The Verification Experts

USER MANUAL

CX380C

CATV Maintenance Test Set

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

No part of this user manual may be reproduced, translated into a foreign language, or be transmitted electronically without prior agreement and written consent of VeEX Incorporated as governed by International copyright laws. Information contained in this manual is provided “as is” and is subject to change without notice. Trademarks of VeEX Incorporated have been identified where applicable, however the absence of such identification does not affect the legal status of any trademark. D07-00-147P RevA00

Copyright 2020 VeEX Incorporated. All rights reserved.

Table of Contents

Go back to top

1.0 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 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 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.

© Copyright VeEX, Inc. All rights reserved. VeEX, Sunrise Telecom, Digital Lightwave, Air Expert, CaLan, FaultScout, Fiberizer, MPA, MTT, RXT, VeGrade, VeriPHY, and VeSion, among others, are trademarks or registered trademarks of VeEX, Inc. and/or its affiliates in the USA and other countries. All trademarks or registered trademarks are the property of their respective companies. No part of this document may be reproduced or transmitted electronically or otherwise without written permission from 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.

Go back to top Go back to TOC

1.1 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

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

MPA Product Technical Support

Support is generally available 8:30 AM to 5:30 PM, Eastern Standard Time, Monday to Friday.
Phone: +1 877 929 4357
International: +1 727 475 1206
E-mail: serviceandsupport@veexinc.com

Go back to top Go back to TOC

1.2 Warranty

For warranty information on VeEX products, go to https://www.veexinc.com/Support/Warranty.

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

Go back to top Go back to TOC

1.3 Patent Information

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

Go back to top Go back to TOC

1.4 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 missteps.
	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.

Go back to top Go back to TOC

2.0 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.

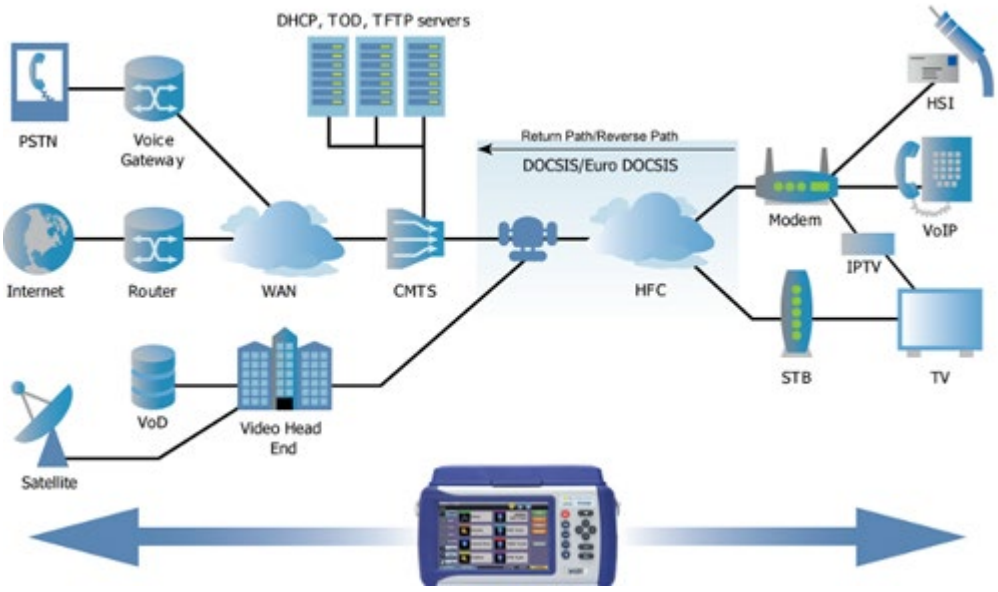
Electrical Connectors

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

Go back to top Go back to TOC

3.0 Introduction to CX380C

The VeEX® CX380c is a powerful CATV Maintenance test set featuring Forward and Return Path Sweep, DOCSIS 3.1 OFDM Analysis, Spectrum Analysis, Advanced QAM, and VeTest speedtest capabilities. For the most recent product specifications, see the product page on www.veexinc.com.



3.1 Key Features

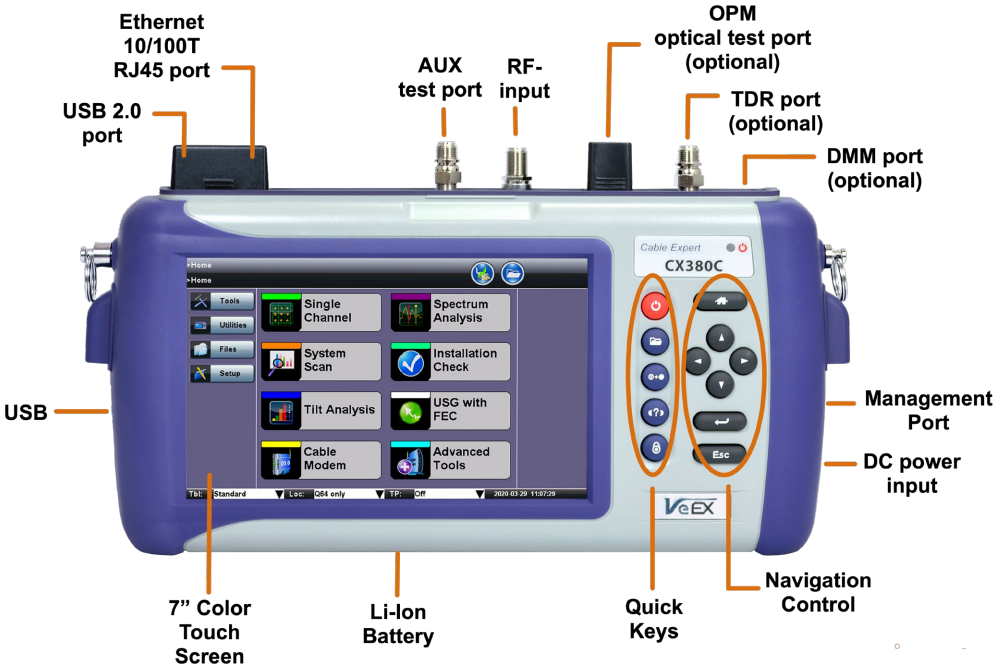
- Full compatibility with CaLan 3010H+ Sweep System for Forward Path to 1.8 GHz and optional Return Path to 204 MHz
- Comprehensive SLM measurements (VeCheck Full Band Scan, Tilt, and Single Channel)
- Advanced Digital Measurements (MER, BER, Equalizer, HUM, Center Frequency Error, Symbol Rate Error, Frequency Response, Group Delay)
- DOCSIS 3.1 Cable Modem with OFDM Analysis
- FCC POP including Digital POP (optional)
- V-Test Throughput tests for both RF and Layer 4+ interfaces
- V-Perf Layer 4+ TCP Test (optional)
- Physical layer cable testing with TDR or DMM (optional)
- Optical Power Meter (optional)

Go back to top Go back to TOC

4.0 Basic Operations

Power ON the unit by pressing the **Power** key on the keypad. Power OFF the unit by pressing the **Power** key for at least **2 seconds.** If the unit does not respond, force the unit to power down by holding the Power key down for more than 10 seconds.

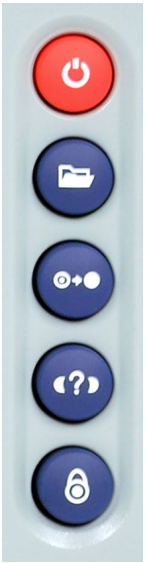
4.1 Platform Overview



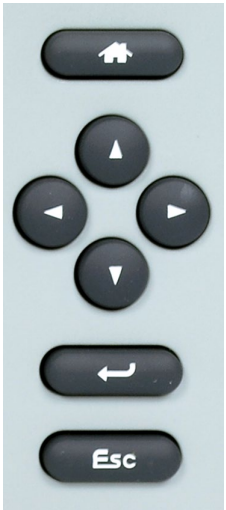
Go back to top Go back to TOC

4.2 Keypad

The keypad comprises the following keys:



- **Power**: Press for **3-5 seconds** to power the test set ON or OFF (prevents accidental ON/OFF). FORCE OFF by pressing more than **10 seconds**.
- **Save Test Results**: Saves the current Test Results or snapshot in autonamed file with time stamp. See *File Management*.
- **Clear History**: Resets blinking LED reminders of past Errors or Alarms. Test results are not affected. (not used in OTDR).
- **Help**: Accesses the User Manual.
- **Lock/Unlock Touch Screen**: Can also be programmed to capture screen shots (**>Utilities>Settings>Global>Save Settings**).



- **Home**: Returns to the Main Menu.
- **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).
- **Enter**: Application dependent. Enter menus/functions.
- **Escape**: Application dependent. Returns to previous screen/function.

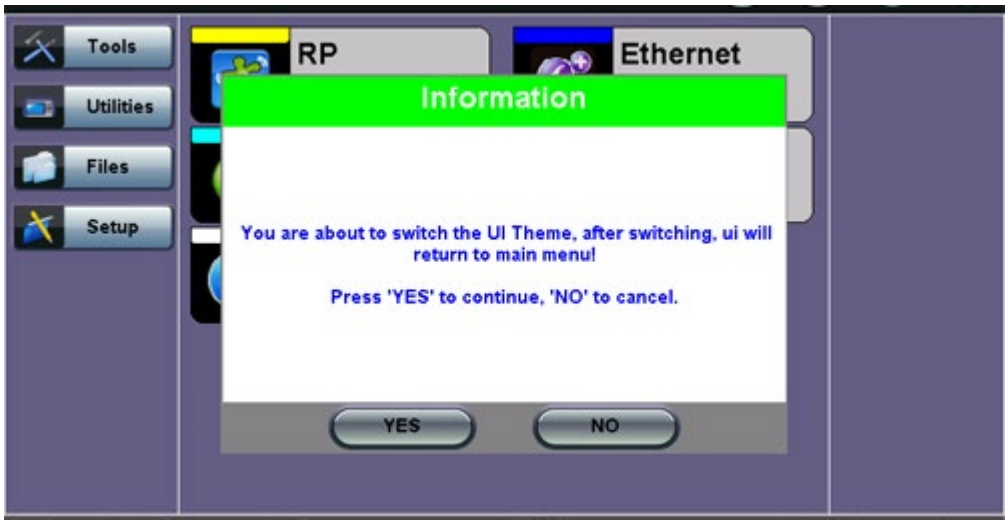
Power Save/Sleep Mode

Save the unit's battery power by turning on "Sleep Mode" when needed. From the **Home/Main Menu Screen**, press the key for **3 seconds**. Press the key again for **3 seconds** to restore normal operation.

Battery Status: Check the battery status by pressing the key for **1 second**.

Outdoor Visibility

To change the screen to "High Contrast" mode and make it easier to see when outdoors, press the Esc key for **3 seconds**. Press the key again for 3 seconds to switch back to "Standard Mode". The color scheme can also be changed by going to **>Utilities>Settings>Global>General Settings**.



Switch UI Contrast for Visibility

Go back to top Go back to TOC

4.3 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. The unit can also be used in non-touch screen mode (i.e., using the **Arrow**, **Enter**, and **Escape** keys on the keypad to navigate). The location of the cursor on the screen is indicated by a focus state. The focus state varies depending on the function or section of the test set.

Touch Screen Navigation

The unit is equipped with a state of art, full color, LCD TFT touch screen. When used properly, the screen is designed to give years of reliable and precise operation. Always use the stylus supplied with the unit to operate the touch screen. Observe the following precautions to avoid damaging the screen and **voiding the warranty**:

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

Go back to top Go back to TOC

4.4 Battery

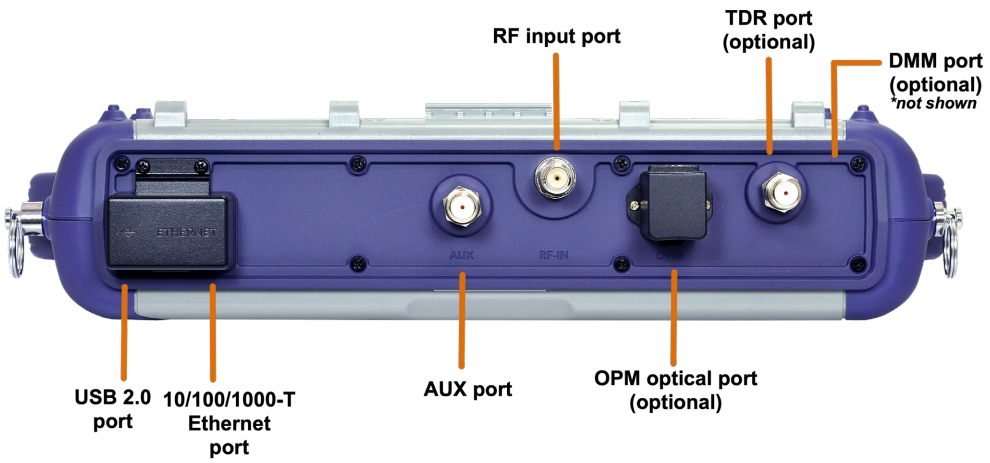
The CX380C chassis is equipped with an intelligent Li-ion rechargeable battery pack, which is located in the rear of the unit. The battery will be partially charged upon delivery, so it is recommended to fully charge the battery before use. Please charge the battery at room temperature to preserve its 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 adaptor. Removing the battery while the unit is powered on is not recommended - this may result in damage. Remove the rubber cover on the left side to connect the AC Main adaptor to the unit.

Go back to top Go back to TOC

4.5 Connectors and Panels

4.5.1 Test Ports

To access the test connectors, open the top cover.



The following test ports are available on the CX380C:

- **RF-IN:**
  - "F" Connector, 75 ohms for connection to the CATV network *(maximum voltage input 100VAC*)
  - Provides access to:
    - VeCheck, Signal Level Meter (SLM) and associated functions
    - DOCSIS 3.1 Cable Modem and OFDM Analysis

- **AUX:**
  - "F" Connector for Sweep Transmitter

- **10/100/1000-T:**
  - Ethernet
    - For Layer 4+ V-TEST and V-PERF. Used for Cable Modem emulation mode that allows an external PC to be connected.

- **OPM:** *(optional)*
  - *Optical Power Meter*: The optical fiber is connected to the OPM port on the top panel. Depending on fiber connector type, use interchangeable adaptors. FC, SC, ST or LC type are supplied standard.

- **TDR:** *(optional)*
  - *Time Domain Reflectometer:* RJ45 test port

- **DMM:** *(optional)*
  - *Digital Multimeter, 2 mm Banana test port*

Go back to top *Go back to TOC*

4.5.2 Utility Ports

One USB port is located on the left side of the unit. An Ethernet Management port is located on the right side of the unit. A second USB port is located on the top left panel.

RJ45, 10/100Base-T Port:

To access the Ethernet port, remove the protective rubber cover on the right hand side of the unit to expose the connector. Ethernet applications include:

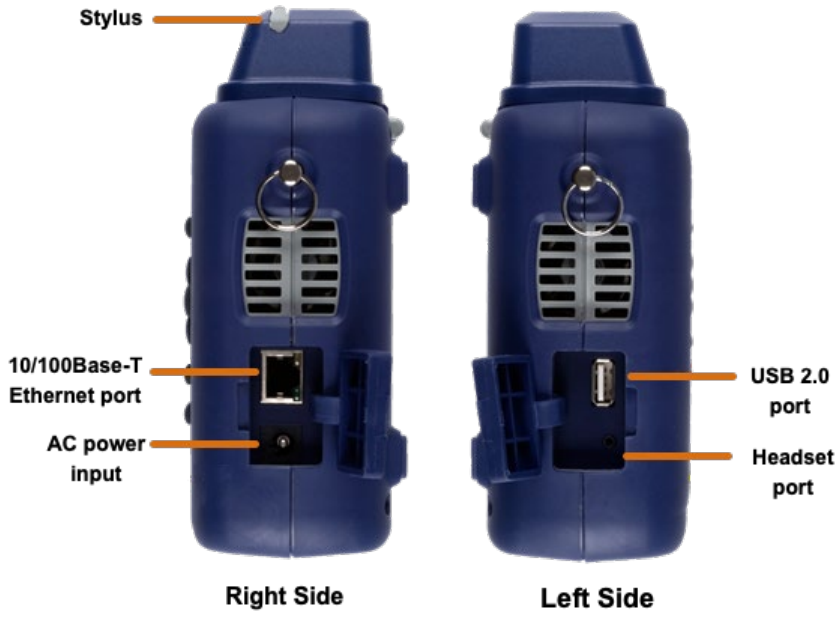
- *IP connectivity testing*
- *Net Wiz testing*
- *WiFi Wiz testing*
- *Transfer measurement results and test profiles between the instrument and a computer using ReVeal CX300 software*
- *Upload/download channel tables between the instrument and a computer using ReVeal CX300 software*
- *Remote control of the instrument using VNC remote access software or a Web Browser*

USB Port:

To access the USB port, remove the protective rubber cover on the left hand side of the unit to expose the connector. The USB port supports:

- *Memory drives for test results transfer and software upgrade*
- *WiFi adaptor for WiFi testing or IP connection*
- *Bluetooth adaptor for file transfer or coupled with a mobile device for IP connection*
- *USB data modem for IP connection*
- *Digital Fiber Inspection Scope*

There is a second USB Port on the top left panel.



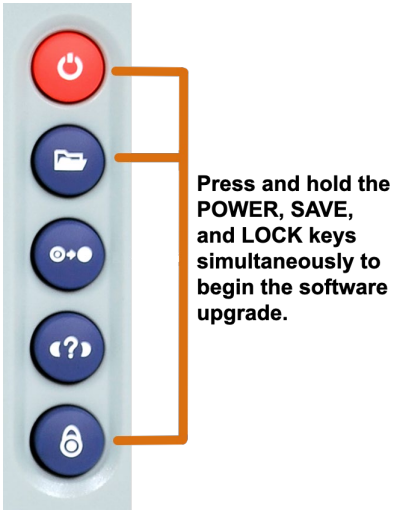
Go back to top Go back to TOC

4.6 Software Upgrade

To update the software via the USB port:

1. *Download the CX380C software from the product page on the VeEX website at www.veexinc.com.*
2. *Locate the .zip file and double-click it to unzip the files.*
3. *Copy the unzipped file (filename ends with the phrase veex-arm.tar.gz, e.g., "cx380C-veex-arm.tar.gz") and copy it onto a USB stick formatted in the FAT-32 file format.*
4. *Power OFF the CX380C unit and verify that the AC adaptor connected to the unit is charging the battery.*
5. *Insert the USB stick into the port on the right side of the unit.*
6. *Press and HOLD the **Save**, **Lock**, and **Power** keys simultaneously until the unit powers ON. As the unit powers ON the new software installation begins automatically. A message appears stating the upgrade is in progress. Installing the software will take around 10-15 minutes.*

Do NOT remove the USB memory stick until the upgrade is complete. Doing so will interrupt the software upgrade and corrupt the upgrade progress.



Go back to top Go back to TOC

5.0 Home Screen and Menu

Access the **Home** menu at any time during operation by pressing the **Home** button  on the rubber keypad.

5.1 Screen Layout

The test unit's screen displays four sections/panels (Left, Middle, Right, Bottom). For more information about the menus listed below, see the relevant sections of this manual from the Table Of Contents.

Left Panel:

- **'V' Icon - Utilities Menu**
- **Setup**
  - Main Menu

Middle Panel:

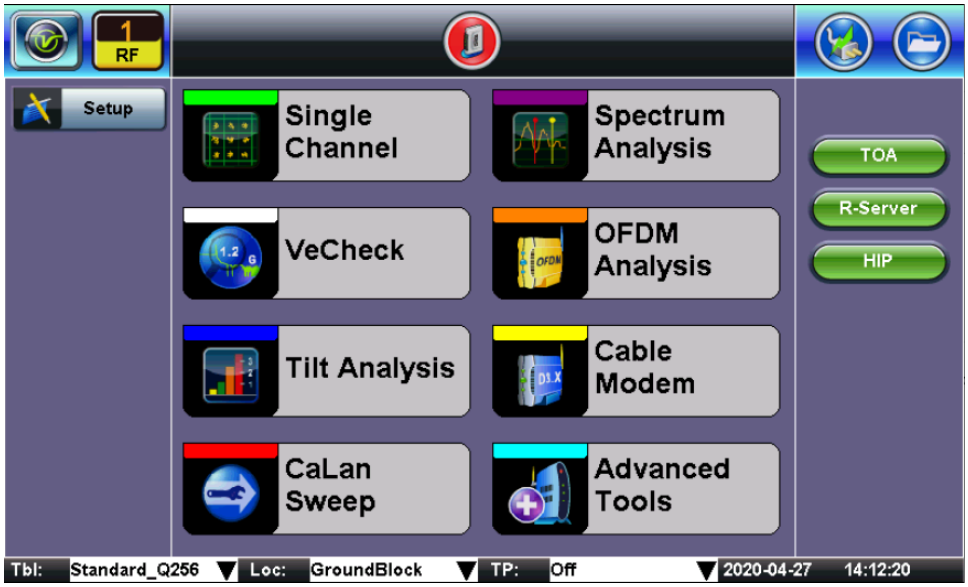
- **Test Applications** specific to the test set:
  - Single Channel
  - Spectrum Analysis
  - VeCheck
  - OFDM Analysis
  - Tilt Analysis
  - Cable Modem
  - CaLan Sweep
  - Advanced Tools (to access more advanced features):
    - Ethernet Tools
    - In Service Sweep
    - HIP
    - R-Server
    - TDR
    - Digital Multi-Meter
    - Optical Power Meter

Right Panel:

- Function keys
  - The function keys are application dependent.

Bottom Panel:

- **Tbl (Channel Table):** Select a channel table to test.
- **Loc (Location):** Select Location threshold.
- **TP (Test Point):** Select test point compensation
- **Date and Time**

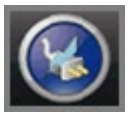


CX380C Home Menu

Go back to top Go back to TOC

5.2 Screen Icons

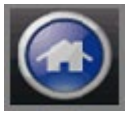
The following icons are displayed and located at the top of the screen:



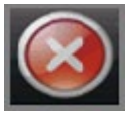
Power: Indicates the unit is being powered by the external AC power.

Battery Power: Indicates the unit is being powered by the internal Li-ion battery. Tap the icon to see how much battery power is remains.

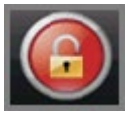
File: Provides File Storage Information.



Home: Provides instant navigation back to the main Home menu screen.

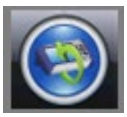


Close: Closes screen and returns to the previous screen.



QAM Unlocked: Indicates QAM Lock has not been achieved on the digital carrier.

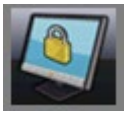
QAM Locked: Indicates QAM Lock has been achieved on the digital carrier.



Remote View: Indicates the test unit is being accessed remotely.

Bluetooth: Bluetooth detected.

Data/GPS card: Data/GPS card detected.



Screen Lock: Indicates the screen is locked.

WiFi: Unit is connected to WiFi.

QAM Lock is required to make Constellation measurements.

Go back to top Go back to TOC

6.0 Setup

- Channel Tables
- Locations
- Test Point Compensation

Test mode, test port/s and network settings are required prior to performing any measurements or applications.

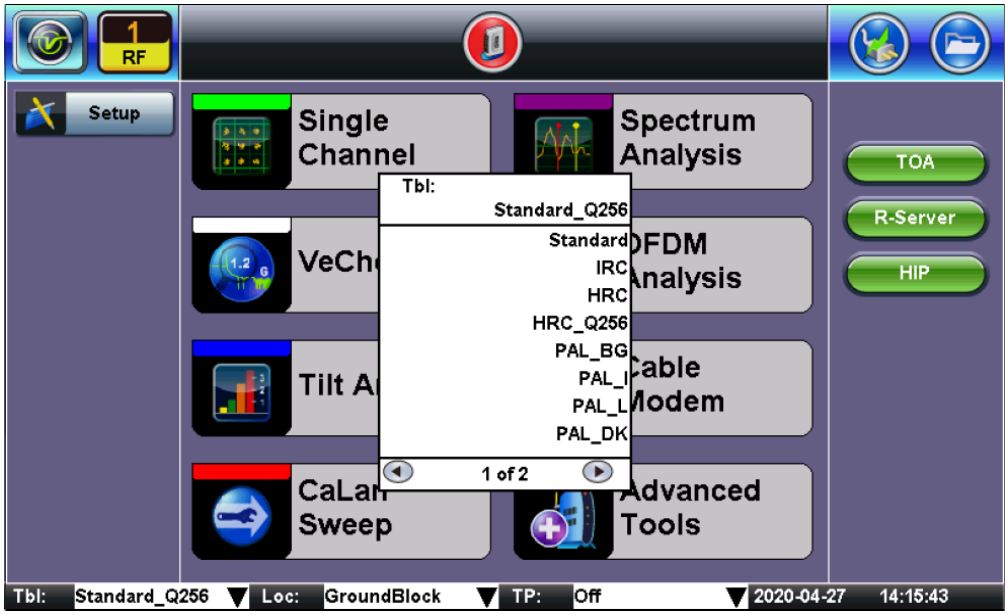
Go back to top Go back to TOC

6.1 Channel Tables

The unit requires Channel Tables to perform measurements in Single Channel mode. By default, the unit is preloaded with several channel tables, according to industry standard Annex A, B, and C systems.

Selecting a Channel Table

1. In the left panel, tap **Setup<Main Menu**.
2. At the bottom, tap **Tbl** drop-down arrow (▼) and select a table from the drop-down menu.



Channel Table Selection

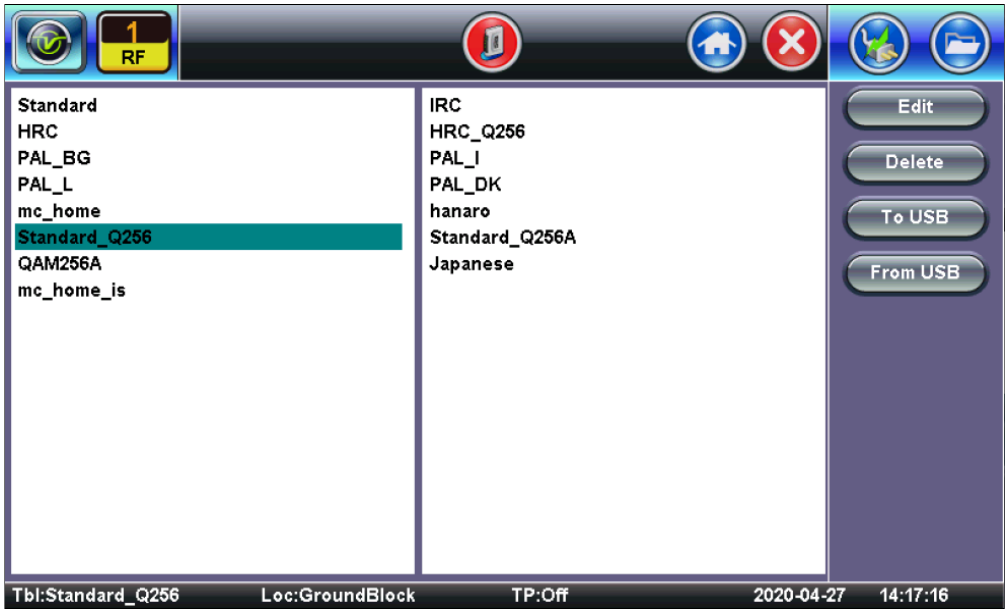
Go back to top Go back to TOC

Editing or Creating New Channel Tables

To create new channel tables or edit existing ones:

1. In the left panel, tap **Setup<Main Menu**.
2. At the bottom, tap **Tbl** drop-down arrow (▼) and select a table from the drop-down menu.
3. On the **Channel Table Selection** screen, tap the **Channel Table** drop-down arrow (▼) select **Manage**.
4. On the **Channel Table List** screen, select a table and press the **Edit** button.
5. On the **Channel Table Editor** screen, make changes as required and press **Save**. To add this table to the existing list, type a new name for the table. *For field descriptions, see Setup - Main Menu.*

Channel Table Selection: Main Menu



Channel Table List

Channel Table Editor

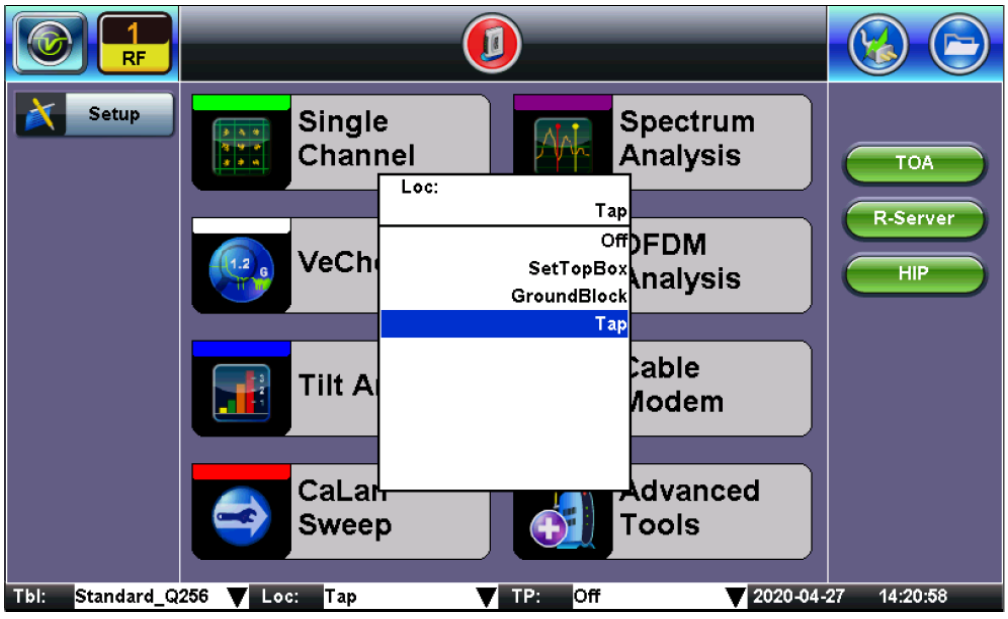
Creating Channel Tables with ReVeal

Alternatively, the channel tables can be created and managed using ReVeal PC software, which is a standard accessory. Additional tables can be created from a blank table or from existing templates. The test set and the PC software can exchange the tables for easy updating. For more information about the ReVeal tool, see Remote Access and the *ReVeal User Manual* on www.veexinc.com.

Go back to top Go back to TOC

6.2 Locations

Location settings are pre-set measurement thresholds for analog and digital carriers. By default, the unit is pre-loaded with Groundblock, Set Top Box and Tap locators. When performing a measurement, one of these preset locations can be selected by tapping the check box.



Location Selection

To edit measurement thresholds for the preset locations:

1. In the left panel, tap **Setup<Main Menu**.
2. At the bottom, tap **Loc** drop-down arrow (▼) and select a Location from the drop-down menu.
3. Modify threshold settings for Analog and Digital Carriers in the **Location Editor** screen.
4. Tap the checkboxes to apply the threshold settings.
5. Once new values have been entered, press **Save** or **Save As** and type a new name to save the new thresholds as a new Location.

Location Editor - Analog

Location Editor - Digital

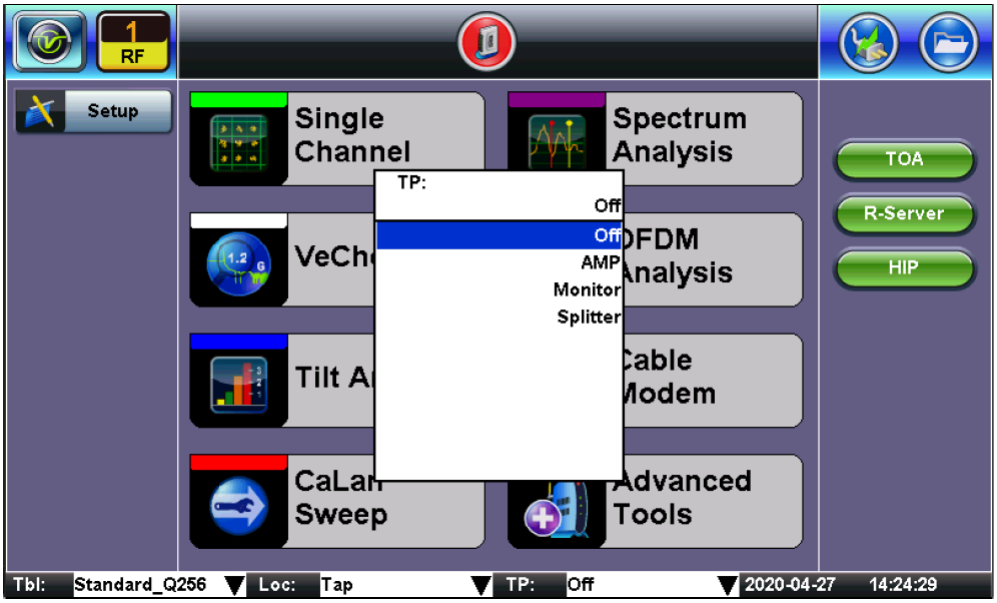
Go back to top Go back to TOC

6.3 Test Point Compensation

Test point compensation allows the loss at a certain test point to be compensated automatically. When performing a measurement, one of these preset test points can be selected by tapping the check box. The test set stores 10 sets of TP compensation values by name.

To edit measurement thresholds for the preset locations:

1. In the left panel, tap **Setup<Main Menu**.
2. At the bottom, tap **Loc** drop-down arrow (▼) and select a Location from the drop-down menu.
3. After editing the values, press **Save**.



TP Selection

- **Forward Comp (dB)**: Downstream related measurements, such as Single Channel, Installation Check, and Cable Modem Downstream Levels.
- **Return Comp (dB)**: Cable Modem Upstream Transmit Levels.

TP Editor

Go back to top Go back to TOC

7.0 Test Applications

- For more information about **Sweep Operations**, see Section 8.0 Sweep.
- For more information about the Advanced Tools menu, including **Layer 4+ Applications**, **HIP**, **TDR,OPM**, and **R-Server**, see Section 9.0 Advanced Tools Menu.

7.1 Single Channel Measurement

The Single Channel SLM function performs a level measurement of a user-selected frequency or a channel that is defined in the selected and active channel table. The contents of the Single Channel screen will depend upon whether the selected channel contains an analog or digital signal.

In analog mode, both video and audio levels including Video/Audio (V/A) and Carrier to Noise (C/N) ratios are indicated. In digital mode, the average power of the QAM channel is measured and MER and BER performance and other related parameters are displayed.

