TX300s User Manual

All-in-one, T1/E1 to 100G

P/N D07-00-092P Rev. C01

Please direct all questions to your local VeEX® Sales Office, Representative, or Distributor. Or, contact VeEX technical support at www.veexinc.com.

Table of Contents

General Information

This user manual is suitable for novice, intermediate, and experienced users and is intended to help use the features and capabilities of VeEX Inc. products successfully. It is assumed that the user has basic computer experience and skills, and is familiar with telecommunication and other concepts related to VeEX Inc. product usage, terminology, and safety.

Every effort was made to ensure that the information contained in this user manual is accurate. Information is subject to change without notice and we accept no responsibility for any errors or omissions. In case of discrepancy, the web version takes precedence over any printed literature. The content in this manual may vary from the software version installed in the unit. For condition of use and permission to use these materials for publication in other than the English language, contact VeEX Inc.

This manual describes software and/or a device that uses software either developed by VeEX Inc. or licensed by VeEX Inc. from third parties. The software is confidential and proprietary of VeEX Inc. The software is protected by copyright and contains trade secrets of VeEX Inc. or VeEX's licensors. The purchaser of this device and/or software, downloaded or embedded, agrees that it has received a license solely to use the software as embedded in the device and/or provided by VeEX Inc., and to use it solely as intended and described in this manual. The purchaser is prohibited from copying, reverse engineering, decompiling, or disassembling the software.

Customer Support

For more technical resources, visit www.veexinc.com.

For assistance or questions related to the use of this product, call or e-mail our customer care department for customer support. Before contacting our customer care department, have the product model, serial number, and software version ready. Please locate the serial number on the back of the chassis. Please provide this number when contacting VeEX Inc. customer care.

Support hours may vary depending on the product.

Product Technical Support Contact Information

Hours: Support is generally available 8:00 AM to 8:00 PM, Eastern Standard Time, Monday to Friday.
Phone: +1 510 651 0500
E-mail: customercare@veexinc.com

Warranty

For warranty information on VeEX Inc. products, go to www.veexinc.com.

To activate the warranty, please register your production at www.veexinc.com/Support/ProductRegistration.

Patent Information

VeEX Inc. product hardware and software may be protected by one or more patents on file with the United States Patent Office.

Documentation Conventions

Icons used in this manual:

	Marks a helpful tip (action or method), which can save time and improve usability of the product.
	Provides important information needed to use this product and avoid mis-steps.
	Cautions against and action or inactivity, which can hinder productivity.
	Strongly warns against a condition, an action, or inactivity which can lead to a health hazard, injury, equipment damage, data loss, and/or financial losses.
	Stop and read before continuing.

Safety Information

Safety precautions should be observed during all phases of operation of this instrument. The instrument has been designed to ensure safe operation; however, please observe all safety markings and instructions. Do not operate the instrument in the presence of flammable gases or fumes or any other combustible environment. VeEX Inc. assumes no liability for the customer's failure to comply with safety precautions and requirements.

Lithium-ion Battery Precautions

Lithium-ion (Li-ion) battery packs are compact and offer high capacity and autonomy, which make them ideal for demanding applications, like providing long lasting power to portable test equipment. For safety reasons, due to their high energy concentration, these batteries packs and products containing them must be used, charged, handled, and stored properly, according to the manufacturer’s recommendations.

Li-ion battery packs contain individual Li-ion cells as well as battery monitoring and protection circuitry, sealed in its plastic container that shall not be disassembled or serviced.

The test set unit's battery pack is also fitted with a safety connector to prevent accidental short circuits and reverse polarity.

- Always charge the unit's battery pack inside the test platform battery bay using the AC/DC adapter supplied by VeEX.
- Do not charge or use the battery pack if any mechanical damage is suspected (shock, impact, puncture, crack, etc).
- Do not continue charging the battery if it does not recharge within the expected charging time
- Storage: For long term storage, the battery pack should be stored at 20°C/68°F (room temperature), charged to about 30 to 50% of its capacity. Spare battery packs should be charged and used at least once a year to prevent over-discharge (rotate them regularly).
- It is recommended to charge and use battery packs at least every three months. Battery packs shall not go without recharging (reconditioning) for more than six months.

- After extended storage, battery packs may reach a deep discharge state or enter into sleep mode. For safety reasons, Li-ion batteries in deep discharge state may limit the initial charging current (pre-recharge) before starting their regular fast charging cycle. The pre-charging state may take several hours.
- Air transportation of Li-ion batteries is regulated by United Nations' International Air Transportation Association (IATA) Dangerous Goods Regulations and by country-specific regulations. Please check local regulations and with common carriers before shipping Li-ion battery packs or products containing relatively large Li-ion battery packs.

Optical Connectors

The test sets display a laser warning icon when the laser source is active to alert the user about a potentially dangerous situation. It is recommended to:

1. Deactivate the laser before connecting or disconnecting optical cables or patchcords.
2. Never look directly into an optical patchcord or an optical connector interface (SFP+) while the laser is enabled. Even though optical transceivers are typically fitted with Class 1 or 2 lasers, which are considered eye safe, optical radiation for an extended period can cause irreparable damage to the eyes.
3. Never use a fiber microscope to check the optical connectors when the laser source is active.

Safe Module Handling

While replacing test modules, all work on the open panel must be performed only by suitably qualified personnel who is familiar with the dangers both to people and to the instrument itself.

Modules are not hot swappable. The platform must be turned off and unplugged from VAC mains when removing or inserting test modules.

For safety and EMC (Electromagnetic Compatibility), empty module slots must be properly covered with blank panel covers.

Prevent foreign objects from entering the chassis, before, during and after module exchange or re-configuration process. They could create short circuits or damage internal fans.

Always store test modules by themselves in individual ESD protected packaging (with no loose elements, like screws or tools).

Electrical Connectors

Telephone lines may carry dangerous voltage. Always connect the electrical test ports to known test interfaces which carry low level signals.

ESD: Electrostatic Discharge Sensitive Equipment

Test modules could be affected by electrostatic discharge. To minimize the risk of damage when replacing or handling test modules, make sure to follow proper ESD procedures and dissipate any electrostatic charge from your body and tools and the use proper grounding gear.

- Perform all work at a workplace that is protected against electrostatic build-up and discharging.
- Never touch any exposed contacts, printed circuit boards or electronic components.
- Always store test modules in ESD protected packaging.
- Wear ESD protection and grounding gear when:
  - Inserting, extracting, or handling test modules.
  - Inserting or removing SFPs, XFPs, QSFPs, or CFPs from the platform.
  - Connecting or disconnecting cables from modules or platform.

Getting Started

Introduction to TX300s Multi-Service Test Platform

VeEX® VePAL TX300s Family is a fully-integrated and self-contained multi-service test solution for OTN, SDH, SONET, PDH, DSn, Fibre Channel, Ethernet, Mobile Backhaul, CPRI/OBSAI and Fiber Optics networks. Equipped with SyncE, 1588v2 PTP, and CPRI/OBSAI test options, the unit offers unprecedented synchronization turn-up and troubleshooting test functions for mobile operators migrating to 4G LTE. Powered by the VeExpress™ system, TX300s users are able to share test options, either purchased or leased, with multiple devices, dramatically reducing Opex and Capex.

Platform Highlights

- All-in-One hardware platform reduces Capex
- The VeExpress ecosystem allows users to Buy, Rent, Lease-to-own and share test feature licenses

- Optimized for field engineers or technicians installing and maintaining OTN, SDH/SONET, Carrier Ethernet, Fibre Channel, CPRI/OBSAI and Fiber Optics networks transporting legacy and next generation services
- Flexible Software platform allows for multiple test applications running simultaneously
- GPS Receiver and built-in Atomic Clock reference options for frequency, phase and delay measurements
- Available in Single or Dual module versions and optional factory-installed OTDR
- Test set connectivity via Ethernet Management interface, Wi-Fi, Bluetooth®, or Data Card for back office applications and workflow optimization
- User defined test profiles and thresholds
- Fast and efficient test result transfer to USB memory stick
- Interchangeable Li-ion battery pack extends field testing time
- Asset Management: Maintain instrument software, manage test configurations, process measurement results and generate customer test reports using VeExpress

TX300s Hardware Options

TX300s

VeEX® VePAL TX300s Family is a fully-integrated and self-contained multi-service test solution for OTN, SDH, SONET, PDH, DSn, Fibre Channel, Ethernet, Mobile Backhaul, CPRI/OBSAI and Fiber Optics networks. Equipped with SyncE, 1588v2 PTP, and CPRI/OBSAI test options, the unit offers unprecedented synchronization turn-up and troubleshooting test functions for mobile operators migrating to 4G LTE. Powered by the VeExpress™ system, TX300s users are able to share test options, either purchased or leased, with multiple devices, dramatically reducing Opex and Capex.

TX320s

The factory-installed Dual Test Port Hardware Option offers a full-featured portable test solution for OTN, SONET/SDH, PDH/DSn, Carrier Ethernet, Fibre Channel and CPRI/OBSAI, as well as Wander and Phase synchronization measurements. The dual SFP+ interface adds bi-directional Ethernet monitor and pass through.

TX340s

The TX340s hardware option for the TX300s portable test platform offers advanced test solutions for OTN, SONET/SDH, PDH/DSn, Carrier Ethernet, Fibre Channel and CPRI/OBSAI. This factory-installed hardware option allows flexibility to fit any application, for example, the addition of a second TX340s, 100G or OTDR module, to be installed concurrently in the same test platform.

TX300s-OTDR

All-in-One Optical and Service Test Platform

The Fiber Optics test option for the VeEX® VePAL TX300s adds a full range of Optical test features that support OTDR, OPM, Light Source and VFL. Together with Advanced OTN, SDH/SONET, PDH/DSn, Ethernet, Fibre Channel, and Synchronous Packet Networks support, the TX300s offers a complete network test solution from physical layer up to higher layers of multi-service performance testing.

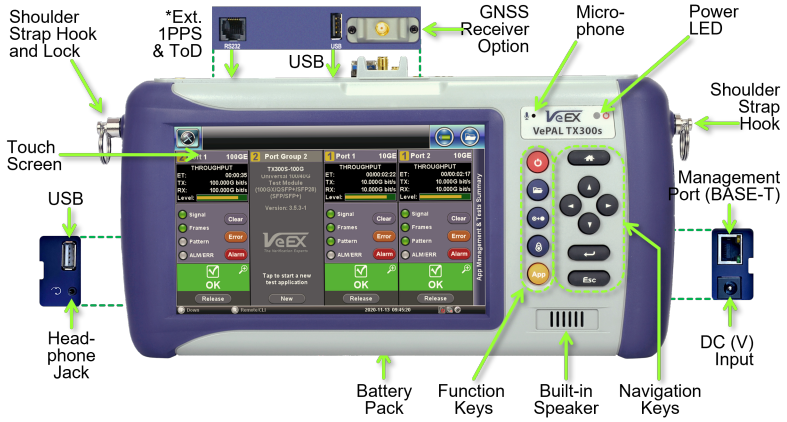
TX300s-100G

The TX300s-100G hardware option for the TX300s platform offers a full-featured portable test solution for Ethernet, Mobile Backhaul, Storage Area Networks, OTN, SDH/SONET links and services testing — 40 Gbps and 100 Gbps. The TX300s-100G factory-installed modules are available in the following versions:

- TX300s-100GX (QSFP28/QSFP+, SFP28SFP+/SFP and RJ45 test ports)
- TX300s-100GQ (QSFP28, QSFP+ test ports)
- TX300s-100G (CFP4, QSFP+ test ports)

TX300s Hardware Configuration

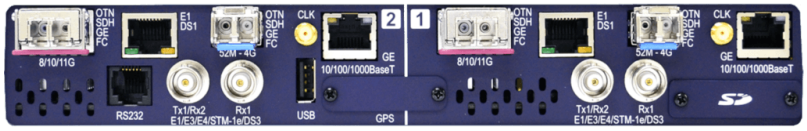
Please refer to their individual datasheets and manuals for further details. For specifications and an up to date list of modules available for the TX300s platform, go to www.veexinc.com/Products/TX300s.



TX300s Multi-Service Test Platform (a.k.a Chassis):[1]

Modules/Hardware Options *(Factory Installed)*

TX300s Module



- All-in-one multi-service test solution
- XFP ports support Ethernet interface for 10GE, SDH STM-64, SONET OC-192, Fibre Channel 8G and 10G, OTN at OTU2, OTU1e/2e and CPRI

[1] *The TX300s all-in-one rugged field test platform can be configured to meet all technologies required by field engineers to install, maintain and troubleshoot any communication technology and service. From Fiber Optics characterization to SAN, metro, core, and transport technologies, as well as IPv4/6, MPLS, ISDN, VoIP, IPTV, Precision Timing Protocol and synchronization services.*

- SFP ports support Ethernet interface from 100Base-FX to 1GE, SDH from STM-0 to STM-16, SONET from OC-1 to OC-48, Fibre Channel from 1G to 4G, OTN at OTU1 and CPRI/OBSAI
- RJ45 ports support 10/100/1000Base-T
- RJ45/Bantam and BNC ports support PDH/DSn and G.703 64k Codirectional electrical interfaces
- Modules 1 and 2 support independent measurements

TX320s Module

- All-in-one multi-service test solution
- Dual SFP+ ports support Ethernet interface from 100Base-FX to 10GE, SDH from STM-0 to STM-64, SONET from OC-3 to OC-192, Fibre Channel from 1G to 10G, OTN at OTU1, OTU2, OTU1e/2e and CPRI/OBSAI
- Dual RJ45 ports support 10/100/1000Base-T
- RJ45/Bantam and BNC ports support PDH/DSn and G.703 64k Codirectional electrical interfaces
- Port 1 and Port 2 support independent and simultaneous measurements
- Offers bi-directional Ethernet pass-through monitor test mode

TX340s Module

- Flexible, all-in-one multi-service test solution, from 64 kbps to 16 Gbps (can be combined with 100G and OTDR modules)
- Transport, Core, Metro, SAN, Backhaul and Fronthaul applications
- Supports up to four test port groups with independent and simultaneous measurements
- Test cards summary provides an overview of up to four running tests, as well as test application switching and management functions

OTN/SDH/SONET/PDH/DSn

- Advanced flexible OTN, SDH/SONET, PDH/DSn test payload map/mux, including EoOTN (ODU2e, ODU0 and ODUflex)
- Overhead Monitoring and Byte decoding
- Protection Switching and Service Disruption time
- Round Trip Delay on all interfaces and payload mappings
- Tandem Connection Monitoring
- Jitter and Wander (E1, E3, DS1, DS3, STM-1o, OC-3)
- Pulse Mask Analysis at E1, E3 and DS1, DS3 rates

Fibre Channel

- Storage Area Networks (SAN) testing up to 16G
- BERT and Throughput test
- RFC2544: Throughput, latency, frame loss, back to back tests
- Layer 1 and layer 2 loopbacks

CPRI Testing

- Common Public Radio Interface standard (CPRI): Unframed, Layer 1 Framed and Layer 2 tests (REC/BBU and RE/RRH emulation)

- Open Base Station Architecture Initiative (OBSAI): Unframed tests
- BER testing with PRBS stress patterns
- Latency measurements

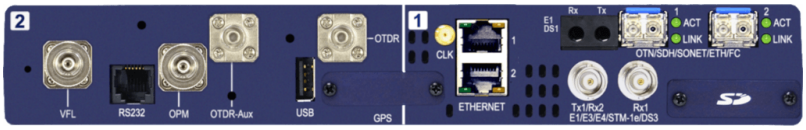
Ethernet

- RFC2544 Throughput, latency, frame loss and back to back tests
- V-SAM test suite compliant with ITU-T Y.1564 standard
- IEEE 802.3ah, ITU-T Y.1731, IEEE 802.1ag, MPLS-TP OAM support
- Q in Q (VLAN stacking), MPLS, MPLS-TP, PBB support
- RFC6349 V-PERF TCP test suite
- Layer 2 Control Protocol Transparency test
- In-service monitoring with frames capture and on-screen protocol decode
- One way latency with optional built-in GNSS receiver
- Fully integrated solution for synchronized packet networks
- Supports IEEE 1588v2/PTP and SyncE/ITU-T G.8261 standards
- Master Clock and Slave clock emulation
- IEEE 1588v2/PTP protocol monitor & decode, and PDV analysis
- Wander measurement and MTIE/TDEV analysis
- ESMC SSM generation, monitoring, and decoding
- VoIP and IPTV testing

IEEE C37.94™

- Power/Utilities Teleprotection Network testing
- BERT, SDT/APS, RTD, and transparency tests
- Passive bidirectional Monitoring and intrusive Pass-Through modes
- GNSS-assisted One-Way-Delay measurements
- Jitter and Wander Measurements

TX300s-OTDR Module



Optical Testing

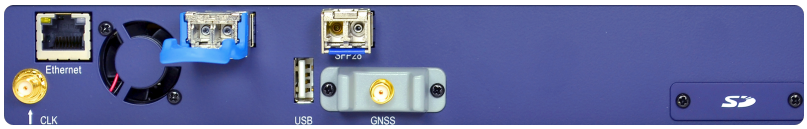
- FTTx/PON optimized parameters for best in class dead zones for 1xN splitters and normal reflective events
- Multimode and Singlemode Wavelength test options - 850, 1300, 1310, 1490, 1550 & 1625 nm
- Filtered 1625 nm OTDR port for in-service measurements and live fiber detection with embedded power meter
- High dynamic range (up to 45 dB) for long haul fibers and testing through high-port-count PON splitters
- Sampling points up to 256,000
- Event dead zone < 1m, Attenuation dead zone < 4m
- Telcordia GR-196 and SR-4731.sor file formats
- Optional V-Scout mode – Intelligent Link Mapping using intuitive icons derived from multiple test acquisitions

- Optional Built-in Visual Fault Locator, Optical Power Meter and Light Sources
- Optional Fiber Inspection Scope (USB)

Multi-Service Testing

- SyncE and IEEE 1588v2
- OTN, SDH/SONET, PDH/DSn
- Ethernet and Fibre Channel
- CPRI and OBSAI Testing

TX300s-100G Module



The TX300s-100G factory-installed modules are available in the following versions:

- TX300s-100GX (QSFP28/QSFP+, SFP28SFP+/SFP and RJ45 test ports)
- TX300s-100GQ (QSFP28, QSFP+ test ports)
- TX300s-100G (CFP4, QSFP+ test ports)

Change language and user interface style

Before using the platform, set the language and user interface style as needed. By default, the user interface style is set to USA if the unit is shipped to North America and to International if the unit is shipped to outside North America.

To change the GUI language and user interface style:

1. Tap **Utilities** and then tap **Settings**.
2. Tap the **Global** option.
3. Select the language from the **Language** drop-down list box.
4. Select the user interface style from the User Interface drop-down list box.

- **International:** Provides layer-based SDH/PDH configuration menus with access to detailed settings.
- **USA:** Provides simplified application-based SONET/DSn menu with more automation. The **Advanced Mode** option displays the configuration menu for additional settings.

To manually change the Date & Time:

Go to **System Tools >Utilities >Settings >Date & Time**, to manually set the date, time and time zone. Then, tap **Apply**.

To enable daylight saving time (DST), manually select a neighboring time zone with a +1:00 relative to the standard time zone of the current location. Set it back to the standard time zone offset when DST ends.

Get Standard Time from GPS/GNSS

If equipped with the GPS/GNSS receiver (hardware option), manually copy the GPS time into the system.

Go to **System Tools >Utilities >Settings >GPS/High Precision Clock**, to configure the GNSS Receiver and turn it ON. Once it recovers time (ToD UTC) from the satellites, click the **Sync ToD** button to apply the standard time to the RTU. The standard time will be applied at the start of the next second (rise of the internal 1PPS timing signal). The local UTC Offset (Time Zone) setting is used to apply the correction for local time. This manual Sync ToD time setting function should not be used when NTP is enabled.

For more information on the atomic clock and relative phase monitoring, see "High Precision Clock Sources" on page 65 and "GNSS/GPS & Sky View" on page 143.

Launching Test Applications

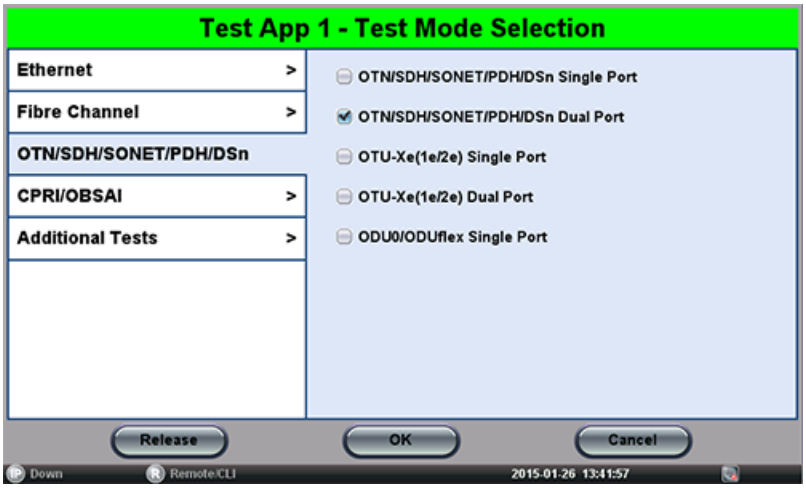
A Quick Guide is always presented in the Home screen after boot up.

This procedure can be started at any time, from any screen or menu.

The **Test Cards** Summary/Status screen offers intuitive test application management (launch, monitor, switching and release). Each test card is associated with a test module (orange numbers) and their individual test port groups (white numbers); capable of showing two, three or four possible tests, depending on the capabilities of the modules installed in the test platform.

- Test Cards are aligned in the same order of modules and ports they represent, for easy identification and correlation.
- Select the test card related to the desired module and port group, to start a test mode configuration, then follow the already familiar process.
- Use the chassis yellow App rubber button to quickly toggle among the active tests (up to four independent tests).
- Use the Test Cards icon, on the top-left corner of the screen, to see a summary of all running tests, available test resources, switch to a different test (touch on the status box with the magnifying glass icon), and release tests.
- Once a new test port group has been selected, using the New button on its Test Card, users can select the specific test interface type (Test Port), if required. Then the test module will present a menu of all applicable technologies (protocols) available for the selected port (QSFP-DD, CFP, SFP+, BNC, Bantam, RJ48, etc.)

1. Select an empty **Test App** (gray) button. The **Test Mode Selection** menu is displayed. If applicable, select a **Test Port**.
    - Up to four independent tests can run simultaneously (test set or test module dependent)
    - Some test applications may require two port groups (e.g., router wrap-around test) and may not be supported by all test modules or test sets configurations.



2. **Protocol** (technology group or link type), using the vertical tabs. (The available selection will depend on the capabilities of the selected port type.)
3. **Test Application/Mode**, using the check boxes. (The available test functions will depend on the of the selected protocol and purchased licenses.)

If the Test Set shows a different Test Mode Selection menu, update its software to the latest version available using VeExpress or download the upgrade package from the product page on www.veexinc.com.

4. Press **OK** to launch the Test Application

The test port is assigned to the selected test application and the required software/firmware is loaded.

Understanding Test Application GUI

A.  **System Utilities Button:** Tap this button access TX300s Utility functions Or press the orange App rubber button to toggle.

B.  **Active Test Application GUI:** Shows the Test Port Group being used and the Test App ID (Rate/Technology)

- Tap this button to release the Test App or change its Test Mode.

C. **Test Application Menu**

- Lists all test Functions, Applications and Tools available for the selected test mode
- Setup = Port and Test Signal configuration

D. **LEDs** - Test Signal Status

E. **History** - Clears past events reminder (blinking)

F. **Current test interface line rates**

G. **Action buttons** section

- This vertical section displays direct access functions applicable to each specific Test Mode, such as Start/Stop test, Laser control, Error and Alarm injection, Start protocol capture, etc.
- Most of these buttons offer immediate action. A few open a configuration menu.

Chassis Overview

To power on the test set, press for approximately two seconds, until the test set beeps once. See "Key Pad" on the next page for more information on the test set's buttons.

LEDs

Power LED

A single LED indicates the power state of the unit.

- **OFF** : The LED is off when the unit is powered off
- **GREEN**: The LED is green when the unit is powered on and fully charged.
- **ORANGE**: The AC/DC adapter is plugged in and the battery is charging.

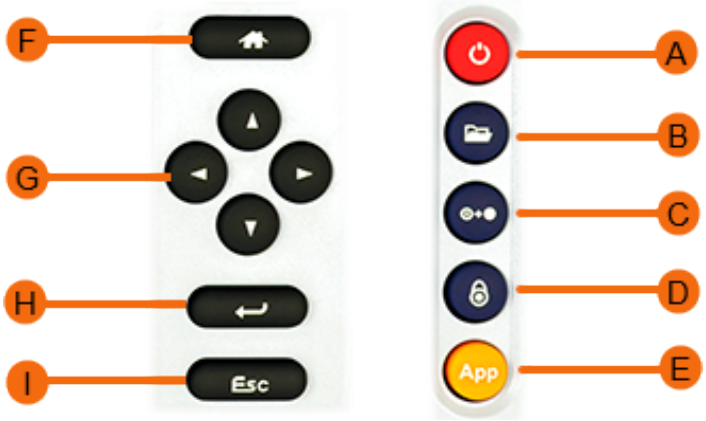
Audible Beeps

Low Battery status is indicated by a periodic beeping sound, every four seconds, and displaying a warning pop-up message on the screen.

When working on battery power, once the charge capacity reaches about 10%, the test set will start beeping to notify users to plug in the AC/DC adapter. A pop-up message may also be presented on the screen. When the charge level reaches 5%, the test set automatically initiates the shutdown process, to protect the battery.

To get information about the amount of battery charge and autonomy estimate (under current usage condition) tap the battery icon displayed on the top-right corner of the screen.

Key Pad



TX300s Keypad

A. Power: Press for 3-5 seconds to turn the test set ON or OFF (prevents accidental ON/OFF). FORCE OFF by pressing more than 10 seconds.

B. Save Test Results: Saves the current Test Results with customized or auto naming (yyyymmdd-hhmmss format). The **F1** key on standard keyboards can be used when controlled via VNC. Refer to "File Manager" on page 155 for details on saving files.

C. Clear History: Resets blinking LED reminders of past Errors or Alarms. Test results are not affected (not used in OTDR). The **F2** key on standard keyboards can be used when controlled via VNC.

D. Lock/Unlock Touch Screen: Can also be programmed to capture Screen Shots (**>Utilities >Settings >Global >Save Settings**). Use the **F3** in standard keyboards.

E. Test Application Selector: Quickly switches back-and-forth between the active Test Application and RXT platform Utilities functions; Active test is not affected.

F. Home: Returns to the Main Menu.

G. Cursor Keys: Application dependent. Offers alternative Navigation to touch screen (e.g. while wearing gloves in cold weather). Moves the cursor in any of the four supported directions (left, right, up, down).

H. Enter: Application dependent. Enter menus/functions.

I. Escape: Application dependent. Returns to previous screen/function.

Touch-Screen Display

The LCD supports touch-screen operation. To operate the touch-screen, use the stylus located in the top cover to navigate the menus and tabs. Please observe the following precautions:

- Never use excessive pressure on the touch-screen as this may damage its functionality.
- Never use sharp objects such as a pen, screwdriver etc. as this may damage the surface.
- Clean the surface of the touch screen using a soft cloth and mild detergent only. Do not use alcohol.

See "Touch Screen Calibration" on page 39 for instructions on how to recalibrate the touch-screen.

Battery

Overview

The test set platform is equipped with a smart Li-ion rechargeable battery pack, which is located on the rear of the unit. The battery will be partially charged upon delivery, so it is recommended to fully charge the battery before use. Please charge the battery at room temperature to preserve its life and to obtain maximum charge. The battery is charged during operation, provided the unit is connected to the AC Mains using the supplied AC/DC adapter. Removing the battery while the unit is powered on is not recommended - this may result in damage. Remove the rubber cover on the right side to connect the AC/DC adapter to the unit.

When battery capacity declines to 10%, an audible alarm and pop-up warning displays a notification to plug in the A/C adapter or shut down the unit. If this warning is ignored and the battery capacity is allowed to decline to under 5%, the unit will initiate a shutdown to protect the battery from damage and for safety.

If an event, such as the AC/DC adapter being unplugged, a power interruption occurs or some other event triggers the power load to exceed the 95W battery limit, the unit will initiate an emergency shutdown to protect the battery from damage and for safety.

During an emergency shutdown all modules' power is switched off. ***No test files (results or configurations) are saved****.*

Battery Charging Time

The total charging time depends on the remaining battery capacity percentage and the actual current load in the test unit. An idle test unit would recharge faster than an active one.

Attention!

- *For safety reasons, the battery charging time is always limited to a maximum of three hours.*
- *If the unit is being used while charging and a full charge (100% capacity) cannot be achieved within three hours, the charging will stop automatically.*
- *To resume charging, unplug the AC/DC adapter and use the test unit on battery power for a couple of minutes before plugging the adapter back into the unit. This will reset the charging circuitry.*

Warning!

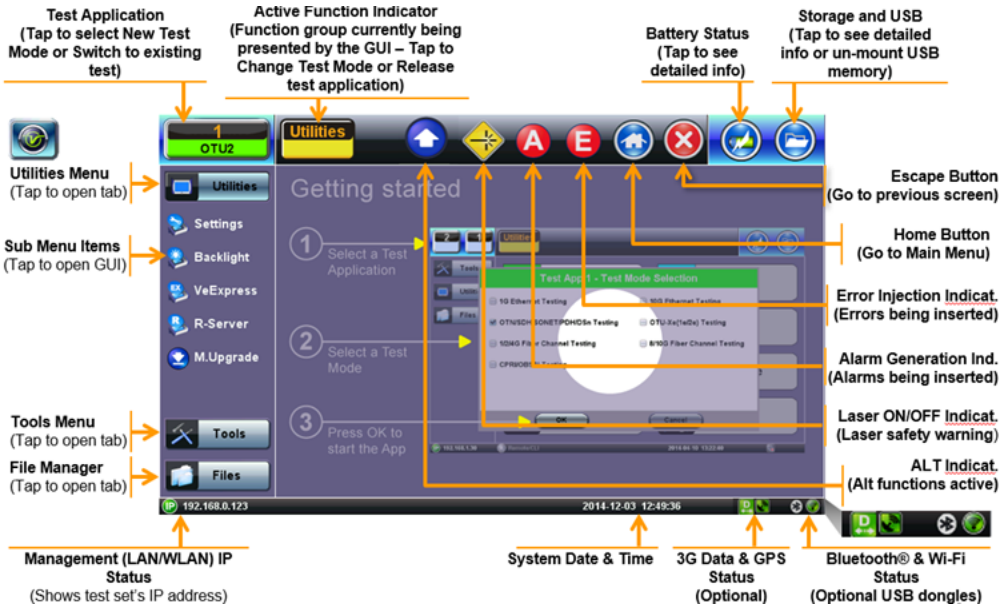
- ***DO NOT disconnect the AC/DC power supply when the unit is running under heavy load conditions (greater than the battery's current ratings), such as certain multi-module multi-test applications.***
- ***If the current required is too high, but still within the battery's limits, a warning message will be displayed when the AC/DC adapter is unplugged. All the tests are properly closed and the test unit shuts down.***
- ***Under overload conditions, the battery may not be able to supply enough current to keep the test scenario running and its safety mechanisms may shut the battery down without warning and test results may be lost.***

Battery Safety Precautions

For more information on safety precautions for batteries, see Lithium-ion Battery Precautions in "Safety Information" on page 8.

Home Screen

A Quick Guide is always present in the Home screen after booting up (actual image may vary with models and software version). *This screen can be displayed at any time from any screen.*



Menu Navigation

Navigate between test applications, setup menus, tabs, or active functions using the supplied stylus or by pressing ▲ / ▼ followed by ↵ on the keypad.

Quick Access Menu

This multi-tasking section provides convenient and immediate access to system features, connectivity, accessories, results, etc., always at your fingertip. Those features are always available, independently of whether tests are running or not.

Platform Functions

Utilities

About/Software Options

This section provides information about the software platform version, serial number, and as well other information relevant to the test set, which may be required when contacting Customer Support. The tab provides a list of software licenses (optional test features) currently loaded in the test set.

Software Options Tab

Activating New Licenses: Features and options marked as ‘Expired’ or "Disabled" (not currently loaded into the test set) can be purchased at any time and activated via VeExpress using an internet connection. Upon order confirmation, connect the test set to the internet via LAN or Wi-Fi, go to **>Utilities >VeExpress** and press

the **Check** button. The test set will download all newly added features and options from VeExpress servers and install them automatically.

If company policy doesn't allow access to the public internet or the test sets are used within a secured network, request License Keys for manual activation. License keys must be requested at the time new options are purchased. To activate new features, tap on the **expired item** and enter the Activation Code received from VeEX, VeEX partner or manager. Press **Activate** to complete the licensing process. Each activation code is specific to a test set and a feature. If multiple features are ordered, individual activation codes will be sent for each of them. Manually activated features are specific to a test set and can't be shared with other test sets.

Backlight

This section provides backlight control of the unit. There are two intensity settings:

1. Battery power and
2. AC power.

On Battery Power

- Select a timer to turn off the backlight if the unit is not in use. This function helps improve the battery autonomy and preserve LCD life.
- To enable the timer, check "Turn off backlight if device is not used for" and with the drop-down menu, adjust the duration of the idle time before the backlight is turned off.
- Once the timer is active and the backlight turned off, any action on the test set (touch screen, keypad) will turn on the backlight again.

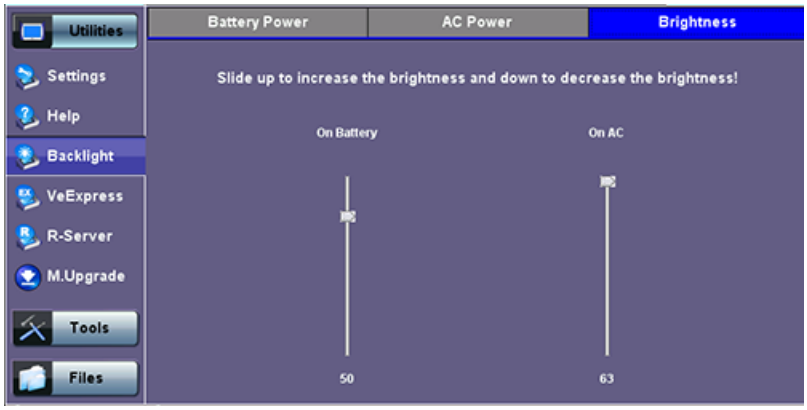
Backlight - Battery Power

Similar settings can be applied for when the test set is operating on **AC Power**.

