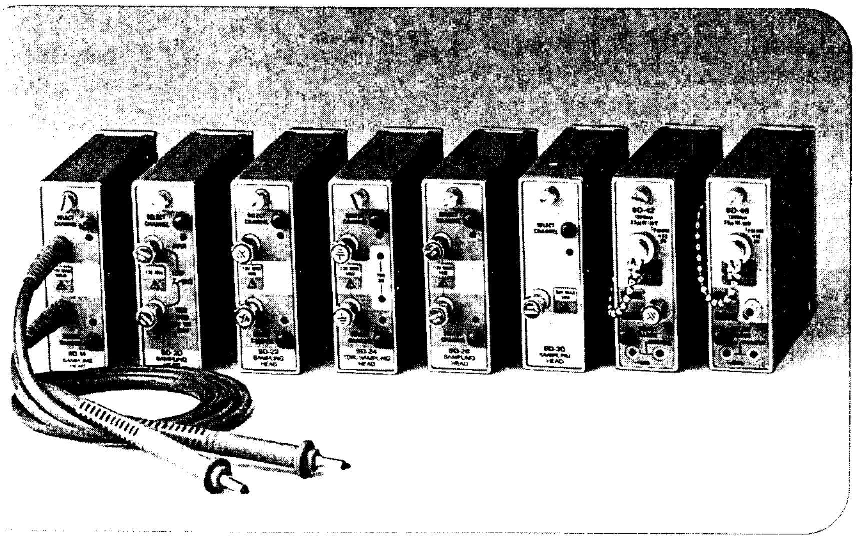
Sampling Heads

SD14 • SD20 • SD22/24/26 • SD32 • SD42/44 • ORR24



► *Sampling Heads.*

The following Tektronix sampling heads enable the high performance features of the CSA803C and 11801C sampling oscilloscopes.

SD14 High Impedance Probe Sampler

The SD14 is a dual-channel, 3 GHz probe sampler designed for high-impedance signal acquisition where a 50 Ω acquisition system is not the optimal solution. The SD14 is ideal for high-speed device characterization such as ECL, CMOS, ACL and GaAs testing. The 100 kΩ input impedance and 0.5 pF capacitance results in very low loading of the device under test. The 7 V dynamic range and ±3.5 V offset range, makes the SD14 suitable for testing all digital logic families as well as most analog circuits.

The SD14 consists of two samplers, each attached at the end of a 1.0 meter cable for easy circuit probing. The modular architecture of the CSA803C/11801C enables the use of extended samplers, bringing a new level of performance to sampling scopes. In conjunction with the 11801C and SM11 multi-channel unit, it is possible to configure up to 136 channels of high-impedance, high-bandwidth acquisition with measurement accuracy approaching 140 ps.

SD14 Option 01 adds a longer probe tip, two probe-to-PCB (etched circuit board) adapters, and two probe-to-SMB adapters. These ease probing of printed [illegible] found [illegible] for IC testers [illegible]

SD20 Loopthrough Sampling Head

The SD20 is a single-channel, 20 GHz loopthrough sampling head designed for low-loss testing in applications such as microwave systems research and development, digital device characterization and high-speed digital communications circuit design. It provides an acquisition rise time of 17.5 ps with typically 750 μV_{RMS} of noise (350 µV with smoothing) to ensure clean, undistorted signals.

The SD20 is nonterminated and keeps losses to a minimum by routing the signal of interest directly through the sampling head without the need of a power divider. The SD20 can also be used for customized TDR measurements of transmission lines and controlled impedance devices. An external signal generator may be used, instead of the SD24 step generator, to tailor the TDR stimulus to fit a particular situation. For instance, slower slew rates or higher amplitude may be utilized, or you may perform half-sine or impulse testing.

In digital communications, the SD20 is useful for viewing and triggering on the clock signal without the use of a power divider.