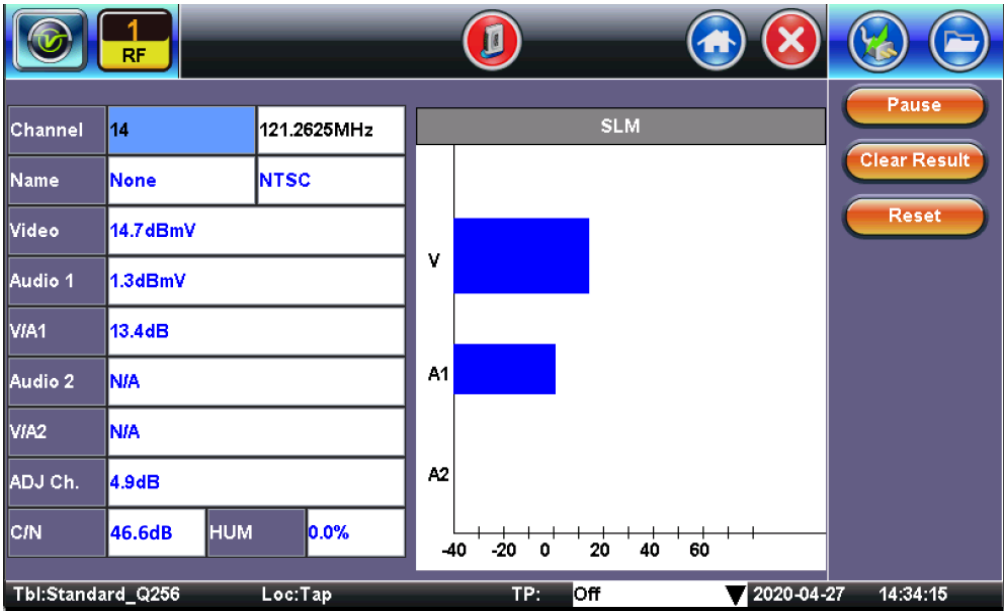
The channel to be measured can be entered by either tapping on the Channel box or the Frequency box to the right and use the pop up keypad to enter the channel number or frequency respectively. After the first channel is entered, use the Arrow Up key or Down key to scroll through the next or previous channel in the channel table. About 3 seconds after releasing the Arrow Up or Down key, the measurement will start. CX380C remembers the last channel measured, and upon entry, the last channel number will be used.

The CX380C supports histogram analysis, which records the current minute by second and past 60 minutes by minute.

7.1.1 Analog Channel Measurements

The following measurement information is provided for analog signals:

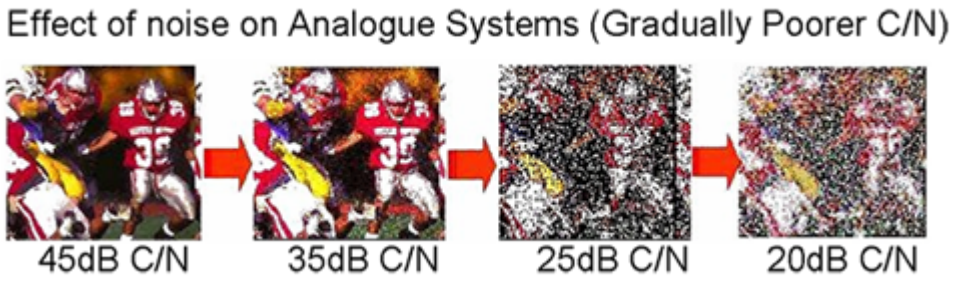
- Channel number (defined in the channel table)
- Channel frequency (defined in the channel table)
- Video Power Level in dBmV/dBuV including graphic bar indication
- Audio1 Power Level in dBmV/dBuV including graphic bar indication
- Video/Audio1 ratio in dB
- Audio2 Power Level in dBmV/dBuV including graphic bar indication
- Video/Audio2 ratio in dB
- Max Adjacent Channel in dB
- Carrier to Noise (C/N) in dB
- HUM in %



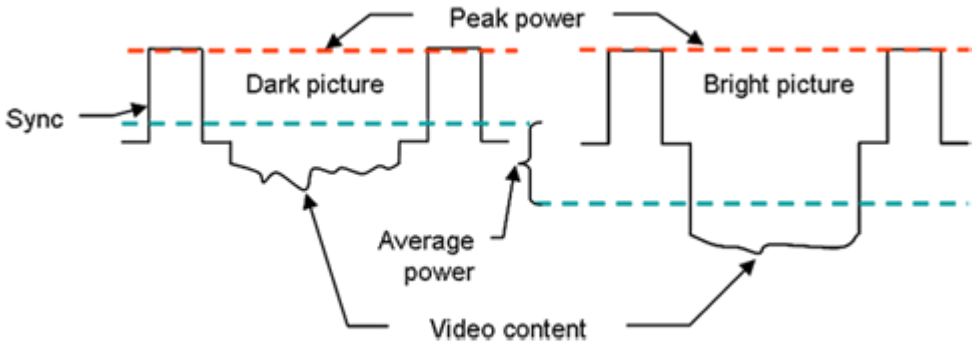
Single Channel - Analog Results

Red blocks indicate the predefined threshold window for the measurement parameter.

The effect of noise or poor C/N on analog video carriers is described below.



The average power changes depending on the picture content e.g. dark scenes have a higher average power than bright scenes. Using sync pulses, the carrier is at its peak power and it does not change from scene-to-scene; therefore, peak power has become the standard for analog video carrier level measurements. The CX380C measures the peak level for analog carrier.



Analog Carriers - Peak Power Measurement

CSO/CTB

The CX380C measures the CSO/CTB by taking the measurement at the programmed frequency offsets of an analog channel's video carrier. The frequency offsets can be programmed in **Setup Main Menu**.

The default values are:

- CSO-1 offset: 1.25MHz
- CSO-2 offset: 0.75MHz
- CTB offset : 0 MHz
- CSO-3 offset: -0.75MHz
- CSO-4 offset: -1.25MHz

The CX380C first measures the signal levels at those frequency offsets of a live carrier then prompts to either use a channel blocker or remove the carrier. The same frequency offsets will be measured after the carrier is removed or blocked and they are used to compare with the previously measured results with a live carrier to determine the final CSO/CTB values.

Alternatively, the CX380C can measure the CSOs of a live carrier without using a channel blocker or removal of the carrier by selecting the GATED CSO mode. In this mode, the CX380C measures the noise level at the frequency offsets during the sync pulse period where the carrier signal is quiet then compare with the measured levels during the non sync pulse period.

Go back to top Go back to TOC

7.1.2 Digital Channel Measurements

When testing a digital channel, the unit first tries to lock onto the QAM signal. Once the QAM signal is locked, the unit starts displaying the digital measurement results as well as the constellation diagram.

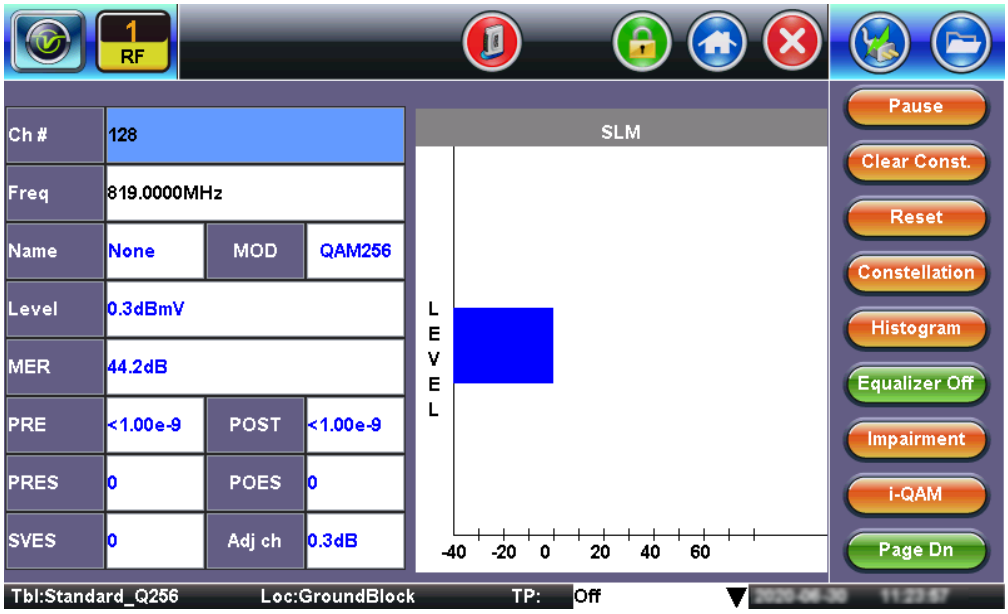
QAM unlock

If the unit is unable to lock onto the digital channel, the following icon is displayed.
Always ensure QAM lock is achieved prior to making Constellation and related digital measurements.

SLM button: The following measurement information is provided for digital signals:

- Channel number (defined in the channel table)
- Channel frequency (defined in the channel table)
- Channel or program name
- Modulation type measured
- QAM Power Level in dBmV/dBuV including graphic bar indication
- Modulation Error Ratio (MER) in dB
- Pre BER & Pre Error Second ratio
- Post BER & Post Error Second ratio
- Severely Error Second count
- Max Adjacent Channel Delta in dB

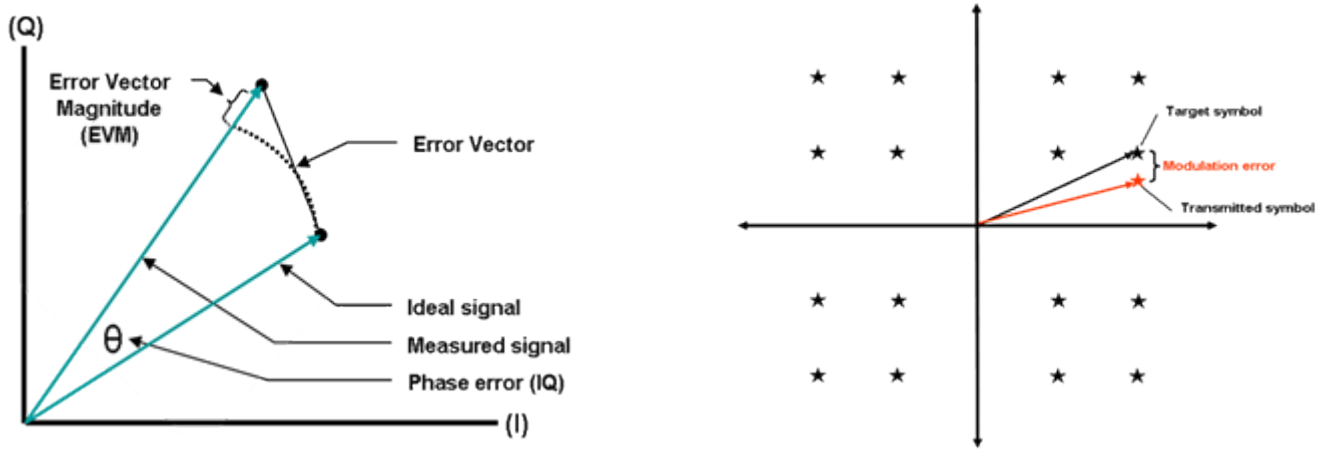
Graphic limit indicators are provided for all graphically displayed signal levels. Numeric data that is outside of limits are displayed in red.



SLM Measurement (Digital Carrier)

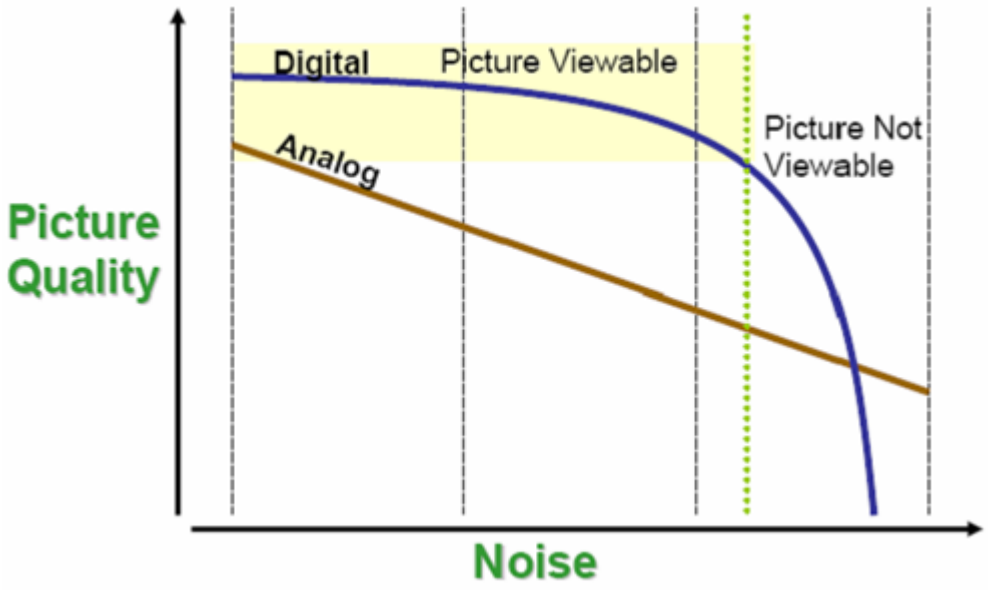
Modulation Error Ratio (MER)

In digital systems, MER is very similar to Carrier to Noise (C/N) in analog systems. MER measures how tightly symbols are recorded with respect to an optimum location based on the Error Vector Magnitude (EVM).

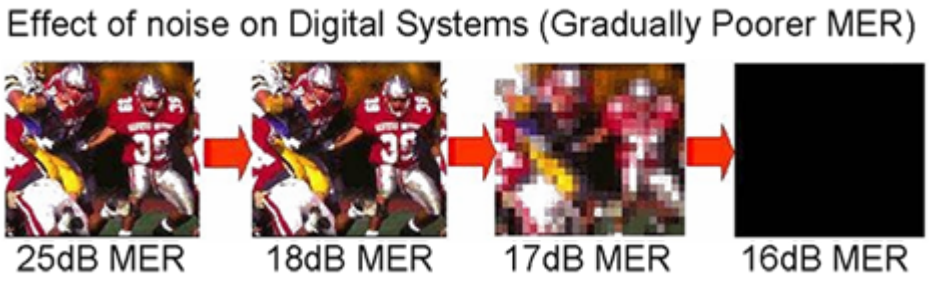


Modulation Error Ratio (MER) and Error Vector Magnitude (EVM) Relationship

MER determines how much margin the system has available before a failure can be expected. A poor MER is not noticeable on the picture up until the point of system failure - this is often referred to as the "Cliff Effect". Ideally, there should be at least 4 to 5dB of margin from the MER where significant errors occur to allow for system degradation. MER measurements are useful for early detection of non-transient (noise) impairments, such as system noise Ingress.



Cliff Effect - Digital Carriers



Go back to top Go back to TOC

7.1.3 Constellation Measurements

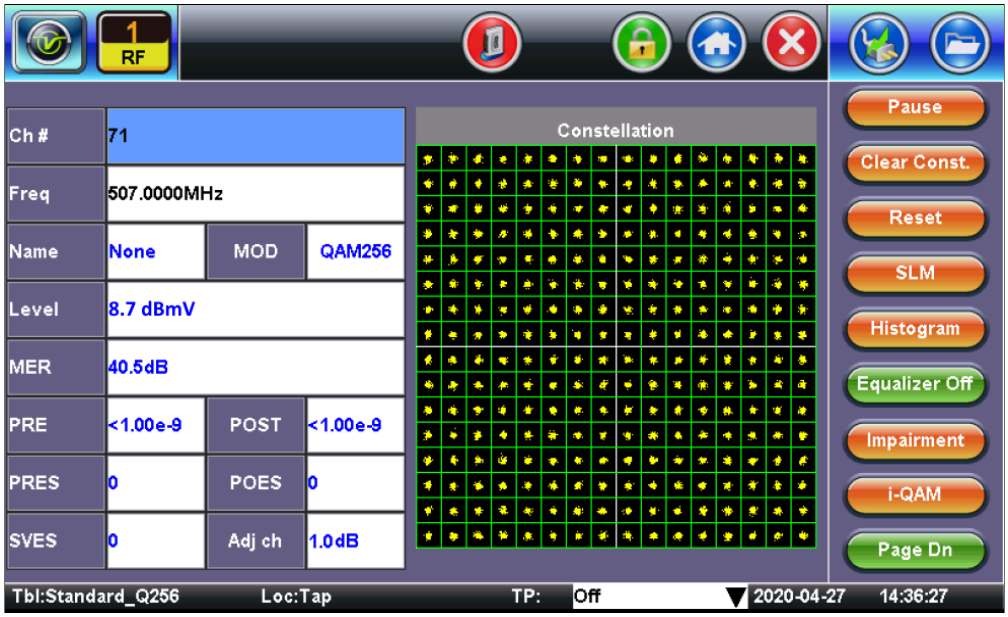
In contrast to measuring techniques used on digital TV signals transmitted via satellite, a wider and necessary range of measuring techniques is provided for broadband cable testing. The influence acting on the broadband cable signal, which can be modulated with up to 256QAM, are more varied and critical than in the satellite domain.

Constellation measurements are an example of such advanced measurements and are an ideal tool to identify QAM modulator problems.

- QAM Power Level (numeric in dBmV/dBuV)
- MER (numeric in dB) is an indication of the operating margin of the system
- Pre BER & Pre Error Seconds (numeric) is the error rate of the incoming signal prior to being corrected FEC circuitry
- Post BER & Post Error Seconds (numeric) is the error rate of the signal after the FEC has corrected all the possible errors
- Severely Error Seconds (numeric)
- Max Adjacent Channel Delta (numeric in dB)
- Constellation (graphic)

Zooming in on Constellation

The constellation display supports a zoom function. For QAM64 and QAM256 modulation, the constellation is split into 4 quadrants for simplified viewing. Tap on any of the four quadrants to zoom into this selected quadrant.



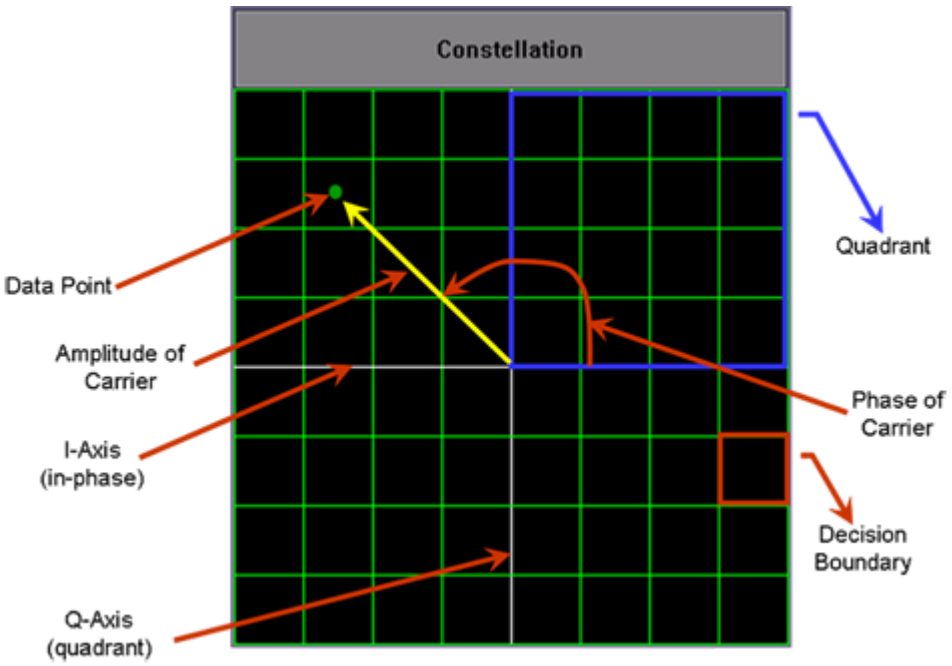
Constellation Diagram - Digital Carriers

Bit Error Rate (BER)

- Bit Error Rate (BER) measures how often an error occurs in a given amount of data.
- The more errors, the more difficult it is for the FEC circuitry to correct those errors before picture problems occur.
- BER is useful for measuring long term system performance and periodic transient impairments that can occasionally affect system performance.
- BER is usually displayed in scientific notation e.g.;
  - where 1E-3 means one error in every 1000 bits
  - where 1E-6 is one error in every 1,000,000 bits
- Ideally, the signal should have the highest exponent value - the higher the number, the lower the errors.

Constellation diagrams

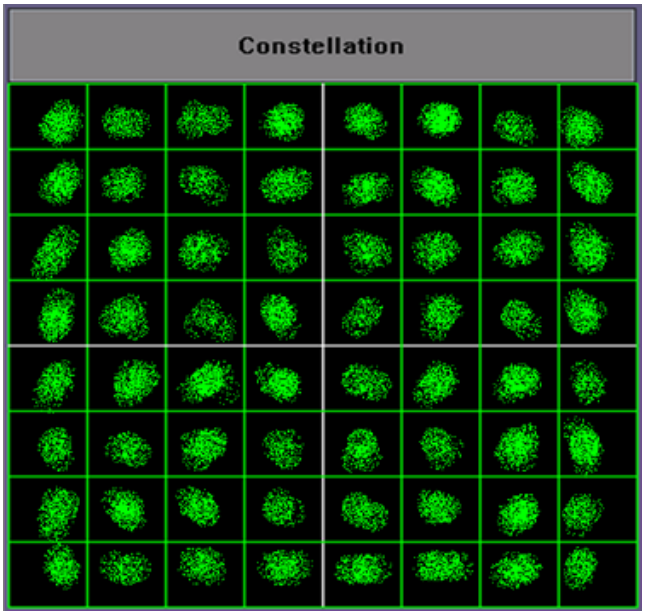
- Constellation diagrams are used to graphically represent the quality and distortion of a digital signal.
- The diagram is an X/Y plot of the I (In-phase) and Q (Quadrature) axis components of the QAM signal and is particularly useful for viewing impairments due to ingress and/or modulation problems present on the digital signal.
- A symbol (essentially a waveform representing one or more bits) should ideally appear as a compact or clean dot in the center of each symbol box. Decision boundaries exist within the constellation so that if the symbol falls within the boundary, the correct data is received.
- If due to noise or other interference, the symbol falls outside the boundary, the data is in error. Error detection and correction (e.g. FEC) will attempt to the correct these errors, thus avoiding video impairments.
- Observing the symbol's shape and location relative to their ideal positions allows some conclusions about the nature of an impairment



Understanding the Constellation Diagram

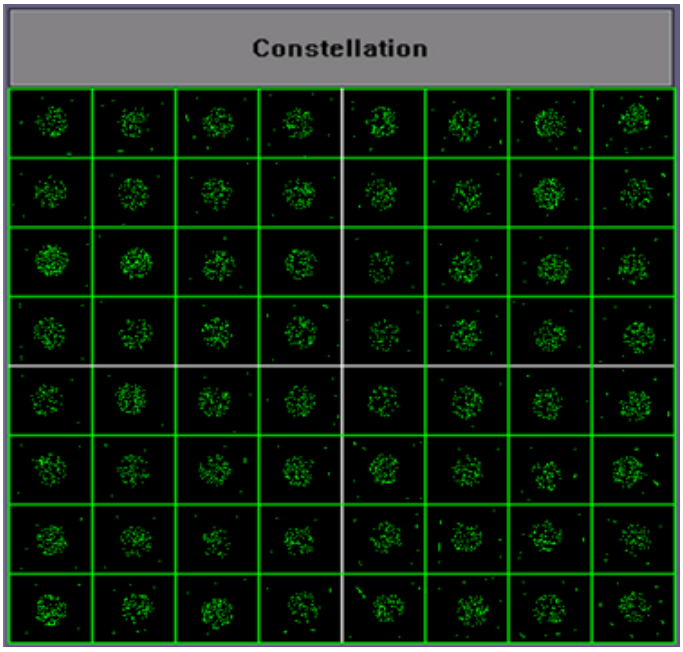
The following impairments can be assessed visually:

- **Gain compression** - Pulls the symbol clusters into the center while the middle ones are unaffected. Gain compression can result from poor or bad amplifiers, IF equalizers and up/down converters.



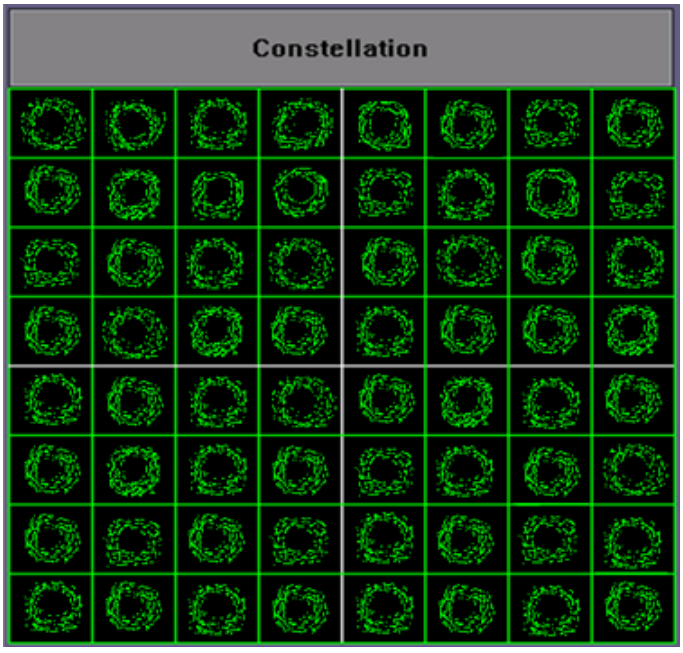
Gain Compression

- **Broadband or system noise** - Causes symbol clusters to enlarge, which increases the probability of errors. An error occurs when the dot is pulled across a decision boundary.



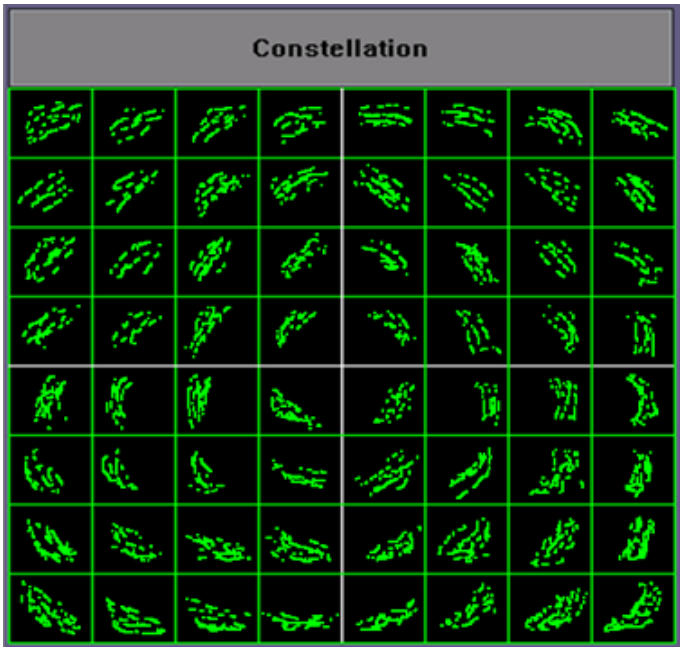
System Noise - Incoherent Interference

- **Coherent interference** - CSO/CTB, spurs or ingress produce symbol clusters with a hole in the center so they appear as "donuts". This can also be a result of laser clipping or sweep interference.



Coherent Interference

- **Phase noise** - Also known as Phase jitter in a QAM signal, it is caused by transponders in the transmission path or by the I/Q modulator. Phase jitter is a statistical quantity that affects the I and Q path equally. Phase noise causes the symbol clusters to appear as arcs, particularly those near the edges of the constellation. Phase noise can also result from faulty headend up/down converters.



Phase Noise

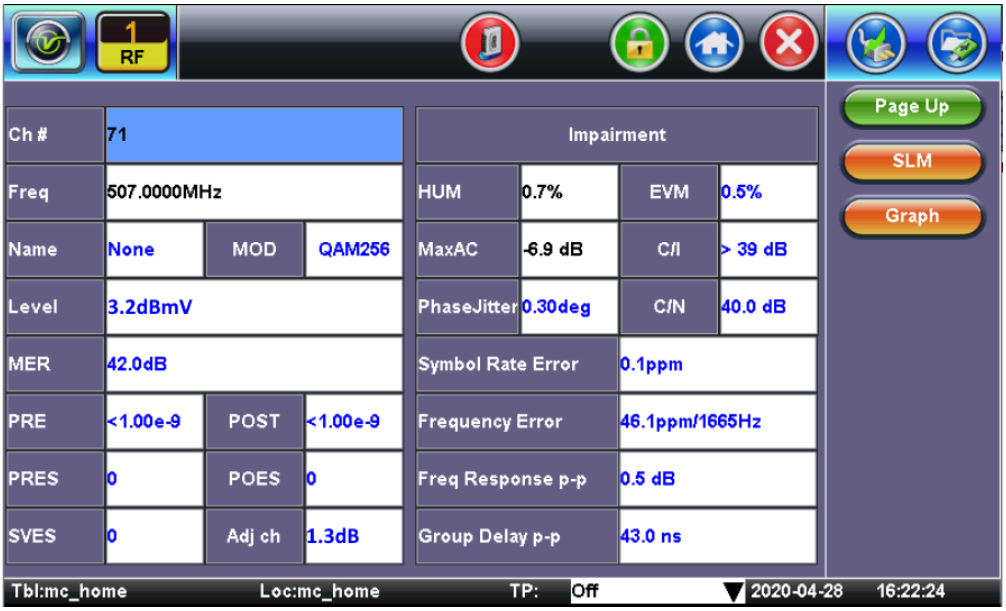
Go back to top Go back to TOC

7.1.4 Impairment Measurements

7.1.4.1 Table Mode

In addition to the standard digital carrier measurements, the following impairments are also measured with the optional Advanced Digital Measurement:

- Error Vector Magnitude (EVM) in %
  - Measurement of modulation quality of the transmitted signal before forward error correction.
  - Error Vector Magnitude = (maximum symbol magnitude / rms error magnitude) X 100%
- Maximum AC (maximum haystack amplitude change/variation)
- Carrier to Ingress
- Carrier to noise
- HUM in %
- Phase jitter in degrees
- Symbol Rate Error in ppm
- Frequency Error in ppm (deviation from nominal preset frequency)
- Peak-to-Peak Frequency Response
- Peak-to-Peak Group Delay



Impairment Table (Digital Carrier)

Go back to top Go back to TOC

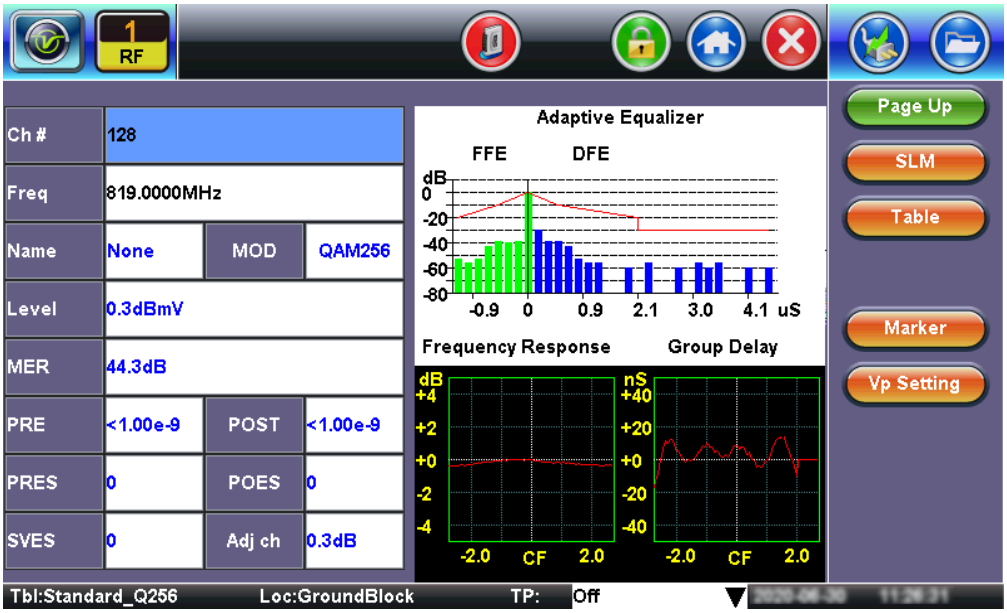
7.1.4.2 Graph Mode

The graph mode displays the **Adaptive Equalizer Stress**. The adaptive equalizer graph is a useful tool for troubleshooting linear distortion.

Adaptive Equalization

Modern Cable Modems, Set-top-boxes and Cable Modem Termination Systems (CMTS) use advanced Adaptive Equalizer technology to compensate for complex in-channel frequency response impairments caused by micro-reflections, amplitude ripple and group delay occurring in the cable network. Signals in a cable system can arrive at the receiver before or after the desired signal. Signals normally arriving afterwards are either reflections or micro-reflections.

Rather than equalizing the entire upstream or downstream RF frequency spectrum, an adaptive equalizer adjusts its characteristics based on a single digitally modulated QAM carrier only as channel conditions change. This process maximizes or greatly improves the Modulation Error Ratio (MER) in the forward or reverse path.

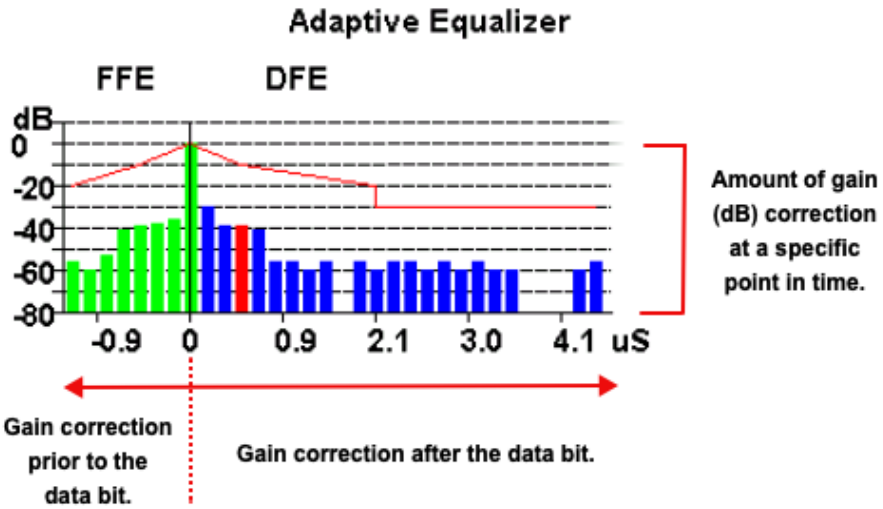


Impairment Graph (Adaptive Equalizer)

Adaptive Equalizer Measurement

The bar graph shows the performance of the Feed Forward Equalizer (FFE) and Decision Feedback Equalizer (DFE) circuitry.

- The vertical axis displays the level in decibels (dB), while the horizontal axis displays units of time typically relative to the adaptive equalizer tap spacing.
- Each bar displays a coefficient corresponding to the Feed-Forward Equalizer (FFE) and Decision Feedback Equalizer (DFE) taps.
- There are eight coefficients for the FFE and 24 coefficients for the DFE. The 8th coefficient, or the tallest vertical bar, is the incident signal (main signal path) and it is normally close to 0dB representing unity gain.
- If any bar appears above the average noise floor to the right of this incident signal, the problem is related to one or several micro-reflections.



- The adaptive equalizer is like a frequency equalizer, however instead of changing the level at a specific frequency, it changes it at a specific time.
- The specific time matches the time at which the reflection occurs - the gain is reduced only at this instant thus reducing the reflection.
- The maximum recommend correction is usually specified by the set top manufacturer and you should allow adequate margin for degradation.
- The taps on the horizontal axis are proportional to the symbol rate.

Interpreting the Adaptive Equalizer Display

Go back to top Go back to TOC

Equalized and Un-equalized MER measurements

Un-equalized MER is typically measured before the adaptive equalizer, and equalized MER is measured after the adaptive equalizer, but often this circuitry resides in the QAM receiver and cannot be disabled. So while the adaptive equalizer does a great job of improving the MER of a QAM signal, it makes troubleshooting marginal amplifiers, small ingress, CPD and related impairments a lot more difficult.

