OneExpert CATV

Extended Quick Start Guide
ONX-620 + ONX-630 Sweep

June 2018 – Update release v3.8

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✓ 3 - OneExpert CATV - Features Overview

OneExpert CATV – ONX-620

Simple - Every technician is an expert

- **Channel Plans** built by the meter **automatically**
- **Sweep, align, and troubleshoot faster than ever. Stealth™ sweep** with integrated tilt/align quickly validates amps and HFC networks faster than any other test.
- Dashboard simplifies and **identifies RF issues**
- **Expertise is built in –** Session Expert™ identifies issues and helps technicians fix them
- Connects to the cloud – quickly and easily – ensuring consistency via StrataSync™

Fast - Testing and Troubleshooting faster than ever

- Downstream scan *including* MER/BER in **about 60sec.**
- Ingress and Downstream testing performed **simultaneously**
- 15x more Downstream coverage in half the time

Powerful- Get the most from your investment

- **32x8 DOCSIS 3.0**, Wi-Fi, Ethernet **1Gbps – DOCSIS 3.1 service testing**
- Network expansion ready - dual diplexers - 65 & 204 MHz networks
- **Add on module** capable to support future need
- Field exchangeable DOCSIS & RF unit reduces cost of ownership

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OneExpert CATV - ONX-630 - Sweep

Fast – Sweep, Align and Troubleshoot faster than ever

- Stealth™ Sweep with integrated Tilt/Align quickly validates amps and HFC networks faster than any other test
- Downstream scan *including* MER/BER in **about 60sec.**
- AutoChannel™ instantly identifies channel lineup and eliminates guesswork

Powerful – Designed to find difficult problems

- Combined DOCSIS 3.1 and Sweep testing validates the complete HFC network
- Ingress Expert with Hyper Spectrum™ catches difficult return noise problems
- Expert modes with advanced parallel processing finds hidden problems and root cause
- 40+ Years of trusted CATV testing knowledge integrated into one simple device

Flexible – Ready for your changing network needs

- *Dual Diplexer 42/85 or 65/204 with 1.2GHz support for next generation networks*
- Fiber Scope and Power Meter support for FTTx and fiber deep networks
- Gigabit Service testing over DOCSIS, Ethernet and WiFi
- Compatible with DSAM-6300 and SDA-55XX simplifies transition to new platform
- Common Sweep reporting for ONX-630 and DSAM ensuring consistency via StrataSync™

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OneExpert advanced capabilities

- **Multi-touch**, user-friendly interface is similar to smart devices.
- **StrataSync™** cloud-enabled architecture provides easy asset and test data management.
- **OneExpert CATV** is first cable installation/service meter with DOCSIS 3.1 service test capability (also **32x8 bonding**)
- **Simple, Fast, Powerful** – this is the OneExpert CATV
- **Simple upgradeability**
  - All units are DOCSIS 3.1 capable
  - D3.1 capability can be activated with a purchased key code
- **Associated Products**
  - **WiFi Advisor**
  - **P5000i** Fiber Scope
  - **MP-80** Optical Power meter
  - **StrataSync**
  - **SmartID**
  - Bluetooth devices
  - Mobile Sync App
  - Seeker HL – home leakage testing

MP-60/80
Optical Power Meter

SmartID

P5000i Fiber Scope

WiFi Advisor

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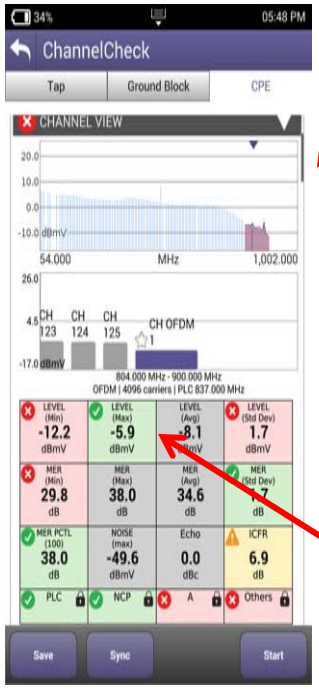
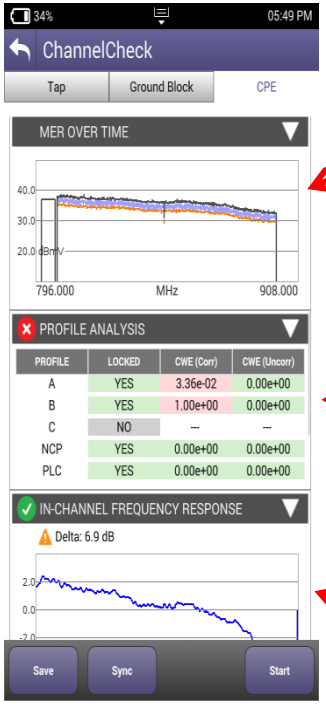
OneExpert CATV DOCSIS 3.1 Innovation