► Features & Benefits

SD14

100 kΩ, 0.5 pF Typical

7 V_{p-p} Dynamic Range

3 GHz Bandwidth

SD20

Loopthrough Sampling Head

Nonterminated

SD22

12.5 GHz Bandwidth

Low-noise

Dual-channel

SD24

TDR/Sampling Head

Dual-channel, Differential TDR

20 GHz Bandwidth

35 ps Reflected Rise Time

SD26

20 GHz Bandwidth

SD32

50 GHz Bandwidth

Single-channel

2.4 mm Connector

SD42/44*1, ORR24*1

Optical-to-electrical Converter

DC to 15 GHz

Optical Reference Receiver

DC to 2.0 GHz

► Applications

ECL, CMOS and ACL GaAs Device Characterization (SD14)

General-purpose TDR (SD20)

Digital Data Communications (SD22)

Line Impedance and Crosstalk Characterization (SD24)

Dual Channel Device Characterization (SD26)

High Bandwidth Communication & Microwave (SD32)

*1 For more information on this product, see the Telecommunications products section of this catalog.

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1916, inside the U.S. call: 1-800-426-2200.

CE

ISO 9001

Tektronix measurement products are manufactured in ISO registered facilities.

Sampling Heads

SD14 • SD20 • SD22/24/26 • SD32 • SD42/44 • ORR24

SD22 Low-noise Sampling Head

The SD22 is a dual-channel, 12.5 GHz sampling head specifically designed for low-noise measurement in digital communications and device characterization applications. It provides an acquisition rise time of 28 ps, and typically 450 μV_{RMS} of displayed noise. With smoothing, noise levels are 180 μV_{RMS}.

In order to precisely capture and display the switching characteristics of high-speed communications circuits, to make accurate statistical measurements of signal noise and signal timing jitter, or to obtain stable timing measurements of fast digital ICs, the noise floor of the test equipment must be kept to a minimum. The SD22 is the ideal instrument for these low-noise applications.

SD24 TDR/Sampling Head

The SD24 is a dual-channel TDR/Sampling Head. This sampling head has a rise time of 17.5 ps or less, with a typical 20 GHz equivalent bandwidth.

Each channel of the SD24 is also capable of generating a fast rising step for use in Time Domain Reflectometry (TDR). In TDR mode, the acquisition portion of the sampling head monitors the incident step and any reflected energy. The reflected rise time of the TDR step is 35 ps or less. The polarity of each channel's TDR step can be selected independently of the other channel. This allows for differential or common-mode testing of two coupled lines, in addition to the independent testing of isolated lines. The SD24 can be used to characterize crosstalk by using the TDR step to drive one line while monitoring a second with the other channel.

The "filter" function on the CSA803C/11801C can be used with TDR or crosstalk measurements to characterize a system at a slower rise time.

SD26 Sampling Head

The SD26 is a dual-channel, 20 GHz equivalent bandwidth sampling head. This sampling head has the same acquisition capability as the SD24 TDR/Sampling Head but does not include the TDR step generators.

SD32 Sampling Head

The SD32 is a single-channel, 50 GHz bandwidth sampling head. The SD32 performance is available for any new or existing CSA803A/11801B mainframe. The SD32 has measured bandwidth of greater than 50 GHz and calculated rise time less than 7.0 ps. The front-panel connector is female 2.4 mm, and an adapter is provided (011-0157-00; 2.4 mm male to 2.92 mm female) in order to maintain compatibility with SMA connector systems.

SD42 Optical-to-electrical Converter*1

The SD42 Optical-to-electrical Converter head can be used to analyze optical signals in the 1000 nm to 1700 nm wavelength range. The pulse response of the measurement system is less than 55 ps FWHM (Full-width, Half-maximum), which is equivalent to a calculated bandwidth of DC to 6.4 GHz. The electrical output on the front panel is coupled to the adjacent sampling head via the semi-rigid coaxial link provided.

The SD42 is also equipped with an optical power meter for average power monitoring through a pair of voltage outputs on the front panel. Power from 5 nW to 5 mW can be measured.

