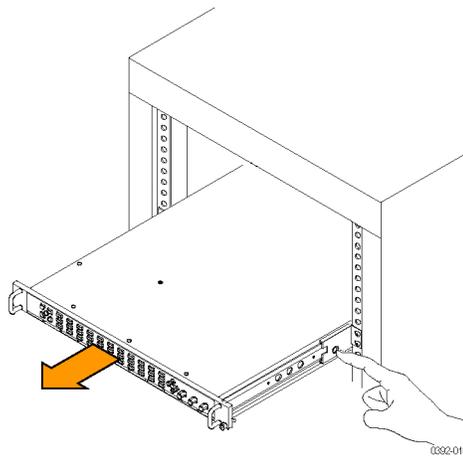


**To remove the instrument**

1. Before removing the instrument, be sure to disconnect all cabling.
2. Loosen retaining screw and pull instrument outward until the stop latches snap into the holes.



3. Press stop latches (visible in the stop-latch holes) and carefully slide the instrument free from the tracks.



**Rack slide maintenance**

The slide-out tracks do not require lubrication.

## Instrument connectors

The instrument has connectors on the front and rear panels. The following pages describe the connector types, pin numbering, and associated signal requirements.

The first illustration shows the rear panel of a fully optioned instrument. Your instrument may have a different configuration than that shown.

**NOTE.** More illustrations and photographs of these instruments are available in JPEG format on the Tektronix Web site ([www.tektronix.com](http://www.tektronix.com)) and on the Product Documentation CD that was shipped with your instrument.

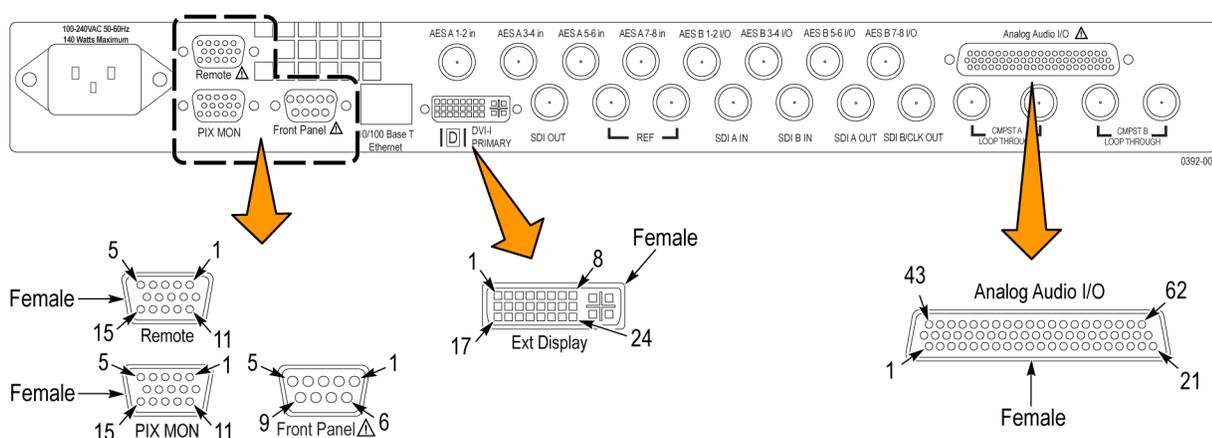
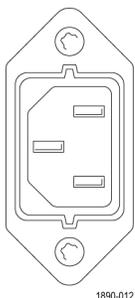


Figure 1: Rear panel with Option CPS, EYE or PHY or PHY3, and AD or DDE installed

## Power connector



The instrument has the following power requirements:

- A single-phase power source with one current-carrying conductor at or near earth-ground (the neutral conductor).
- The power source frequency must be 50 or 60 Hz, and a operating voltage range must be from 100 to 240 VAC, continuous.



**WARNING.** To reduce risk of fire and shock, ensure the mains supply voltage fluctuations do not exceed 10% of the operating voltage range.

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- Systems with both current-carrying conductors live with respect to ground (such as phase-to-phase in multiphase systems) are not recommended as power sources.

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**NOTE.** Only the line conductor is fused for over-current protection. The fuse is internal and not user replaceable. Do not attempt to replace the fuse. If you suspect the fuse has blown, return the unit to an authorized service center for repair.

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**SDI video connectors**

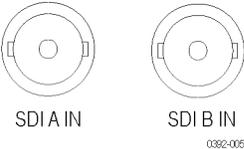
SDI inputs are self-terminating inputs. Use the SDI A and SDI B inputs to connect a serial digital video signal to the instrument.

The SDI A Out signal is the reclocked output of the SDI A input and has the same data rate as the input signal. The SDI B/CLK Out signal is the reclocked output from the SDI B input and has the same data rate as the input signal. If the instrument has Option EYE, PHY3, or PHY, the SDI B/CLK Out signal can also be the recovered clock output. You can connect the Clock Out signal to a spectrum analyzer to view jitter frequency components in the video signal.

The SDI OUT can be selected to output either the looped-through input signal, a test signal (Option 3G only), or the Pix Mon signal output, which contains configurable error brightups. This is done from the Config > Outputs > SDI Output menu.

