Optical Transmitter and Receiver
► OI1125 • OI2125

Features & Benefits
OI1125 E/O Transmitter
- Generates SONET/SDH Compliant Optical Waveforms up to 12.5 Gb/s
- Internal DFO Laser at 1550.9 nm
- Adjustable Extinction Ratio from 5 dB to >12 dB (>12 dB nominal) to Test with Worst-case Conditions
- Accepts a Wide Range of Input Voltage Levels from 0.25 to 1.5 Vp-p
- Remote Operation and Monitoring

OI2125 O/E Receiver
- High Performance Receiver Supports Data Rates up to 12.5 Gb/s
- User-installable Modules for Clock Recovery at 10.664 Gb/s, 9.953 Gb/s, 2.666 Gb/s, 2.488 Gb/s, 622 Mb/s and 155 Mb/s Data Rates with a Single O/E Receiver
- Broad Wavelength from 1100 to 1620 nm
- High Sensitivity (–16 dBm) to Detect Low-level Optical Input Signals
- Amplified Electrical Output to Connect Directly to Most Commercial Error Analyzers

Applications
- Bit Error Rate Testing
- Optical Receiver and Transmitter Testing
- Optical Component and Fiber Loop Testing
- Optical Signal Analysis
- Remote Operation for System Integration

A High-performance Optical Interface for Bit Error Rate Testing of Optical Systems, Subsystems and Components up to 12.5 Gb/s

The Tektronix high-performance OI1125 E/O transmitter and OI2125 O/E receiver offer a simple and cost-effective solution for generating and receiving SONET/SDH compliant optical signals for bit error rate (BER) testing and optical signal analysis up to 12.5 Gb/s. Both include a remote port for easy integration and remote monitoring and control in a test system environment. Users can completely control instrument settings, monitor instrument status and access additional features through the remote port.

Transmitter Generates SONET/SDH Compliant Optical Waveforms up to 12.5 Gb/s for Testing Optical Subsystems and Components

Using the internal 1550 nm DFB laser or an external C-band tunable laser, the OI1125 is excellent for generating optical signals modulated by a high-performance pattern generator and is designed so most commercial generators connect directly to the modulation input. The input voltage range (250 mV to 1.5 V) accommodates most commercial pattern generators for bit error ratio (BER) testing of optical components and receiver testing. The adjustable extinction ratio allows testing the receiver sensitivity at worst-case conditions without complex test setups. The OI1125 also generates optical signals for optical signal analysis of components, systems and subsystems using a CSA8000 sampling oscilloscope.

Receiver Clock Recovery and Multi-data Rate Support Simplify Testing of High-performance Optical Transmitters, Laser Diodes, Optical Components and Fiber Loops

The OI2125 O/E Receiver receives modulated optical signals up to 12.5 Gb/s from transmission systems, including SONET/SDH compatible systems, and converts them to electrical signals for further testing by equipment such as a bit error rate tester (BERT). The OI2125 electrical output can be connected...
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Directly to most commercial error analyzers, and does not require an external amplifier. The data and clock output voltage ranges (0.5 to 1.5 V<sub>p-p</sub>) make the OI1255 an excellent optical interface for most commercial error analyzers.

With the optional OM1420 and OM1200 modules, the receiver can extract the clock on signals up to 10.664 Gb/s (OC-192 FEC). The recovered clock signal can then be used to trigger a CSA8000 sampling oscilloscope or serve as the clock input to an error analyzer. Used with the Tektronix TDS/CSA8000 series sampling oscilloscope and a pattern generator, the OI1125 can create modulated optical signals for high-speed optical communications testing, extinction ratio measurements, eye-pattern analysis and optical signal analysis. The optical signal is passed through the DUT and received by the appropriate 80Cxx sampling head on the oscilloscope.