SD44 Optical-to-electrical Converter*1

The SD44 is an optical-to-electrical (O/E) converter for use with the Tektronix CSA803 and 11800 Series sampling oscilloscopes equipped with an SD2x or SD3x Electrical Sampling Head. The SD44 Optical-to-electrical Converter can be plugged directly into a 11800 sampling slot, CSA803 power slot, or attached via a sampling head extender cable for remote use. The head extenders come in either 1 meter (012-1220-00) or 2 meter (012-1221-00) options.

Optical signal input on the SD44 is a standard FC/PC fiber optic connector. Other connector types can be accommodated by using hybrid fiber optic jumper cables (SA/SD42) or an assortment of hybrid mating adapters (SD44).

ORR24 Optical Reference Receiver*1

The Synchronous Data Hierarchy (SDH) and the Synchronous Optical NETwork (SONET) standards are the cornerstones of today's high-speed digital telecommunications systems. The Tektronix ORR24 optical reference receiver provides an important interface for compliance testing of SDH/SONET optical transmission products or components.

The amplified design of the ORR24 converts the incoming optical light into a high gain, low noise electrical signal. This allows easy testing of optical designs as well as repeatable measurements. The ORR24 is DC coupled which is required for accurate extinction ratio measurements.

*1 For more information on this product, see the Telecommunications products section of this catalog.

▶ Selection Guide

	Channels	Bandwidth	Rise Time	Impedance	Noise	Applications (Typical)
SD14	2	3 GHz (typical)	140 ps	100 kΩ/0.5 pF 0.55 pF Opt. 01	2 mV	ECL, CMOS, ACL GaAs Dev. Characterization
SD20	1	20 GHz	17.5 ps	50 Ω unterm.	750 µV	Special TDR, Communications
SD22	2	12.5 GHz	28 ps	50 Ω	450 µV	Communications
SD24	2	20 GHz	17.5 ps	50 Ω	750 µV	TDR/TDT Crosstalk
SD26	2	20 GHz	17.5 ps	50 Ω	750 µV	Device Characterization
SD32	1	50 GHz	7.0 ps	50 Ω	1.8 mV	High Bandwidth Communications & Microwave
SD42	1	6.4 GHz				Optical-to-electrical
SD44	1	15 GHz				Optical-to-electrical
ORR24	1	2.0 GHz	205 ps	50 Ω		Optical Reference Receivers (SONET/SDH)

Sampling Heads

SD14 • SD20 • SD22/24/26 • SD32 • SD42/44 • ORR24

▶ Characteristics

Acquisition System – SD14, SD22, SD24, SD26: dual channel; SD20, SD32: single channel.

Rise Time – SD14: 140 ps; SD20, SD24, SD26: 17.5 ps; SD22: 28 ps, all from 10% to 90%.

Bandwidth – 3 GHz (typical) for the SD14; 20 GHz for the SD20, SD24, and SD26; 12.5 GHz for the SD22; 50 GHz for the SD32.

Dynamic Range – 1 $V_{p\text{-}p}$ within a ±1.6 V range for the SD20, SD22, SD24, SD32; 7 $V_{p\text{-}p}$ within a ±3.5 V offset range for the SD14.

Dot Transient Response – Accuracy after calibration at operating temperature is ±5% for signals up to 0.5 $V_{p\text{-}p}$. Adjustable to unity for signals up to 1.0 $V_{p\text{-}p}$.

Input Impedance – SD22, SD24, SD26, SD32: 50 Ω ±0.5 Ω. SD14 is 100 kΩ and 0.5 pF (0.55 pF for Opt. 01). SD20 is not terminated and not rated.

