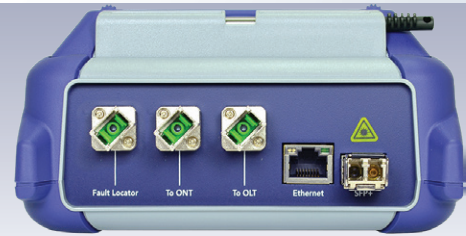


FX120

PON Analyzer & Multi-Gigabit Service QoE Test Set



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 downstream/upstream power levels as well as OLT/ONT IDs and status and TC-Sync. Certify QoE using Speed Test and V-PERF to check internet connectivity and speed up to 10 Gbps. Optional Fault Locator feature allows technicians to check drop cables.

Product Highlights

- Compatible with GPON, XG(S)-PON, and EPON networks
- Pass/Fail ITU-T 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
- 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
- Complete Layer 4+ test suite: V-TEST (Ookla® Speedtest®), V-PERF (RFC6349), and V-FTP upload and download tests

Basic Mode

- Dual port wavelength filtered, through-meter for simultaneous ONT/ONU service verification
- Wavelengths: 1270/1310/1490/1577nm with optional 1550nm
- Upstream/downstream LED status indicators for signal and frame status
- ITU-T/IEEE standards
- Low insertion loss: ≤ 1.5 dB typ.

GPON/XGS-PON

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

EPON (option)

- Automatic EPON OLT Mac detection
- EPON ONU LLID, ONU MAC and ONU status per IEEE

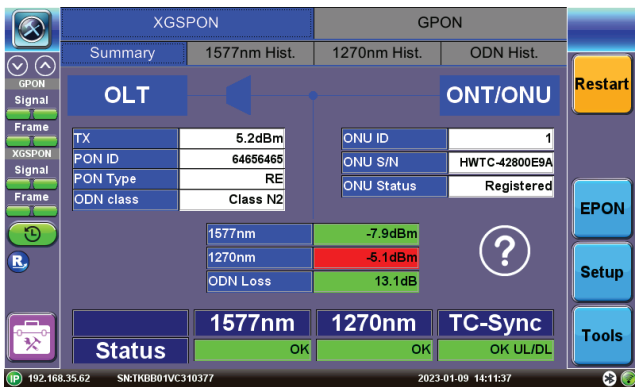
GPON/XGS-PON Advanced Function Mode

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

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.



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
	Link Type	0b0
PON ID	Administrative Label	0x6465646
	DWLCH ID	0x5
R	Reserved	0b0
C	TX Optical Level Reference	0b0
TOL	Transmit Optical Level	0x161

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

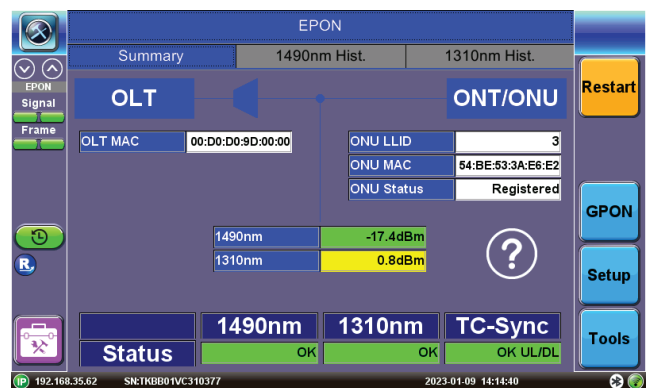
PLOAM Capture/Decode

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.

Dir	Time	Id	Message
Down	23/01/13 07:01:44.985375	Broad	Upstream Overhead
Down	23/01/13 07:01:44.985500	Broad	Upstream Overhead
Down	23/01/13 07:01:47.338000	Broad	PON-ID
Down	23/01/13 07:01:50.685500	Broad	Upstream Overhead
Down	23/01/13 07:01:50.685625	Broad	Upstream Overhead
Down	23/01/13 07:01:50.685750	Broad	Upstream Overhead
Down	23/01/13 07:01:52.338500	Broad	PON-ID
Down	23/01/13 07:01:56.385625	Broad	Upstream Overhead
Down	23/01/13 07:01:56.385750	Broad	Upstream Overhead
Down	23/01/13 07:01:56.385875	Broad	Upstream Overhead
Down	23/01/13 07:01:57.338125	Broad	PON-ID
Down	23/01/13 07:02:02.085875	Broad	Upstream Overhead
Down	23/01/13 07:02:02.086000	Broad	Upstream Overhead
Down	23/01/13 07:02:02.086125	Broad	Upstream Overhead