Backlight - AC Power

Brightness

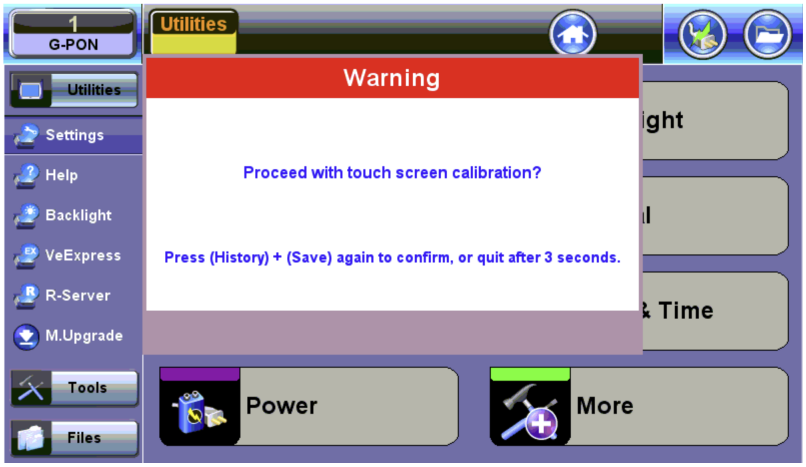
Select the brightness level for Battery and AC operation modes.



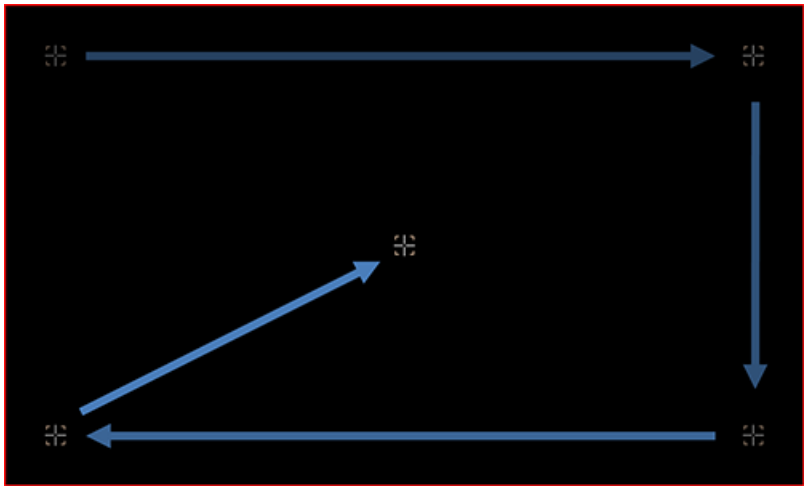
Backlight - Brightness

Touch Screen Calibration

Screen calibration can be accessed from the **Utilities** > **Settings** > **Screen**.



Press the **History** and **Save** buttons simultaneously to continue.



Once the touch screen calibration sequence has been started, it must be completed. Accurately touch the calibration points with the tip of the stylus.

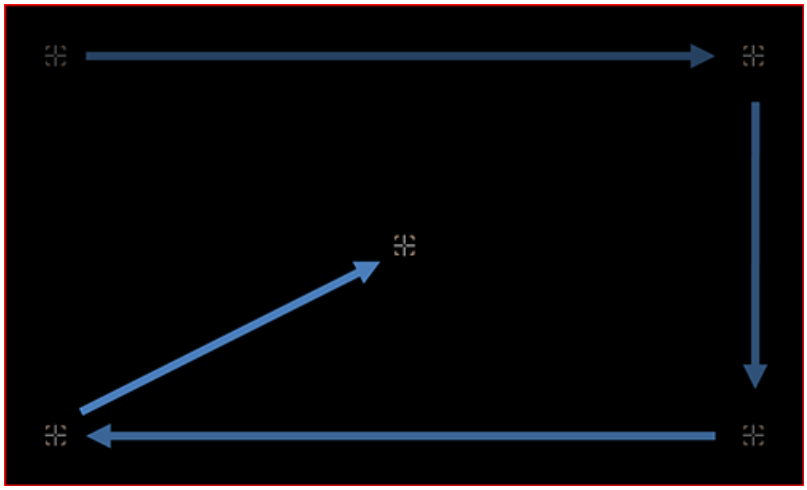
In the rare case that a VeEX product loses touch screen calibration, use the Web Remote function (*see below*) to launch the Screen Calibration.

Besides using the built-in screen and its graphical user interface (GUI) to launch the Screen Calibration directly from the test set, VeEX offers alternatives to correct stylus-to-cursor offsets when it is not possible from the touch panel.

Calibrate via Web Remote

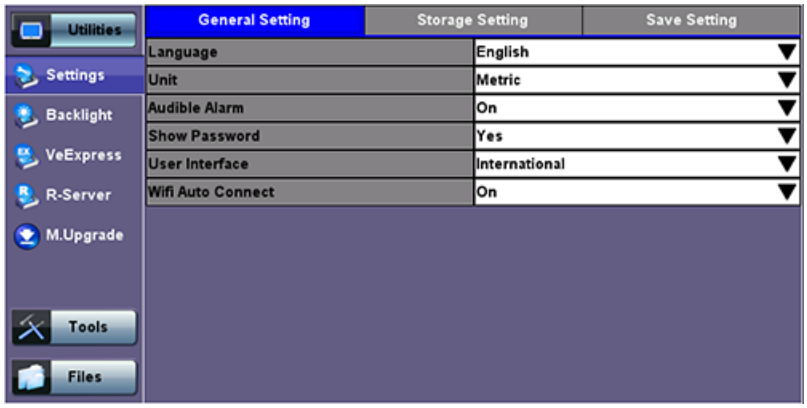
If the test set can still be connected to LAN or Wi-Fi, users can just launch a web browser, from a PC, tablet or smartphone, enter the test set's IP address, select Remote Control, enter the password.

Then, use the mouse to go to the touch Screen calibration function in the system tools menu and launch it. Go back to the test set and use the stylus to tap on all the calibration points with the tip of the stylus.



If the above procedures do not fix the touch screen issues, go to the VeEX website's Contact Us page, select [√] Customer Service/Tech Support, then provide the Product Type, Serial Number and a brief description of the behavior being experienced. If it is related to colder ambient temperatures, please state the approximate temperatures.

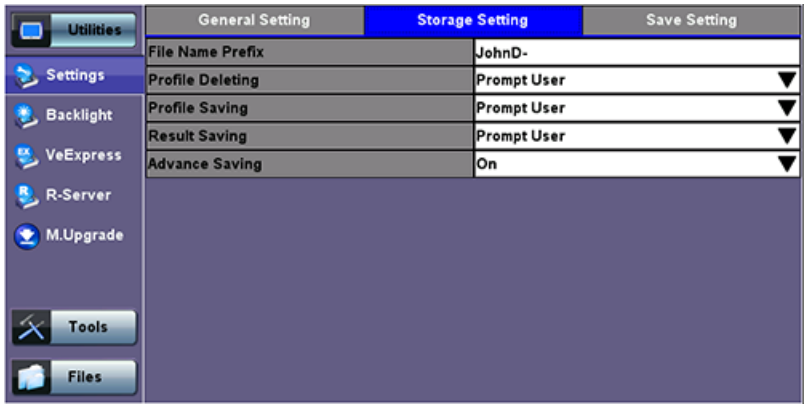
Global Settings



Utility Settings - General Setting

General Setting

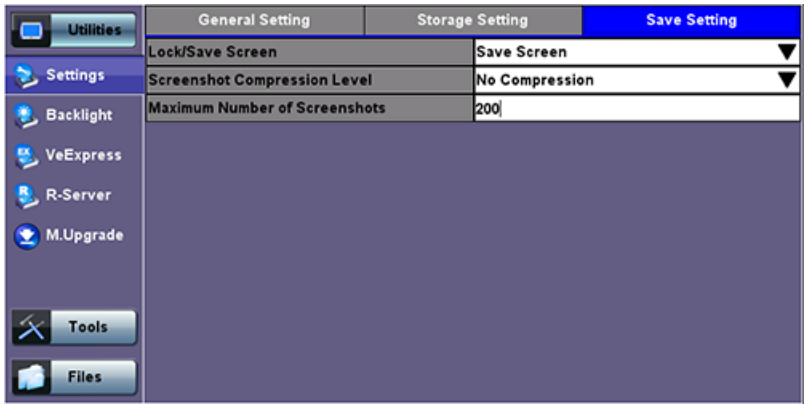
- **Language:** An alternative language for the user interface (if available). The device must be rebooted to fully activate the new language.
- **Unit:** Measurement system (English - feet or Metric - meter).
- **Audible Alarm:** When enabled, the test set's buzzer will sound (beep) when alarms and errors are being detected (if supported by the test application).
- **Show Password:** Hides/unhides username and password information associated with FTP and related IP functions.
- **User Interface:** The USA user interface version presents SONET/DSn application-oriented menus, while the International setting is more open to all settings.



Storage Setting

Storage Settings are not currently supported for OTDR, OPM, and Fiberscope results.

- **File Name Prefix:** Tap on the box to enter the file name prefix using the pop up alphanumeric keypad. Not used for OTDR filenaming.
- **Profile Deleting:** Auto Delete or Prompt before deleting profile.
- **Profile Saving:** Auto Overwrite or Prompt before saving profile.
- **Result Saving:** Manual or Prompt before saving results.
- **Advanced Saving:** Turn ON to add extra information to the results file to be uploaded to a centralized R-Server. *Requires Advanced Management Option.*.



Utility Settings - Save Setting

Save Setting

These options configure the behavior of the Lock key on the keypad. The Lock key can be set to do the following:

- **Lock/Save Screen**: Lock/Unlock the unit's screen to prevent accidental interruption during a long term test.
- **Screenshot Compression Level**: The compression level of the screen image (affects size of file and quality).
- **Maximum Number of Screenshots**: Sets the maximum number of screenshots that can be saved

on the unit. Each time the lock key on the keypad is pressed, a screen shot will be saved in memory. The screen shots can be recovered under **Files**>**Saved**.

Bluetooth

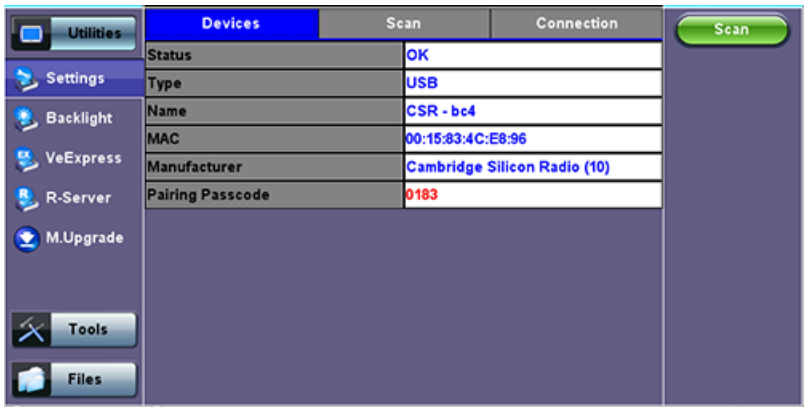
Built-in Bluetooth support offers wireless connectivity up to 10 meters (30 feet), providing an untethered connection between the tester and other Bluetooth compatible devices such as a PCs and smart phones, enabling users to transfer test results and other files.

A **Bluetooth** icon displayed on screen indicates the Bluetooth connectivity status. A grey icon indicates no Bluetooth connectivity, while a green icon indicates a successful Bluetooth connection.

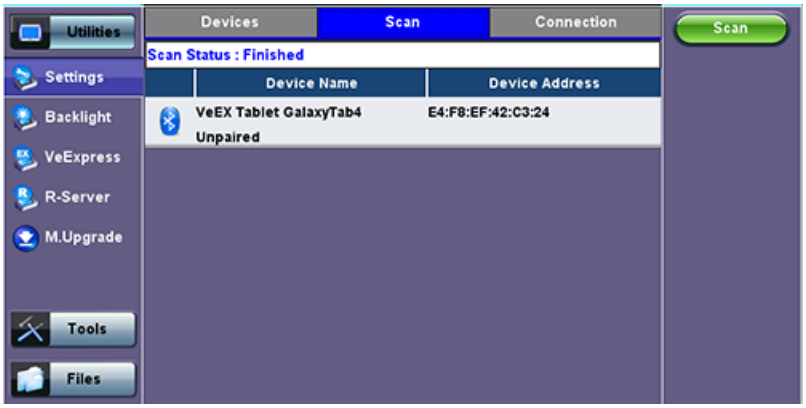
Bluetooth Adaptors - Compatibility Not all Bluetooth adaptors on the market are supported. Please use adaptors that have been tested and supplied by VeEX only to ensure compatibility and correct operation.

Devices

Bluetooth details will be displayed including the MAC address of the device and the last 4 digits of the test set serial #. The last 4 digits of the test set will be the pairing code between the unit and the external device.



Bluetooth Devices



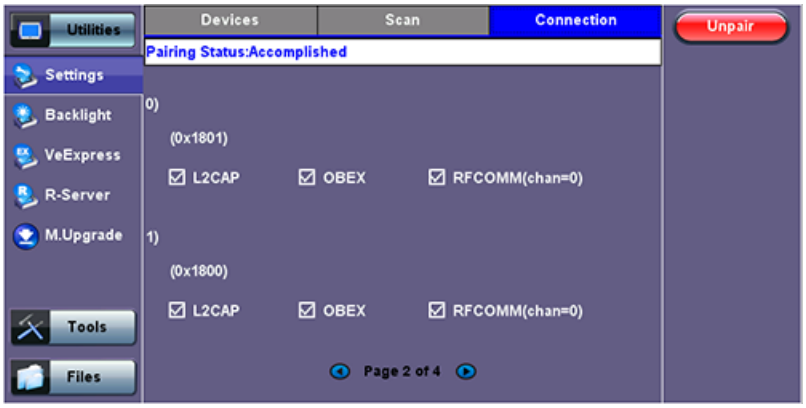
Bluetooth - Scan

Bluetooth - Connection - Passcode

Bluetooth Setup

1. Press **Scan** to check for available Bluetooth devices. Once scanning is complete, a list of discovered Bluetooth devices will be listed. Please ensure the peripheral device is set to **Discoverable** during Scanning and Pairing operation.
2. Press **Pair BT** to begin the pairing process. During the pairing operation, you will be prompted to enter a code on the peripheral device (PC or Mobile Phone) in order to pair successfully. Enter the last 4 digits of the test set's serial number as shown in the **Connection** tab.
3. Once paired, click the **Services** button at the bottom of the screen to check the service attributes. To upload test results via Bluetooth, full data upload service will be required.

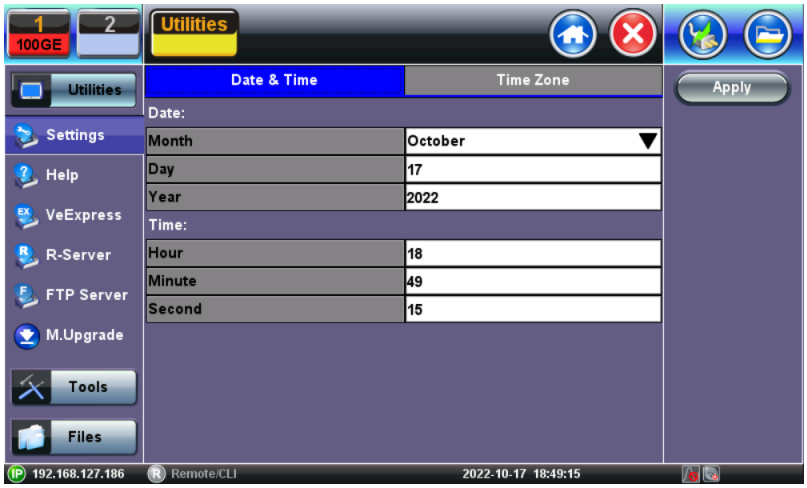
Bluetooth - Connection Established



Bluetooth - Connection Page 2

Date and Time

This screen allows the date, time and time zone to be set. Daylight Daylight Savings Time (DST) is enabled automatically.



Date and Time Setup

Time Zone Setup

Using NTP Server

For automatic time of day (ToD) synchronization, go to **System Tools >Utilities >Settings >Global >General Settings**, and enable the **NTP Time Services** field by selecting a synchronization period (e.g., 1 hour).

Click here for a list of local, regional and global public NTP servers.

An internet connection (WiFi or LAN) is required to reach the selected public or private NTP server.

To manually change the Date & Time:

Go to **System Tools >Utilities >Settings >Date & Time**, to manually set the date, time and time zone. Then, tap **Apply**.

To enable daylight saving time (DST), manually select a neighboring time zone with a +1:00 relative to the standard time zone of the current location. Set it back to the standard time zone offset when DST ends.

Get Standard Time from GPS/GNSS

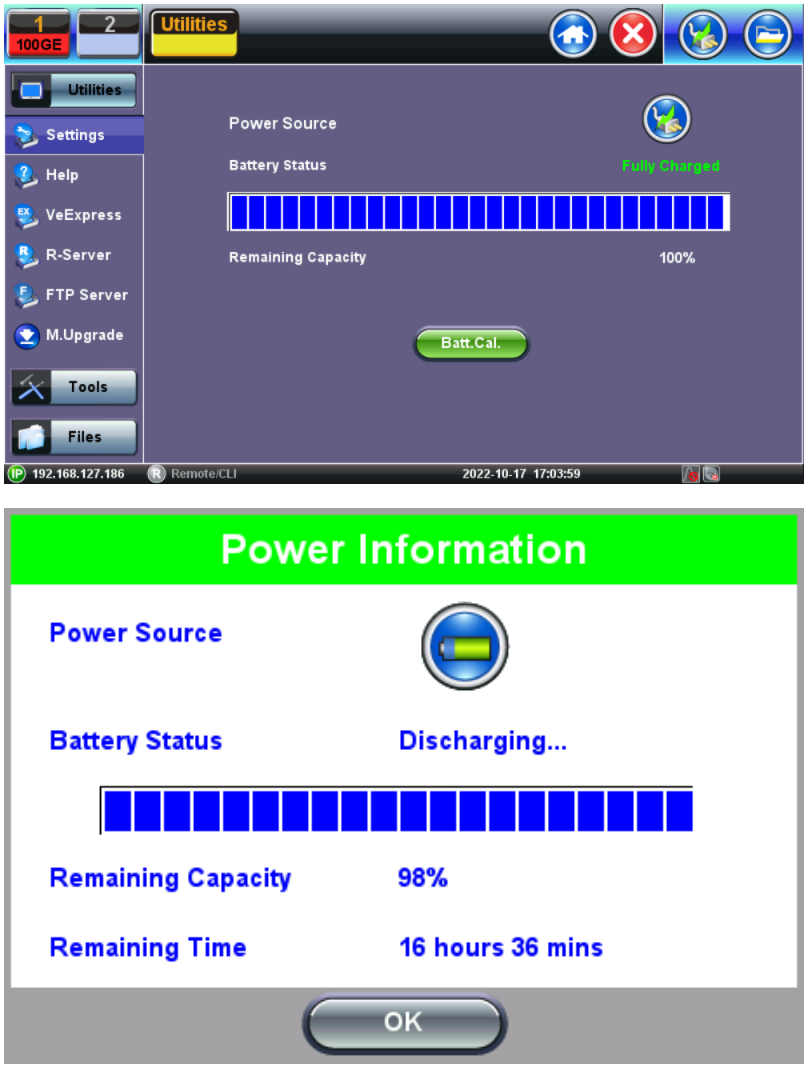
If equipped with the GPS/GNSS receiver (hardware option), manually copy the GPS time into the system.

Go to **System Tools >Utilities >Settings >GPS/High Precision Clock**, to configure the GNSS Receiver and turn it ON. Once it recovers time (ToD UTC) from the satellites, click the **Sync ToD** button to apply the standard time to the RTU. The standard time will be applied at the start of the next second (rise of the internal 1PPS timing signal). The local UTC Offset (Time Zone) setting is used to apply the correction for local time. This manual Sync ToD time setting function should not be used when NTP is enabled.

For more information on the atomic clock and relative phase monitoring, see "High Precision Clock Sources" on page 65 and "GNSS/GPS & Sky View" on page 143.

Power

This section provides information about current power source and information about the battery's charge level and estimated autonomy (under current load conditions) . Tap the **battery icon** on the top bar to bring battery charge and estimated autonomy information.



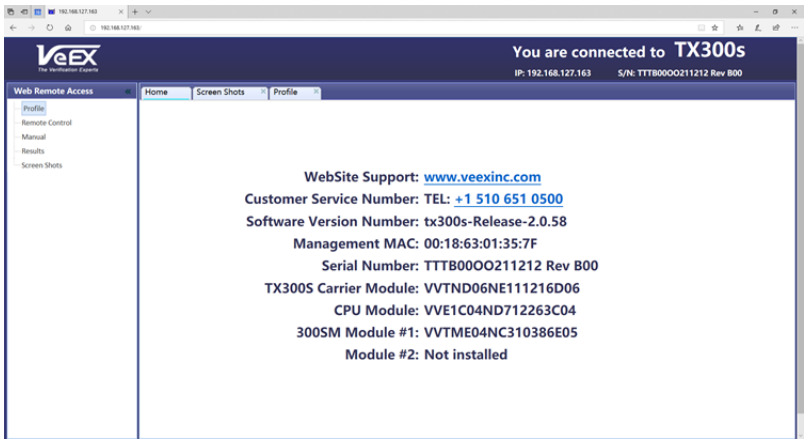
Utility Settings - Battery Power

Remote Access

There are different ways to control or access the test set and the information it contains, from a local (LAN) or remote (WAN) connected PC.

The EZ Remote service provides public registration servers to help users and test sets establish remote sessions, without having to get IT departments involved. It is considered a convenient on-demand service, for quick/temporary collaboration tasks. It should not be used for long-term applications (VeEX offers other remote tools for long-term applications). Refer to "EZ Remote" on page 55 for more information.

After accessing the test set remotely, a tab will open up for each selection made, allowing for quick access to each function.



Profiles

Test Profiles are configurations saved by the user that can be retrieved and reapplied to the test set. For example, commonly used configurations and test limits/threshold can be saved as test profiles, for different types of services.

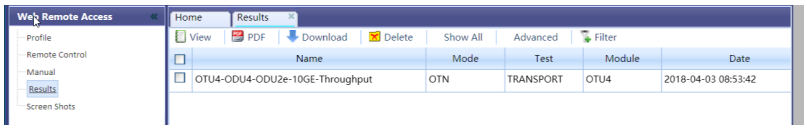
Manual

The feature provides access to the user manual that is built into the test set. In this application, the use of a local copy of the PDF file is recommended as the PDF client in the local computer is most likely faster than accessing the remote one and may offer better tools and function, including search capabilities. User manuals can be downloaded from the products' page at www.veexinc.com.

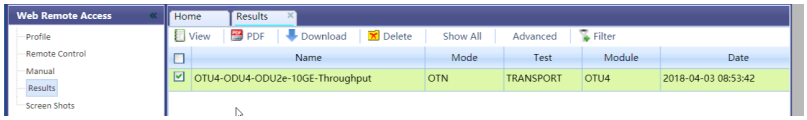
Results

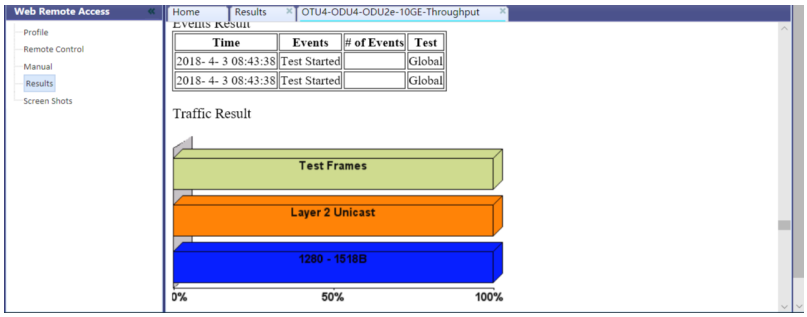
Results list all the test results files currently stored in the remote test set. Users can **View**, **Rename** and **Delete** files stored in the remote test set, as well as **Download** selected files to the local computer or convert them to

PDF and download.



To open a test results file, select it from the list and tap on **View**.





Files can be downloaded by clicking on **Download** (original file format) or **PDF**.

Screen Shots

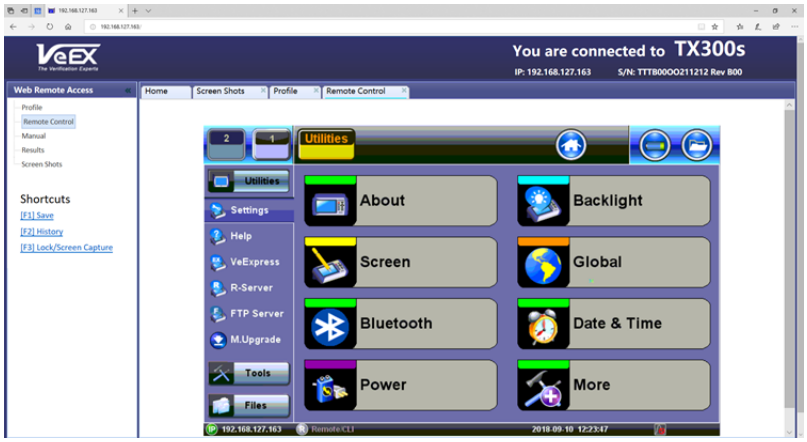
Pictures (PNG) taken of the screen can be accessed from this link and sub-tab. Pictures can be viewed or downloaded to the local computer.

Screen captures can be made using the Lock button ( ) on the test set or from the remote computer, using the links provided or the respective F-key on the computer's keyboard. The screen capture function can be enabled in .

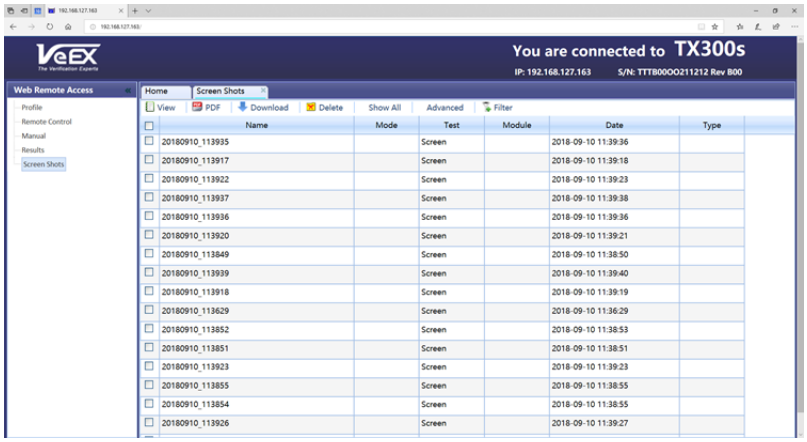
Remote Control (Screen Mirroring)

It is similar to using VNC, but in this case no VNC client installation is required. It uses standard Java-based web browser as a client. It mirrors the screen, mouse inputs and the rubber buttons available in the front panel of the test set.

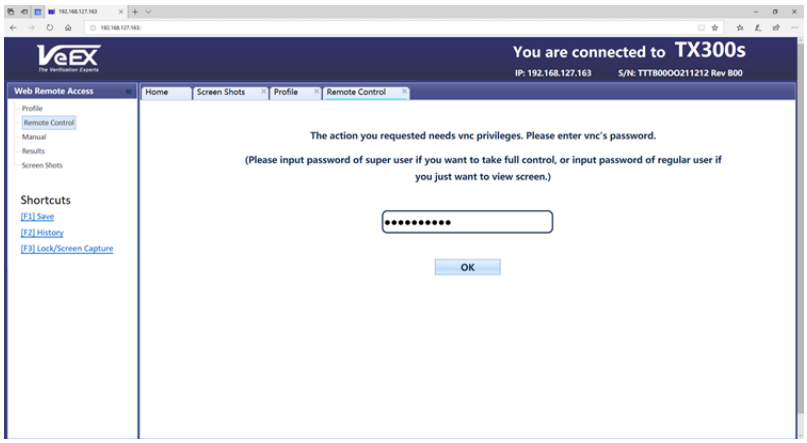
1. On the test set, select the **Remote Access** option and enter the following information:
   - **VNC Service:** Enable or disable the remote access through remote web-browser clients running on PCs, Macs or certain tablets. The web browser must support Java (tm)
   - **Web Super User Password:** Defines the password for users allowed to control the test set via standard web browser clients
   - **Web Regular User Password:** Defines the password given to users who are only allowed to view the test set current screen via standard web browser clients, but not make any changes to test or test set.
2. In a web browser, enter the test set IP address. To locate the test set local IP address, refer to "WiFi Wiz" on page 90.
3. Click **vnc-home.html** and enter the Super/Regular password when prompted for a password. Use the buttons and icons on the right to navigate the test set remotely.



Web Browser - Remote Access Menu



Test Set IP Address in Web Browser



Web Browser - Password Prompt

EZ Remote

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

The basic EZ Remote service is offered by VeEX free of charge. It provides public registration servers to help users and test sets establish remote sessions, without having to get IT departments involved. All you need is internet access for the test set and a remote user. Feature location and functionality may vary from product to product.

VeEX's EZ Remote provides:

- **Remote Control** functionality to give users full control of remote test sets (screen mirroring and control).
- **Remote Access** functionality allows users to View, Download, Rename, Delete, Export and Convert results (PDF).

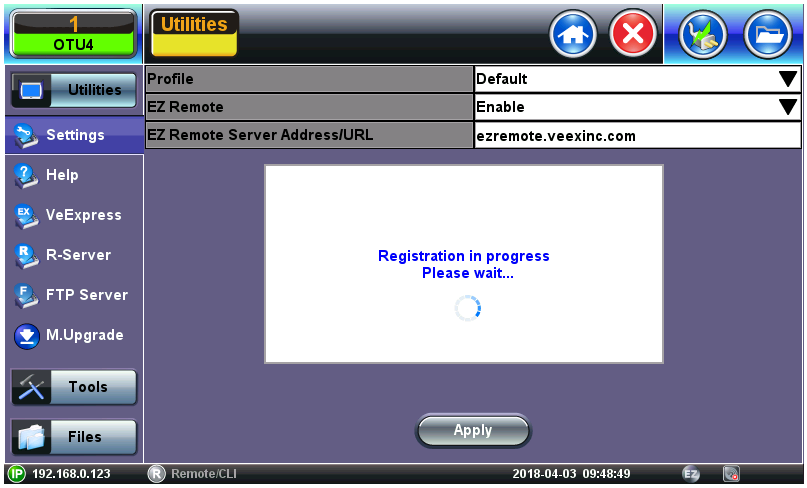
EZ Remote is considered a convenient on-demand service, for quick/temporary collaboration tasks. It should not be used for long-term applications (VeEX offers other remote tools for long-term applications).

Initiate an EZ Remote Session from the Test Set

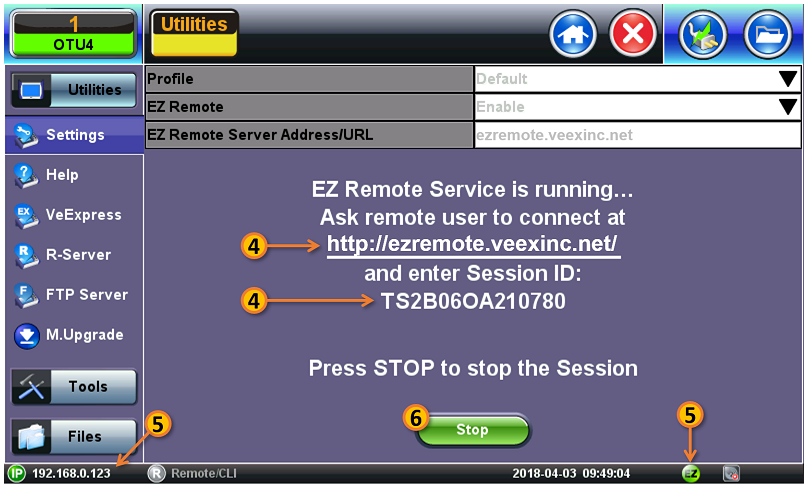
1. Use the **System Tools** to connect the test set to a LAN using the RJ45 Ethernet management port, located on the side of the unit (recommended), or use **WiFi Wiz** to connect to a WLAN (using built-in Wi-Fi or a compatible external USB dongle). Make sure the test set gets a local IP address and that the LAN/WLAN provides access to the public internet (web).

2. Go to **>Utilities >Settings >More >EZ Remote**.

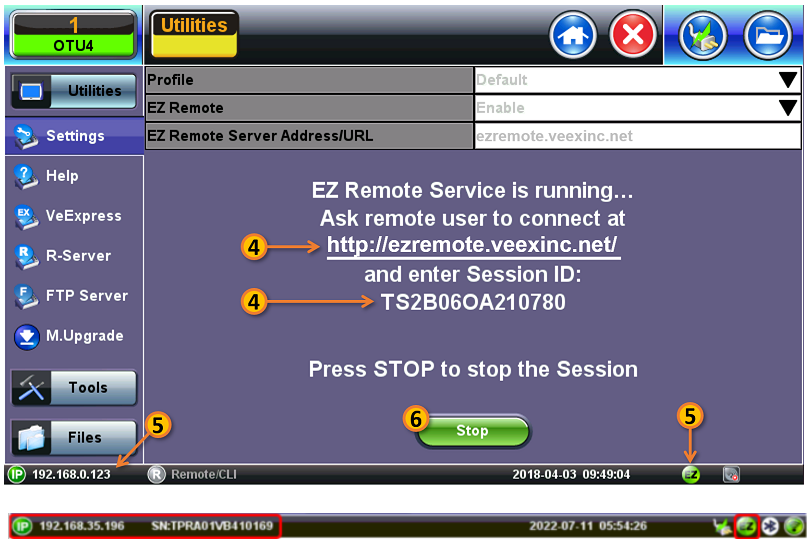
3. On the EZ Remote screen, set **EZ Remote** to **Enable**, confirm the **URL** is **ezremote.veexinc.net** (without www.), and tap on **Apply** to connect and establish a session with the EZ Remote server.



4. Provide the resulting **URL** and **Session ID** to the intended remote user.



5. You may continue to use the test set until a remote user logs in, then both will share control over the unit. Make sure the test set remains connected to the LAN/WLAN/Internet and that the **EZ remote session indicator** at the bottom of the screen stays green.