Displayed Noise –

	Maximum	Typical
With unity dot response:		
SD20, SD24, SD26	1.2 mV	750 µV
SD22	800 µV	450 µV
SD14	8 mV	7 mV
SD32	2.3 mV	1.8 mV
With smoothing:		
SD20, SD24, SD26	550 µV	350 µV
SD22	400 µV	180 µV
SD32	1 mV	700 µV

Aberrations (typical) (SD20, SD22, SD24, SD26 only) – The following are acquisition aberrations. 10 ns to 20 ps before step: ±3% or less. <300 ps after step: +10%, –5% or less. 300 ps to 5 ns after step: ±3% or less. 300 ps to 5 ns after step: ±4 or less (SD20 only). 5 ns to 100 ns after step: ±1% or less. Elsewhere: ±0.5% or less.

Aberrations (typical) (SD14 only) – <1.5 ns after step: +12%, –25%. 1.5 ns to 4 ns after step: +1%, –3%. 4 ns to 30 ns after step: ±2%. Elsewhere: ±1%.

Maximum Input Voltage – ±3 V. SD14: ±15 V; SD32: ±2 V.

Isolation Between Channels – 1% p-p voltage transmission from the channel driven by the 067-1338-00, to the quiescent channel (see page 127 in this catalog).

Time Coincidence Between Channels – 10 ps accuracy; <0.2 ps/°C stability.

TDR System (SD24 only)

Displayed Rise Time

Incident – 28 ps typical, 10% to 90%, at +250 mV or –250 mV output, elsewhere ±1%.

Reflected – 35 ps or less, 10% to 90%, at +250 mV or –250 mV output.

TDR Step Amplitude – Adjustable to ±250 mV (polarity of either step may be inverted).

Time Coincidence Between TDR steps – Adjustable to less than 1 ps.

Source Resistance – 50 Ω ±0.5 Ω.

Aberrations (at ±250 mV amplitude) – The following are TDR aberrations. 10 ns to 20 ps before step: ±3% or less. <300 ps after step: +10%, –5% or less. 300 ps to 5 ns after step: ±3% or less. Elsewhere: ±1% or less.

Environmental Characteristics

(11801C, CSA803C, SD Series Heads)

Temperature – Operating: 0°C to +50°C; nonoperating: –40°C to +75°C.

Altitude, Vibration, Shock, Bench Handling – Operating and nonoperating: meets MIL-T-28800C, Type III, Class 5.

Electromagnetic Compatibility (not SD14) – Meets the following requirements of MIL-STD-461C: CE-03 Pt 4 Curve 1, CS-01 Pt 7, CS-02 Pt 4, CS-06 Pt 5, RE-02 Pt 7, RS-01 Pt 4, RS-02 Pt 5, RS-03 Pt 7 (limited to 1 GHz). Meets FCC Part 15, subpart J, Class A. For Germany: Meets VDE 0871/6.78 Class B. (Not all for SD14.)

Humidity – To 95% RH at up to 50°C.

Sampling Heads

SD14 • SD20 • SD22/24/26 • SD32 • SD42/44 • ORR24

▶ Ordering Information

Current price information is available worldwide on-line from the Tektronix web site or from your local Tektronix representative. Inside the U.S., also see the price list in the back of this catalog.

SD14

High Impedance Probe Sampler.

Includes: Installation/User Manual (070-8286-01); Service Manual (070-8285-01); 4-post ECB Mount Ground Socket; Edge Tab Ground Socket; 10 ea. Wire-form Ground, .050 Spacing; 10 ea. Wire-form Ground, .040 Spacing; Plastic Accessories Case.

Opt. 01 – Longer Probe Tip. Probe to ECB Adapters. Probe to SMB Adapters.

SD20

Loopthrough Sampling Head.

Includes: Installation/User Reference (070-7531-01), Service Reference (070-7528-01), Precision 3.5 mm Termination (011-0155-00), 2 SMA Short-circuit Terminations (015-1020-00).

SD22

Low-noise Sampling Head.

Includes: Installation/User Reference (070-7226-02), Service Reference (070-7227-02), 2 SMA Short-circuit Terminations (015-1020-00).

SD24

Dual TDR/Sampling Head.

Includes: Installation/User Reference (070-7052-01), Service Reference (070-7053-01), SMA Short-circuit Terminations (015-1020-00).