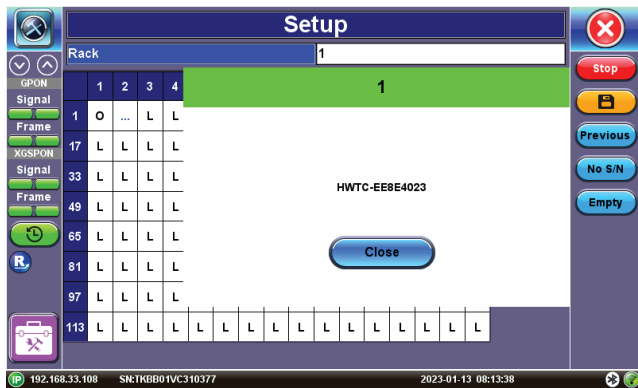
Passive Optical Network Test Set EPON

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.



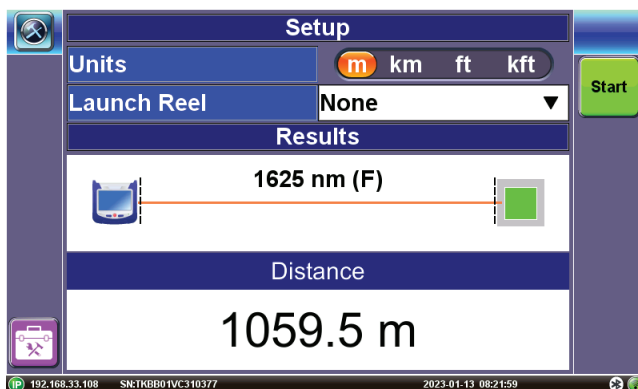
Super PM - Advanced Splitter and Cabinet Analysis

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, FTTx, LAN/WAN, CATV and military 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 60m to 10 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

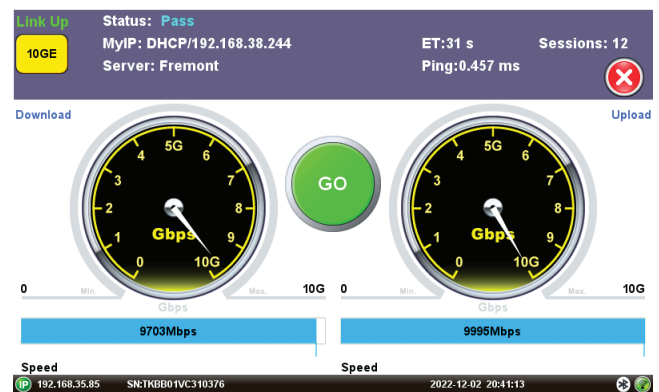
ROHS compliant and Lead Free per Directive 2002/95/EC

***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.



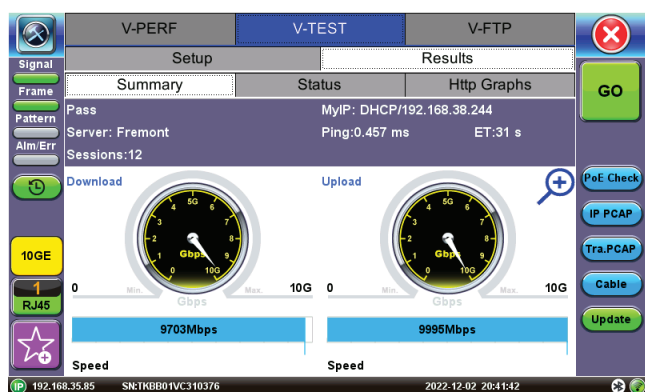
The V-TEST application is flexible enough to operate in different modes depending on user preference:

- 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)

