FX120
PON Analyzer & Multi-Gigabit Service QoE Test Set

VeEX

The FX120 is an all-in-one advanced PON analyzer with an Ethernet interface and an SFP+ cage to support Layer 4+ testing. Monitor activation process by displaying pass-through power levels as well as OLT/ONT IDs, status, and TC-Sync. Certify QoE using Speed Test and V-PERF to ensure internet connectivity and speed up to 10 Gbps. Optional Fault Locator feature allows technicians to verify drop cables. Optimize testing and report compilation with NoApp® and Flow™.

Product Highlights

- Compatible with GPON, XG(S)-PON, EPON, 10G EPON networks
- Pass-through selective wavelength PON meter for ONT/ONU service verification
- Pass/Fail ITU-T/IEEE thresholds enable fast, efficient, and consistent turn-up of services
- Layer 4+ test option including V-TEST, V-PERF, and V-FTP up to 10GE; SFP+ cage for additional test options
- Fault Locator – End of Fiber detection (option)
- Simple and intuitive user interface
- Flow™ for efficient testing and report compilation process
- NoApp® QR code capability for faster result transfer
- Easy report generation and data transfer using R-Server for workflow and results management
- Test set connectivity via micro-B USB and optional built-in WiFi and Bluetooth® wireless interfaces; USB-A and LAN interfaces available via OTG cables
- Remote access/control via web browser and VNC® client. Compatible with VeEX EZ Remote collaboration services.
- Field upgradeable using USB stick
- Fiber tool accessory options: OPX-BOXe OTDR, DI-1000/1000MPO/3000 Fiber Scope and FX40/45/80 series OPM
- Fast boot and ready to test in <60 seconds
- Field replaceable Li-Ion battery pack with >12 hour autonomy
- 5-inch LCD color touch screen
- Rugged and compact form factor

*GPON/XG(S)-PON per ITU-T standards, EPON per IEEE standards

Key Features*

Ethernet
- IPv4/IPv6 and PPPoE, DHCP and static IP
- Ping, trace route, IP PCAP, Traffic PCAP, Loopback
- Complete Layer 4+ test suite: V-TEST (Ookla® Speedtest®), V-PERF (RFC6349), and V-FTP upload and download tests

Basic Mode
- Wavelengths: 1270/1310/1490/1577 nm with optional 1550 nm
- Upstream/downstream LED status indicators for signal and frame status; TC-SYNC status
- Low insertion loss: ≤1.5 dB typ.

GPON/XG(S)-PON
- Automatic PON-ID detection including OLT-ID, ODN class, OLT TX power level and ODN link pass/fail
- ONU/ONT ID, serial number and status
- GPON ONT Emulation

EPON/10G EPON (Option)
- Automatic OLT Mac detection
- ONU LLID, ONU MAC and ONU status

Advanced Function Mode
- Track/manage active ONT IDs and serial numbers
- PLOAM Capture/Decode
- OC decode
- Super PM - Advanced Splitter and Distribution Cabinet Analysis (option)

Fiber Optic/PON Expert

Passive Optical Network Test Set GPON and XG(S)-PON

Basic In-Service Qualification Mode

Service activation should be EASY. Simply insert the FX120 PON test set at the customer premises between the ONU/ONT and the last splitter in the ODN. In the OPM Summary view, LEDs indicate if upstream/downstream signals are present and frame quality. PON-ID information such as OLT-ID, OLT TX power and PON class are shown. When TC-Sync is achieved, the technician can verify the ONU-ID and Serial Number and ONT status. Signal levels and ODN Loss will indicate Pass/Fail per ITU-T or user defined limits. If laser instability is suspected, the technician can also monitor signal/ODN loss budget history to verify signal stability over time.
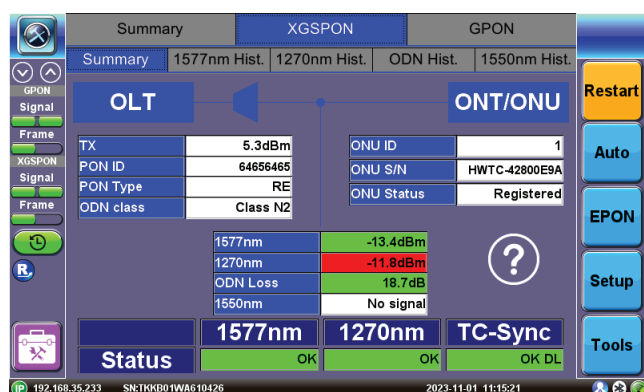