Identify **Downstream OFDM carrier** in the lineup

Downstream scan measurement requires no learning curve, same as DOCSIS 3.0 scan, but shows OFDM signal

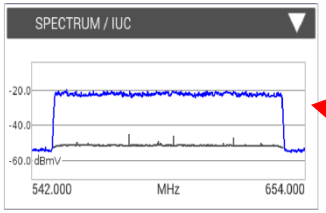
Overall OFDM carrier performance metrics including best and worst case; simple pass/fail indications



MER over entire OFDM channel provides insight into why higher tier profiles are failing

Analysis of different profiles available and which profiles can be supported at test location

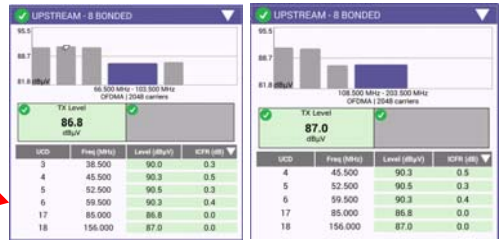
In-Channel Response identifies roll-off and excessive ripple



Spectrum and noise identify portions of carrier where degradation may occur

OneExpert CATV with DOCSIS 3.1

- OFDM demodulation with D3.1 Profile Analysis
- **Full DOCSIS service testing**
- **including 32 Bonded + DOCSIS 3.1 OFDM carrier**
- **Upstream DOCSIS OFDM-A**



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What's new in v3.6.9?

Feature	Model Compatibility
Customizable menus – hides unused features to simplify operation according to specific tech procedures	Standard – All Models
SmartID full frequency support – test premises coax wiring to 1,600 MHz to locate splitters or impairments for performance verification and troubleshooting	SmartID support is standard on all models
WiFi Advisor, Smart Channel Wizard – Simplified user interface for easier home WiFi network optimization and troubleshooting	WiFi Advisor support is standard on all models
QuickCheck Expert – full scan, use saved channel plan for comparison	ONX-620 – Optional ONX-630 – Standard
HomeTDR – Time domain reflectometer mode for cable length check, home network component and cable damage location	Optional – All Models

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What's new in v3.6.20?

Feature	Model Compatibility
Mobile Tech – Sync meter config data via mobile device from StrataSync to ONX - Several Bluetooth connection improvements for both Android and iOS- Added geolocation data to test reports. The data is only available if the technician is connected to the OneExpert CATV meter via the Mobile Tech app.	Standard – All Models
Improvement time to first measurement – Port 1 measurement (Channel Check/Expert, DOCSIS Check/Expert, OneCheck)	Standard – All Models
Sweep – Added a yellow highlighted area to the graph to help indicate that the sweep measurement plan is causing the ONX to measure below or above acceptable diplexer frequency ranges.	ONX-630-SWX Standard
Ethernet Test – Speedtest – Added support for Ookla Speedtest	Optional – IPX Models
OFDM measurements – Channel/DOCSIS Expert - Added MER Subcarrier Plot full screen graph that can be opened from the MER Variations Widget. Also added MER Subcarrier plots to HTML report. - Added OFDM Profile MER Max Modulation to OFDM Profile Analysis widget - Also added OFDM Profile MER Max Modulation to the HTML report.	NTX / SWX package - Standard
HomeTDR – Improvements to Home TDR and PosiScan drop length calculation on sweep capable hardware - Added return loss for max reflection on Drop Check and Cable Length screens	Optional – All Models
StrataSync - easily identify in which time zone the meter is currently operating - Added StrataSync config item labels to HTML test reports- Added geolocation data to test reports. (Mobile Tech app) - Added support for StrataSync assigned time and time zone on the ONX. - Improved connection checks and error messages (sync) .	Standard – All Models

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What's new in v3.8.x?

