

**INSTALL
VERIFY
DELIVER
MONITOR**



Test Solutions Bridging the Digital Divide

Deliver Quality Broadband Internet Solutions to Rural Communities

VeEX[®] RDOF Test Solutions

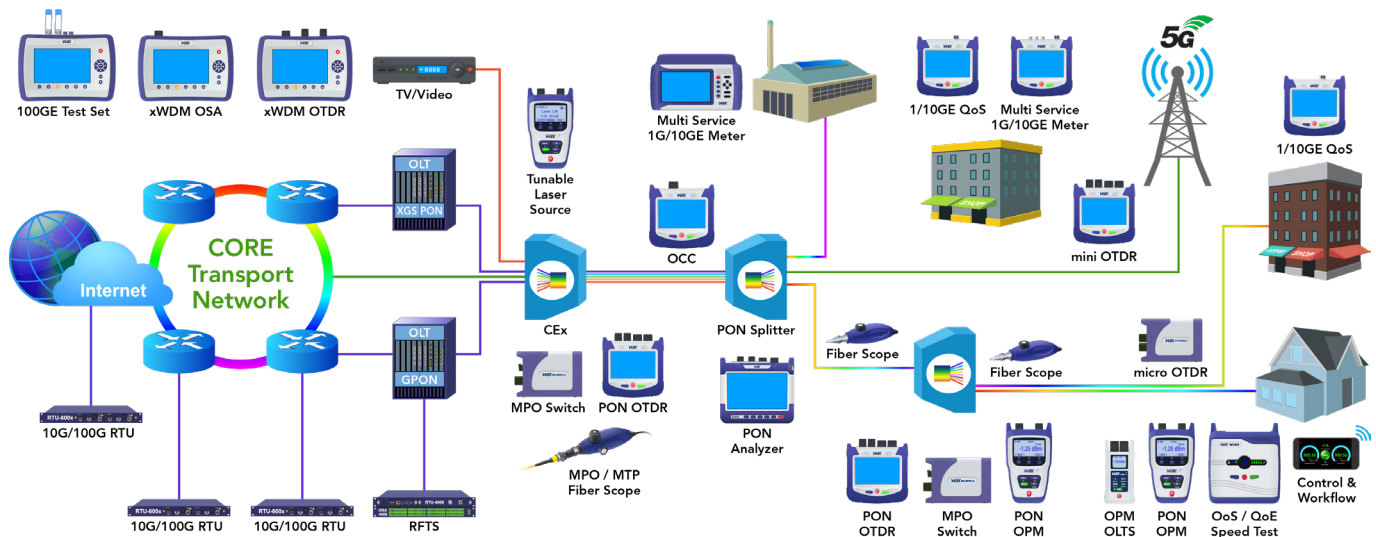
The Federal Communication Commission (FCC) Rural Digital Opportunity Fund (RDOF) and 5G Fund for Rural America are programs focused on bridging the digital divide by bringing fixed and mobile broadband services to unserved and partially served rural communities. These funds are awarded to service providers offering the best performance. Quality of Service (QoS) and compliance are at the core of these programs, including the attainable data rates and latency (delay), defined by four service tiers.

RDOF Performance Requirements

Performance Tiers	Rates (Down/Up)	Usage Allowance
Minimum	≥ 25/3 Mbps	≥ 250 GB*
Baseline	≥ 50/5 Mbps	≥ 250 GB*
Above Baseline	≥ 100/20 Mbps	≥ 2 TB
Gigabit	≥ 1 Gbps/500 Mbps	≥ 2 TB




Latency Tiers	Latency
High Latency	≤ 750 ms (VoIP MOS ≥ 4)
Low Latency	≤ 100 ms

* Or U.S. median, whichever is higher.




High-speed Internet Service Activation, QoS Verification and Assurance








Ethernet and Internet service activation are key to compliance, customer satisfaction and user experience. VeEX test sets offer V-PERF and V-TEST throughput performance tests, as well as a broad range of troubleshooting tools from Layers 1 to 4+. The V-PERF stateful TCP throughput test, based on the RFC 6349 standard, is compatible with VeEX hardware-based test heads and iPerf servers. Compared to CPU-based and software solutions, hardware-based V-TEST Internet speed test offers reliable measurement and is compatible with Ookla® Speedtest™ servers. VeEX solutions meet the needs for the inevitable move to multi-Gigabit Services and 5G backhaul. Think beyond 1 Gbps.