The following table lists the characteristics of the SDI video connectors.

**Table 4: SDI video connector specifications**

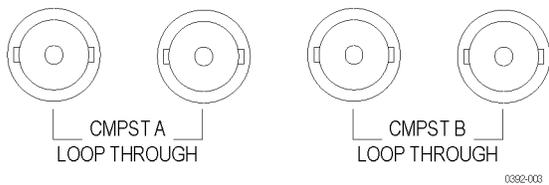
Connector	Characteristic	Description
 SDI A IN      SDI B IN 0382-005	Input Type	BNC, 75 Ω internally terminated
	Input Level	800 mV ± 10%
	Cable Loss Accommodation: 270 Mb/s	0 to 30 dB attenuation at ½ of serial rate Equivalent to approximately 300 m of Belden 8281 at 270 Mb/s
	Cable Loss Accommodation: 1.5 Gb/s, 3 Gb/s	0 to 20 dB attenuation at ½ of serial rate Equivalent to approximately 80 m of Belden 8281 at 1.485 Gb/s. Typical performance to 110 m
 SDI A Out      0391-003	Output Type	BNC, 75 Ω internally terminated Reclocked output of the SDI A input.
	Output Level	800 mV ± 10% into 75 Ω load
 SDI B/CLK Out      0391-004	Output Type	BNC, 75 Ω internally terminated Reclocked output of the SDI B input.
	Alternate Output Type (for instruments with Option EYE or PHY or PHY3)	Reference clock; BNC, 800 mV ± 10% p-p into 75 Ω load
	Alternate Output Frequency	SD = 27 MHz HD = 74.25 or 74.17852 MHz
 SDI OUT	Output Type	BNC, 75 Ω internally terminated
	Output Level	800 mV ± 10% into 75 Ω load

**Composite video connectors**

Use the CMPST A and CMPST B inputs to connect an NTSC or PAL composite video signal to the instrument. The following table lists the signal characteristics of the composite video connectors.

**Table 5: Composite video connector specifications**

Connector	Characteristic	Description
	Input Type	BNC, passive loop-through, 75 $\Omega$ compensated; 2 inputs (Composite A and Composite B)
	Maximum Operating Amplitude with Clamping Off (DC Coupled)	-1.8 V to +2.2 V (all inputs), DC + peak AC
	Maximum Absolute Input Voltage	-6.0 V to +6.0 V, DC + peak AC



**Video external reference connector**

Use the REF LOOP connector to input a composite Black Burst signal or a tri-level sync signal for use as a sync timing reference for the selected video input signal. The following table lists the signal characteristics of the external reference connectors.

**Table 6: External reference connector specifications**

Connector	Characteristic	Description
	Input Type	BNC, passive loop-through, 75 $\Omega$ compensated
	Input Level	-6 to +6 dB
	Maximum Input Voltage Level	$\pm$ 5 V, DC
	Maximum Absolute Input Voltage	$\pm$ 5 V, DC

## AES digital audio connectors

Use the AES audio connectors to input or output digital audio signals. The "A" connectors are input only. You can configure the "B" connectors to function as additional inputs or as outputs of the selected audio inputs. Use the Audio Inputs/Outputs menu to configure the channel mapping in the audio displays.

The following table lists the signal characteristics of the AES Audio connectors.

**Table 7: AES digital audio connector specifications**

Connector	Characteristic	Description
	Input Type (A and B connectors)	BNC, 75 $\Omega$ terminated, unbalanced (meets requirements of AES 3-ID and SMPTE 276M-1995)
	Input Amplitude Range (A and B connectors)	0.1 V <sub>p-p</sub> to 2 V <sub>p-p</sub>
	Output Type (B connectors only)	BNC, 75 $\Omega$ terminated, unbalanced (meets requirements of AES 3-ID and SMPTE 276M-1995)
	Output Amplitude Range (B connectors only)	0.9 V to 1.1 V Pk-Pk into 75 $\Omega$

AESA 1-2 in	AESA 3-4 in	AESA 5-6 in	AESA 7-8 in	AES B 1-2 I/O	AES B 3-4 I/O	AES B 5-6 I/O	AES B 7-8 I/O
							

0382-004

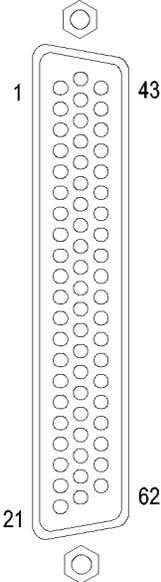
## Analog audio connector

The ANALOG AUDIO connector is used to receive and send analog signals. The connector is a 62-pin, female, D-subminiature connector. Pin assignments and pin names are listed in the following figure and table.

Use the ANALOG AUDIO connector to input or output analog audio signals. Use the Audio Settings menu to configure the channel mapping in the audio displays.