A single receiver with the OM1420 and OM1200 modules supports a broad range of signal bit rates. The OM1420 OC-192 Dual-rate Clock Recovery Module supports standard OC-192 (9.953 Gb/s) and OC-192 FEC (10.664 Gb/s). The OM1200 OC-48 Multi-rate Clock Recovery Module supports OC-48 (2.488 Gb/s), OC-48 FEC (2.666 Gb/s), OC-12 (622 Mb/s) and OC-3 (155 Mb/s) rates.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate*1</td>
<td>2.4</td>
<td>12.5</td>
<td>Gb/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Input Voltage</td>
<td>0.25</td>
<td>1.5</td>
<td>V&lt;sub&gt;p-p&lt;/sub&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int. (DFB) Wavelength</td>
<td>1550.82</td>
<td>1550.92</td>
<td>1551.02</td>
<td>nm</td>
<td>±1 nm adjustment range</td>
</tr>
<tr>
<td>Ext. (Modulator)</td>
<td>1530</td>
<td>1565</td>
<td>nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Power</td>
<td>+5</td>
<td>+12</td>
<td>dBm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extinction Ratio</td>
<td>12</td>
<td>10</td>
<td>db</td>
<td></td>
<td>Up to OC-192 Rates &gt;OC-192</td>
</tr>
<tr>
<td>Adjustable Extinction Ratio*3</td>
<td>&lt;5</td>
<td>&gt;12</td>
<td>dB</td>
<td>(typical)</td>
<td></td>
</tr>
<tr>
<td>Peak-to-peak Jitter</td>
<td>0.15</td>
<td>18</td>
<td>UI</td>
<td>up to OC-192 Rates &gt;OC-192 Data Input Voltage 0.5 to 1.5 V&lt;sub&gt;p-p&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Random Jitter</td>
<td>0.02 UI</td>
<td>2 ps RMS</td>
<td>up to OC-192 Rates &gt;OC-192</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Power</td>
<td>+0</td>
<td>+2</td>
<td>+4</td>
<td>dBm</td>
<td>Using the internal laser</td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>8</td>
<td>dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Crossing</td>
<td>45</td>
<td>55</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Mask Testing*4</td>
<td>GR-1377-CORE</td>
<td>GR-253-CORE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1Data rates down to 622 Mb/s are achievable, but specifications are not guaranteed at rates below 2.4 Gb/s.

*2Wavelength range from 1565 nm to 1600 nm is achievable, but specifications are not guaranteed above 1565 nm.

*3The range of adjustment for the extinction ratio may vary from unit to unit, but is typically 5 dB to 12 dB. The OI1125 is calibrated with the adjustable extinction ratio disabled. Specifications are guaranteed at the calibrated (fixed) position.

*4No mask hits with 5% mask margin for OC-48, OC-192, and 12.5 Gb/s (scaled OC-192 mask).
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**O12125 O/E Receiver Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>Data Rate</td>
<td>2.4</td>
<td></td>
<td>12.5</td>
<td>Gb/s</td>
<td></td>
</tr>
<tr>
<td>Wavelength (typical)*5</td>
<td>1100</td>
<td></td>
<td>1620</td>
<td>nm</td>
<td></td>
</tr>
<tr>
<td>Input Power</td>
<td>-16</td>
<td></td>
<td>+0</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>Loss of Signal Threshold</td>
<td>-27</td>
<td></td>
<td>-25</td>
<td>-23 dBm</td>
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</tr>
<tr>
<td>Input Fiber Size</td>
<td>9</td>
<td></td>
<td></td>
<td>µm</td>
<td></td>
</tr>
<tr>
<td>Data Output Voltage</td>
<td>0.05</td>
<td>1.5</td>
<td>Vpp</td>
<td>µm</td>
<td>8 to +0 dBm input power</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>1.5</td>
<td>Vpp</td>
<td>µm</td>
<td>16 to -8 dBm input power</td>
</tr>
<tr>
<td>Upper Bandwidth</td>
<td>7.5</td>
<td></td>
<td></td>
<td>GHz</td>
<td></td>
</tr>
<tr>
<td>Lower Bandwidth</td>
<td>50</td>
<td></td>
<td></td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td>Jitter (rms)</td>
<td>1.5</td>
<td></td>
<td></td>
<td>µm</td>
<td></td>
</tr>
<tr>
<td>Percent Crossing</td>
<td>45</td>
<td>55</td>
<td></td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

*Manufacturer specifications for the photodiode are 1100 to 1620 nm. The O12125 specifications are tested and verified for 1530 to 1565 nm, but are not verified beyond this range.