Applications	Tests	VeEX Test Set	Product Highlights
Internet Service Activation, QoS and QoE	Internet Access Verification, Speed Test, Latency	NET-BOX™ 	Low-cost high-performance hardware-based Internet services test set <ul style="list-style-type: none"> • V-TEST speed test up to 4 Gbps. • 1000BASE-T and 1GBASE-X interfaces • Easy to use with smartphone or tablet
Ethernet and Internet Service Activation, QoS and QoE, Troubleshooting	Internet Access Verification, Speed Test (up to 10 Gbps), Latency, Throughput, Errors Ethernet Troubleshooting, WiFi check, VoIP/MOS, and more	MTX150x 	Complete Ethernet handheld test set for Business and Residential services <ul style="list-style-type: none"> • Copper: 2x 10/100/1000BASE-T RJ45 • Fiber: 2x 1G/10GBASE-X SFP+ • Ethernet Layer 2, 3 and 4+ tests • V-TEST speed test, V-PERF, V-FTP • VoIP tests
Service Activation, QoS and QoE, Troubleshooting, Network Maintenance, Transport link activation, etc.	Internet Access, Speed Test, Latency, Throughput, Errors Ethernet Troubleshooting WiFi check, ISDN PRI, VoIP/MOS OC192-ST51, T3, T1 Datacom, and more	MTX150-10G 	All-in-one Multi-service test set from 50 bps to 10 Gbps <ul style="list-style-type: none"> • Ethernet up to 10GE, Layers 2, 3, 4+ • SONET, STS1 to OC192 • T3, T1, ISDN PRI, VF • Datacom • VoIP tests

Fiber Optics/PON/FTTx Construction and Maintenance

Although RDOF is considered technology agnostic, it favors FTTx solutions for its higher performance, lower latency, robustness, being considered a long-term investment and its performance at the Gigabit tier. Installing, handling, testing, troubleshooting, and monitoring the fiber plant becomes crucial.



Applications	Tests	VeEX Test Set	Product Highlights
Mini OTDR	Fiber link characterization and fault location for Point-to-Point and multi-point (PON) fiber networks	FX150+ 	<ul style="list-style-type: none"> • Single and/or multimode OTDR support • LAN/WAN, FTTx/PON applications • Various dynamic range versions available • Built-in OPM and OLS options • Supports VeEX Fiberscopes • Save results internally or Fiberizer® Cloud

Applications	Tests	VeEX Test Set	Product Highlights
Micro OTDR	Out-of-service or In-service testing, Link characterization and fiber troubleshooting	OPX-BOXe 	<ul style="list-style-type: none"> • OTDR without display designed to work with mobile devices, Windows PCs or VeEX testers • Android and iOS mobile device support • USB, Bluetooth and WiFi support, • Rechargeable 5Volt Lithium-Ion battery
CWDM/DWDM Optical Channel Checker (OCC)	Measures CWDM and DWDM signal levels according to User defined thresholds and wavelengths per ITU-T grids	FX180X 	<ul style="list-style-type: none"> • CWDM version - measures all 18 CWDM wavelengths • DWDM version – measures all 97 DWDM channels in C-band
CWDM & PON Light Source	Laser source for construction of CWDM, PON and Hybrid networks	FX86 	<ul style="list-style-type: none"> • Four-port CWDM laser source • Supports any combination of four CWDM wavelengths including 1270, 1310, 1490 and 1570 nm for 1G/10G PON ODN loss characterization • Outputs can be activated and modulated individually • Can be used with Fiber Identifiers
Optical Loss Test Set (OLTS)	Optical Loss Measurement	FX84/FX45 	<ul style="list-style-type: none"> • OPM, OLS, and OLTS configurations • Absolute and Relative measurement • Single and/or Multimode support • Test results with date/time stamp • PC software or Mobile App for reporting
10G PON Optical Power Meter	FTTx through mode optical power measurement for G-PON, XG(S)-PON, EPON and 10G-EPON systems	FX81 	<ul style="list-style-type: none"> • ONU and OLT test ports with filtered, pass-through design • Concurrent Upstream and Downstream measurements • High speed digital design to measure 1270/1310 nm upstream burst signals accurately • 1490/1550/1577 nm Downstream
PON Power Meter	FTTx through mode optical power meter for service activation of B/E/G-PON systems	FX80 	<ul style="list-style-type: none"> • ONU and OLT ports • Concurrent Upstream and Downstream measurements • 1310 nm Upstream CW/Burst support • 1490/1550 nm CW Downstream
Optical Power Meter (OPM) Optical Light Source (OLS)	Optical power measurement, Laser light source	FX48/FX45/FX40 	<ul style="list-style-type: none"> • PON, Telco, CATV and LAN/WAN applications • Singlemode and Multimode testing • Standard and high-power versions • Dual wavelength laser source • OPM, OLS configurations • High accuracy and wide dynamic range