Feature	Model Compatibility
Home Leakage Option – Works in conjunction with the Seeker HL transmitter to perform home coaxial network "pressure tests" to find leaks caused by damaged cable/components or craftsmanship issues, and to mitigate ingress.	Optional – All Models
OneCheck Retest – specific test sections can be retested without running the entire set of OneCheck tests	Standard – All Models
Specify Throughput Server – Select a specific throughput server URL set in DOCSIS service plan	Standard – All Models
Specify Cable Modem Emulation Type – choose DOCSIS 3.0 or 3.1 emulation	DOCSIS 3.1 Units Only
Metadata updates – including problems detected information	Standard – All Models
New Configuration Notification – Sync success provides new configuration notification	Standard – All Models

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- ✓ 11 – System Settings Overview
  - Control Keys, Ports, LEDs, system keys
  - User interface, Tray menu
  - Home screen
  - System settings

Controls and keys

Network Indicator **LEDs**

High Sensitivity **Touch Screen**

Shortcut Buttons

Short Cut Hard keys – **Functions keys**

Navigation Directional Buttons

Back, Home Screen, and Utility Buttons

Power On/Off Button

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Interfaces

Port 2 – RF Ingress Port
Connect to upstream from house for Ingress Scan

Port 1 – RF US/DS Analysis
DOCSIS, QAM

D-Ring

Dual 10/100/1000 RJ45 Ports

Dual USB 2.0 Ports

Battery Charger Port (under flap)

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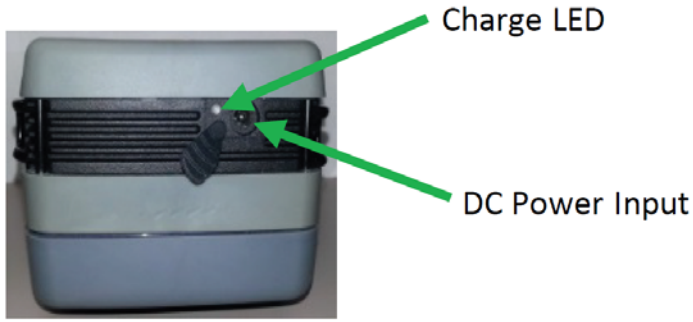
Power LED - Systems Keys

Bottom Panel

The right side panel contains the following ports:



SYSTEM KEYS

Under the Navigation arrow keys, there are three System keys:

Back/Cancel
Go back to the previous menu

Home
Return to the main/home screen

Tray
Launch the Tray Menu

The DC Power Input, located on the bottom of the instrument, is used to connect the AC adapter.

The Charge LED located next to the power input indicates that the adapter is connected.

- Solid green indicates that charging is complete.
- Slow flashing red indicates that the battery charge is critically low, and less than 10%.
- Fast flashing red indicates that the charging was suspended due to a fault and user intervention is necessary (for example, an incorrect charger is attached).
- Solid red indicates that the charging was suspended due to overheating. The unit can continue to run, and no user intervention necessary.
- Solid amber indicates that the battery is charging.

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LED's

Error – Solid red indicates error and alarm conditions. The type of error varies and depends on the application.

Sync – Reports the status of modem synchronization.

- Blinking green indicates that the modem is ranging.
- Solid green indicates that the modem has successfully ranged.

Network – Indicates the status of network connectivity.

- Blinking green indicates that the unit is acquiring an IP address.
- Solid green indicates that an IP address has been acquired.
- Blinking amber indicates a timeout – the unit was unable to acquire an IP address.
- If the LED is not illuminated, the network is not active – either the unit is not connected or it is logged off.

Batt – A multi-color LED that indicates the battery status.

- Solid green indicates that either the battery charge is higher than 30%, or that an external source is powering the unit.
- Solid red indicates that the battery charge is critically low, and less than 10%.
- Solid amber indicates that the battery is getting low, and the charge is between 10% and 30%.

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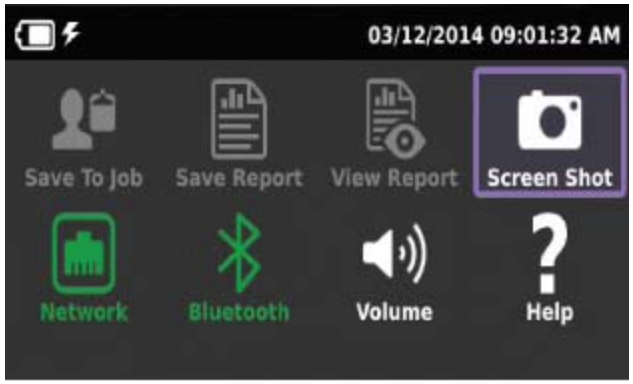
Tray Menu



USING THE TRAY MENU

The tray menu allows access to commonly used functions. It can be accessed either by pressing the Tray system key or by swiping downward from the top of the LCD.

Hint:

A long push on TRAY key will automatically start a screen capture. It is useful when a short Tray key push doesn't open the Tray menu (when for example a function key menu is open)

SAVE TO JOB – Saves the results to job ticket.

SAVE TO REPORT – Saves the results to a report. Formats available: XML, PDF, or HTML.

VIEW REPORT – Views a saved report. Select View Report and then select the saved report to view. If there are no saved reports, the text will be grayed out.

SCREENSHOT – Takes a screen capture of the current menu (the screen you were viewing when you launched the tray menu).