It is important to know how hard the adaptive equalizer is working to determine if there is any margin for system degradation. To solve this problem, the CX380C adaptive equalizer can be turned off, allowing a technician to easily identify, sectionalize and locate these difficult linear type distortion problems. Tap the function of “Equalizer On/Off” to enable or disable the adaptive equalizer.

Go back to top Go back to TOC

7.1.5 Timed Stats

For a Digital Channel, run a timed test, where key measurements are averaged over the designated test time. Press **Timed Stats** and input the desired test duration. Press **Start** to initiate the test.

Timed Stats

Go back to top Go back to TOC

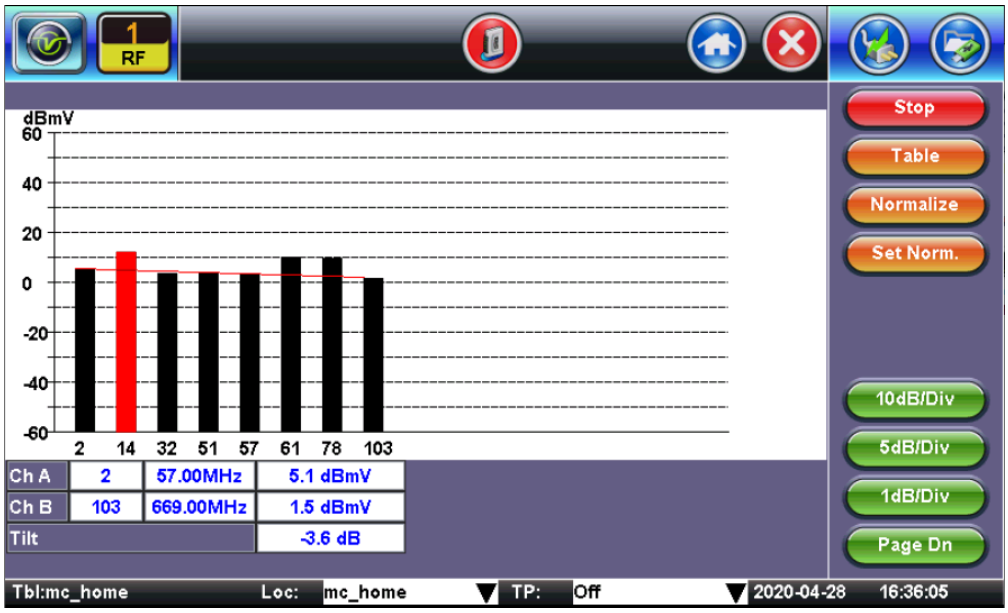
7.2 Tilt Analysis

Tilt measurement is used to check the channel levels at the lowest and highest frequencies because level across the frequency spectrum are indicative of distortion. Tilt measurement is also the most efficient tool for balancing distribution amplifiers. By tapping on the channel bars to select a channel then press the Enter key, the Tilt measurement will measure the two most recently selected channels.

Typically, the same analog and digital channels which have been recommended or defined for the Scan function should be used when performing Tilt measurements. Often, Tilt measurements are useful to identify excessive cable lengths at the customer premises that can cause high frequency roll off.

The CX380C measures up to 8 analog and 8 digital channels simultaneously. Normally, the tilt is measured from the lowest frequency channel to the highest frequency channel; however, any two channels can be selected to measure their tilt by tapping on the channel in the bar graph. The selected channel's bar graph will change to Yellow.

Press the **ENTER** key on the keypad to engage the selected channel.



Tilt

7.3 Spectrum Analysis

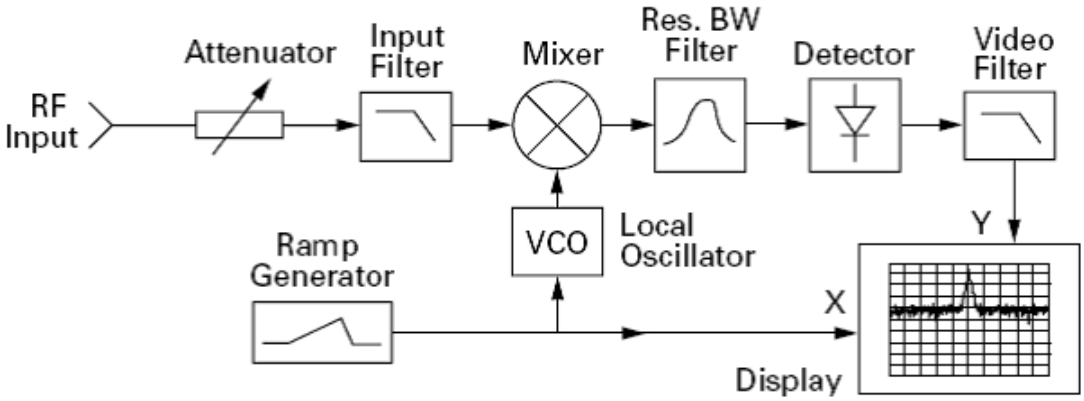
The spectrum analyzer, like an oscilloscope, is a basic tool used for observing signals. While an oscilloscope provides a window into the time domain, the spectrum analyzer provides a window into the frequency domain. Spectrum analysis provides a convenient way to measure the amplitude of digitally modulated carriers and to troubleshoot ingress in the forward and reverse paths.

The following measurements and capabilities are possible:

- **Analog Channels**
  - Direct channel tuning and positioning of visual and audio carriers
  - Visual and audio carrier level and frequency measurement
  - Survey of system visual and aural carrier levels and frequencies
  - Depth of modulation measurement
  - Audio carrier FM deviation measurement
  - Visual carrier-to-noise measurement
  - In-channel response measurement
  - Hum/low-frequency disturbance measurement
  - Intermodulation distortion measurement (CTB and CSO)

- **Digital Channels:** (applicable to QAM, QPSK, and OFDM signals)
  - Average power
  - Adjacent channel leakage (ACL)
  - CSO and CTB
  - Direct channel tuning and positioning of digital signal
  - Survey of system digital channel levels
  - System frequency response

To understand the capabilities of the spectrum analyzer and the various elementary settings, it is important to have a basic understanding of how a spectrum analyzer operates. Referring to the block diagram below:



Simplified Spectrum Analyzer Block Diagram

1. The RF input signal first travels through the attenuator and the low-pass input filter where the attenuator limits the amplitude of the signal, while the filter eliminates undesirable frequencies.
2. After the input filter, the RF signal is mixed with another signal generated by a Voltage Controlled Oscillator (VCO) to produce an intermediate frequency. The frequency of the VCO is controlled by a repeating ramp generator, whose voltage also drives the horizontal axis of the display. As the frequency of the VCO changes, the intermediate frequency sweeps through the resolution bandwidth filter (IF filter), which is fixed in frequency.
3. A detector then measures the power level of the signal passing through the IF filter, producing a DC voltage that drives the vertical portion of the display. As the VCO sweeps through its frequency range, a trace is drawn across the screen. This trace shows the spectral content of the input signal within a selected range of frequencies.

Go back to top Go back to TOC

7.3.1 Setup

The following setup parameters are available:

- **Center Frequency (MHz) and Frequency Span (MHz)**
  - The two selections are independent of each other and made on two separate settings.
    - The center frequency selection sets the frequency of the center of the scale to the chosen value - normally where the signal to be monitored would be located. In this way, the main signal is in the center of the display and the frequencies on either side can be monitored.
    - The span selection is the extent of the frequency coverage that is to be viewed or monitored on the display. Any custom values can be entered. The display may show the default values of 2.4, 4.8, 7.2, and 9.6 MHz (for values of less than 9.6MHz), however, the screen displays two vertical purple lines representing the entered span's frequency boundaries.
- **Start Frequency (MHz) and Stop Frequency (MHz)**
  The CX380C allows the entry of Start and Stop frequency in place of the CF and Span. The entry mode can be changed by tapping on the CF or START icon. The entry range is from 5MHz to 1000MHz.
- **Zero Span**
  - Zero Span mode is typically used for measuring the level variation of an analog channel. There are two ways to enter the Zero Span mode:
    - Select CF of an analog channel and enter 0Hz for the frequency span, or
    - Select Start and Stop frequencies to be the same as the CF of an analog channel.
  - The display can be set for Linear or Log mode.
- **Vertical scale (dB)**
  - Sets the logarithmic scale to 1, 2, 5, 7, or 10dB per division.
- **Resolution Bandwidth (kHz, MHz)**
  - Selectable filter sizes (100 kHz, 300 kHz, 1000 kHz, 3000 kHz)
  - Resolution bandwidth is the bandwidth of the IF filter, which determines the selectivity of the spectrum analyzer. A wide resolution bandwidth is required for wide sweeps, while a narrow filter is used for narrow sweeps.
  - The narrower the RBW setting, the better the frequency resolution; however, narrower filter settings require more measurement time
  - Wider filters are used when the display needs to be updated rapidly, or when wide modulation bandwidths are to be displayed.
- **Reference Level (dB)**
  - To ensure that the input stages of the analyzer are not overloaded, an RF attenuator is used. If input stages are overloaded, spurious signals may be generated within the instrument, resulting in possible false readings. However, if too much attenuation is inserted, additional gain is required in the later stages (IF gain) and the background noise level is increased, which can sometimes mask lower level signals. Thus, a careful choice of the relevant gain levels within the spectrum analyzer is needed to obtain optimum performance. Select the appropriate Reference Level from 0 dB to 70 dB, in 10 dB increments.
- **Signal**
  Select the appropriate Signal type for your test:
  - **Burst**: Best for burst signals such as Return Path UCD / OFDMA or detecting intermittent interference.
  - **Digital**: Best for QAM and OFDM power measurements.
  - **Analog**: Best for Analog Channel measurements.

The **Dwell/Average** setting selections are dependent on the **Signal Type.**.

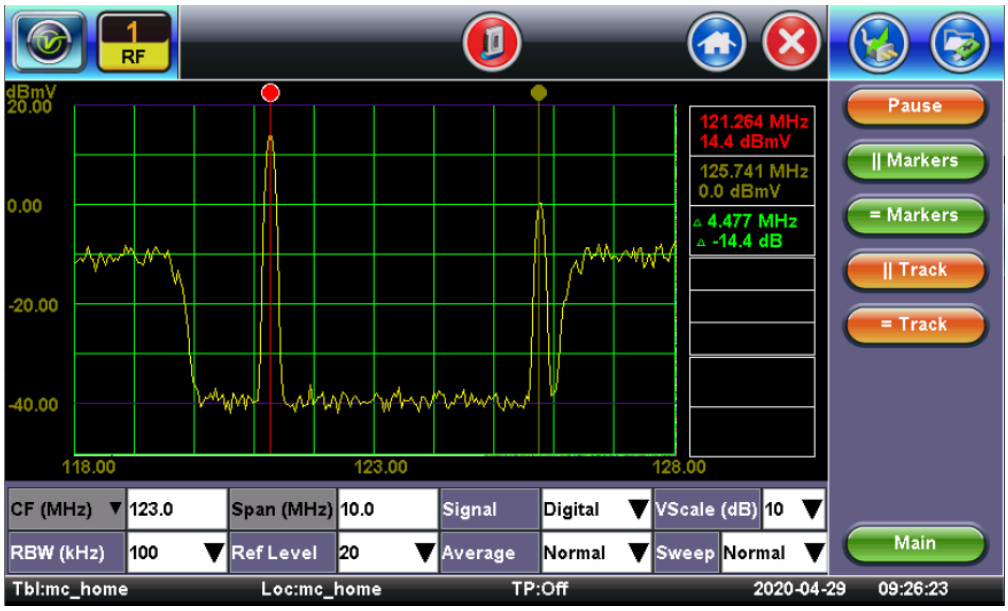
- **Resolution**
  - **Low**: uses 120 data points
  - **Medium**: uses 240 data points (recommended)
  - **High**: uses 480 data points
- **Marker**
  - There are 4 markers available -- two verticals and two horizontal. They can be activated by tapping the MARKER function key.
  - Signal levels, frequencies and deltas are displayed with color coding.
  - To move a marker, tap on the Circle associated to each marker. For fine tuning of the marker, use Up, Down, Left, and Right arrow keys.
  - Vertical and horizontal markers can be paired and be moved together.
- **Search**
  - The Peak or Min or both in the measured span can be searched automatically. The search is updated per sweep.

Peak-Left and Peak-Right functions functions for Peak Search allow configurable peak level thresholds. A blue horizontal line appears on the screen when Peak Left (Pk-Pk Left) or Peak Right (Pk-Pk Right) is pressed, indicating the peak level threshold. This can be moved to the desired threshold by tapping on the dot at the end of the line and moving it.

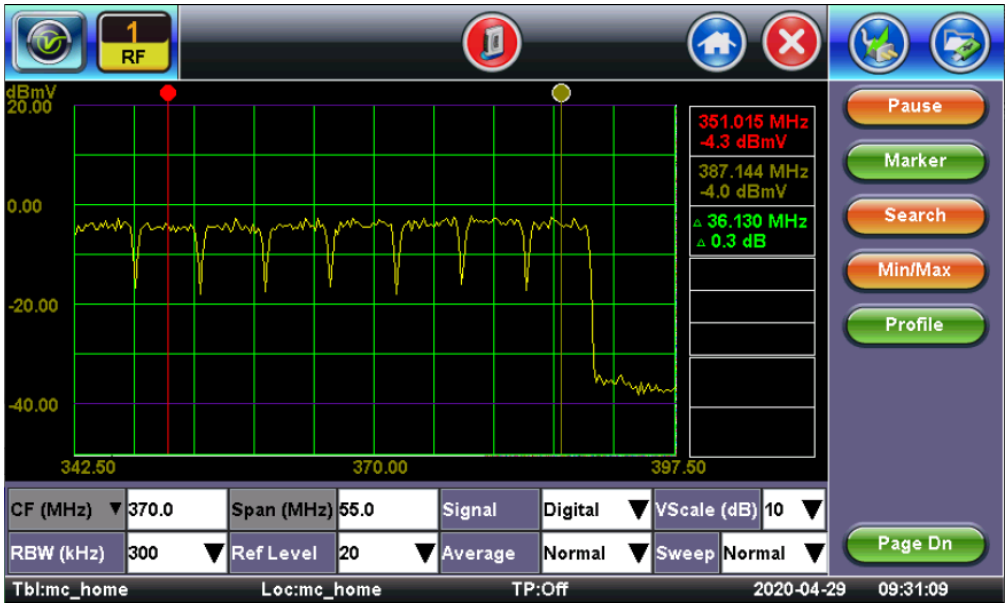
- **Min/Max Hol**
  - Minimum, Maximum or both per sweep are detected and held at their location in the spectrum analysis mode.
  - The Min is shown in BLUE color and Max is in RED.
  - By tapping the UPDATE function key, the current spectrum, in YELLOW color can be shown together with the Min/Max or removed.
- **Persistence**
  - Ideal for measuring Return Path transient noise. Applies heat map color coding to represent how often a signal appears.
    - Dark Blue color means the signal has been briefly detected. This color means the least persistence.
    - Light Blue color represents more signal persistence.
    - Green to Red colors represent highest signal persistence.
- **Profile**
  - For repeated use of the same spectrum analysis settings, tap the PROFILE function key and save the current settings in a profile or recall a pre-stored setting for a list up to 20 profiles by name.

	**Dynamic Range** CX380C has a dynamic range of 60dB with a display range of 70dB. If the received signal level is higher than the peak of the dynamic range, the RF receiver will be overdriven and results in unexpected spurious spikes on the spectrum display. It is recommended that should the peak of the signal is less than 5dB from the top of the display, increase of the attenuation becomes necessary until the peak of the signal is about 10dB below the top of the spectrum display. The full 60dB dynamic range upper and lower limits are shown as purple lines horizontally on screen.

Spectrum analysis is not overly complicated, but it is very easy to make mistakes. The following overview provides simple guidelines to accurately measure the amplitude of analog and digitally modulated carriers.



Spectrum Analysis - Analog Signal



Spectrum Analysis - Digital Signal

Go back to top Go back to TOC

7.3.2 Amplitude Measurements

Analog and digital carriers are very different in terms of the signal content and distribution of power over the channel and therefore need to be measured differently. Signal level meters that are designed to measure only analog carriers will not always measure digital carriers accurately.

Power is measured either as an absolute level or relative to another power level. Carrier levels are absolute measurements and are measured in power units, such as dBmV or dBuV. Relative power measurements are C/N, delta audio to video, CTB and CSO, and are always measured in dB.

- **Analog TV channel amplitude measurement**
  The DOCSIS RF Specification recommends that the average power of a downstream digitally modulated carrier be set 6dB to 10dB below what the amplitude of an analog TV channel on the same frequency would be. Before measuring or setting the amplitude of a digitally modulated carrier, first measure the amplitude of the cable network's analog TV channels.

- **Digital Carrier amplitude measurement**
  - On a digital carrier, the power is spread out more evenly over time and frequency compared to an analog carrier. To obtain an accurate representation of the power, measure the total power across the frequency band, not just at one narrow frequency the way an analog SLM measures level.
  - The 6/8MHz downstream QAM carrier is often referred to as the haystack because it resembles a pile of hay. The haystack is a continuous MPEG bit stream. The idea is not to just measure the amplitude of the QAM signal, but to measure the total power contained within the 6 or 8MHz carrier. This is similar to needing to measure the area within the signal (haystack) instead of its height only.
  - Using this example, the power has to be measured within one channel or within a specific frequency range. Use caution when viewing digital modulated signals because the signal level is dependent on the selected measurement bandwidth (resolution bandwidth).
  - Spectrum Analyzers typically do not have an IF or resolution bandwidth wide enough to measure a whole digital signal at once. To overcome this problem, the CX380C makes multiple measurements across the frequency range of the carrier. The powers of each of these measurements are summed up and the average power of the whole channel is calculated.

Amplitude Measurements

Analog TV channel visual carrier amplitude and digitally modulated carrier average power are commonly measured in decibel millivolt (dBmV), a unit of power expressed in terms of voltage.
Mathematically, dBmV = 20log (signal amplitude in millivolts/1 millivolt).

Go back to top Go back to TOC

7.3.3 Ingress Measurements

Ingress noise is a term assigned by cable operators to describe any interference that is coupled into the forward or return path cable plant via an external source, and can be broadly categorized as follows:

- **Narrow band ingress:** The predominant coupling mechanism for ingress noise is a poorly shielded drop coaxial cable that acts more like an antenna than a drop cable. AM modulated carriers, amateur band and maritime radio transmission generate unwanted signal frequencies at varying amplitudes according to the propagation conditions.
- **Location specific ingress:** Electronic equipment in the subscriber premises can pass strong signal carriers back into the cable system, and these can interfere with reverse signals, such as cable modems.

Go back to top Go back to TOC

Return Path Outages

Return Path Noise and Ingress can be a result of:

- Stationary impairments
  - Thermal noise
  - Intermodulation Distortion (IMD)
  - Frequency response problems
- Transient impairments
  - RF Ingress
  - Impulse noise
  - Signal clipping
- Multiplicative impairments
  - Transient hum modulation
  - Intermittent connections

Go back to top Go back to TOC

Troubleshooting Techniques

1. The "divide and conquer" method normally works best. Establish the most distant point from the headend at which the signal is known to be good quality. Start midway between this point and the affected subscribers to locate the problem amplifier
2. Systematically check the signal level at the return path receiver test points in the headend or hub until the problem node is found

Go back to top Go back to TOC

Ingress Measurement Notes:
The spectrum analyzer's ability to measure low-level signals is limited by the noise generated inside the spectrum analyzer. The sensitivity required to measure low-level signals is determined by the measurement setup. The spectrum analyzer **Input Attenuator** and **Resolution Bandwidth** settings are the key factors that determine how small of a signal the spectrum analyzer can measure.

Input attenuator - When enabled, reduces the level of the signal at the input of the mixer to avoid compression, which can produce unwanted frequency products. An amplifier at the mixer's output will re-amplify the attenuated signal to keep the signal peak at the same point on the analyzer's display. However, in addition to amplifying the attenuated input signal, the noise present in the signal and analyzer is amplified as well. This has the undesired effect of raising the displayed noise level of the analyzer.

Resolution bandwidth - Affects how closely a small signal can be seen in the presence of a large one. By increasing the width of this filter, more noise energy is allowed to hit the envelope detector of the analyzer. This also has the effect of raising the displayed noise level of the analyzer.

Maximum sensitivity - For maximum sensitivity, both the input attenuator and resolution bandwidth settings must be minimized. If, after adjusting the attenuation and resolution bandwidth, an ingress signal is still near the noise, stability of the displayed trace can be improved by video filtering the display using the Video Bandwidth (VBW).

Common Path Distortion (CPD)
Produced by poor contacts in the cable distribution network, these contacts create a diode or rectifier effect which produces potentially harmful 2nd and 3rd order Intermodulation Distortion (IMD) products or beats. These beats will occur every 6, 7 or 8MHz in the reverse path, depending on the channel plan used. Although the magnitude of these beats is small, they increase at a node when several reverse paths are combined.

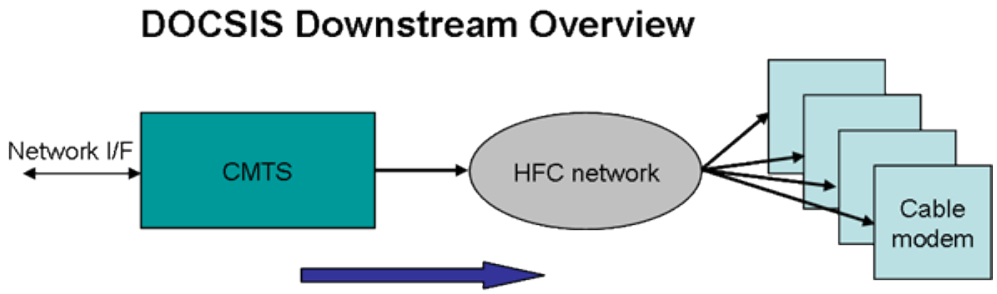
7.4 Cable Modem

Historically, CATV was a unidirectional medium designed to carry broadcast analog video channels to the maximum number of customers at the lowest possible cost. The DOCSIS interface specification basically enables the deployment of data-over-cable systems on a non-proprietary, multi-vendor, interoperable basis for transparent bidirectional transfer of Internet Protocol (IP) traffic between the cable system head end and customer locations over an all-coaxial or Hybrid-Fiber/Coax (HFC) cable network.

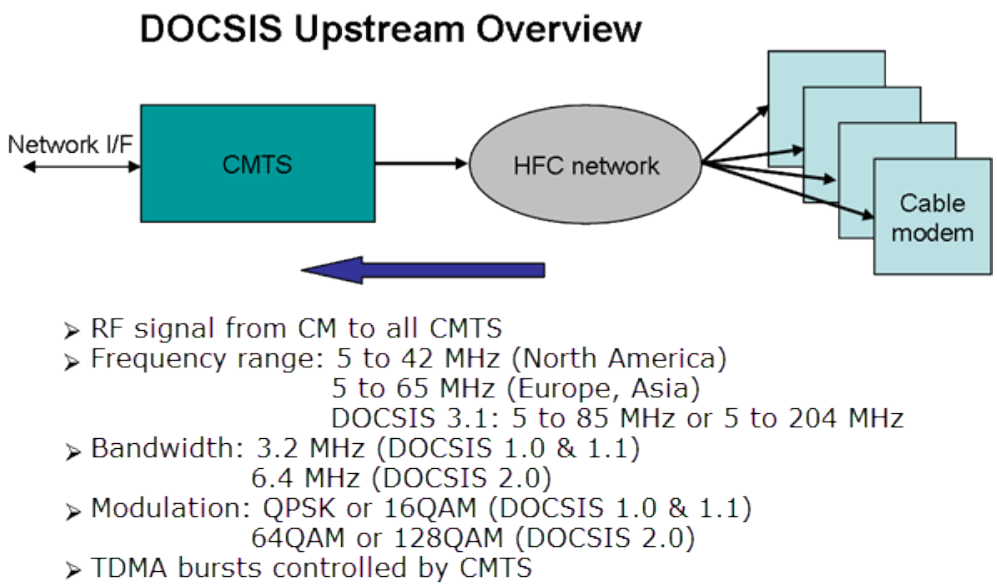
In its simplest form, the system consists of a Cable Modem Termination System (CMTS) located at the headend, a coaxial or HFC medium, and a Cable Modem (CM) located at the customer premises. In addition, DOCSIS defines physical, signalling and protocol layers to support interoperability and evolutionary feature capabilities to permit future value-added services.

The DOCSIS layers are briefly outlined as follows:

- IP network layer
- Data link layer comprising:
    - Logical Link Control (LLC) sublayer conforming to Ethernet standards
    - Link security sublayer for basic privacy, authorization, and authentication
    - Media Access Control (MAC) sublayer for operation supporting variable-length Protocol Data Units (PDU)
- Physical (PHY) layer comprising:
    - Downstream convergence layer conforming to MPEG-2 (Recommendation H.222.0)
    - Physical Media Dependent (PMD) sublayer for:
        - Downstream based on ITU-T Rec J.83 Annex B with either 64 or 256 Quadrature Amplitude Modulation (QAM), concatenation of Reed-Solomon and Trellis Forward Error Correction (FEC), in addition to variable-depth interleaving
        - Upstream employing Quadrature Phase Shift Keying (QPSK), 16, 64 or 128QAM, support for multiple symbol rates, cable modem controlled and programmable from the CMTS, frequency agility, fixed-frame and variable-length PDU formats, Time-Division Multiple Access (TDMA), programmable Reed-Solomon FEC and preambles, and capability to support future physical layer technologies.



- RF signal from CMTS to all Cable Modems (CM)
- Frequency range: 88 to 860 MHz (North America)
  108 to 862 MHz (Europe, Asia)
  DOCSIS 3.1: 108 to 1218 MHz
- Bandwidth: 6 MHz (North America)
  8 MHz (Europe, Asia)
- Modulation: 64QAM or 256QAM

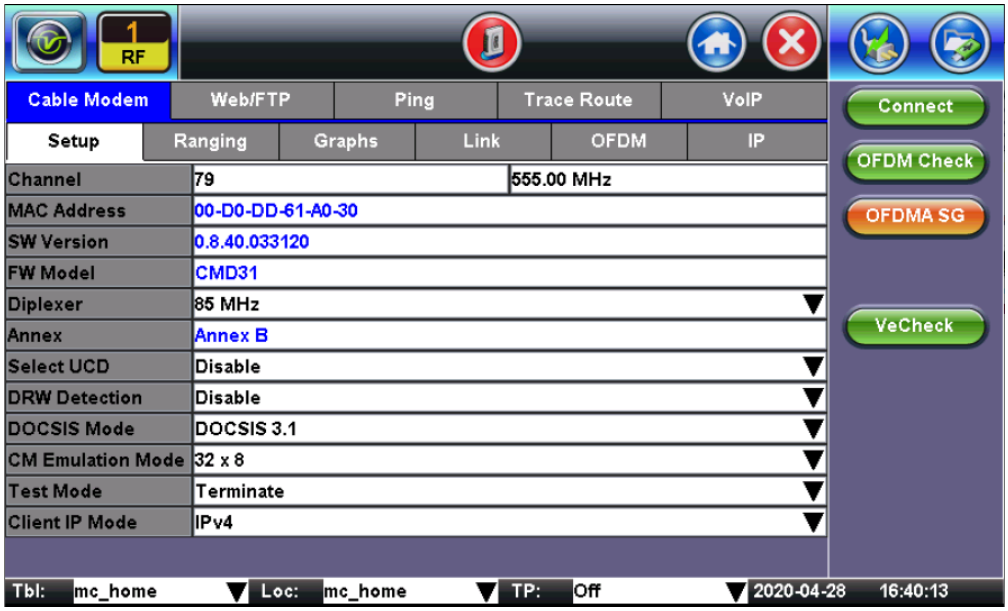


Go back to top Go back to TOC

7.4.1 Setup

The CX380C offers a built-in DOCSIS 3.1 cable modem as an option. The built-in cable modem is able to range, register and connect with the headend CMTS to obtain the necessary parameters and a valid IP address on the network.

Launch the **Cable Modem** application to access the **Setup** screen.



Cable Modem Setup

Channel: Enter the system's primary DOCSIS channel

DOCSIS Mode:

- **DOCSIS 3.0:** for DOCSIS 3.0 systems, with up to 32x8 Channel Bonding support.
- **DOCSIS 3.1**: for DOCSIS 3.1 / OFDM systems
  Note: *Legacy DOCSIS 2.0/1.x systems are not supported.*

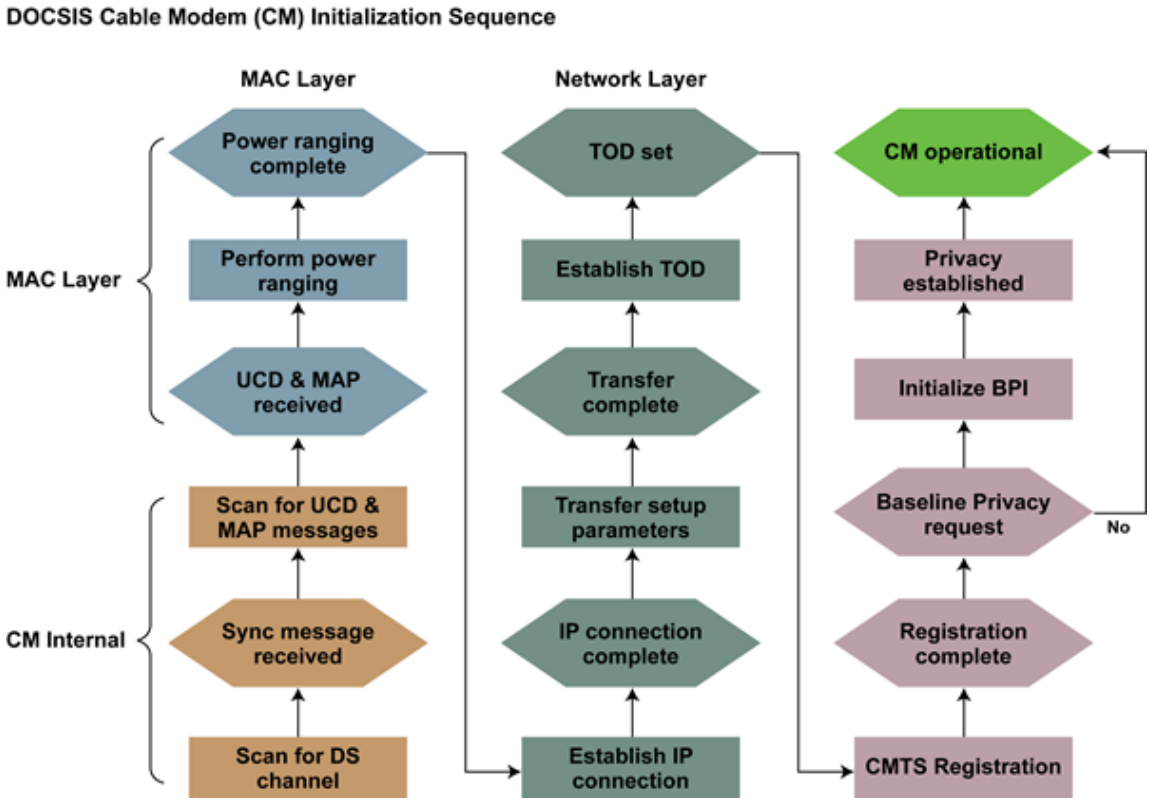
Test Mode:

- **Terminate:** terminate mode

- **Pass Through:** emulating a stand-alone Cable Modem. Once the Cable Modem goes online, connect a PC to the 10/100/1000 Ethernet test port at the top of the unit. The meter will automatically assign a Client IP address to the PC. Then with the PC, access the internet. This mode helps sectionalize and troubleshoot issues in the customer premises (e.g. replace the actual cable modem).
- **Always On:** terminate mode and also enables the Cable Modem to remain online when exiting from the Cable Modem. This allows online connectivity while using other features, such as Remote View and V300 R-Server access.

Once these settings are completed, press **Connect**. The test set will go directly to the Results page. Each step of the connection process is listed. As a step is performed, an *"in progress"* indicator displays the current status.

After a step is completed, a **Pass** or **Fail** status is provided. If any one of the steps fails during the connection process, the cable modem will stop and declare a failed connection. At this point, reset the test and try again, or go back to setup and verify the settings.



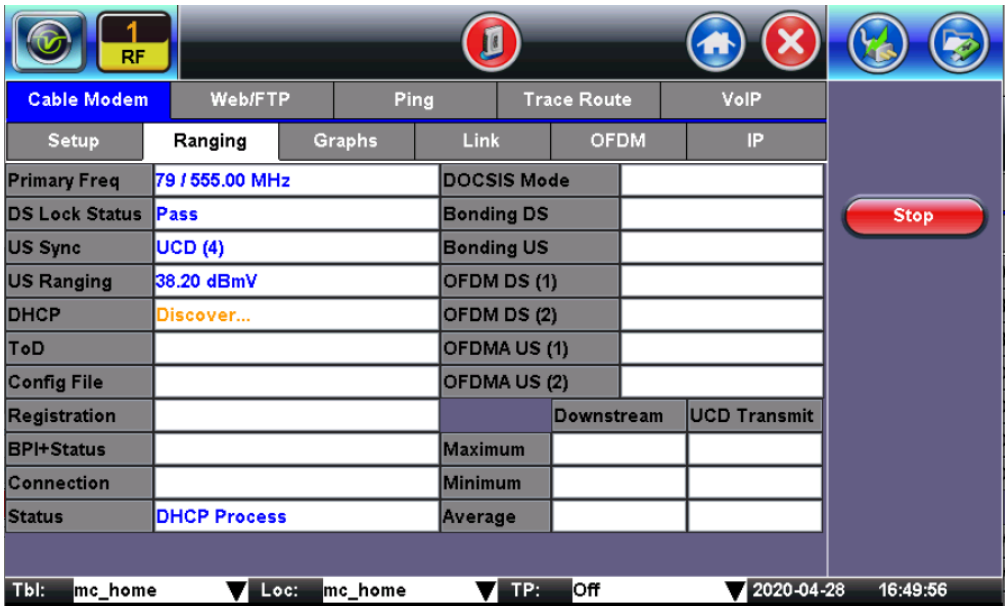
DOCSIS Cable Modem (CM) Initialization Sequence

Cable Modem (CM) Connection Procedure and Training Sequence

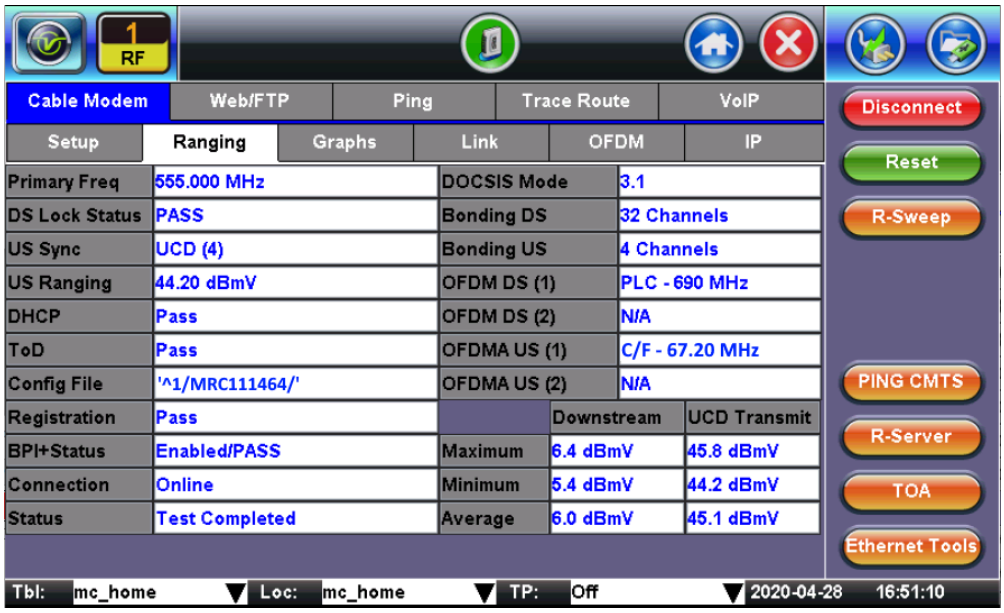
1. CM scans the Downstream (DS) spectrum for a valid DOCSIS signal (either 64QAM or 256QAM). This can be a time consuming step if the CM is not on a channel.
2. CM demodulates the DOCSIS signal and looks for a SYNC message.
3. CMTS periodically broadcasts Upstream (US) Channel Descriptors (UCD) over the DS channel, from which a CM learns its assigned upstream operational frequency.
   The CM in turn scans for these UCD messages, which instructs the CM how to configure a burst profile (frequency, modulation, and burst parameters).
   The CM has now established both a US and a DS frequency.
4. CMTS periodically transmits US bandwidth allocation maps (MAP) in shared time slots in the DS direction. The CM looks for these MAP messages, which list the granted and contended Time Slots (TSs) for US communication.
5. CMTS assigns a temporary Service Identifier (SID) to the CM, which initiates a coarse power ranging and time synchronization process.
   The first Upstream burst that the CM sends is the initial maintenance - the CMTS responds with the Range-Response (RGN-RSP) message for frequency, power, and timing settings.
6. CMTS periodically sends keep-alive messages to verify link continuity between itself and all CM units in the same domain. When a CM receives its first keep-alive message, it reverts to a fine power ranging.
7. CM now forwards a bandwidth request to the CMTS, which in turn forwards a grant to the CM, permitting it to forward upstream information in allocated time slots.
8. CM now makes a DHCP discovery followed by a DHCP request. The CMTS forwards a DHCP acknowledgment from the

DHCP server containing an IP address, a default gateway, the addresses of a TFTP and TOD server, and a TFTP configuration file name.