Advanced PON Functions

Even when signal levels are good, service quality may still be poor. A Tier2 technician/engineer can remotely connect into a test set to assist the local technician by using advanced features.

• Active ONU List
• PLOAM and XG(S)-PON PLOAM decoder
• OC decode

PLOAM Capture/Decode

The PON tester captures and decodes PLOAM messages. PLOAM will display the activation process showing the message exchange from OLT to ONT. The PLOAM messaging can also be used to determine OLT commands to ONT including ONT disconnect commands. Use Setup to filter out unwanted messages to streamline your work.
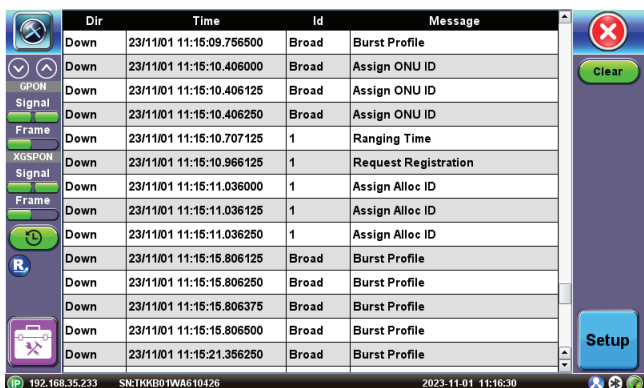

OC Decode

To help services technicians verify their PON network accuracy, OC Decode is included to help monitor and break down the information that is sent from the OLT. Colorcoded for visibility, it is broken down by PON-ID Type, PON ID, Reserved, TX optical Level Reference, and Transmit Optical Level.


Passive Optical Network Test Set 1G/10G EPON

Similar to testing the GPON and XG(S)-PON networks, simply insert the FX120 PON test set at the customer premises between the ONU/ONT and the last splitter in the ODN. On the OPM summary screen, LEDs are shown to indicate upstream/downstream loss of signal and frame status. PON information such as OLT MAC is displayed once connected to the OLT. When TC-Sync is achieved, technicians can then verify their ONU LLID, ONU MAC and ONU status. Signal levels will indicate pass/fail per IEEE or user defined thresholds. Advanced EPON Function includes Active ONU listing.
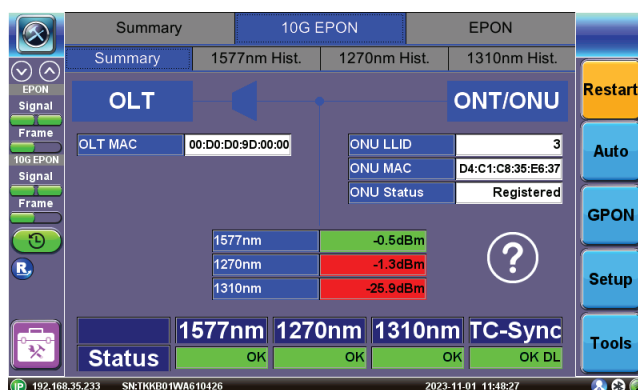