6. When finished, use the **Stop** button to terminate the EZ Remote session and disconnect from the server.

Connect to the Remote Test Set from a Computer, Tablet or Phone

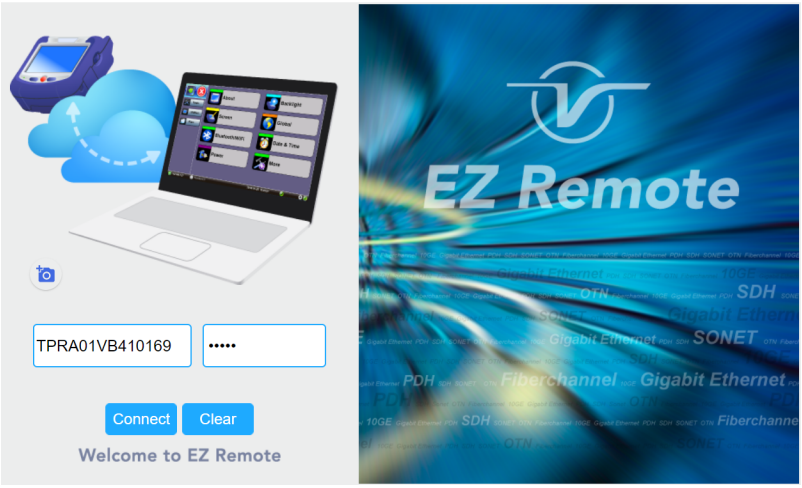
Establish a Remote Access Connection

EZ Remote provides two types of services:

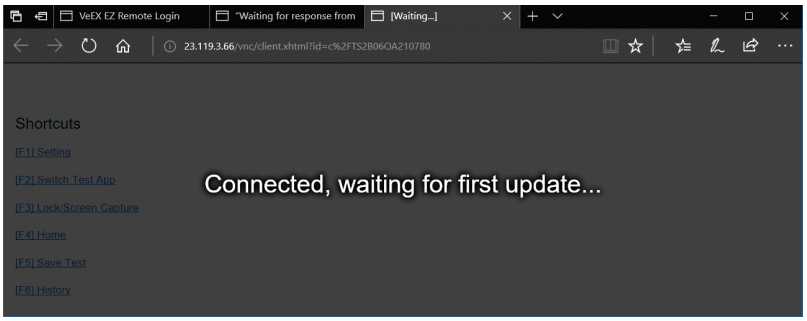
- **Remote Control** (screen and mouse/touch mirroring) to operate a test set from a different location.
- **Remote Platform Access** to access information stored in the remote test set, such as Test Results, Profiles, User Manual, Screen Captures (screen shots), information about the test set (Home) and its local IP address.

Although multiple users could simultaneously log-in to the same test set, they would be sharing the same mirrored GUI image and mouse control. This is not recommended since it is equivalent to having multiple users trying to operate one test set at the same time (also known as "mouse fight"). Nonetheless, it may be effective for training purposes with one or two extra users.

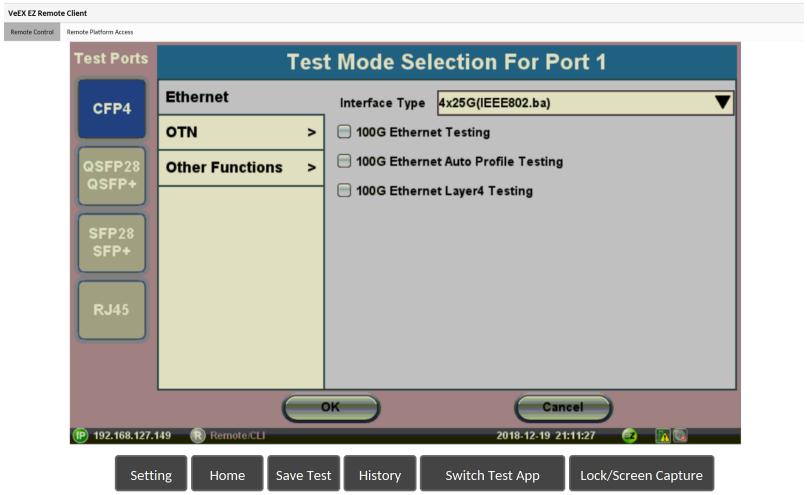
1. From a PC, Mac, Tablet or Smartphone launch an industry-standard Web Browser application and enter the URL http://ezremote.veexinc.net (without the www.). Enable pop-ups for your browser and be sure to authorize access to the site, if confirmation is requested by the browser or OS.
2. Enter the **Session ID** provided, making sure not to confuse zeroes (0) with Os. Click **Search** to find the target test set and stablish a peer-to-peer connection.



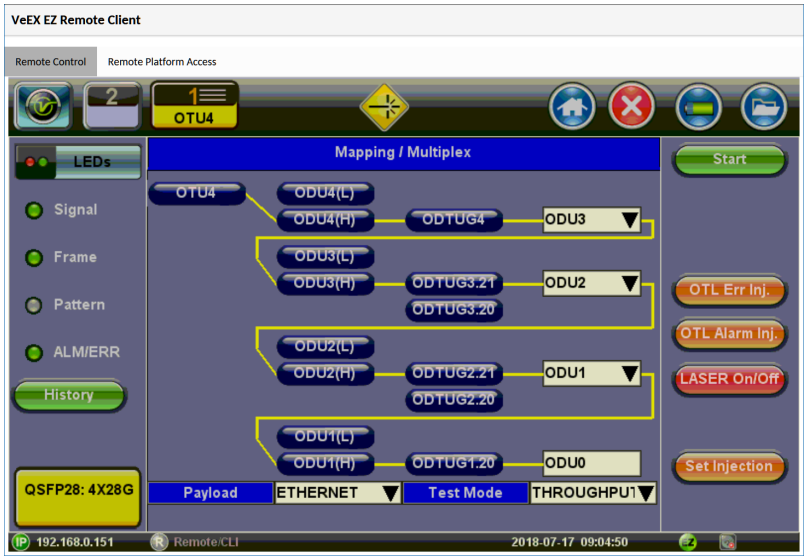
3. Once verified and connected, wait for the remote user interface to refresh. This may take a few seconds.

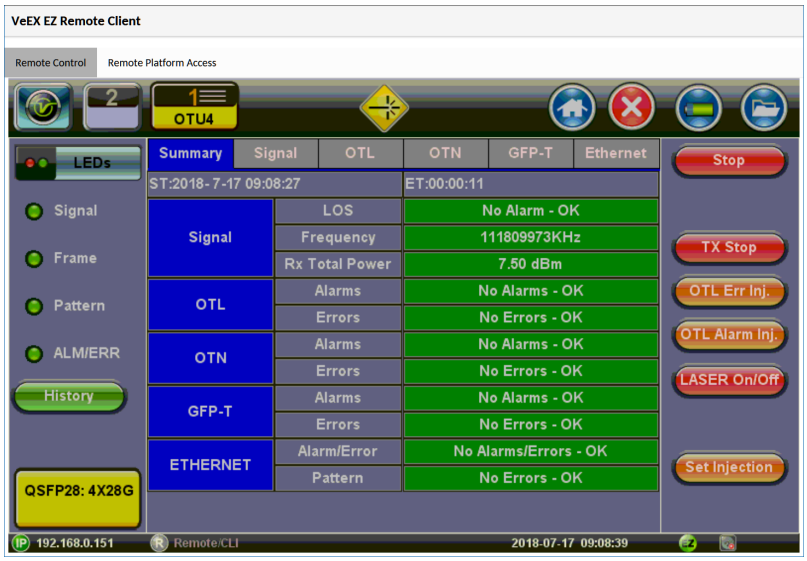


4. Depending on the type of test set used, shortcut buttons may be provided below the mirrored screen, allowing access to functions provided by physical buttons on the instrument, such as **Settings**, **Home**, **Save Test** results. Click or tap on the shortcut to activate it.



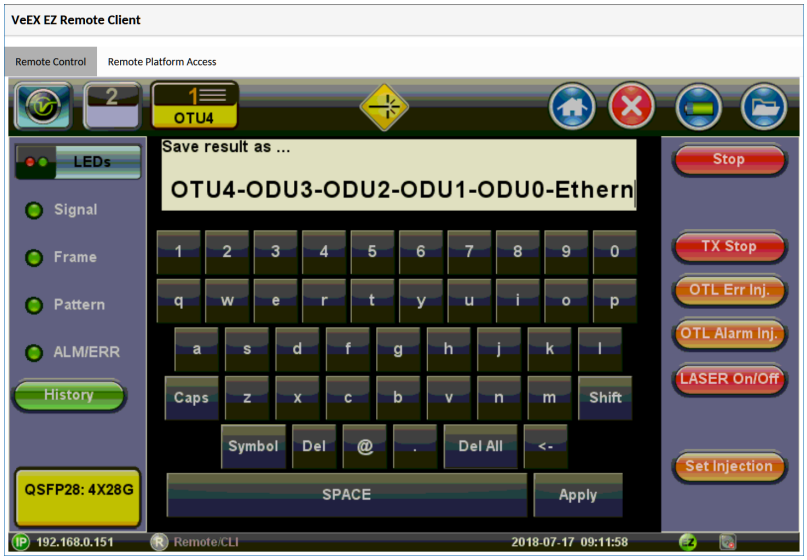
5. Once the remote GUI appears, you can use the **Remote Control** tab to operate the test set in the same way you would control a local unit from its touch screen.





Save Test Results

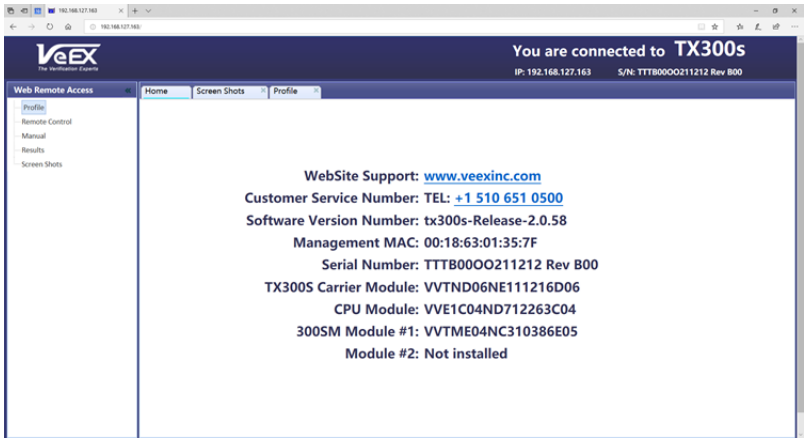
To save the results of a test, from the remote computer, press the **Save** button below the screen image. Then use the pop-up keypad and/or the PC keyboard to enter the file name and add any extra details (if Advanced Save is enabled).



Access Remote Test Result Files

The **Remote Platform Access** tab provides links to access test results, test profiles, screen shots, the user manual and other information stored in the test set.

After accessing the test set remotely, a tab will open up for each selection made, allowing for quick access to each function.



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Results

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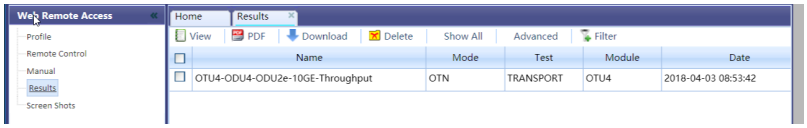
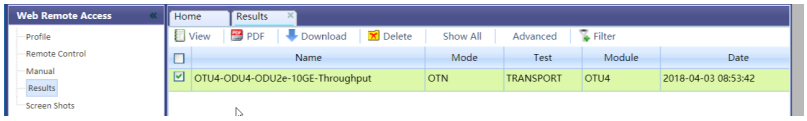
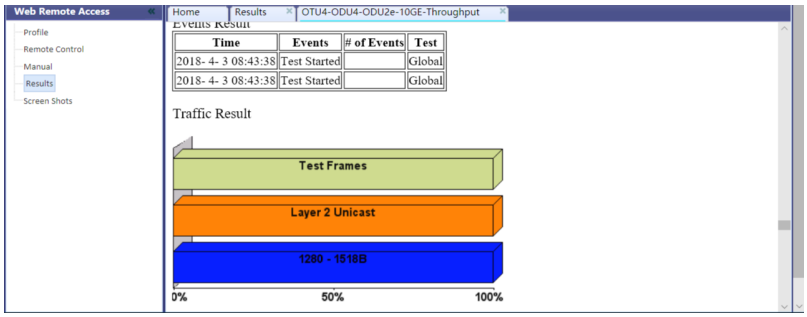


To open a test results file, select it from the list and tap on **View**.





Files can be downloaded by clicking on **Download** (original file format) or **PDF**.

Screen Shots

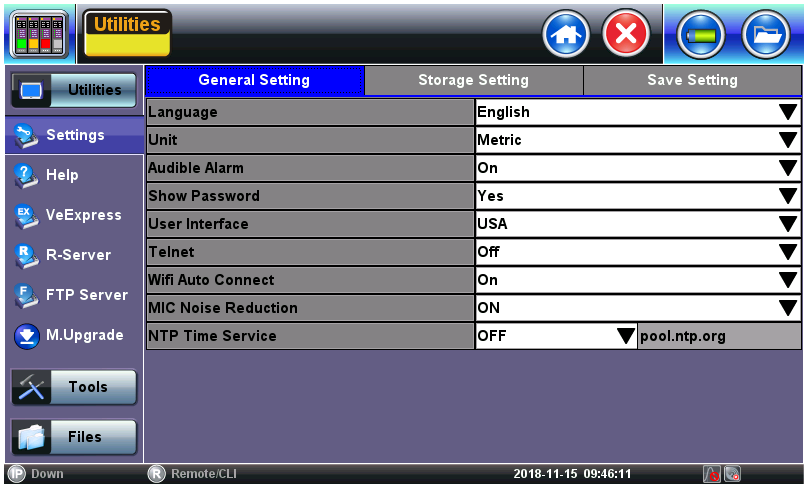
Pictures (PNG) taken of the screen can be accessed from this link and sub-tab. Pictures can be viewed or downloaded to the local computer.

Screen captures can be made using the Lock button ( ) on the test set or from the remote computer, using the links provided or the respective F-key on the computer's keyboard. The screen capture function can be enabled in .

VF Noise Calibration (Microphone)

The test platform offers ambient audio Noise Reduction for its built-in microphone, to improve voice quality in Voice Frequency (VF) applications like ISDN and VoIP calls. When the microphone noise reduction function is enabled, in **>Utilities >Settings >Global >General Settings >Mic Noise Reduction = ON,**

Users can calibrate it to remove typical environmental noise and improve voice quality. The test set must be recalibrated before use and when moved to a different environment (e.g. from the equipment room to an office). The Noise Calibration function can be found in >Utilities >Settings >More >Noise Calibration.



Stay silent while the calibration is in progress. If a headset is used for ISDN or VoIP calls, it must be plugged in during the calibration process.

High Precision Clock Sources

GPS/GNSS Receiver (HW Option)

The optional high-sensitivity GPS/GNSS modules (built-in) provide accurate Phase alignment and Coordinated Universal Time (UTC) synchronization to the test set, in the form of internal pulse-per-second (1PPS) clock synchronized to the standard second and timestamps. This is used to assure that two or more geographically-distributed test sets have the exact same time and can calculate delays. One example is the One-Way-Delay (Latency) tests used to identify asymmetry between each direction of a link.

The GPS Time of Day (ToD) can also be used to precisely set the local date and time in the test set, using the Sync ToD function, which will apply the local time zone correction before applying it to the test set system real time clock. This timestamp is used for reports and events, but not for time-sensitive testing.

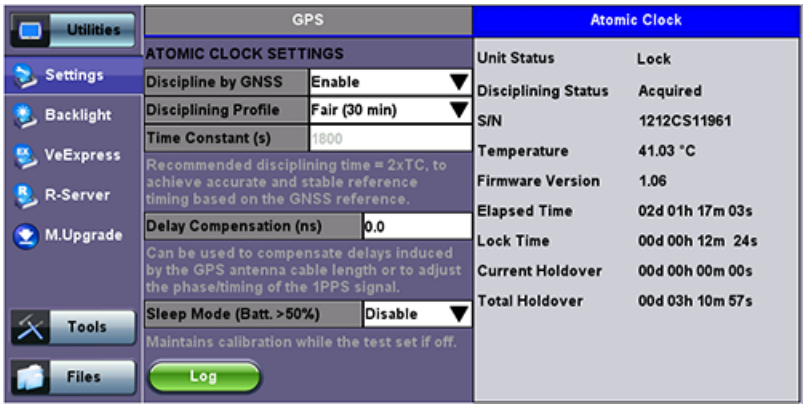
GPS ToD is also used in One-Way-Delay (OWD) measurements and time is applied directly to each test set before the test starts, so they all have accurate time.

The GPS/GNSS receivers can be turned **OFF** if not used, to save battery power.

A satellite table, showing satellites in view, satellites being used and signal to noise density, is provided for information only, so the correct antenna installation can be verified. Geographical coordinates are also provided for information only and it could be used in the future to geo-tag some position-sensitive results. The GPS/GNSS antenna must have direct view to the sky. At least four satellites with SNR of 34 dB-Hz or better are recommended for accurate testing.

Atomic Clock (HW Option – Factory installed)

The optional built-in chip-scale Atomic Clock module provides a highly stable clock source to the test set, in the form of a highly accurate and stable internal 10 MHz frequency and 1PPS timing references. These references can be used to drive PDH/DSn, SDH/SONET/OTN or SyncE Master transmitters or be used as a reference for Frequency, Phase, Time Error, and Wander measurements. Their main function is to serve as a precision reference to measure wander (clock stability), even in places where there is no reference clock signals available that can be traced back to a Primary Reference Clock (PRC) or Primary Reference Time Clock (PRTC).



GPS-Disciplined Clock

When GPS/GNSS and Atomic Clock options are installed and enabled, the Atomic Clock uses the GPS signal to calibrate its frequency (10 MHz) and timing references (1PPS), to improve their accuracy and stability. The Atomic Clock 1PPS phase is disciplined to the UTC to align it with the standard second. The raising edge of the 1PPS pulse indicates the beginning of a new second all over the world.

Disciplining can be disabled or enabled. When disabled, the atomic clock runs at its natural frequency (free-running), providing a very stable frequency source. When disciplining is Enabled, the atomic clock will use the GPS/GNSS accuracy to correct its frequency and align its phase.

The Disciplining Profile sets a time window the atomic clock's dynamic control loop, to filter any short term frequency and phase variations coming from the GPS/GNSS receiver, this is called Time Constant. The longer the time constant, the more accurate and stable the atomic clock output can be. The Disciplining Profile field provide suggested options for the minimum disciplining times and sets the equivalent Time Constant. The selection varies with applications and location, so some experimentation may be required by users to select their own default value. For quick field Wander or Phase measurements a disciplining time of ≥ 60 minutes (TC ≥ 1800 seconds) is recommended. Users can also enter a customized time constant in seconds.

Holdover

In case of GPS/GNSS signal loss (e.g. indoor testing) the high stability of the Atomic Clock can maintain synchronization for a few hours allowing users to perform quick Wander and Absolute Phase Error in conditions that were not possible before. This is called holdover mode.

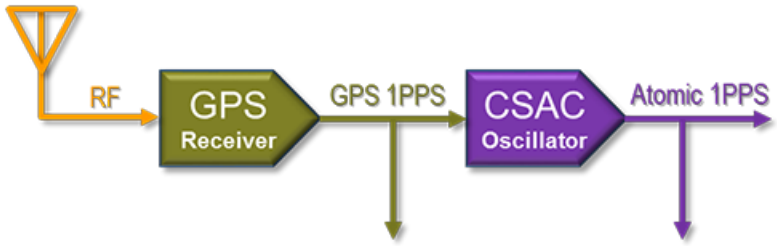
Delay Compensation can be used to perform minor adjustments to the 1PPS phase, to align it to a specific reference or to compensate for short cable delays.

When enabled, the low power Sleep Mode keeps the atomic clock powered up when the test set is turned off. This way it maintains its last calibration by drawing little current from the batteries. In this state, the test set will only cut the power to the atomic clock if the battery charge reaches a level less than 50% of charge, to conserve battery. The Elapsed Time counts the time since its first initialization, including the time the test set has been off. If disabled, the atomic clock is shut down with the test set and will require full initialization the next time it is powered up.

Atomic Clock Relative Phase Monitoring

VeEX test sets equipped with GPS/GNSS receiver and Chip Scale Atomic Clock options include a relative phase monitoring tool that can be used for the Relative Phase Measurements that provide a bit more visibility into the disciplining process.

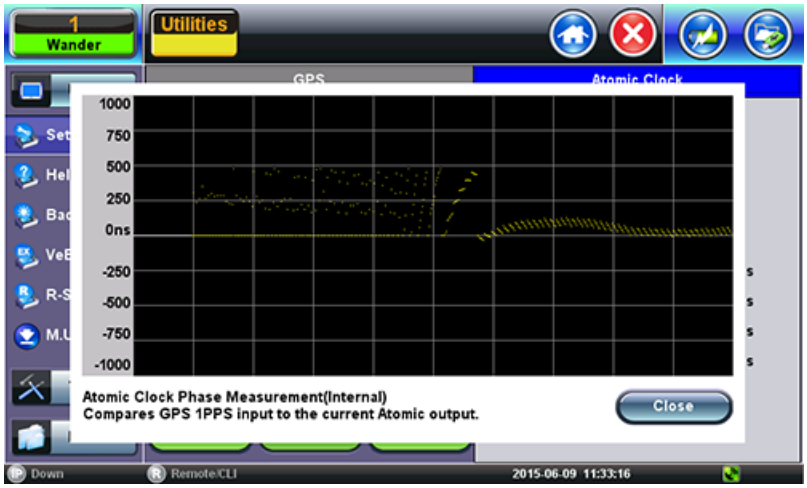
In the absence of another traceable frequency source or timing reference, users have to rely on relative phase measurements. It is a direct comparison between the GPS/GNSS receiver's "raw" 1PPS signal being fed to the high-precision oscillator (CSAC) and the filtered (stabilized) 1PPS output from the oscillator, which ultimately would be the reference signal to be used by the test set for Wander, Absolute Time Error (Phase) and One-Way Delay (link symmetry) measurements. Since the disciplined output combines the short-term stability of the precision oscillator and the long-term accuracy of the GPS/GNSS, it provides the best of both worlds, so it can be used to measure the internal GPS/GNSS receiver output to verify they are in agreement.



Relative phase compares disciplined Atomic 1PPS vs. GPS 1PPS

Relative phase measurements are more useful when monitored at the beginning of the disciplining process, to track the phase alignment between the oscillator's output (Atomic 1PPS) and its input (GPS 1PPS). Since the oscillator filters the raw 1PPS noise and fine tunes its frequency to align its own 1PPS to true time, the input vs output differential graph can become a very useful tool to monitor and verify that the convergence process is going as expected.

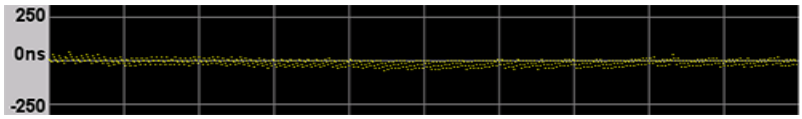
Phase Graph The Atomic Phase Graph can be found in the Atomic Clock settings and status screen at **>Utilities >Settings >More >High Precision Clock Source >Atomic Clock**



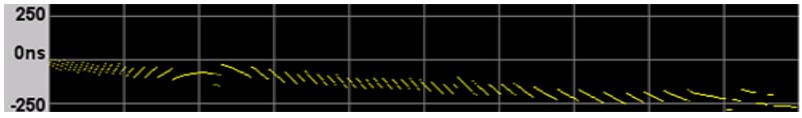
Example of GPS-disciplined Atomic relative phase convergence graph

- Yellow dots indicate valid relative phase measurements (output - input).
- Scattered yellow dots could indicate bad GPS/GNSS signal, which in turn provides bad timing accuracy, or that the oscillator trying to compensate for large phase differences.
- White dots (line) at zero indicates loss of GPS 1PPS. It basically indicates holdover periods.

What you want to see in this graph is a tight bundle of differential phase measurements forming a line converging to zero and staying at zero. Since the Atomic Clock output is very stable, it will slowly try to infer the true (accurate) time alignment out of the GPS 1PPS output and maintain it. The less disperse the individual measurements (dots) are, the better the GPS timing signal is. So, you want to see a straight line formed by not-so dispersed group of dots.



Example of proper (converged and stable) phase alignment

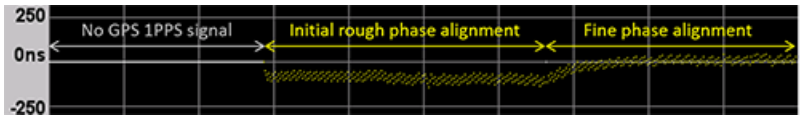


Not so good phase alignment

The chip scale atomic clock oscillator uses its 10 MHz frequency source for the disciplining process. Its 1PPS phase is initially aligned to the 10 MHz phase, so it should be within ±100 ns (one 10 MHz cycle). Then the

CSAC would start steering its frequency to finely align its 1PPS output within a few nanoseconds to the “average” 1PPS input coming from the GPS receiver.

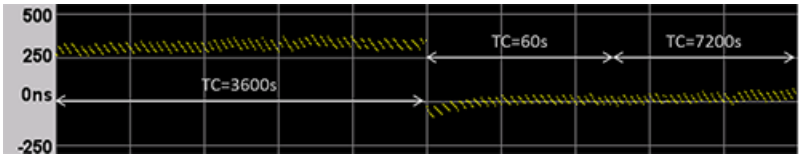
In the context of this document the term “GPS Receiver” is not considered a synonym of “GPS Clock” or “GPS-disciplined Clock”. A GPS Clock is considered a combination of a GPS receiver and a highly stable precision oscillator.



Example of initial phase alignment

Although the relative phase alignment may converge rather fast in many occasions, users must still observe the minimum recommended disciplining time.

If the disciplining time constant (TC) is changed in the middle of the process, from one long value to another, the phase may take long time to converge to zero or could display a somewhat erratic behavior for a while. In this scenario, if users need to change the TC, it may be worth temporarily changing it to a short TC (e.g. 60s) for faster steering and then change it to the desired value. (Note that although the Sync 1PPS button could also be used to force alignment of the Atomic 1PPS output, it does not adjust the required disciplining or steering parameters.)



Using short TC to force quicker phase convergence to zero

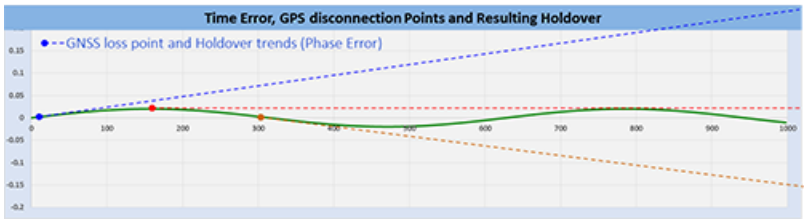
Phase Alignment and Holdover

Knowing whether the oscillator is still steering (changing) its frequency to correct the 1PPS output’s phase has a big impact in deciding when to force the test set into holdover for indoors testing. The Phase Graph can help in identifying when the disciplining process has stabilized.

A disciplined oscillator will continuously adjust its frequency to keep the 1PPS aligned to the standard second, but those offset adjustments are usually small fractions of ppb when proper disciplining has been achieved.

Upon the loss of the GPS 1PPS reference, the oscillator enters holdover mode. This means that the precision oscillator will hold its last frequency and the phase error will continue its trend. That means, you want the

instantaneous frequency to be as accurate as possible at the moment when the GPS receiver is turned off. Keep in mind that any ±X.XXX ppb frequency offset would result in a cumulative time error of ±X.XXX ns per second and that would impact the resulting usable holdover time, by reaching the defined error tolerance faster or slower.



Illustrative examples of what would happen if GPS 1PPS is lost during different steering stages

Limitations: This method of determining proper 1PPS phase disciplining convergence would only work at the beginning of the disciplining process, which is what would be needed in the field.

Long-term, especially when long time constants are used, the oscillator will become hard to steer as it would be trying to hold what it "believes" is true time alignment, based on a long learning process. In this case, if the GPS receiver starts to wander and becomes somewhat inaccurate, the graph would show such discrepancy, but the oscillator's 1PPS output would still be stable and accurate.

GPS instant accuracy could change within ±150ns during the course of a day depending on atmospheric conditions and satellites visibility. The job of the atomic clock is to filter those slow variations, so in the long term it is normal to see the GPS and CSAC phases temporarily disagree (relative phase ≠ zero).

Warm Up Times

All precision reference sources require a "warm up" time to achieve high accuracy and stability. The warm up term is being used loosely because it is not just about attaining the right temperature. It also includes disciplining of a local oscillator, negotiating and stabilizing a clock through protocol messages, etc. Each of the tasks involved takes time to stabilize before it can be used for testing.

Operational Temperature

It is still a major player in the warm-up waiting time and it all depends on the ambient temperature and the initial temperature of the test set. For example, a test set left in the trunk of a car in a winter night will take longer to reach operational temperature.

Atomic Clock Warm Up

If fitted with a chip-scale atomic clock, they are housed in a miniature oven to maintain its internal temperature constant in spite variations in ambient temperatures and it can take up to five minutes to warm up and should not be used until its status shows "Locked". The atomic clock temperature and status can be monitored at \Util-

ities \Settings \More \High Precision Clock Source \Atomic Clock. The chip-scale atomic clock is oven-controlled and temperature-compensated to minimize the effects of ambient temperature variations.

Beside temperature, users must be aware of other factors that require time to settle, before accurate measurements can be made.

GPS Lock

The time to get an stable clock output varies depending on the conditions, antenna type and installation, sky visibility and whether or not the test set has changed position. Using the test set for the first time on a new site (different geographical position) would increment the time to its first satellite lock. Users can follow the different stages (Searching, Sync 1PPS, and Lock) by checking the GPS status GUI at **>Utilities >Settings >More >High Precision Clock Source >GPS.**

Disciplining Time

Disciplining the atomic clock means using the accurate GPS timing signal to correct or align the atomic clock output signals. GPS are known for their high accuracy as they are traceable to the universal time standard (UTC). Atomic Clocks are known for their great stability. So, the combination of GPS + Atomic Clock = Highly Accurate and Stable clock source. Achieving such levels of precision takes time. The total time to stable output depends on the precision required. The disciplining time can be programmed in the Atomic Clock settings and users must add it to the total “warm-up” time, before starting measurements.

Precision Timing Protocol

PTP, like IEEE 1588v2, require some time for the two ends (master and slave) to agree on the current time. This protocol “warm-up” time is dependent on the link conditions (traffic, latency, delay variations, PTP settings, etc.). Tests shall not be started until the protocol has stabilized and the recovered clock has achieved its maximum accuracy and stability. This is sometimes referred as “Convergence” or “Sync PDV” convergence. Users can use the long tail of the 1588v2 Sync PDV graph as an indication the PTP has reached synchronous state.

VeExpress

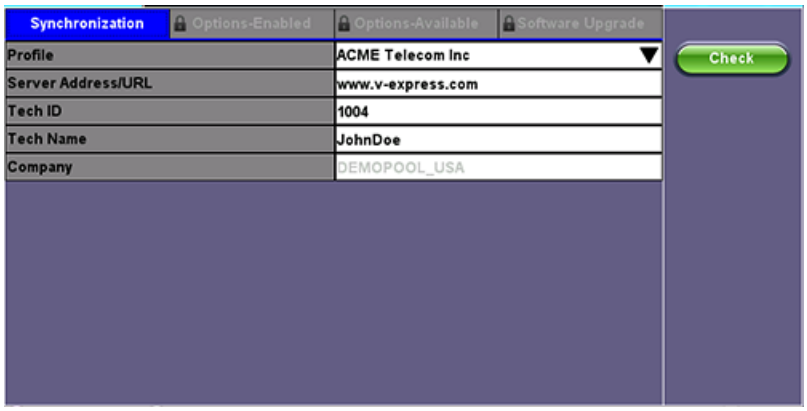
VeExpress is a cloud-based asset management system. VeEX VeExpress cloud services is included with every test set. It allows the following services / functions:

- Delivers Software/Firmware Updates and Upgrades directly to the test set.
- Makes any new Purchased or Rented licenses (new functions) assigned to the test set immediately available for testing.
- Allow Managers to Share (float) purchased or rented test options among deployed test sets (fleet). Licenses can be temporarily assigned to the test set that needs it, for specific jobs, and later recalled to pass it on to the next test set.
- Allows users to rent optional test features (licenses) for the required number of days. Adds the flexibility required for special jobs or those new technologies or services that are not yet commonly deployed. Rented options are automatically released when lease time elapses (no need to connect to the server).

Built-in VeExpress Client

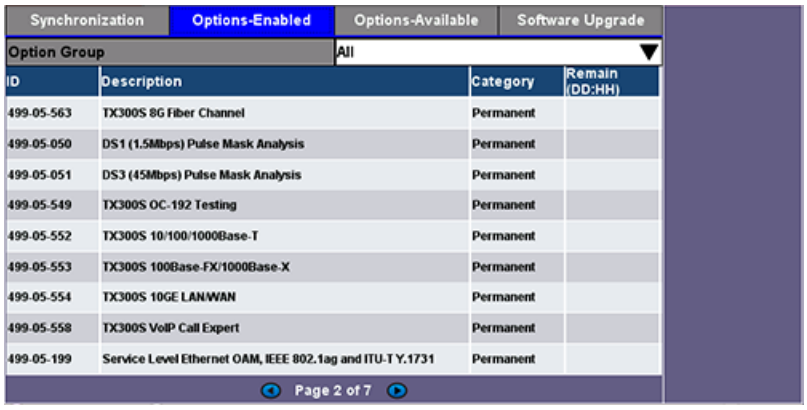
- Lets users connect to VeExpress Cloud directly from the test set, from the field, using any available internet connection (e.g. LAN, Wi-Fi, Modem, CPE, Smartphone hot-spot, Cellular Data Card, etc.)
- View test features currently assigned to the test set and licenses available in the pool
- Activates new licenses and let users perform software (firmware) updates

Connecting VeExpress



1. Connect the TX300s to the Internet.
    - Use LAN, WLAN or Cellular Data Card.
2. Go to **>Utilities >VeExpress**. (The URL is: www.v-express.com.)
3. Tap the **Check** button.
    - Any tests must be stopped and released.
    - Confirm the Release of any active Test Application.
    - It gets the latest information related to the test set, directly from VeExpress Cloud.
    - Enables any new licenses assigned.
    - Releases any recalled shared licenses.
4. Wait for the Confirmation message: “Registered and Authorized”.
    - All Licenses have been updated and any new features should be ready to use.

Options Enabled (in Test Set)



- Up-to-date list of licenses assigned
- Permanent = Purchased, owned (users can still share permanent licenses by releasing the option from one test set and assign it to another)
- Leased = Rented, temporary

- Displays remaining time (Days and Hours)
- Countdown starts upon first assignment

- Both permanent & leased can be shared

Options Available (in the Cloud)

- Lists all options, permanent or leased, currently available in the company's or group's VeExpress account
- Users can check availability before requesting assignment of new function(s) to their VeExpress Managers

Software Upgrade

- Checks if newer version is available

Software Upgrade Procedure - Full Version

1. Open the **Software Upgrade** tab.
   - Larger Full Upgrade package is shown if the test set has not been updated for a while, when major new features are introduced or an OS update is required.
2. Attach the DC charger to the test set.
3. Insert a FAT32 USB Memory Stick into the left-side USB port (>300MB free).
4. Confirm IP connection (IP address).
5. Check the new software version box.
6. Tap the **Download** button.
   a. Wait until the download process finishes. Install package is in the memory stick.
   b. Power the test set **OFF**.
   c. Leave the USB memory stick attached.