9. CM now initiates the TOD and TFTP process. From the TFTP server, the CM receives a configuration file containing QoS, security, applicable frequency assignments and any new software images.
10. CM forwards TFTP configuration file to the CMTS and initiates a registration request. If the configuration file is valid, the CMTS assigns the CM a permanent SID and registers the CM to online status.
11. Following registration, the CM optionally initiates the activation of the 56-bit DES encryption algorithm to provide security between the CMTS and itself over the cable plant.
12. CM is now operational and online.



Cable Modem Connection Process 1



Cable Modem, Ranging Tab, Online Status

Go back to top Go back to TOC

Server Connections

DOCSIS specifies that for a system to become functional and operational, the CMTS and CM must interface with the following mandatory servers:

Dynamic Host Configuration Protocol (DHCP) server - Defined by RFC2181, it provides the IP addresses for both the CM and subsequent PC devices that follow.

- **Time of Day (TOD) server** - Defined by RFC868 for the purpose of time stamping operational system events.
- **Trivial File Transfer Protocol (TFTP) server** - Defined by RFC1350 for the purpose of registering and downloading CM configuration files for individual customer service. These configurations could include Quality of Service (QoS) parameters, Baseline Privacy Implementation (BPI), operating frequency assignments, the number of host devices, etc.

Go back to top Go back to TOC

7.4.2 Cable Modem Results - DOCSIS 3.0

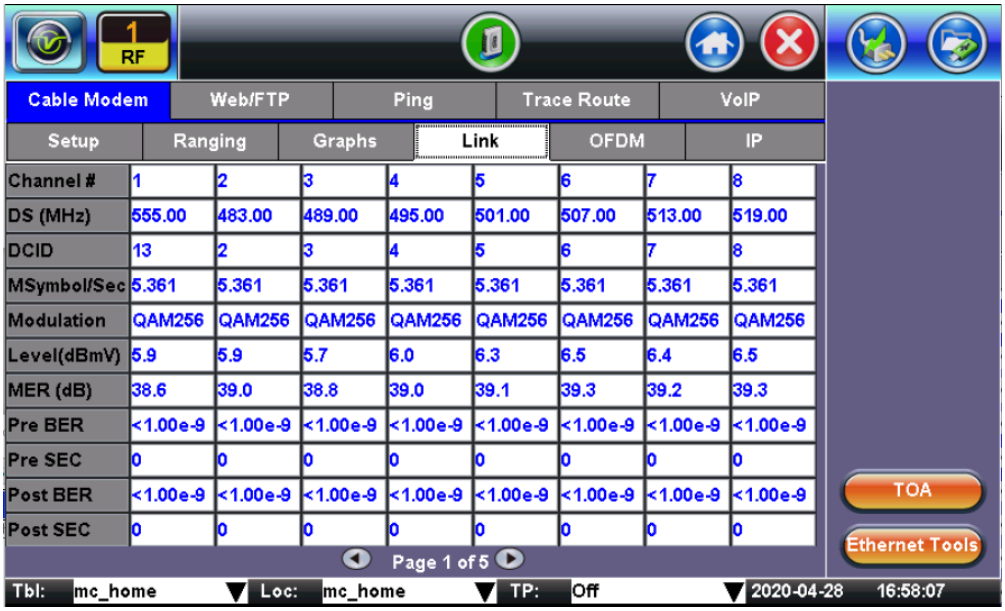
Ranging tab:
Provides information about ranging results, including channel bonding status, downstream power levels and UCD Transmit levels.

IP tab:
Once online, access the IP results. This screen provides all the information related to the various IP addresses acquired or used during the connection process.

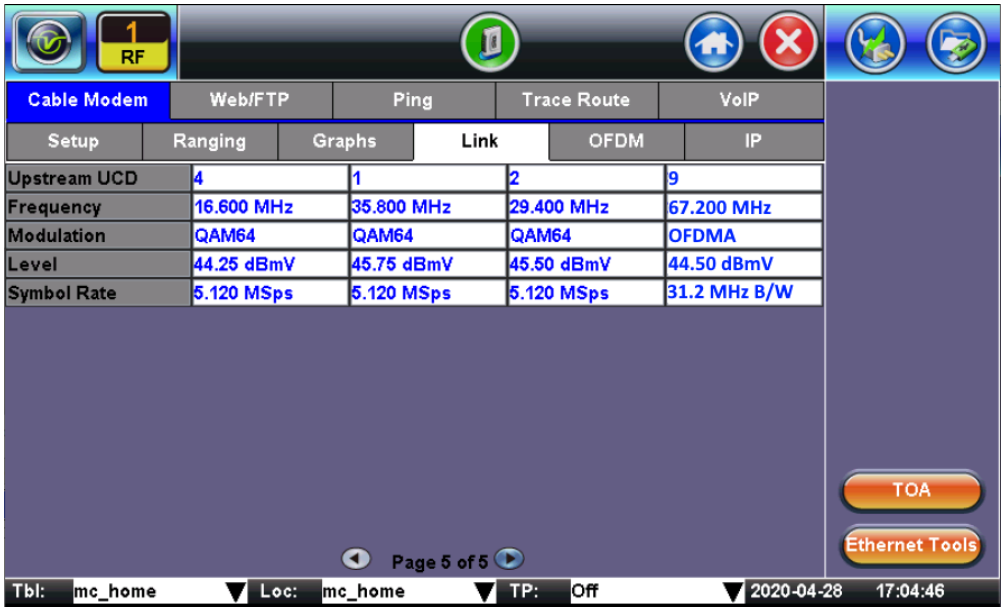
Cable Modem - IP Results

Go back to top Go back to TOC

Link tab:
Provides information about the packets received, the downstream signal (frequency, modulation, level, MER) and about the upstream signal (frequency, level, modulation).



Cable Modem - Link Results (Downstream)

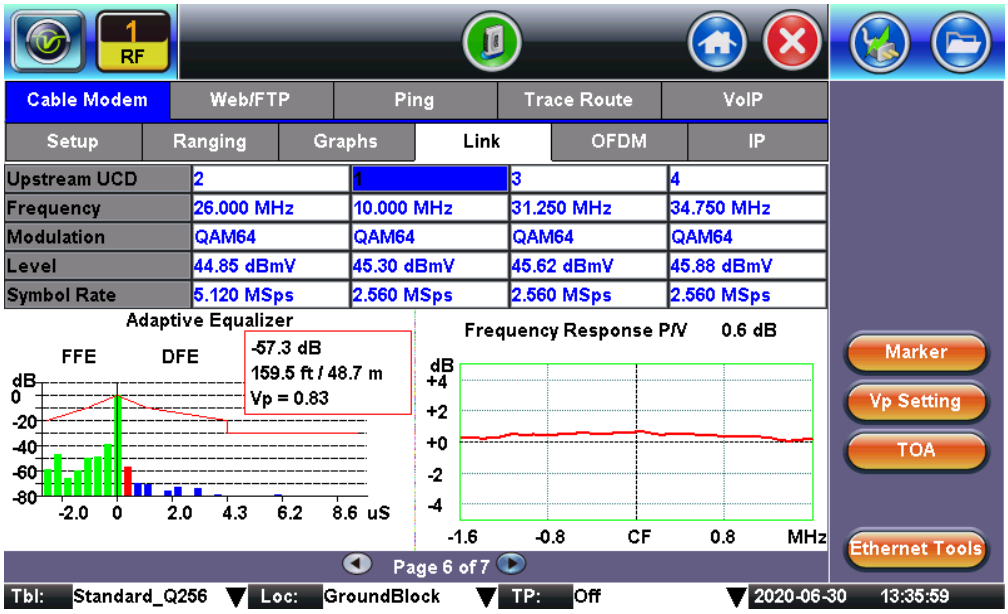


Cable Modem - Link Results (Upstream)

Go back to top Go back to TOC

The Upstream channels provide Upstream Pre-Equalization information, which can be obtained by tapping on an Upstream UCD number.

Press the **Marker** button to highlight a specific pre-equalizer coefficient, for advanced troubleshooting information.



Cable Modem - Upstream Pre-Equalization Information

Go back to top Go back to TOC

Ping / Trace Route / VoIP / Web/ FTP tab:
The IP functions are similar to the ones described in IP Tools. ARPWiz is not supported on the Cable Modem interface.

VeTest:
VeTest is a throughput test to an actual customer speed test server site.

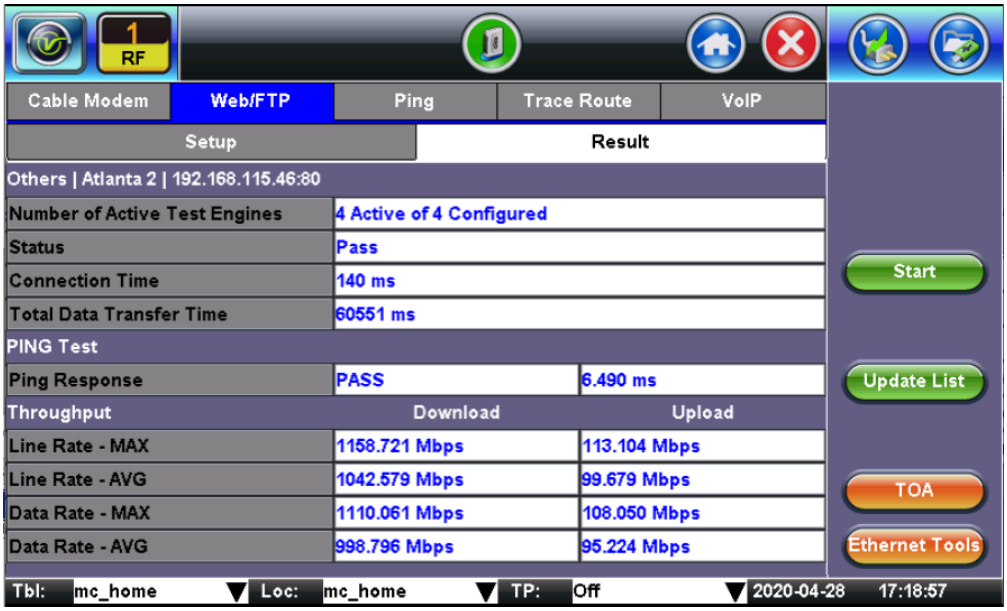
To run a VeTest:

1. In the **Web/FTP** tab, select VeTest from the **Mode** drop-down list.
2. Make appropriate selections for **Provider** and **VeTest Server**. If the selections cannot be found, press **Update List** to check for the latest VeTest Server List site.

   *The **Update List** feature requires the Cable Modem to be online.*

3. Press **Start** to begin the test.

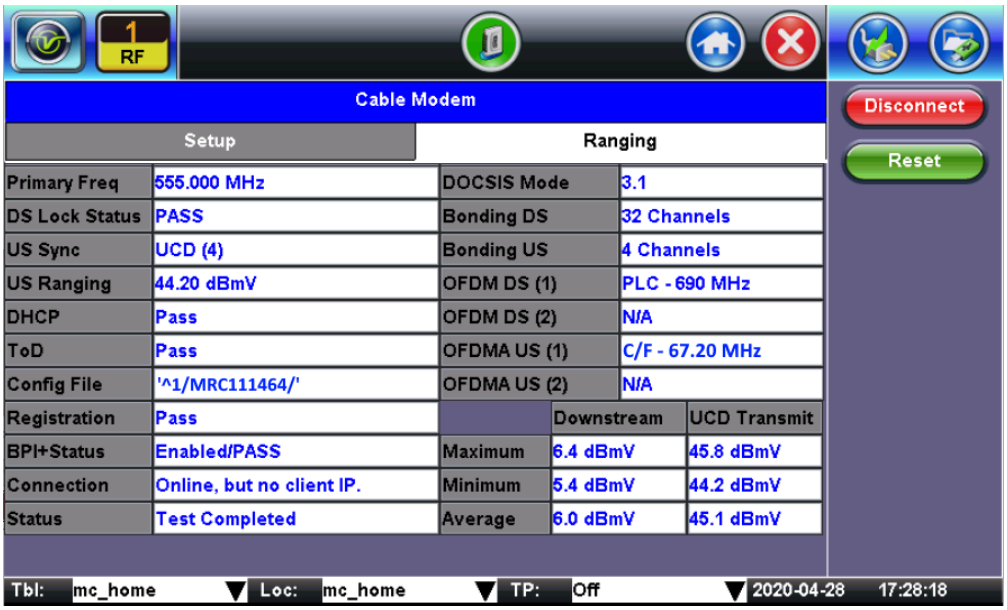
Cable Modem - VeTest Setup



Cable Modem - VeTest Results

Go back to top Go back to TOC

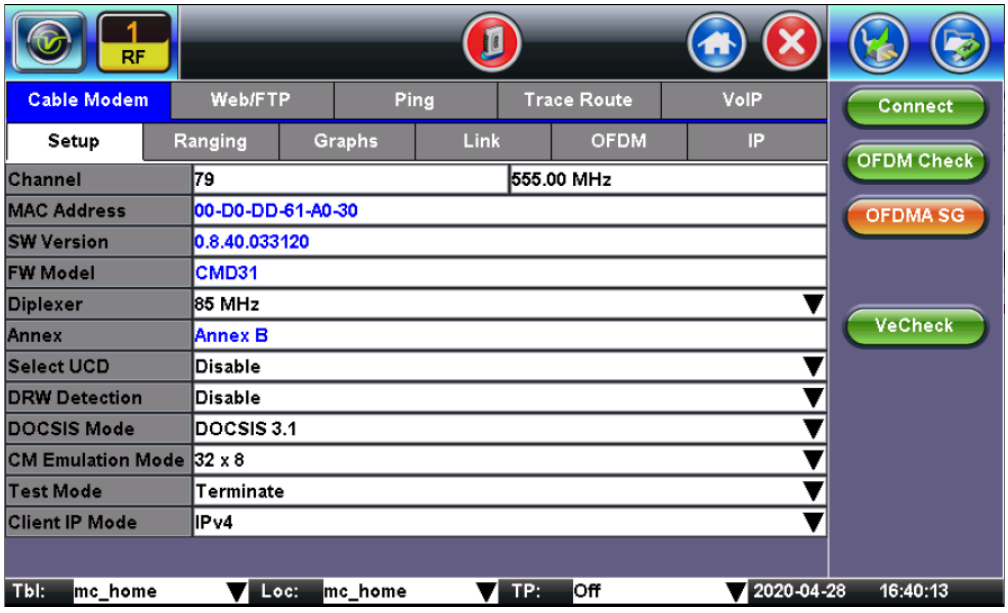
Pass Through tab:
Provides the ability to emulate a real cable modem. In the **Setup** screen, select P**ass Through f**or the T**est Mode** and press **Connect**. Once the Cable Modem goes online, connect a PC to the meter's 10/100/1000T RJ45 port at the top of the unit. Traffic will pass through the meter, which functions like an actual cable modem.



Cable Modem - Pass Through

Go back to top Go back to TOC

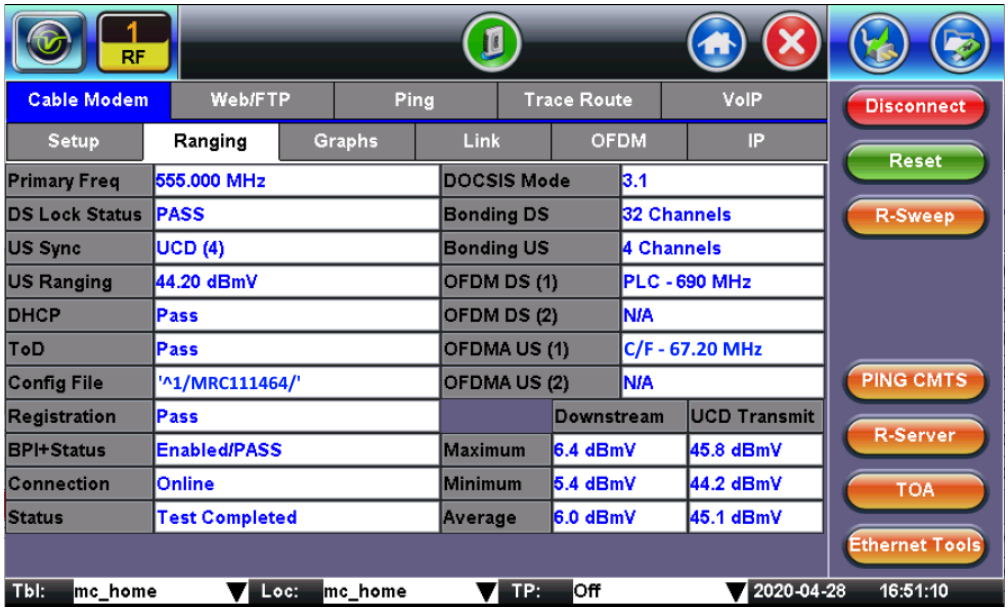
7.4.3 Cable Modem Results - DOCSIS 3.1/OFDM



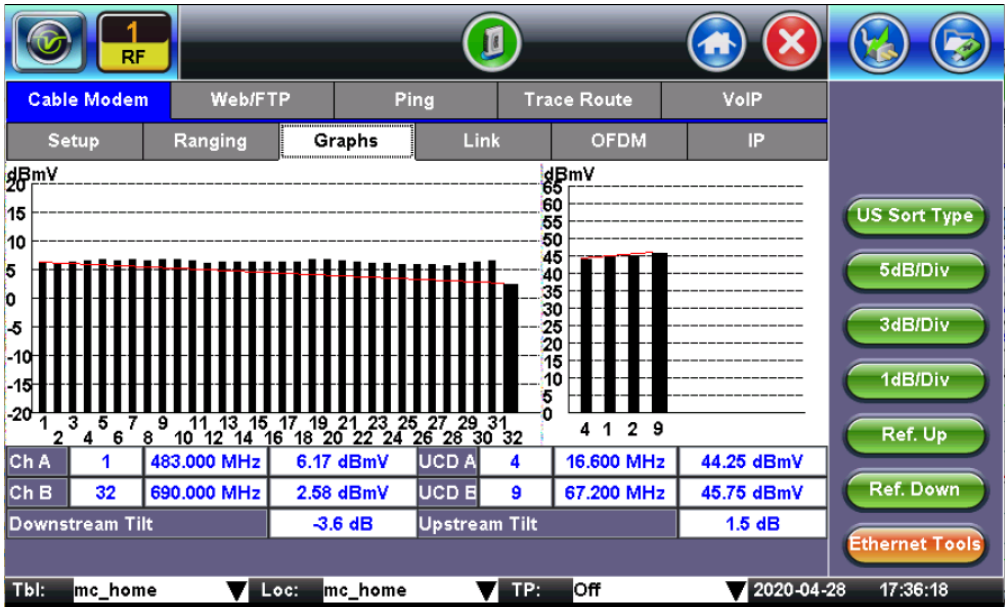
Setup for DOCSIS 3.1/OFDM Systems

For testing with DOCSIS 3.1 systems, follow these steps.

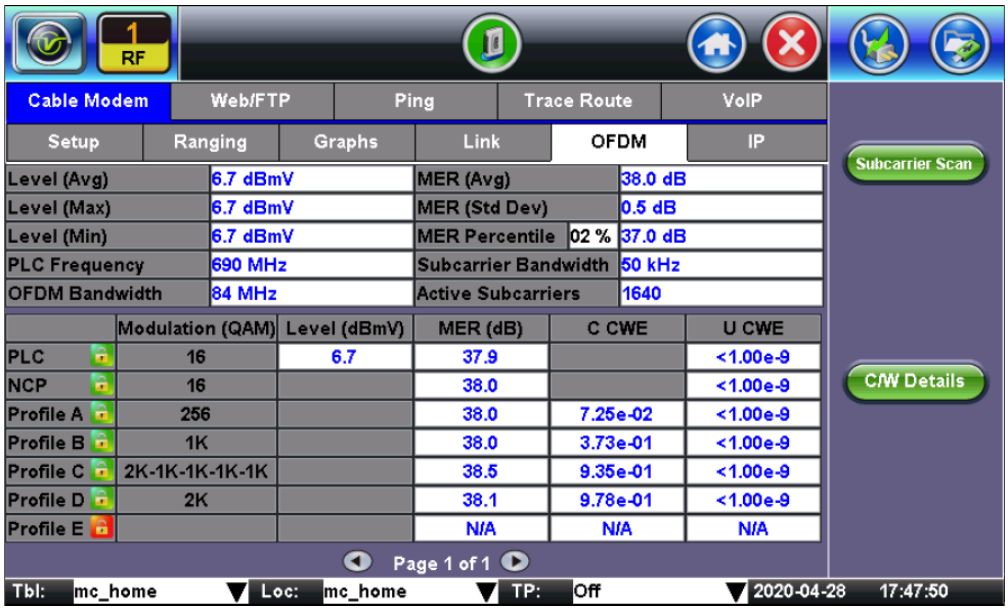
1. For a system that contains both Single Carrier QAM (SC-QAM) and OFDM channels, enter the primary SC-QAM DOCSIS Channel number and press **Connect** to go online.



Ranging tab, Online Status in D3.1 Mode



Graphs tab, Online Status in D3.1 Mode

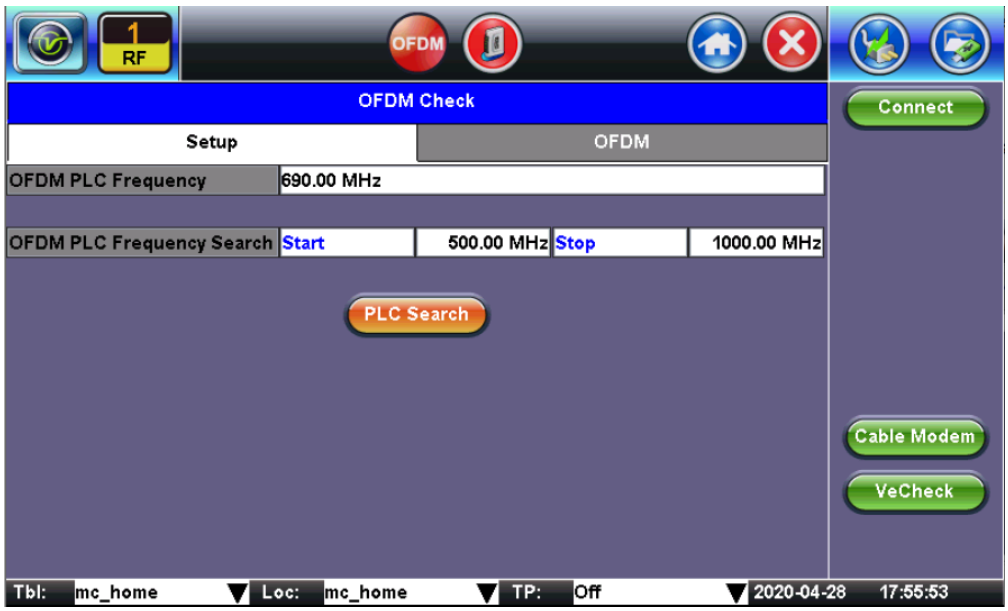


D3.1 OFDM Tab Results

OFDM Tab measurements:

- **Level**: Reports Average, Maximum, and Minimum for the OFDM PLC.
- **Frequency**: Primary OFDM PLC Frequency
- **Bandwidth**: OFDM Channel Bandwidth
- **MER (Avg)**: Average MER for the Active OFDM Subcarriers
- **MER (Std Dev)**: Standard Deviation for the Active OFDM Subcarriers
- **MER Percentile (2)**: MER value for the worst 2% of all OFDM Subcarriers
- **Subcarrier Bandwidth**: Bandwidth setting used for each OFDM Subcarrier
- **Active Subcarriers**: Number of active Subcarriers in the OFDM channel.
- **PLC**: Phy Link Channel
- **NCP**: Next Codeword Pointer
- **Modulation Profiles A, B, C, D, E**
- **C CWE**: Corrected Codeword Errors
- **U CWE**: Uncorrectable Codeword Errors

2. For a system that contains only OFDM channels, in the **Setup** tab, press **OFDM Check**. Enter the center frequency of the OFDM Phy Link Channel (PLC). Press **Connect**.



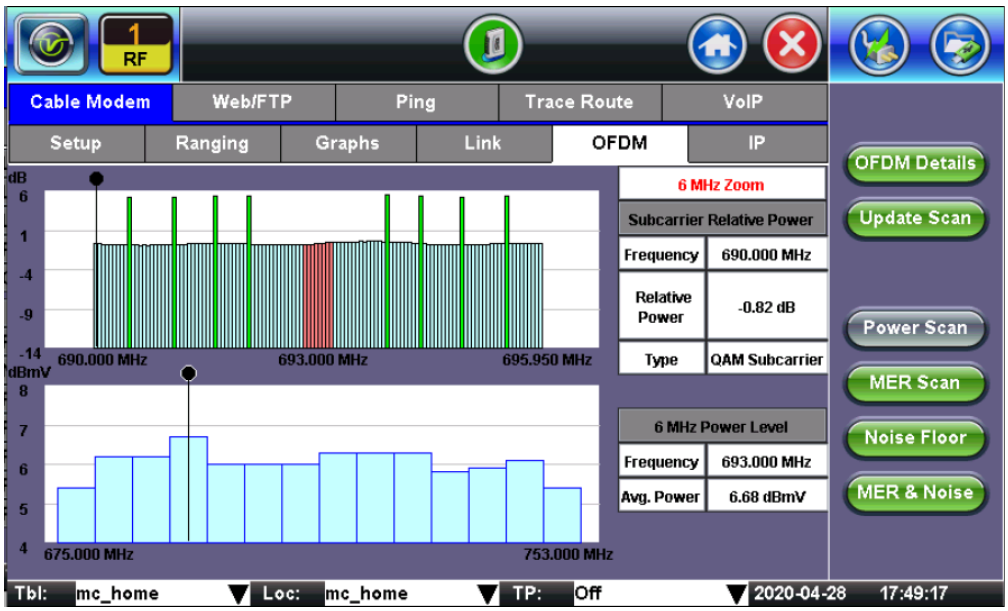
D3.1 OFDM Check Mode

Go back to top Go back to TOC

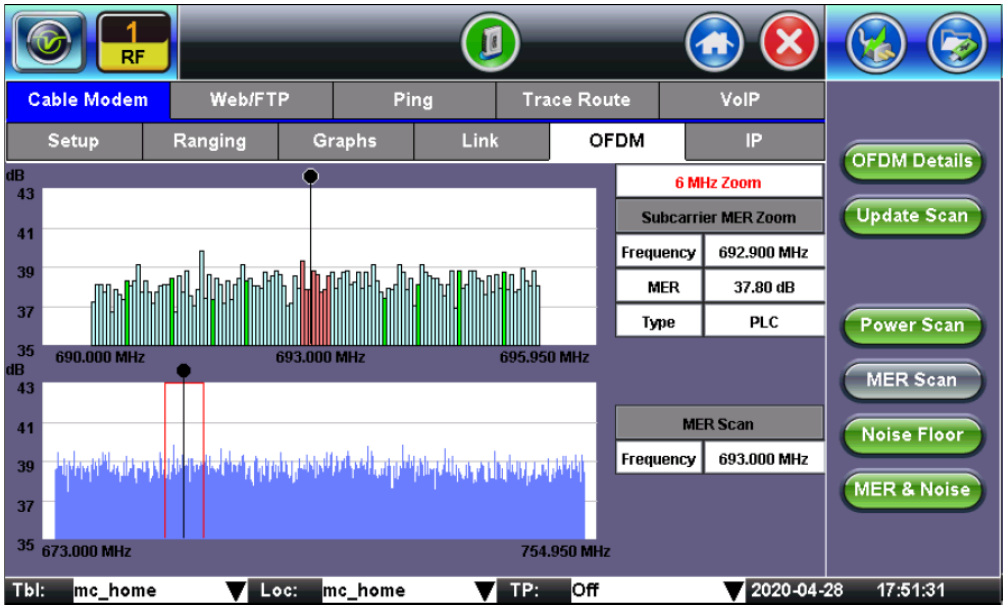
7.4.4 OFDM/Subcarriers

To scan subcarriers, press **Subcarrier Scan** from the **OFDM** tab.

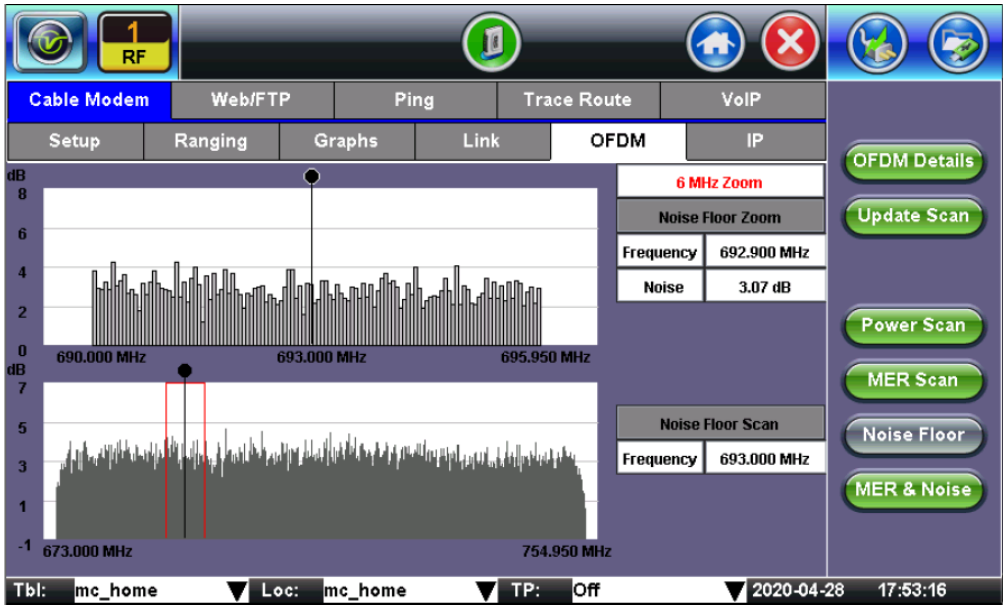
- **OFDM Details:** Returns to the OFDM tab.
- **Update Scan:** Reruns the scan for updated measurements.
- **Power Scan:** Runs power signal level scan.
- **MER Scan:** Runs MER measurement.
- **Noise Floor:** Measures noise.
- **MER & Noise:** Runs MER scan and displays noise.



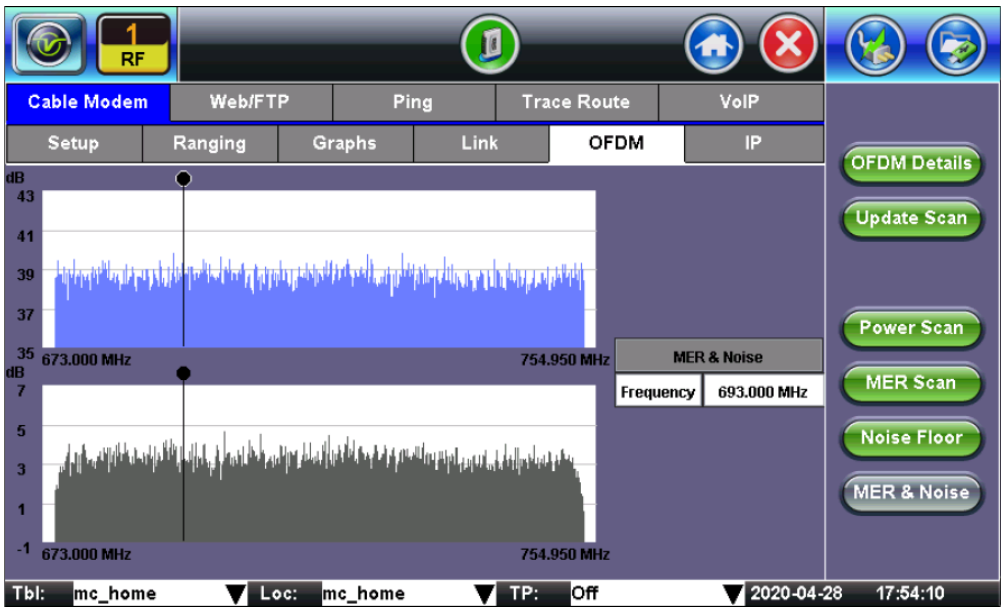
OFDM Subcarrier Power Scan



OFDM Subcarrier Scan - MER



OFDM Subcarrier Scan - Noise Floor

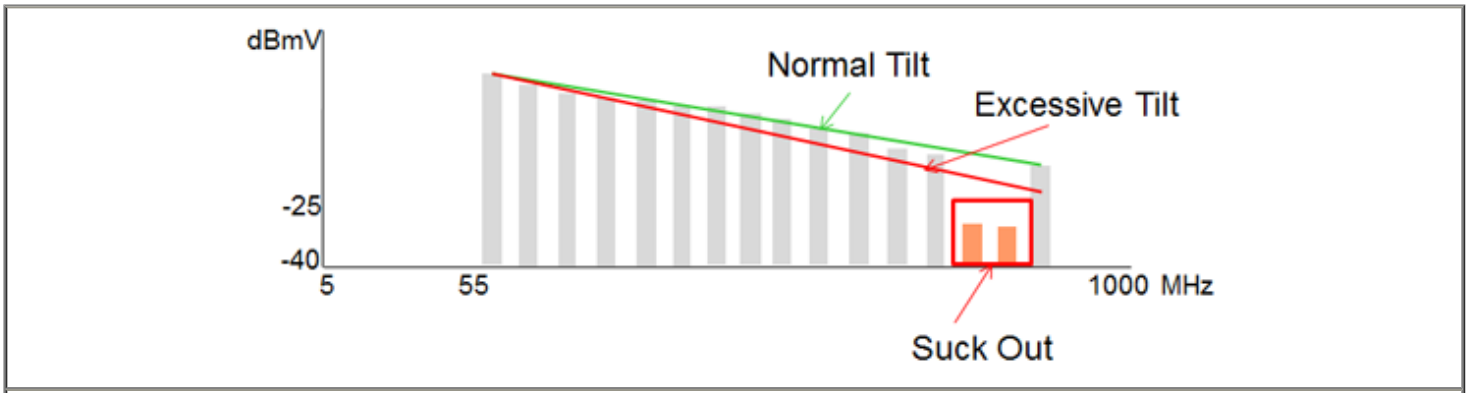


OFDM Subcarrier Scan - MER & Noise

Go back to top Go back to TOC

8.0 Sweep Monitoring

Sweep is used to identify improper balance of amplifiers, tilts, or suck outs. DOCSIS 3.1/4.0 deployments utilize previously unused and untested frequency spectrum exposing potential trouble for operators. Initial Downstream expansions go to 1.2 GHz, evolving later to 1.8 GHz, while the Return Path will extend to 85 MHz or 204 MHz depending on market or MSO service delivery objectives.