Flow

An advanced work process optimization tool, Flow is a sophisticated feature engineered to facilitate operational efficiency. It offers robust capabilities to define a roadmap, execute batch testing, and generate detailed reports with minimal effort. Flow is designed to streamline complex workflows, enhance task optimization, and expedite result-sharing. It's the ideal solution to simplify your system, improve productivity, and maintain compliance standards.
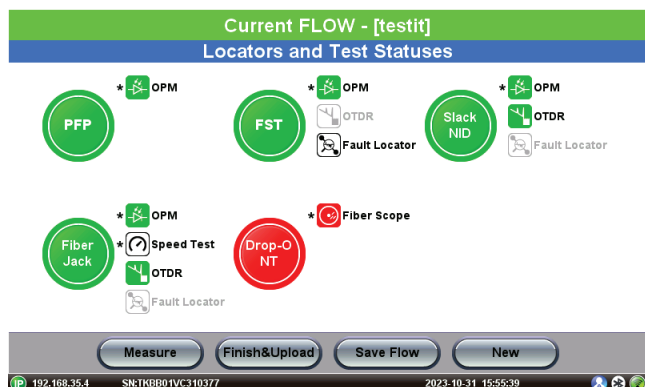
Super PM - Advanced Splitter and Cabinet Analysis

Advanced Splitter and Cabinet analysis is a wizard allowing the field technician to do a full survey of a street cabinet by identifying all the ONTs by serial number and locating each ONT - both on the splitter side and on the distribution panel. The operator can fully update their database according to the field reality from one result file, fixing all the discrepancies caused by massive undocumented changes in the field. The process is secured with libraries and graphical display, limiting the risk of errors. The user can also bind each ONT to their operator when several operators share the same street cabinet, allowing a full audit.
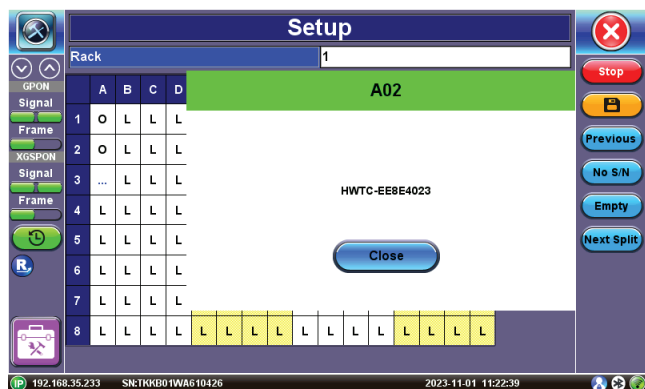
Fault Locator

During service activation, most technicians need to be able to measure short fibers links and drop cable fibers for PON, 5G rollout, and FTTx applications. With the built in optional fault locator, users can plug in a drop fiber and find the end of the fiber, or up to the first event. Having a measuring range between 10 m to 20 km, users can find the EOF for most drop cables.

Ethernet Specification

Electrical Interfaces
RJ45 (Cat 6a compliant)
- 100/1000 BASE-T
- 2.5 GBASE-T
- 5G BASE-T
- 10G BASE-T
- Ethernet Classification: Per IEEE 802.3

Optical Interfaces
SFP+(LC connectors)
- 100/1000BASE-X
- 10G BASE-R

Pluggable transceivers conforming to Multi Source Agreement (MSA) specifications
Optical Power Measurement: ±2 dB accuracy, 1 dB resolution
Safety: Class 1, per FDA/CDRH, EN (IEC) 60825 eye safety regulations
ROHS compliant and Lead Free per Directive 2002/95/EC

**Data rates, performance, and supported transmission protocols are only guaranteed for SFP supplied by VeEX Inc. If selecting or using other vendors, users should excercise caution.