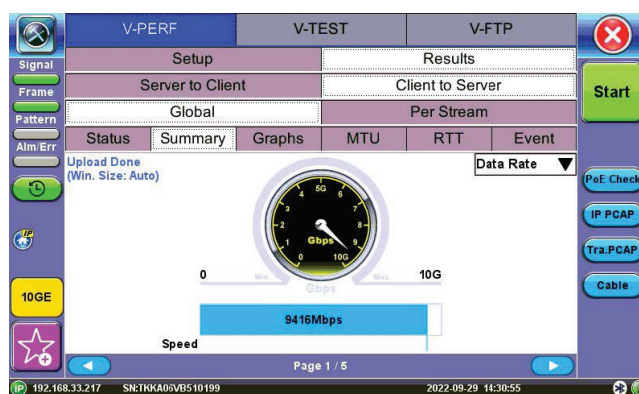
- Full HTTP line rate
- HTTP client mode
- Connection time to server
- Total Data Transfer time
- Requires V-TEST Server Speedtest® Compatible Mode
- Compatible with Ookla's network of Netgauge Servers
- Speedtest® Powered



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

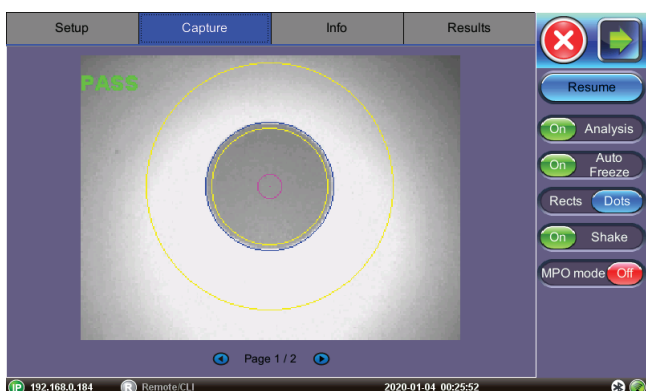
Digital Fiber Inspection Scope

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 Specifications¹

FTTx Specifications		Spectral passband (nm)	Power measurement range (dBm) ⁶	Calibrated wavelength (nm)	Max power (dBm)
OLT	Downstream 1490 nm	1470-1510	-35 to 2	1490	2
	Downstream 1550 nm ⁵	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 ²	1270	13
	Upstream 1310 nm, burst mode	1300-1320	-28 to 12 ²	1310	
Isolation (dB)		40			
ORL (dB)		50			
Pass-through insertion loss (dB) ³		≤1.5			
Power uncertainty (dB) ⁴		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 ⁷ (OLT-ID, OLT-Class, OLT-Tx, ONU/ONT SN)	Standard offering
Active ONU/ONT List	Standard offering
PLOAM Decoder	Standard offering

Notes:

1. At 23°C ± 3°C using SC/APC
2. Burst mode -35 dBm to 13 dBm
3. Measured at 2 dBm
4. Measured at -10 dBm
5. 1550 nm only displays signal level
6. Data recovery range is reduced but meets ITU-T standards
7. Requires activation of PON-ID functionality in PON system per ITU-T G.984.3 Amd 3

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)	Battery Autonomy	Application dependent (>12h idle)
	micro-B USB 2.0 OTG	AC Adaptor	Input: 100-240 VAC, 50/60 Hz, 1.5A
	USB A 2.0 via OTG cable		Output: 15 VDC, 4A
	10/100Base-T via OTG adapter (optional)	Operating Temperature	-5°C to 45°C (23°F to 113°F)
Languages	Multiple languages supported	Storage Temperature	-25°C to 55°C (-13°F to 131°F)
Size (H x W x D)	150 x 150 x 80 mm (5.9 x 5.9 x 3.15")	Humidity	0% to 95% non-condensing
Weight	1.0 kg (2.2 lb)	Certifications	CE & ROHS compliant

Ordering Information

XG(S)-PON Analyzer Models	
P/N	Description
Z06-05-054P	FX120 XG(S)-PON Analyzer, 1270/1310//1490/1550/1577 nm, Fixed SC/APC
Z06-05-055P	FX120 XG(S)-PON Analyzer, 1270/1310//1490/1577 nm, Fixed SC/APC



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