

# Optical-to-Electrical Converters

SA-42/SD-42 • SD-43 • SD-44 • SD-48

## ★ Features and Benefits

- Ultra High Bandwidth for Analyzing High Frequency Signal Components
  - DC to 6 GHz (SA-42, SD-42)
  - DC to 8 GHz (SD-43)
  - DC to 15 GHz (SD-44)
  - DC to 30 GHz (SD-48)
- Plug-in Form Factor that is Compatible with 11800/CSA 803 Series Sampling Oscilloscopes
- 10 Gb/s SONET/SDH Reference Receiver (SD-48, Opt. RR) for Communication Signal Compliance Testing
- Optional External Power Supply (016-1609-00) for Stand Alone Operation

## Ⓐ Applications

- High Speed Optical Communication Testing (SONET/SDH)
- Optical Source and Device Characterization
- Pulse Shape Analysis
- Analyze Relaxation Oscillation



### SD-42, SD-43, SD-44, SD-48

The SD-42, SD-43, SD-44 and SD-48 are optical-to-electrical (O/E) converters for use with the Tektronix CSA 803 and 11800 Series sampling oscilloscopes equipped with an SD-2x or SD-3x Electrical Sampling Head. The SD-42, SD-43, SD-44 and SD-48 Optical-to-Electrical Converters can be plugged directly into a 11800 sampling slot or CSA 803 power slot.

Optical signal input on the SD-42, SD-43, SD-44, and SD-48 is a standard FC/PC fiber optic connector. Other connector types can be accommodated by using optional hybrid fiber optic jumper cables (SD-42) or an assortment of hybrid mating adapters which are standard with the SD-43, SD-44 and 48. The SD-42 has an average power meter capability when used with a Digital Multi-Meter (DMM) which has selectable ranges of 1 V/mW and 1 V/μW.

### STAND ALONE OPERATION

The SD-42, SD-43, SD-44 and SD-48 can operate as standalone, wide-bandwidth optical-to-electrical converters with an optional power supply (016-1609-00). These optical-to-electrical converters can be used with Tektronix oscilloscopes or other instrumentation (e.g., spectrum analyzers). These easy to use O/E converters can be used in support of frequency and time domain analysis of light-wave modulation in optical fiber based products and communications systems.

The SA-42 has an internal battery power source that can be recharged via the external power supply/battery charger. The SA-42 also has an integral battery test indicator to monitor battery status.

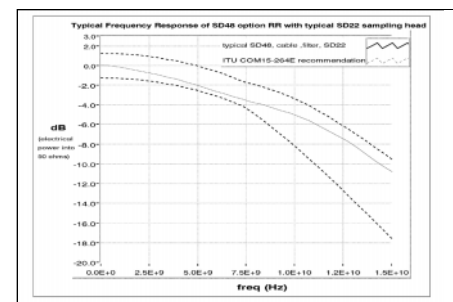
### CHARACTERIZATION

Opto-electronic devices such as laser diodes, light emitting diodes, optical waveguides,

optical detectors, and electro-optic modulators is becoming more important as applications for fiber optics in telecommunications and data communications expand. These Optical-to-Electrical Converters offer fiber optic equipment designers and researchers optical waveform measurement capability from DC to 30 GHz in the 700 nm to 1650 nm wavelength range. Measurements such as rise time, aberrations, optical power vs. drive current and voltage, modulation bandwidth, and sensitivity can now be made accurately and easily at high bandwidth.

### 10 GB/S SONET/SDH COMPLIANCE TESTING

As optical communication signals increase in speed, the required reference receiver performance continues to be challenging. The SD-48 with option RR provides customers with reference receiver performance per ITU-T COM15-264E. The external reflectionless hardware filter mates between the 50 Ω reverse terminated SD-48 O/E Converter and a SD-22 electrical sampling head. The result is a smooth 4th order Bessel-Thompson frequency response within ±1.25 dB from DC to 7.5 GHz and ±4 dB from 7.5 GHz to 15 GHz (see below).