NETWORK – Enables or disables the home/Ethernet network.

BLUETOOTH – Enables or disables Bluetooth.

VOLUME – Control the device volume.

HELP – Provides TAC phone numbers.

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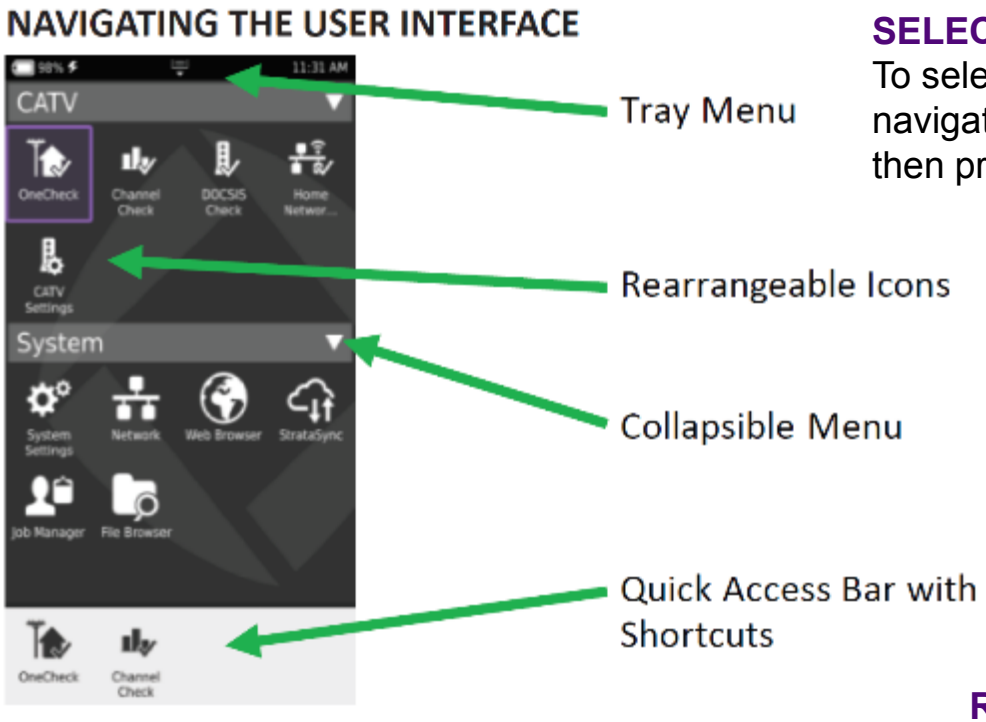
User interface



SELECTING A MENU

To select a menu, either touch the item or use the arrow navigation keys to highlight the desired menu item and then press the OK key.

COLLAPSIBLE MENUS

Each main item is a collapsible menu. Touch the triangle on the right (the triangle rotates from pointing left to pointing down) or use the arrow keys to highlight the menu item and then press the OK key.

SHORTCUTS

- If you have a test or function that you use frequently you can make it a shortcut.
- Touch and hold the icon for the function and then drag it to the bottom of the screen to create a shortcut.
- You can create up to four shortcuts.
- To remove the shortcut, drag it off the shortcut bar.

REARRANGING ICONS

- You can rearrange icons within a menu for tests or functions you use frequently.
- To rearrange icons inside a menu, touch and hold the icon and then drag it to the new location.

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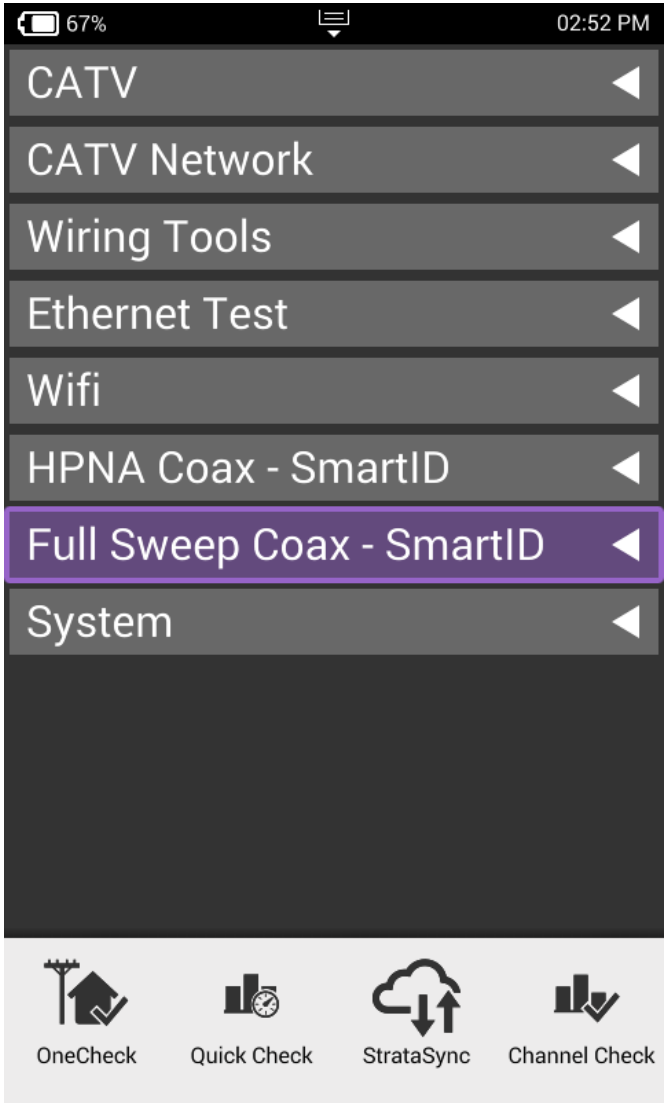
Home Screen



