FX160

Handheld Bidirectional OLTS and OTDR for FTTx/PON and Point-to-Point Applications

Handheld Bidirectional OLTS and OTDR

The FX160 combines bidirectional insertion loss and optical return loss (ORL) with OTDR measurement in one report with easy, automated testing. Each FX160 pair communicates using the fiber under test, allowing a single technician to perform bidirectional testing without having to return to the remote device.

Platform Highlights

- Robust, handheld design for demanding field test conditions
- High resolution, 5” TFT color touch-screen suitable for both indoor and outdoor use
- Fast boot-up for fiber troubleshooting and restoration
- Intuitive display, function keys and touchscreen for fast navigation and easy operation
- Internal data storage
- Micro-USB OTG interface for flash drives, fiber inspection probe connection and test data transfer
- Rechargeable Lithium Polymer battery with capacity indicator, low voltage alarm and Auto-off function
- Continuous operation >9 hours without recharging batteries
- Built-in WiFi option:
  - Perform software upgrades using Windows® PC
  - Upload test data to Fiberizer® Cloud via Internet connection
  - Connect wirelessly to Fiber Inspection Microscope
- Built-in Bluetooth® option:
  - Pair with mobile devices/Windows® PC to transfer test results
- Remote measurement using EZ Remote, VNC, or built-in web based software
- Available with the Optical Connector Protector option

Key Features

- Automated bidirectional insertion loss and ORL measurement with one-way OTDR
- Supports up to 3 wavelengths
  - 1310, 1550, 1625 nm OLTS/ORL and OTDR
- Insertion loss range up to 40 dB
- PON optimized OTDR option for single or cascaded splitters
- Optimized dead zones (DZ) for FTTx/PON applications
  - Event 0.8 m, Attenuation 3.5 m typical
- User-defined pass-fail thresholds
- 15 second OLTS/ORL test time
- Combined OLTS and OTDR reports generated on the device
- Auto mode - setup, events detection, and trace diagnostics
- PON OTDR Smart Link Mapping for different PON link configurations - balanced, unbalanced and/or Taps
- Markers for distance, attenuation, reflectance and splice loss measurements
- Additional OPM port for loopback referencing and power measurement
- Optional VFL

Multi-Function, Fiber Certification Tester

Overview

Fiber testing is a crucial step in verifying network performance and guaranteeing compliance with industry standards. Demand for accurate insertion loss and return loss testing has intensified over recent years, as high speed networks operate at higher bit rates, lower latency, and stricter optical loss budgets.

The FX160 fiber certification tester addresses these demands - the test set integrates optical power meter (OPM), optical light source (OLS), visual fault locator (VFL) and optical time domain reflectometer (OTDR) functions in a single, rugged and compact portable platform. Paired with a companion FX160 tester, automated test procedures certify fibers according to industry or custom performance standards.

Test Modes

The FX160 supports three primary test modes, major features briefly summarized below.

FiberBEAST™

- ORL and Unidirectional OTDR Expert or V-Scout with LinkMap Analysis
- Single Port, One Button Test

EZ-OTDR

- Unidirectional, Simple OTDR Auto Setup of Test Parameters only
- LinkMap Analysis

Expert OTDR

- Unidirectional OTDR
- Auto/Manual Setup of Test Parameters
- V-Scout & LinkMap Analysis

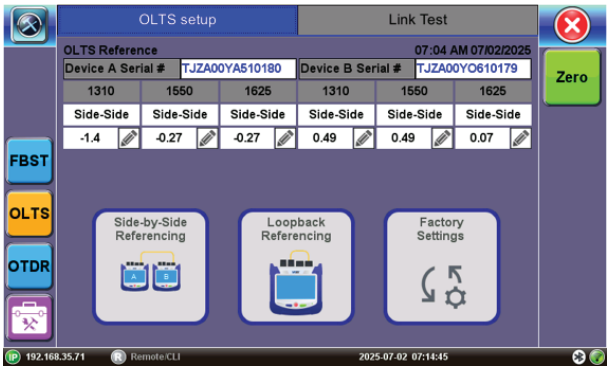
Automated Referencing

Referencing ensures accurate measurements and is recommended whenever test jumpers or launch cables are changed. The FX160 supports multiple reference methods to ensure that technicians can get right to testing in any scenario.