For all audio options, use the supplied 62-pin DSUB connector to attach analog-audio signals to the instrument. Solder wires to the connector as needed to accommodate the desired audio inputs and outputs. Audio signals can be connected as either balanced or unbalanced. Be sure to use a suitable cable when you are wiring balanced audio. An example of a suitable cable is Belden 8451, which is a shielded twisted pair cable. Alternatively, you can purchase an audio breakout cable (Tektronix part number 012-1688-00), which provides a two meter cable with XLR connectors for all twelve inputs and eight outputs.

**Table 8: Analog audio connector specifications**

Connector	Pin	Description	Pin	Description
	1	Ch. 1 input, line A, positive	22	Ch. 1 input, line A, negative
	2	Ch. 1 input, line B, positive	23	Ch. 1 input, line B, negative
	3	Ch. 2 input, line A, positive	24	Ch. 2 input, line A, negative
	4	Ch. 2 input, line B, positive	25	Ch. 2 input, line B, negative
	5	Ch. 3 input, line A, positive	26	Ch. 3 input, line A, negative
	6	Ch. 3 input, line B, positive	27	Ch. 3 input, line B, negative
	7	Ch. 4 input, line A, positive	28	Ch. 4 input, line A, negative
	8	Ch. 4 input, line B, positive	29	Ch. 4 input, line B, negative
	9	Ch. 5 input, line A, positive	30	Ch. 5 input, line A, negative
	10	Ch. 5 input, line B, positive	31	Ch. 5 input, line B, negative
	11	Ch. 6 input, line A, positive	32	Ch. 6 input, line A, negative
	12	Ch. 6 input, line B, positive	33	Ch. 6 input, line B, negative
	13	Ground	34	Ground
	14	Ch. 1 output, positive	35	Ch. 1 output, negative
	15	Ch. 2 output, positive	36	Ch. 2 output, negative
	16	Ch. 3 output, positive	37	Ch. 3 output, negative
	17	Ch. 4 output, positive	38	Ch. 4 output, negative
	18	Ch. 5 output, positive	39	Ch. 5 output, negative
	19	Ch. 6 output, positive	40	Ch. 6 output, negative
	20	Ch. 7 output, positive	41	Ch. 7 output, negative
	21	Ch. 8 output, positive	42	Ch. 8 output, negative
		43-62	No connection	
Characteristic	Description			
Input Type	62 pin, 3 row, DSUB, balanced, unterminated			
Maximum Input Level	+24 dBu ± 0.3 dBu			
Output Type	62 pin, 3 row, DSUB, balanced, unterminated; ground negative output to support unbalanced mode			
Maximum Output Level	+24 dBu ± 0.5 dBu (designed to drive a ≥ 600 Ω load)			

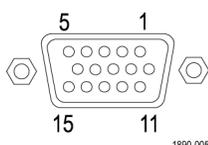
### Remote connector (WVR8200 and WVR8300)

The Remote connector is a 15-pin, female, D-type connector with socket contacts. It uses ground closures for remote control and sending indications to external equipment when alarms have occurred. The input of LTC is through the REMOTE connector.

Use the Remote connector to input LTC time code signals, and to remotely select one of the first four instrument presets in group "A" using ground closure. The following table lists the signal characteristics of the Remote connector.

**Table 9: WVR8200/8300 Remote connector pin assignments, specifications, and preset functions**

Characteristic	Pin out	Preset functions			
		Hex	Binary	Direct mode selection	Encoded mode selection
Connector Pin Assignments	1 GND (In)				
	2 Reserved (I/O)				
	3 Reserved (I/O)				
	4 Reserved (In)				
	5 Reserved (In)				
	6 GND (In)				
	7 Time Code Positive (LTC In)				
	8 Time Code Negative (LTC In)				
	9 Ground Closure (Alarm Out)				
	10 Preset 1 (In)				
	11 Preset 2 (In)				
	12 Preset 3 (In)				
	13 Preset 4 (In)				
	14 Preset 5 (In)				
	15 Preset 6 (In)				
		F	111111	none	No action
		E	XX1110	Preset 1	No action
		D	XX1101	Preset 2	No action
		C	XX1100		SDI B
		B	XX1011	Preset 3	SDI A
		A	XX1010		No action
		9	XX1001		No action
		8	XX1000		Preset 8
		7	XX0111	Preset 4	Preset 7
		6	XX0110		Preset 6
		5	XX0101		Preset 5
		4	XX0100		Preset 4
		3	XX0011		Preset 3
		2	XX0010		Preset 2
		1	XX0001		Preset 1
		0	XX0000		Unused
		N/A	101111	Preset 5	N/A
		N/A	011111	Preset 6	N/A



Characteristic	Description
LTC Input Connector	15-pin DSUB, balanced, unterminated
LTC Input Signal	Longitudinal Time Code per IEC Publication 461
LTC Signal Amplitude Range	0.2 V <sub>p-p</sub> to 5.0 V <sub>p-p</sub> balanced differential or single-ended
Ground Closure Input Signal	TTL thresholds, 5 V max input, -0.5 min input; pull low to assert
Ground Closure Output Signal	One open collector output

**Remote connector (WVR7200)**

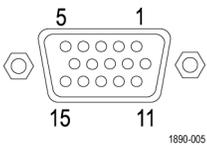
The Remote connector is a 15-pin, female, D-type connector with socket contacts. It uses ground closures for remote control and sending indications to external equipment when alarms have occurred. The input of LTC is through the REMOTE connector.