Tilt and Suck Out

Starting from a drop point nearest to the signal source, for example, a Headend office, a Sweep measures the signal levels across the bandwidth with predefined check points in a Sweep table. The measurement is kept as a reference. Move the test set to the next drop point away from the first one, take the same measurement and compare with the reference measurement. Ideally, the signal of each check point should be relatively less or more, proportionate to the reference signal.

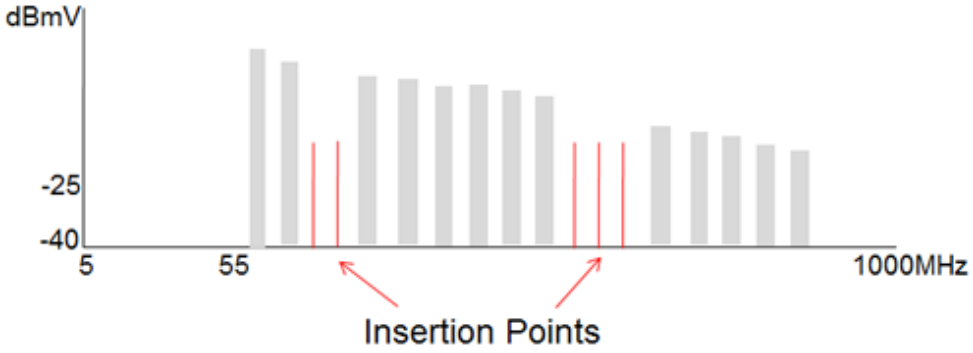
Forward Path Sweep

Forward Path Sweeps verify the frequency response and proper operation of amplifiers to ensure proper tilt and balancing. The CX380C is fully compatible with the CaLan 3010H+ Headend Sweep Transmitter, which injects active sweep points, enabling a forward path sweep up to 1.8 GHz. Even with an all-digital HFC system, tone insertion between QAM channels is made possible by the CaLan 3010H+'s ability to transmit lower level sweep tones that do not impair live QAM channels.

In Service Sweep

This is a non-service interrupting forward path sweep feature. In Service Sweep measures existing channels based on the user configured Channel Table. The sweep trace is displayed by plotting a line between points. The points are based on channel measurements, in place of sweep measurements. The start and stop points are the lowest and highest channels.

In the Analog spectrum, sweep can be performed by inserting tones within the analog TV channels or unused bands - a sweep tone generator is then required at the Headend. In an all-digital HFC system, tone insertion between channels is not possible, therefore In Service Sweep (ISS) is the preferred solution. ISS measures existing channels and makes a comparison. See the diagram below.



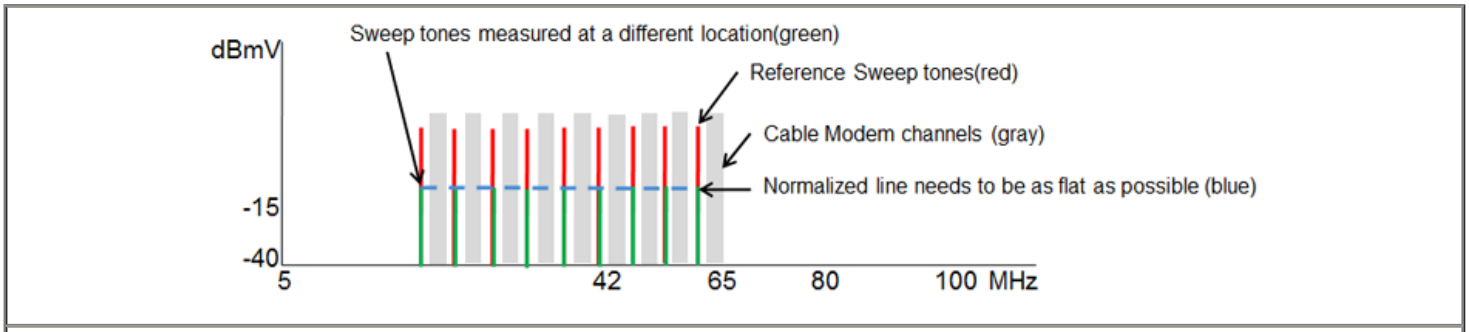
Forward Path Sweep Insertion Points

The current channel table is used. The CX380C measures the in-service analog and digital channels to obtain the frequency response of the HFC networks.

Return Path Sweep

This function verifies the frequency response, tilt and proper operation of the amplifiers. CX380C works in conjunction with the CaLan 3010H+ Sweep System installed at the Headend, enabling a return path sweep up to 204 MHz. CX380C operates as a return path transmitter, injecting active sweep points. This function verifies the frequency response, tilt and proper operation of the amplifiers.

In the example below, a measurement by the sweep receiver in the Headend while sweep tones are inserted at point 2; the closest point to the Headend. Save this measurement as reference. Move and insert sweep tones at points 4, 5, 6, and 7, compare results and verify the frequency response and tilt at each point is relatively flat.



Return Path Sweep

The Return Path Sweep operation on CX380C depends on the test mode selection of either Controller or Responder. The CX380C operates as a return path signal generator unit if Controller is selected, and a measurement unit if Responder is selected.

Go back to top Go back to TOC

8.1 Sweep Settings

Before using Forward or Return Sweep functions, sweep settings can be configured with all the necessary settings for the Sweep System. On the CX380C, the Sweep Setup screen can be accessed in one of two ways:

- **Main Menu<CaLan Sweep<Setup**

--OR--

- **Main Menu<Advanced Tools<In Service Sweep<Setup**

Main Setup Menu (Sweep Setup)

- For field descriptions on the **Main Setup Menu**, see Main Menu - Setup.
- For information on setting up **Channel Plans**, **Locations**, and **TP Compensations**, see Setup.

Go back to top Go back to TOC

8.1.1 Sweep Limits

Each Location has Pass/Fail Limits for Forward and Return Sweep measurements. For each Location, set the Pass/Fail criteria.

To set the Sweep limits:

1. On the **Sweep Setup** screen, tap the **Default Location** drop-down list box and select **Manage.** The **Locations** screen appears.
2. Tap the Location for which you want to set limits and tap **Edit**. The **Limits** screen appears.
3. Tap **Page Dn** until the **CaLan Sweep Limits** appear.
4. After making changes, tap **Save** to save the changes to the existing Location or tap **Save As** to create a new Location.
5. Tap the **Exit** icon to return to the previous screen.

Location Settings - Limits Screen

Location Settings - Limits Screen (continued)

The ideal Sweep Level for each Location is calculated based on a line passing through the mean of the High Pilot and Low Pilot Min and Max Limits. These are set for each Location. The difference between these ideal Sweep responses is then used as the offset for the Automatic Gain & Slope Offsets.

A Minimum and Maximum Limit is added for both Forward and Return Sweep Tilt measurements. A Maximum Peak-to-Valley limit may be set for both Forward and Return Sweep Tilt measurements.

Return Sweep Tx (transmit) Level and Slope setting are added for each Location. When the user selects a Location in the Return Sweep mode, the Tx and Slope will automatically be set.

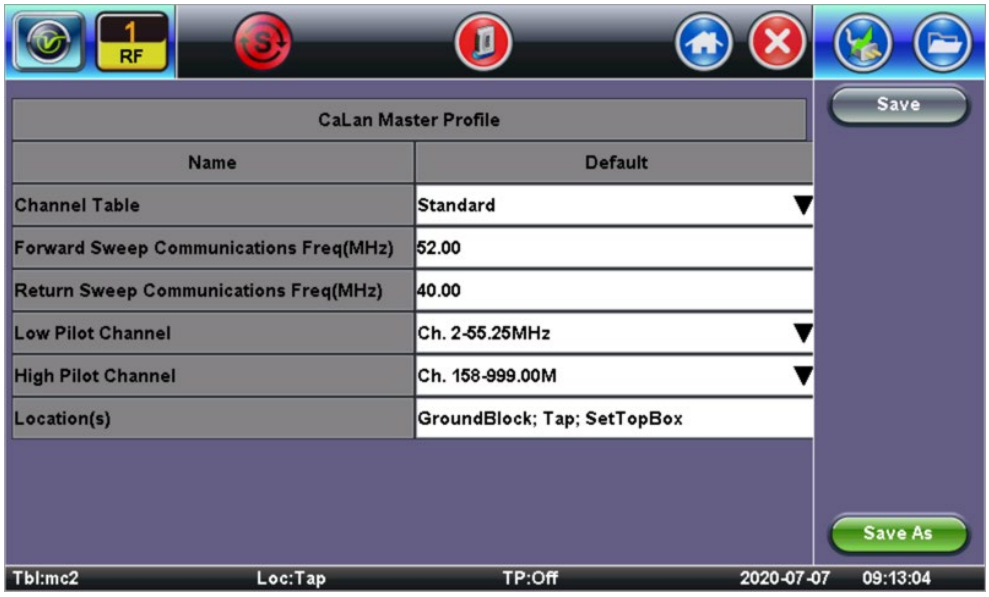
Go back to top Go back to TOC

8.1.2 CaLan Master Profile

Set the CaLan Master Profile which contains the communications frequencies between the CaLan 3010H+ and the CX380C. In most cases, this profile will be previously configured on the CaLan 3010H+; however profiles can be edited or created by the unit.

To configure a CaLan Master Profile:

1. On the **Main Sweep Setup** screen, tap the **CaLan Master Profile** drop-down list box and select **Manage.** The **CaLan Master Profile List** screen appears.
2. Tap the profile for which you want to configure and tap **Edit**. The **CaLan Master Profile** screen appears.
3. After making changes, tap **Save** to save the changes to the existing profile. To save settings as a new CaLan Master Profile, tap **Save As,** enter the name for the new profile, then tap **Apply**.
4. Tap the **Exit** icon to return to the previous screen.



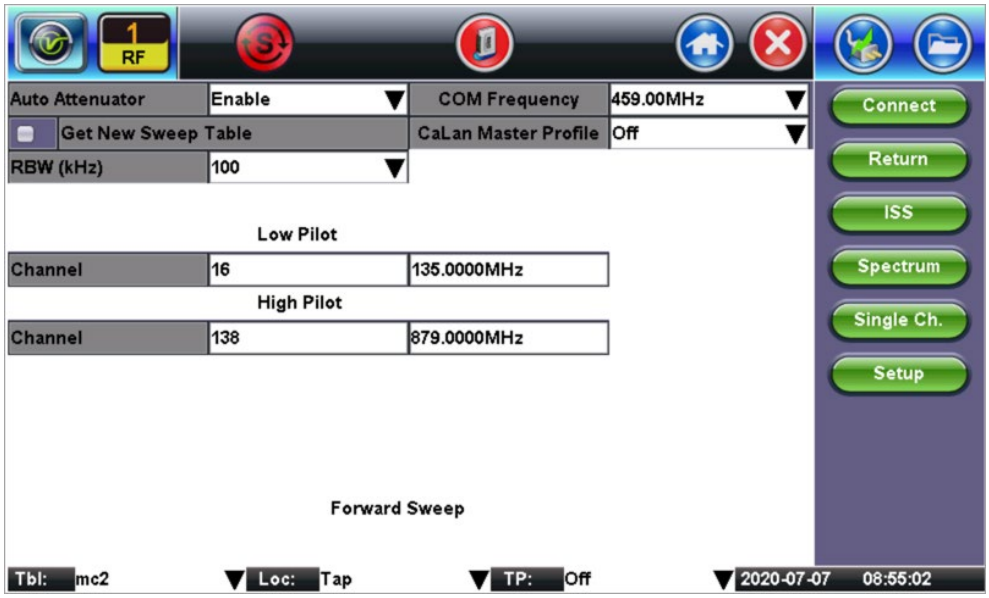
CaLan Master Profile

- **Channel Table**: Select the channel table that matches the system being swept.
- **Communications**: Two communication downstream frequency settings are required, one for the Forward Sweep and a second for the Return Sweep. The upstream communications for the CX380C to communicate back to the CaLan 3010H+ is set by the 3010H+ and sent to the CX380C on the downstream communications. No upstream communications frequency setup is required.
    - **Forward Sweep Communications Freq (MHz)**:Enter the Communications Forward Frequency.
    - **Return Sweep Communications Freq (MHz)**:Enter the Communications Return Frequency.
- **Low Pilot Channel**: Enter the Pilot channel/frequency.
- **High Pilot Channel**: Enter the Pilot channel/frequency.
- **Location(s)**: Tap the field to select the location with Sweep Limits configured. Multiple locations can be selected for the CaLan Master Profile.

Go back to top Go back to TOC

8.2 Run Sweep

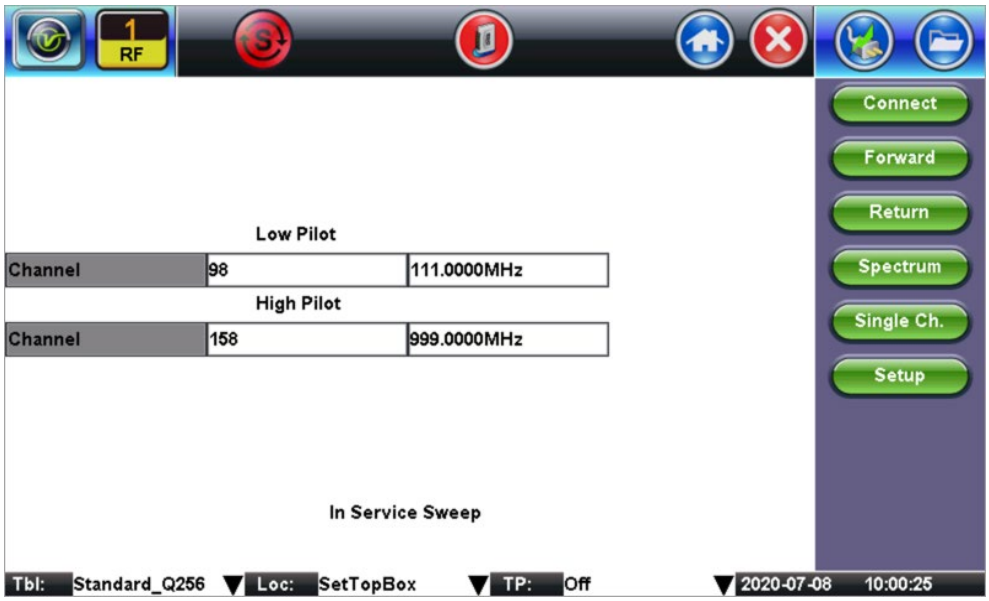
From the CaLan Sweep Forward Sweep screen, select the Pilots and other settings to run Sweep.



CaLan Sweep (Forward Sweep)

- **Auto Attenuator**: Enable to search all signals. Disable and enter channel for which to search and lock in on.
- **COM Frequency**:
- **Get New Sweep Table**: The Sweep Table is used when the Forward or Return Sweep measurement is initiated.
  Select this option when moving from one network to another or making significant changes to the Sweep Table. When selected it clears the existing Sweep Table from the unit's memory.
  Then once initiated, the Sweep will not start until a new Sweep Table has been downloaded from the CaLan 3010+.
  If this option is not selected, the first time a sweep is performed, the unit cycles through all channels first before generating a sweep table automatically and saving it in the unit.
- **CaLan Master Profile**: Select the CaLan 3010H+ Master Profile configured in the Setup screen or using R-Server.
- **RBW (kHz)**: Select 300 kHz for standard sweep. Select 100 kHz to go deeper with lower Sweep Transmit Levels.
- **Pilots**: Pilots help determine system levels at each location. Enter the Low/High Pilot channels and frequencies if not using a CaLan Master Profile.
  - **Low Pilot**: Enter the channel and frequency for the low pass/fail limit.
  - **High Pilot:** Enter the channel and frequency for the high pass/fail limit.

Tap the **ISS** button to view the Pilot Limits for In Service Sweep. Tap **Forward** to return to the Forward Sweep Settings.



In Service Sweep (Pilot Limits)

- **Spectrum**: Tap to enter the Spectrum Analyzer screen. See Spectrum Analysis for more information.
- **Single Ch.**: Tap to see the Single Channel SLM screen. See Single Channel Measurement for more information.

Tap the **Return** button to view the Return Sweep Settings. See the above descriptions for field details.

CaLan Sweep (Return Sweep Settings)

Go back to top Go back to TOC

8.2.1 Sweep Screen

Connect the network to the RF input and tap the green **Connect** button. The Sweep icon flashes green during Sweep.

Sweep Screen

To receive the communications signal the sweep input level to the CX380C must be at least -20 dBmV with the attenuation set to 0 dB. If **Auto Attenuator** is enabled on the Setup screen, the attenuation setting is set automatically when sweep is initialized. If communication is not established, go to the Scale screen and manually adjust the attenuation. Too little Attenuation can cause the communications to fail due to overload. Too much Attenuation can cause loss of communication due to noise or show a noisy sweep trace.

Pilot level bar graphs and their associated pass fail limits are displayed. Digital Level measurements are provided in the lower right corner of the display. In addition to the sweep trace two markers are provided to allow measurements at any point on the sweep trace. Tap on the Marker radial button to select the desired marker and then tap on the desired screen location or use the Right and Left arrow buttons for each marker,

Tilt and P/V (peak-to-valley) calculations are made between the marker settings. Vertical or Horizontal markers may be selected by tapping on the Vertical Marker or Horizontal Marker radial buttons at the bottom of the screen. When selected the Horizontal makers

are automatically set at their last used levels.

Use the **Controls** button to view the following at the bottom of the Sweep screen.

- **Frequency**: Displays the **Start**, **Stop**, **Center**, and **Span** frequencies.
- **Scale**: Displays the **Reference Level**, **Attenuation**, and **dB/Division**.
- **Trace**: Displays the **Smoothing**, **Average**, **Gain Offset**, and **Slope Offset**.
- **Marker**: Displays the **Vertical** and **Horizontal** marker control settings.

Tap **Measure** to return to the **Sweep Controls** menu.

Go back to top Go back to TOC

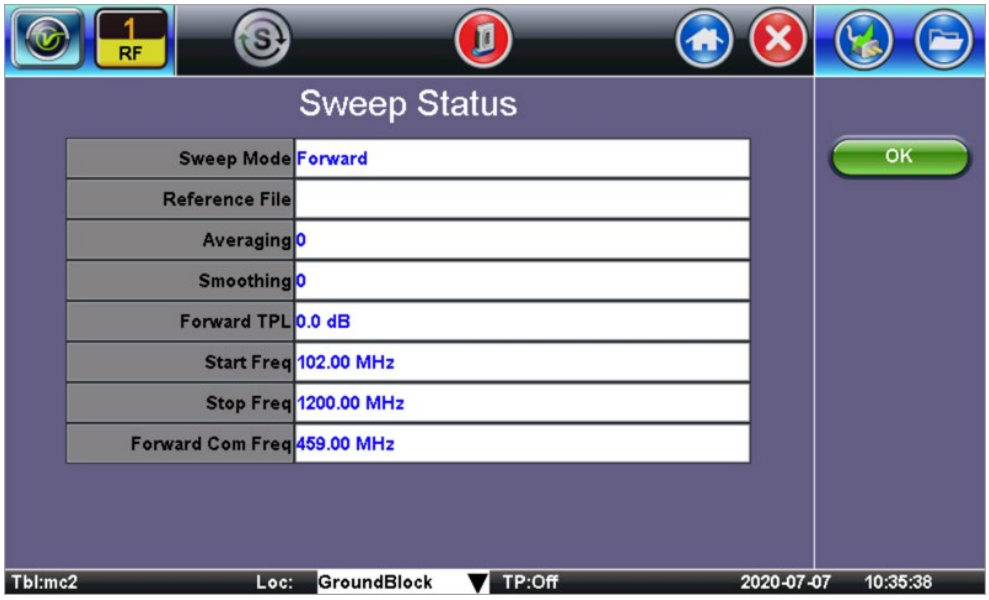
8.2.2 Sweep Mode

Tap the **Return** button to switch to the **Return Sweep mode**. Similar to Forward Sweep, the test signal is generated by the CX380C, injected into the system, and measured by the CaLan 3010H+ at the headend of Hub. The results data is then sent back to the CX380C unit.

When in Return Sweep mode, tap the **Forward** button to switch to Forward Sweep mode.

8.2.3 Sweep Status and Sweep Table

Tap **View** to access the **Sweep Status** and **Sweep Table** buttons.



Sweep Status

The Sweep Table displays Downstream Frequencies for both Forward and Reverse Sweep. These are displayed for viewing only. To make changes to the Sweep Table, so to the Sweep Setup screen.

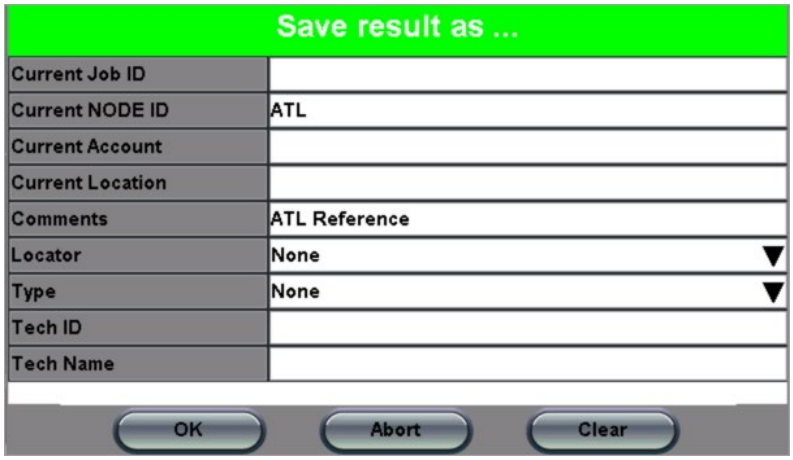
Sweep (Guardband) Table

Go back to top Go back to TOC

8.3 Reference

The Reference Sweep mode displays the difference between the reference file trace and the current live measurements. The reference and the live data includes Test Point compensation and manual or automatic Gain and Slope Offsets. It uses a saved file to be used as reference for comparison to the current trace.

To set a Reference, save the current sweep by pressing the **Save** key on the test unit's keypad. Then, identifying information in the **Save result as...** screen.



Save Reference

Tap **Reference<Load File** to see a list of reference files. Select the one to be used for comparison by tapping the radio button next to the file and tap **OK**. Once a file is selected it is used to display the Reference Sweep mode.
Note: Check the **Automatically load selected reference file** box at the bottom to initialize the sweep mode with the selected reference file automatically.

Tap **Live Only** to display the current Sweep only.

Reference Sweep Mode - Live Only View

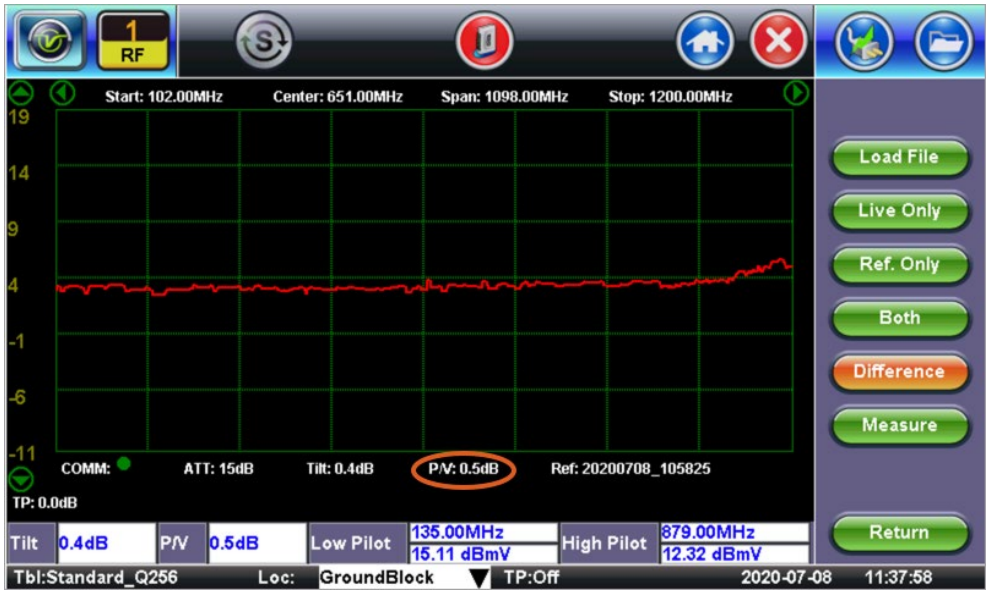
Tap **Ref. Only** to display only the saved Sweep that is loaded to use for comparison.

Reference Sweep Mode - Reference Only View

Tap **Both** to display both the saved Sweep that is loaded to use for comparison and the Live Sweep.

Reference Sweep Mode - Both Live and Reference View

Tap **Difference File** to display the difference between the Sweeps. The P/V ratio is shown below the graph.



Reference Sweep Mode - Difference between Live and Reference

Go back to top Go back to TOC

8.4 Controls

8.4.1 Frequency Controls

Selecting **Controls>Frequency** to display frequency range at the bottom of the screen: **Start** & **Stop** or **Center Frequency** and **Span**.

This controls the display only. The sweep transmitter maintains it's sweep frequency range. Channel or frequency may be set. Tap the arrow keys or tap the display box and enter the desired setting. Tap the small green left & right arrows at the top of the graph to "slide" the displayed frequency range up or down the spectrum.

Frequency Controls

8.4.2 Scale Controls

Selecting **Controls>Scale** to display controls below the graph for setting the **Reference Level**, **Attenuation**, **dB per Division**, and **Auto Center**.

When Auto Center is selected the CX380C will automatically set the initial attenuation level to provide an appropriate sweep display. The attenuation can also be set after the initial display.

Scale Controls

8.4.3 Trace Controls

Selecting **Controls>Trace** to display controls below the graph for setting the **Trace Smoothing**, **Averaging**, **Gain Offset**, **Slope Offset**, and **Automatic Gain and Slope**.

Smoothing sets the number of points before and after a graphed data point that are averaged for the display. When 0 is set, it means that the raw data is displayed. If 3 is selected, 3 points before the measurement and 3 points after the measurement are averaged and the result is plotted on the graphic display.

Averaging is the number of sequential traces that are averaged for each trace. Check the **Auto** box (Automatic Gain & Slope Offset) to have the Gain and Slope Offset set automatically based on the Location Limits. The CX380C will compare the limits set for the current Location to the limits set for the location of the Reference File and then offset the test results by the appropriate Gain and Slope Offset.

Trace Controls

8.4.4 Marker Controls

Selecting **Controls>Marker** to display controls below the graph for setting and positioning Markers.

Select the **Vertical** or **Horizontal** checkbox for the marker to control. Tap the marker number, **M1** or **M2**, and then tap the screen to position the marker. Alternatively, use the right and left arrow hard keys on the keypad.

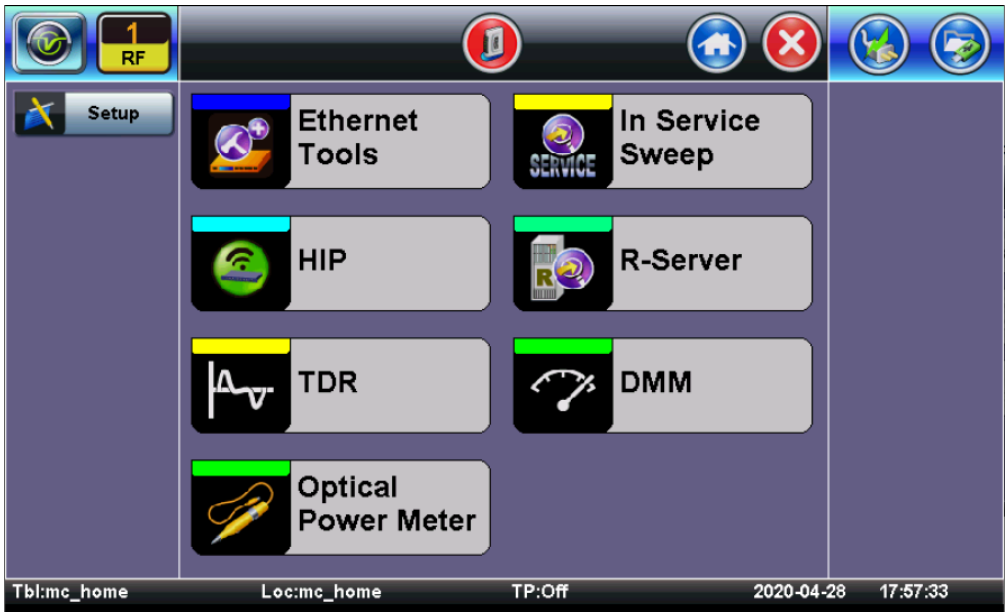
Marker Controls

Go back to top Go back to TOC

9.0 Advanced Tools Menu

Under the **Advanced Tools** menu, the following features are available:

- Fiber Scope
- Optical Power Meter (OPM)
- Data Card
- WiFi inSSIDer
- OTDR Viewer
- Ethernet Tools
- HIP
- TDR
- In Service Sweep
- R-Server
- DMM



Advanced Tools - new

Go back to top Go back to TOC

9.1 Fiber Scope

The Fiber Scope Inspector is an ideal tool for checking fiber optic connectors for dirt and end face quality. The handheld probe design enables easy inspection of patch cords and difficult to reach bulkhead or patch panel connectors. Clear images are displayed on the V300 products for immediate analysis and can be saved for record keeping.

Fiber Scope

Key features include:

- Optical connector end face inspection
- Easy to change adaptor tips
- Multi mode and single mode fiber patch cords
- Sharp images displayed on VeEX V300 products
- Visual comparison mode of saved image

The ISO/IEC 14763-3 standard for Testing Optical Fiber Cabling specifies visual standards for connector end face inspection with a fiber microscope. The ISO-related standards and general industry practices recommend the following:

- Markings on the core or damage to the cladding close to the core are unacceptable
- Slight scratches and small pits on the cladding away from the core are, however, acceptable
- Cracks are not permitted in neither core nor cladding

Equipped with 400x magnification, the VeEX Fiber Scope Inspector is well suited for general installation and maintenance checks on both single mode and multi mode fiber types. Contamination or damage that cannot be viewed at this magnification is unlikely to impact practical connector performance; thus, it is an ideal tool for patch cord inspection, optical laboratory or field test applications.

Lightweight construction and the ergonomic positioning of the rotary focus dial enables one-handed operation and fast viewing, leaving one's hand free to move the connector under test as needed. Interchangeable screw-on adaptors are available for most modern optical connectors, while the probe design blocks any hazardous infrared light from reaching the operator, resulting in completely eye-safe operation.

Go back to top Go back to TOC

9.1.1 Automatic Focus Detection and Analysis

In the past, fiber connector end-face inspection not only required a good Fiber Microscope (Fiber Scope), but a certain amount of knowledge and hand-eye dexterity. Results were prone to inconsistencies, subject to interpretation and PCs were required for post analysis against the criteria set forth by the IEC 61300-3-35 Sect 5.4 standard.
VeEX has made the task easier, faster and foolproof, with the introduction of its patent-pending revolutionary Automatic Focus Detection technology. Turning ordinary digital fiber scopes, like DI-1000, into accurate semi-automated inspection systems. All with the help of TX300S, FX300, RXT-1200 or SunLite OTDR test sets.

Instead of adding the extra complexity, fragility, cost, size and weight of other electromechanical focusing systems currently available in the market, VeEX's auto focus detection technology still relies on the incredible fast response and finesse of human hands, but leaves the focus assessment, image capturing and analysis to the test set. A perfectly focused image of the connector end-face can be achieved in a few seconds even with eyes closed. Moreover, manual control remains an option for non-trivial scenarios that require the dexterity of human hands.

Go back to top Go back to TOC

9.1.2 Main Advantages of Automatic Focus Detection

- Investment protection (no need to replace existing scopes, like DI-1000, with a more expensive ones)
- It's a simple software option upgrade to the test set
- Much faster focus, acquisition and analysis, compared to slow electro-mechanical auto-focusing scopes
- Robustness: Less moving parts and no internal motors makes a better choice for field applications
- No training necessary, yet get it right every time
- Smaller scope size
- Report generation (HTML and PDF)
- The test set detects when the image has reached optimal focus level, automatically freezes the picture, captures the image and runs the IEC 61300-3-35 analysis
- No need to move hands or press any buttons (movement and vibration are common causes of focus loss)
- No PC required for image acquisition or Pall/Fail analysis

Go back to top Go back to TOC

9.1.3 The Importance of Fiber Connector Inspection

Dirty or scratched connectors introduce loss, increase ORL and/or damage other connectors (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 optics connector's End Face, focusing on the contact areas (prone to loss or damage by mating). 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.

Go back to top Go back to TOC

9.1.4 Fiber Connectors and Test Gear Vulnerabilities

Opposed to the permanent or semi-permanent connections often found in network environments, "promiscuous" Test Equipment and their patch cords connect to multiple devices on a daily basis, increasing the chances to damage or get damaged. Extra care must be taken, not only to avoid potentially expensive damage, but to make sure that any tests and their results remain valid. Bad fiber or dirty/damaged connectors can result in false anomalies, defects or errors, even expensive repairs.