Side-by-side referencing at a local site, establishes a connection between test partners and automatically checks insertion and return loss of the fiber jumpers or launch fiber at the preselected wavelengths. Reference values are stored and later applied to obtain true loss readings.

Loopback referencing accommodates scenarios when technicians are located at different locations and it is impractical or time consuming to bring the test units together for referencing.

If a technician can't access a remote unit to perform a reference, they can use the output power (measured and stored at time of manufacture) as a reference.



Pass/Fail Thresholds

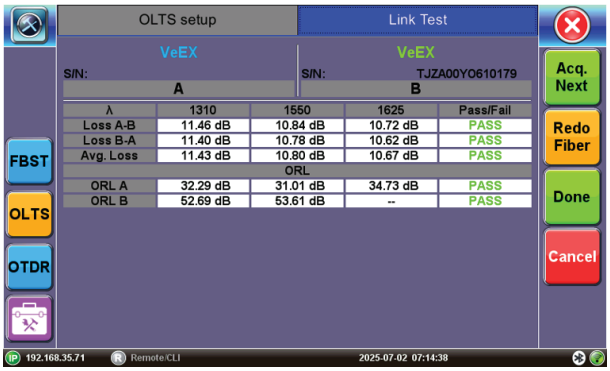
Thresholds for acceptable loss and ORL can be configured for each wavelength in the OLTS setup. Similarly, pass/fail criteria for OTDR measurements, such as splice loss, connector loss, and reflectance including attenuation, can also be defined. For PON/FTTx systems, loss thresholds for optical splitters and taps are also supported.

Launch and receive fibers are often used for OTDR test applications because they help overcome receiver saturation effects resulting from the pulse transmitted into a fiber. These cables also help to evaluate the first and last connector of the link under test. Length or index compensation of these cables is supported in the OTDR setup menu, and the loss associated with these cables is applied to the OLTS measurement to obtain the true link loss only.

Bidirectional OLTS Link Test

Automated bidirectional measurement of each fiber is initiated in the FiberBEAST mode. Insertion loss and ORL measurements for each wavelength are exchanged using a proprietary VeEX fast protocol.

OLTS test results are available in the Link Test tab in both OLTS and FiberBEAST screens. Loss in the A-B and B-A directions including average loss are displayed. These bidirectional values help technicians optimize transmission direction. Color coded Pass/Fail messages flag bad fibers and alert the technician to troubleshoot or retest.



PON Optimized OTDR

Fiber Certification

Two levels of certification are defined by the ANSI/TIA and ISO/IEC standards for fiber optic networks.

- Tier-1 certification focuses on measuring total link insertion loss using an optical power meter and optical light source, or by using an optical loss test set (OLTS) which is essentially a combination of the two. Visual inspection of the fiber connections is also a requirement.
- Tier-2 certification involves characterizing individual components of a fiber link using an OTDR. Each fiber segment, connection, and fusion splice is analyzed and presented in a trace, event table or LinkMap format, which identifies the various events including their performance.

OTDRs are unrivalled for fiber installation and commissioning tasks because they are the only instrument capable of identifying the precise location of events, including detecting unwanted faults located in the fiber link. This ability is essential for documenting the network and expediting the troubleshooting and repair process.

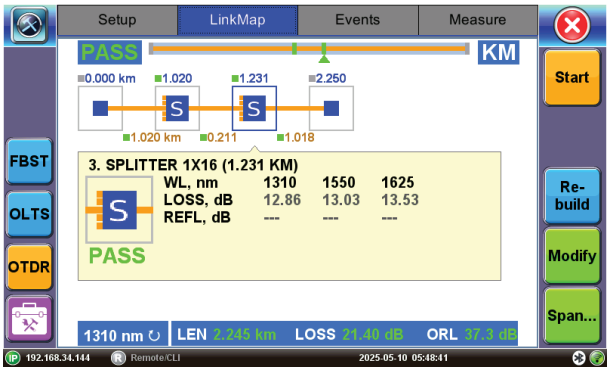
FTTx/PON Testing

The FX160 OTDR can be configured with PON optimization for testing point-to-point and point-to-multipoint FTTx/PON networks.