Use the Remote connector to input LTC time code signals, and to remotely select one of the first four instrument presets in group "A" using ground closure. The following table lists the signal characteristics of the Remote connector.

**Camera tally mode.** This mode is used to define which input is on-air (RED) and which input is available to be adjusted (GREEN). This state is indicated in the status bar and above the Picture display of the selected input on the instrument display screen.

**Table 10: WVR7200 Remote connector pin assignments, specifications, and preset functions**

Characteristic	Pin out	Preset functions			
Connector Pin Assignments	1 GND (In)	Hex	Binary	Direct mode selection	Encoded mode selection
	2 Reserved (I/O)		Pins 15, 14, 13, 12, 11, 10		
	3 Reserved (I/O)				
	4 Reserved (In)				
	5 Reserved (In)	F	111111	none	No action
	6 GND (In)	E	XX1110	Preset 1	CMPST B
	7 Time Code Positive (LTC In)	D	XX1101	Preset 2	CMPST A
	8 Time Code Negative (LTC In)	C	XX1100		SDI B
	9 Ground Closure (Alarm Out)	B	XX1011	Preset 3	SDI A
	10 Preset 1 (In)	A	XX1010		Channel B
	11 Preset 2 (In)	9	XX1001		Channel A
	12 Preset 3 (In)	8	XX1000		Preset 8
	13 Preset 4 (In)	7	XX0111	Preset 4	Preset 7
	14 Preset 5 (In)	6	XX0110		Preset 6
	15 Preset 6 (In)	5	XX0101		Preset 5
	4	XX0100		Preset 4	
	3	XX0011		Preset 3	
	2	XX0010		Preset 2	
	1	XX0001		Preset 1	
	0	XX0000		Unused	



Characteristic	Description
LTC Input Connector	15-pin DSUB, balanced, unterminated
LTC Input Signal	Longitudinal Time Code per IEC Publication 461
LTC Signal Amplitude Range	0.2 V <sub>p-p</sub> to 5.0 V <sub>p-p</sub> balanced differential or single-ended
Ground Closure Input Signal	TTL thresholds, 5 V max input, -0.5 min input; pull low to assert
Ground Closure Output Signal	One open collector output

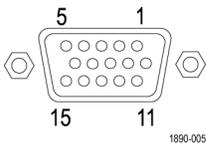
**PIX MON connector**

The PIX MON connector is a 15-pin, female, D-type connector with socket contacts. This is the video picture output. The output is compatible with standard analog PC monitors, either CRT or LCD-based.

Use the PIX MON connector to output the video picture, including configurable cursor, safe area graticules, and error brightups, to an external monitor. For HD and SD input signals, use the CONFIG > Outputs menu to configure the output signal to be RGB, YPbPr, or off.

The following table lists the signal characteristics of the PIX MON connector.

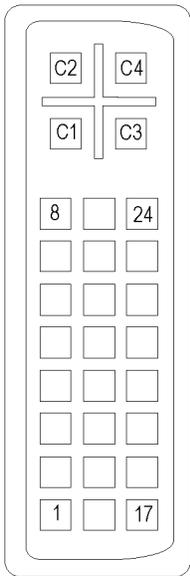
**Table 11: Picture Monitor connector pin assignments and specifications**

Connector	Pin	Description	Pin	Description
	1	Red output	9	Not used
	2	Green output	10	Ground
	3	Blue output	11	Not used
	4	Not used	12	Not used
	5	Ground	13	Horizontal sync output
	6	Ground	14	Vertical sync output
	7	Ground	15	Not used
	8	Ground		
Characteristic	Description			
Output Connector	VGA DSUB			
Output Format	Y, Pb, Pr with sync on Y; RGB with sync on all			
Active Video Accuracy	700 mV <sub>p-p</sub> ± 5% (Y-Pb-Pr mode)			

**EXT DISPLAY connector**

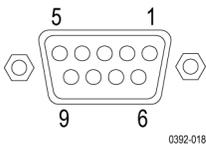
The EXT DISPLAY connector is a female DVI-I connector with socket contacts. This is the external display monitor output. The display resolution is 1024 x 768. The output supports DVI monitors directly and analog PC (RGB) monitors with the use of a DVI-I to VGA adapter.