Home Screen is default when ONX is turned on

- It can be reached by selecting the Home Screen button above the On/Off Button
- Back Button also returns the user to the Home Screen

Each **Menu option** is labeled and can be opened or collapsed by the triangle buttons to the right

Shortcuts are located across the bottom and can be customized by selecting an icon and dragging it to the shortcut bar

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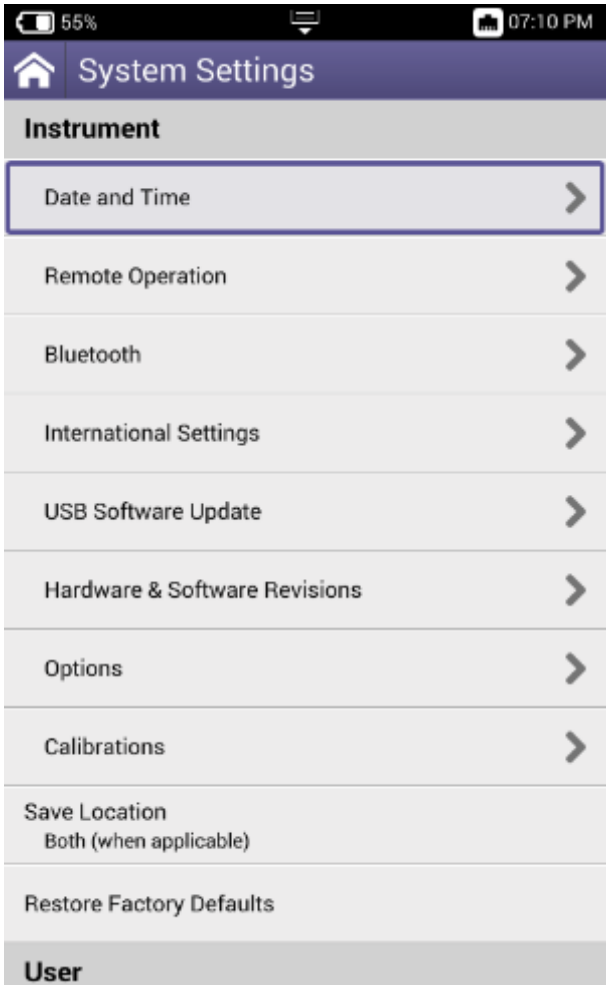
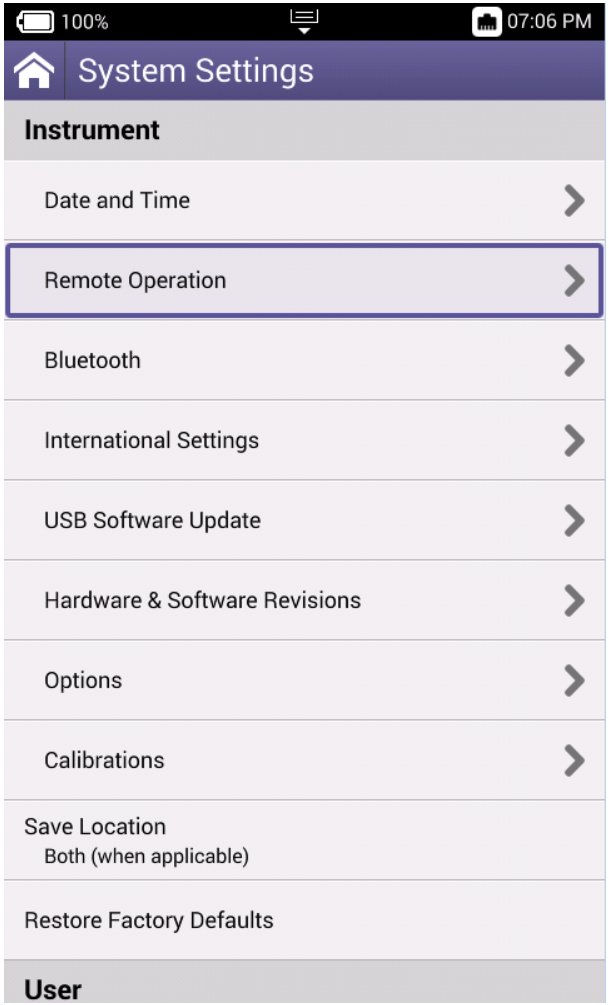
System Settings