Layer 4+ Service Test

V-TEST Internet Speed Test

This multi-gigabit high-speed test features provide additional Layer 4-7 verification and troubleshooting. The V-TEST feature qualifies network TCP/HTTP protocol performance by testing against a V-TEST or Ookla® Speedtest® HTTP server. It can test up to the full line rate depending on the server's specifications and limitations. Connection time to the server, data transfer time, line rate throughput rates, and protocol throughput rates key metrics are reported during the tests.
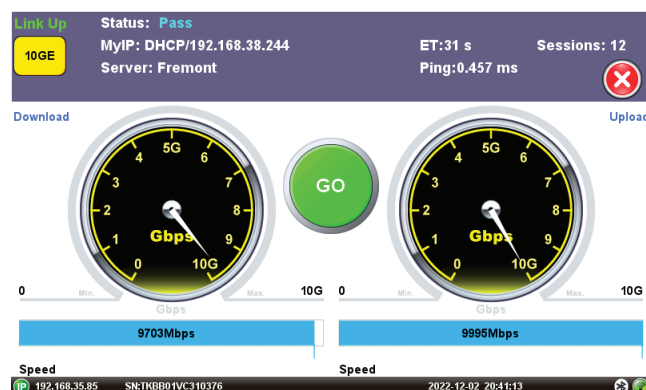

The V-TEST application is flexible enough to operate in different modes depending on user preference:
- In VeEX Managed mode, the customer's servers are added to a customer server list that is maintained and managed by VeEX for the end-user's ease of use and convenience. The full list of server IP addresses or URLs are provided to VeEX. Once added, all the user has to do is select the server from their company list and initiate the test to the selected server.

- In Speedtest Powered™ mode, the test follows Ookla's methodology and tests to the Speedtest® Server Network. In this mode, the test is compatible with Ookla's protocol/methodology; it will scan nearby servers in the local market and test to the server with the fastest (lowest latency) response.
- In User Managed mode, the user is allowed to enter the server IP/URL and save it to a server list that they can maintain and manage on their own.

Hardware-based HTTP Throughput rate test (Internet speed test) helps verify quality of service (QoS) and assure quality of experience (QoE)

- Full HTTP line rate
- HTTP client mode
- Connection time to server
- Total Data Transfer time
- Requires V-TEST Server Speedtest® Compatible Mode
- Compatible with Ookla's network of Netgauge Servers
- Speedtest® Powered
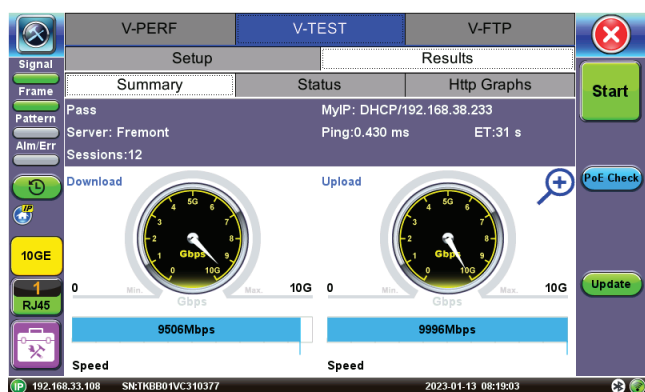
V-PERF TCP/UDP Test (RFC6349)

A common source of customer complaints come from file transfer speeds not matching the throughput rates guaranteed in the SLA. While many factors affect TCP applications performance, including customer's operating system hardware performance and settings (TCP window size), service providers need to prove SLA with hardware-based test tools that can show maximum TCP performance, independent of Operating System or Server limitations, and present repeatable reliable results.

The V-PERF test feature uses RFC6349 test methodology and metrics for qualifying TCP or UDP network performance. It offers a full line rate stateful TCP test with configurable window sizes, client and server modes as well as compatibility with third-party iPerf/iPerf3 servers. For best performance, multiple field test set can test against centralized hardware-based RTU-300 test heads, for guaranteed availability and repeatability.
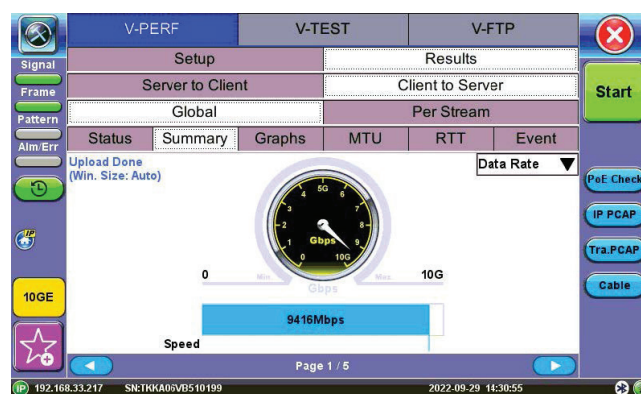
V-PERF is a hardware-based benchmarking test for network performance at different TCP window sizes, to verify stateful TCP/UDP throughput at full line rate, understand KPIs that may be causing network congestion and speed degradation, optimize window sizes, and assure the link meets the required quality of service (QoS)