For PON systems, optimal pulse widths and specialized algorithms are employed to identify split ratios, evaluate splitter loss, and to minimize dead zones.

Skilled technicians can create custom PON test profiles by defining the splitter counts and ratios, provided these values are known. VeEX's proprietary V-Scout multi-pulse acquisition can also be enabled for complex testing situations.

Out-of-service testing and troubleshooting is possible in both auto and manual modes based on the technician's experience.

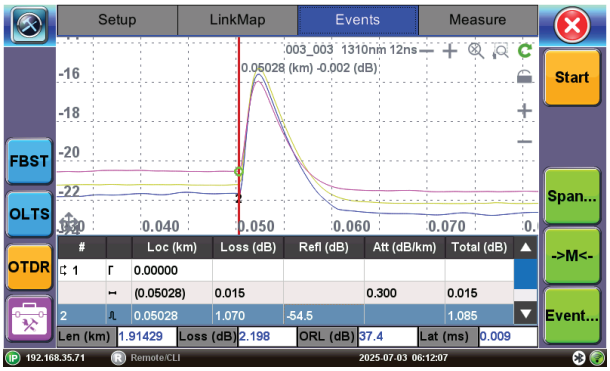


Advanced Trace Analysis

Fiber traces are displayed, and results are presented in an easy-to read event table. Location, fiber and event loss, reflectance, fiber attenuation and total loss are included. The user simply taps the event on the trace or event table to display its properties.

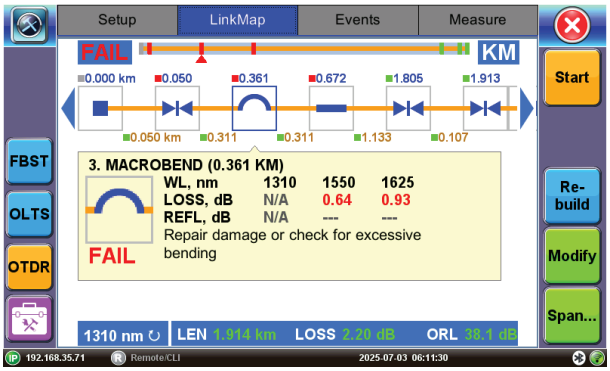
A toggle icon allows users to switch between traces and view the corresponding event table when multiple wavelengths are used for testing. Markers can also be enabled for manual measurements in both Event and Measure tabs.

A summary table at the bottom of the screen lists the total values of each major parameter, giving a valuable overview of the link under test. Latency in milliseconds is also provided.



Intuitive LinkMap

Technicians not familiar with OTDR traces can refer to the LinkMap, which is a symbolic representation of the fiber link under test. Advanced signal processing and software analyze the fiber, eliminating trace interpretation and preventing human analysis error.



Users simply tap on the symbol in the block diagram to view the attributes of each event. A message window displays the location, event type, loss, and reflectance values. A color-coded Pass/Fail verdict is also provided based on the thresholds defined in the OTDR setup menu.

A link summary is provided for each wavelength at which the fiber was tested. A toggle facility allows the technician to switch between the measurements. Anomalies such as macrobends can be identified on a link tested using two or more wavelengths.

Analysis confidence improves as LinkMaps identify and highlight potential issues which may have otherwise gone undetected.

FiberBEAST

Overview

Fiber deployments continue to ramp up worldwide, with service providers struggling to keep pace with the testing and reporting aspects. A shortage of skilled technicians with fiber certification experience adds to the challenge, so demand for a simple one button, full function tester with automated fiber test capabilities, smart workflow routines, and test reporting features is growing rapidly.

FiberBEAST™ (***B**idirectional **E**asy **A**nalysis by a **S**ingle **T**echnician*) performs automated bidirectional insertion loss (IL), optical return loss (ORL), and unidirectional OTDR measurements at one, two, or three wavelengths via a single test port.

