

# FX120T

## Terminated PON Analyzer & Multi-Gigabit Service QoE Test Set



The FX120T is an advanced Terminated PON analyzer with a PONT OPM port, an Ethernet interface and an SFP+ cage to support Layer 4+ testing. Verify your construction build with downstream level measurements and PON ID. 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
- Terminated selective wavelength PON meter for OLT 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

### 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: 1490/1577 nm
- Downstream LED status indicators for signal and frame status
- Low insertion loss:  $\leq 1.5$  dB typ.

#### GPON/XG(S)-PON

- Automatic PON-ID detection including OLT-ID, ODN class, OLT TX power level and ODN link pass/fail
- GPON ONT Emulation

#### EPON/10G EPON (Option)

- Automatic OLT Mac detection

#### Advanced Function Mode

- Track/manage active ONT IDs and serial numbers
- PLOAM Capture/Decode
- OC decode

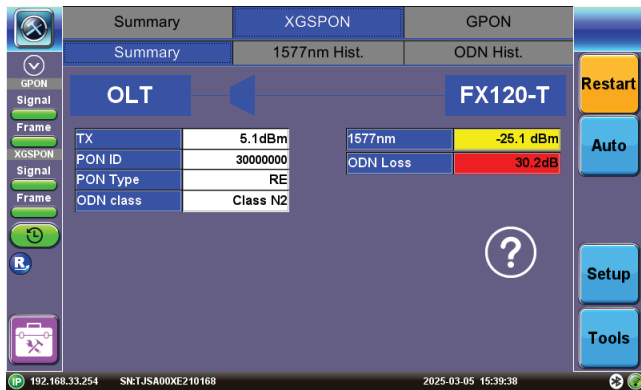
\*GPON/XG(S)-PON per ITU-T standards, EPON per IEEE standards

**Fiber Optic/PON Expert**

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

### Basic In-Service Qualification Mode

Construction build verification should be EASY. Simply insert the FX120 PON test set after the OLT to measure downstream levels and PON ID. In the OPM Summary view, LEDs indicate if downstream signals are present and frame quality. PON-ID information such as OLT-ID, OLT TX power and PON class are shown. 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.



### 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.

PON-ID Type	RE Flag	0b1
	ODN class	0b1
	DS FEC Flag	0b0
	P Flag	0b0
PON ID	Link Type	0b0
	Administrative Label	0x6465646
	DWLCH ID	0x5
R	Reserved	0b0
C	TX Optical Level Reference	0b0
TOL	Transmit Optical Level	0x161

## 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 after the OLT at any point to measure downstream EPON power levels and OLT MAC. On the OPM summary screen, LEDs are shown to indicate downstream loss of signal and frame status. PON information such as OLT MAC is displayed once connected to the OLT. Signal levels will indicate pass/fail per IEEE or user defined thresholds. Advanced EPON Function includes Active ONU listing.

### Advanced PON Functions

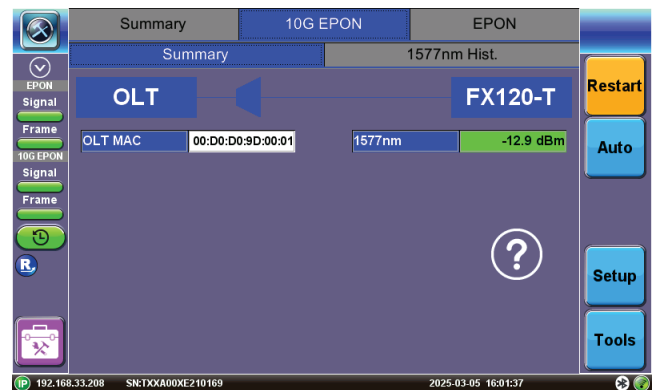
Even when signal levels are good, service quality may still be poor. A Tier2 technician/engineer can remotely connect into a test set to assist the local technician by using advanced features.

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

### PLOAM Capture/Decode

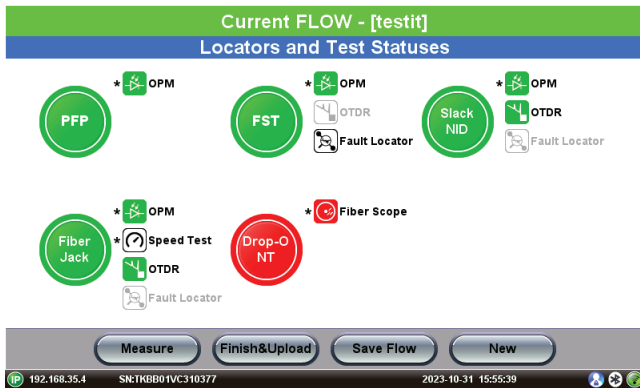
The PON tester captures and decodes PLOAM messages. PLOAM will display the messages captured from the OLT regarding the PON ID. The PLOAM messaging can also be used to determine OLT commands to ONT including ONT disconnect commands. Use Setup to filter out unwanted messages to streamline your work.