- TCP/UDP Throughput Compliant with RFC6349
- Stateful TCP/UDP Test at full line rate
- TCP/UDP Client and Server modes
- Compatible with iPerf and iPerf3 Client/Server
- Up to 64 parallel streams
- MTU search per RFC4821
- Round Trip Time Measurement
- Configurable TCP Window sizes, with Manual and Auto window sizing
- Multi-Window size tests
- Measurements: TCP Throughput rate (min, max, average),
- Transfer file size and duration, Transfer time ratio, TCP, Efficiency %, Buffer Delay %
- Test duration: By time or file size

V-FTP Throughput Test

FTP Throughput provide additional Layer 4-7 testing. VFTP allows users to test the link and service's FTP protocol performance, to any FTP Server, up to full line rate, by uploading and downloading large test files. This feature can test up to the full line rate depending on the server's specifications and limitations. Connection time to the server, data transfer time, line rate throughput rates, and protocol throughput rates key metrics are reported during the tests.

- FTP Throughput rates
- Full line rate
- FTP client mode
- Connection time to server
- Total Data Transfer time
- FTP Throughput rates
- Compatible with Linux and Windows FTP servers

Fiber Optic Tools

Digital Fiber Inspection Scope

End-face contamination is the leading cause of fiber link failures. Dirty/damaged connectors can increase loss and return loss resulting in poor service quality. Contamination can transfer and damage other connectors through mating. Inspecting and cleaning patch cords and pluggable optics connectors before mating them is always recommended.

This option allows digital video microscope probes to be connected directly to the test set through a USB port or WiFi. Featuring live video feed on the screen for visual analysis, it offers clear image capture, compare (before and after), IEC 61300-3-3 Sect 5.4 Pass/Fail templates for SMF and MMF, save, export and generate report to USB flash drives.

- Auto-focus detection and analysis option
- Analysis per IEC 61300-3-3
- SMF and MMF templates (core, cladding, adhesive and contact areas)
- Dots or square to highlight contamination, debris, and scratches
- Report generation

Fiberscope sold separately. See datasheet for details.
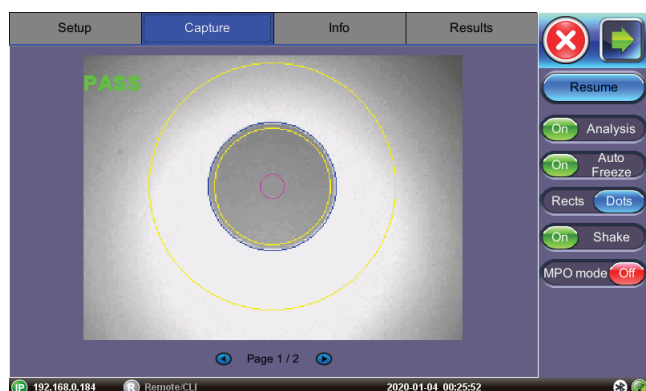
OTDR Viewer

Built-in OTDR Viewer and Client application provides full post-analysis of SOR traces, as well as control of an ultra-compact OPX-BOX OTDR via direct USB connection, WiFi or Bluetooth®. Once paired or connected to the micro OTDR, the test set displays a virtual OTDR user interface that is used to control the OPX-BOXe and perform measurements.