**Table 12: EXT DISPLAY connector specifications**

Connector	Pin	Description	Pin	Description	
 <p style="text-align: center; font-size: small;">0392-017</p>	1	TMDS Data 2– Red – (Link 1)	13	TMDS Data 3+ Blue + (Link 2)	
	2	TMDS Data 2+ Red + (Link 1)	14	Ground	
	3	TMDS Data 2/4 shield	15	+ 5 V Power for monitor when in standby	
	4	TMDS Data 4– Green – (Link 2)	16	Hot plug detect	
	5	TMDS Data 4+ Green + (Link 2)	17	TMDS Data 0– Blue – (Link 1) and digital sync	
	6	DDC clock	18	TMDS Data 0+ Blue + (Link 1) and digital sync	
	7	DDC data	19	TMDS data 0/5 shield	
	8	Analog vertical sync	20	TMDS Data 5– Red – (Link 2)	
	9	TMDS Data 1– Green – (Link 1)	21	TMDS Data 5+ Red + (Link 2)	
	10	TMDS Data 1+ Green + (Link 1)	22	TDMS clock shield	
	11	TMDS Data 1/3 shield	23	TDMS clock + Digital clock + (Links 1 and 2)	
	12	TMDS Data 3– Blue – (Link 2)	24	TDMS clock – Digital clock – (Links 1 and 2)	
	C1	Analog red	C4	Analog horizontal sync	
	C2	Analog green	C5	Analog ground Return for R, G, B signals	
	C3	Analog blue			
	<b>Characteristic</b>	<b>Description</b>			
	Output Connector	DVI-I (integrated, digital and analog)			

**Front Panel connector** The Front Panel connector is a 9-pin, female, D-type connector with socket contacts. This is the interface connector between a WVR7200, WVR8200, or WVR8300 and the optional WVR8RFP Remote Front Panel.

**Table 13: Front Panel connector pin assignments**

Connector	Pin	Description	Pin	Description
	1	RX+ (RS422 input from RFP, Terminated)	6	+12 V DC power to RFP
	2	RX- (RS422 input from RFP, Terminated)	7	TX+ (RS422 output to RFP)
	3	+12 V DC power to RFP	8	TX- (RS422 output to RFP)
	4	Ground (chassis and 12 V DC return)	9	Fault output (5 K pull up to 12 V indicates fault, ground indicates OK)
	5	Ground (chassis and 12 V DC return)		

The pin assignments on the connector of a WVR8RFP Remote Front Panel are identical to those of the Front Panel connector on the rasterizer instruments.

The WVR8RFP comes with a 25 foot remote cable. (An optional 100 foot remote cable is available.) If building a custom length cable, it's recommended to use twisted pair wiring. Shielded cable is recommended for high-noise environments.

For detailed installation and operation information of the WVR8RFP, see the *WVR8RFP Remote Front Panel Instructions* (Tektronix part number 071-2804-XX).

**Ethernet connector**

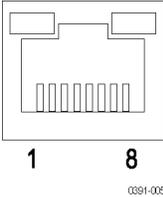
Use the Ethernet connector to connect the waveform monitor to your local network. A network connection is required for remote control, software upgrades, and enabling some instrument options.

The Ethernet connector includes built-in green and yellow LEDs to indicate signal status as indicated below:

- Lit green LED indicates connection is active
- Lit yellow LED indicates a 100 MB transmission rate
- Unlit yellow LED indicates a 10 MB transmission rate

The following table lists the signal characteristics of the Ethernet connector.

**Table 14: Ethernet connector pin assignments**

Connector	Pin/LED	Name	Description
	1	TX_D1+	Transceive Data+
	2	TX_D1-	Transceive Data-
	3	RX_D2+	Receive Data+
	4		Not used
	5		Not used
	6	RX_D2-	Receive Data-
	7		Not used
	8		Not used
Characteristic	Description		
Ethernet connector	RJ-45 LAN supporting 10/100/1000 BaseT; supports manual and DHCP address modes		

**Headphone jack** Use the headphone jack, located on the front panel, to listen to the audio associated with the selected video input signal. The following table describes the signal characteristics of the headphone jack.

**Table 15: Headphone jack specifications**

Connector	Characteristic	Description
	Output Type	Standard 1/4-inch stereo phone jack, capable of driving a 6.25 dBu sine wave into 32 $\Omega$ or 16 $\Omega$

**USB connector** Use the USB connector, located on the front panel, to save and restore instrument presets and captured data using a USB memory drive. The following table describes the signal characteristics of the USB connector.

**Table 16: USB connector specifications**

Connector	Characteristic	Description
	Type	Host
	Speed	Complies with USB 1.1 and 2.0 Full Speed Specification (12 Mb/s)

# Video system installation

The instrument can operate almost anywhere in the distribution system.

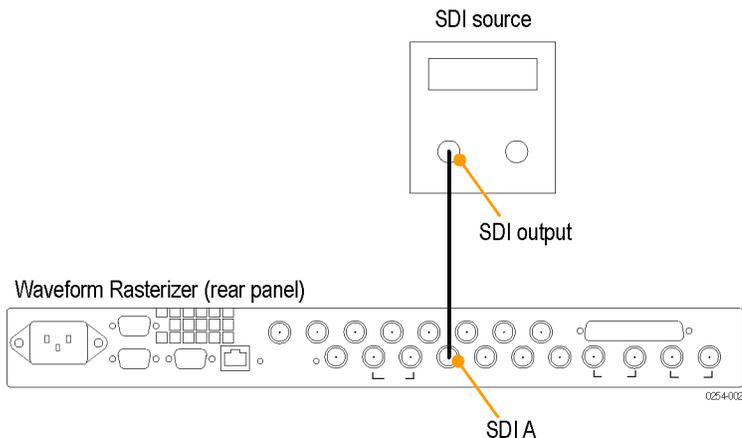
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**NOTE.** See the *Specifications and Performance Verification manual on the Product Documentation CD* for maximum-allowed cable lengths.