This fiber certification test suite leverages the test capability of multiple instruments (light source, power meter, ORL meter, and OTDR) integrated within the FX160 test set. Using a single test port, automated bidirectional tests are performed when paired with a FX160 companion instrument.

Master Unit

FiberBEAST™

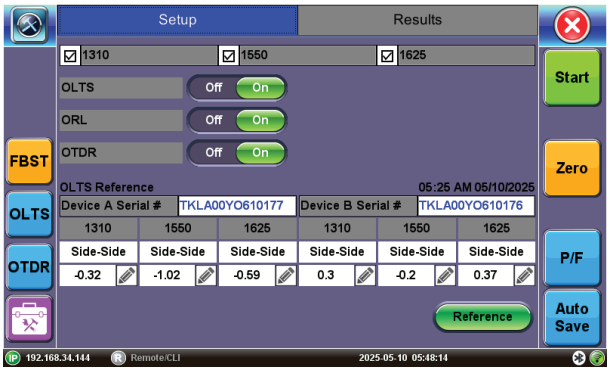
Remote Unit

Simplified Test Configuration

The FX160 automatically pairs with its remote test partner when connected to the fiber link under test. Serial number information and fiber reference values are exchanged before testing starts.

In the setup, the technician simply selects the OLTS, ORL or OTDR option (or any combination thereof), and configures the desired wavelength(s). Prior to testing, Pass/Fail thresholds and reference values can still be modified as needed.

A single Start button initiates the test sequence based on the test options selected and the measurement parameters configured in the OLTS and OTDR setup menus. The unit initiating the test automatically becomes the Master and controls communication and test sequence with the remote unit.



Test Results

Test results for the fiber under test are available very quickly. Multi-wavelength OLTS tests for A-B, B-A and Average values are presented with their Pass/Fail evaluation criteria.

One way OTDR results are based on the OTDR test mode, length of fiber, and network topology being tested. Test times can be adjusted between seconds for short spans and up to minutes for very long fibers which require additional trace result averaging.

Test results are displayed in tabular format for each fiber # under test. Pass/Fail verdicts are displayed for OLTS and OTDR results based on predefined threshold settings. The fiber can be retested in the event of failure, or the result can be saved before switching to the next fiber.

Detailed results can be accessed using the side buttons, allowing technicians to view the OTDR trace and LinkMap for detailed analysis when a fiber test fails, requiring troubleshooting and corrective actions.

Test Reporting

Best Practices

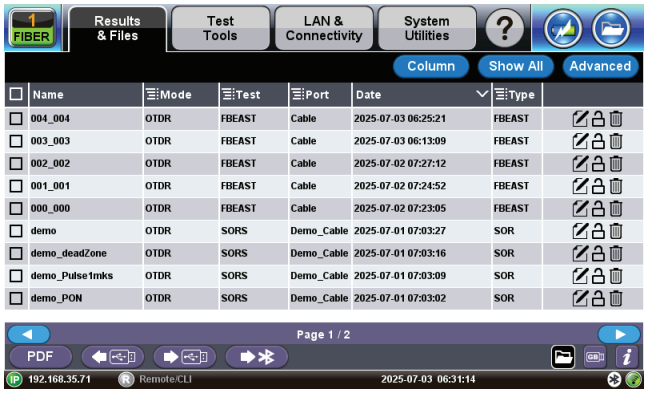
Fiber installation contractors are required to document the quality and performance of a fiber link to prove the cable meets the minimum required specifications as defined by the standards or customer. Submitting a detailed test report is also usually required to receive payment.

Service providers use these records to check if a fiber is suitable for the intended application – this gives them a thorough understanding of the link's performance and limitations prior to provisioning services. Test records also provide valuable information for future troubleshooting purposes, since they are used to compare measurements saved during the fiber installation versus values when problems are encountered.