*No mask hits with 5% mask margin for OC-48, OC-192 and 12.4 Gb/s (scaled OC-192 mask) at an input power of 0 to -8 dBm. For input power levels down to -16 dBm, a minimum BER of 10^-12 is typical for OC-192, and 10^-10 for rates above OC-192.

**Characteristics**

**Environment**

- Temperature:
  - Operating: 0°C to +40°C.
  - Nonoperating: -40°C to +71°C.
- Humidity:
  - Operating: 5% to 95% RH (up to +30°C) / 5% to 45% RH (30°C to +50°C).
  - Nonoperating: 5% to 95% RH (up to +30°C) / 5% to 45% RH (30°C to +50°C).
- Altitude:
  - Operating: Up to 3000 m (10,000 ft.).
  - Nonoperating: Up to 12,000 m (40,000 ft.).
- EMC Compliance:
  - Meets or exceeds EN55011 Class A Radiated and Conducted Emissions, FCC47 CFR, Part 15, Subpart B, Class A.
  - Safety:
    - UL3111-1; CSA1010.1; EN61010-1; IEC61010-1.

**Power Supply**

- Rating: 100 to 240 VAC.
- Range: 90 to 265 VAC.
- Maximum Power and Current: 40 W Max.
- Frequency: 47 to 63 Hz.

**I/O Interface**

- O1125 E/O Transmitter:
  - Laser In (Optical) FC/APC PMF.
  - Modulator Data In (Electrical SMA).
  - Low-Frequency Direct Modulation (Electrical SMA).
  - Laser Out (Optical) FC/APC PMF.
  - Modulator Out (Optical) FC/APC: Universal.
  - Remote Interface/Laser Interlock (DB25).

- O12125 O/E Receiver:
  - Optical Input (Optical) FC: Universal.
  - Data Out (Electrical SMA).
  - Attenuated Data Out (Electrical SMA).
  - Remote Interface (DB25).

**Physical Characteristics**

**O1125 E/O TRANSMITTER**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>mm</th>
<th>in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>45</td>
<td>1.75</td>
</tr>
<tr>
<td>Width</td>
<td>204</td>
<td>8</td>
</tr>
<tr>
<td>Depth</td>
<td>331</td>
<td>13</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument only</td>
<td>1.72</td>
<td>3.79</td>
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**O12125 O/E RECEIVER**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>mm</th>
<th>in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>45</td>
<td>1.75</td>
</tr>
<tr>
<td>Width</td>
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<td>8</td>
</tr>
<tr>
<td>Depth</td>
<td>331</td>
<td>13</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument only</td>
<td>1.91</td>
<td>4.20</td>
</tr>
<tr>
<td>With slot cover installed</td>
<td>2.09</td>
<td>4.62</td>
</tr>
<tr>
<td>With OM1420 installed</td>
<td>2.26</td>
<td>4.99</td>
</tr>
<tr>
<td>With OM1200 installed</td>
<td>2.26</td>
<td>4.99</td>
</tr>
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</table>

**Shipping Weight with Packaging**

<table>
<thead>
<tr>
<th>Instrument/Module</th>
<th>kg</th>
<th>lbs.</th>
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<tbody>
<tr>
<td>O1125</td>
<td>5.12</td>
<td>11.39</td>
</tr>
<tr>
<td>O12125</td>
<td>5.49</td>
<td>12.22</td>
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**Rackmount**

<table>
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<tr>
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<th>in.</th>
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<tbody>
<tr>
<td>Height</td>
<td>89</td>
<td>3.5</td>
</tr>
<tr>
<td>Width</td>
<td>483</td>
<td>19</td>
</tr>
<tr>
<td>Depth</td>
<td>477</td>
<td>18.75</td>
</tr>
</tbody>
</table>

**Ordering Information**

**O1125 E/O Transmitter**

Instrument - O1125.