Applications	Tests	VeEX Test Set	Product Highlights
Fiber Inspection Scopes	Inspect optical connectors, patch cords and bulkheads on patch panels before and after cleaning and prior to making any connection	DI-1000  DI-1000MPO 	<ul style="list-style-type: none"> • Singlemode and multimode inspection per IEC standards • Precise and stable single-finger focus • Single or multi-fiber (MPO/MTP®) from 12 up to 48 fibers • Powered by USB 2.0 from VeEX testers, Android mobile devices or PC
Live Fiber Identifier (LFI)	Live fiber detection Traffic direction indicator Fiber identifier when used with modulated light source	FX15 	<ul style="list-style-type: none"> • Signal level readout • Tone detection LEDs (270 Hz, 1/2 kHz) • Fiber chuck adapters for different fiber sizes • Rugged, metal design
Visual Fault Locator (VFL)	Visual identification/detection of macrobends and broken fibers in splice enclosures	FX10+ 	<ul style="list-style-type: none"> • Small pen size for field applications • Simple operation • CW and Pulsed operation • Rugged and Weatherproof

Compliance Testing, Monitoring and Quality Assurance

Proactive network testing, monitoring and rapid reaction is important to RDOF participants. Under FCC 19-104 and Performance Measures Order, all high-cost support recipients serving fixed locations must perform regular Internet speed and latency tests from the customer premises (active subscribers) to a remote test server located at or reached by passing through FCC-designated IXPs. VeEX field testers can perform hardware-based speed tests up to 10 Gbps towards centralized test heads. These RTUs can also test critical transport/interconnect links between network nodes, up to 100 Gbps.

Applications	Tests	VeEX Test Set	Product Highlights
Centralized & Automatic Compliance Testing	Internet Speed Test, QoE, QoS, RFC 6349 PERF, Ethernet performance, Throughput, Latency, Errors	RTU-320 	<ul style="list-style-type: none"> • Hardware-based centralized test head, for guaranteed performance • Access, Intra and Interconnect services and link testing • Proactive network test scheduling, on-demand verification and maintenance tests, 24/7 availability
Remote Fiber Test System (RFTS)	Automated fault location, Degradation detection, Alarming and dispatch	RTU-4000 	<ul style="list-style-type: none"> • Proactively monitor network fibers in real-time, 24/7 • In-service testing using filtered 1625 nm or 1650 nm channels • OTDR test ports fitted with fixed or universal connectors • Built-in launch fiber

Fiber Monitoring uses non-intrusive, out of band OTDR technology to monitor the health of FTTx/PON networks. Service providers worldwide recognize the value of testing and troubleshooting the optical distribution network (ODN) from the OLT location which significantly reduces Mean Time to Repair (MTTR) and CAPEX. Since 5G wireless networks play an integral part in addressing the digital divide, monitoring the fiber backhaul associated with these systems is also of particular importance.

VeEX Test and Measurement Solutions

Our innovative and cost-conscious solutions are well positioned to address the technical requirements for construction, service activation, QoS verification, proactive monitoring and troubleshooting. We offer a broad line of high performance instruments to help assure compliance with required quality of service (QoS) and Quality of Experience (QoE) are met and maintained. Contact us to learn more.

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