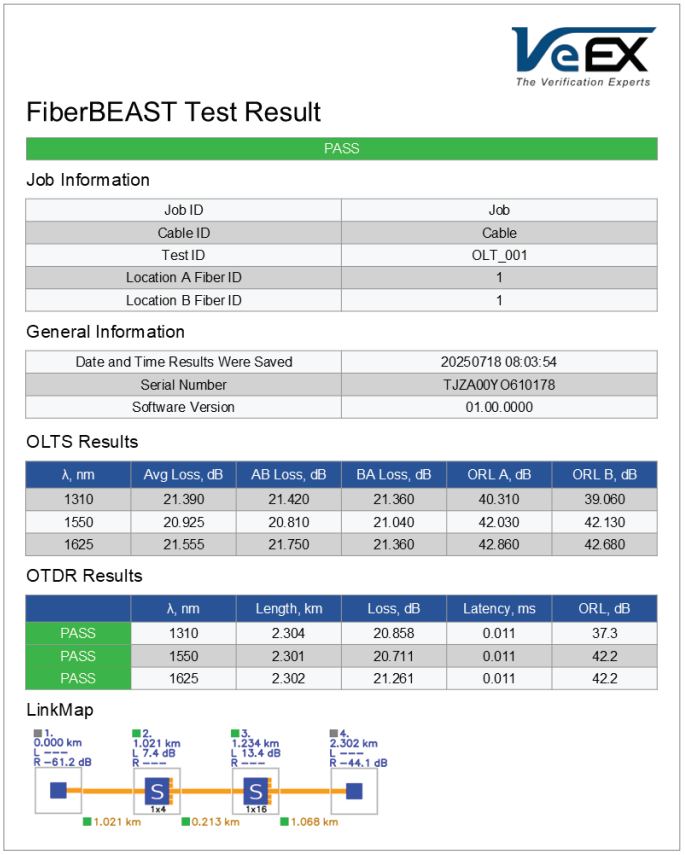
Professional Reports

The FX160 generates detailed fiber cable reports containing all measurements and link information such as job/cable/fiber ID, location, date/time, plus instrument information.

Onboard PDF file reporting merges multiple measurements into a single report. Pass/fail criteria based on customer thresholds or industry standards including a summary of the test result values, anomalies, and launch cable or test-cord references are also provided.



FiberBEAST reports include Insertion Loss + Optical Return Loss (Tier 1) and OTDR (Tier 2) results. Results in standard OTDR record (sor) format with LinkMap data can be exported via USB and Bluetooth for additional post processing or workflow operations.



VeEX
The Verification Experts

FiberBEAST Test Result

PASS

Job Information

Job ID	Job
Cable ID	Cable
Test ID	OLT_001
Location A Fiber ID	1
Location B Fiber ID	1

General Information

Date and Time Results Were Saved	20250718 08:03:54
Serial Number	TJZA00Y0610178
Software Version	01.00.0000

OLTS Results

λ, nm	Avg Loss, dB	AB Loss, dB	BA Loss, dB	ORL A, dB	ORL B, dB
1310	21.390	21.420	21.360	40.310	39.060
1550	20.925	20.810	21.040	42.030	42.130
1625	21.555	21.750	21.360	42.860	42.680

OTDR Results

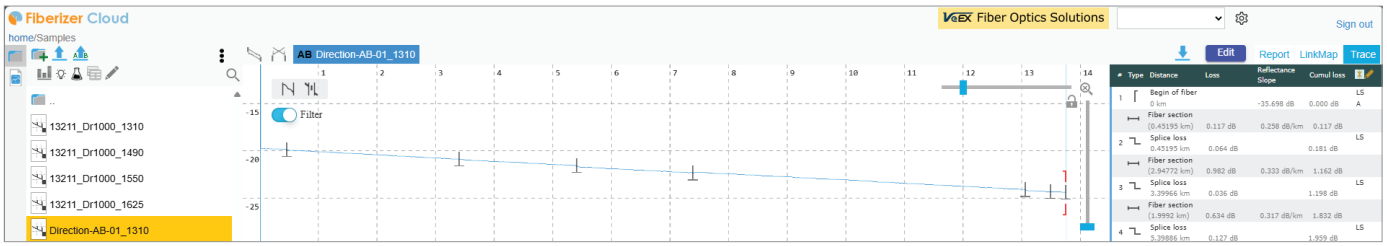
	λ, nm	Length, km	Loss, dB	Latency, ms	ORL, dB
PASS	1310	2.304	20.858	0.011	37.3
PASS	1550	2.301	20.711	0.011	42.2
PASS	1625	2.302	21.261	0.011	42.2