**Service Options**

- Opt. C3 - 3 years of calibration services.
- Opt. C5 - 5 years of calibration services.
- Opt. R3 - Repair warranty extended to cover 3 years.
- Opt. R5 - Repair warranty extended to cover 5 years.
- Opt. D3 - Calibration data report; must order with C3.
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Included Accessories
- 071-1052-00 - User Reference: English only
- 006-8018-01 - Important Documents Folder.


Placed inside “Important Documents Folder.”

Opt. C5
- 119-5155-00 - Optical Adapter (FC).
- 015-1022-01 - Terminator (1 each).
- 131-7350-00 - Laser Safety Interlock.
- 174-4664-00 - Polarization Maintaining Single-mode Fiber Cable (FC/APC) (<1 ft. long).
- 174-4727-00 - Optical Cable (FC/APC-FC/PC) (2 m long).
- 015-0561-00 - Electrical Cable, SMA, (1 m long).
- 006-8217-00 - Optical Cleaning Kit.

Opt. C3
- 119-6690-00 - Module Assy, Clock Recovery Slot Cover.

Included Accessories
- 071-1053-00 - User Reference: English only.
- 006-8018-01 - Important Documents Folder.


Placed inside “Important Documents Folder.”

Opt. R5
- 119-5155-00 - Optical Adapter (FC).
- 015-1022-01 - Terminator (2 each).
- 174-3922-00 - Optical Cable (FC/PC-FC/PC) (2 m long).

Opt. R3
- 006-8217-00 - Optical Cleaning Kit.

Recommended Accessories
- OM1420 - OC-192 Dual-rate Clock Recovery Module.
- OM1200 - OC-48 Multi-rate Clock Recovery Module.
- TVGF13 - Dual Rackmount Kit.
- 131-7368-00 - Laser Safety Interlock.

Power Cord Options

- A1 - Universal European power cord (220 V, 50 Hz).
- A2 - UK power cord (240 V, 50 Hz).
- A3 - Australia power cord (240 V, 50 Hz).
- A5 - Switzerland power cord (220 V, 50 Hz).
- AC - China power cord (240 V, 50 Hz).
- A99 - No power cord.

Included Accessories
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Opt. R5
- 119-5155-00 - Optical Adapter (FC).
- 015-1022-01 - Terminator (1 each).
- 131-7350-00 - Laser Safety Interlock.
- 174-4664-00 - Polarization Maintaining Single-mode Fiber Cable (FC/APC) (<1 ft. long).

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- AC - China power cord (240 V, 50 Hz).
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Contact Tektronix:
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- Canada 1 (800) 661-5625
- Central Europe & Greece +33 2226 8092 301
- Denmark +45 44 850 700
- Finland +358 (9) 4783 400
- France & North Africa +33 (0) 1 69 86 80 34
- Germany +49 (221) 94 77 400
- Hong Kong (852) 2858-6688
- India (91) 80-2275577
- Italy +39 (02) 25086 1
- Japan (Sony/Tektronix Corporation) 81 (3) 3448-3111
- Mexico, Central America & Caribbean 52 (55) 56686-333
- The Netherlands +31 (0) 20 569 5555
- Norway +47 22 07 07 00
- People’s Republic of China 86 (10) 6235 1230
- Poland +48 (0) 22 521 53 40
- Republic of Korea 82 (2) 528-5299
- Russia, CIS & The Baltics +358 (9) 4783 400
- South Africa +27 11 254 8360
- Spain +34 (91) 372 6055
- Sweden +46 8 477 6503/4
- Switzerland +41 (01) 372 6055
- Taiwan 886 (2) 2722-9622
- United Kingdom & Eire +44 (0) 1344 392400
- USA 1 (800) 426-2200

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For more information on available accessories, contact Tektronix, Inc. at 1 (503) 627-7111.

Power Cord Options

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