- Traces and Events table view
- Loss calculations
- V-Scout Link Mapper option
- Compatible with Fiberizer Cloud (upload and download)
- Controls external OPX-BOXe OTDR

Since fibers are commonly placed in access, metro, and transport networks, having a companion add-on OTDR to inspect drop fiber reduces dependence on specialized fiber construction crews troubleshooting fiber related problems.

VeSion® R-Server™ Client

Part of VeEX's VeSion centralized monitoring and management solutions, the R-Server Workflow and Asset Management system provides crucial tools to manage fleets of technicians, test equipment, standardized test profiles, thresholds, centralized test results collection, reporting, jobs/ticketing, and software update delivery to create coordinated and efficient disciplined workforce and test procedures. R-Server enhances the workflow to achieve the level of quality and repeatability required by telecommunications service providers, MSOs and their contractors. The flexible R-Server can be deployed in cloud, hosted, and corporate networks, on physical or virtualized servers.

Makes the job simpler for field technicians as they can download test profiles and upload test results. Supervisors can preset and upload test parameters which are provided to the test sets as profiles. Technicians can simply download profiles, run tests, and upload results to a centralized system that stores and secures the data.

Platform Features & Options

Remote Access

The test set offers multiple ways to Remote Control it or access the information remotely (e.g. test results, test profiles, etc.). The test set can be reached via:

- Built-in web browser software (Web Remote Control)
- EZ Remote
- VNC® Client
- Connectivity: Optional 10/100Base-T, WiFi 802.11 b/g/n

EZ Remote

The EZ Remote functionality allows users to quickly connect to VeEX test sets all over the world, without the need for VPN, port forwarding or public IP addresses. This VeEX hosted cloud service takes care of all the complex tasks required, and presents users with a simple application. Connect online anytime, anywhere, with any computer, tablet, or smartphone, using standard web browsers for screen-sharing, remote control and access to test results. Use it for remote control, collaboration, technical support or training purposes.

- Remote Control functionality gives users full control of remote test sets (screen mirroring and control)
- Remote Access functionality allows users to View, Download, Rename, Delete, Convert to PDF the test results
- No VPN required
- Works through firewalls, no ports to open
- Web browser based
- Multi-platform support
- No software to install
- Service included with test set (no extra charge)

File Manager
- Saves results to internal SD card view, rename, delete and lock result files
- Filter and sort by Name, Test Mode, Test Type, Port, Date and Result/Profile
- Report generation: Test results generate in PDF format export test results and profiles via USB memory, Bluetooth, web browser, and retrieve to/from USB
- Screen capture: Screen shots in PNG format

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.
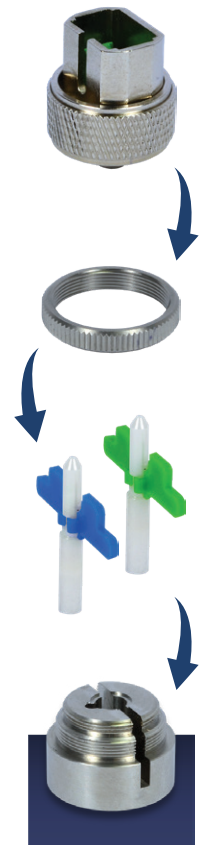
Optical Specifications[1]

FTTx Specifications		Spectral passband (nm)	Power measurement range (dBm)[5]	Calibrated wavelength (nm)	Max power (dBm)
OLT	Downstream 1490 nm	1470-1510	-35 to 2	1490	2
	Downstream 1550 nm[4]	1540-1560	-40 to 18	1550	20
	Downstream 1577-1578 nm	1572-1582	-35 to 2	1577	2
ONT/ONU	Upstream 1270 nm, burst mode	1260-1280	-27 to 12	1270	13
	Upstream 1310 nm, burst mode	1300-1320	-28 to 12	1310	
Isolation (dB)		40			
ORL (dB)		50			
Pass-through insertion loss (dB)[2]		≤1.5			
Power uncertainty (dB)[3]		0.5			
Auto Pass/Fail levels by Class or user threshold		ITU-T or user specified			
Fiber Inspection		Optional fiberscope			

