# Optical Reference Receivers (SONET/SDH)

ORR24

Features

- Data Rate: SONET/SDH 2.488 Gb/s
- ITU-T G.957 Compliance
- 4th Order Bessel-Thompson Frequency Response
- Bandwidth: DC to 2.0 GHz
- High Gain: 0.7 V/mW
- Wavelength: 1310 nm / 1550 nm
- Compatible with Tektronix 11800 or CSA 803 Series Sampling Scopes
- Assortment of Fiber Optic Mating Adapters (standard)
- Optional External Power Supply (016-1609-00)
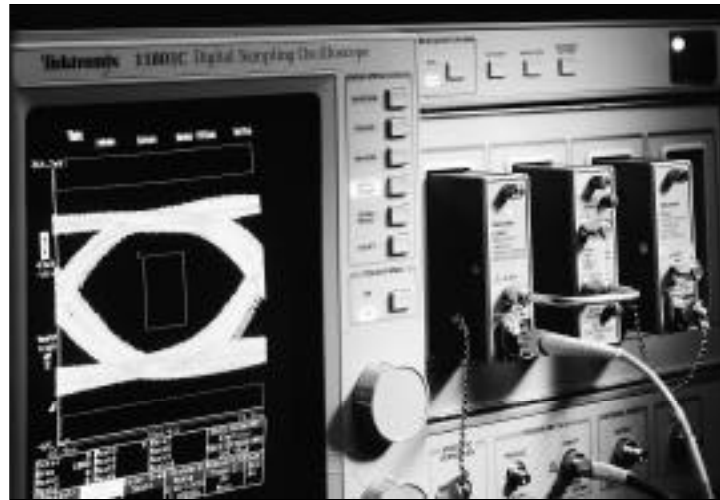
Applications

- Standards Compliance: SONET/SDH 2.488 Gb/s
- Accurate Extinction Ratio Measurements
- Eye-Pattern and Pulse Shape Measurements

Verification of SONET/SDH Signals

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.

The controlled frequency design of the ORR24 optical reference receiver ensures that the measurements correctly represent the true transmitted signal for the purpose of pulse shape analysis or eye-pattern measurements. A certificate of calibration and a frequency response graph are supplied with the ORR24 for performance documentation. The compact SD-xx form factor enables the ORR24 to conveniently plug into the Tektronix 11800 or CSA 803 Series sampling oscilloscopes for complete compliance testing. An optional power supply is available for other instrument applications.

Nominal Frequency Performance Values for an Optical Reference Receiver

SDH/SONET recommendations define the nominal transfer function for an optical reference receiver as being a fourth-order Bessel-Thompson response. The following table lists the corresponding attenuation at various frequencies, f. In this table f_o is the transmitted data rate and f_r is the 3 dB cutoff, which is defined as $f_r = 0.75 f_o$.

f/f_o	f/f_r	Attenuation (dB)	f/f_o	f/f_r	Attenuation (dB)
0.15	0.2	0.1	1.0	1.33	5.7
0.3	0.4	0.4	1.05	1.4	6.4
0.45	0.6	1.0	1.2	1.6	8.5
0.6	0.8	1.9	1.35	1.8	10.9
0.75	1.0	3.0	1.5	2.0	13.4
0.9	1.2	4.5	2.0	2.67	21.5

Note: Allowable deviation from the nominal attenuation in the table is very tightly specified in the SDH/SONET recommendations. The actual allowable deviation values depend on f/f_r and the bit rate. These values run as low as ±0.5 dB.

ORR24 with standard accessories and optional power supply.

Certified for CE Marking.

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

Tektronix Measurement products are manufactured in ISO registered facilities.

ISO 9001
ACCREDITED BY THE DUTCH COUNCIL FOR CERTIFICATION

Tektronix

Optical Reference Receivers (SONET/SDH)
ORR24

Wavelength Range – 1100 nm to 1650 nm.

Bandwidth [1] – DC to 2.0 GHz.

Rise Time – 205 ps.

Conversion Gain (typical) – 0.7 V/mW
(1310 nm/1550 nm).

Maximum Input Optical Power –
Maximum average linear response power: 100 µW
(–10 dBm).
Maximum average non-destruct power: 5 mW
(7 dBm).
Maximum peak non-destruct power: 10 mW
(10 dBm).

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[1] Optical bandwidth (–6 dB electrical power).
[2] Single-mode fiber input.
[3] Reference receiver performance over 25° C ±10° C.

Noise Equivalent Power – ≤15 pW per √‾.

Aberrations – ≤5% peak-peak.

Optical Return Loss [2] – ≥–30 dB.

Output Termination Impedance – 50 Ω ±4%.

Internal Fiber Size – 9 µm.

ENVIRONMENTAL CHARACTERISTICS

Operating Temperature (Class VI) [3] – +10° C to
+40° C.

Non-operating Temperature (Class VI) – –40° C to
+70° C.

Humidity – 75% non-condensing.
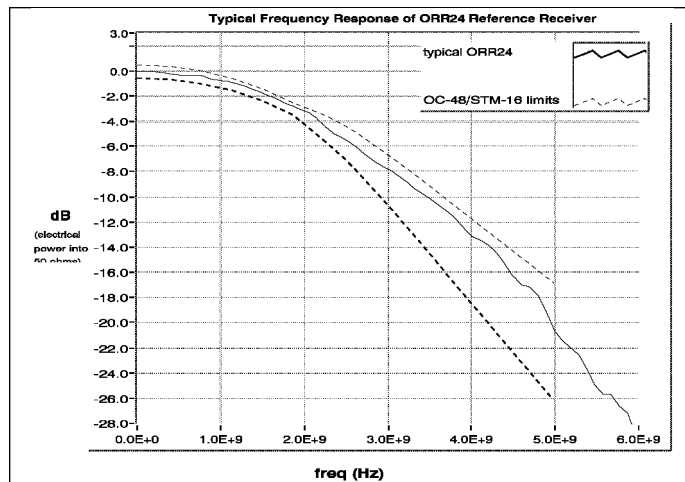
ORR24 frequency response (typical).

ORR24
2.488 Gb/s SDH/SONET Optical Reference Receiver.

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.

ORR24 PRODUCT SERVICE OPTIONS

Opt. 95 – Calibration Data.

Opt. R3 – Three Year Extended Warranty.

Opt. C3 – Three Year Calibration Service.

ORR24 AVAILABLE ACCESSORIES

External Power Supply – 016-1609-00. Includes:
IEC compatible Power Supply, ORR24 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.

2 m Single-mode Fiber Optic Cables, 8/125 µm –
FC/PC to FC/PC: 174-1387-00.
FC/PC to ST: 174-1386-00.
FC/PC to Biconic: 174-1388-00.
FC/PC to Diamond (2.5): 174-1497-00.
FC/PC to Diamond (3.5): 174-1385-00.

2 m Multimode Fiber Optic Cables, 62.5/125 µm –
FC/PC to FC/PC: 174-2322-00.
FC/PC to SMA: 174-2324-00.
FC/PC to Biconic: 174-2323-00.

**90/10, 3-Port Single-Mode Optical Splitter, FC/PC
Connectors –** 174-3737-00.

**10 dB, In-Line Single-Mode Optical Attenuator,
FC/PC Connectors –** 119-5118-00.

50 Ω Power Dividers, DC to 12 GHz (50% splitter) –
SMA Female: 015-0565-00.
SMA Male: 015-1014-00.