SD-48 (Opt. RR) Frequency Response.

See Tektronix on the World Wide Web:  
<http://www.tek.com>

**ISO 9001** Tektronix measurement products  
are manufactured in ISO  
registered facilities.

CE Exempt

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## CHARACTERISTICS

	SA-42/SD-42	SD-43	SD-44	SD-48
Wavelength	1000 to 1700 nm	700 to 1650 nm	950 to 1650 nm	950 to 1650 nm
Bandwidth (Optical)* <sup>1</sup>	DC to 6.0 GHz	DC to 8.0 GHz	DC to 15.0 GHz	DC to 30.0 GHz (typ)
Impulse Response (FWHM)	≤55 ps	≤40 ps	≤30 ps	15 ps (typ)
Noise Equivalent * <sup>2</sup>	23 pW per $\sqrt{\text{Hz}}$	15 pW per $\sqrt{\text{Hz}}$	15 pW per $\sqrt{\text{Hz}}$	15 pW per $\sqrt{\text{Hz}}$
Maximum Non-Destructive Power				
Peak Power* <sup>3</sup>	≤25 mW	≤100 mW	≤100 mW	≤100 mW
Average Power	≤5 mW	≤5 mW	≤5 mW	≤5 mW
Aberrations* <sup>4</sup>	≤15% p-p	≤10% p-p	≤10% p-p	≤20% p-p
Conversion Gain* <sup>5</sup>	≥40 mV/mW	≥20 mV/mW @ 850 nm ≥30 mV/mW @ 1310 nm	≥35 mV/mW	≥15 mV/mW
Output Impedance	> 100 k $\Omega$	1 k $\Omega$	1 k $\Omega$	50 $\Omega$
<b>Environmental, Physical</b>				
Operating Temperature Range	0° C to 50° C	10° C to 40° C	10° C to 40° C	10° C to 40° C* <sup>6</sup>
Internal Fiber Size	9 $\mu\text{m}$	62.5 $\mu\text{m}$	9 $\mu\text{m}$	9 $\mu\text{m}$
Optical Return Loss	≤-30 dB	≤-14 dB	≤-30 dB	≤-30 dB
Output Connector Style	SMA	K (2.92 mm)	K (2.92 mm)	K (2.92 mm)

\*<sup>1</sup> Optical bandwidth (-6 dB electrical power).

\*<sup>2</sup> Root Hertz into 50  $\Omega$ .

\*<sup>3</sup> Pulse width less than 100 ps.

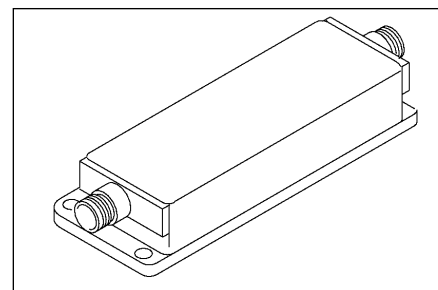
\*<sup>4</sup> Within the first 400 ps following a pulse input.

\*<sup>5</sup> DC termination into 50  $\Omega$ .

\*<sup>6</sup> Reference Receiver Performance (Opt. RR) 25° ±5°C.



CD Laser Relaxation Oscillation with SD-43.



SONET/SDH Hardware Filters.

## ORDERING INFORMATION

### SD-42

Optical-to-Electrical Converter.

**Includes:** Red 2 mm to Banana Lead 1 m length (012-1286-00), Black 2 mm to Banana Lead 1 m length (012-1287-00), 50  $\Omega$  Semi-rigid Cable Link (174-1635-00), Instruction Manual (070-8671-00).

### SD-43

Optical-to-Electrical Converter.

**Includes:** Hard Case, User Manual (English), Assorted Fiber Optic Hybrid Connectors (FC/FC, FC/ST, FC/SC), FC/FC Multi-mode Fiber Jumper, Rigid 50  $\Omega$  U-Cable, Certificate of Traceable Calibration.