Dir	Time	Id	Message
Down	23/11/01 11:15:09.756500	Broad	Burst Profile
Down	23/11/01 11:15:10.406000	Broad	Assign ONU ID
Down	23/11/01 11:15:10.406125	Broad	Assign ONU ID
Down	23/11/01 11:15:10.406250	Broad	Assign ONU ID
Down	23/11/01 11:15:10.707125	1	Ranging Time
Down	23/11/01 11:15:10.966125	1	Request Registration
Down	23/11/01 11:15:11.036000	1	Assign Alloc ID
Down	23/11/01 11:15:11.036125	1	Assign Alloc ID
Down	23/11/01 11:15:11.036250	1	Assign Alloc ID
Down	23/11/01 11:15:15.806125	Broad	Burst Profile
Down	23/11/01 11:15:15.806250	Broad	Burst Profile
Down	23/11/01 11:15:15.806375	Broad	Burst Profile
Down	23/11/01 11:15:15.806500	Broad	Burst Profile
Down	23/11/01 11:15:21.356250	Broad	Burst Profile



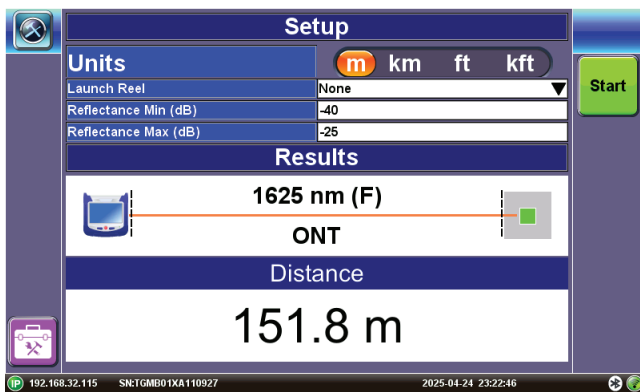
### Flow

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.



### 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 FTTH 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

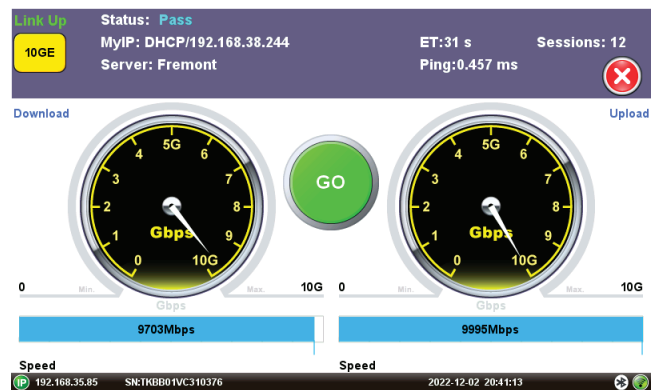
ROHS compliant and Lead Free per Directive 2002/95/EC

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

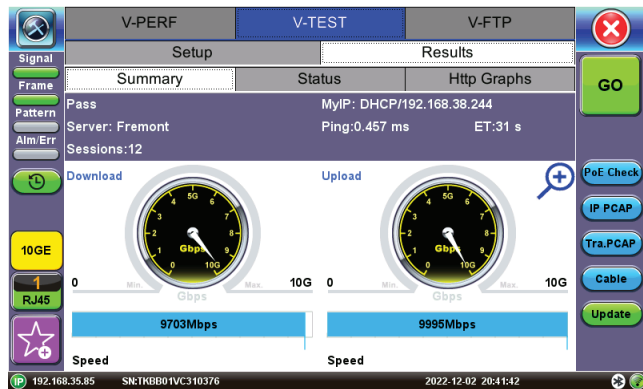


The V-TEST application is flexible enough to operate in different modes depending on user preference:

- 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)

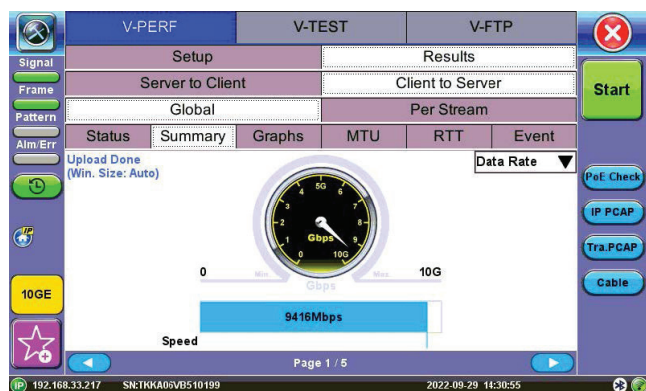
- Full HTTP line rate
- HTTP client mode
- Connection time to server
- Total Data Transfer time
- Requires V-TEST Server Speedtest® Compatible Mode
- Compatible with Ookla's network of Netgauge Servers
- Speedtest® Powered



