

# Optical Receiver System

## ORS20



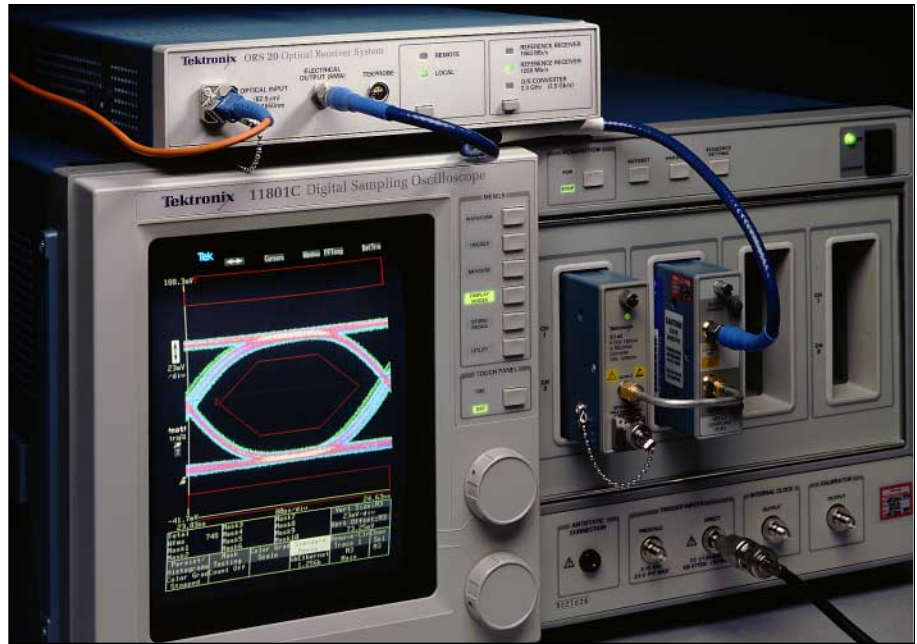
### Features and Benefits

- Switchable Filter Design Which Supports Fibre Channel 1.063 Gb/s, Ethernet 1.25 Gb/s & SONET/SDH 2.488 Gb/s Data Rates
- Reference Receiver Performance Compliant with IEEE P802.3z, ANSI FC-PH and ITU-T G.957 for Standards Compliance Testing
- Broad Wavelength Performance for Testing Both Short (780 nm, 850 nm) and Long (1310 nm, 1550 nm) Wavelength Optical Signals
- 2.3 GHz Bandwidth for Analyzing Communication Eye-Patterns or General Purpose Optical Signals
- High Dynamic Range
- 4th Order Bessel-Thompson Frequency Response
- Internal Power Supply for Use with 11800/CSA803 Series Sampling Oscilloscopes or Other Instruments



### Applications

- Standards Compliance Testing: Ethernet 1.25 Gb/s, Fibre Channel 1.063 Gb/s, SONET/SDH 2.488 Gb/s
- Eye-Pattern Measurements
- Extinction Ratio Measurements
- Characterize Relaxation Oscillation
- Optical Signal Analysis



1.25 Gb/s Ethernet Eye-Pattern with ORS20

### VERIFICATION OF GIGABIT ETHERNET AND FIBRE CHANNEL SIGNALS

Data rates for the Local Area Networks (LANs) and Wide Area Networks (WANs) have exceeded 1 Gb/s and therefore increased the required interface performance for testing these high speeds optical signals. The Tektronix ORS20 optical receiver systems provides the latest optical-to-electrical interface for compliance testing of Gigabit Ethernet as well as Fibre Channel optical transmission signals. Whether your transmission system or component is short wavelength (850 nm) or long wavelength (1310 nm) design, the ORS20 utilizes a revolutionary broad wavelength photodetector design that allows engineers to verify standards compliance with a single optical-to-electrical converter.

The amplified design of the ORS20 converts the incoming optical light into a high gain, low noise electrical signal that can then be fed directly into the SD-22 electrical sampling head. This allows convenient testing of both low power level as well as high peak amplitude power level optical signals commonly

associated with Fabry Perot lasers. The ORS20 has integrated filters which allows users to manually or automatically (TTL interface) engage 4<sup>th</sup> Order Bessel Thompson filters required for Fibre Channel and Gigabit Ethernet eye-pattern testing. The 2.3 GHz full bandwidth setting allows designers to view the relaxation oscillation associated Vertical Cavity Side Emitting Lasers (VCSELs) or CD laser based transceivers and it also operates as a 2.5 Gb/s reference receiver as required by ITU-T G.957 for SONET/SDH 2.5 Gb/s signals. A certificate of calibration and two frequency response graphs are supplied with each ORS20 for performance documentation.

### FREQUENCY PERFORMANCE VALUES FOR AN OPTICAL REFERENCE RECEIVER

Gigabit Ethernet and Fibre Channel recommendations define the nominal transfer function for an optical reference receiver as being a fourth-order Bessel-Thompson response where  $f_0$  is the transmitted data rate and  $f_r$  is the 3 dB cutoff, which is defined as  $f_r = 0.75f_0$ .