7. Initiate Software Upgrade process.
    a. Simultaneously press the App, and Power buttons, until it beeps.
    b. Let the upgrade process finish (it could take a few minutes).
    c. The test set reboots itself at the end.
8. The test set is now up-to-date.

Software Upgrade Procedure - Delta Version

1. Open the **Software Upgrade** tab.
    - A smaller Delta Update package could be made available between consecutive versions (e.g. from 1.2.5 to 1.2.6) for easier and faster field firmware update
2. Attach the DC charger to the test set.
3. Confirm IP connection (IP address).
4. Check the new software version box.
5. Tap the **Download** button.
    a. Wait until the download process finishes.
    b. The install package is in internal memory.
    c. Turn the test set **OFF**.
6. Power the test set **ON**.
7. The test set software is now up-to-date.

R-Server

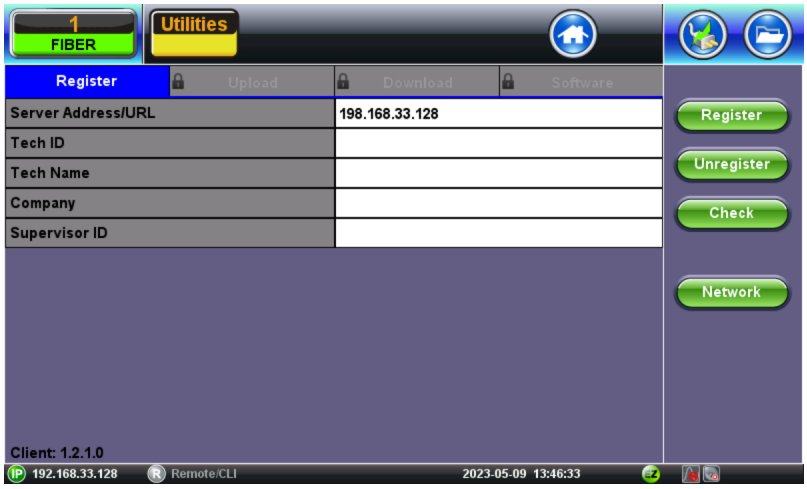
Use the R-Server option to manage test sets and store test results.

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.

Supervisors can preset and upload test parameters which are provided to the test sets as profiles. Technicians can download profiles, run tests, and upload results to a centralized system that stores and secures the data.

A test set must register to an R-Server (establish IP connection) before it can upload results to the server; otherwise, a reminder message will pop up.

Register a test set (establish IP connection)



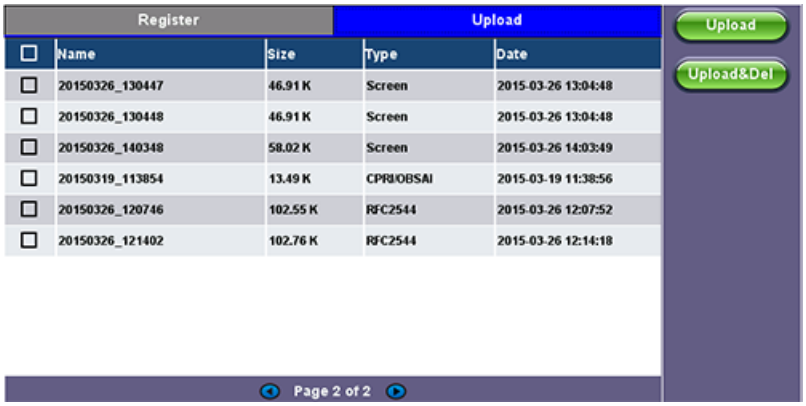
R-Server on test set

*If you are unsure if a test set has already been registered, press **Check**. If it has not been registered, complete the steps to register the unit.*

1. Contact the R-Server administrator and/or supervisor to get and enter the following information in the corresponding fields.
    - **Server Address/URL**: IP address or URL of the R-Server
    - **Tech ID**: Registered Tech ID
    - **Tech Name**: Registered Tech Name
    - **Company**: Company name
    - **Supervisor ID**: Supervisor ID
2. Press the **Register** button to register the test set on the R-Server. The test set sends the request to register to R-Server and a message appears saying that the registration is complete. Next, the registration must be authorized and approved by the R-Server manager in order to allow access.
3. When the test set registration is complete and approved by the R-Server manager, press the **Check** button to verify that the test has been authorized for use. Once authorized, results can be uploaded. If authorized, a message appears saying the test set has been registered and authorized.

*To unregister a test set from a R-Server account, press the **UnRegister** button. To select a network, press the **Network** button.*

Upload Results



Uploading results to R-Server

1. Select the **Upload** tab and select the desired files to upload.
2. Tap **Upload** or **Upload&Del**.
    - **Upload**: Transfers the selected result file(s) and keeps the file(s) in the test set.
    - **Upload&Del**: Deletes the file(s) from the test set after uploading them.

Tools

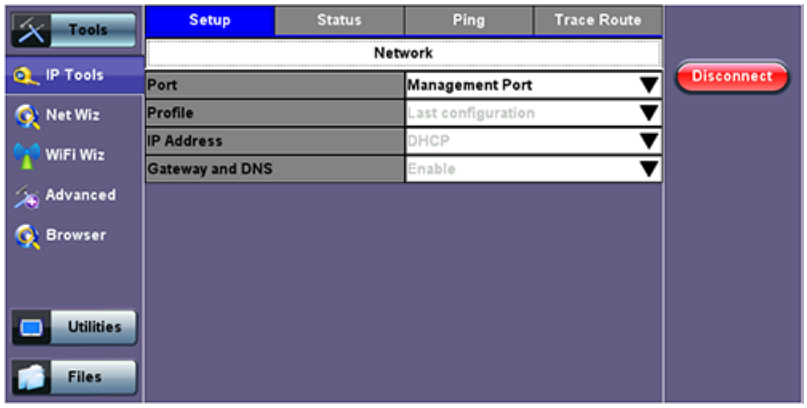
IP Tools

The LAN port, also known as Management Port, is used by the test platform functions, to communicate with remote clients, Internet, cloud applications and run some basic connectivity tests. Network parameters must be configured prior to performing any connection dependent measurements. An IP connection needs to be established in order to perform a Ping or Trace Route test. An (optional) external USB OTG to 10/100BASE-T adapter is required for LAN connection.

You can access the management port configuration on the **Tools > IP Tools** menu.

Setup

Network configuration settings are available in the Setup menu.



Setup

By default, the IP configuration is set to DHCP and the unit will automatically attempt to connect. Additional fields will vary depending on Static or DHCP connection:

- **Port:** Select Management Port from the drop-down menu
- **Profile:** Default, Delete, Save, Save as..., Default, or Last configuration
- **IP Address:** Select from Static or DHCP
    - **Static:** If Static is selected, enter the Local IP, Gateway address (if Gateway and DNS are set to Enable), and Subnet. All Static fields can be filled by tapping on the section to access an alphanumeric keypad.
    - **DHCP:** If DHCP is selected, the unit will obtain IP address parameters from the DHCP server

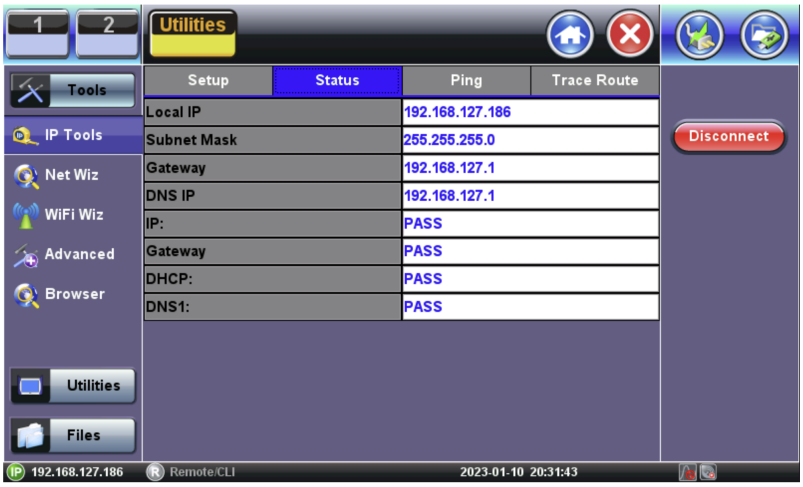
- **Local IP:** IP address of the test set
- **Subnet:** Enter the subnet mask
- **Gateway and DNS:** ON or OFF
  - **ON:** If enabled, enter the IP address of the Gateway and DNS server in Static mode, or use the IP address provided by the DHCP server in DHCP mode

    If DNS is set to Primary or Primary & Secondary, a DNS IP is required in order to use the URL as a destination.
  - **OFF:** If disabled, no Gateway or DNS server will be used for the tests

Enter all parameters then press **Connect** to start the test.

IP Connection Status

Ensure the Status is **PASS** before continuing with any IP tests. If the connection fails, go back to the setup screen to verify that the parameters are entered correctly. Verify that the Ethernet cable is properly connected on the management port on the left hand side of the unit.



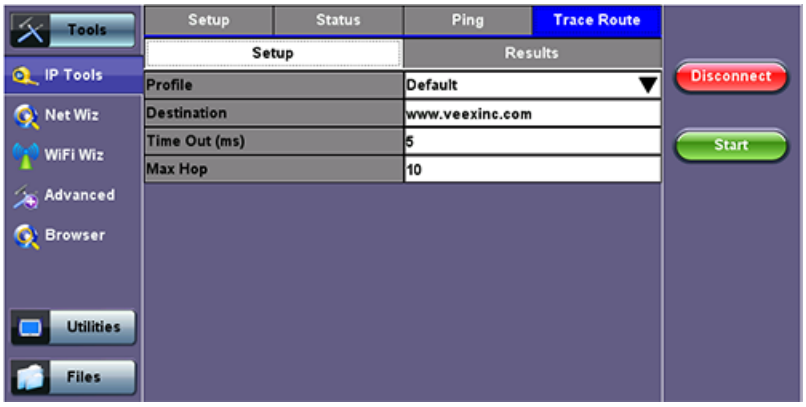
Status

- **DHCP:** PASS indicates that an IP address has successfully been assigned.
- **IP:** PASS indicates that the IP address assigned has been verified to be unique in the network.

- **Gateway:** PASS indicates that the gateway IP address is valid.
- **DNS:** PASS indicates that the DNS IP address is valid.

Trace Route

Trace Route is a common method used to find the route to the destination IP address or URL. It is often used to identify routing problems and unreachable destinations. All the remote IP addresses and their response times are displayed indicating possible network congestion points.



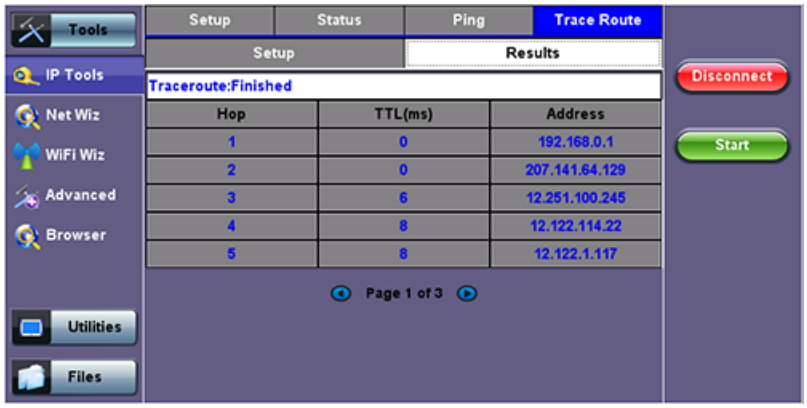
Trace Route - Setup

Trace Route Setup

The following setup selections are available:

- **Profile:** Delete, Save, Save as..., Default. Select Default to recall a trace route file or create a new test
- **Destination:** Enter the IP address or URL of the network device to be detected
- **Time Out:** Enter the maximum time allowed between an ICMP echo and response at each hop
- **Max Hop:** Enter the maximum number of network devices the packet is allowed to transit

Once the parameters are configured, press **Start** to begin the test.



Trace Route - Results

Results

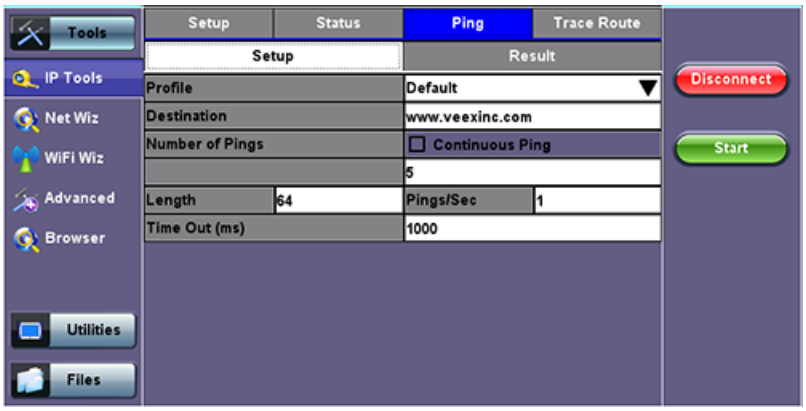
- **Hop:** Order of the routers on the route
- **TTL:** Time to reach each router on the route
- **Address:** Address of each router on the route

If there is no response from a particular hop, an asterisk will be displayed.

Ping Testing

The Ping Result provides the number of Sent, Received, Unreach, Missing, and the Round Trip delay.

Ping is a popular computer network tool used to test whether a particular host is reachable across an IP network. A ping is performed by sending an echo request or ICMP (Internet Control Message Protocol) to the echo response replies.



Ping Setup

Ping Setup

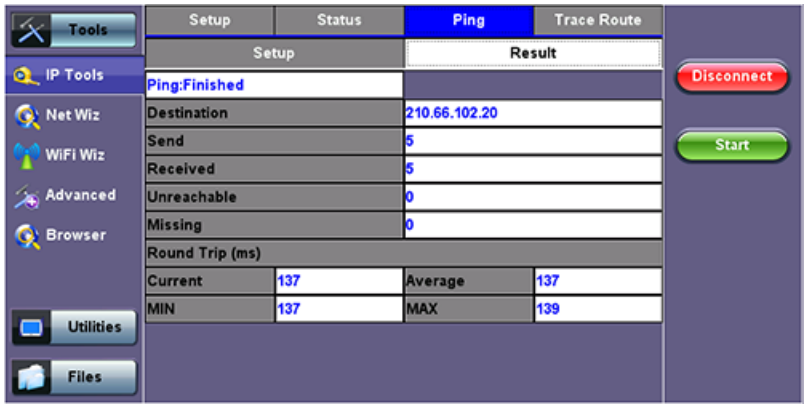
- **Profile:** Delete, Save, Save as..., or Default.
- **Destination:** Press the drop -down menu and enter the destination IP address or URL to ping.
- **Number of Pings:** Enter the number of ping attempts (up to 10000) that will be performed to reach the network device.

  *If Continuous Ping is selected, the user is not required to enter the number of pings. The test set will continuously ping the target host until the user presses **Stop**.*
- **Length:** Enter the length of the ICMP echo request packet transmitted.
- **Ping/Sec:** Enter the Ping repetition rate (Ping/second).
- **Time Out:** Time-to-Live (TTL) in milliseconds. Enter the maximum time allowed (in ms, up to 99999 ms) between an ICMP ping and echo response.

Once the parameters are configured, press **Start** to begin the test.

Ping Results

Pressing Ping will take you to the **Result** tab and start the Ping test.

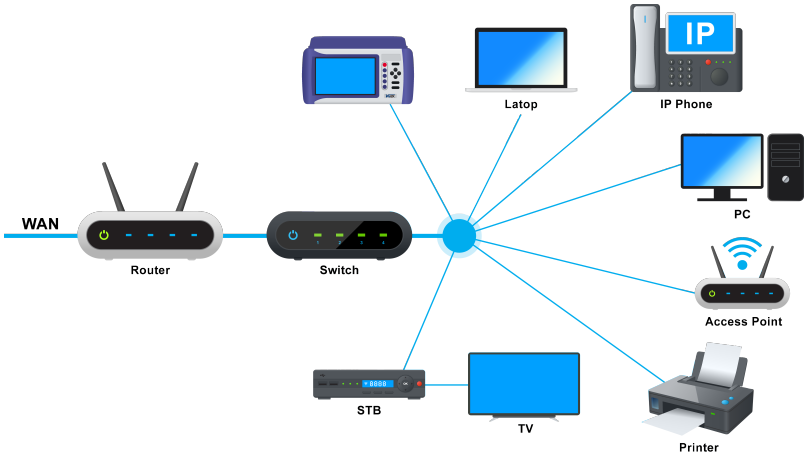


Ping Result

- **Destination:** Indicates the destination IP address.
- **Ping status:** In Progress, PASS, or FAIL.
- **Sent, Received, Unreach, Missing:** Number of pings sent, received, unreached or missing. A Ping is counted missing if no response is received before timeout. A Ping is counted unreached if an echo response is received with host unreachable set.
- PING also estimates the round-trip time in milliseconds.
    - **Current:** The current time for a Ping request to be answered.
    - **Average:** The average time recorded for a Ping request to be answered.
    - **Max:** The maximum time recorded for a Ping request to be answered.
    - **Min:** The minimum time recorded for a Ping request to be answered.

Net Wiz

The Net Wiz function tests the Ethernet cable and associated network environment. A typical application is shown below.



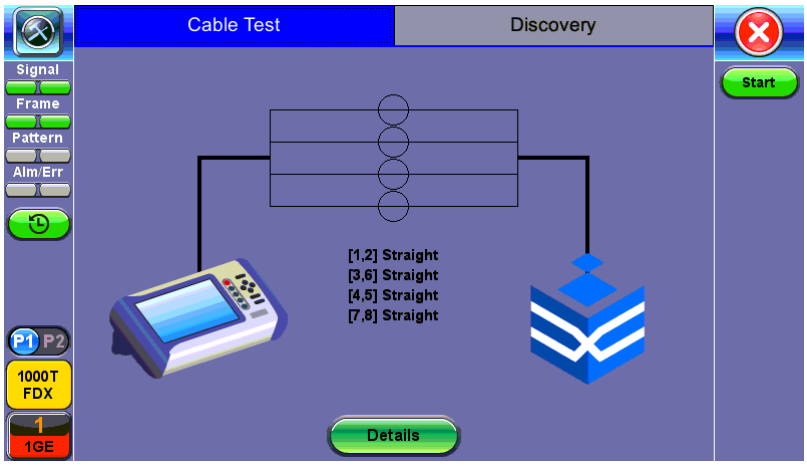
Typical Net Wiz Application

Net Wiz tests include:

- Cable Analysis with distance (Ethernet RJ45 Test port only, not available on Ethernet RJ45 Management port)
  - to switch with MDI mode (Straight or Crossover)
  - to fault, type of fault (Open, Short, Impedance Mismatch)
- Analyze the network and automatically report
  - Stations
  - Routers/Gateway
  - Printers
- Provide MAC and IP addresses of each device
- PING each device and verify the device is active
- Provide detected networks (NetBiOS, IPX, etc.)

Before proceeding with any Net Wiz tests, make sure that an IP connection has been established. Refer to IP Connection for more information.

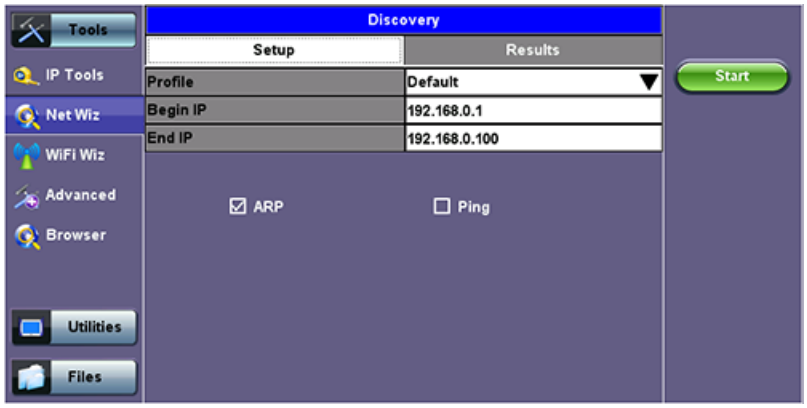
Cable Test



Cable Test

Press **Start** to begin the test. The test set will return the connection type (Straight or Cross Over) if connected to an end device. If fault is detected (Open or Short) the fault will be indicated as well as the distance to the fault.

Discovery Setup



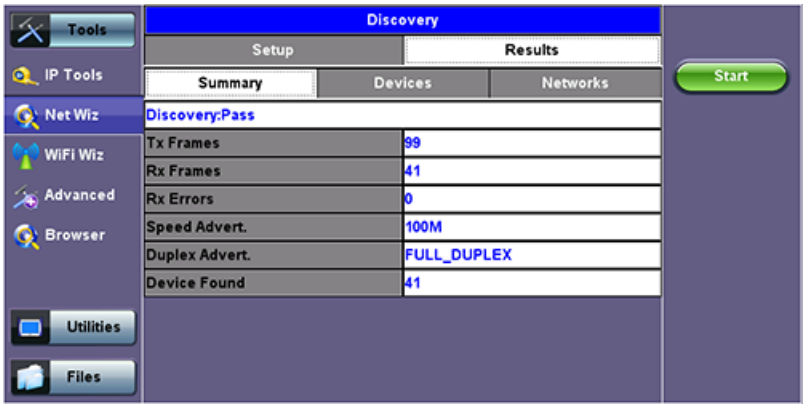
Discovery Setup

- **Profile:** Drop-down selections are Default, Delete, Save, Save As...
- **Begin IP:** Set the start address for the desired IP range using the numeric keypad

- **End IP:** Set the end address for the desired IP range using the numeric keypad

Select by placing a check mark in the corresponding box of any of the following: ARP, SNMP, NetBios, Ping, Net .

Discovery Results

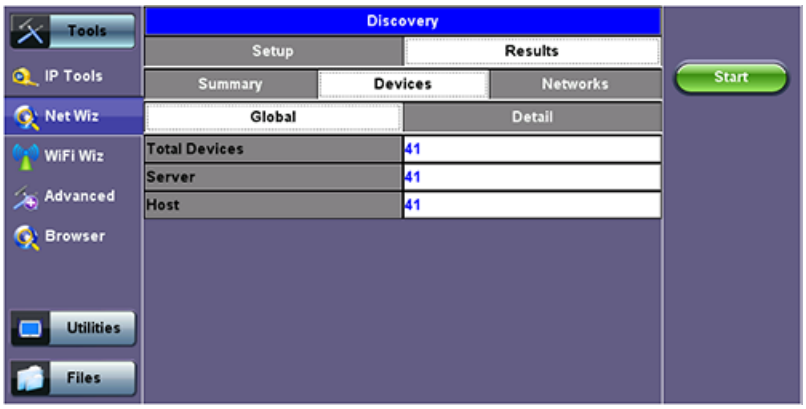


Discovery Results - Summary

Summary indicates the test status and reports:

- **TX/RX Frames:** Total number of TX (transmitted) and RX (received) frames
- **RX Errors:** Received frames in error
- **Speed Advert:** Speed advertised
- **Duplex Advert:** Duplex mode advertised
- **Devise Found:**Total number of Devices and Networks found

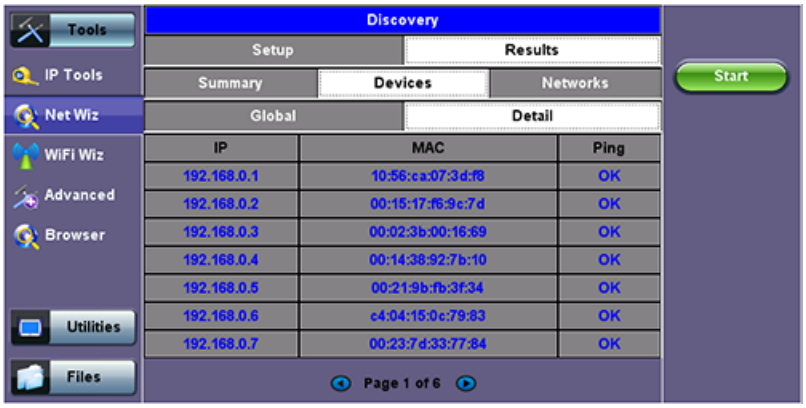
The **Devices** tab reports global and detailed device information.



Discovery Results - Devices - Global

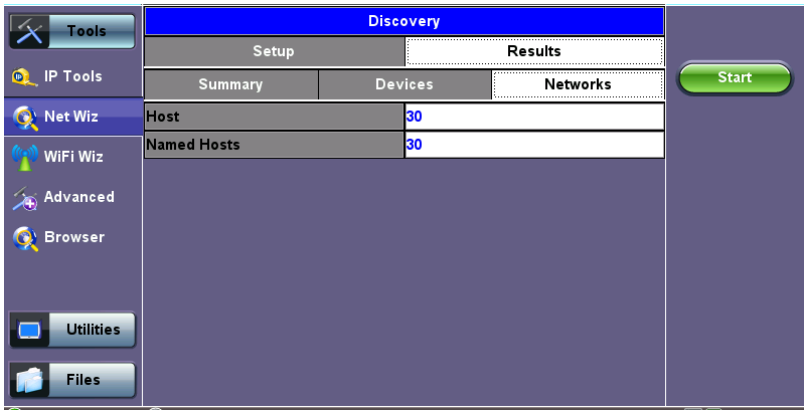
Global reports:

- Total number of devices found
- Number of devices (Routers, Servers, Hosts)



Discovery Results - Devices - Detail

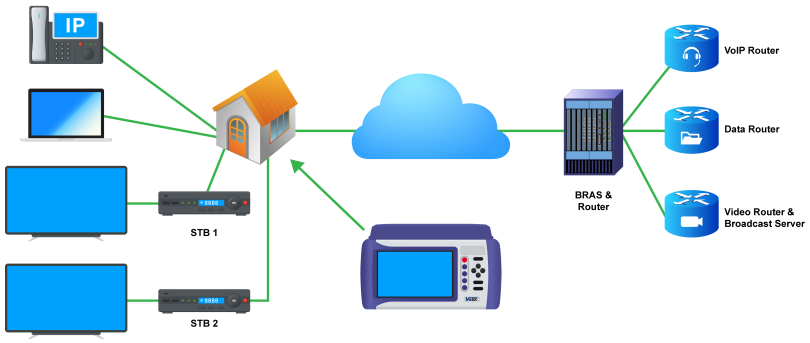
Detail displays the Attribute, MAC and IP Addresses, Group and Machine Names and Ping test results of each device discovered.



Discovery Results - Networks

Networks reports the number of IP Subnets, Hosts, Domain, and Named Hosts found.

WiFi Wiz



WiFi or Bluetooth options are available using WiFi and/or Bluetooth dongles.

Built-in web browser remote control is available when WiFi is enabled.

Passwords are case sensitive. If the wrong network key is entered, the test set will still connect to the Access Point but will not be able to connect to the web or perform the Ping test.

The WiFi Wiz function can be used to provide WiFi connectivity to the unit. Depending on the unit's model, it supports 802.11 b/g/n (2.4 GHz frequency band) connectivity or 802.11 a/b/g/n/ac (2.4 GHz and 5 GHz frequency bands) connectivity. Refer to the unit's specification sheet for details.

The WiFi Wiz function supports:

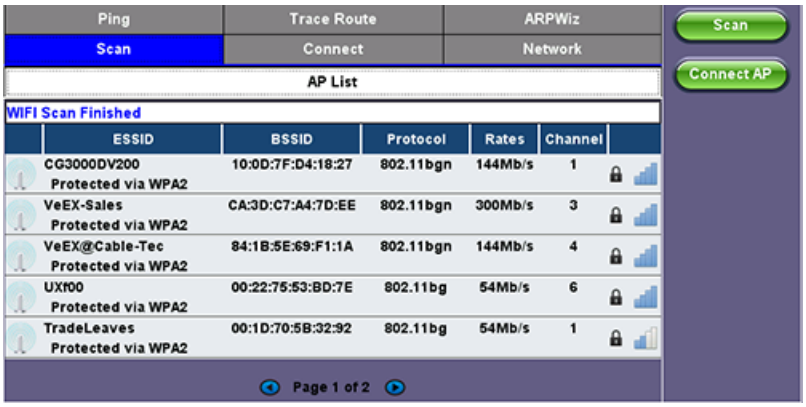
- 802.11 a/b/g/n/ac standards (WiFi USB adapter provided by VeEX)
- WEP, WPA, WPA2 Encryption
- Scanning
- SSID broadcasting and report
- Signal Strength
- IP Connection and Ping Test

WiFi Procedure

Plug the WiFi adapter into the USB port. Allow at least 30-45 seconds for the unit to detect the wireless adapter and for the software driver to load.

Products support USB wireless adapters supplied by VeEX only and have the necessary software driver built into the test set.

1. To access the WiFi option, tap **Tools**, and then tap **Bluetooth/WiFi**.
2. Select the **WiFi Wiz** tab.
3. Tap **Scan** to scan the list of available WiFi APs.



WiFi Wiz - AP List

AP List

The following information is displayed for each AP:

- SSID name of the AP
- BSSID (MAC address) of the AP
- 802.11 protocol version supported by the AP
- Max data rate supported by the AP
- AP's radio channel number
- Lock symbol indicates if security is set on the AP (WEP, WPA or WPA2).

When the AP is unsecured, no lock symbol is displayed.

- Signal strength of the AP

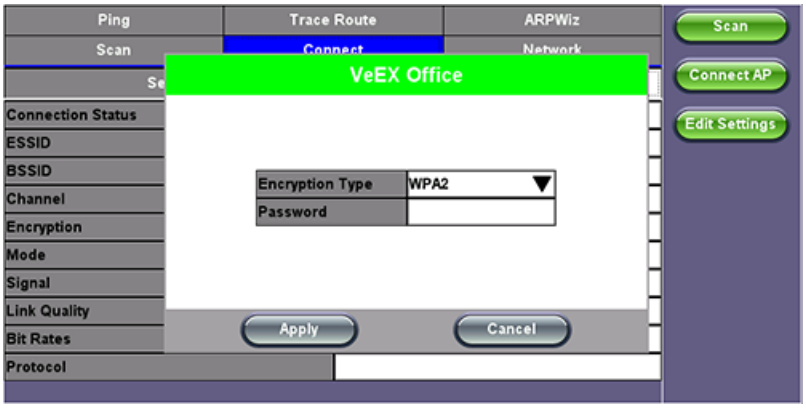
4. Select one of the Access Points (AP) to start a connection. If the AP is locked, a network key is required to complete the connection. The key can either be 10 characters or 26 characters. Once selected, an **Edit Settings** function key appears.

If the wrong network key is entered, the test set will still connect to the Access Point, but will not be able to connect to the web or perform the Ping test.

5. Tap **Edit Settings** or **Connect AP** to change the Encryption Type and enter the WiFi Key.
   - **Encryption Type:** Supported encryption types include WEP, WPA, and WPA2.
   - **Password/Key:** Security phrase or password necessary to access SSID and network. Tap the **Password** field to enter the AP password on the pop-up keypad.
     - ASCII formatting supported
     - The password/phrase can be hidden (**Global Settings** > **Show Password** > **Yes/No**).

Passwords are case sensitive.

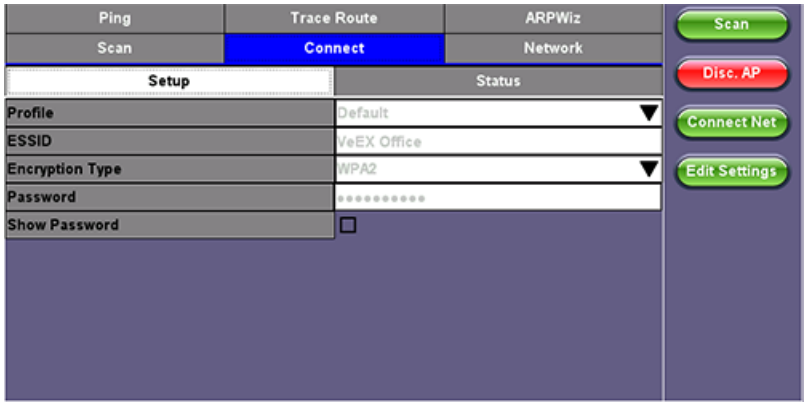
6. Tap **Apply** after selecting the Encryption Type and entering the key/password. The **Connect AP** button will change to **Disc. AP** upon successful connection and the **Connect Net** key will appear.



WiFi Wiz - AP Encryption Settings

Connect

The **Setup** tab displays the Profile, ESSID, Encryption Type and Password.



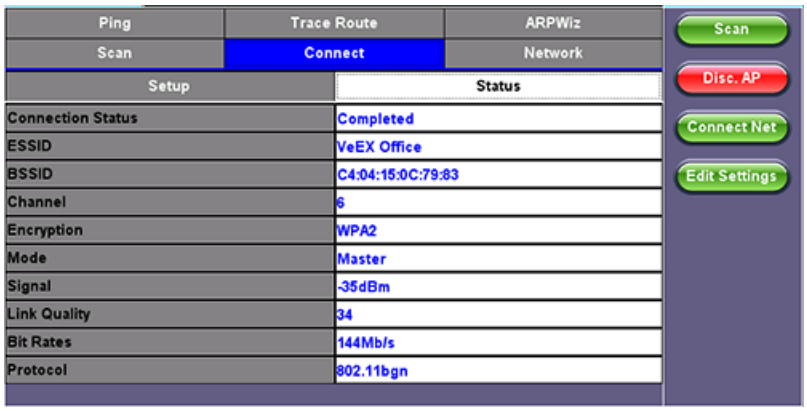
WiFi Wiz Connection Setup

Status

The Status Tab displays the following information on the connection:

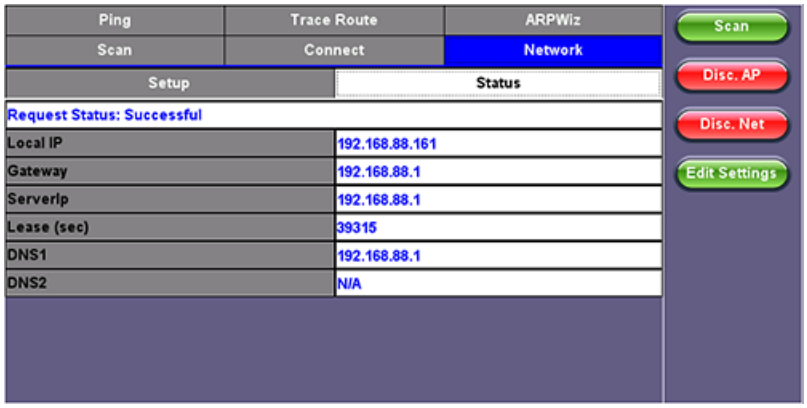
- **Connection Status**
- **ESSiD:** Name connected to
- **BSSiD:** MAC address of wireless router/device connected to
- **Channel:** WiFi Channel # connected to
- **Encryption:** Encryption type

- **Mode**
- **Signal:**
  - Radio signal level (dBm)
  - Link quality score
  - Max data rate
  - 802.11 protocols supported



WFi Wiz Connection Status

After a successful connection to the Access Point, tap **Connect IP** to obtain an IP address and access the additional IP tests like Ping, Trace Route etc.