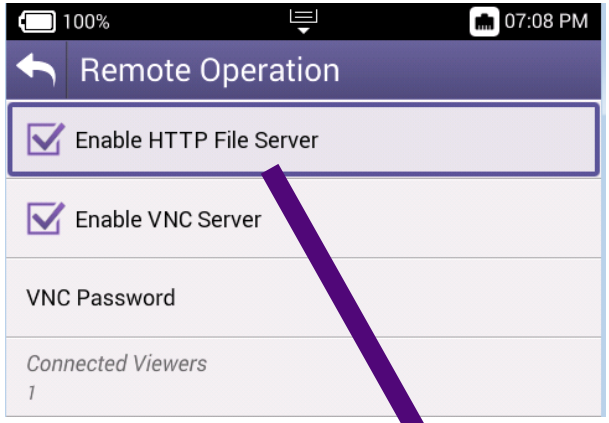
System Settings menu offers the ability to

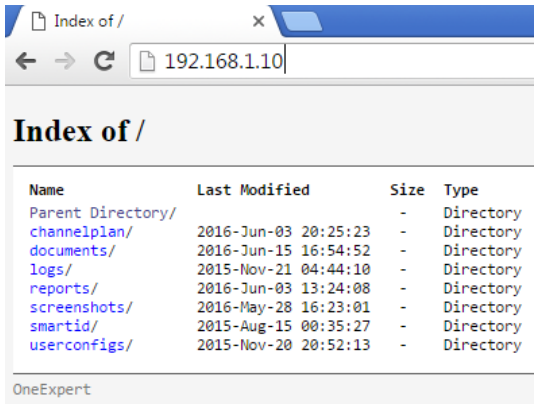
- turn on Remote Operation (via VNC Viewer)
- change power and screen settings
- view Hardware and Software versions
- view Options purchased with ONX 620 meter
- complete USB Software updates

System Settings – Remote Operation



- The ONX CATV supports interoperability via IP connection such as Tight VNC or VNC Viewer
- Under Systems Settings is **Remote Operation** allowing IP connection and control and also remote file browsing over HTTP





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OneExpert CATV – Mobile App

- **Remote Operations**
  - All under one screen
  - Troubleshoot faster & more efficiently
    - Fault & test point often at different locations
  - Integrate with StrataSync
  - iPhone
- **Technician Aids On App**
  - Tutorials, videos, manuals
  - Accessory guide

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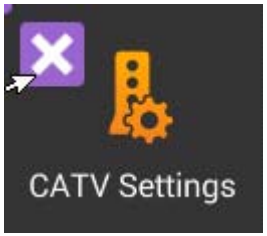
✓ 22 – Configure CATV Settings on ONX

CATV Settings



Capability to configure CATV measurements directly on the ONX

- **Units**: dBmV, dBµV, dBm
- **Tilt:** selection of low & high frequency (range 85-1218MHz)
- **Hardware configuration**: selectable diplexer , AUTO, low 65-1200MHz, high 200-1200MHz
- **Channel Plan Build settings**:
  - Enable channel plan rebuild on new work order
  - Add quick Check channels to Channel Plan (This should assist with discovery of any CW channels that are being missed or misidentified.)
- **Digital Measurement settings:**
  - **OneCheck:** Measure BER 1.0e-9 setting can now be locked. BER dwell multiplier configuration has been added to make BER dwell time 1 -10 times as long as normal.
  - **ChannelCheck:** Measure BER 1.0e-9 setting has been added to ChannelCheck.
- **Ingress Measurement settings:** now provides the possibility to select Ingress Measurement settings (65, 85, 110, 204 MHz)
- **Debug Utilities:** capability to save Cable Modem CM logs - for DOCSIS troubleshooting
- **Cable type**: added cable type selection for ingress & TDR measurements, custom type available
- **Automatic File Purge:** StrataSync Workflow - **Auto-purge** functionality is now supported
- **Work Order Naming Convention** : select Current Date or last selected Work Order Name
- **Restore Defaults :** This will Remove all work order data, restore all mode configuration data, and remove all deployed StrataSync settings