Go back to top Go back to TOC

9.1.5 About the DI-1000 Fiber Inspection Scope

- Digital Fiber Inspection Probe
- Native USB 2.0 (no adapters required, no image degradation)
- Compatible with existing UX400, TX300S, FX300, RXT-1200 and SunLite OTDR
- Precise and stable single-finger focus knob for one hand operation
- Blue light source for better contrast
- 400X magnification
- Interchangeable tips – Most commonly used tips are available (FC, SC, LC, ST, MTP, E2000, including PC, APC, 60° angled tips, among others)
- Compatible with VeEX test sets offering built-in Auto Focus-Detection & Analysis
- Ergonomic design

Go back to top Go back to TOC

9.1.6 Fiber Connector Inspection Setup

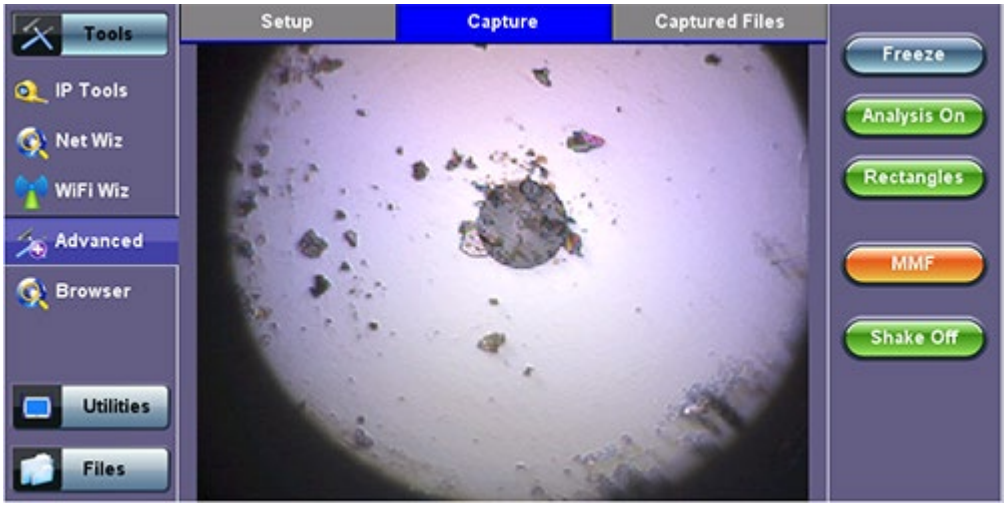
The Setup tab allows basic settings

File Prefix: String of alphanumeric characters to be appended at the beginning of the file name, every time the results are saved. For example Fiber0239-
Starting #: Every time a result is saved, this suffix number will automatically increment. Manually enter the initial value here.
Auto Freeze: This is amount of time the optional Auto Focus Detection feature will look for a stable in-focus image before automatically freezing the image and starting an analysis. Select Never, if manual capture or real-time analysis is desired. Auto freeze comes handy when both hands are tied (e.g. one holding the connector and the other holding the probe, or working on a pole)
Scope Mode: Use Local for USB fiber inspection scopes that directly attached to the test set. Use Remote if the probe is attached to a wireless transmitter using WiFi connection.

Go back to top Go back to TOC

9.1.7 Capture Tab (View)

The Capture tab is the main user interface for the connectors' face inspection and analysis. It presents a real-time view of the connector's end face allowing for alignment and focus.



Fiber Scope - Capture tab

What the Buttons Mean

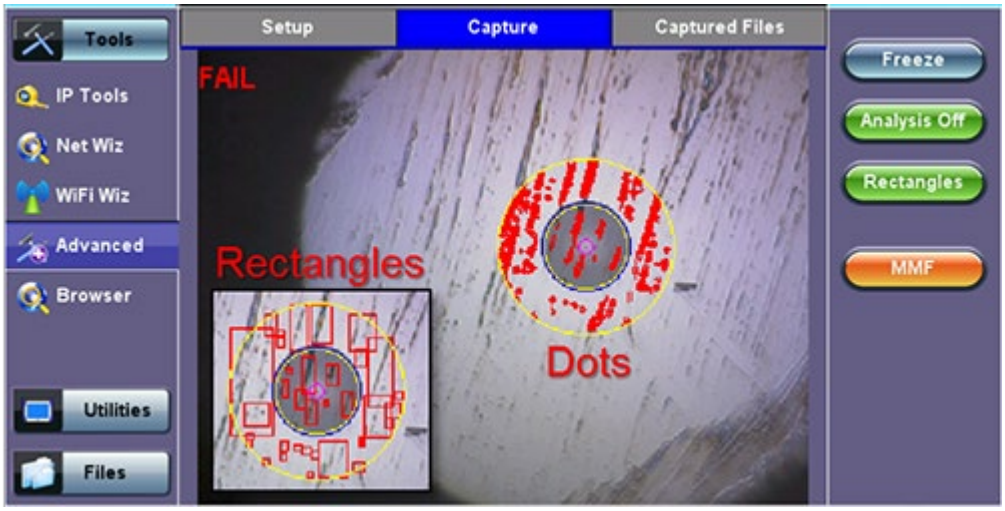
The soft buttons on the action bar (right side of the screen) do not indicate the current state or setting. They indicate the action that would take place if pressed. For example, if the “Analysis OFF” button is tapped, the analysis function is turned OFF and the button toggles to show “Analysis ON”. These soft buttons should be interpreted as “Go to…” .

Freeze: Manually freezes the image in the desired view. If the optional Auto Focus Detection feature is enabled, the test set will automatically freeze the image when the image comes into focus. Once the image is frozen, tap the image to save it.

Analysis ON/OFF: Turns the optional auto-analysis feature ON and OFF. If turned ON, the test set automatically analyzed the image in real time. If the markers get in the way of seeing the picture details, turn this feature OFF and perform manual analysis.

Dots/Rectangles: They are two ways of highlighting the different impurities found in the face of the connector. The dots tightly contour each individual anomaly, capturing its area. In some cases, impurities or scratches that are otherwise covered by the dots may need to be seen, so rectangles are used in this case to highlight the anomaly and still keep them visible. The selection between dots or rectangles does not affect the area calculation or the Pass/Fail results.

Save: The Save button appears after freezing an image. I performs the same action as tapping on the screen to save the current image. Use the >Utilities >Files function to View the report, export to PDF format and copy to USB.



MMF/SMF: Selects the type of connector/fiber to be analyzed and loads the correct Pass/Fail mask.

The button label DOES NOT indicate the current mask type. It indicates what the mask would be changed to, if activated.

Shake ON/OFF: Turning the Shake ON may help in situations when the image is not very stable, such as inspecting a female connector or bulkhead.

Go back to top Go back to TOC

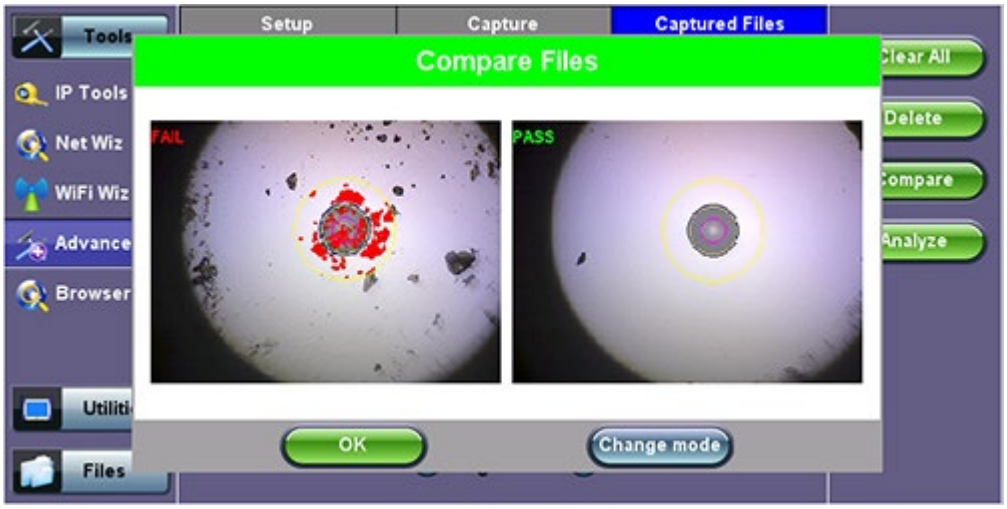
9.1.8 Captured Files Tab

This section of the user interface lists all the connectors' end face images that have been captured with the fiber inspection microscope. "Before" and "After" identifiers or remainders can be seen when comparing images before or after cleaning or polishing.

Clear All: Deletes all the image files in the Captured Files list

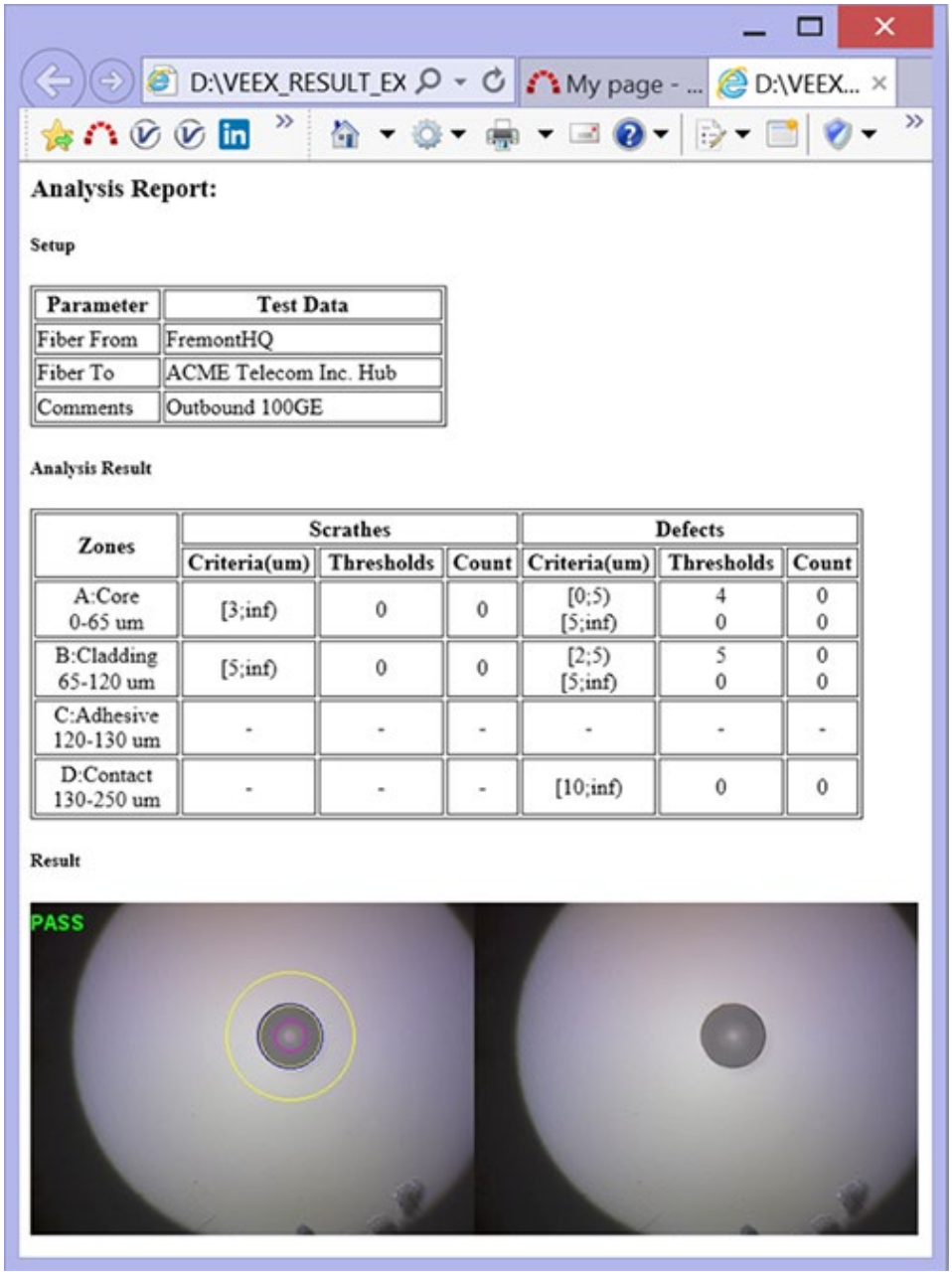
Delete: Deletes any selected files from the Captured Files list. Use the check-boxes to select

Compare: Compares two images, for example, ones taken before and after cleaning. Use the check-boxes to select any two image files and then tap on the Compare soft button. Use the Change Mode button on the comparison window to enable and disable the analysis overlay.



Analyze: This soft button opens a more detailed analysis and report generation. Use the check boxes to select the images to be analyzed

- **Image File:** shows the name of the picture currently being displayed. Use the Open button to navigate, select and load any other file.
- **Show/Hide Overlay:** Enables or disables the mask, anomalies identification and analysis.
- **Finer From/To:** Identifies the fiber under test.
- **Save Report:** Generates a full report including a table with measurements and images. Use the >Utilities >Files function to View the report, export to PDF format and copy to USB.



Analysis Report:

Setup

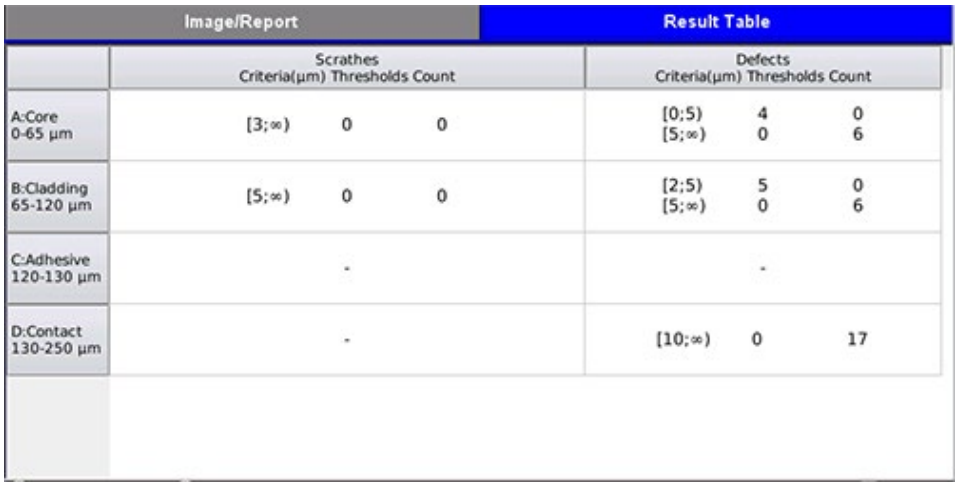
Parameter	Test Data
Fiber From	FremontHQ
Fiber To	ACME Telecom Inc. Hub
Comments	Outbound 100GE

Analysis Result

Zones	Scrathes			Defects		
	Criteria(um)	Thresholds	Count	Criteria(um)	Thresholds	Count
A:Core 0-65 um	[3;inf)	0	0	[0;5) [5;inf)	4 0	0 0
B:Cladding 65-120 um	[5;inf)	0	0	[2;5) [5;inf)	5 0	0 0
C:Adhesive 120-130 um	-	-	-	-	-	-
D:Contact 130-250 um	-	-	-	[10;inf)	0	0

Result

- **Results Table:** Shows the defects and scratches count by sizes and position, used for the evaluation of the Pass/Fail criteria, according to the IEC 61300-3-35 standard.



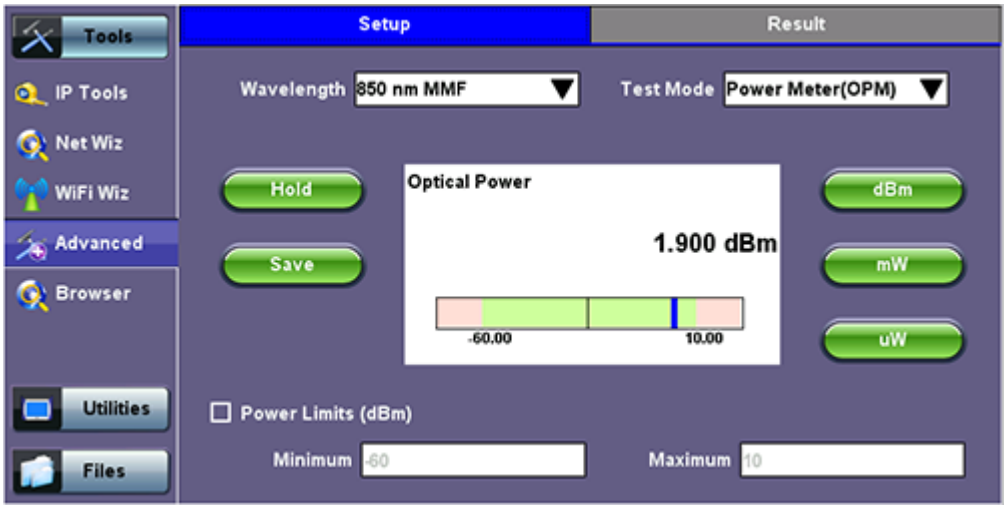
Image/Report	Result Table					
	Scrathes Criteria(µm)	Thresholds	Count	Defects Criteria(µm)	Thresholds	Count
A:Core 0-65 µm	[3;∞)	0	0	[0;5) [5;∞)	4 0	0 6
B:Cladding 65-120 µm	[5;∞)	0	0	[2;5) [5;∞)	5 0	0 6
C:Adhesive 120-130 µm		-			-	
D:Contact 130-250 µm		-		[10;∞)	0	17

Go back to top Go back to TOC

9.2 Optical Power Meter (OPM)

This function works in conjunction with Optical Power Meter dongles (USB), such the optional UPM-100.

Insert the OPM dongle to on of the test set's USB port before launching this application.



Optical Power and Loss Measurements

Wavelength: This pull-down menu provides a list of calibrated wavelengths to match the signal being measured.

Test Mode: Select between Power or Loss measurements.

- In Power Meter mode the test set presents the direct power readings, which are displayed in dBm, mW or uW units. Perform the conversions by using the button on the right side of the reading.
- In Loss Meter mode the test set reports the difference in power readings between the Laser Source (LS) output being used and what is currently present at the connector after being attenuated by the fiber. The results are presented in dB. Loss meter requires to be referenced (calibrated) to the Laser Source output. You must connect the LS to the OPM dongle using a short patch cord and tap on the Reference button to record the 0dB point. Then that LS can be connected to the far-end of the fiber to measure the loss.

Hold: Freezes the last power or loss reading on the screen

Save: Records instantaneous power or loss readings in the Result's tab. This is useful when measuring multiple fibers or testing one fiber with multiple wavelengths. Up to 12 measurements can be logged in the Results tab. You must use the 1 button to save these results.

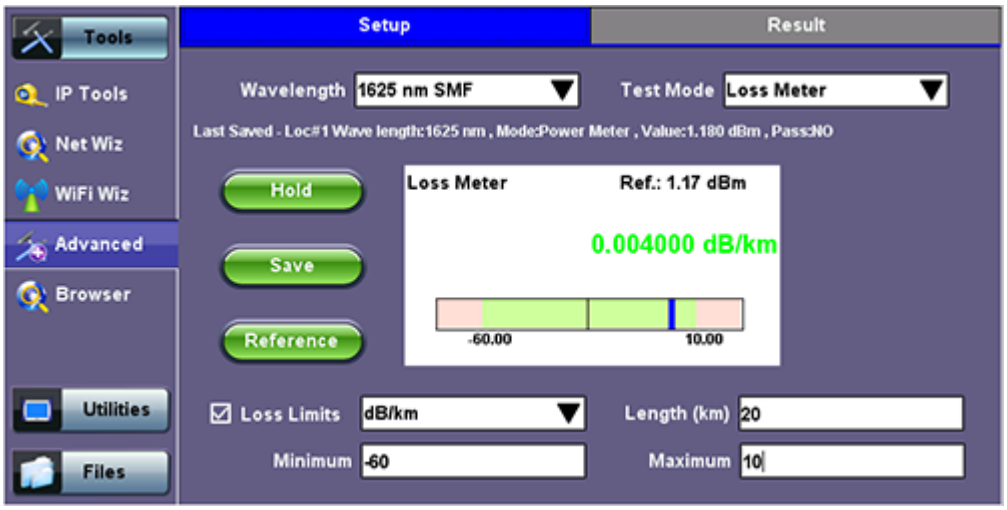
Go back to top Go back to TOC

9.2.1 Setting Pass/Fail Limits

Whether measuring optical power or loss, there are always power input limits (saturation and Loss) or attenuation allowances that determine whether the fiber cable meets the requirements for the desired application or network elements.

Power Limits (dBm): When the check-box is marked, enter the Minimum and Maximum power levels allowed for the application (e.g. in line with the transceiver's dynamic range). If the power reading falls beyond those limits, the power measurement reading will turn red.

Loss Limits: Similar to power limits, set Minimum and Maximum amounts of optical power loss that are acceptable for the application or specified for the cable or installation. Specify the total amount of attenuation in dB. Alternatively, select the dB/km or dB/mi if the results are being compared against cable specifications. In this case, enter the length of the cable under test for the test set to make the conversion.

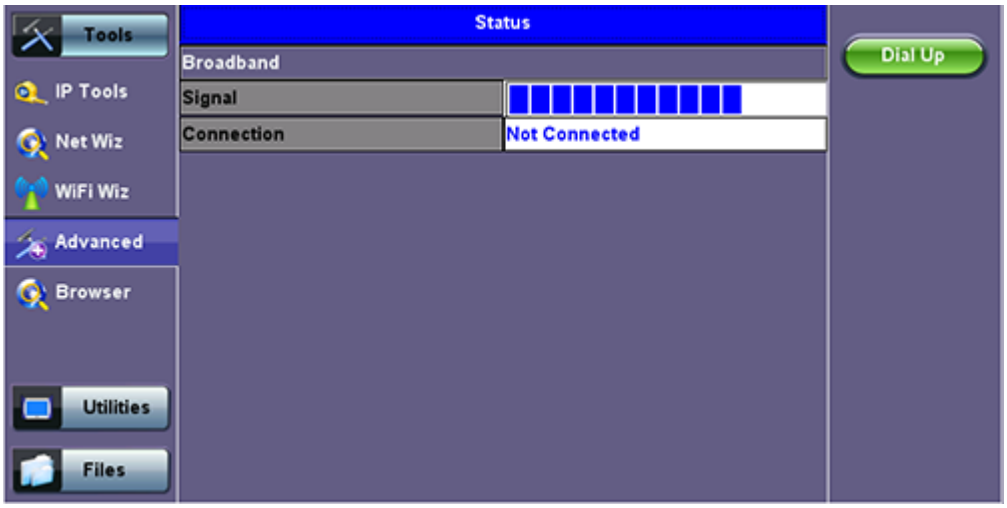


Go back to top Go back to TOC

9.3 Data Card

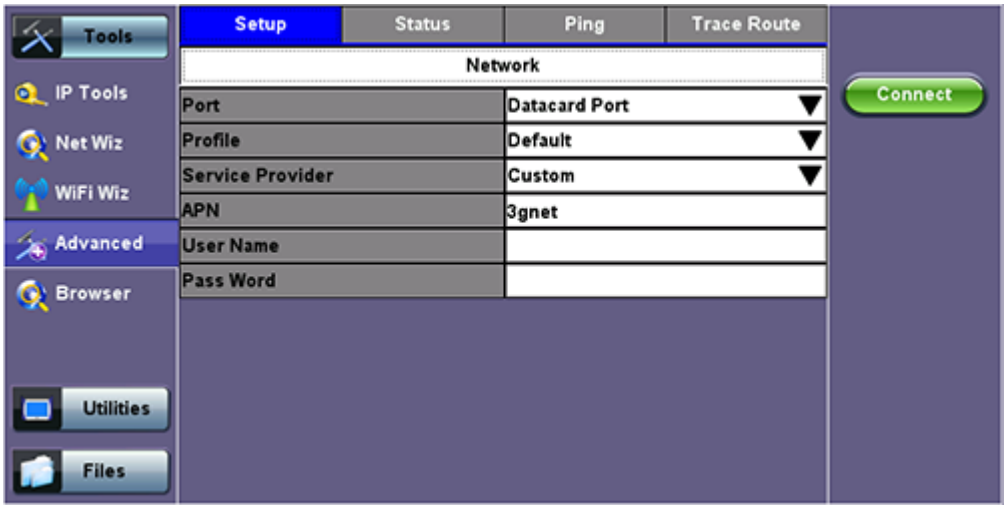
To establish an IP connection using a data card, please make sure that the data card is connected on the USB port. The **Data Card** icon, as shown below, will appear at the bottom of the screen.

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



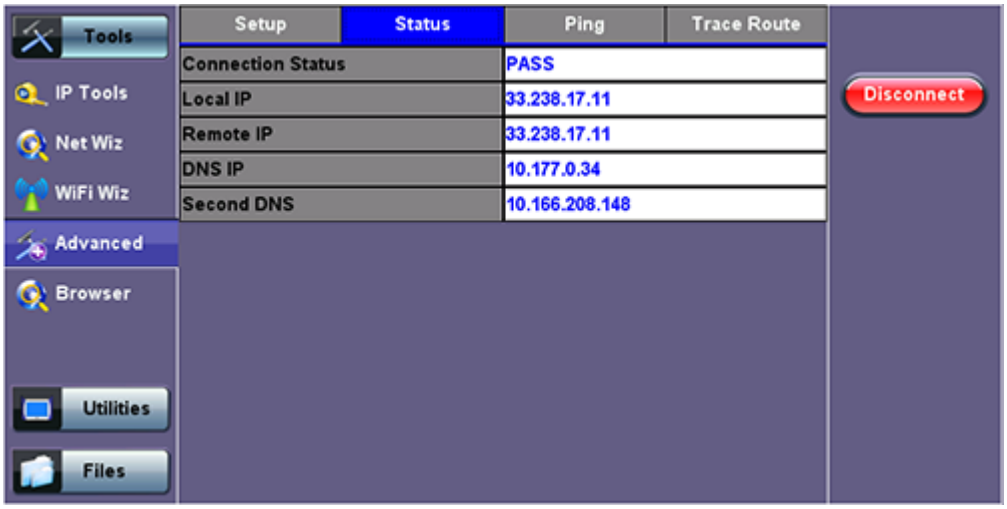
Data Card - Setup

Press the **Dial Up** key.
In the IP Tools Setup menu, the 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**.



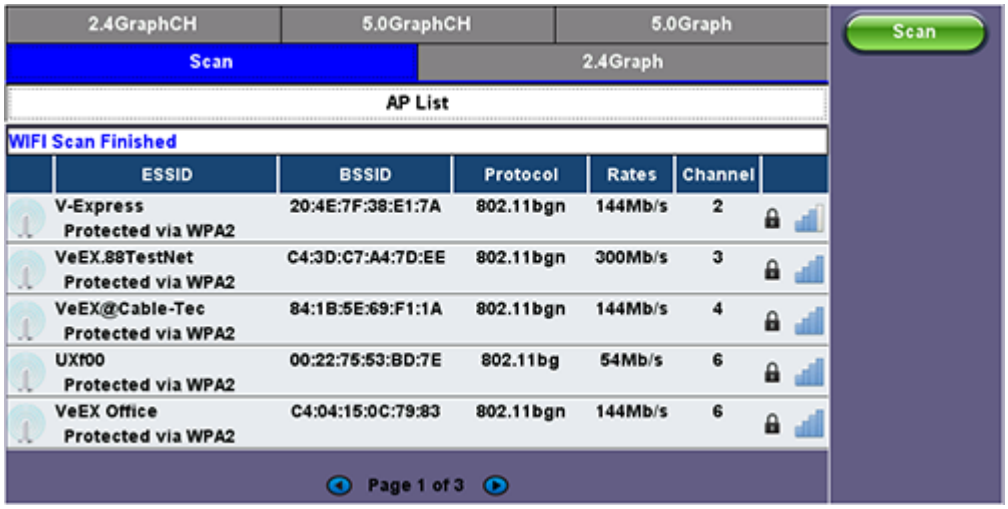
Now that a connection has been established:

- The **D** for Data in the icon turns green  .
- The connection details are displayed in the IP Tools Status tab (shown below)
- It will automatically reconnect if the test set is powered off/on and you are in a good reception area
- It will automatically reconnect if you enter a bad cell area and return to a good one



Go back to top Go back to TOC

9.4 WiFi inSSIDer



WiFi inSSIDer Home

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

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

The WiFi InSSider supports 2.4GHz and 5.0GHz Bands. The home screen has tabs to display test results for both frequency bands and also for graphical presentation of results for both.

2. Tap the **Scan** button on the right side of the screen.

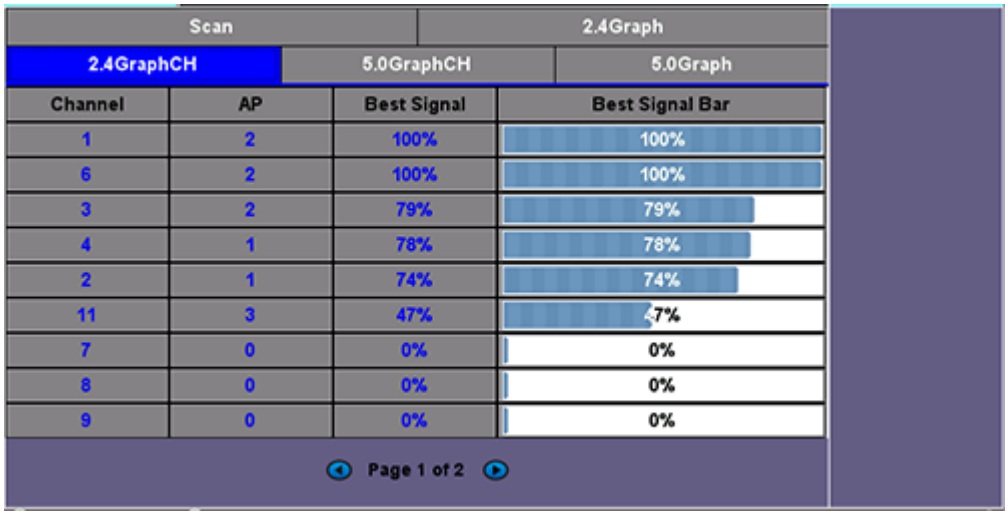
After the scan is completed, the unit displays the list of access points (AP) detected in the 2.4 GHz and 5GHz bands.

The following information is displayed for each AP:

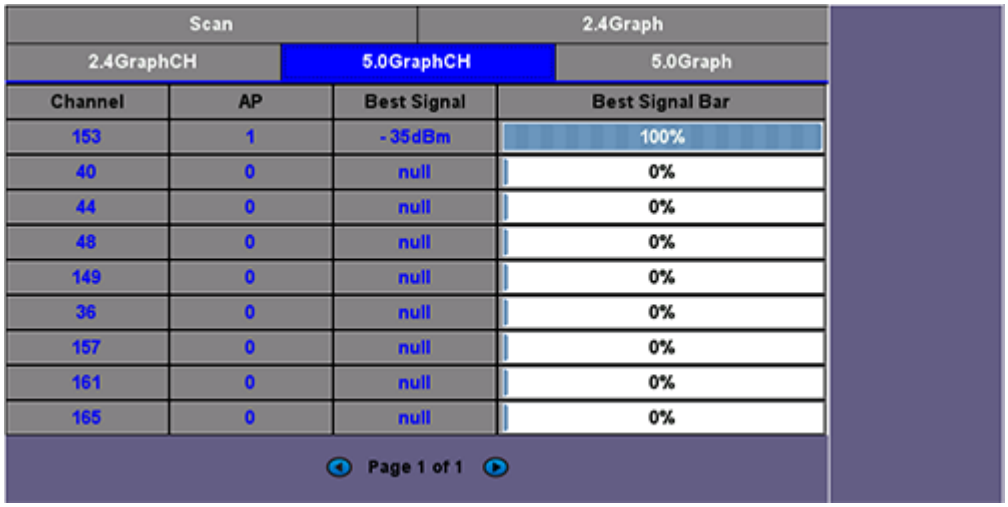
- SSID name of the AP
- BSSID (MAC address) of the AP
- 802.11 protocol version supported by the AP
- Max data rate supported by the AP
- AP's radio channel number
- Lock symbol indicates if security is set on the AP (WEP, WPA or WPA2).
  When the AP is unsecured, no lock symbol is displayed
- Signal strength of the AP

Access Points in the 5.0GHZ 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.

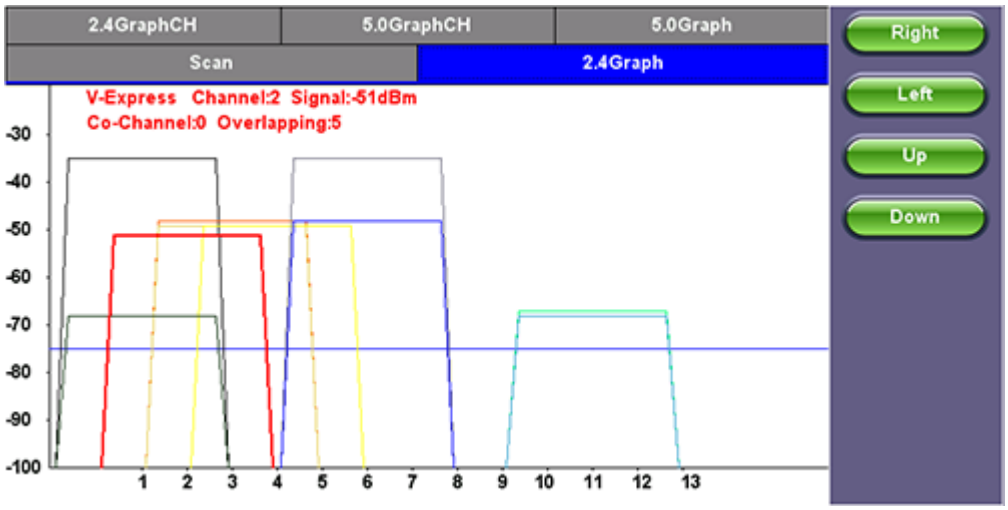


2.4GHZ Channel



5GHZ Channel

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



Graph

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.

Go back to top Go back to TOC

9.5 OTDR Viewer

This functionality allows the test platform to open and analyze standard OTDR .SOR files created by the TX300S-OTDR, RXT-4100 OTDR, FX300 OTDR or other OTDR test sets. It can also be used to control the wireless OPX-BOXe OTDR via Bluetooth or USB connection, offering full-featured OTDR functionality.

For more information about OTDR information, see the *OTDR Series User Manual* at www.veexinc.com.

Go back to top Go back to TOC

9.6 Ethernet Tools

Use this option for Layer 4+ V-Test Throughput and V-Perf TCP tests using the top 1000BT test port.

Go back to top Go back to TOC

9.7 HIP (Home Installation Process)

The Home Installation Process can be downloaded to the test unit to ensure consistency with installation practices. A HIP certificate will confirm that each new installation conforms to provider operating guidelines and ISO quality standards. For more information about the Home Installation Process feature, contact Customer Care.

Go back to top Go back to TOC

9.8 TDR

The optional built-in Time Domain Reflectometer (TDR) supports up to 2 km/6000 ft of coaxial cable. It detects faults along the full run. It provides a pre-set gain and pulse width feature which adjusts the vertical position for each range setting. Additionally, impedance settings can be selected and Velocity Propagation (VP) factors can be adjusted to perform tests on different cables.

Go back to top Go back to TOC

9.9 In Service Sweep

For more information on this non service interrupting forward path sweep feature, see Section 8.0 Sweep Operations.

Go back to top Go back to TOC

9.10 R-Server

The VeEX R-Server provides a central system to upload results and download profiles. Profiles that were pre-configured can be downloaded with all parameters preset for testing. Once results are uploaded to R-Server, it stores and protects the data.

For more information about R-Server, go to www.veexinc.com.

Go back to top Go back to TOC

9.11 DMM

The DMM (Digital Multimeter) option provides functions to check the continuity of the coaxial cable signal strength between test leads.

Go back to top Go back to TOC

10.0 Tools

10.1 IP Tools

The 10/100BaseT management port is located on the right hand side of the unit. This port can be used to connect to the unit for management purposes (e.g., results retrieval, software upgrade, remote connectivity, etc).