WiFi Wiz Connect IP

ARP Wiz

ARP Wiz uses the Address Resolution Protocol (ARP) to verify the status of each IP address in a user-selectable IP range. ARP is the standard method for finding a host's hardware address when only its network layer address is known. In other words, ARP is used primarily to translate IP addresses to Ethernet MAC addresses. ARP is defined in RFC826.

ARP Setup

Configure the following parameters and press **Start**. The test will continue to run until **Stop** is pressed. A finished status indication will display when the test finishes.

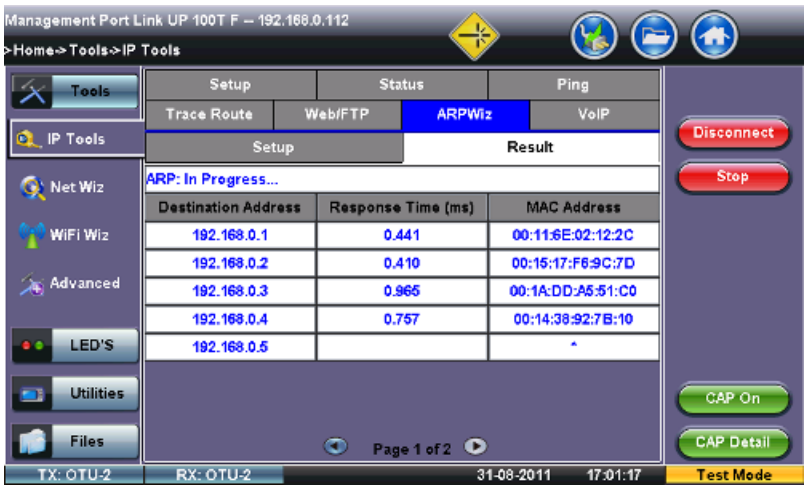
- **Profile:** Default, Delete, Save, or Save As...
    - **Start IP:** Starting IP Address.
    - **End IP:** Ending IP Address.
    - **Time Out(s):** Range from 1-99 seconds. Input using the numeric keypad.

ARP Wiz Setup

ARP Result

The MAC addresses associated with active IP addresses in the range are displayed. If no MAC address is associated with the IP address, a **FAILED** status is displayed.

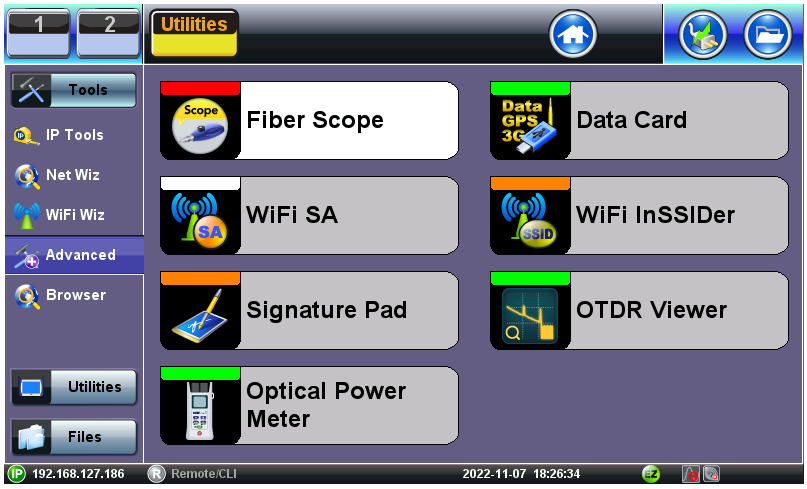
ARP Wiz uses the ARP protocol and can only work within the same subnet as the IP address provided to the test set in IP Status



ARP Wiz Result

Advanced Tools

Fiber Scope



- "DI-1000 Digital Fiber Inspection Microscope" on page 99
- "DI-1000MPO Digital Fiber Inspection Microscope for Single and Multi-Fiber Connectors" on page 100
- "DI-3000 Auto-Focus Digital Fiber Inspection Microscope" on page 104

The VeEX digital fiber inspection scopes evaluate fiber optic connectors for dirt and end face quality. The hand-held probe design enables easy inspection of patch cords and connector panels. Extended tips are available for hard to reach bulkhead or patch panel connectors. Clear images are displayed on the test sets for immediate analysis and can be saved for record keeping.

The Fiberscope test application can be used in conjunction with any VeEX Digital Fiber Inspection Microscope.

All DI series fiberscopes can auto freeze image when focus is achieved to capture the image and qualify the connector endface for cleanliness and damage per IEC 61300-3-35. For more information about available connector tips, see the *DI-1000/DI-1000MPO/DI-3000 Digital Fiber Inspection Microscope Adapter Tips Guide*.

All wired fiber inspection scopes are powered via a USB Type-A connection with a host device or the VeEX Power Bank/WiFi Bridge. For host devices that have Micro-B or Micro-C input ports, USB Type A to Micro-B or Micro-C OTG dongle adapters are available as an add-on order from VeEX.

The Importance of Fiber Connector Inspection

Dirty or scratched connectors introduce loss, increase ORL and/or damage other connectors (Loss and Return Loss becomes more critical at higher data rates). End-face contamination is a leading cause of fiber link

failures in data centers, corporate networks, MSOs and Telecom environments.

Fiber Inspection Scopes provide a magnified image of the fiber optic connector's end face, focusing on the contact areas (most likely to impact network performance or permanent damage by mating of contaminated connectors). Images, visual inspection, and automated tools are often used to grade the health and cleanliness of connectors, after polishing or cleaning and before being used.

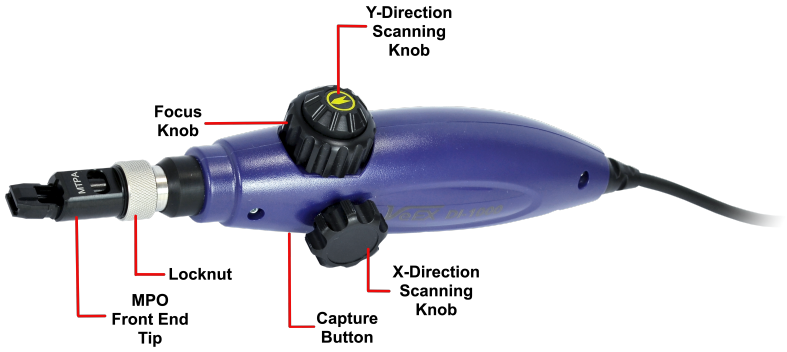
To achieve maximum power and prevent false readings, clean the optical fiber connector interfaces before inserting them into the test port.

Please ensure the correct fiber connector type is used before inserting it into the test port or connector. Mismatched connector types will damage the optical end faces and the test set.

DI-1000 Digital Fiber Inspection Microscope

DI-1000 Digital Fiber Inspection Microscope

- **Locknut**: a threaded fastener that secures the tips in place.
- **Inspection Tip**: a front-end component inserted to view the connector endface
- **Capture Button**: a button that starts and stops (play or pauses) the video stream of the fiber end-face to save an image at the current frame.
- **Focus Knob**: a rotating dial that can be turned clockwise or counterclockwise to view clearer image. Make sure connector is properly seated in the adapter tip.
- **USB Type A output**: USB connector to plug into host power source to enable operation.



DI-1000MPO Digital Fiber Inspection Microscope for Single and Multi-Fiber Connectors

- *WiFi support requires VeEX Power Bank/WiFi Bridge accessory and host device/test set has built-in WiFi capability. See the test set's data sheet on www.veexinc.com or contact VeEX Customer Care for more information.*
- *To work with single fiber tips, the front end tip should be replaced with the collar provided with the scope. For more information adapter tips, see the DI-1000 Digital Fiber Inspection Microscope Adapter Tips Guide on www.veexinc.com.*

For more information on using the DI-1000MPO, see the DI-1000MPO Quick Guide on www.veexinc.-com.

DI-1000MPO Fiber Analysis

There are two methods to inspect MPO fibers using the DI-1000MPO:

1. **Touchscreen (standard)**

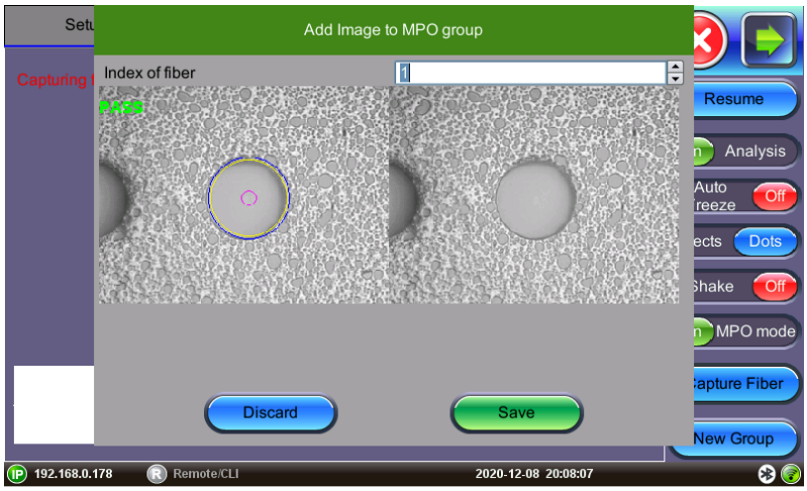
   Press the **Capture Fiber** button on the touchscreen for every MPO fiber properly focused, analyzed, and scoped.

   Press **OK** in the pop-up window to confirm the MPO fiber number, then adjust the scope controls (horizontal (x-axis) control only) to navigate to the next fiber.

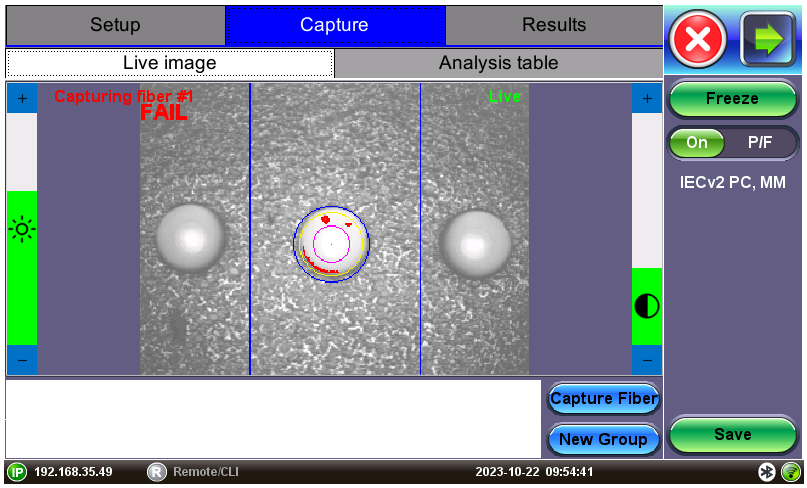
2. **Fiber Scope button (fast)**

   Press the Capture button (located on the bottom of the DI-1000MPO fiberscope) successively to capture, confirm the MPO fiber number, and add the fiber screenshot to the list. As the x-direction (horizontal control) is rotated to the next consecutive MPO fiber the logging actions are done on the fiberscope itself. Scoping an MPO-12 fiber can be done under a minute.

   Press **New Group** to create a new set of MPO images.



MPO Group - Add Image

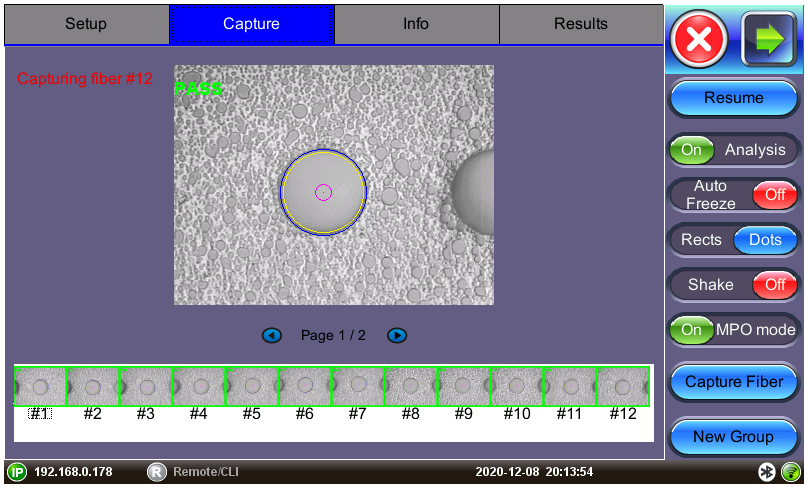


Aligning Fiber for Analysis

When using a DI-1000MPO+, which has a wider field of view, align the correct fiber between the two lines for analysis.

The example below shows a completed MPO-12 cable inspection.

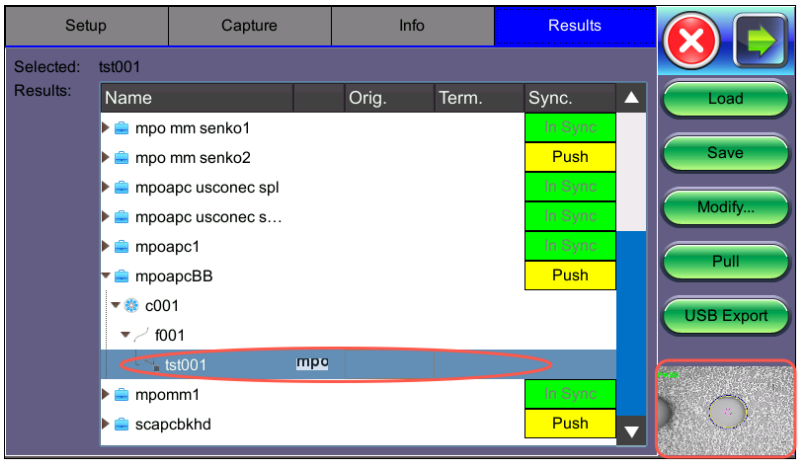
The key-up and key-down adapter that comes with the DI-1000MPO standard package is a straight-through connection so the MPO fiber # at the start matches the MPO fiber # at the end (not flipped). When using the adapter, fibers will be in the opposite orientation of the camera. In the below example, fiber #1 is on the right.



MPO Group - Completed (PASS)

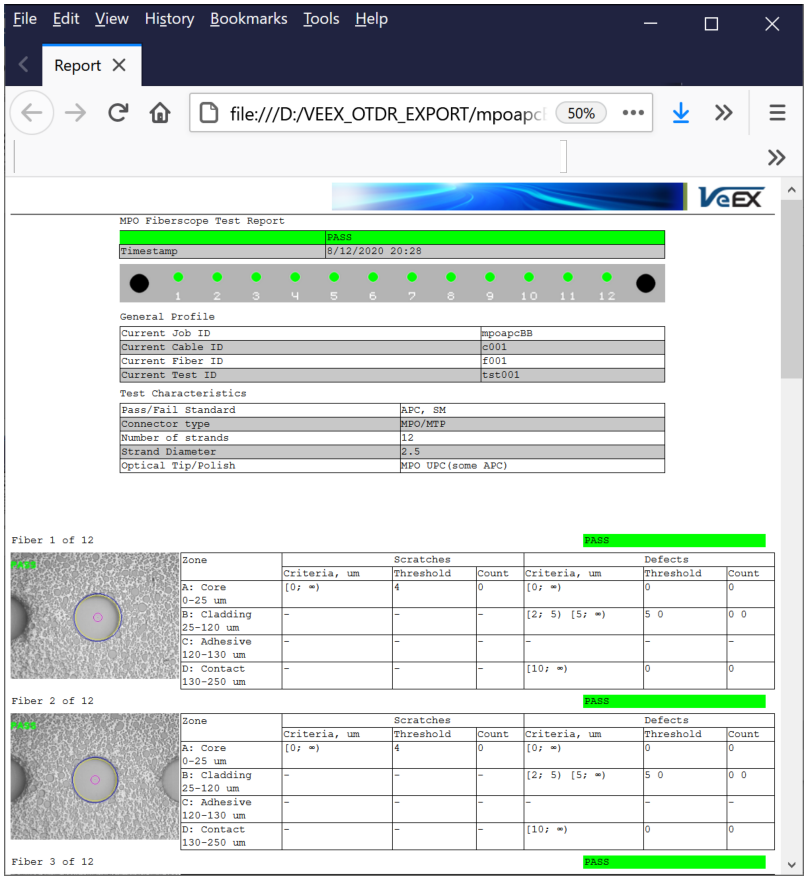
To save MPO results, navigate to the **Results** tab once all fibers have been captured and press the **Save** button.

To view results on the unit, on the **Results** tab navigate to the **mpo** heading on the saved trace and press **Load**. Tap each individual screenshot to view the individual MPO fibers.

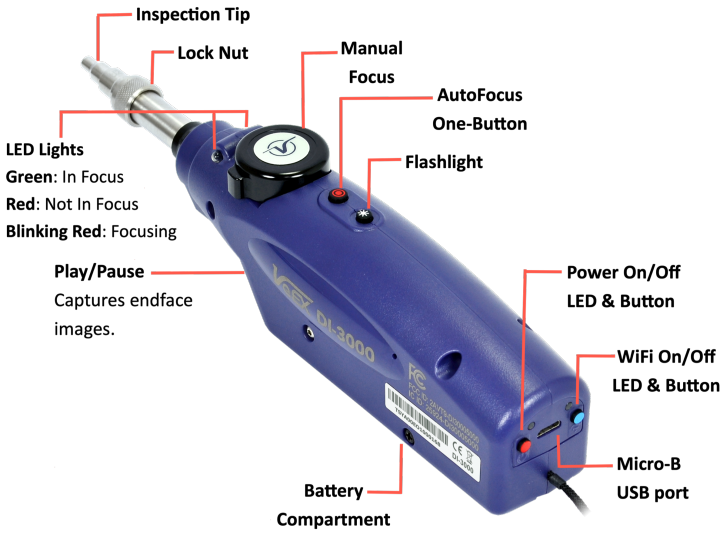


MPO results

(Scope image appears on bottom right corner of the screen.)



Fiberscope MPO endface test viewed in an HTML browser



DI-3000 Wi-Fi Autofocus digital inspection scope

WiFi support requires host device/test set has built-in WiFi capability. See the test set's data sheet on www.veexinc.com or contact VeEX Customer Care for more information.

Connecting the Fiberscope

Use an USB-A OTG cable (optional with purchase) to connect a USB to the micro-B USB port. The port supports memory drives and USB add-on devices such as fiberscopes.

OPTICAL SAFETY

- *Deactivate the laser before connecting or disconnecting optical cables or patchcord.*
- *Never look directly into an optical patchcord or optical interface while the laser is enabled. Exposure to optical radiation for an extended period can caused irreparable damage to eyes.*
- *Never use a fiber microscope to check the optical connectors when a laser source is active.*

The operator is assumed to have received basic training in fiber optics and related testing and measurement practices.

Read the "Safety Information" on page 8 before beginning using optical features of the test set.

Fiber Scope image view requires the Fiber Scope Expert option to be enabled on the chassis/platform except for the VS500 which can already include this option. This can be confirmed by viewing the device ID is either -1500 or -2500.

Attach the DI-1000/DI-1000MPO/DI-3000

Attach the fiberscope to an available USB Type-A interface on the test set.

Older analog fiberscopes require a USB adapter.

If using a DI-3000, WiFi can be used to connect to a platform with WiFi available. See below.

When the DI-1000, DI-1000MPO, or DI-3000 are powered, they will emit a blue LED. Select the tip that best matches the connector endface that is to be inspected.

For more information about available connector tips, see the DI-1000 Digital Fiber Inspection Microscope Adapter Tips Guide on www.veexinc.com.

After powering on and setting up the fiberscope, select the tip that best matches the connector endface that is to be inspected.

Scope tips are secured in place with a locknut. There is a slot (specialty tips may have more than one slot) that will ensure the tip is aligned properly to the top of the fiberscope prior to securing the locknut. Attach a tip by rotating the locknut clockwise (tip faced away). Remove a tip by rotating the locknut counterclockwise (tip faced away). With the correct tip fastened and secured, launch the Fiberizer application (PC, mobile, VeEX test set) and plug into an available USB interface or connect to the WiFi network.

Rotate the round focus knob to manually bring the image into focus. For the DI-3000 scope, a built-in autofocus button can also be used.

Once the fiberscope is detected, tap **Yes** in the pop-up window to enter the Fiberscope menu.

Fiber Scope Detected Message

Alternatively, select the **Test Application icon** > **Utilities** > **Fiber Scope**.

Fiber Scope Connection Mode Selection (USB for direct connection, Wi-Fi for DI-3000 AP)

Select the **USB Fiber Scope** checkbox for wired fiberscopes, such as the DI-1000, DI-1000MPO, VS500 *(discontinued)*, or DI-3000 via USB.

Select **WiFi Fiber Scope** to initiate a scan for an available DI-3000.

See the WiFi Wiz section for more information on setting up a WiFi Access Point if automatic scanning fails.

The WiFi Access Point password is: "veex" plus the last six digits of the serial number of the DI-3000 to connect with e.g. "veexA00700", where the serial number is SN:LA-3KA00700.

Fiberscope Setup

Captured patch cord image files are saved within a folder directory. In the **Setup** tab, name each folder and file in the directory and select a save increment.

Fiber Scope Setup - Page 1

- **Scope mode**: Sets Fiber Scope connection method.
  - **Local**: Direct USB (wired) connection.
  - **Remote DI-3000**: Wifi connection to DI-3000.
- **Reset Con**: Resets connection method currently used (Remote or Local) with fiberscope, so another can be selected.
- **Auto Save**: **Disable**, **Autosave on Tap**, or **Autosave after freeze**. If **Autosave on Tap** or **Autosave after freeze** is enabled, the unit automatically saves and creates the filename using the Trace ID after the test. The file location and name will display. Auto Save is available for single fiber analysis only.
  - **Disabled**: Turns off Autosave function. When Autosave is disabled, results can be manually saved on the Results tab after finishing the fiber endface inspection.
  - **Autosave on Tap**: On the **Capture** tab, tap the screen to automatically save the captured image. “Tap screen to save” will appear to indicate that the feature is enabled.

- **Autosave after freeze**: Automatically saves the captured image upon freezing the image. (Auto-freeze enabled or normal Freeze.)

When **Ask Before Save** is selected, the **Save** menu will display with naming and comment options.

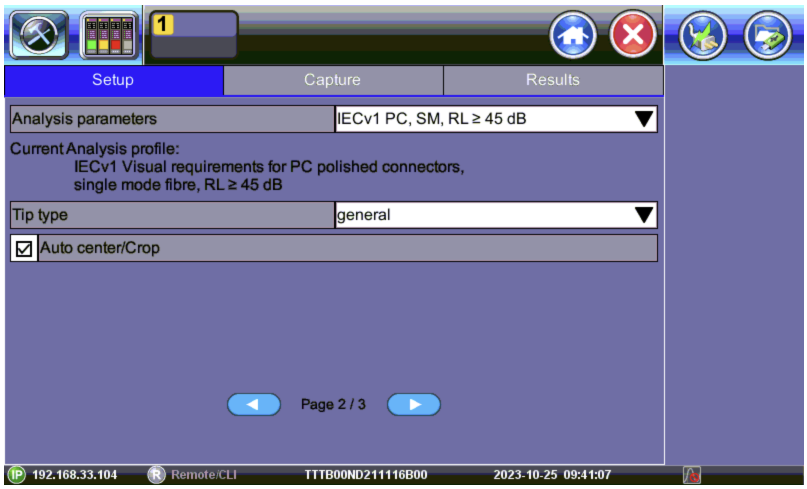
The details entered in the following fields can be used to pre-set the filename automatically and increment the fiber or test number automatically.

- **Job ID**, **Cable ID**, **Fiber ID**, and **Trace ID** are nested folders that store saved results. Folders are nested in the following order: **Job** > **Cable** > **Fiber** > **Trace**.

  Tap the blank fields to edit the names.

- **Increment**: Increments the selected ID name if an Auto Save option is selected.

Saved image files can be retrieved from File Manager or managed from the **Results** tab. Refer to "File Manager: Working with Saved Results, Profiles, Images" on page 156 for more details.



Fiber Scope Setup - Page 2

Fiber Scope Setup - Page 3

Analyze Fiber Connectors

1. After assigning the scope mode and save options on Page 1, select the analysis profile from the **Analysis parameters** drop-down box on **Page 2/2** of the **Setup** tab.
   The analysis profile is based on the fiber endface connector inspected, as well as applicable to MTP™/MPO (multi-fiber) connectors. .
   - **PC, SM RL ≥ 45 dB**: SPC or UPC polished connector
   - **PC, SM RL ≥ 26 dB**: Older connectors with flat or PC polish (used with LC/MU)
   - **APC, SM**: Angled polished connector
   - **PC, MM**: Multi-mode connector
2. Select the **Tip Type** from the drop-down box. Tip Type is used to optimize Pass/Fail analysis for certain types of connector tips.
   - **General**: Encompasses standard SC, FC, ST, and other 2.5 mm ferrules. LC/APC and E2000/APC should not use general tip type.
   - **LC**: Lucent connector (male). Use on all 1.25 mm connectors with ceramic (LC/MU connectors).

- **LC female**: Lucent connector (coupler/bulkhead). Use when inspecting 1.25 mm type patch panels, MUX and test ports.
- **E2000™**: Proprietary family of connectors invented by Diamond SA known for its low insertion loss characteristics and built-in (latched) shutter. Use when inspecting Diamond E2000 connector with ceramic ferrule.

3. After the image is frozen, select the **Auto center/Crop** checkbox to take the current video frame and center it by the detected fiber image inside the program window, i.e. in case of long (extension) tips or handshaking. Initially, a blank screen will display. This is ideal for APC images. This is recommended when inspecting Angled bulkheads/couplers with Shake OFF.
4. Select the **Capture** tab.

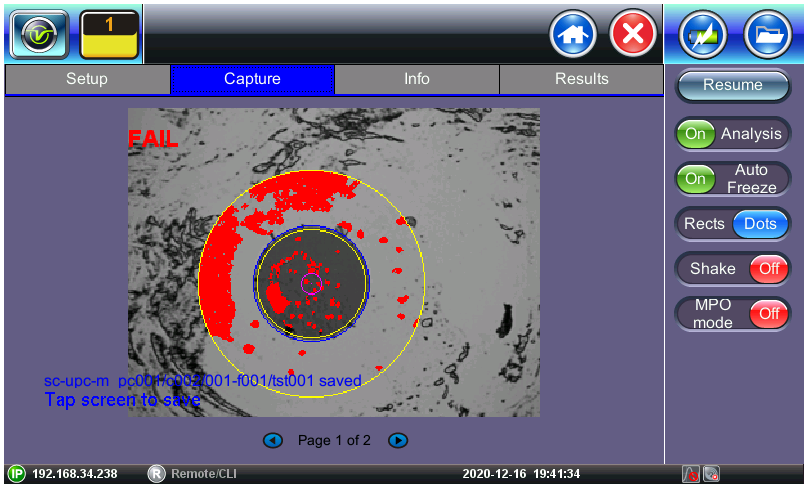
Capture Images (View)

The **Capture** tab is the main user interface for the connector end face inspection and analysis. It presents a real-time view of the connector's end face allowing for alignment and focus. **Page 1** of the capture screen displays a live image of the connector face and features analysis and freeze tools.

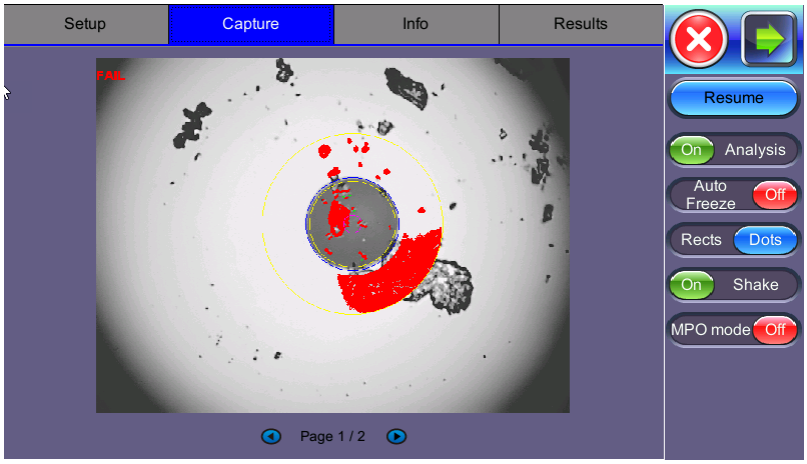
The fiber end face image will normally display near the middle of viewing window area. The exception will be when inspecting bulkhead/couplers of APC connectors or using A6 type tips. The end face image will appear off-center. AutoFocus and Shake OFF setting is recommended when inspecting couplers. Gently adjust centering while manually focusing the image and image will freeze as soon as focus is achieved.

For the DI-3000, press the autofocus (red target) button when the image is out of focus to enable the device's automated focusing operation. With a steady hand, the end face will be promptly autofocused and ready for capture.

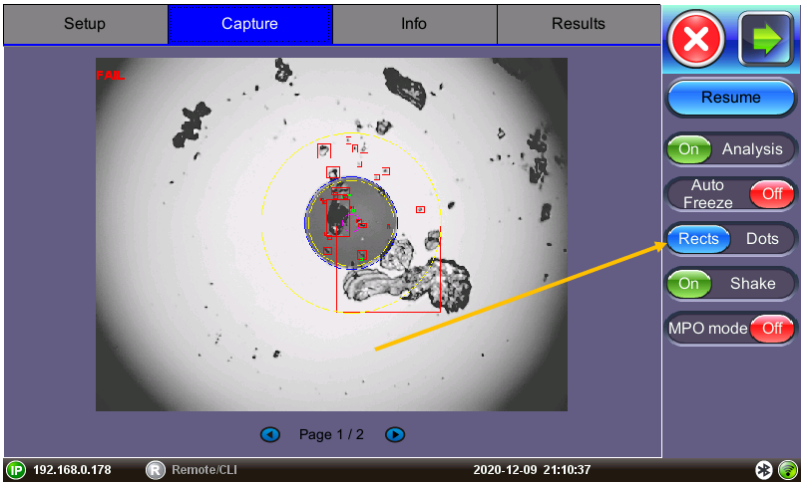
*Initially, there is no screen shown until **Resume** is pressed.*



Real time video of the connector face. Red contours indicate scratches and defects.



Fiber Scope Capture - Dots vs Rectangles



Rects function highlighting overlay

The radio buttons on the right panel do not indicate the current state or setting, they indicate the action that would take place if pressed. For example, if “Analysis OFF” is tapped, the analysis function is turned OFF and the button displays “Analysis ON”.

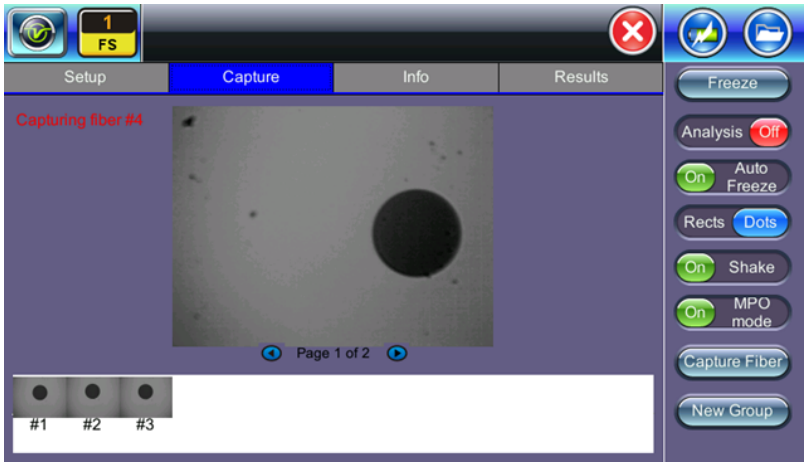
- **Resume / Freeze**: Stops the video capture from the fiberscope. If the optional Auto Freeze feature is enabled, the test set will automatically freeze the image when it comes into focus. Once the image is frozen, tap the image to save it.
- **Analysis On / OFF**: Turn ON/OFF the automatic Pass/Fail threshold defined by IEC 61300-3-35.

- **Auto Freeze**: Turn ON/OFF the ability to freeze the video automatically, when in Focus. The default is set to OFF. To see the image after it freezes, tap **Resume**.

Auto Freeze may be useful when scoping certain angled polish fibers.

- **Rectangles / Dots**: Dots draw a red contour around scratches and defects. Rectangles highlight scratches and defects without obstructing the view. The selection between dots or rectangles does not affect the area calculation or the Pass/Fail results. Dots are set as default.
- **Shake**: Turn ON or OFF the ability to Auto Freeze or Analyze when probe image is unsteady, such as when inspecting a female connector or bulkhead. It minimizes significant vibrations and unsteadiness generated from the fiberscope being held. Typically, this function is not always needed with the use of image focusing.
  When inspecting bulkhead couplers or MUX/transceivers set Shake to OFF.
- **MPO mode**: Turn ON when inspecting ribbon fibers (MPO/MPT connectors). Create a **New Group** for each MPO ribbon and **Capture Fiber** to save an image for each strand.

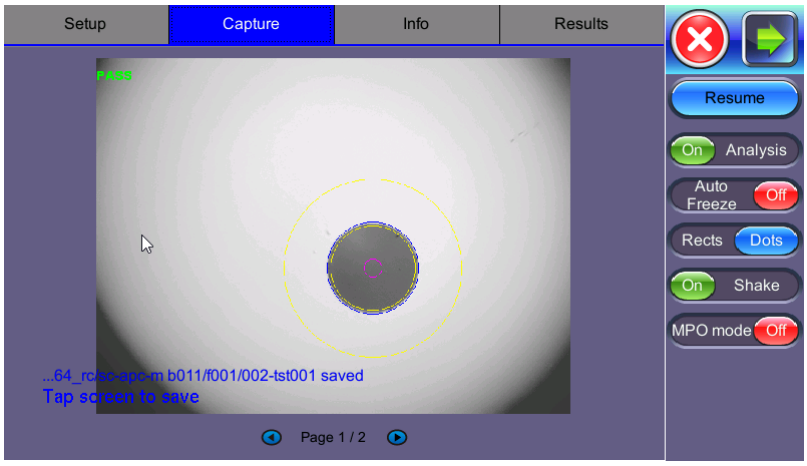
*When inspecting MPO/MPT connectors, it is recommended to set **Auto Freeze** and **Shake** to **OFF**.*



Fiber Scope MPO mode

To save the image on the screen, tap the screen after freezing.