LinkMap

Fiberizer® Cloud

Leveraging Cloud technology, Fiberizer Cloud is the industry's first online repository where you can save, manage, view, and analyze all your fiber optic test results (OTDR, OLTS, Fiberscope) in a single, secure database.

Fiberizer Cloud is based on latest generation HTML5 resources, so you can access your valuable test data from anywhere, anytime using any web browser. Test results can be uploaded to your personal or company's Cloud account directly from the field using any available Internet connection.



Once uploaded, test results can be organized in custom collections - test data can be accessed and recalled at any time for reporting or comparison purposes. Advanced OTDR loss measurements using 2-point or 5-point LSA modes, including bi-directional analysis, can also be performed – powerful editing features also support insertion of user defined events. Default or user defined thresholds can be applied when generating professional PDF reports from built-in standard or customized templates.

Optical Connector Protector (Hardware Option)

Optical Connector Protector

Replaceable Ferrule

Optical Protector Cover (optional)

1 Patent pending
2 Spare ferrules available in pack of 4 for APC or UPC

The innovative, patent pending field-replaceable optical ferrule system[1] adds an extra layer of protection to the internal end-face of calibrated optical test ports, preventing contamination and accidental damage.

Users can quickly replace the ferrule[2] without the need for any tool while maintaining the integrity of the instrument's factory calibration. This novel approach eliminates the downtime, logistical hurdles and high cost associated with sending test sets to a service center for repair and recalibration.

All components in the system are reusable, with the exception of the small replaceable ferrule, helping to reduce environmental waste.

Field-Replaceable Optical Ferrule System

Universal Adapter

The universal connector adapter allows users to change the optical connector type conveniently whenever needed. Available in FC, SC, ST and LC.

Locking Ring

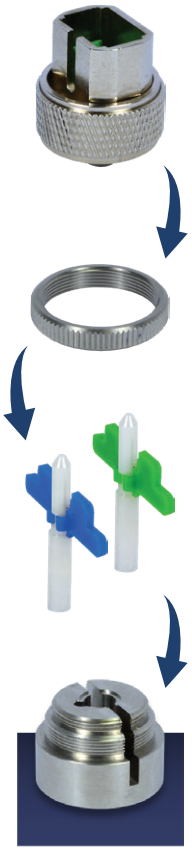
To secure the replaceable ferrule at its optimum location for the best performance.

Replaceable Ferrule with APC or UPC End-face

The self-aligned field-replaceable ferrule can be changed out in seconds. Users can select between APC or UPC end-face, ensuring compatibility with any test application requirement.

Optical Connector Protector Base

The panel mount protector base is made from high-grade stainless steel using a precision CNC process. This achieves proper alignment of the replaceable ferrule, minimizing insertion loss.



Optical Specifications[1]