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

Go back to top Go back to TOC

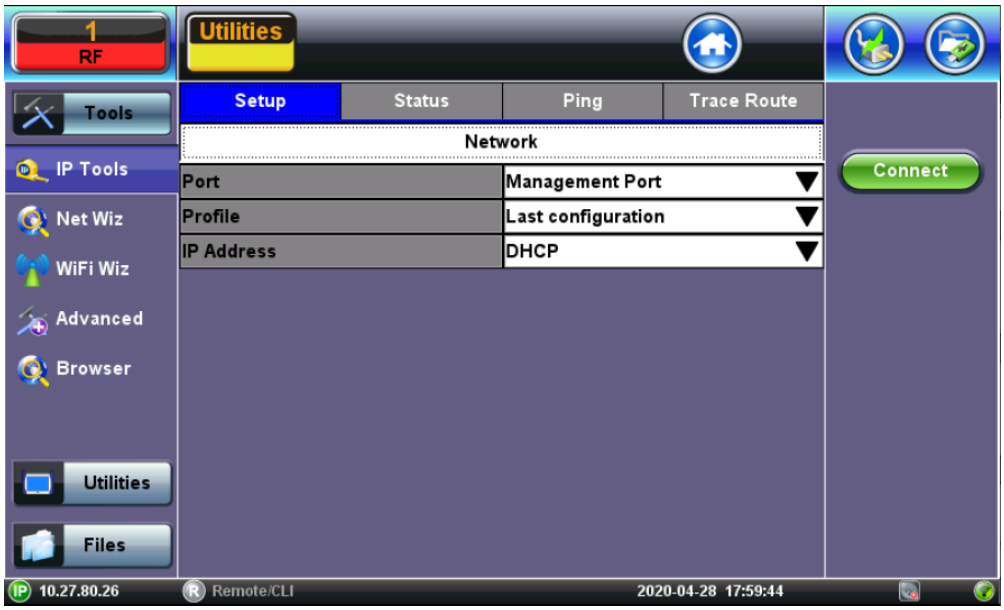
10.1.1 Setup

By default the IP configuration is set to DHCP and the unit will automatically attempt to connect.

For IP configuration, the following fields are required. Additional fields 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, manually enter the IP address parameters (local IP, Gateway IP and DNS server IP)
  - **DHCP:** If DHCP is selected, the unit will obtain IP address parameters from the DHCP server

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



DHCP Setup

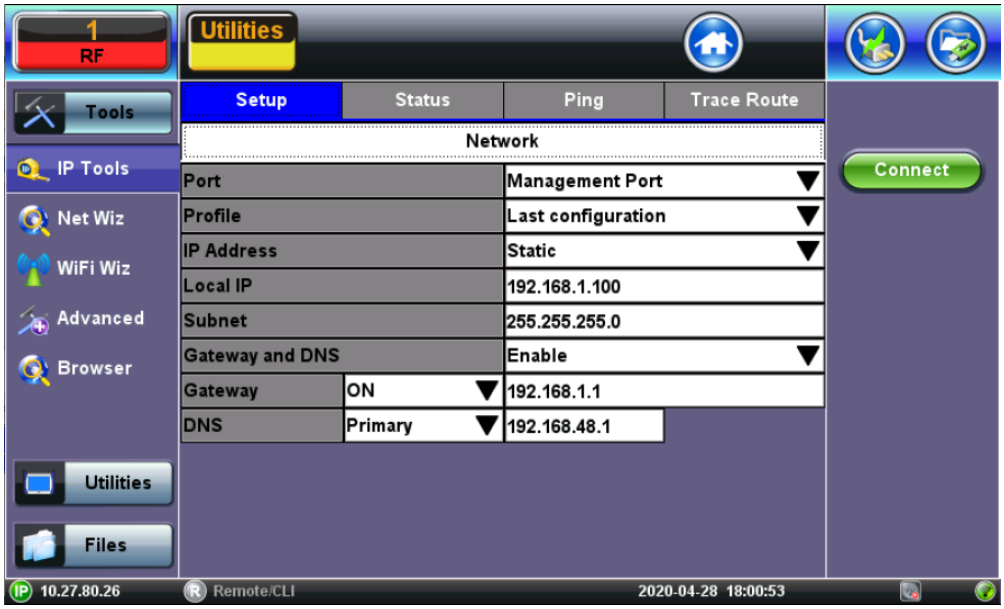
For **Static** type connection, these additional fields are required:

Static: Enter a 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.

- **Port:** Select **Management Port** from the drop-down menu
- **Profile:** Default, Delete, Save, Save as..., Default, or Last configuration
- **IP Address:** Static or IPv4 address of the test set.
- **Subnet:** Enter the subnet mask.
- **Gateway and DNS:** Enable or Disable. If set to enable, Gateway and DNS fields become available.

- **Gateway:** Off or On. IPv4 address of the network gateway.
- **DNS:** Off, Primary, or Primary & Secondary. If set to Primary or Primary & Secondary, a DNS IP is required in order to use the URL as a destination.

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



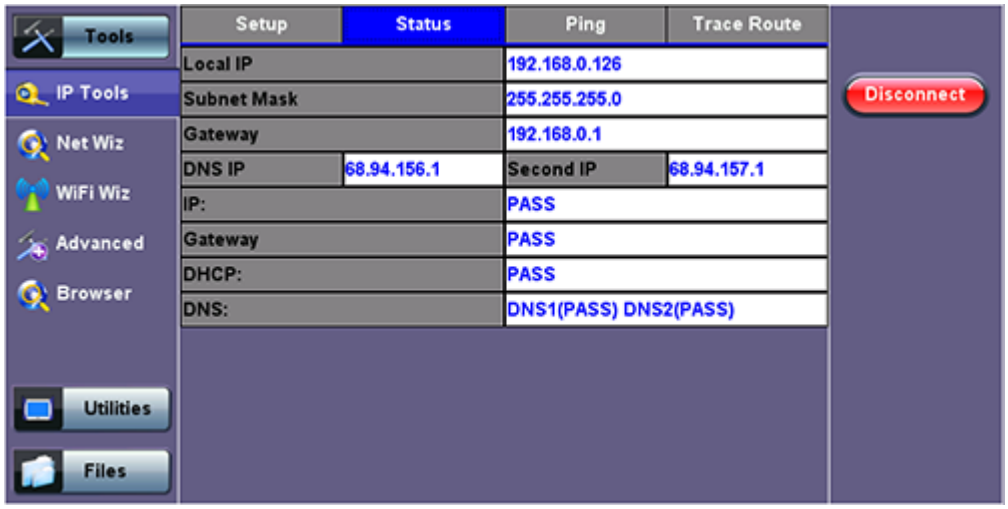
Static Setup

Go back to top Go back to TOC

10.1.2 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.

- **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.



IP Connection Status

Go back to top Go back to TOC

10.1.3 Ping

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

Ping Testing

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.

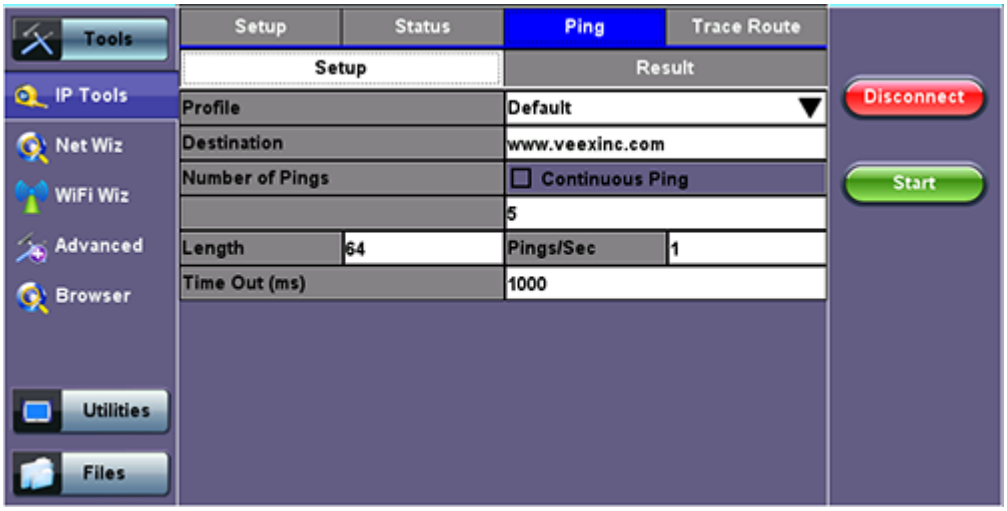
Ping Setup

- **Profile:** Delete, Save, Save as..., or Default.
- **Destination:** Enter the destination IP address or URL to ping.
- **Number of Pings:** Press the field and use the alphanumeric keypad to enter the number of ping attempts that will be performed to reach the network device.

  If Continuous Ping is selected, the number of pings is not needed. The test set will continuously ping the target host until the **Stop** is pressed.

- **Length:** Use the alphanumeric keypad to enter the length of the ICMP echo request packet transmitted.
- **Ping/Sec:** Use the alphanumeric keypad to enter the Ping repetition rate (Ping/second) up to 10 pings per second.
- **Time Out:** Time-to-Live (TTL) in milliseconds. Use the alphanumeric keypad to enter the maximum time allowed (in ms, up to 99999ms) between an ICMP ping and echo response.

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



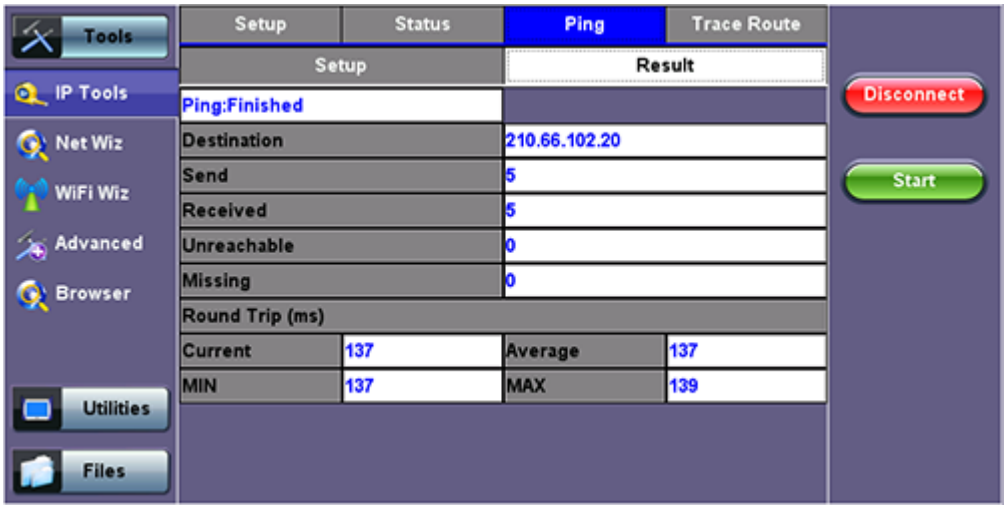
Ping Setup

Go back to top Go back to TOC

Ping Results

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

- **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.



Ping Result

Go back to top Go back to TOC

10.1.4 Trace Route

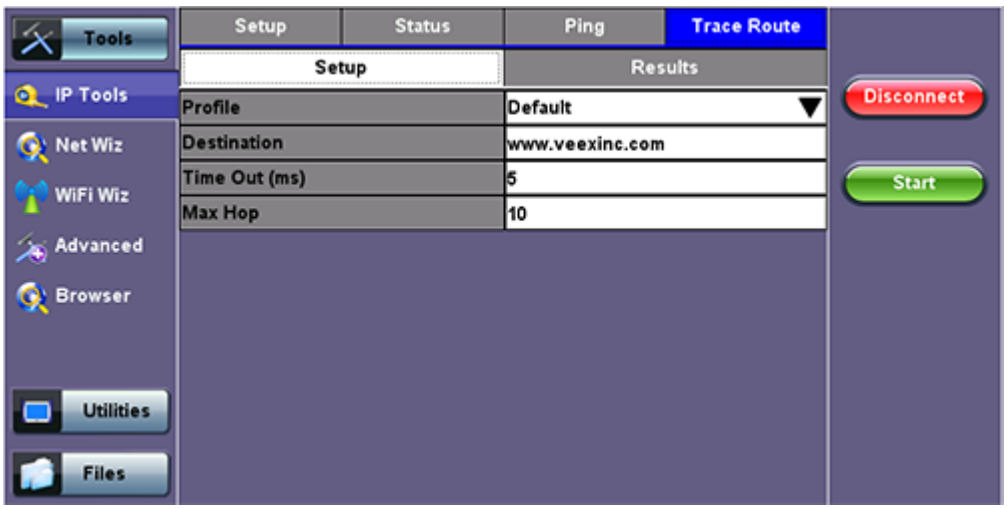
Trace Route is a common method used to find the route to the destination IP address or URL. It is often used to identify routing problems and unreachable destinations. All the remote IP addresses and their response times are displayed indicating possible network congestion points.

Trace Route setup tab:

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.



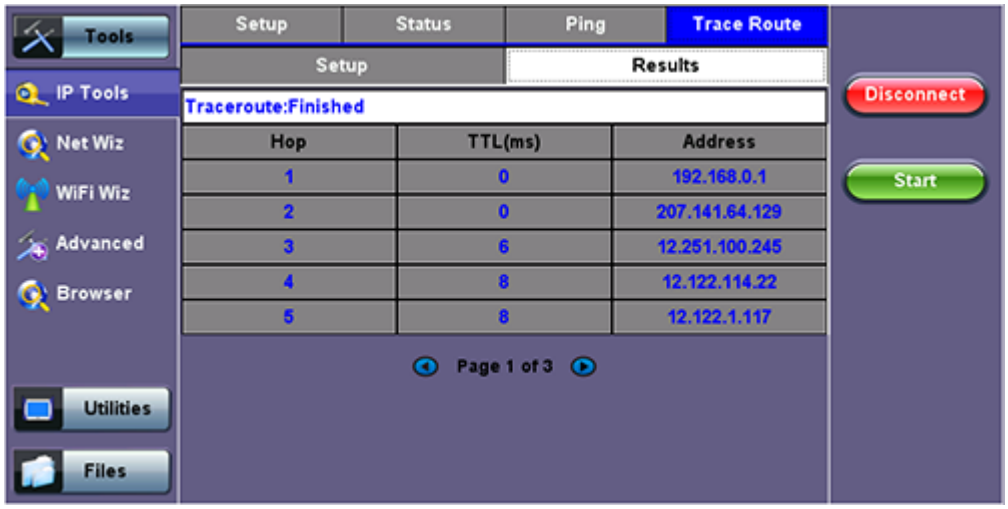
Trace Route Setup

Go back to top Go back to TOC

Trace Route 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.



Trace Route Result

Go back to top Go back to TOC

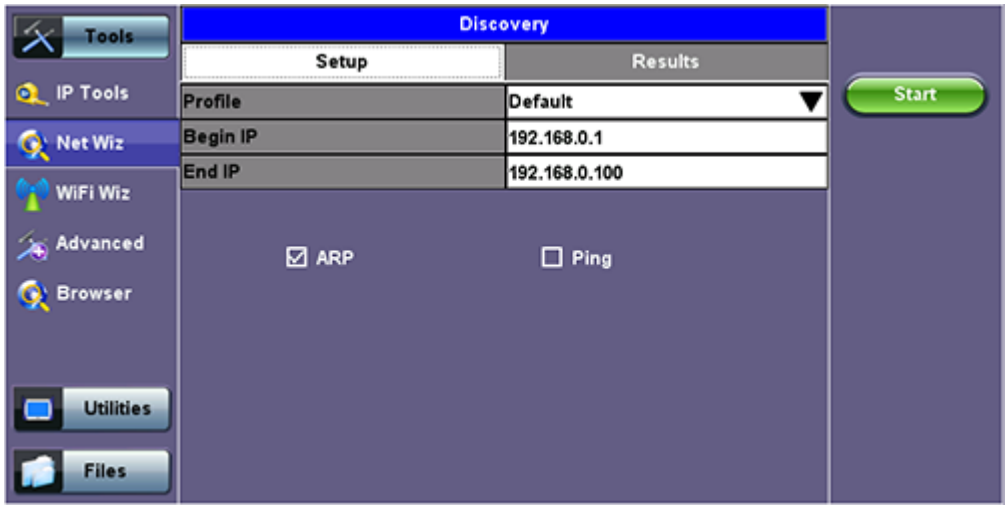
10.2 Net Wiz

Net Wiz verifies the status of each IP address in the selected range, by using ARP (Address Resolution Protocol) and ICMP test.

10.2.1 Net Wiz 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 the test by placing a check mark in the corresponding box of any of the following: ARP, Ping.



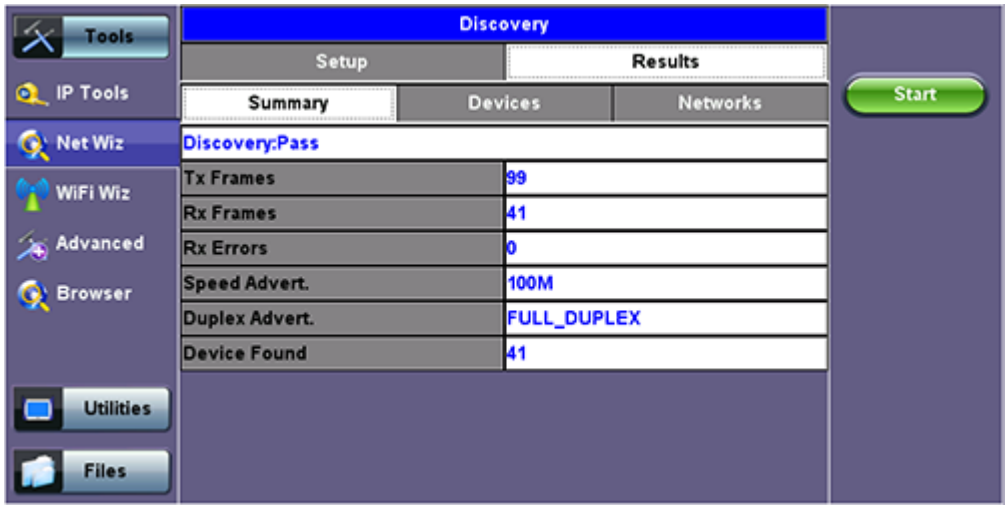
Net Wiz Setup

Go back to top Go back to TOC

10.2.2 Net Wiz Results

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
- **Device Found**: Total number of Devices and Networks found

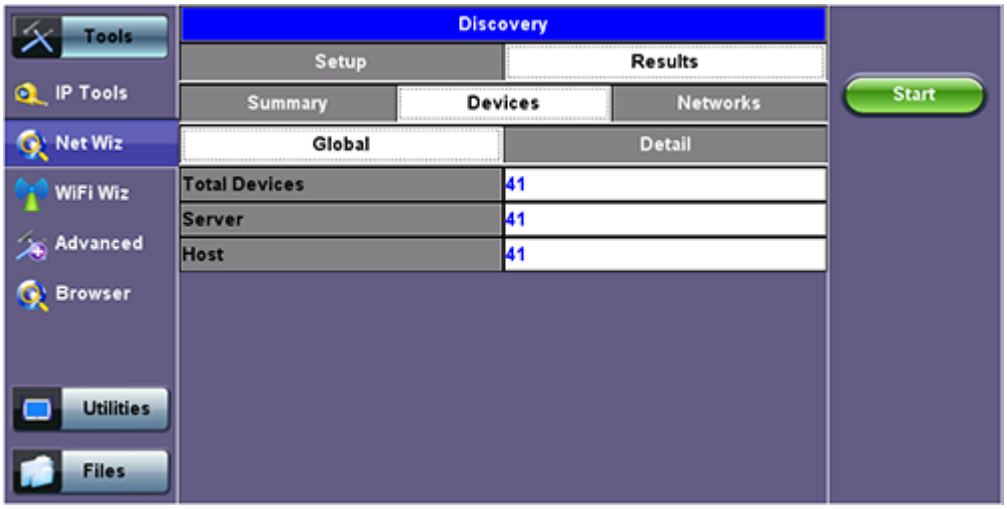


Net Wiz Results Summary

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

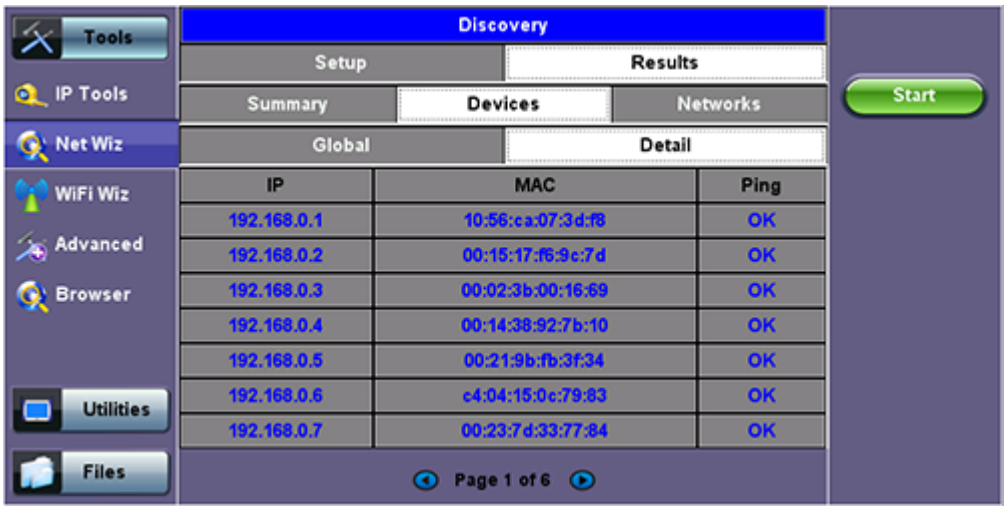
Global reports:

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



Net Wiz Results - Devices - Global

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

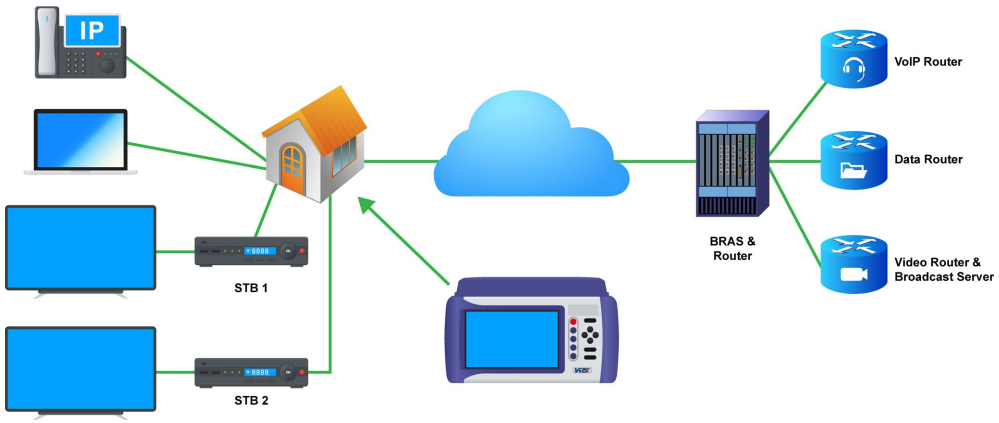


Net Wiz Results - Devices - Detail

Go back to top Go back to TOC

10.3 WiFi Wiz

The WiFi Wiz allows you to test wireless WiFi 802.11a,b,g,n,ac networks (based on capabilities supported by WiFi USB adaptor provided by VeEX). A typical application is shown below.



Typical WiFi Wiz Application

The WiFi Wiz function supports:

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

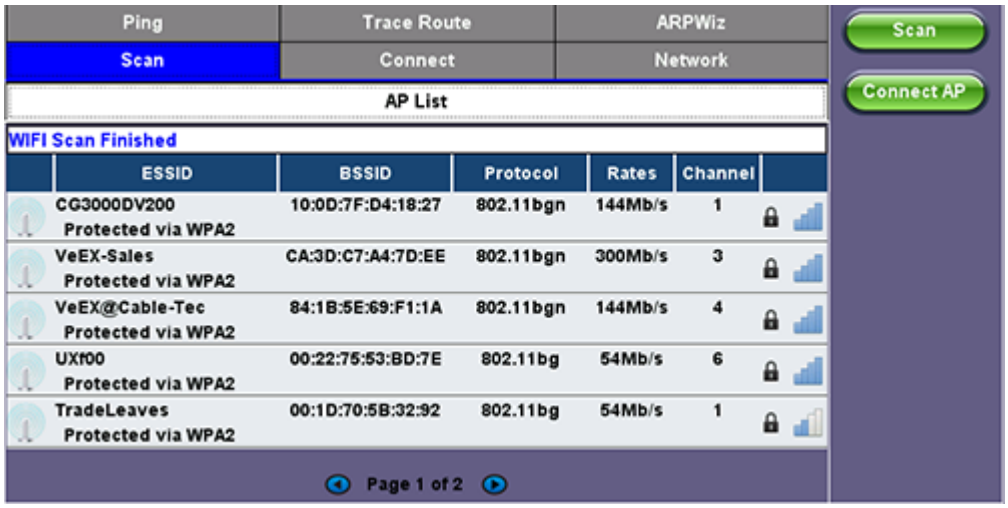
Go back to top Go back to TOC

10.3.1 WiFi Procedure

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

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

- Tap on the **Scan** tab once the test set has detected the wireless USB adaptor.



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

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.

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

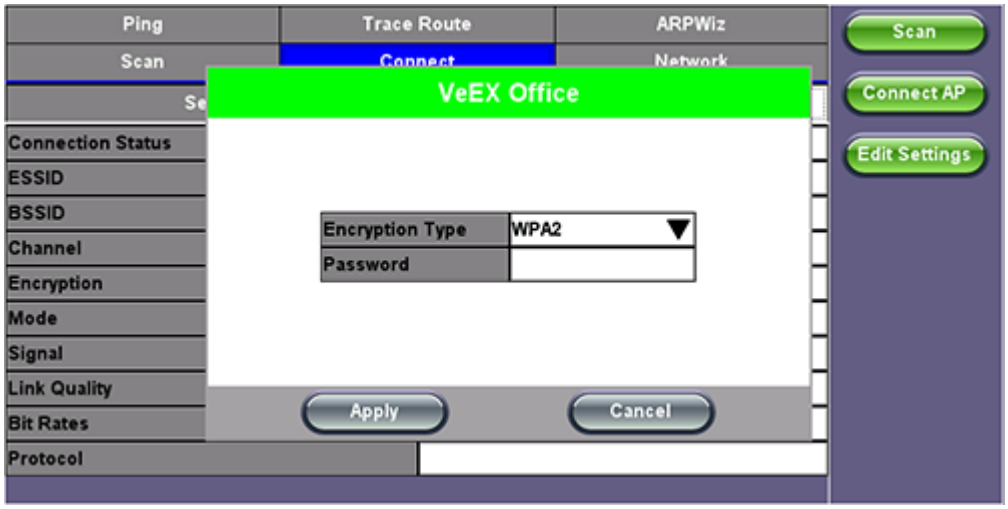
Once selected, an **Edit Settings** function key appears on the right hand side bar.

Tap on **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.
- **Key:** Security phrase or password necessary to access SSID and network. Tap the **Key** 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.

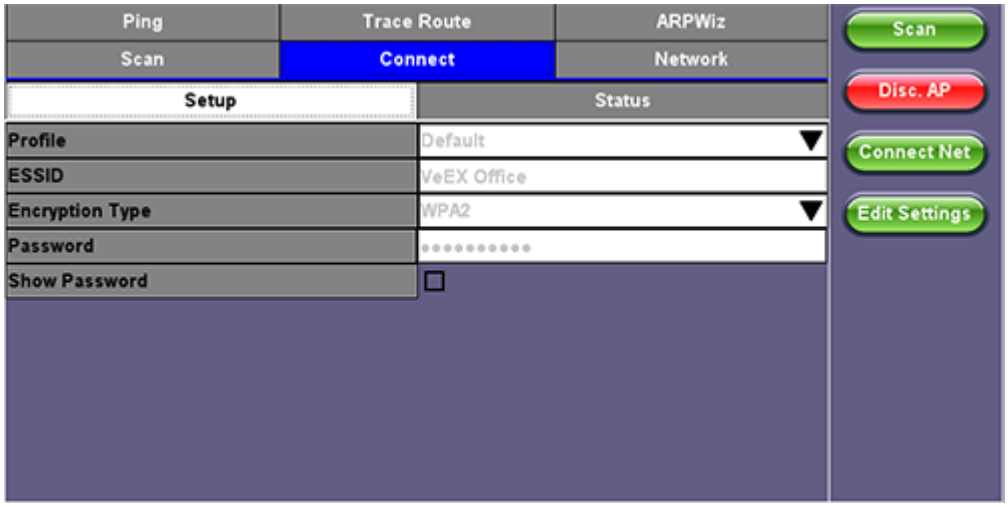
Tap **Apply** after selecting the Encryption Type and entering the Key. If the encryption menu was accessed via **Edit Settings**, press **Connect AP** to connect to the AP. If the encryption menu was accessed via **Connect AP**, the test set will automatically connect to the AP after hitting Apply.



WiFi Wiz - AP Encryption Settings

Connect

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

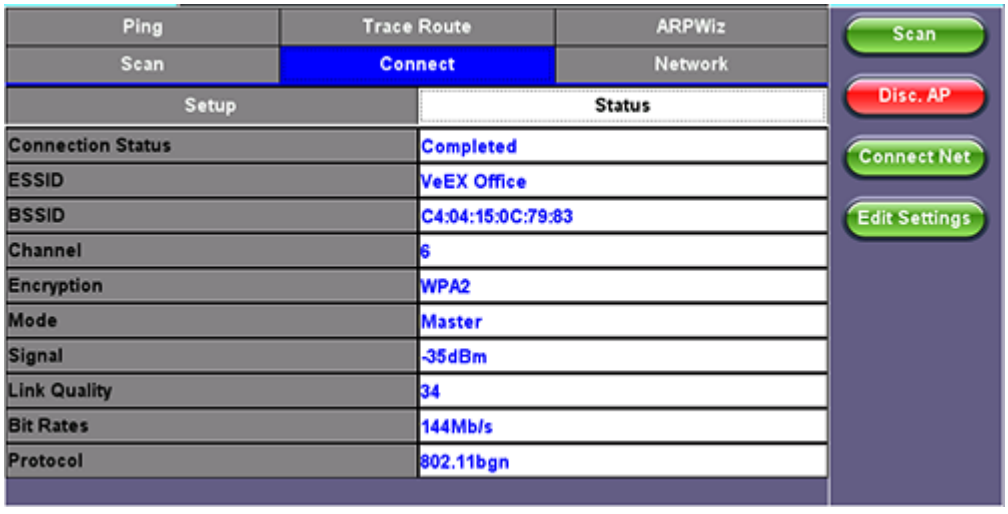


WiFi Wiz Connection Setup

Status

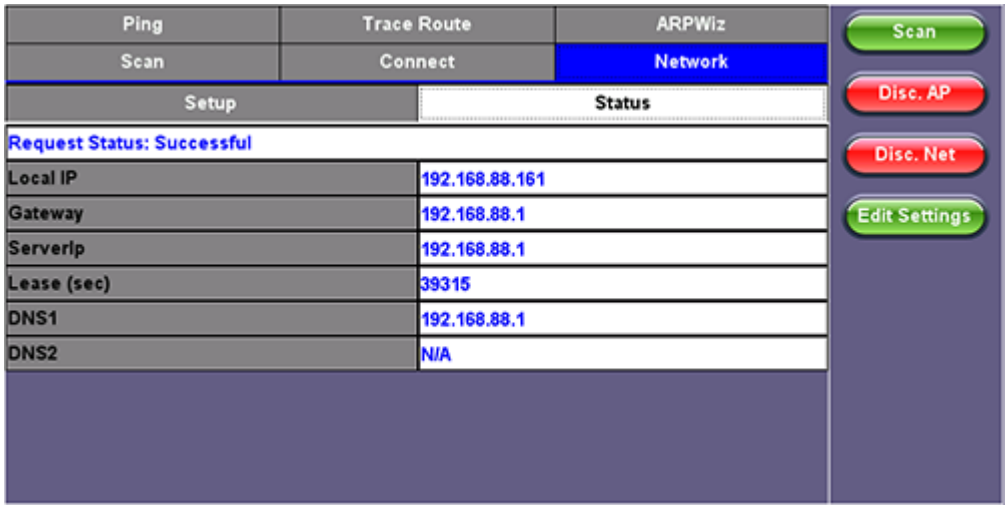
The Status Tab displays the following information on the connection:

- **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



WiFi Wiz Connection Status

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



WiFi Wiz Connect IP

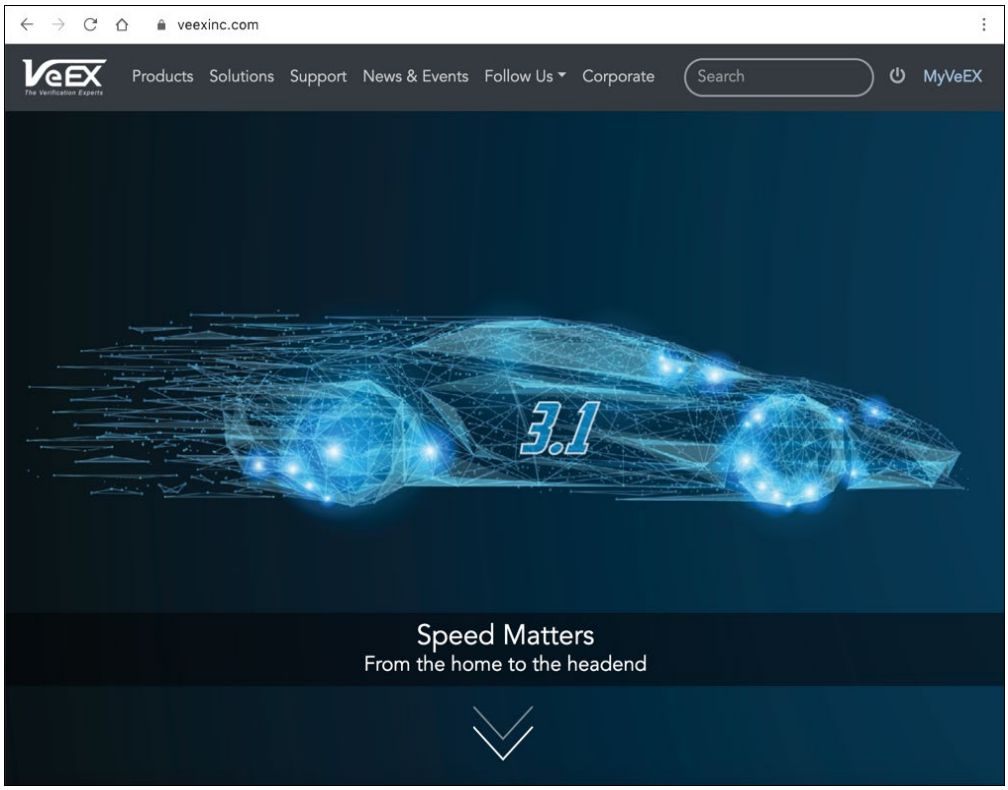
Go back to top Go back to TOC

10.4 Web Browser

A web browser is available in the **>Utilities >Tools > Browser** menu and can be used as a convenience (browse the web) or 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, WiFi or datacard ports.

The web browser defaults to VeEX's website. Use the Web browser's navigation bar to enter the name of the website you wish to reach.



Web Browser

Go back to top Go back to TOC

11.0 Utilities

11.1 Platform Settings

This section provides settings for the global parameters of the test set or platform (system settings).