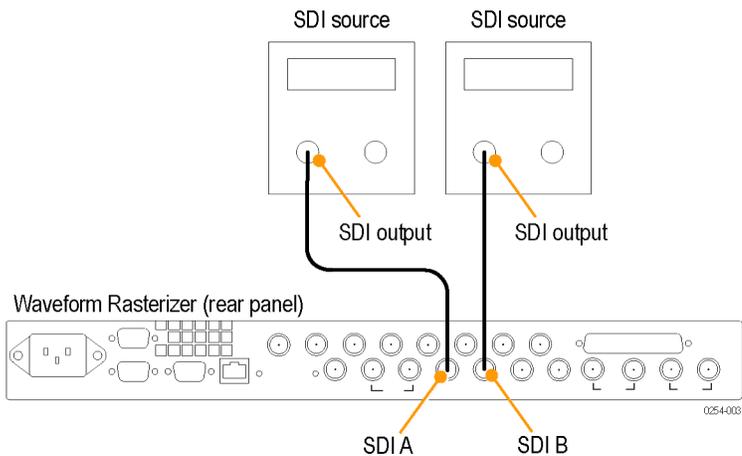
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## To monitor the video bit stream of a serial receiver

You can route one or two incoming serial signals into the SDI inputs of the instrument. (See Figure 2.) (See Figure 3.)



**Figure 2: Connecting a single SD, HD, or 3 Gb/s SDI input**



**Figure 3: Connecting two SD, HD, or 3 Gb/s SDI inputs**

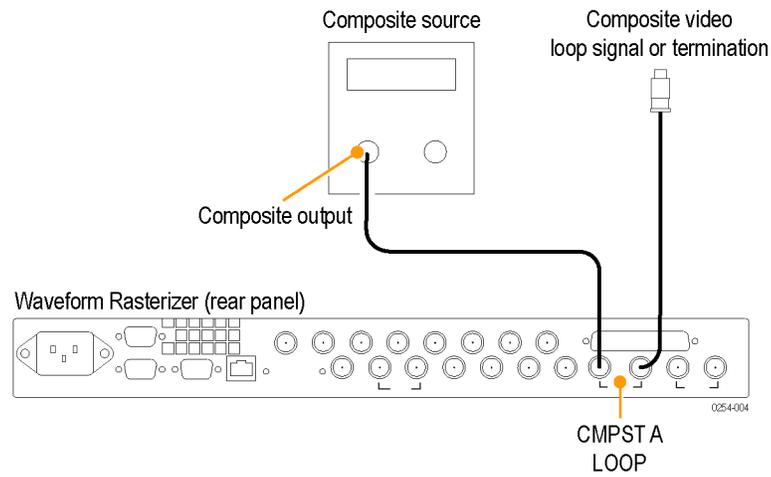
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**NOTE.** To monitor serial digital signals around a routing switcher, connect your serial sources through a patch panel to a serial router. Connect the output of the serial router to an SDI input for comparison.

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**To monitor composite signals**

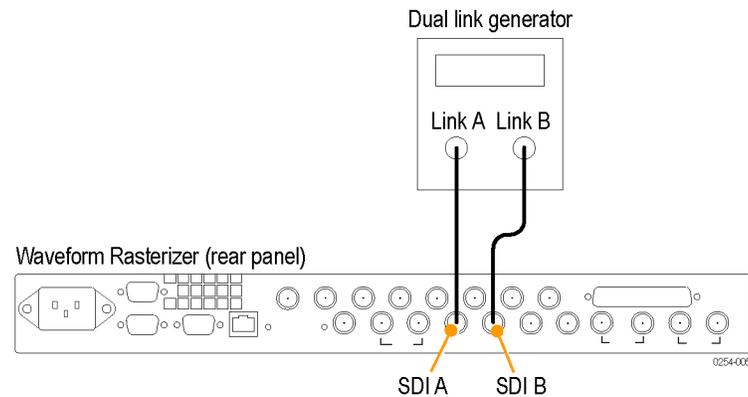
Connect your sources to the CMPST A or CMPST B loop-through inputs on the rear-panel. (See Figure 4.)



**Figure 4: Composite signal connection**

**To monitor Dual Link signals**

You can connect two SDI signals or one SDI signal and one composite signal when you are using a Dual Link signal or monitoring two signals in simultaneous input mode. (See Figure 5.)