After saving, go to **Results** or **> Utilities > FilesFiles** to view the report and export to PDF or USB.

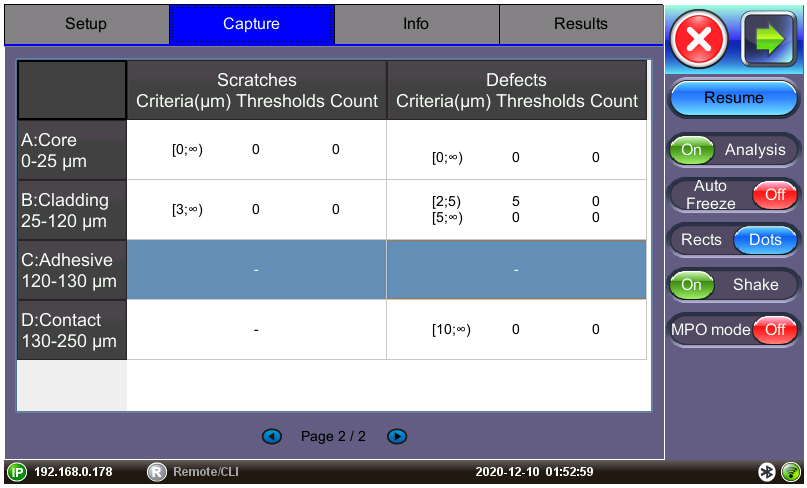


Fiber Scope Capture - PASS

In the example above, the message in blue states that the image can be saved when tapped. This indicates that the **Autosave** on Tap option was enabled on **Page 1** of the **Setup** tab. If **Autosave after freeze** were selected, no message to tap the screen would appear.

Page 2 displays all numeric results from defect and scratch events found for all four zones. These are used for the evaluation of the Pass/Fail criteria, according to the IEC 61300-3-35 standard. (Scratch requirements refer to width.)

This table will also be included in the reports.



Pass/Fail IEC analysis table

(Measured scratches and defects compared with threshold criteria for each fiber layer)

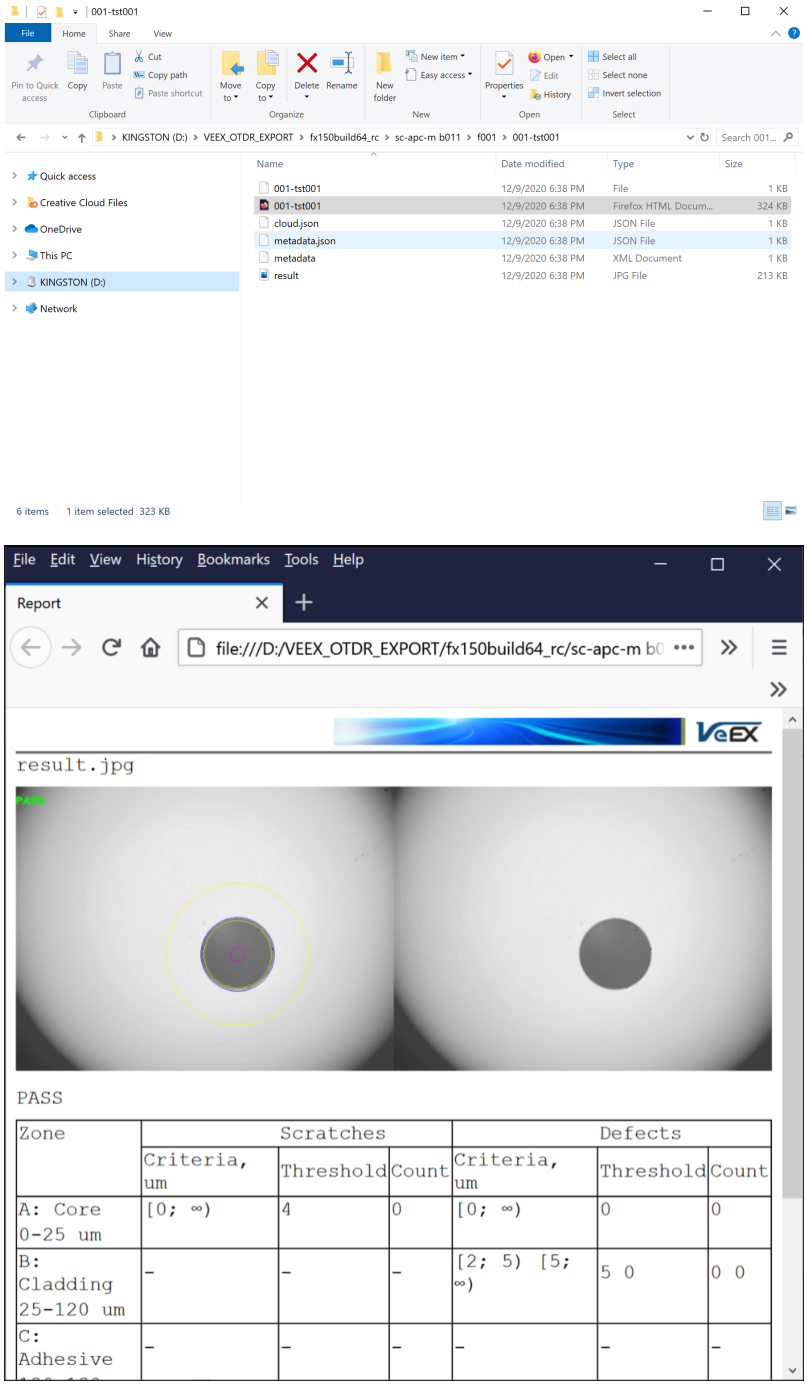
Results/Reports

Fiber Scope Analysis

(For Fiberscope Results, Scope image appears on bottom right corner of the screen.)

The results screen is used to view previously saved results. Test results can be pushed/pulled from Fiberizer Cloud. The directory displays the location of stored files. Connect to Fiberizer Cloud, then select the file(s) by tapping them.

- **Push/In Sync**: Uploads locally saved results to Fiberizer Cloud. *In Sync* indicates the results have been saved to Fiberizer Cloud successfully.
- **Load**: Loads the selected image onto the Capture tab.
- **Save**: Manually saves and names the image displayed in Capture (autosave is disabled). Once saved, the files can be accessed in the "File Manager" on page 155 or "R-Server" on page 76.
- **Modify**: Select a file or folder in the directory to modify. Options to Rename, Remove, and upload the selection to Fiberizer Cloud are available.
- **Pull**: When connected, pulls file from Fiberizer Cloud onto test set.
- **USB Export**: Exports files to USB stick. Choose Export Group to retain the tree format (sub-directory) or Export Flat to create a single filename using sub-directories to build a name.
  In the Result Files example above when choosing to retain the tree format, the highlighted 022-tst001 results file can be found in the following directory after exporting:
  >fx150build64_rc > sc-apc-m b01.

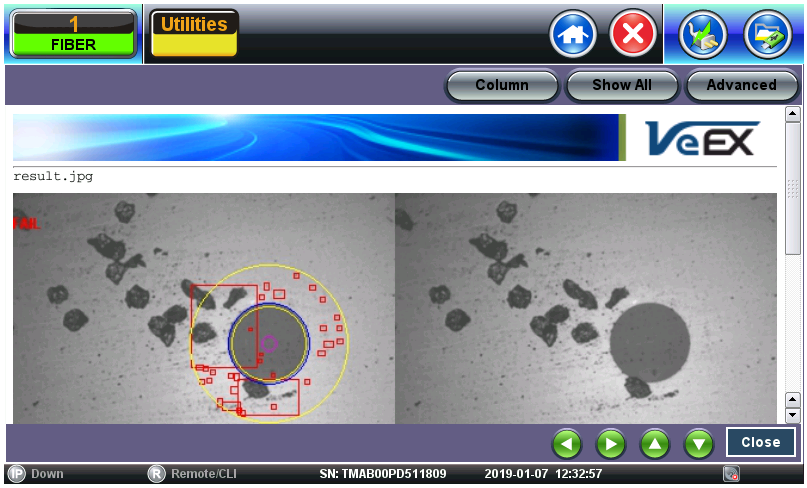


Fiberscope test viewed in an HTML browser

Reports can also be viewed as pdf files.

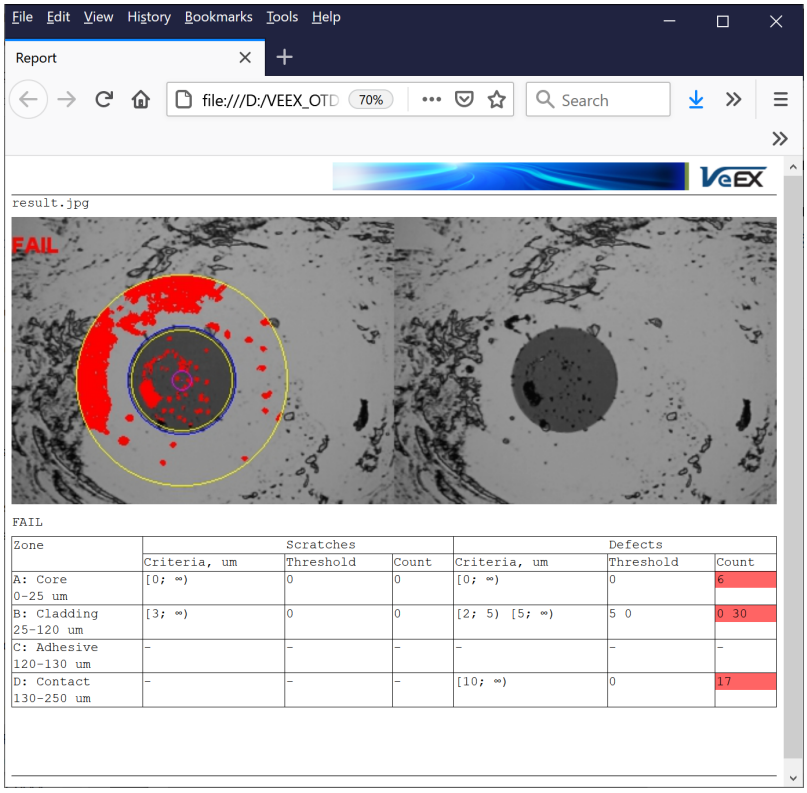
Test Analysis Report

To view the report files, tap **Utilities>Files>Save**. The Fiber Scope test report can be viewed in JPG format or exported to PDF. In addition, all fiber optic test results can be viewed using Fiberizer Cloud or the Fiberizer Desktop Plus PC software. For more information on viewing reports, see "File Manager" on page 155.



Analysis Report (.jpg format)

The test report can also be viewed in HTML format.



Zone	Scratches			Defects		
	Criteria, um	Threshold	Count	Criteria, um	Threshold	Count
A: Core 0-25 um	[0; ∞)	0	0	[0; ∞)	0	6
B: Cladding 25-120 um	[3; ∞)	0	0	[2; 5) [5; ∞)	5 0	0 30
C: Adhesive 120-130 um	-	-	-	-	-	-
D: Contact 130-250 um	-	-	-	[10; ∞)	0	17

Test Report viewed in an HTML browser

Fiberizer Cloud

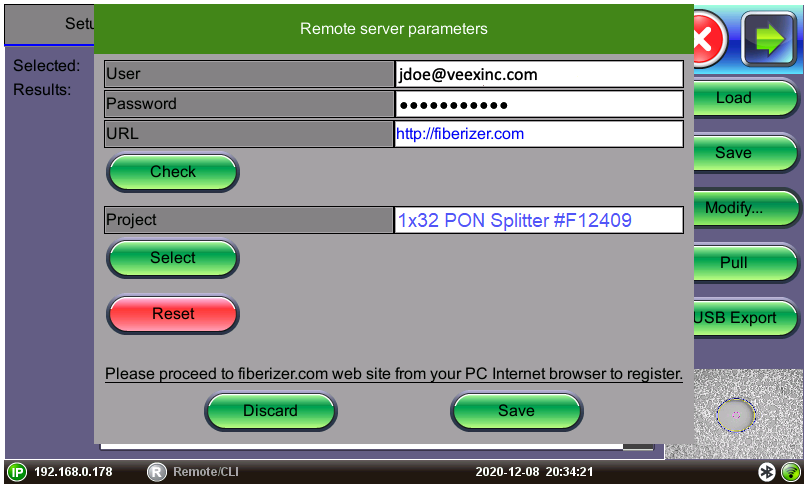
Fiber test results including Fiberscope images can also be uploaded to a registered Fiberizer Cloud account. Registration is free.

Connecting to Fiberizer Cloud

To connect the test set to Fiberizer Cloud, you must be a registered user. For new users, go to the fiberizer.com website from a PC Internet browser to register before proceeding with these directions.

Go to http://fiberizercloud.com to register.

1. After registering, tap on **Modify > Settings**.
2. Enter the username and password, then tap **Check**. If the message ***Connection has been successfully verified*** does not display, recheck the username and password.
3. Tap **Select** to choose a project folder to upload files to and tap **OK**.
4. **Save** or **Discard** the cloud login details.



Settings to connect to Fiberizer Cloud

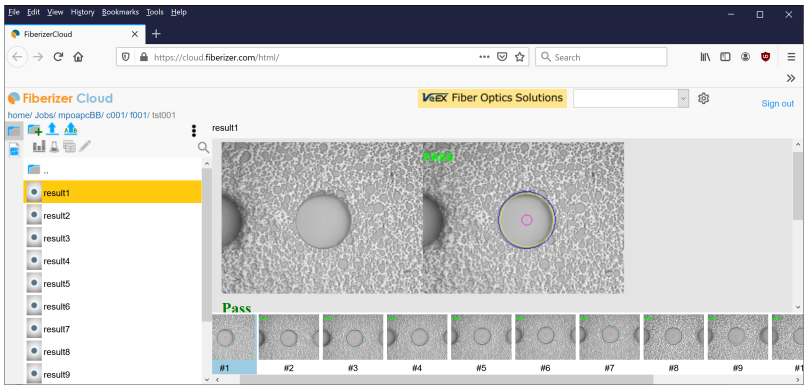
Uploading/Downloading Files with Fiberizer Cloud

Before attempting to upload or download, ensure that the test set is successfully connected to Fiberizer Cloud. Tap **Push** next to a directory item to upload it into Fiberizer Cloud. Tap **Pull** to download the directory collection from Fiberizer Cloud.

The Project selection defines the project folder location on the Fiberizer Cloud account to which to save the results. The default setting uploads to the global root folder.

For a project folder to appear in the project list, it must be created in Fiberizer Cloud first. The test set cannot create Fiberizer Cloud project folders.

After pushing results to the Fiberizer Cloud project, check the Jobs folder to which the saved cable folder was uploaded. Use Fiberizer Cloud to create professional reports or serve as an online storage backup. The example below shows MPO results on Fiberizer Cloud.



MPO Fiber View on Fiberizer Cloud

Optical Power Meter (OPM)

The VeEX Inc Optical Power meters are made with fast and accurate testing in mind. They are used to measure the power running through a cable at a given wavelength, and interface with phone, PC, or other VeEX devices to save and generate reports on the findings. This information is used to verify that the cable span is working correctly and to find the source of the problem when it's not. When paired with a VeEX Optical Light Source (OLS) or as part of a VeEX Optical Loss Test Set (OLTS), which includes both, WaveID can be used to quickly test several wavelengths without having to adjust the OPM settings.

Only optical power meters (e.g. Built-in or FX4x/8x OPM series meters) approved by VeEX are supported. WaveID will work with OLS in CW mode only. Accessing the Optical Power Meter module shuts down GPS and the atomic service.

Do not connect the fiber before opening the OPM application. First, zero the meter with the dust cap closed before making any measurements.

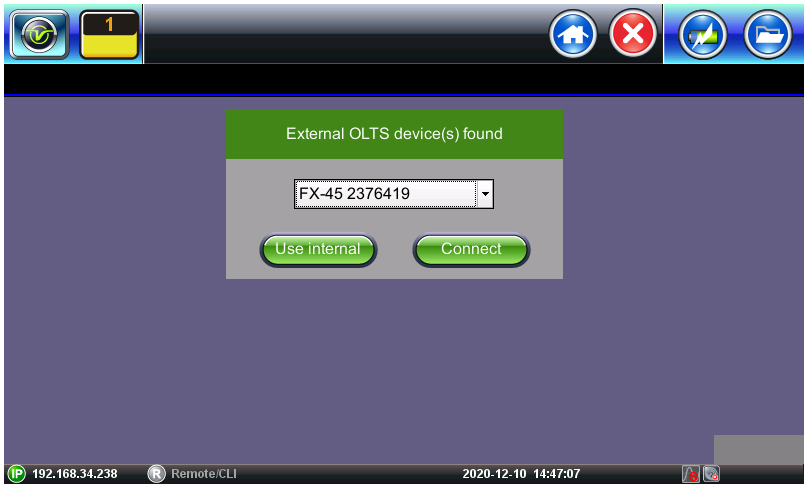
Connecting to the internal (built-in) OPM

1. Tap the **X** icon to close OTDR mode. The **Fiber main menu** appears.
2. Tap **Optical Power Meter** on the main menu. The **OPM** screen appears with the **Caution** warning.

Alternatively, access the OPM screen by selecting **Optical Power(USB)** from the Platform menu.

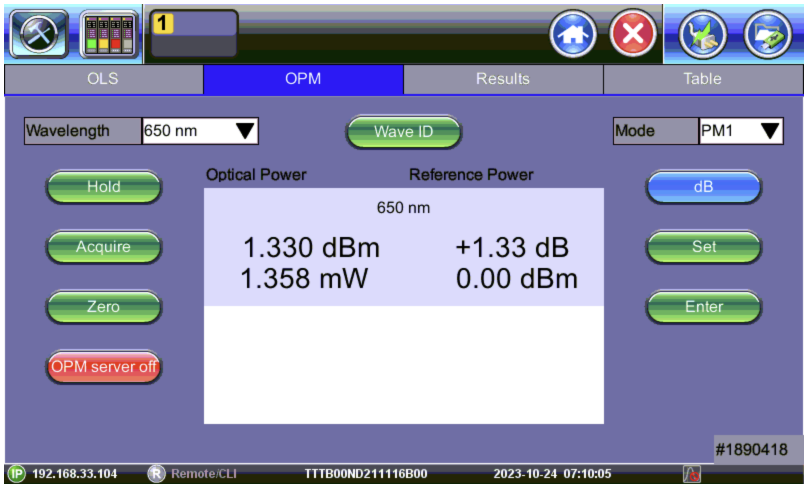
Connecting an External OLTS Device

1. Insert USB dongle into the test set's microUSB port and connect it to a VeEX Inc. supported Optical Light Test Set (OLTS) device before launching the application.
2. Power on the external meter. Then, tap **Optical Power Meter** on the menu. The **External OLTS device(s) found** screen appears.
3. Select the connected external meter and tap **Connect** to proceed to the external OPM menu or **Use Internal** to use the built-in OPM menu if it supported by the test set. The **OPM** screen appears with the **Caution** warning.



The Name of the External OLTS device is Displayed Once Detected

OLS Menu



OPM Menu

- **Wavelength**: Matches the calibrated wavelength to the signal being measured.
- **Wave ID**: Detects the incoming wavelength automatically from a supported VeEX Inc.OLS. Use when operating the OLS in continuous wave (CW) mode with or without Loop enabled.
- **dB/dBm:** Switches between dB and dBm measurement units. A Green dB button shows absolute power level in dBm. A Blue dB button measures relative power loss in dB. Use the Set (Reference) and Enter (edit Reference) to set Reference, edit Reference, and view measurements in three units: dBm, dB, and Watts.

  After toggling to the dB button to blue, the Set and Enter buttons appear.
- **Set**: Sets the reference value for the current wavelength.
- **Enter**: Edits current wavelength reference value.

- **Hold**: Freeze measurement to the last power or loss reading on the screen. “HOLD” appears next to “Optical Power” when tapped. Tap **Hold** again to unfreeze it.
- **Acquire**: Loads current measured value into the **Table** tab. The **Table** tab indicates how many new records have been temporarily saved into memory. In manual IL test mode, the **Acquire** button must be used to capture each individual reading (e.g. same fiber at different wavelengths) unless Loop is turned on.

   *If your device is equipped with a built-in clock, the saved measurement result will have a time stamp.*

   *To permanently save the table of results, you must save into a test file.*
- **Zero**: Recalibrates the OPM to treat current conditions as zero. Used when measurement conditions change significantly or to re-calibrate the OPM. Make sure the cover is shut on the OPM test port before tapping **Zero**. When in doubt, recalibrate prior to making any measurements, e.g, when testing in cold outdoor temperatures and then moving testing into a heated building.

   *Put the cover over the OPM test port BEFORE recalibrating.*
- **OPM Server On:***Remote control feature not currently supported.* Broadcasts the IP address on the current network for users to connect to the test set module's built-in optical power meter through Ethernet/TCP/IP using **Fiberizer LTSync Windows Desktop** software for remote control and access.
- **Mode**: Designates the measurement specification built-in: PM1 (-70 to +10dBm), PM2 (-50 to +25dBm), or PM3 (-65 to +15dBm). For specific information on the PM1, PM2, and PM3 specifications, see the platform's datasheet at *www.veexinc.com*.

Calibrating to Laser Source

To perform loss (dB) testing, the meter must be referenced (calibrated) to the Laser Source output.

To measure reference cable loss using the built-in light source (Loopback Referencing):

1. If beginning testing, zero the meter by closing the dust cap and pressing the **Zero** button.
2. Connect the port with the desired wavelength OLS to the OPM port using a patch cord.
3. Turn on dB measurement by toggling the **dB** button to **blue**.
4. Select the **OLS** tab, select the laser wavelength, and turn **ON**. Press **Loop** to cycle through all supported wavelengths.
5. Select the **OPM** tab and select the measurement wavelength or press **Wave ID** to automatically detect the correct wavelength.
6. Tap **Set** to record the 0.00 dB point. A reference point is established and the calibrated LS can be connected to the far-end of the fiber to measure the loss. Tapping **Set** will overwrite previously saved reference value(s).

To measure reference cable loss using an external light source:

1. Connect the OLS to the OPM port using a patch cord.
2. Turn on dB measurement by toggling the **dB** button to **blue**.
3. Select the measurement wavelength. If using a supported VeEX light source in CW mode, pressing "Wave ID" automatically selects the correct wavelength.
4. Tap **Set** to record the 0.00 dB point. A reference point is established and the calibrated LS can be connected to the far-end of the fiber to measure the loss. Tapping **Set** will overwrite previously saved reference value(s).

Measuring Power (dBm)

1. If beginning testing, zero the meter by closing the dust cap and pressing the **Zero** button.
2. Insert the fiber being tested into the OPM port.
3. Select the measurement wavelength. If using a supported VeEX light source in CW mode, pressing "Wave ID" automatically selects the correct wavelength.
4. Tap **Acquire** to record a result. Acquired results can be viewed from the **Table** tab and saved from the **Results** tab.

Measuring Loss (dB)

1. Set reference values for all testing wavelengths (refer to [Calibrating to Laser Source] for more details.
2. Remove the reference cable and connect fiber to the OPM port on the unit.
3. Tap **Acquire** to record a result. Acquired results can be viewed from the **Table** tab and saved from the **Results** tab.

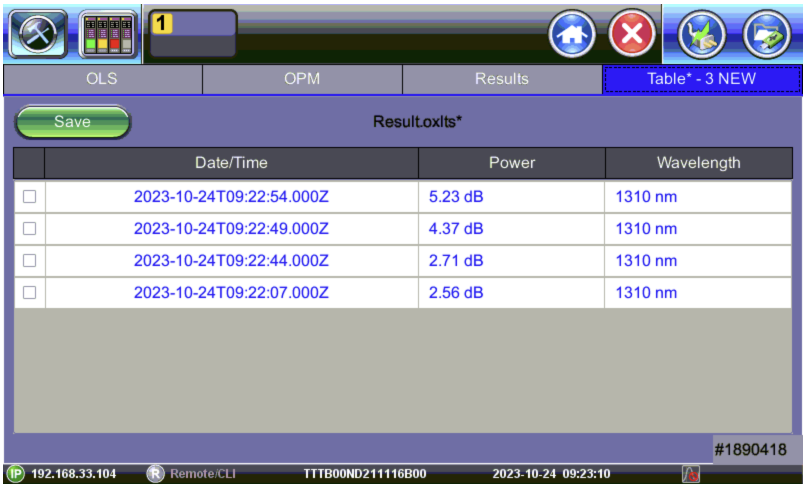
Readings (Table tab)

OPM readings appear in the **Table** tab. Saving readings will permanently write data to the **Results tab**. More than one reading can be saved at a time. Use this function to organize/filter results in project batches, so that the correct set of results are grouped together appropriately. Pressing **Remove** will permanently remove the readings from the current list.

To view and save (enter) test results into the Results table:

1. Select the OPM tab. Verify the insertion loss (IL) values are acceptable, then tap **Acquire** to load values into the **Table** tab. The **Table** tab title shows how many fiber records have been temporarily saved in the format **Table*-*n* NEW**, where n is the number of new records.

2. To view the active results table, select the **Table** tab.



3. To permanently save the fiber record locally, select the record(s) and press **Save**. The **Result saving** screen appears. The filename will default to the date/time stamp unless a specific file name is entered.

The JobID/CableID/FiberID/TraceID fields determine the location to which the trace is saved. If these settings are not set accurately, the trace will not save to the desired location.

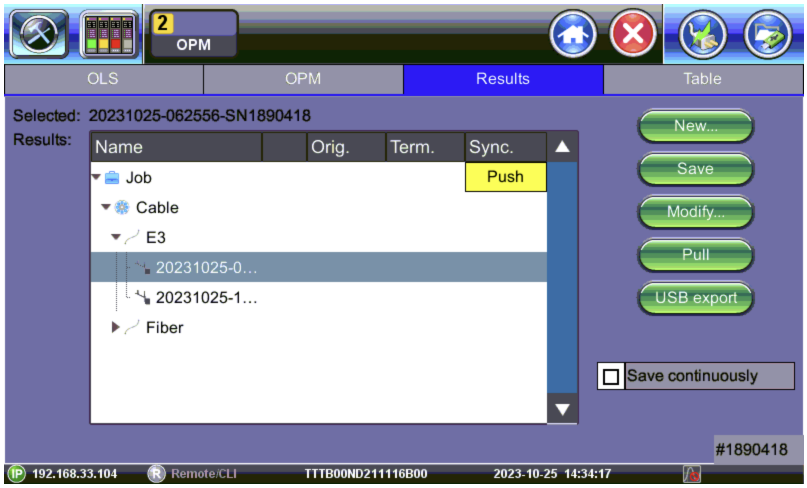
4. Tap **OK**. The readings are saved to a file and the table resets.

To remove results before saving, select the checkbox next to the reading(s), then tap **Remove**.

After saving power or loss readings to a file, access the file in the **Results** tab.

Results

Results can be saved to the test set, exported to USB, or uploaded to Fiberizer Cloud.

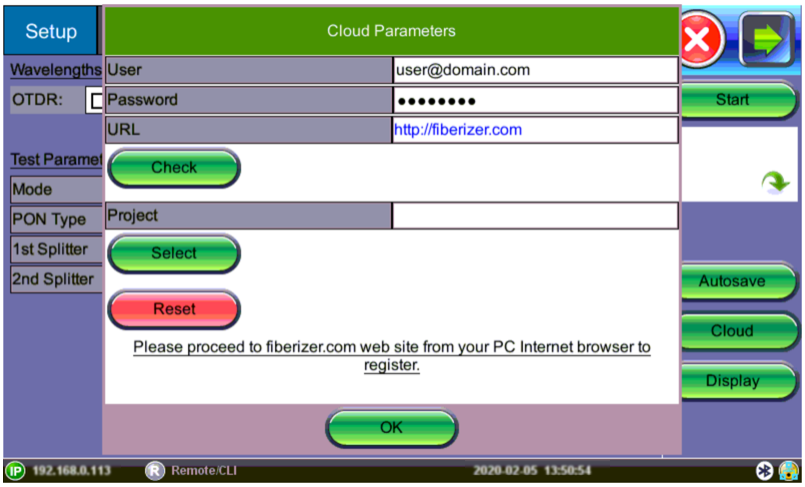


Results Management Menu

The results screen is used to view previously saved results. Test results can be pushed/pulled from Fiberizer Cloud. The directory displays the location of stored files. Connect to Fiberizer Cloud, then select the file(s) by tapping them. Refer to "Fiberizer Cloud" on page 119 for details on connecting to Fiberizer Cloud. Refer to "Results/Reports" on page 116 for more details on fiber test results.

Use the following options when using the **Results** screen:

- **Push/In Sync**: Uploads locally saved results to Fiberizer Cloud. *In Sync* indicates the results have been saved to Fiberizer Cloud successfully. To push the results to Fiberizer Cloud, ensure connection to the network via Ethernet or WiFi, and then tap **Modify>Settings** to sync with Fiberizer Cloud. Then, tap **Push** to sync saved files to the cloud.



Fiberizer Cloud set up screen

- **New**: To create a new folder.
- **Save**: Saves results. Once saved, the files can be accessed in File Manager and R-Server (if available). Refer to Working with Saved Results, Profiles, Images and "R-Server" on page 76 for more information.
- **Modify**: Select a file or folder in the directory to modify. Options to Rename, Remove, and upload the selection to Fiberizer Cloud are available.
- **Pull**: When connected, pulls file from Fiberizer Cloud onto the test set.
- **USB Export**: Exports files to a USB stick. Choose Export Group to retain the tree format (sub-directory) or Export Flat to create a single filename using sub-directories to build a name.
- **Save continuously:** To autosave results at a specified interval (1 to 60 seconds). Use this option to check power drift.

Wifi Spectrum Analyzer

The VeEX WiFi SA USB dongle is discontinued and no longer supported.

WiFi SA was a portable spectrum analyzer on a USB dongle that displayed all RF activity in the WiFi bands (e.g., wireless networks, cordless phones, microwave ovens, Bluetooth devices, etc.).