## 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

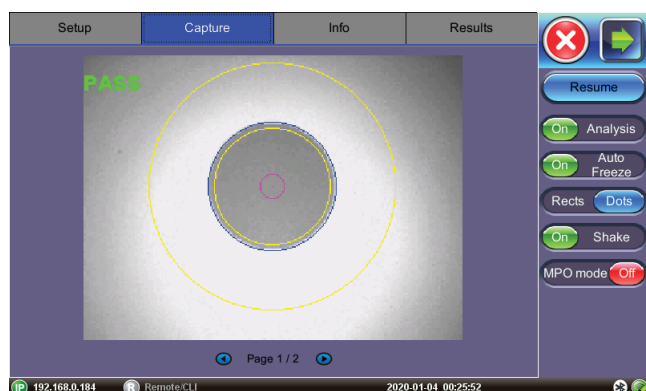
### Digital Fiber Inspection Scope

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*

The innovative, patent pending field-replaceable optical ferrule system<sup>1</sup> 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<sup>2</sup> 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.



*Replaceable Ferrule*



*Optical Protector Cover  
(optional)*

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

### 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

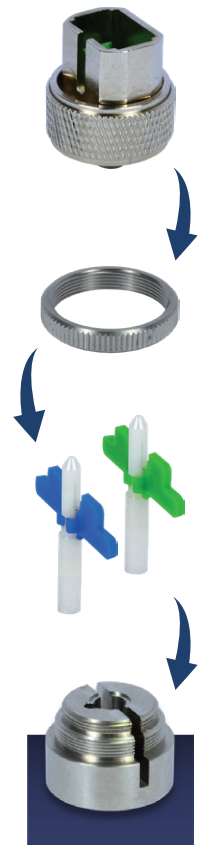
To secure the replaceable ferrule at its optimum location for the best performance.

#### 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<sup>1</sup>

FTTx Specifications		Spectral passband (nm)	Power measurement range (dBm) <sup>3</sup>	Calibrated wavelength (nm)	Max power (dBm)
OLT	Downstream 1490 nm	1470-1510	-40 to -5	1490	-5
	Downstream 1577-1578 nm	1572-1582	-40 to -5	1577	-5
PON ID Decode (dB)		≥-30			
Isolation (dB)		40			
ORL (dB)		50			
Power uncertainty (dB) <sup>2</sup>		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 <sup>4</sup> (OLT-ID, OLT-Class, OLT-Tx)	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 <sup>5</sup> (dB)	10 m to 20 km
Distance Measurement Accuracy (m) <sup>6,7</sup>	±(1 + .01 x L)
Laser Safety	Class 1 per 60825-1:2014 edition

### Notes:

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

## Ordering Information

P/N	Description
<b>PON Analyzer Models</b>	
Z06-05-109P	FX120T GPON and XG(S)-PON Analyzer (Downstream/Terminated only), 1490/1577nm
Z06-05-110P	FX120T EPON and 10G-EPON Analyzer (Downstream/Terminated only), 1490/1577nm
<b>PON Software Options</b>	
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)
499-05-949	ONT Emulation (must use with SFP xPON ONT, 301-01-026G/027G/028G)
499-05-882	OPM Mode Setting (Advanced if off)
<b>Hardware Options</b>	
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
<b>Ethernet Options</b>	
499-05-879	V-Test/V-Perf Line Rate HTTP Throughput up to 10GE
499-05-940	Multi-Gig Loopback Mode
<b>Pluggable Optics</b>	
301-01-026G	SFP GPON ONT Emulation (required for ONT Emulation, 499-05-949)
301-01-027G	SFP - 10G EPON ONT Emulation (requires 499-05-949 ONT Emulation)
301-01-028G	SFP - 10G XGS-PON ONT Emulation (requires 499-05-949 ONT Emulation)

## General Specifications

Storage	Internal 16 GB flash	Battery	56 Wh smart Li-Ion battery
Connectivity	Built-in: WiFi 802.11b/g/n (optional), Bluetooth® (optional) micro-B USB 2.0 OTG USB A 2.0 via OTG cable 10/100Base-T via OTG adapter (optional)	Battery Autonomy	Application dependent (>12h idle)
		AC Adaptor	Input: 100-240 VAC, 50/60 Hz, 1.5A Output: 15 VDC, 4A
		Operating Temperature	-5°C to 45°C (23°F to 113°F)
		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)		



VeEX Inc.  
2827 Lakeview Court  
Fremont, CA 94538 USA  
Tel: +1.510.651.0500  
Fax: +1.510.651.0505  
www.veexinc.com  
customer@veexinc.com

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D05-00-226P B00 2025/07