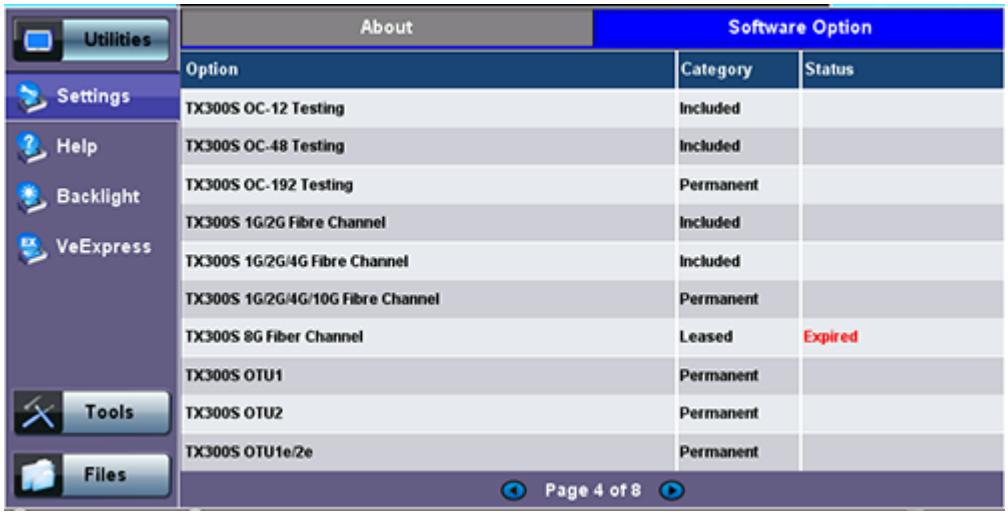
Settings Menu

Go back to top Go back to TOC

11.1.1 About

The **About** screen displays information about the software version, serial number, and MAC address of the management port of the unit, as well as a list of software licenses (optional test features) currently loaded in the test set.

Utility Settings - About

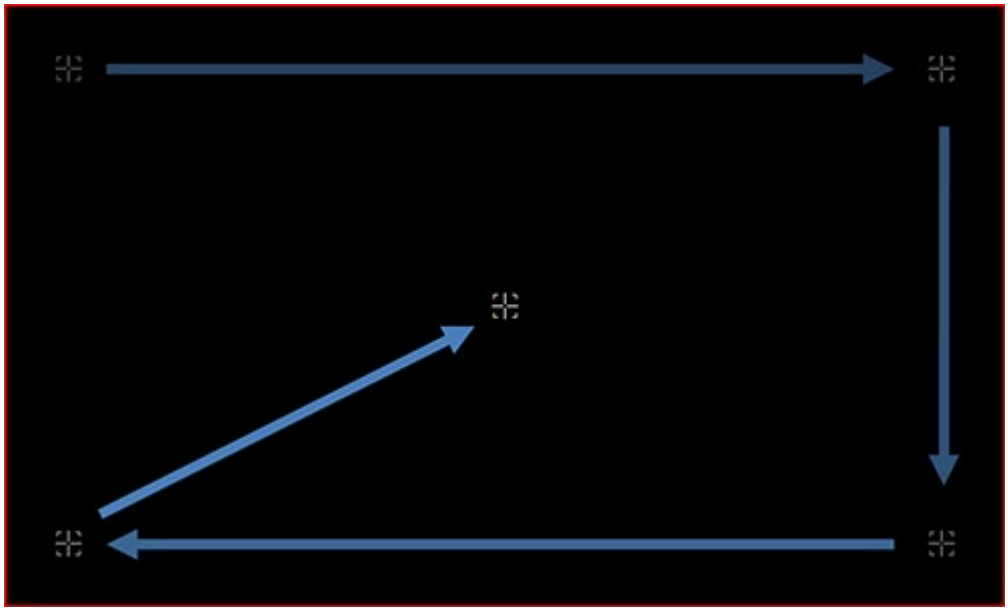


Utility Settings - About - Software Option

Go back to top Go back to TOC

11.1.2 Screen Calibration

Calibrate the touch screen using the **Screen Calibration** option.



Utility Settings - Screen Calibration

Follow the instructions and tap on the center of the five targets displayed at all four corners. A message displays when calibration is complete. If the touch screen is miscalibrated by mistake, use the cursor and enter keys to start the calibration feature and repeat the procedure.

Go back to top Go back to TOC

11.1.3 Bluetooth

VeEX products support a micro USB Bluetooth adaptor offering wireless connectivity up to 10 meters (30 feet). Ultra compact and portable, the adaptor provides an untethered connection between the tester and other Bluetooth compatible devices such as a Notebook PC or cell phone. Test results can be transferred quickly and easily without having to hassle with memory sticks or Ethernet connections.

An overview of the application is shown below.

Bluetooth Adaptors - Compatibility

Not all Bluetooth adaptors on the market are supported by the V300 product series. Please use adaptors that have been tested and supplied by VeEX only to ensure compatibility and correct operation.

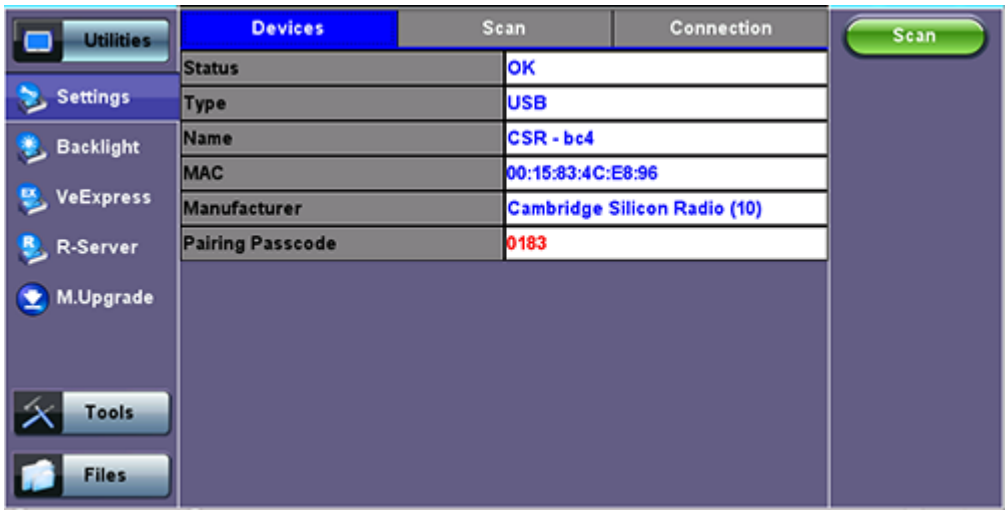
Go back to top Go back to TOC

Bluetooth Setup

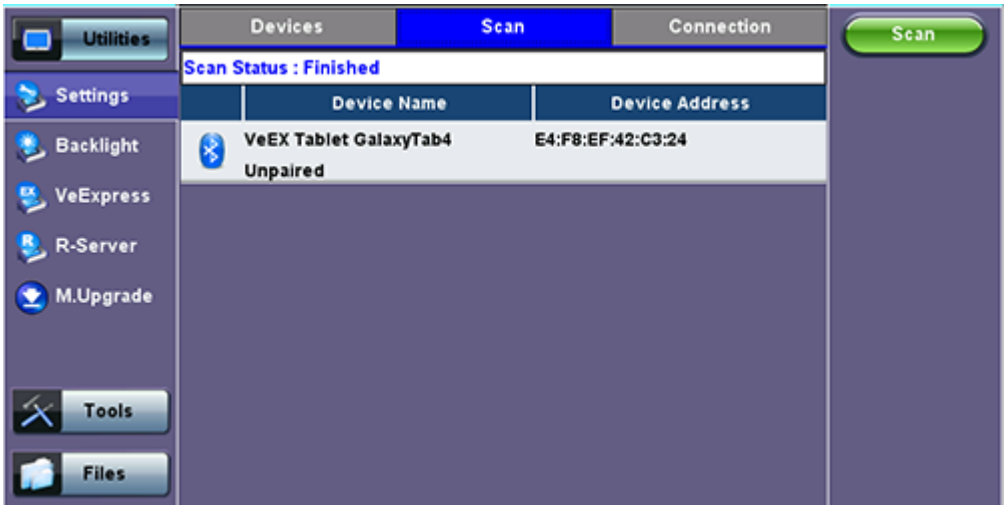
Insert the Bluetooth adaptor into the USB port on the side of unit. If you are using more than one USB device, use an external USB hub to connect additional devices. Once detected, a **Bluetooth** icon is displayed on screen.

Devices

The test platform will automatically detect the Bluetooth adaptor once plugged into the USB port. Details of the Bluetooth adaptor will be displayed including the MAC address of the device and the last 4 digits of the serial # of the V300 test set. The last 4 digits of the V300 series test set will be the pairing code between the unit and the external device. Press the **Connection** tab to view the passcode.



Bluetooth - Devices Tab



Bluetooth - Devices Tab

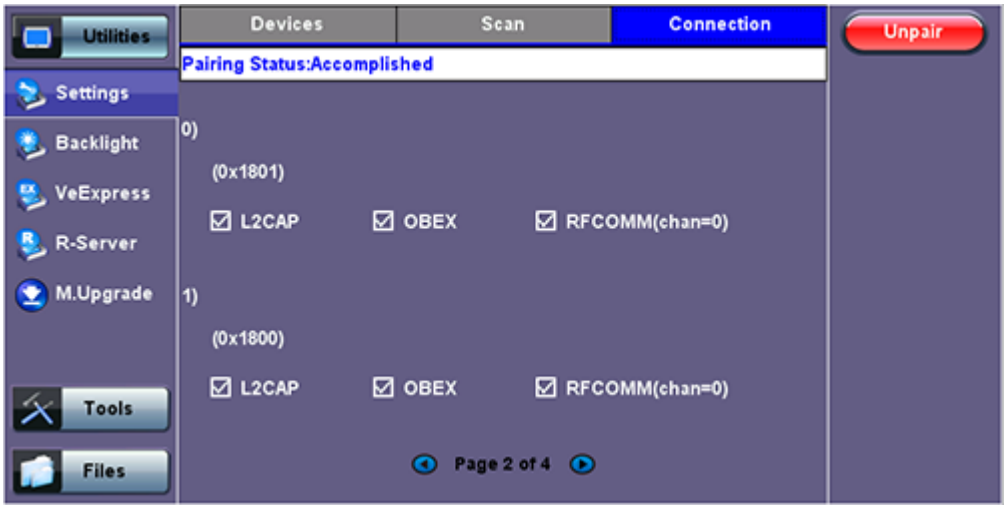
Bluetooth - Connection - Passcode

Go back to top Go back to TOC

Setup

- 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.
- 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 V300 serial number as shown in the **Connection** tab.
- Once paired, click the **Services** button at the bottom of the screen to check the service attributes. To upload test results via Bluetooth and Mobile phone to a UMTS or 3G network, full data upload service will be required.

Bluetooth - Connection Established

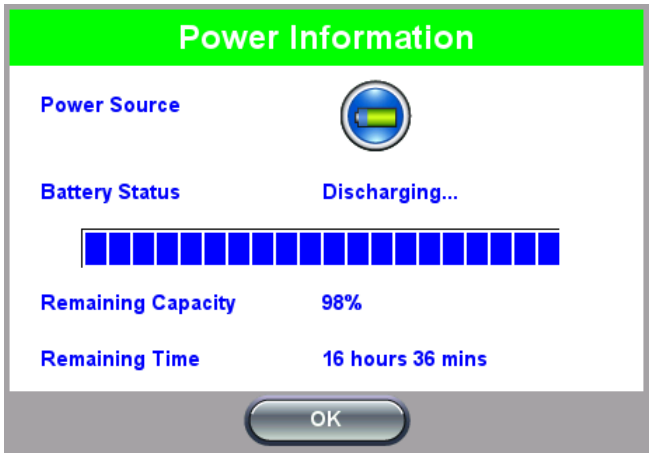


Bluetooth - Connection Page 2

Go back to top Go back to TOC

11.1.4 Power

The **Power** option provides information about current power source and information about the battery gauge. Tap on the battery icon, on the top bar, to bring battery charge and estimated autonomy information.



Utility Settings - Battery Power

Go back to top Go back to TOC

11.1.5 Backlight

Use **Backlight** option to control the backlight for the unit via Power and Brightness settings.

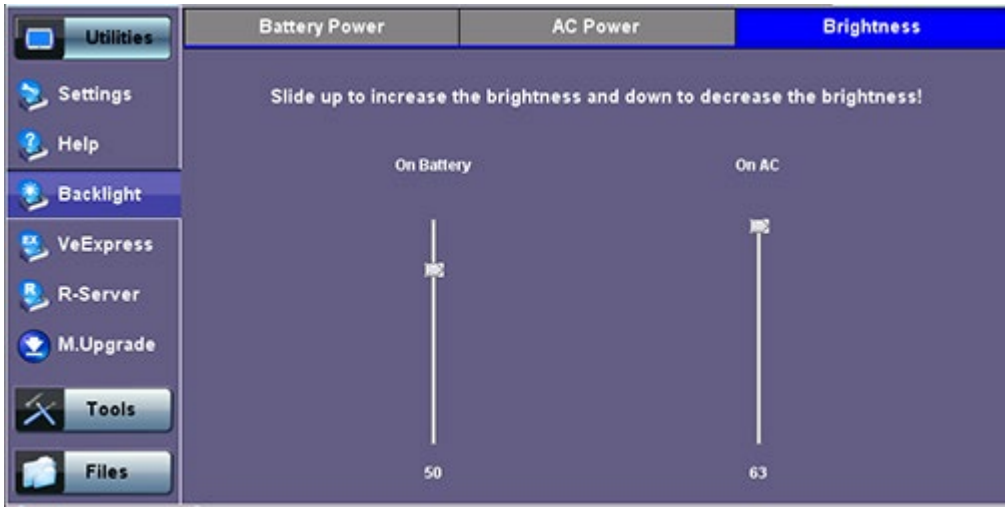
Battery Power/AC Power:

- 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

Backlight - AC Power

Brightness: Select the brightness level for Battery and AC operation modes.



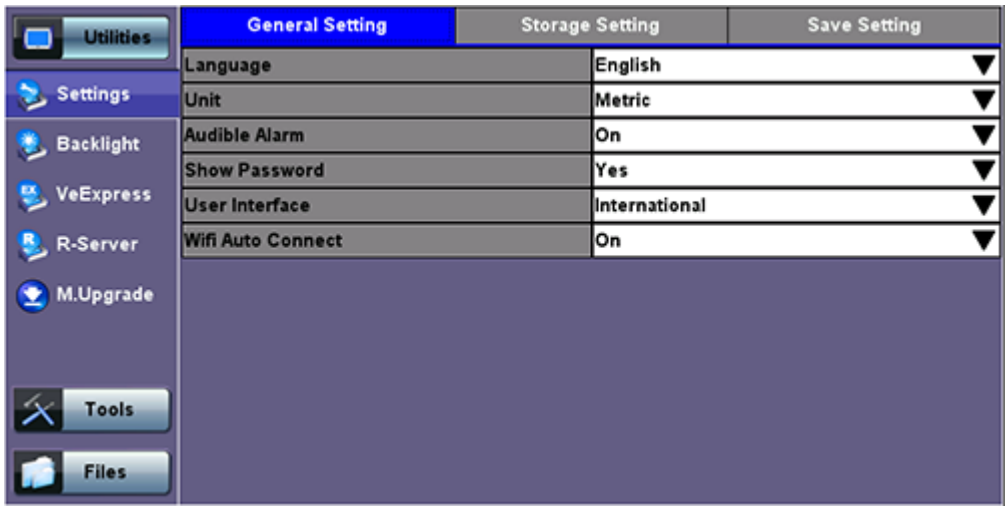
Backlight - Brightness

Go back to top Go back to TOC

11.1.6 Global Settings

General Setting

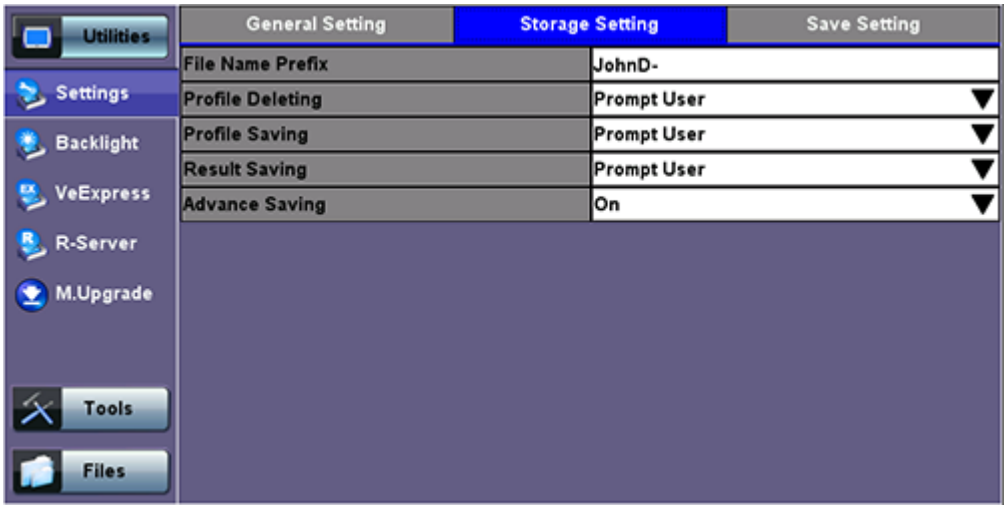
- **Language:** An alternative language for the user interface.
- **Units:** Measurement system (English - feet or Metric - meter)
- **Audible Alarm:** When enabled, the test set's buzzer will sound (beep) when alarms and errors are being detected.
- **Show Password:** Hides/shows username and password 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.



Utility Settings - General Setting

Storage Setting

- **File Name Prefix:** Tap on the box to enter the file name prefix using the pop up alphanumeric keypad
- **Profile Deleting:** Auto Delete or Prompt User
- **Profile Saving:** Auto Overwrite or Prompt User
- **Result Saving:** Manual or Prompt User
- **Advanced Saving:** On/Off. Turning ON allows the addition of extra information to the results file so it can be uploaded to a centralized R300 Server. Requires Advanced Management Option.



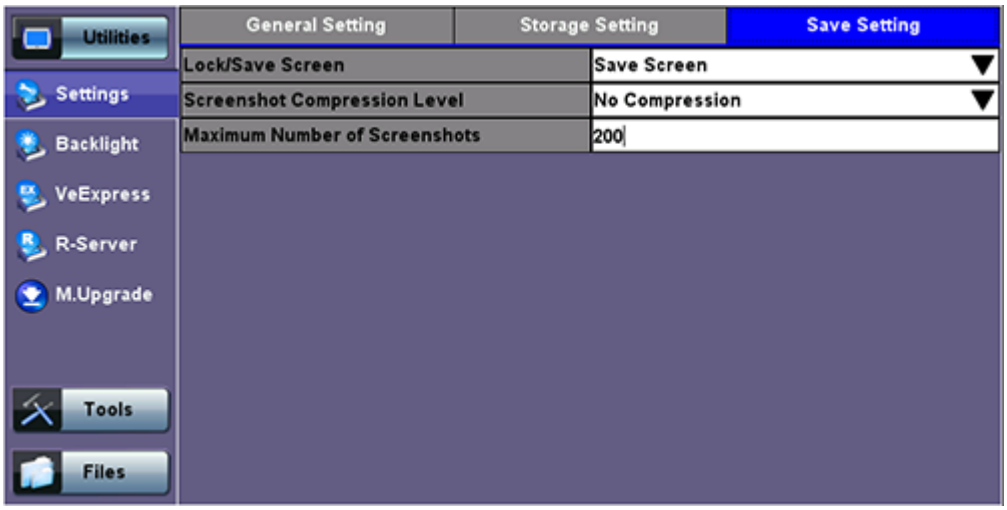
Utility Settings - Storage Setting

Save Screen Settings

Save Screen tab**:** Helps control the behavior of the Lock key on the keypad. The Lock key can be set to do the following:

- **Lock/Unlock** the unit's screen to prevent accidental interruption during a long term test.
- **Save Screen Shots:** The following configurations can also be done:
  - The compression level of the screen picture
  - Maximum number of screenshots that can be saved.

  Each time the lock key is pressed from the key pad a screen shot will be saved in memory. The screen shots can be recovered under Files>Saved.

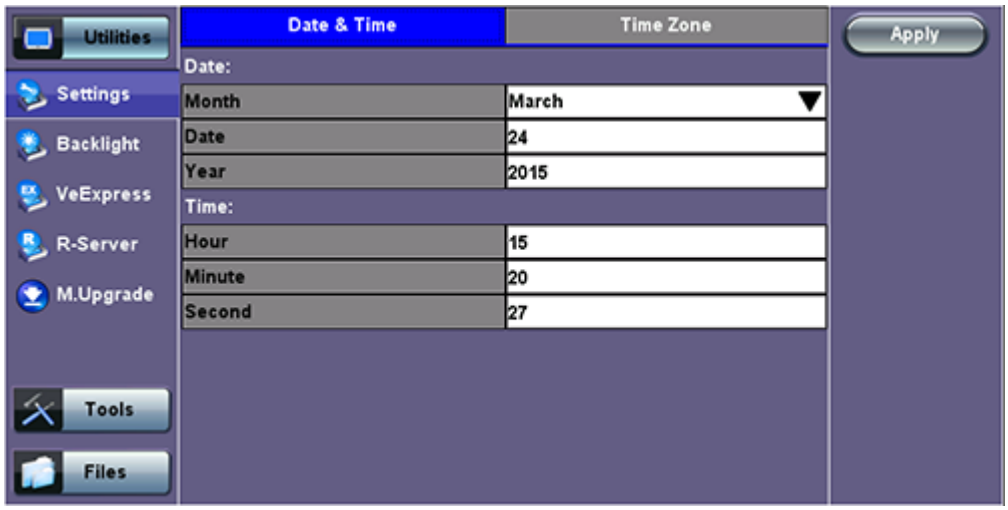


Utility Settings - Lock/Save Screen

Go back to top Go back to TOC

11.1.7 Date and Time

Use the **Date and Time** option to set the date and time. Daylight savings are automatically enabled in the utility.



Date Setup

Go back to top Go back to TOC

11.1.8 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:

- ReVeal PC software
- VNC Client

Go back to top Go back to TOC

ReVeal

Use this VeEX application to connect to the test set, using the platform's IP address. The ReVeal intuitive user interface offers the following functions:

- Test Profiles Management: Create, Edit, upload and download complex Ethernet and Fibre Channel test profiles (BERT, Throughput, RFC2544, Y1564 SAM, Scan, IP, Ping/Trace, Packet Capture, etc)
- Test Results Management: Download results from the test set, manage local test results (PC HDD), generate detailed test reports, export to CSV or PDF, and print.
- View software options, licenses, serial numbers, perform remote software updates

ReVeal is a Windows® application that can be downloaded free of charge from www.veexinc.com.

Connect remotely from a desktop PC via ReVeal tool software or through Remote Access on the test set. To proceed with remote access, make sure that remote control software is installed on the PC device. Configure the Profile, VNC Server Service, Web Service, VNC and Web passwords on the Remote Access page. Input the test set IP address and specified user password when prompted by the software to initiate Remote Access. For more information, see the *ReVeal User Manual* at www.veexinc.com.

Go back to Remote Access

Go back to top Go back to TOC

Remote access with VNC Server/Viewer:

The test set VNC service can be managed in **>Utilities >Settings >More >Remote Access** menu, to enable or disable the VNC server and assign remote access passwords.

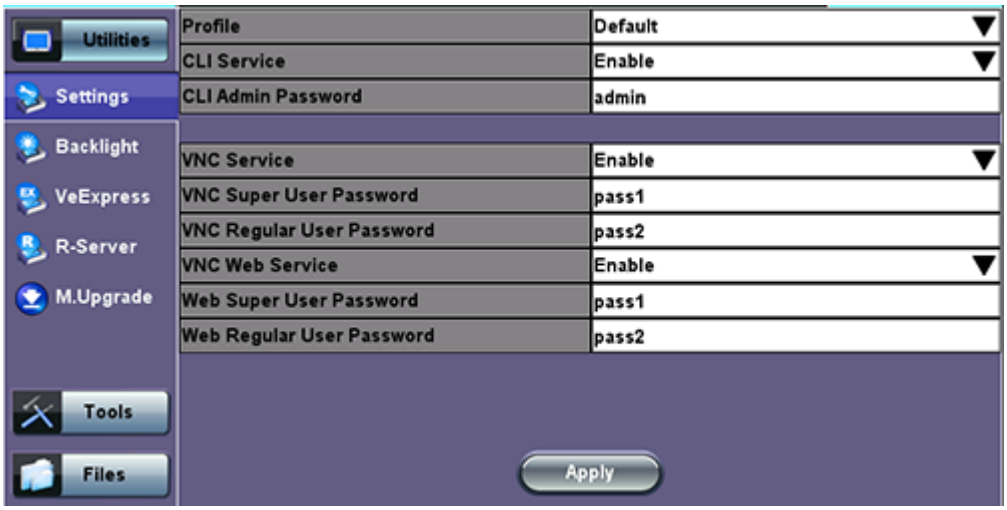
- **Super User Password:** Allows remote VNC clients to view and control the user interface via mouse.
- **Regular User Password:** Allows remote VNC users (guests) to view what's currently on the test set screen, but no interactions with the GUI are allowed.

Although the test set VNC services allows multiple users to be connected simultaneously, it is a screen mirroring service, so all users would be seeing and interacting with the same GUI. Such feature can certainly be used for training purposes, but it is not recommended for multi-user or multi-test environments.

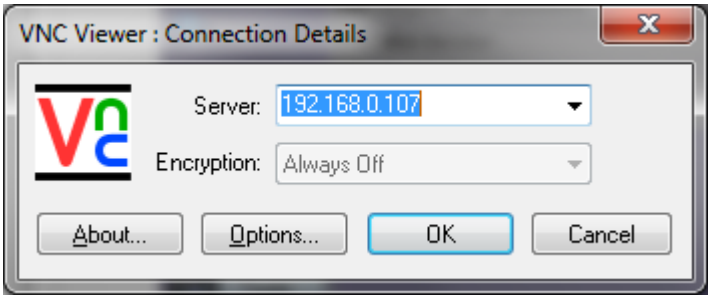
VNC clients, such as RealVNC®, are readily available for download for different platforms and form factors, including Windows®. Mac OS®, Linux, iOS, Android.

- **VNC Service:** Enable or disable the remote access to remote VNC clients running on PCs, Macs, tablets or smart phones.
- **VNC Super User Password:** Defines the password for users allowed to control the test set via standard VNC clients.
- **VNC Regular User Password:** Defines the password given to users who are only allowed to view the test set current screen via standard VNC clients, but not make any changes to test or test set.

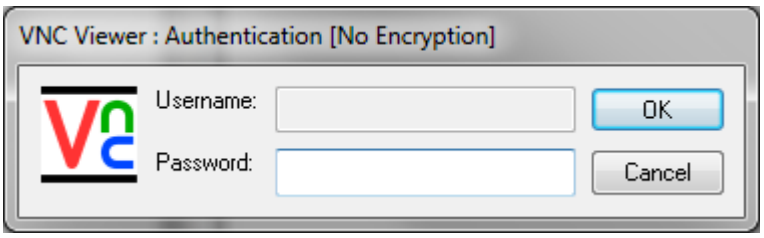
After configuring these settings in the Remote Access menu, run VNC on the PC. A message box will prompt the user to enter a Server number, which is the test set IP address. Enter the VNC Super/Regular password when prompted by the message box for a password.



Remote Access



VNC Viewer - Enter Server Address



VNC Viewer - Password Prompt

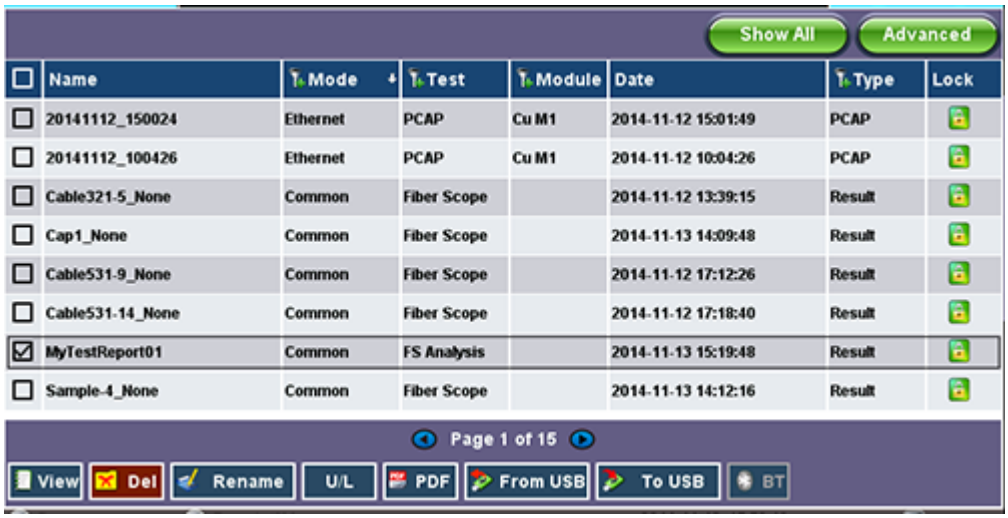
Go back to Remote Access

Go back to top Go back to TOC

12.0 File Management

The test unit's **File Manager** displays saved results, profiles, and images stored on the unit. The saved file can be exported to PDF, a USB stick, or through Bluetooth to a PC, Tablet or other mobile device.

To access saved files, select **Utilities>Files>Saved**.



File Manager

Go back to top Go back to TOC

12.1 File Manager: Working with Saved Results, Profiles, Images

Always use the stylus provided with the unit to files and perform files functions.

Tap the check box to select the desired files and perform functions.

Sorting/Filtering Files

- Use **File Filters** to isolate desired types of results from all other test results stored in the test set and reduce the number of pages displayed.
- Tap any column header to sort by that specific parameter in ascending or descending order. Tap again to change the sorting order.
- Tap **Show All** to reset filters.

File Functions

- **View**: Displays the results on the unit.
- **Del:** Deletes the file.
- **Rename**: Renames the file.
- **U/L**: Unlocks/Locks the file to prevent accidental deletion.
- **PDF**: Select the results file, then tap PDF at the bottom. A "*PDF file will be generated to USB disk*" message appears. Tap **Yes**.
- **From USB**: Imports files from a connected USB memory device.
- **To USB**: Select the results file, then tap To USB at the bottom. If a USB memory device is plugged in, the file will be exported to it. Each file is saved into its own folder using the "MyVeEX" tree directory format.

Transferring files via the USB port requires a FAT32 USB stick.

- **BT**: Transfers files to and from a paired device (*requires a compatible USB dongle*).

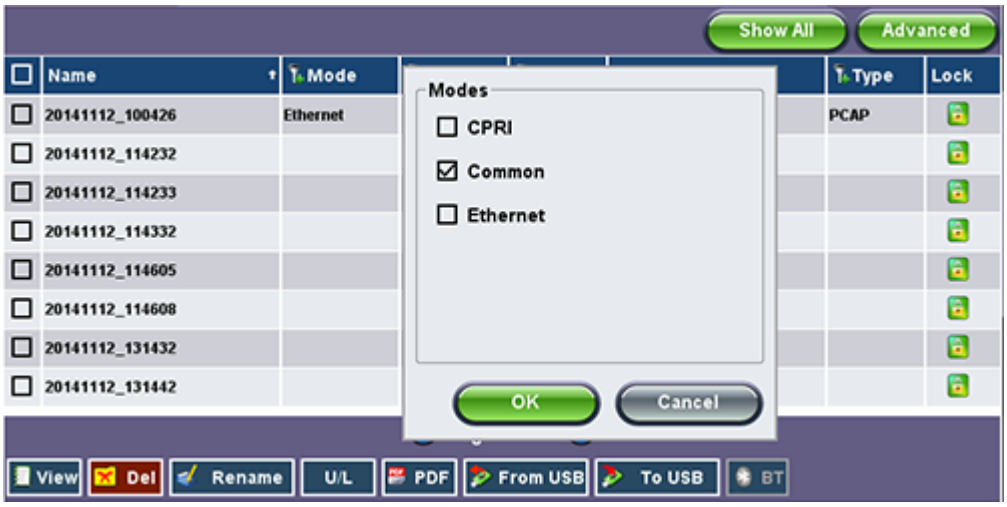
File Manager: Save Files

12.1.1 Backup and Restore Files

Backup and restore files using a FAT32 compatible USB stick inserted into the test unit or via Bluetooth® File Transfer (*requires compatible USB dongle)*.

USB:

- Tap the file(s) to transfer, then tap **To USB** to copy the selected files to the USB stick or tap **From USB** to restore all files from the USB stick.



File Manager: Backup and Restore Files

Bluetooth: *This function requires a compatible USB dongle. For more information, see Bluetooth.*

- **To Export using Bluetooth *(optional)*:** Select the results file, then tap **BT** at the bottom. The device automatically scans for devices. After pairing the device, tap **Send**. The file will be exported to the paired PC or Mobile device.
- **To Export to a Tablet:** Using a Bluetooth dongle accessory, select the results file, then click **BT** at the bottom. The device automatically scans for devices. After pairing the device, click **Send**. The file will be exported to the paired PC or Mobile device.

Go back to top Go back to TOC

13.0 Setup - Main Menu

The Main menu contains CX380C related system operation and parameter settings. Select the **Setup** option 

in the left panel to access the **Setup** screen.

- **Channel Table**
- **Default Location**

  *For more information on setting up **Channel Tables**, **Locations**, and **Test Point Compensation**, see Section 6.0 Setup.*

- **Tilt A&D Start Mode** - Select the Tilt 'A&D Combined' mode to start in Graph or Table mode.
- **Unit** - Changes the display unit between dBmV and dBuV.
- **TP Compensation** - Turns the Test Point (TP) compensation On or Off. Create or edit the name of test point locations and the associated compensation value is added to the level measurement results.
- **VeCheck Scan Range** - Select the maximum of the frequency range for the advanced system scan.
- **VeCheck Scan Type** - Select the channels to scan or use the pre-configured channel table.
- **Analog C/N Offset** - Sets the offset frequency for the noise measurement, 1.00 MHz to +2.50 MHz.
- **Hum Zone** - Sets the Hum/low frequency of a known disturbance or connection causing distortion.
- **D3.1 OFDM Table** - Create and edit OFDM channel table.

  The OFDM Table feature is applicable only for Japan.

- **TDR Cable Type** - Select type of cable to assess.
- **Table Lock** - Locks the channel table to prevent accidentally erasing of pre-stored channel tables.
- **Sweep table (RP)** - Create or edit return path sweep tables.

  This feature is currently not supported.

- **CaLan Master Profile** - Select the CaLan 3010H+ profile to use.
- **Upstream Bound** - Set the Upstream Path frequency.

Setup - Main Menu

Go back to top Go back to TOC

14.0 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 Compliance

VeEX 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.

ROHS Statement

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 the VeEX web site at www.veexinc.com/RoHS.

Go back to top Go back to TOC

15.0 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.

VeEX Incorporated
2827 Lakeview Court
Fremont, CA 94538
USA
Tel: +1 510 651 0500
Fax: +1 510 651 0505

Customer Care

Tel: + 1 510 651 0500
Email: customercare@veexinc.com

Go back to top Go back to TOC