ITU-T PON Data Analysis	
ONT serial numbers identification	Standard offering
PON identification[6] (OLT-ID, OLT-Class, OLT-Tx, ONU/ONT SN)	Standard offering
Active ONU/ONT List	Standard offering
PLOAM Decoder	Standard offering

Fault Locator (option)	
Wavelength (nm)	1625 ± 10 nm
Passband (nm)	1610 to 1680
Filter Isolation	50
Distance Range[7] (dB)	10 m to 20 km
Distance Measurement Accuracy (m)[8,9]	$\pm(1 + .01 \times L)$
Laser Safety	Class 1 per 60825-1:2014 edition

Notes:

1. At 23°C ± 3°C using SC/APC
2. Measured at 2 dBm
3. Measured at -10 dBm
4. 1550 nm only displays signal level
5. Data recovery range is reduced but meets ITU-T standards
6. Requires activation of PON-ID functionality in PON system per ITU-T G.984.3 Amd 3
7. 10m distance range assuming initial reflection at most -55 dB
8. For fiber length <10 km and reflectance ≥-42 dB with refractive index 1.468.
9. For non-reflectance, distance measurement accuracy can be up to ±2.5%.

Ordering Information

P/N	Description
PON Analyzer Models	
Z06-05-054P	FX120 GPON and XG(S)-PON Analyzer and Multi-Gig Service Test Set, 1270/1310//1490/1550/1577 nm
Z06-05-055P	FX120 GPON and XG(S)-PON Analyzer and Multi-Gig Service Test Set, 1270/1310//1490/1577 nm
Z06-05-102P	FX120 EPON and 10G-EPON Analyzer and Multi-Gig Service Test Set, 1270/1310//1490/1577 nm
PON Software Options	
499-05-896	EPON and 10G-EPON Protocol Support (for GPON and XG(S)-PON Analyzer)
499-05-945	GPON and XG(S)-PON Protocol Support (for EPON and 10G-EPON Analyzer)
499-05-865	Super PM - Advanced Splitter and Cabinet Analysis
499-05-949	ONT Emulation (must use with SFP GPON ONT, 301-01-026G)
499-05-882	OPM Mode Setting (Advanced if off)
Hardware Options	
Z66-00-106G	WiFi and Bluetooth for Remote Control and File Transfer
Z66-00-339P	Optical Fault Locator, 1625 nm (F), 10m to 20 km, Fixed SC/APC
Z66-00-349P	Optical Fault Locator, 1625 nm (F), 10m to 20 km, Fixed SC/UPC
Ethernet Options	
499-05-879	V-Test/V-Perf Line Rate HTTP Throughput up to 10GE
499-05-940	Multi-Gig Loopback Mode
Pluggable Optics	
301-01-026G	SFP GPON ONT Emulation (required for ONT Emulation, 499-05-949)

General Specifications

Storage	Internal 16 GB flash	Battery	56 Wh smart Li-Ion battery
Connectivity	Built-in: WiFi 802.11b/g/n (optional),	Battery Autonomy	Application dependent (>12h idle)
	Bluetooth® (optional)	AC Adaptor	Input: 100-240 VAC, 50/60 Hz, 1.5A
	micro-B USB 2.0 OTG		Output: 15 VDC, 4A
	USB A 2.0 via OTG cable	Operating Temperature	-5˚C to 45˚C (23˚F to 113˚F)
	10/100Base-T via OTG adapter (optional)	Storage Temperature	-25˚C to 55˚C (-13˚F to 131˚F)
Languages	Multiple languages supported	Humidity	0% to 95% non-condensing
Size (H x W x D)	150 x 150 x 80 mm (5.9 x 5.9 x 3.15")	Certifications	CE & ROHS compliant
Weight	1.0 kg (2.2 lb)		

The Verification Experts

CE