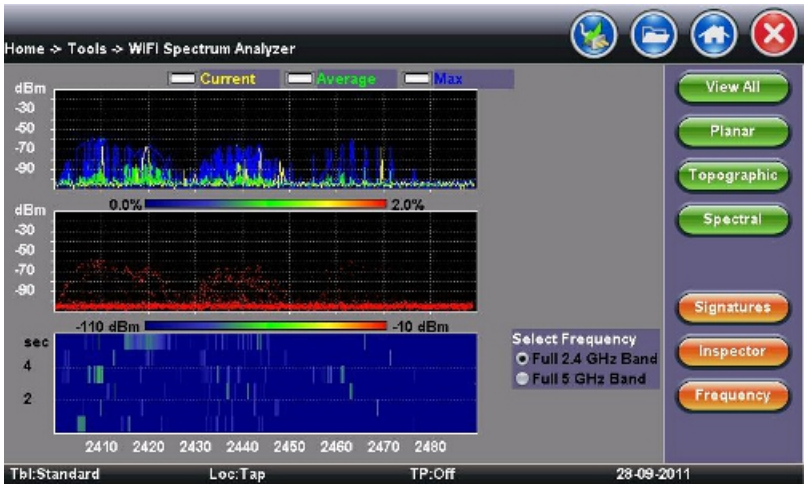
For users who still have the dongle, the feature offers the following capabilities:

- Helps determine the best available WLAN channels quickly for optimal performance
- Helps to visualize and locate RF signals in the 2.4GHz and 5GHz spectrums
- Discover and remedy competing access points
- Optimize WLAN networks by locating and eliminating interference sources

Parameter	2.4 GHz	5 GHz
Frequency range	2.4 to 2.495 GHz	5.15 to 5.85 GHz
Frequency resolution	26 kHz to 3 MHz	24 kHz to 3 MHz
Filter bandwidth	58 to 650 kHz	54 to 600 kHz
Antenna type	RP-SMA	
Amplitude range	-100 dBM to -6.5 dBM	
Amplitude resolution	0.5 dBM	

WiFi SA Specifications

- Supports 802.11a/b/g/n networks
- Supports both 2.4 GHz and 5 GHz bands
- Equipped with RP-SMA antenna jack
    - Allows user to replace standard external Omnidirectional antenna with a higher gain or directional antenna as needed
- The WiFi Analyzer is a compact and portable USB dongle that plugs into the USB 2.0 port of the V300 series
- The WiFi SA test application menu is located in the Tools/Advanced Tools menu

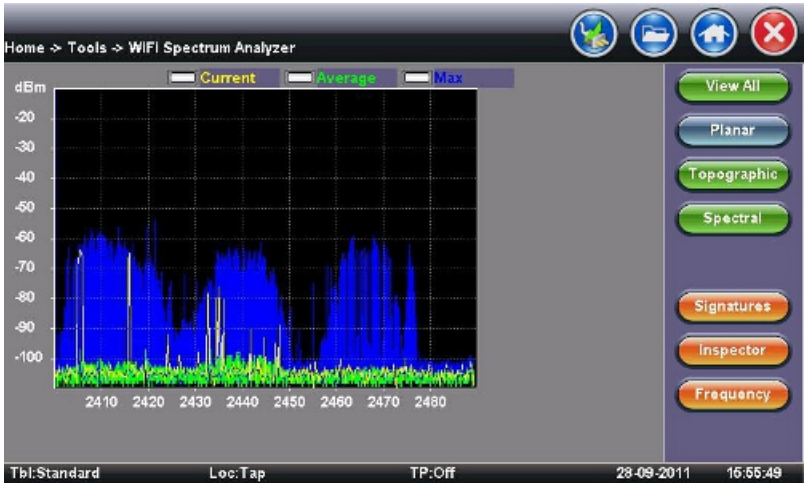


WiFi SA Display Summary

WiFi Analyzer USB dongle

Display Summary

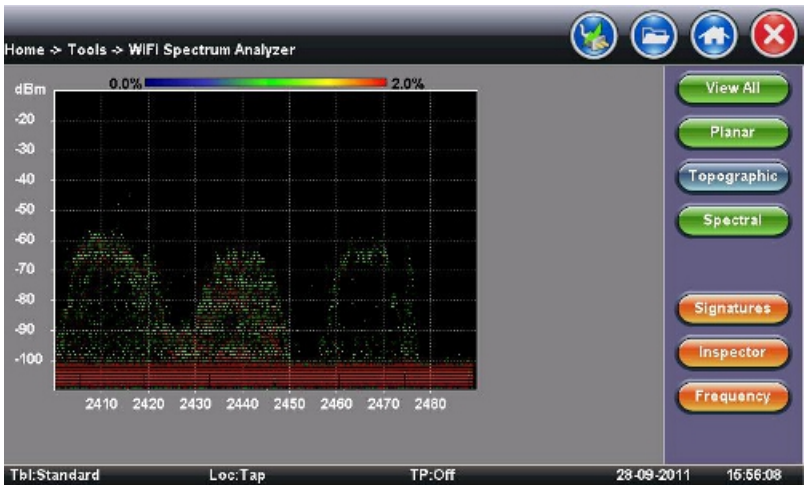
- **Planar view:** Reports current, average, and maximum signal amplitude for each wireless frequency
- **Topographic view:** Emphasizes which frequencies are the busiest across the entire spectrum
- **Spectral view:** Historical view of wireless spectrum use at a point in time



WiFi SA - Planar View

Planar View

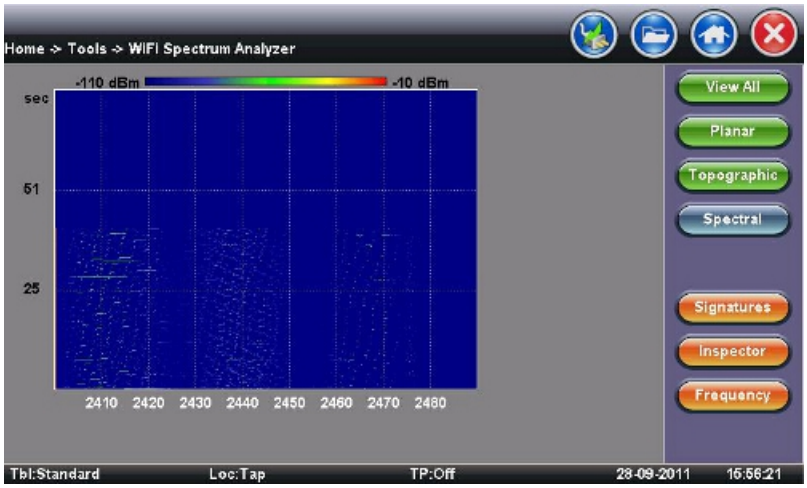
- Traditional Spectrum Analyzer view with Max, Average, and Current results
- Displays RF activity in real time and tracks average and max values over a given period



WiFi SA - Topographic View

Topographic View

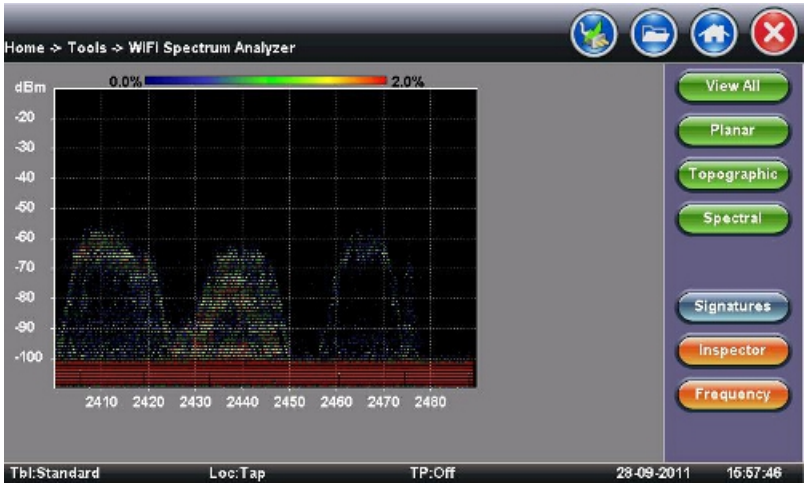
- Similar to a density map - plots frequency versus amplitude
- Uses a special color scheme to assign colors to frequency amplitude points and to identify how often a particular coordinate is recorded
- Great resource for identifying devices with very low duty cycles
- Leaving it running will give a good indication of the typical local network conditions



WiFi SA - Spectral View

Spectral View

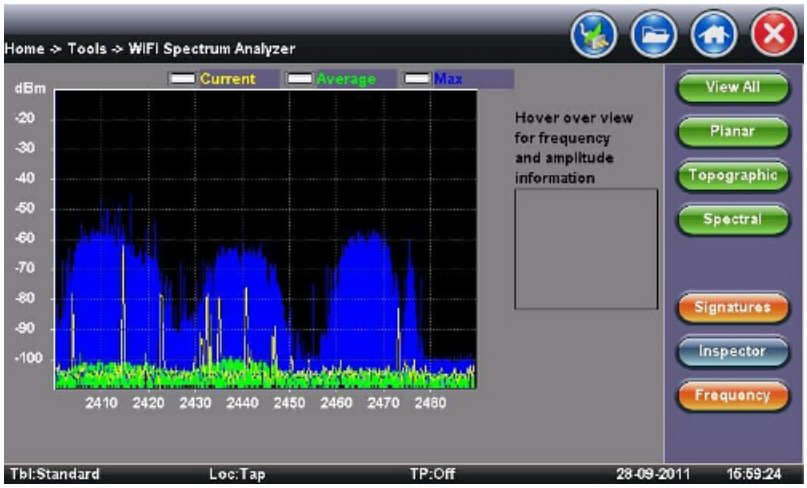
- Waterfall type view across the whole band - graphs amplitude levels over time
- Uses color to pick out the relative signal strength at each point in time
- Great tool for troubleshooting intermittent problems, since it highlights devices that are perhaps emitting only short bursts of noise
    - For example - discover microwave oven in the kitchen interfering with WLAN



WiFi SA - Signatures

Signatures

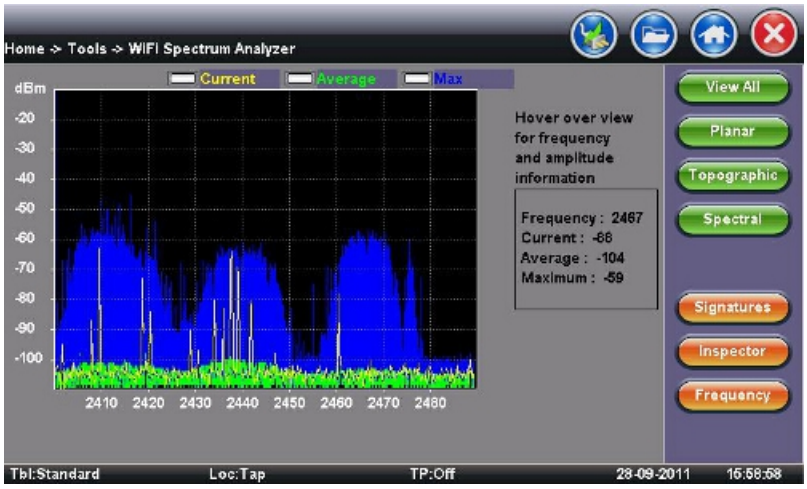
- The Signatures button presets are available to identify unknown sources of RF activity (e.g., microwave oven)
- Select a device in the sidebar and click the pattern in the Topographic view to identify a device



WiFi SA - Inspector

Inspector

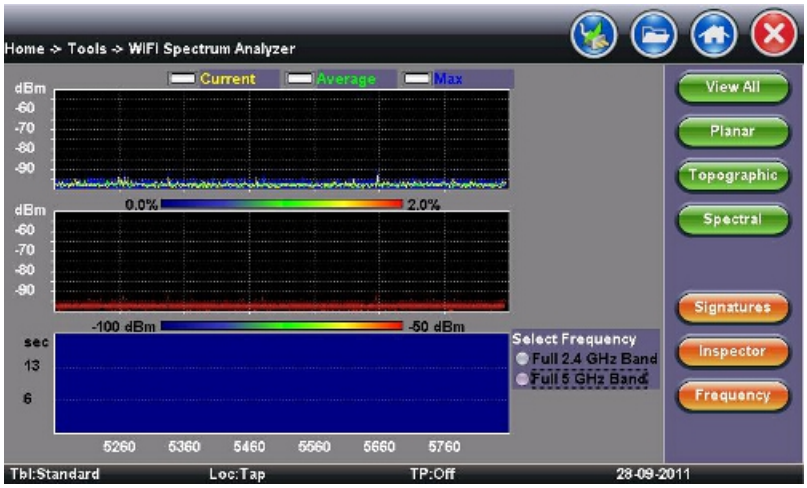
- The Inspector button setup allows the user to measure the frequency of the RF activity or interference of interest
- When selected, a prompt and result box appears



WiFi SA - Inspector - Result

Inspector Button - Result

- Identifies frequency and amplitude
- Current, Average, and Maximum amplitude values provide an indication of level fluctuation over measurement period



WiFi SA - Frequency

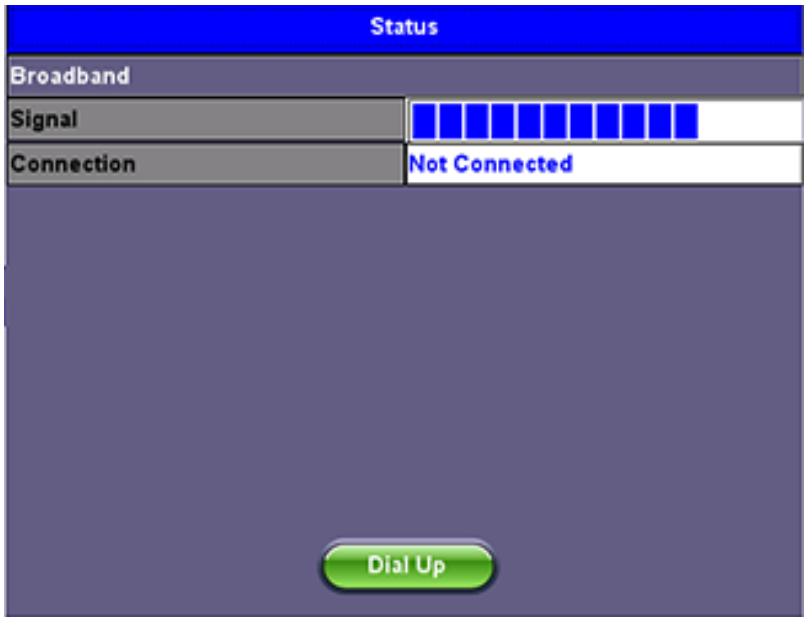
Frequency

- This button allows the user to select frequency band for testing

Data Card (3G/4G Cellular Modem)

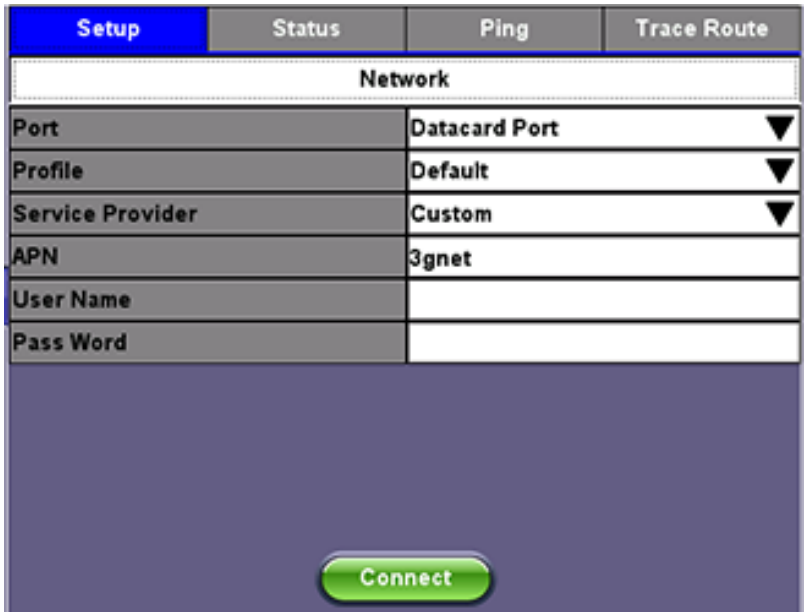
To establish an IP connection using a data card, the data card must be connected to the USB port. Once connected, the **Data Card** icon will appear at the bottom of the screen.

Only datacards provided by VeEX are supported and have the driver necessary for connection.



Data Card - Status

Press **Dial Up**.In the **IP Tools Setup** menu, **Port** will be displayed as "Datacard Port". The D for Data icon in the bar on the lower end of the screen will have a red cross to show that datacard is not connected . Select the **configuration parameters**, then press **Connect**.

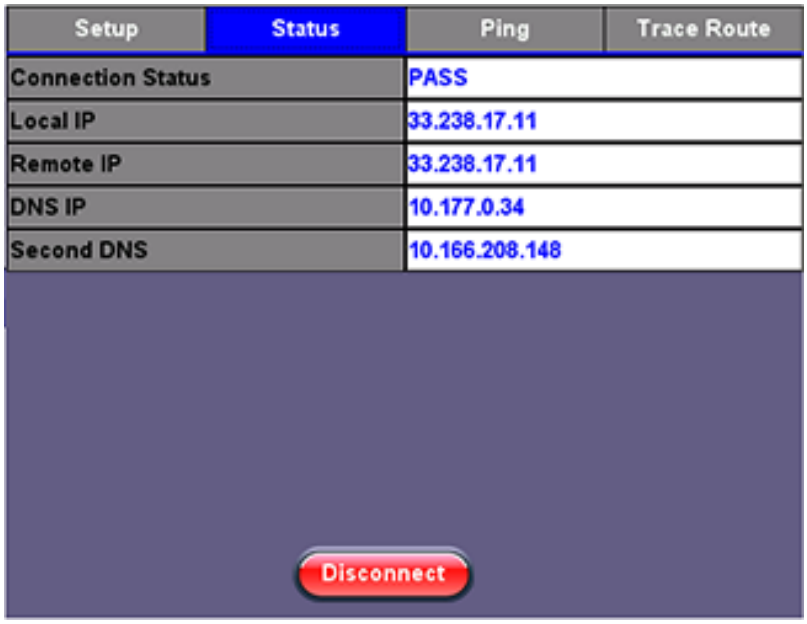


Data Card - Setup

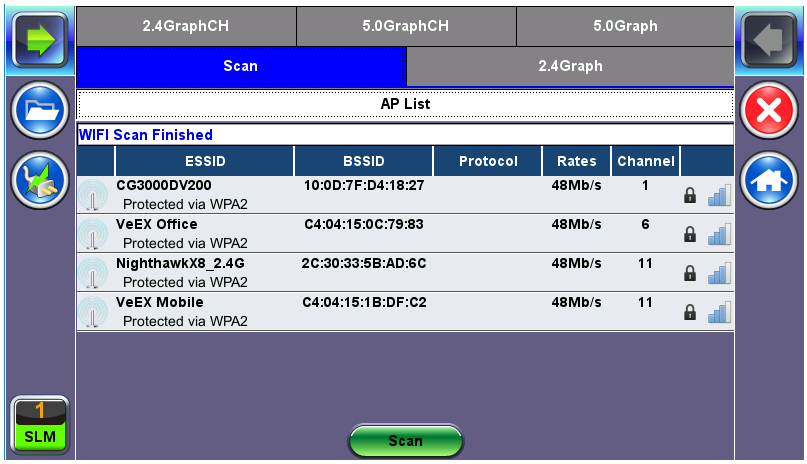
When a connection is successfully established:

- The **D** for Data in the icon turns green  .
- The connection details are displayed in the **IP Tools Status** tab.

If the test set is powered off/on and you are in a good reception area or if you enter a bad cell area and return to a good one, the test set will reconnect automatically.



WiFi inSSIDer



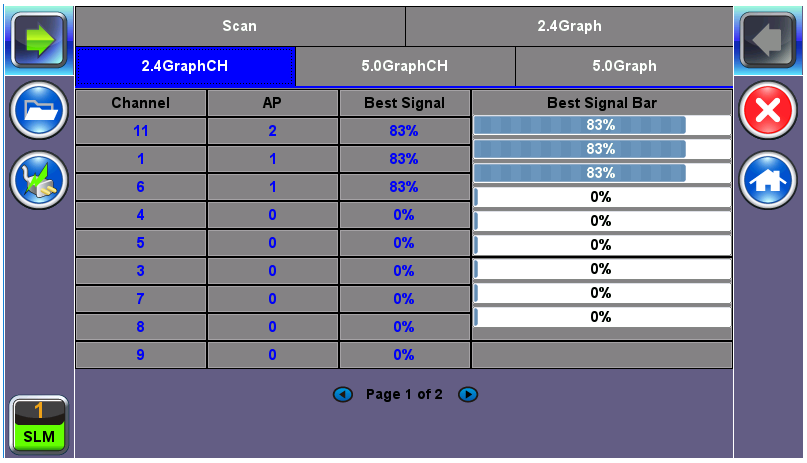
WiFi inSSIDer Home

The WiFi InSSider supports only the 2.4 GHz frequency band or 2.4 GHz and 5 GHz frequency bands depending on the V150 product model (refer to product specifications for details). The home screen has tabs to display test results for both frequency bands and also for graphical presentation of results for both.

1. Tap the **Scan** button on the right side of the screen. After the scan is completed, the unit displays the list of access points (AP) detected in the 2.4 GHz and 5 GHz bands.
2. The following information is displayed for each AP:
   - SSID name of the AP
   - BSSID (MAC address) of the AP
   - 802.11 protocol version supported by the AP
   - Max data rate supported by the AP
   - AP's radio channel number
   - Lock symbol indicates if security is set on the AP (WEP, WPA, or WPA2).
     When the AP is unsecured, no lock symbol is displayed
   - Signal strength of the AP

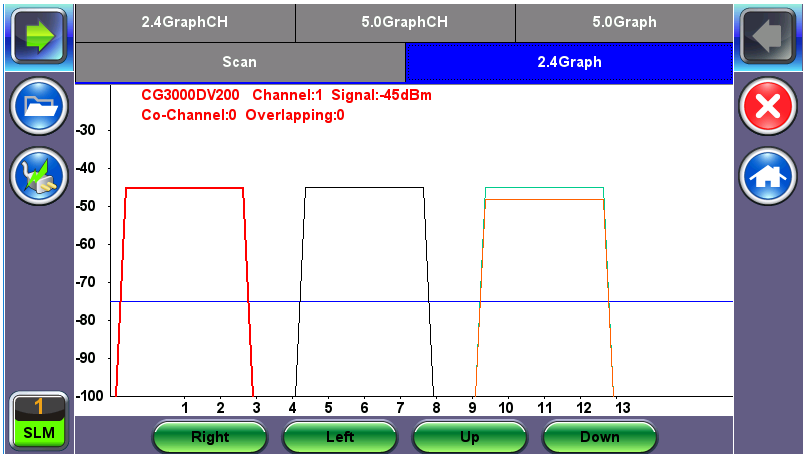
   Access Points in the 5.0 GHZ spectrum can only be displayed if the VeEX USB Wifi adapter supports 802.11a/n or 802.11 a/n/ac. Refer to the USB Wifi adapter specifications.

3. Use the 2.4GHz GraphCH and 5.0GraphCH tabs to view the number of Access Points detected for each channel in the 2.4GHz and 5GH bands and the strength of the strongest AP's signal for each channel.



2.4GHZ Channel

4. Tap the **Graph** tab of the respective Channel to view the results in a graphical presentation.



Graph

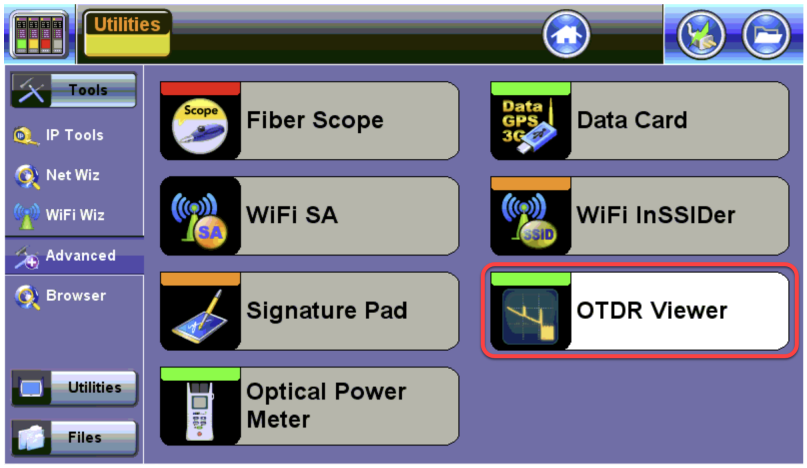
5. Use the Right/Left/Up/Down function keys or the arrow keys on the unit's keypad to navigate the graph and get additional information for the access points. Detailed information for each Access Point includes:

- SSID: name of the AP
- AP's radio Channel number
- Signal strength (dBm)
- Number of co-channel: Number of APs using the same radio channel
- Number of Overlapping APs: Number of APs using channels whose frequency band overlaps with the AP

OTDR Viewer

This built-in application allows the test platform to view previously saved .sor trace results and edit events, as needed. IF an OPX-BOXe is connected to the platform via direct USB connection, WiFi or Bluetooth®., this built-in application can also be used to control all OTDR test functions.

To access the OTDR Viewer from the Platform Screen, select **Tools** > **OTDR Viewer**.



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.

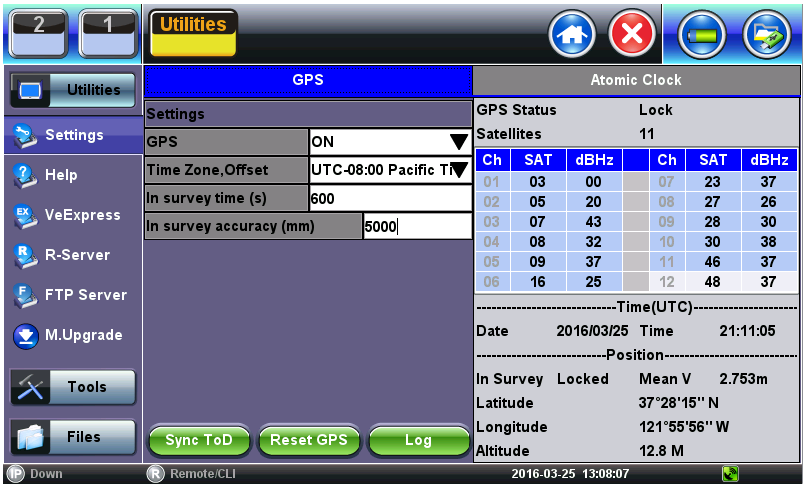
Refer to the OPX-BOXe User Manual for further details about OTDR operations.

GNSS/GPS & Sky View

GNSS Receiver Settings and Operation

This section explains the GNSS Receiver configuration and basic settings required to quickly verify proper module installation and operation. Refer to the tables at the end of this document for application-oriented settings.

1. Install the portable antenna facing up, on a stable surface or mounting, with a wide unobstructed view to the sky or use a professionally-installed in-building roof-top antenna feed.
2. Connect the active GPS or antenna to the GNSS Receiver module's SMA connector. If a BNC-to-SMA or TNC-to-SMA adapters is required, use flexible adapter cables (not rigid adapters) to prevent any mechanical stress.
3. Turn the **GNSS Receiver = ON**.



GNSS Receiver On

4. Go to **>Utilities >Settings >More >High Precision Clock >GNSS**.
5. Set the **Satellite System = GPS**
6. Set **In-survey time (s) = 600**, which is the time window used by the GNSS Receiver to assess stable location, using the specified accuracy (below). Having an accurate tri-dimensional location is required to calculate accurate time.
7. Set **In-survey accuracy (m) = 5**, which is a target of <5m for the Mean V accuracy reading. Smaller values tighten the location accuracy requirements, but the site survey process may take longer. It is

possible to get better than 1.5m location accuracy when using professionally-installed roof-top antennas.

8. Enter any antenna cable delay that needs to be compensated for (velocity of propagation is cable dependent, their values are around 5ns/m or 1.2ns/ft). Enter **20ns** if using the 5m portable antenna.
9. Select the **Time Zone Offset** (it is used to calculate the local time of day).
10. Wait for GPS Status on top to show Lock and the  icon at the bottom of the screen turns green. It indicates that it is successfully tracking enough GPS and GLONASS satellites.
11. Wait for about 15 to 30 minutes for the **Mean V** value to be below **5.00m** and until the **In Survey** status also shows **Locked**. This indicates that the GPS position has reached the required accuracy (site survey finished) and that it has switched into Timing Mode.
12. At this point, the GPS Module should be providing accurate Time and Timing (1PPS).
13. Tap the **Sync ToD** button to synchronize the test set's (system) real-time clock.

Atomic Clock Settings and Operation

This section explains the different disciplining parameters for the optional chip-scale Atomic Clock and provides the settings required to quickly verify its proper operation. For application-oriented configurations, please refer to the suggested configurations table at the end of this document.

Free Running Stage (Frequency only)

By default, the built-in Atomic Clock oscillator starts in free-running mode, providing a calibrated Atomic 10MHz frequency reference. (Its exact frequency could vary over time due to ageing, temperature, storage and other factors.) It also produces an arbitrary (non-traceable) 1PPS timing signal that is not aligned to the standard UTC second. Disciplining must be used in order to make the necessary frequency and timing corrections.

Oscillator Disciplining Process (Frequency & Phase)

The disciplining process acts as a continuous "soft calibration" that corrects any frequency deviation in the oscillator and aligns the timing pulse (1PPS) to the standard UTC second. The chip-scale atomic oscillator can be disciplined by:

1. The built-in precision GNSS Receiver (GNSS 1PPS).
2. An external traceable 1PPS signal from a primary reference time clock (PRTC) or time standard (Cs or Rb).

Oscillator Disciplining Process (Frequency & Phase)

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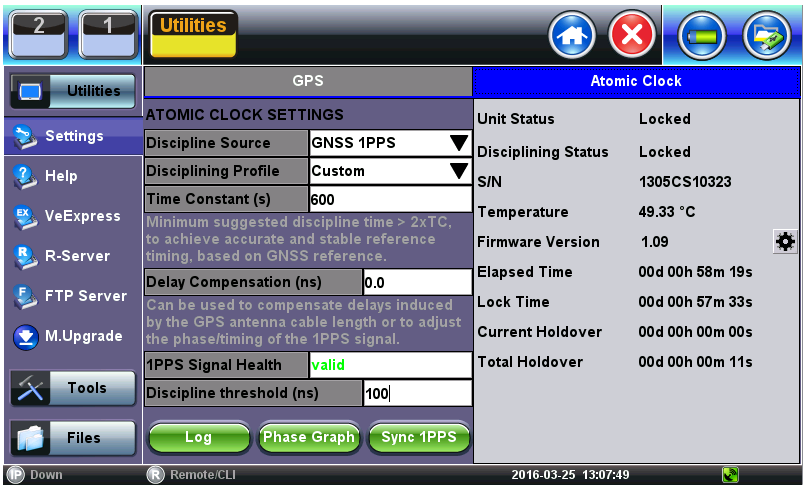
1. The built-in precision GNSS Receiver (GNSS 1PPS).
2. An external traceable 1PPS signal from a primary reference time clock (PRTC) or time standard (Cs or Rb).

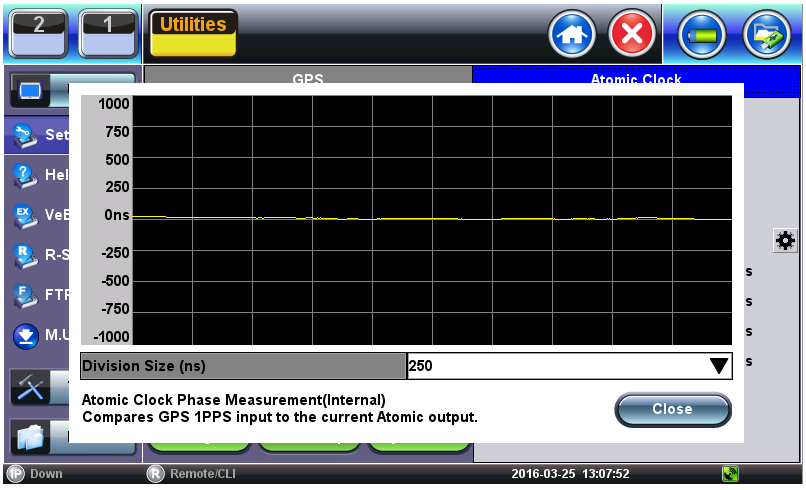
Clock Disciplining - Using the built-in GNSS 1PPS

1. With the GNSS module already locked, go to **>Utilities >Settings >More >High Precision Clock >Atomic Clock**.
2. Set **Discipline Source = GNSS 1PPS**, to use the traceable (UTC aligned) 1PPS timing signal from the GNSS receiver.



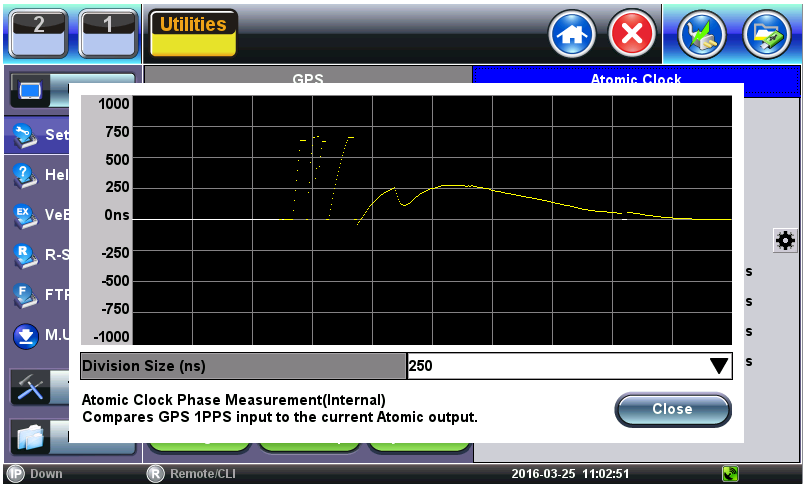
Discipline Source

3. Verify that **1PPS Signal Health = Valid**, to confirm that the one-pulse-per-second signal is being detected.
4. Set **Discipline Profile = Custom**.
5. Set Time **Constant (s) = 60** (this small window is only used to expedite the initial phase alignment process).
6. Set **Discipline Threshold (ns) = 100** (a more stringent 50ns could also be tried, if applicable. Use the Phase Graph to determine the stability range).
7. Verify that **Disciplining Status = Acquiring**. This indicates that the disciplining process is in progress.
8. Tap on the **Phase Graph** to monitor the relative phase error until it becomes a horizontal line close to 0ns. The time required for this may vary (it should take less than 15 minutes)
9. Close the Phase Graph and set the **Time Constant (s) = 900**. You can also experiment with larger time constants (e.g. 1800s, 3600s, 5400s). The larger the constant the more stringent the disciplining process becomes and the longer it takes to achieve disciplining lock. To declare lock, the Atomic Clock verifies that the relative phase stays within the defined Disciplining Threshold for about 2x Time Constant (to confirm its stability). You can use the Phase Graph to monitor the actual phase variations on your current GNSS environment for the past 600s.



Discipline Source Phase Measurement

10. Open the **Phase Graph** again to monitor the time error. Once it stabilizes again around 0ns, wait for about 60 minutes. The line should stay flat and very close to 0ns. If not stable, please check the GPS satellites and antenna installation.



Discipline Source Phase Measurement

11. Close the Phase Graph and verify that the **Disciplining Status** gets into **Locked** mode.

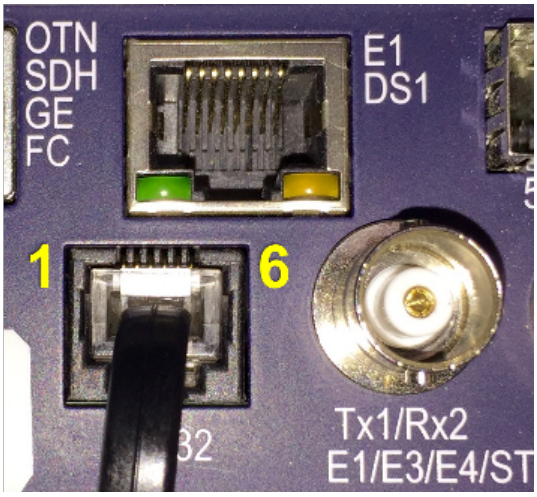
At this point the test set's internal "Atomic 10MHz" frequency and "Atomic 1PPS" timing reference signals can be considered accurate and stable.

The Phase Graph (above) can be used to monitor the short-term stability of the raw GPS clock, which can be used to determine the Discipline Threshold for a particular site or scenario. Zoom in to the 50ns grid and estimate how disperse the 1PPS samples are (in ns), then use a larger value as a threshold. A vertical variation of <30ns is OK.

Clock Disciplining - Using External 1PPS from a PRTC (Cs or Rb)

The TX300s can also be disciplined, faster and more accurately, using a 1PPS reference signal from a traceable time standard (PRTC), which can be connected to the test set's ToD port (RS232).

An RJ11-to-BNC cable is required (RJ11 pin 2 to the BNC's center pin and RJ11 pin 4 to BNC shield/GND). Keep in mind that the same RJ11 form factor comes in 4 and 6-pin versions and this document refers to the 6-pin version.



RJ11 to BNC

1. Go to **>Utilities >Settings >More >High Precision Clock >Atomic Clock**.
2. Set **Discipline Source = Ext. 1PPS (RJ11)**.
3. Verify that **1PPS Signal Health = Valid**.
4. Set **Discipline Profile = Custom**.
5. Set **Time Constant (s) = 600**.
6. Set **Discipline Threshold (ns) = 20**.
7. Verify that **Disciplining Status = Acquiring**.
8. Tap on the Phase Graph to monitor the relative phase error, until it becomes a horizontal line at about 0ns.
9. Close the Phase Graph and wait until the **Disciplining Status = Locked**.

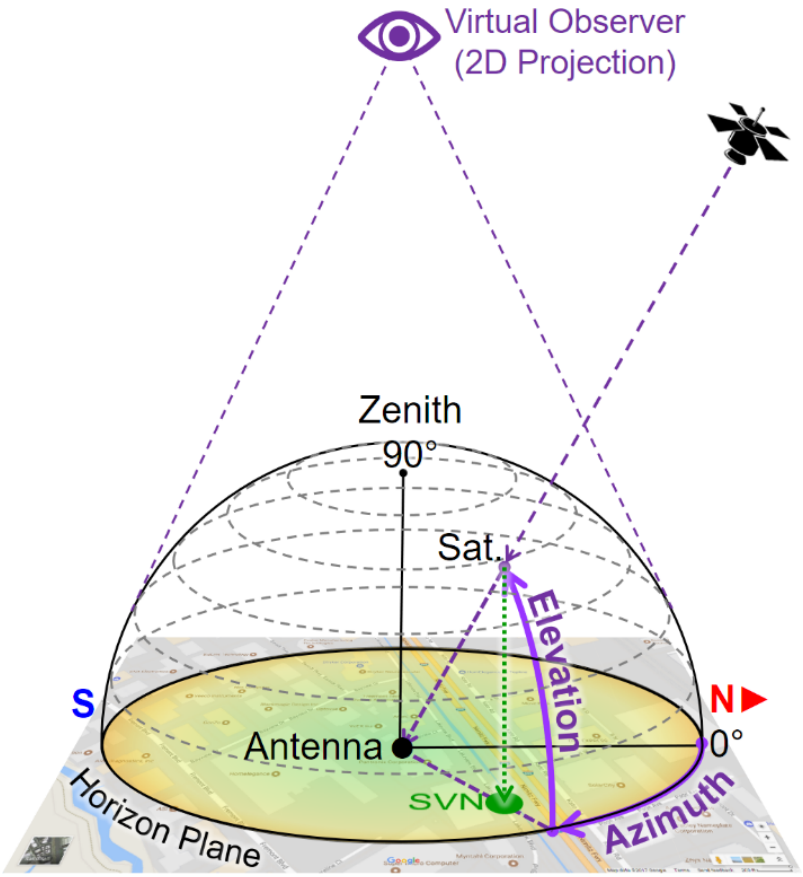
At this point the test set's internal "Atomic 10MHz" frequency and "Atomic 1PPS" timing reference signals can be considered highly accurate and stable.