OLTS	Specification
Testing Speed	15 seconds (two wavelengths, bidirectional automated IL + ORL)
Wavelength	1310/1550/1625[2]
Loss Range (dB)	40
Loss Uncertainty (dB)	±0.2
Loss Repeatability (dB)	<0.05
Loss Resolution (dB)	0.01
ORL Measurement Range (dB)	55
ORL Uncertainty (dB)	±0.5
Laser Safety	Class 1, 21 CFR 1040.10
Optical Connectors	Fixed connector or optional universal interface with interchangeable adapters
OTDR	**Specification**
Wavelength (±20 nm max)[2]	1310/1550/1625[2]
Dynamic Range (dB)[3]	42/41/41
Pulse width (ns)	3, 5, 10, 25, 100, 200, 300, 500, 1000, 3000
Event dead zone (m)[4]	0.8
Attenuation dead zone (m)[5]	3.5 (typical)
PON dead zone (m)[6]	≤16.5m
Distance range (km)	0.1 to 200
Reflectance Accuracy	±2 dB
Distance Measurement Accuracy (m)[7]	± (0.5 + resolution + $3x10^{-5}$ x L)
Sampling resolution (m)	0.03 up to 16m (model dependent)
Loss Resolution (dB)	0.01
Sampling points	Up to 256,000
Linearity (dB/dB)	±0.03
Measurement time (seconds)	Live or predefined values
Memory capacity	>10,000 traces, Telcordia SR-4731 sor format
Fiber analysis	Automatic, event table, user defined PASS/FAIL thresholds
Smart Link Mapping (V-Scout)	Smart Link Mapping, using intuitive icons, is derived from multiple test acquisitions
Light Source (OLS)	
Wavelengths (nm)	As per OTDR laser fitted
Output power (dBm)	>-2.5
Level Instability (dB)	0.03 (15 min); 0.1 dB (8 hour)
Modulation (Hz)[8]	270, 330, 1000, and 2000
Optical Power Meter (OPM)	**InGaAs**
Calibrated wavelengths (nm)	1310/1490/1550/1625
Power range (dBm)	-65 to +10 or -50 to +26
Tone Detection	270, 330, 1000, or 2000 Hz
Accuracy, %[9]	±5
Visual Fault Locator (VFL)	**Optional**
Wavelength (nm)	635-670 ±10
Output (mW)	1
Laser Safety	IEC 60825-1, Class II
Mode	CW and 1 Hz

Notes

1. Unless noted, all specifications are valid at 23°C ± 2°C (73.4°F ± 3.6°F) using FC/APC connectors.
2. Typical central/nominal wavelength deviation for 1310 and 1550 nm is ±20; for 1625 nm it is typically ≤10 nm.
3. Typical dynamic range after three-minute averaging and SNR = 1 using longest pulse.
4. Typical dead zone using 3 ns pulse with 1310 nm reflectance at -45 dB.
5. Typical dead zone using 3 ns pulse with 1310 nm reflectance -55 dB; 1550/1625nm may be slightly larger.
6. Typical value for non-reflective splitter, 16.5 dB loss and PW 25 ns.
7. Excludes uncertainty due to fiber refractive index (IoR) setting.
8. Modulated Power output ~ 3dB lower than CW power.
9. Between 5 to -50 dBm for standard OPM. Between 17 to -35 dBm for high power OPM.

Ordering Information

Order Number	Wavelength (nm)
Point-to-Point	
Z06-05-104P	1310/1550
Z06-05-105P	1310/1550/1625
PON Optimized	
Z06-05-111P	1310/1550
Z06-05-112P	1310/1550/1625

General Specifications

Dimensions	150 x 150 x 70 mm (5.9 x 5.9 x 2.75”)
Weight w/battery	0.94 kg (2.07 lbs) nominal for 2 lasers 1.04 kg (2.25 lbs) nominal for 3 lasers
Drop Test	1 meter flat drop
Battery	37 Wh smart Li-Poly battery
Battery Autonomy	>9 hours continuous operation
Operating Temperature	-10˚C to 50˚C (14˚F to 122˚F)
Storage Temperature	-40˚C to 60˚C (-40˚F to 140˚F)
Altitude	3000 meters
Humidity	0% to 95%, non-condensing
Display	5” TFT 800 x 480 color touchscreen LCD
Interfaces	Micro-B USB 2.0 OTG USB A 2.0 via OTG cable 10/100Base-T via OTG adapter (optional) Built-in: WiFi 802.11b/g/n (optional), Bluetooth (optional)
AC Adapter	Input: 100-240 VAC (50/60 Hz), 1.5A max Output: 12 VDC
Memory	Internal 8 Gbyte micro SD card
Languages	English, French, German, Spanish, Chinese, Japanese (others supported on demand)
Certifications	CE, RoHS and WEEE compliant
Safety Standards	FX160 OTDR - IEC 61010-1, Class III (GOST 12.2.091) AC adapter - IEC 61010-1, Class II (GOST 12.2.091)

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