SD26

Dual Sampling Head.

Includes: Installation/User Reference (070-7226-02), Service Reference (070-7227-02), 2 SMA Short-circuit Terminations (015-1020-00).

SD32

Sampling Head.

Includes: Installation/User Reference (070-8268-01); Service Reference (070-8269-01); 1 SMA Short-circuit Termination (015-1020-00); 2.4 mm Male to 2.92 mm Female Adapter (011-0157-00).

SD42

Optical-to-electrical Converter.

See the Telecommunication Instruments section for complete information.

SD44

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 Ω U-cable, Certificate of Traceable Calibration.

SD44 External Power Supply with SD4x Adapter Cable – Order 016-1609-00. Includes: IEC Compatible Power Supply, SD44 Adapter Cable, U.S. Power Cord, Instruction Sheet.

International Power Plugs –

Order European: 161-0066-09.

Order UK: 161-0066-10.

Order Australia: 161-0066-11.

Order Switzerland: 161-0154-00.

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

10 kHz to 21 GHz DC Block –

"N" Type: Order 015-0509-00.

"K" to "N" Type Adapter: Order 015-0369-00.

1101A

Tektronix Power Supply.

Includes: Hard Case, User Manual (English), Assorted Fiber-optic Hybrid Connectors (FC/FC, FC/ST, FC/SC), FC/FC Single-mode Fiber Jumper, 50 Ω SMA Cable, Frequency Response Graph, Certificate of Traceable Calibration.

Measurement Service Options

SD14

Opt. R3 – Repair warranty extended to cover three years.

SD20/22/24/26/32/42/44

Opt. C3 – Three years of Calibration Services.

Opt. D3 – Test Data (requires Opt. C3).

Opt. R3 – Repair warranty extended to cover three years.

Recommended Accessories

Also see page 333.

Probes

P6150 – 50 Ω Divider Probe, 2 tips: 1X, 10X, 1X: 3 GHz; 10X: 9 GHz.

P6158 – 20X, 3 GHz/KΩ.

Requires SMA Male-to-BNC female adapter when attached to SMA-type inputs.
Order 015-0554-00.

Additional Accessories

Also see page 333.

2X Attenuator – SMA Male-to-female. Order 015-1001-00.

5X Attenuator – SMA Male-to-female. Order015-1002-00.

75 Ω to 50 Ω Min. Loss Attenuator – BNC. Order 011-0112-00.

Blank Sampling Head – Order 200-3395-00.

SMA Accessory Kit – 2 ea. 2X and 5X Attenuators; 2 ea. SMA Terminations, Male Short Circuit, Female Short Circuit, Male 50 Ω , Female 50 Ω, 2 ea. 50 Ω Signal Cables (2 ns), 2 ea. 500 ps Semi-rigid Cable, 2 ea. Male-to-male Adapters, 2 ea. SMA Male-to-BNC Female, 2 ea. Female-to-female, 1 ea. 50 Ω Power Divider, 1 ea. Combination Wrench (.312, 6 point). Order 020-1693-00.

ECL Terminator – Provides the bias and termination for ECL device outputs. At 10 GHz bandwidth and 1% precision attenuation, accurate AC and DC measurements are ensured. Attenuation: 10X ±1.0% @ DC, 20 dB ±3 dB, DC to 10 GHz. Aberrations: ±3% max with 100 ps Rise-time. Order 015-0558-00.

DC Block (Coupling Capacitor) – BNC. Order 015-1013-00.

Slip-on Connector – Order 015-0553-00.

Connector Savers – (SMA) Order 015-0549-00.

Cables and Extenders

Sampling Head Extender Cables –

(1 m) Order 012-1220-00.

(2 m) Order 012-1221-00.

Acquisition Extender – Order 067-1324-00.

Acquisition System Extender – Order 067-1323-00.

Card Cage Extender – Order 067-1267-00.

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CE

ISO 9001

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