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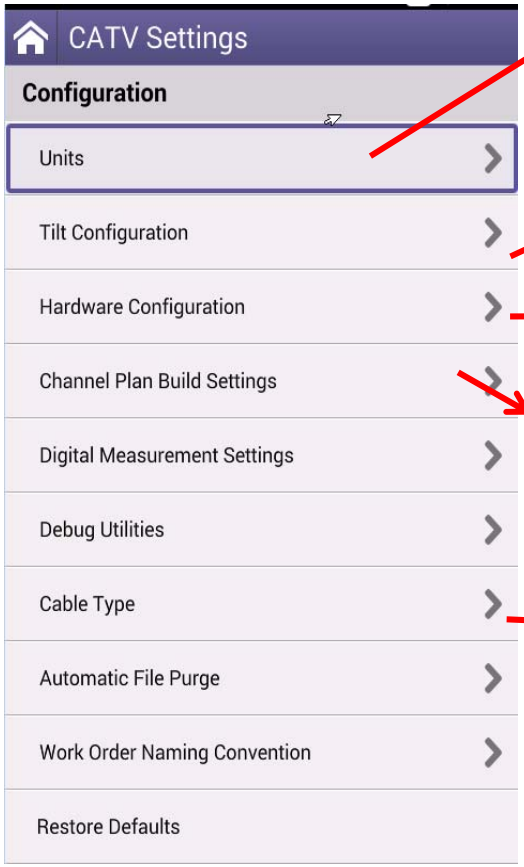
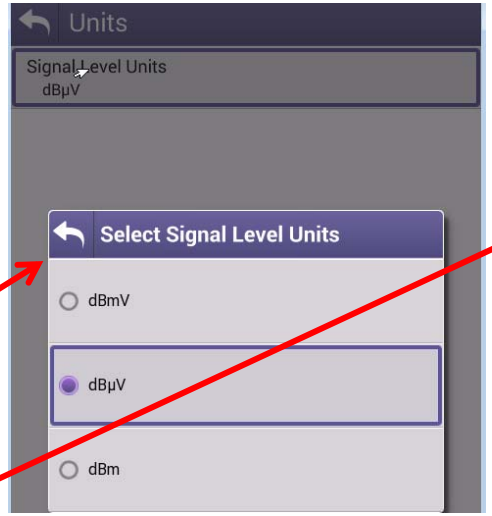
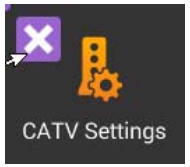
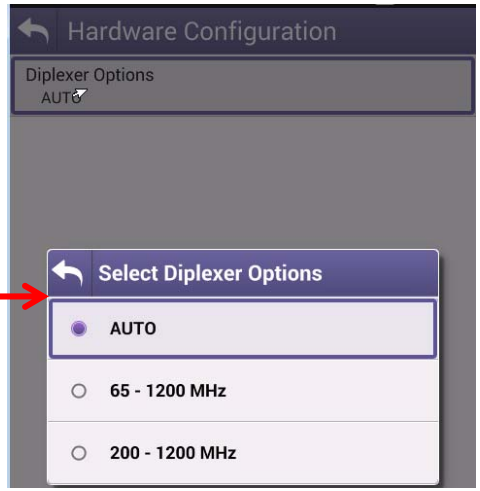
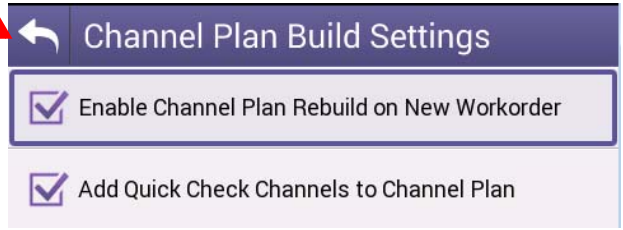
CATV Settings

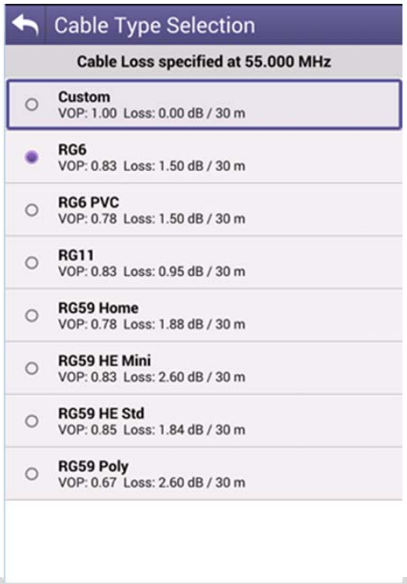












If the applicable setting is enabled, Quick Check CW channels are added to the channel plan build process. This should assist with discovery of any CW channels that are being missed or misidentified.