Verifying the Antenna Field of View

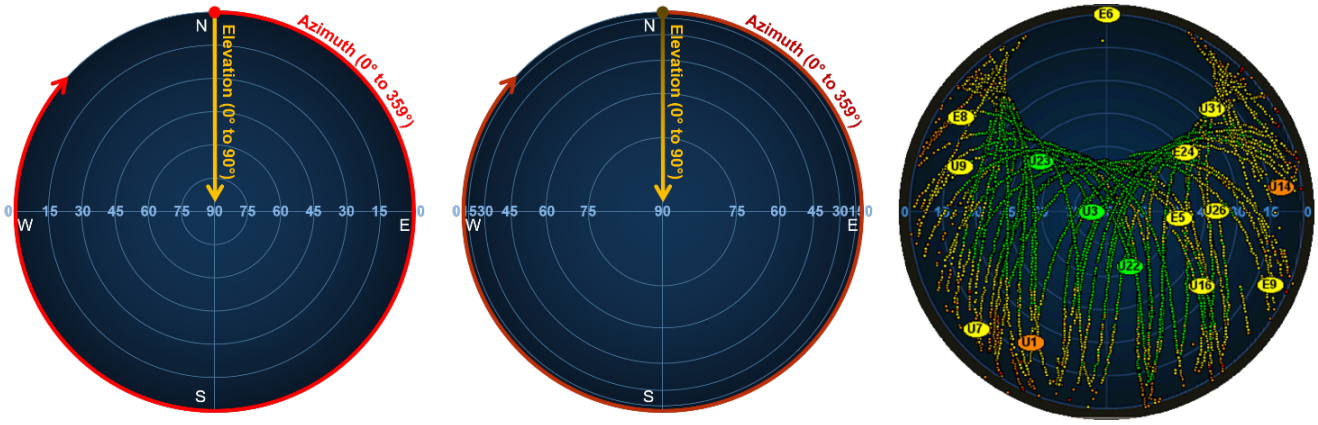
Not many of us would be tempted to get on the roof or climb to the top of a tower to perform a 360° visual inspection to identify any potential satellite signal obstructions. But even if you do, you won't be able to "see" interference, multi-path or other RF effects.

As all “visible” GNSS satellites move around their orbits, the directional vectors pointing at them form dome above the antenna. Their received signal qualities change over time, depending on their elevation angles, obstructions, reflections and other factors.

To track this, you need a tool that records the C/No of every satellite as they pass by the antenna’s aperture (field of view), to create a flat (2D) projection of a 360° color-coded dome-shaped “heat” map representing the field of view of the antenna and the signal quality from every direction. These azimuthal graphs allow you to identify areas (directions) with degraded signal quality.



Building such maps usually takes >**24 hours**, to allow each satellite to complete one cycle over the antenna (not to be confused with their ~12-hour orbital cycles).

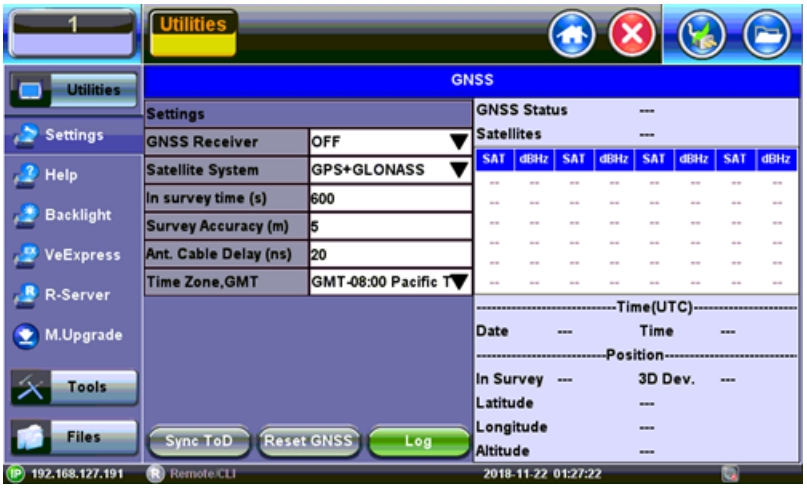


Examples of 2D Linear and Cosine projection (polar) grids, as well as actual satellite trails recorded

This type of tool can also be used to evaluate and benchmark different antennas in real life and under the same conditions. The areas in yellow indicate the directions with degraded satellite signals are, such as RF “shadows” cast bet trees and buildings. They can also indicate interference. As the signal degrade even more they turn orange and red. The example below shows the correlation between the sky view map and a map of the area around the antenna.

1. Go to **>Utilities >Settings >More >High Precision Clock**.

2. Turn the **GNSS Receiver = OFF** and close the screen.



GNSS Receiver Off

3. Go to **>Tools>Advanced>More>GNSS**.

4. Select the **Time Zone** from the **Time Zone Offset:** drop-down list box.

5. Enter a **Test Name** from the **File Name**: drop-down list box.

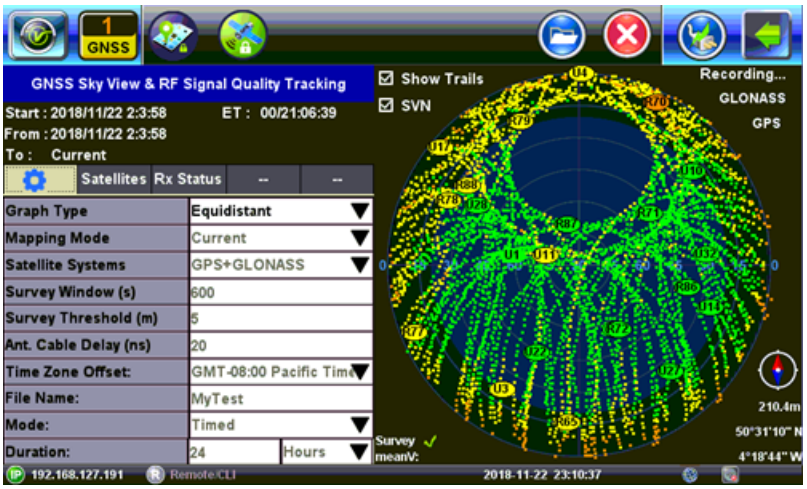
6. Select the **Duration** of the test from the **Duration**: drop-down list box.

GNSS Setup

7. Tap on the **Arrow** to open the menu and tap on **Start**.

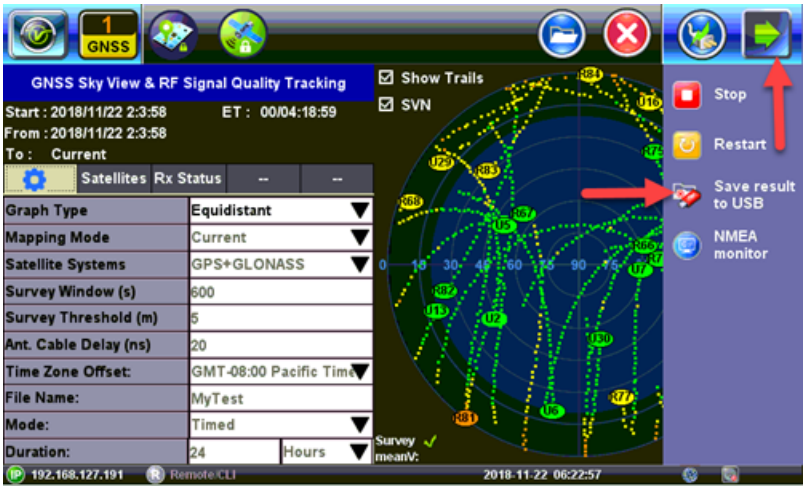
GNSS Start Menu

GNSS Start



GNSS Results

8. To save **Results to USB** tap on the **Arrow** and then tap on **Save Results To USB**.



GNSS Save Results

Web Browser

A web browser is available in the **Tools > Browser** menu and can be used to quickly verify Internet connectivity.

The built-in web browser uses the management port IP connection. An active IP connection can be established either through Ethernet or WiFi. The web browser defaults to VeEX's test website. Use the Web browser's navigation bar to enter the name of the website you wish to reach. Navigation capabilities may be limited.

File Manager

The displays files stored in the test set, including profiles, test results, and screen shots. When managing files, use the check box ☑ to select the desired file(s). The File Management system offers backup **To USB** and restore **From USB** functions to preserve user data.

Tests Results/Reports

To access the test results stored in the test set:

1. Press  , then press  on the top left of the screen.
2. Select . The File Management screen is displayed.
3. Select the desired results file to open the test report.

To navigate the test results report, use the links in its Table of Contents and the right rocker switch to scroll Up and Down.

File Manager: Working with Saved Results, Profiles, Images

Access the File Manager by selecting **Files**> **Saved** in the left panel of the platform menu. Files can be viewed, edited, or exported to a USB dongle or a PDF file (using a FAT32 USB Memory stick). Use the check box ☑ to select the desired file(s) or choose all files by selecting the check box in the top header row.

Table Sorting

Tap a column header to sort the table in ascending or descending order by the column selected.

Tap the filter icon in the column header row to filter for specific test results stored on the unit.

At the top of the screen, tap the green buttons for view options.

Show Name Displays full filename.

Advanced Search for specific file(s) using advanced search terms.

Show All Displays all records.

Column Select columns to make visible.

View Opens the selected test report (one).

Close Closes the current test report and returns to File Manager.

Exits the File Manager.

Del Deletes all unlocked test reports that are selected with checkmarks.

Rename Renames the selected test report (one).

U/L	Unlocks or Locks test reports. Locked reports are identified by a red padlock icon. Locked test reports cannot be deleted or renamed.
PDF	Generates a PDF copy of the test report and stores it in an attached USB memory stick (required) for distribution (e.g., via email).
From USB	Imports (restores) all test results, test profiles and screenshots stored in an attached USB Memory Stick. The included On-The-Go (OTG) micro-B USB to USB-A adapter cable is required for the USB memory stick.
To USB	Exports (backup) all selected test results, test profiles and screenshots stored to an attached USB Memory Stick. The included On-The-Go (OTG) micro-B USB to USB-A adapter cable is required for the USB memory stick.
BT	Transfers selected test results, test profiles and screenshot files to a paired Bluetooth® smartphone, tablet or PC.
Load	Loads the selected test profile, if supported.
Load & Run	Loads the selected test profile and runs the test, if supported.

Enabling To USB and From USB Functions

1. Insert a USB Memory stick (FAT32 file format) into a USB port on the side of the unit.
2. Wait for the USB memory to be detected (the folder icon at the top-right corner will change to a green USB memory icon ). After the unit detects the USB memory stick, files can be downloaded to or restored from USB. See "USB Memory Browser" on page 159 for details about using a USB memory stick with the test set.

Downloading Files To USB

1. Select the test results, test profiles, or screen capture files to be saved. For a full backup, tap the check box in the top header row to select all files.
2. At the bottom of the screen, tap the **To USB** button  to initiate the file transfer procedure and wait for the progress bar to finish. Original files won't be deleted from the test set. Each file is saved into its own folder using the "MyVeEX" tree directory format.

3. When all files have been copied to the USB, tap the folder icon (top-right corner) and select **Remove USB Drive** to make sure all cached data is transferred to the USB drive, especially when transferring small files.

Exporting Files to Mobile Devices via Bluetooth

Applies to test sets with compatible Bluetooth USB dongle attached.

1. Select the test results, test profiles, and/or screen capture files to be exported. For a full backup, tap the check box in the top header row to select all files.
2. At the bottom of the screen, tap **BT** BT. The test set scans for Bluetooth devices automatically.
3. After pairing the device, tap **Send** to export the selected files. Original files won't be deleted from the test set. Each file is saved into its own folder using the "MyVeEX" tree directory format.

Exporting Results to PDF

1. Select the test result files to be exported.
2. At the bottom of the screen, tap **PDF** PDF. A "PDF file will be generated to USB disk" message appears.
3. Tap **Yes**.

USB Memory Browser

The File Manager provides basic USB memory stick management tools to browse and manage files without the need of a PC. If needed, use the micro-B USB to USB-A adapter to connect to the USB memory stick.

Import OTDR	When an OTDR module is used, OTDR test results (SOR files) can be imported.
Reload	Refreshes the USB stick info.
Delete	Erases the selected files or folders.
Up	Exits the current folder and moves up to a higher folder in the file tree hierarchy. The current folder structure is shown in the top bar.
Open	Opens certain file types.

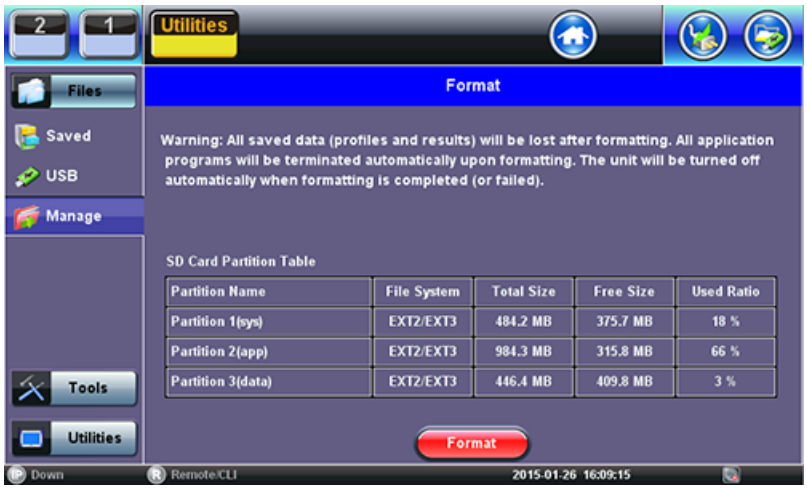
The USB tool supports one USB memory stick. If more than one memory stick is available, it shows the first USB memory stick recognized from any of the two ports.

The following file types are supported:

- **HTML:** Launches the browser to display its content (test results and OPM results)
- **TXT:** Launches a basic text viewer to display its content (test results and OPM results)
- **PCAP:** Launches the built-in Wireshark® protocol analyzer
- **MTIE:** Launches the optional built-in Wander Analysis tool

- **SOR**: Supported with OTDR module or built-in test set only.
- **PNG**: Screenshots (Fiberscope images)

Manage Internal SD Card



The SD card tool provides Internal SD card's partition capacity information.

All saved files, such as profiles, test results, and screen shots, are stored in the Data partition 3(data).

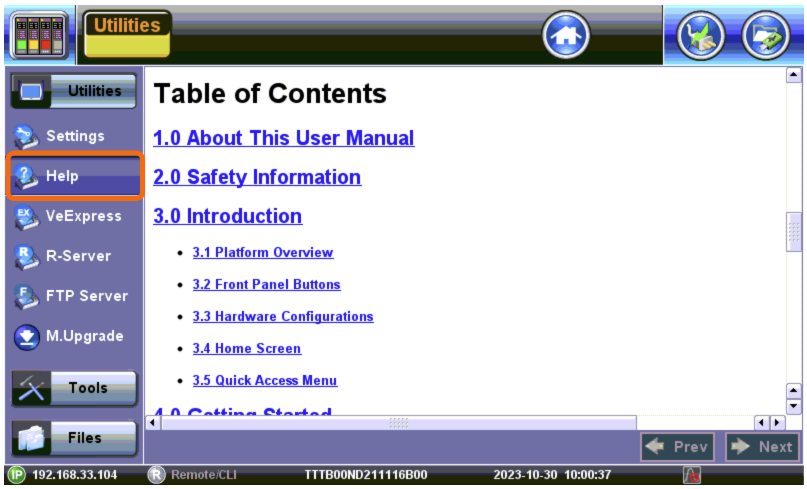
If the data partition is nearly full, use the File Manager to backup files to USB, then delete selected files.

The **Format** function is exclusively a maintenance tool. Use **ONLY** when instructed by a VeEX Customer Care representative. **It erases all the information stored in the test set!**

- *The internal SD Card contains the System OS, all the Test Applications (Apps) and user's data.*
- *Only the Data partition is accessible to users, through the test set's functions.*
- *Do not remove or reformat the SD Card outside of the test set.*
- *The SD card can only be accessed by opening the test set.*

Help

The **Help** option opens up the user manual. Use the scroll bars, table of contents, and hyperlinks to navigate the content.



Software Upgrade

The TX300s includes the bootloader, OS and system-wide (common) features. Its software update package can be identified as The software upgrade packages can be downloaded from www.veexinc.com, or using the test set's built-in "VeExpress" on page 72 client.

Platform Software Upgrade Procedure

1. Obtain the system upgrade package.
   a. Download it from www.veexinc.com, www.v-express.com, a link provided or by using the built-in VeExpress client.
   b. Unzip the file and copy to the root of a FAT32 USB memory stick if necessary.
2. Insert the memory stick to the USB port located on the left-side of the unit.
3. Simultaneously press the Alternate Function, the Enter, and **Power** buttons, until it beeps.

   The update process may take a few minutes. Once it is complete, the test set reboots automatically.

Buttons to be pushed simultaneously

After the System upgrade, the following pop-up message may appear if a module upgrade is required. Follow the module update procedure.

The built-in VeExpress client downloads the uncompressed tx300s-veex.tar.gz upgrade package directly to the root of the memory stick attached to the test set, so the System software upgrade process can be started right away.

Module Software Upgrade Procedure

1. Obtain the required TX300s-300sm.tar.gz, TX300s-320sm.tar.gz and/or TX300s-OTDR.tar.gz, upgrade files.
    a. Download them from www.veexinc.com, www.v-express.com, a link provided or by using the built-in VeExpress client.
    b. Unzip the files and copy to the root of a FAT32 USB memory stick if necessary.
2. Insert the memory stick to the USB port located on the left-side of the unit.
3. Initiate Software Upgrade process.
    a. Open the Utilities section Go to **>Utilities >M.Upgrade**.
    b. Select new version and press **Upgrade**. The test set turns itself **OFF** at the end.

The built-in VeExpress client downloads the uncompressed upgrade packages directly to the root of the memory stick attached to the test set, so the M.Upgrade process can be started right away

The process may need to be repeated if two different blade types are loaded.

Certifications and Declarations

Declaration of Conformity

What is CE?

The CE marking is a mandatory European marking for certain product groups to indicate conformity with the essential health and safety requirements set out in European Directives. To permit the use of a CE mark on a product, proof that the item meets the relevant requirements must be documented.
Use of this logo implies that the unit conforms to requirements of European Union and European Free Trade Association (EFTA). EN61010-1

For a copy of the CE Declaration of Conformity relating to VeEX products, please contact VeEX customer service.

ROHS Statement

RoHS ComplianceVeEX QUALITY AND ENVIRONMENTAL POLICY

Our quality and environmental policy is to limit and progressively eliminate the use of hazardous substances and chemicals in the design and manufacture of our products.

VeEX products are classified as Monitoring and Control Instruments under Article 2, Section (1), Category 9 of the WEEE 2002/96/EC Directive.

RoHS and WEEE Position Statement

The Council of the European Union and the European Parliament adopted Directive 2002/95/EC (January 27, 2003), to Reduce the use of certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment, and Directive 2002/96/EC on Waste Electrical and Electronics Equipment (WEEE), with the purpose of reducing the environmental impact of waste electrical and electronic equipment. Both were later recast by Directives 2011/65/EU and 2012/19/EU respectively. All VeEX products being placed on the EU market conform with these directives.

Additional RoHS substance restrictions for the Monitoring and Control Instruments were adopted by EU Directive 2015/863 (March 31, 2015). These new restrictions will take effect from July 22, 2021. VeEX has established a program to ensure that from July 22, 2021, all its products to be sold and shipped into the EU market will conform with (EU) 2015/863.

VeEX Inc. is committed to comply with RoHS and WEEE Directives to minimize the environmental impact of our products.

For more information about RoHS as it relates to VeEX Inc, go to www.veexinc.-com/company/rohscompliance .

About VeEX

VeEX Inc., a customer-oriented communications test and measurement company, develops innovative test and monitoring solutions for next generation telecommunication networks and services. With a blend of advanced technologies and vast technical expertise, VeEX products address all stages of network deployment, maintenance, field service turn-up, and integrate service verification features across copper, fiber optics, CATV/DOCSIS, mobile 4G/5G backhaul and fronthaul, next generation transport network, Fibre Channel, carrier & metro Ethernet technologies, WLAN and synchronization.

Visit us online at www.veexinc.com for the latest updates and additional documentation.

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TX300s Quick Guide

The TX300s Test Platform is a family of factory-configurable telecommunication test and measurement equipment (different combinations of built-in test module hardware available). It comprises of a common Test Platform (host or chassis) and different interchangeable test modules (each geared toward specific applications and/or technologies).

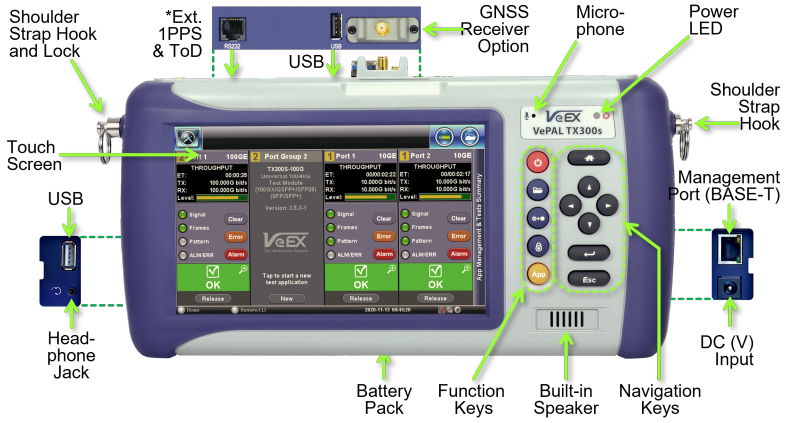
When it comes to user interface (GUI), feature and functions, most VeEX products are very similar, with minor differences to accommodate for the test interfaces and specific hardware capabilities. This section is generic for all products listed, with the subtle differences considered intuitive enough.

Power On Unit

Basic Operation

Select the Test Port Group

Launch the Test Application



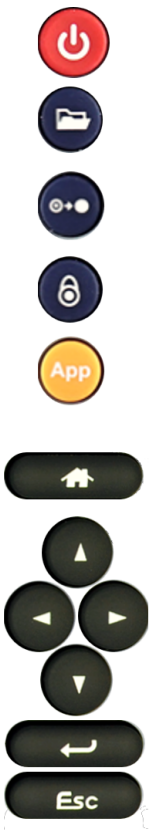
** External 1PPS & ToD RJ11 interface is not available in all hardware configurations. If available, this port can be used to discipline the built-in Atomic Clock option, with an external GNSS receiver.*

Accessories & Hardware Options

- One AC/DC Adapter and Power Cord
- Optional carrying case (if ordered)
- Optional USB WiFi 802.11a/b/g/n/ac dual-band dongle (if ordered)
- Optional USB WiFi 802.11b/g/n + Bluetooth 4.0 dongle (if ordered)

- Optional USB Bluetooth dongle (if ordered)
- Optional Optical Transceivers (if ordered from VeEX)
- Optional GNSS or Multiband GNSS receiver (comes pre-installed)
- Optional GPS or Multiband GNSS portable antenna (if ordered)
- Optional Atomic Clock hardware option (built-in, not visible from the outside)

Basic Operation



Power: Press and hold for 3-5 seconds to power test set on/off. Press more than 10 seconds to force off.

Save Results: Saves the current test result with customized or auto naming (yyyymmdd-hhmmss format).

Clear History: Resets blinking LED reminders of past Errors or Alarms. Test results are not affected.

Lock/Screenshot: Locks touchscreen. When configured, takes screenshots (>Utilities >Settings >Global >Save Settings).

Test Application: Toggles between active test applications.

Home: Returns to the current test applications's Main Menu.

Cursor / Navigation: Application dependent. Offers alternative Navigation to touch screen (e.g. while wearing gloves in cold weather). Moves the cursor Up/Down/Left/Right.

Return: Application dependent. Enter menus/functions.

Escape: Application dependent. Returns to previous screen/function.

Turning the Test Set ON and OFF

- **Turn ON:** Press and hold the red **Power** button for two seconds, until a confirmation tone is heard, and the power LED turns green (in noisy environments, refer to the power LED).

- **Turn OFF:** Press and hold the red **Power** button for about two seconds, until two confirmation tones are heard. Then the shutdown process will start.
- **Forced Shut Down:** In the rare case of a malfunction, our Customer Support team may instruct to press and hold the Power button for approximately four seconds, until the screen turns off. Results, data or configurations are not saved.

Power LED

A single LED indicates the power state of the unit.

- **OFF** : The LED is off when the unit is powered off
- **GREEN**: The LED is green when the unit is powered on and fully charged.
- **ORANGE**: The AC/DC adapter is plugged in and the battery is charging.

Audible Beeps

Low Battery status is indicated by a periodic beeping sound, every four seconds, and displaying a warning pop-up message on the screen.

When working on battery power, once the charge capacity reaches about 10%, the test set will start beeping to notify users to plug in the AC/DC adapter. A pop-up message may also be presented on the screen. When the charge level reaches 5%, the test set automatically initiates the shutdown process, to protect the battery.

To get information about the amount of battery charge and autonomy estimate (under current usage condition) tap the battery icon displayed on the top-right corner of the screen.

Identifying Test Ports and Port Groups

On the connector panel, test ports are identified by group numbers in white rounded squares. In multi-port test modules, each group can run one independent test. These groups are often referred as P1 and P2. In dual module units, the modules are identified by numbers in rounded orange squares, and they may also be referred as M1P1, M1P2, M2P1 and M2P2 (e.g., Module 1 Port 1).

Consider the test port groups as 'Test Resources' or 'Test heads'. Each one can run one test.

TX300s with OTDR and TX320s Test Modules

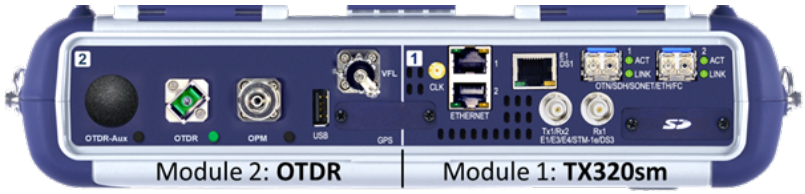
TX320s [Module 1]

The factory-installed Dual Test Port Hardware Option offers a full-featured portable test solution for OTN, SONET/SDH, PDH/DSn, Carrier Ethernet, Fibre Channel and CPRI/OBSAI, as well as Wander and Phase synchronization measurements. The dual SFP+ interface adds bi-directional Ethernet monitor and pass through.

TX300s-OTDR [Module 2]

All-in-One Optical and Service Test Platform

The Fiber Optics test option for the VeEX® VePAL TX300s adds a full range of Optical test features that support OTDR, OPM, Light Source and VFL. Together with Advanced OTN, SDH/SONET, PDH/DSn, Ethernet, Fibre Channel, and Synchronous Packet Networks support, the TX300s offers a complete network test solution from physical layer up to higher layers of multi-service performance testing.



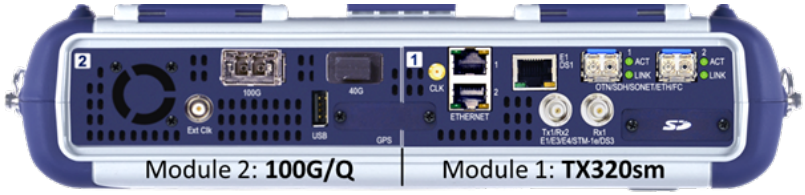
TX300s with 100GQ and TX320sm Test Modules

TX320s [Module 1]

TX300s-100GQ (QSFP28, QSFP+ test ports) [Module 2]

All-in-One Optical and Service Test Platform

The Fiber Optics test option for the VeEX® VePAL TX300s adds a full range of Optical test features that support OTDR, OPM, Light Source and VFL. Together with Advanced OTN, SDH/SONET, PDH/DSn, Ethernet, Fibre Channel, and Synchronous Packet Networks support, the TX300s offers a complete network test solution from physical layer up to higher layers of multi-service performance testing.



TX300s with 100GX Test Module

TX300s-100GX (QSFP28/QSFP+, SFP28SFP+/SFP and RJ45 test ports) [Single Module]

All-in-One Optical and Service Test Platform

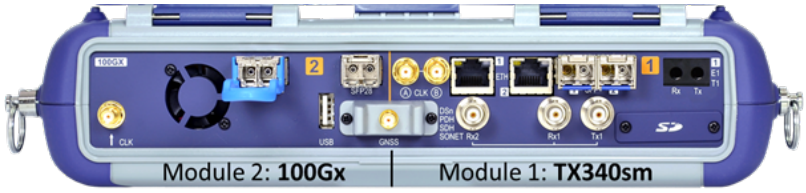
The Fiber Optics test option for the VeEX® VePAL TX300s adds a full range of Optical test features that support OTDR, OPM, Light Source and VFL. Together with Advanced OTN, SDH/SONET, PDH/DSn, Ethernet, Fibre Channel, and Synchronous Packet Networks support, the TX300s offers a complete network test solution from physical layer up to higher layers of multi-service performance testing.

TX300s with 100GX and TX340s Test Modules

TX300s-340s Advanced Multi-Service Test Option [Module 1]

The TX340s hardware option for the TX300s portable test platform offers advanced test solutions for OTN, SONET/SDH, PDH/DSn, Carrier Ethernet, Fibre Channel and CPRI/OBSAI. This factory-installed hardware option allows flexibility to fit any application, for example, the addition of a second TX340s, 100G or OTDR module, to be installed concurrently in the same test platform.

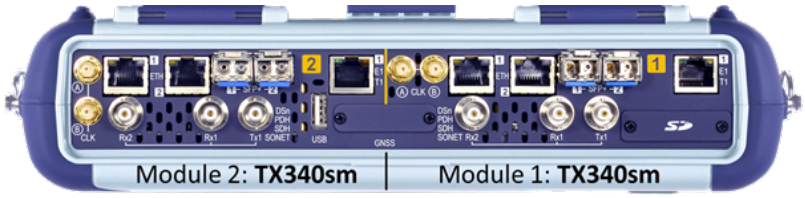
TX300s-100GX (QSFP28/QSFP+, SFP28SFP+/SFP and RJ45 test ports) [Module 2]



TX300s with Two TX340s Test Modules

TX300s-340s Advanced Multi-Service Test Option [Module 1] [Module 2]

The TX340s hardware option for the TX300s portable test platform offers advanced test solutions for OTN, SONET/SDH, PDH/DSn, Carrier Ethernet, Fibre Channel and CPRI/OBSAI. This factory-installed hardware option allows flexibility to fit any application, for example, the addition of a second TX340s, 100G or OTDR module, to be installed concurrently in the same test platform.

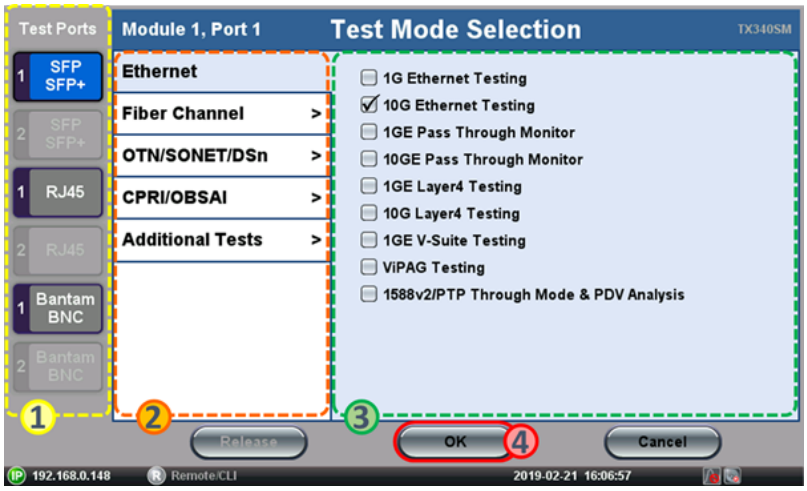


Select the Test Port Group

1. Identify the type of interface being used by the link or device to be tested.
2. On the test module, identify a test port group with an available port or transceiver type that matches the link or device under test. (Note: If you need to use a QSFP28 transceiver for 100GE, but Module 1 Port Group 1 is already running a 25GE test with SFP28, even if the P1 QSFP28 slot is available, it can't be used. Then you must select an available port from Port Group 2 or from Module 2. Each port group can only run one test.)
3. From the GUI, select the test port group by tapping on the desired port group New button (one of the available Test Cards) according to the test interface required for the application. Depending on each individual test module and/or hardware configuration, the screen may display two, three or four test cards, with different test interface options.

4. The test set will display the Test Mode Selection menu

Test Modes - Launching Test Applications



From the Test Mode Selection menu, select the:

1. **Test port**, using the buttons on the left. (The available selection will change based on the capabilities of the selected port group.)
2. **Protocol** (technology or link type), using the vertical tabs. (The available selection will depend on the capabilities of the selected port type.)

3. **Test Application**, using the check boxes. (The available test functions will depend on the of the selected protocol and purchased licenses.)
4. Press **OK** to launch the Test Application

The selected test application will start to launch (it may take several seconds).

Insert the required optical transceiver (if applicable) and connect the selected test port to the Fiber, Link, Line Card and/or Device Under Test (DUT), to set up the test scenario and start testing. Refer to the individual test module and test function manual for more details on the application.

Use the buttons on the left of the top bar to navigate between the different functions (System Tools/Utilities, Test Card Summary/Test Selector, Current Test/Change Test Mode)

Other Features

System Tools & Utilities

 Tap to access to the test platform (system) related settings, test results, utilities and certain tools (Fiber Scope, OTDR Viewer), including connectivity (LAN, WiFi, Bluetooth) and cloud-related applications like EZ-Remote, VeExpress, FTP, R-Server, etc.

Test Cards Summary / Application Switching

 Tap to access the Test Cards Summary, which shows an overview of all active tests and test resource availability. Test applications can be terminated/released or new ones can be assigned.

Active Test Application

This button indicates the current Port (1) and Module (2) being currently presented on the screen. Tap this button to change the Test Mode or Test Application for this port.