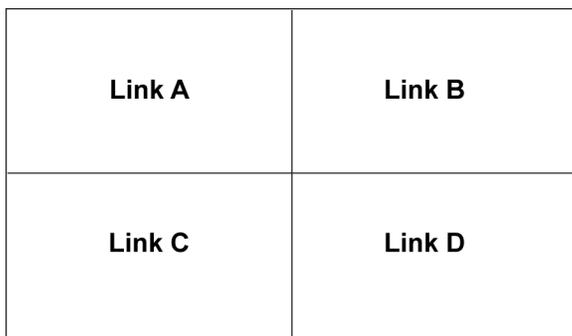


**Figure 5: Dual Link signal connection**

**To monitor UHDTV1/4K signals**

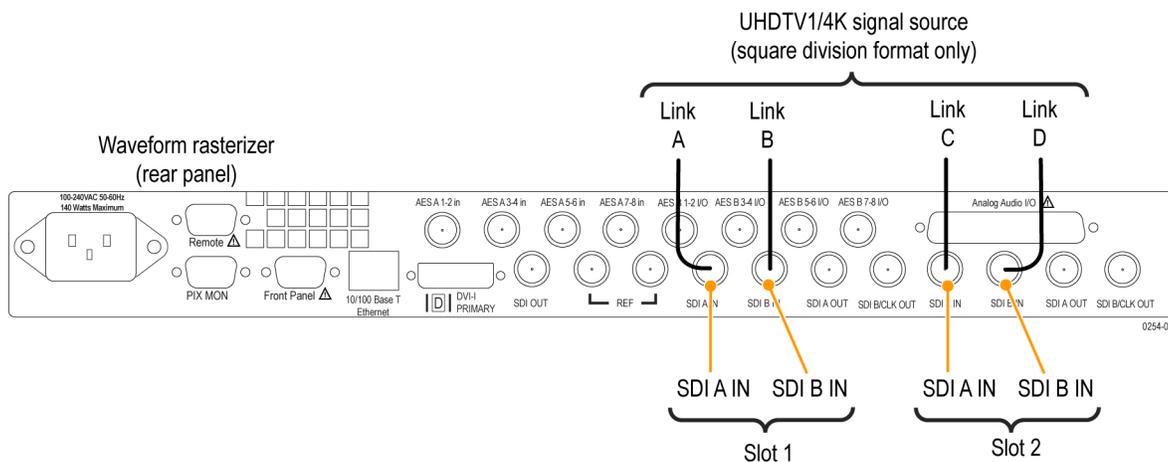
**NOTE.** The UHDTV1/4K signal must be in square division format and each quadrant must connect to the SDI inputs as shown below. The instrument must have Options 4K, 3G, and 2SDI installed.

In square division signals, the four links of the signal combine to display the video picture as shown below.



**Figure 6: Mapping of the four links that make up a UHDTV1/4K format signal**

Connect each link of the UHDTV1/4K signal to each of the SDI inputs as shown below. Use the Picture display to verify proper signal connections.



**Figure 7: UHDTV1/4K signal connections (Options 4K, 3G, 2SDI)**

**Line termination**

The instrument uses passive loop-through analog and reference inputs. Accordingly, the loop-through must be terminated externally. It is important that this external termination meet accuracy and return loss requirements.

If the instrument is installed to monitor an operating link, the destination receiver and the connecting cable serve as the termination. This monitoring connection is best because it checks the performance of the entire path. The return loss of the instrument is sufficiently high that, in most cases, the destination receiver sets the system return loss.

In cases where the instrument is placed at the end of a link, a BNC termination must be installed on one side of the loop-through analog or reference connector. The termination must be 75  $\Omega$  and DC coupled (good return loss extends to DC). Return loss should exceed 40 dB from DC to 6 MHz for composite.

**Compatibility of BNC center pins**

Most BNC connectors for video equipment, whether 50  $\Omega$  or 75  $\Omega$ , use a 50  $\Omega$  standard center pin. Some laboratory 75  $\Omega$  BNC connectors use a smaller diameter center pin. The BNC connectors this instrument are designed to work with the 50  $\Omega$  standard (large diameter) center pins.



**CAUTION.** *To prevent intermittent signal connections, do not use connectors or terminators with the smaller diameter center pins.*

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# Power-on and power-off procedures

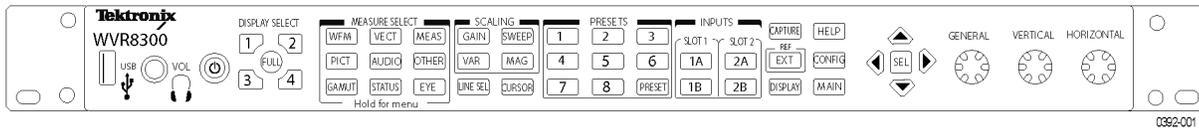
- Power-on**
1. Connect the supplied power cord to the rear-panel power connector.
  2. Press the power button on the instrument front-panel and the instrument will turn on.

---

**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.*

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Make sure that the power cord is accessible when the product is operating.



- Power-off**
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.