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



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

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### CHARACTERISTICS

Wavelength Range – 700 nm to 1650 nm

Bandwidth<sup>1</sup> – DC to  $\geq 2.3$  GHz

Rise Time (typical) –

	Min	Max
2.5 Gb/s (Full Bandwidth)	166 ps	204 ps
1.063 Gb/s	389 ps	479 ps
1.25 Gb/s	331 ps	406 ps

Conversion Gain (typical) –  $\geq 0.4$  V/mW  
(@850 nm),  $\geq 0.6$  V/mW (@1310 nm)

Max. Input Optical Power –  
850 nm 1310 nm

0.16 mW (-8 dBm)* <sup>2</sup>	0.13 mW (-9 dBm)* <sup>2</sup>
5 mW (7 dBm)* <sup>3</sup>	5 mW (7 dBm)* <sup>3</sup>
10 mW (10 dBm)* <sup>4</sup>	10 mW (10 dBm)* <sup>4</sup>

Noise Equivalent Power –  $\leq 15$  pW per square root Hertz

Max. Output Modulation Depth for Reference Receiver Performance\*<sup>5</sup> –  $\leq 200$  mV<sub>p-p</sub>

**Note:** Allowable deviation from the nominal attenuation is very tightly specified in the GIGABIT ETHERNET AND FIBRE CHANNEL recommendations. The actual allowable deviation values depend on  $f/f_c$  and the bit rate. These values run as low as  $\pm 0.5$  dB.

Max. Output Modulation Depth (typical)\*<sup>6</sup>  
RF Switch Path 2x Data  $\leq 1$ dB  
Rate Frequency Compression

1063 Mb/s	2.12 GHz	500 mV <sub>p-p</sub>
1250 Mb/s	2.5 GHz	450 mV <sub>p-p</sub>
Full Bandwidth (2.5 Gb/s)	5.0 GHz	400 mV <sub>p-p</sub>

**Note:** Compression refers to the additional frequency response loss when modulation depth exceeds 200 mV<sub>p-p</sub>

Aberrations –  $\leq 5\%$  peak – peak

Optical Return Loss –  $\leq -14$  dB

Output Termination Impedance –  $50 \Omega \pm 4\%$

Internal Fiber Size – 62.5  $\mu$ m

### ENVIRONMENTAL CHARACTERISTICS

Operating Temperature (Class VI) –  
 $+10^\circ\text{C}$  to  $+40^\circ\text{C}$ <sup>7</sup>

Non-operating Temperature (Class VI) –  
 $-40^\circ\text{C}$  to  $+70^\circ\text{C}$

Humidity – 80% non-condensing

<sup>1</sup> Optical bandwidth (-6 dB electrical)

<sup>2</sup> Typical max. average power for reference receiver performance

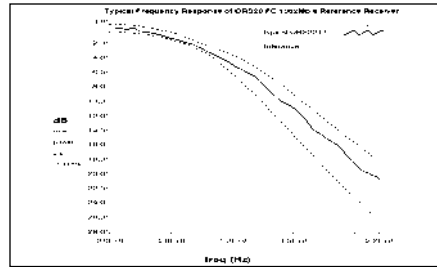
<sup>3</sup> Max. average non-destruct power

<sup>4</sup> Max. peak non-destruct power

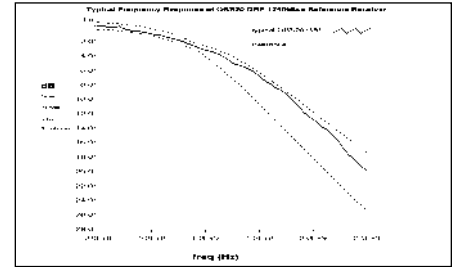
<sup>5</sup> Dependant on conversion gain of wavelength

<sup>6</sup> Saturation of the amplifier can occur above 700 mV<sub>p-p</sub>

<sup>7</sup> Reference receiver performance over  $25^\circ\text{C} \pm 5^\circ\text{C}$



Fibre Channel 1.063 Gb/s Frequency Response Graph(typ).



Gigabit Ethernet 1.25 Gb/s Frequency Response Graph(typ).

### ORDERING INFORMATION

#### ORS20

Optical Receiver System

Includes: User Manual (English), SC/FC Optical Input Connectors, High performance SMA Cable, US Power Cord, 1.25 Gb/s Frequency Response Graph, 1.063 Gb/s Frequency Response Graph, Certificate of Traceable Calibration

#### PRODUCT SERVICE OPTIONS

Option O1 – FC/PC Optical Input Connector

Option FR – 2.5 Gb/s Frequency Response Graph

Option D1 – Calibration Data

Option D3 – 3 Year Calibration Data

Option R3 – 3 Year Extended Warranty

Option C3 – 3 Year Calibration Service

#### AVAILABLE ACCESSORIES

TVGF11A – Single Rack Mount Kit

TVGF13 – Dual Rack Mount Kit

TVGF14 – Dual Half-rack Mount Kit

TekProbe II Adapter Kit- 016-1726-00

Single-mode Fiber Optic Cables, 8/125  $\mu$ m, 2 meters –

FC/PC to FC/PC, 174-1387-00

FC/PC to ST, 174-1386-00

FC/PC to SC/PC, 174-3921-00

Multimode Fiber Optic Cables, 62.5/125  $\mu$ m, 2 meters –

FC/PC to FC/PC, 174-2322-00

FC/PC to SC/PC, 174-4093-00

SONET/SDH Hardware Filters (SMA) –

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

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

#### OPTIONAL POWER CORDS

(IEC compatible)

Opt. A1 – European

Opt. A2 – UK

Opt. A3 – Australia

Opt. A5 – Switzerland

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;

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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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