### SD-44

Optical-to-Electrical Converter.

**Includes:** Hard Case, User Manual (English), Assorted Fiber Optic Hybrid Connectors (FC/FC, FC/ST, FC/SC), FC/FC Single-mode Fiber Jumper, Rigid 50  $\Omega$  U-Cable, Certificate of Traceable Calibration.

### SD-48

Optical-to-Electrical Converter.

**Includes:** Hard Case, User Manual (English), Assorted Fiber Optic Hybrid Connectors (FC/FC, FC/ST, FC/SC), FC/FC Single-mode Fiber Jumper, Rigid 50  $\Omega$  U-Cable, Certificate of Traceable Calibration.

### SA-42

Optical-to-Electrical Converter.

**Includes:** Instruction Manual (070-7733-00), Power Supply and Charger Unit (119-3716-00), DC Power Cable (174-1966-00), and Power Cable (161-0104-00).

### SA-42 INTERNATIONAL POWER PLUG OPTIONS

**Opts. A1 to Opt. A5** – Available.

### SA-42 CE CERTIFIED CONFIGURATION

**Opt. 1E** – Delete Standard Power Supply/Charger.

### SA-48 10 GB/S SONET/SDH REFERENCE RECEIVER

**Opt. RR** – Add 10 Gb/s Hardware Filter (119-5916-00), SMA In-line Connector (015-1011-00), and Frequency Response Graph using a Typical SD-22 Electrical Sampling Head Performance with Boundary Limits per ITU-T COM15-264E.

### OTHER RELATED PRODUCTS/ACCESSORIES

**SD-44/SD-48 External Power Supply with SD-4x Adapter Cable** – 016-1609-00. Includes: IEC Compatible Power Supply, SD-44/SD-48 Adapter Cable, U.S. Power Cord, Instruction Sheet.

### Alternative Power Cords (IEC Compatible):

European: 161-0066-09.

UK: 161-0066-10.

Australia: 161-0066-11.

Switzerland: 161-0154-00.

**DIN/FC Fiber Optic Hybrid Connector** – 119-5118-00.

**50  $\Omega$  Power Dividers, DC to 12 GHz (50% splitter)** –

SMA Female: 015-0565-00.

SMA Male: 015-1014-00.

### SONET/SDH HARDWARE FILTERS (SMA)

155 Mb/s (117 MHz): 119-5936-00.

622 Mb/s (467 MHz): 119-5929-00.

10 Gb/s (with SD-48 and SD-22): 119-5916-00.

### For further information, contact Tektronix:

World Wide Web: <http://www.tek.com>; ASEAN Countries (65) 356-3900; Australia & New Zealand 61 (2) 888-7066; Austria, Eastern Europe, & Middle East +43 2236 8092 0; Belgium +32 (2) 715.89.70; Brazil and South America 55 (11) 3741-8360; Canada 1 (800) 661-5625; Denmark +45 (44) 850 700; Finland +358 (9) 4783 400; France & North Africa +33 1 69 86 81 81; Germany +49 (221) 94 77 400; Hong Kong (852) 2585-6688; India (91) 80-2275577; Italy +39 (2) 25086 501; Japan (Sony/Tektronix Corporation) 81 (3) 3448-3111; Mexico, Central America, & Caribbean 52 (5) 666-6333; The Netherlands +31 23 56 95555; Norway +47 22 07 07 00; People's Republic of China 86 (10) 6235 1230; Republic of Korea 82 (2) 528-5299; South Africa (27 11)651-5222; Spain & Portugal +34 (1) 372 6000; Sweden +46 (8) 629 6503; Switzerland +41 (41) 729 36 40; Taiwan 886 (2) 2722-9622; United Kingdom & Eire +44(0)1628 403400; USA 1 (800) 426-2200.

From other areas, contact: Tektronix, Inc. Export Sales, P.O. Box 500, M/S 50-255, Beaverton, Oregon 97077-0001, USA 1 (503) 627-6877.

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