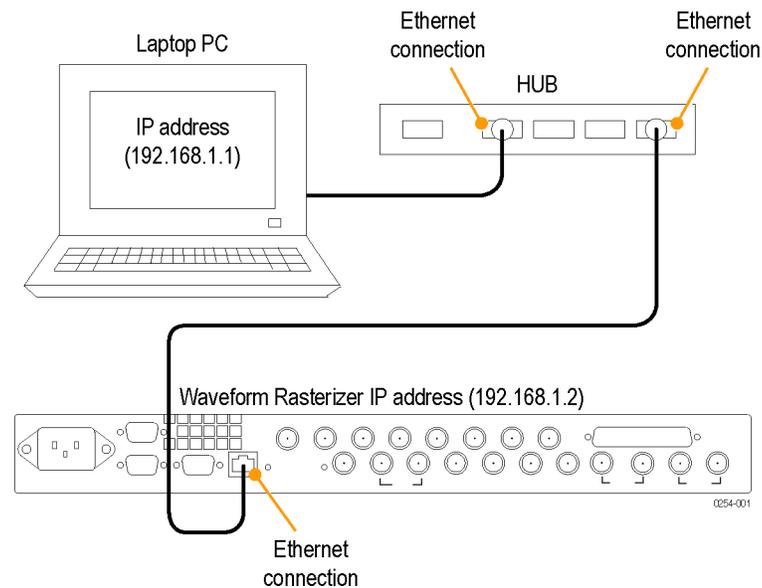
# Network operation

This section provides the following information for operating the instrument on a local LAN network:

- How to configure the instrument for operation on an IP network
- How to configure the instrument to send and/or receive SNMP remote commands
- How to use a Web browser to start a remote application to enable control of the instrument, or to download the Event and Diagnostic log files, or to capture images of the instrument display

## Ethernet connection

Connect the instrument to your network using an Ethernet cable. You can connect it directly to the instrument or through a HUB, as shown below.



## IP settings configuration

To allow network access to the instrument, you need to set the IP address. Assign Network addresses either automatically (DHCP) or manually. If your network does not use DHCP, you need to manually enter the address for the instrument. To obtain a valid IP address, contact your LAN administrator.

Perform the following steps to configure the IP settings on the instrument:

1. Press the **CONFIG** button to display the Configuration menu.
2. Use the General knob to navigate to **Network Settings**.
3. Press the right arrow key to select **IP Config Mode**.
4. Press the **SEL** button to select between **DHCP** and **Manual**.
5. If you selected DHCP, you are finished.
6. If you selected Manual mode, you need to set the Subnet Mask and Gateway Address parameters. Contact your LAN administrator for these values. (Be sure to use compatible addresses between the PC and the instrument.)
7. Press the down arrow key to select **IP Address**.
8. Press the right arrow key. A dialog box will appear that allows you to enter the IP address.
9. Repeat steps 7 and 8 for the Subnet Mask and the Gateway Address.
10. If desired, select **Instrument Name** and then press the right arrow button to assign the instrument a network name.
11. Press the **CONFIG** button to close the configuration menu.

## SNMP remote control configuration

SNMP remote control is primarily intended for instrument access using automated systems. If you intend to use SNMP commands to control the instrument, you must first configure the SNMP settings on the waveform monitor.

---

**NOTE.** *The SNMP commands are contained in a MIB (Management Information Base). Refer to the WFM Series Waveform Monitors and WVR Series Waveform Rasterizers Management Information Base Technical Reference (Tektronix part number 077-1592-XX) for information about using the MIB to control the instrument.*

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The procedure to configure SNMP settings is similar to that previously described for configuring the IP settings. Touch SNMP Setup in the Communication submenu of the Main menu to configure the following SNMP parameters:

- Remote SNMP Mode. Use this setting to configure the remote access to the instrument via SNMP. You can select enabled, disabled, or read only.
- SNMP Traps. Use this setting to enable or disable the SNMP traps that are sent from the instrument when error conditions are detected.
- Trap Destination Address. Use these settings to enter up to four different IP addresses to which SNMP traps will be sent when error conditions are detected.

---

**NOTE.** *A value of all zeroes for the IP address will disable that trap output.*

---

- Private Community String. Use this menu setting to enter the Private Community string, which effectively is a password. Without this string, SNMP commands cannot change values in the waveform monitor.

---

**NOTE.** *Use the Private Community String to control the ability of SNMP commands to make changes to the waveform monitor. Use the Public Community String to control the ability of SNMP commands to read information from the waveform monitor.*

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- Public Community String. This menu entry allows you to set the Public Community string. This string is effectively a password. Without this string, SNMP commands cannot read information from the instrument.

## Web browser operation

You can connect to an instrument installed on an Ethernet IP network without installing any software and using only a Web browser. Using the Web browser, you can perform the following functions:

- Start a remote application to enable control of the instrument
- Download the Event and Diagnostic log files
- Capture images of the instrument display

Perform the following steps to connect to the instrument using a Web browser:

1. Verify that the instrument is configured for IP network operation and note the IP address. (See page 28, *IP settings configuration*.)
2. Press the **CONFIG** button.
3. Use the General knob to navigate to **Network Settings**.
4. Press the right arrow key and then use the General knob to navigate to **Web Enable**.
5. Press the **SEL** button to select **On**.
6. On your PC, start your Web browser and enter the network address of the instrument into the URL entry box like this:

`http://123.123.123.123/`

---

**NOTE.** Many Web browsers do not correctly interpret IP addresses with leading zeros. If the IP address shown in the Configuration menu contains leading zeros, remove any leading zeros when you enter the address in the browser.

For example, the IP address 124.161.038.092 should be entered as follows:

*124.161.38.92*

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7. The Web browser will display the remote interface for the instrument. To make a selection, click the desired link.