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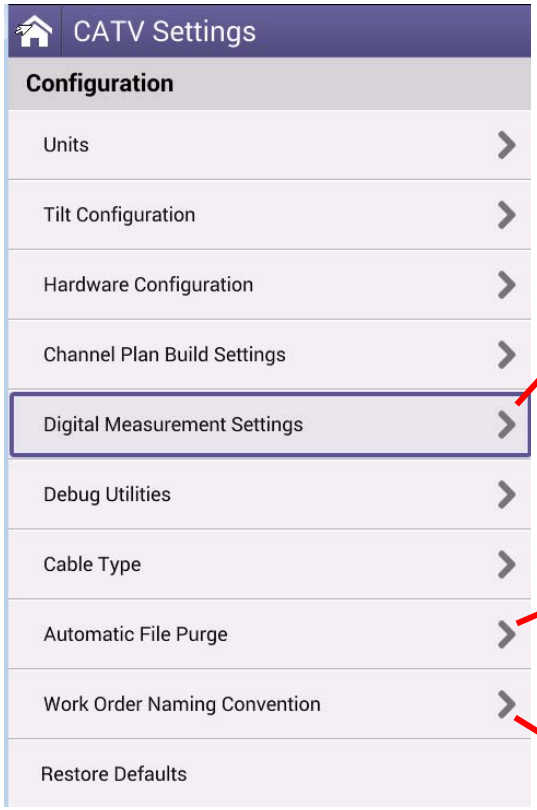
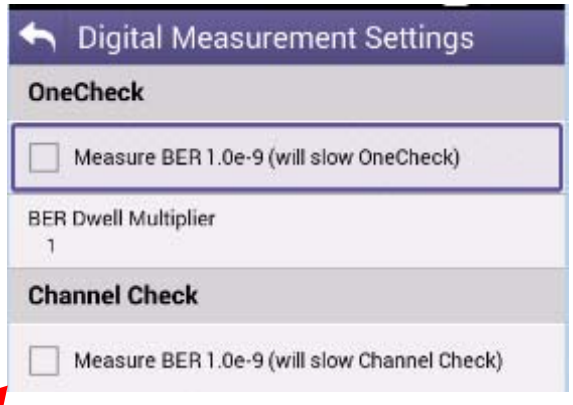
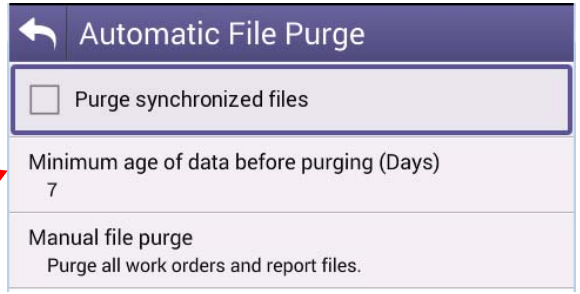
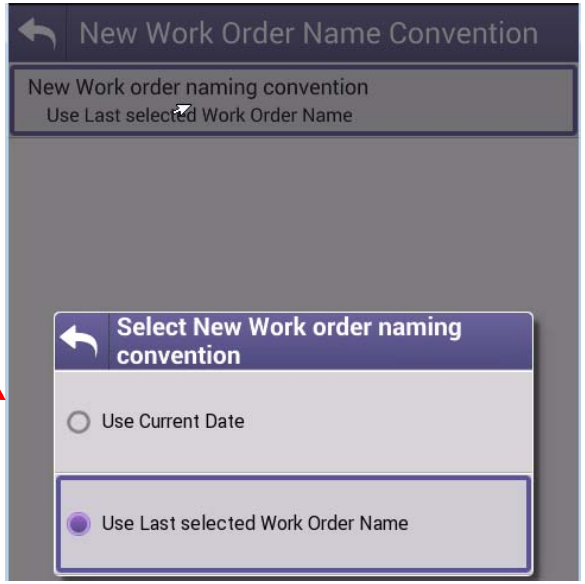
CATV Settings









OneCheck

- Measure BER 1.0e-9 setting can now be locked.
- BER dwell multiplier configuration has been added to make BER dwell time 1 - 10 times as long as normal.

ChannelCheck

- Measure BER 1.0e-9 setting has been added to ChannelCheck.

Auto-purge

- Configuration through StrataSync is now supported

CATV Settings

- provides the option for default work order ID to be the last selected work order instead of “Work Order” with date/time stamp.

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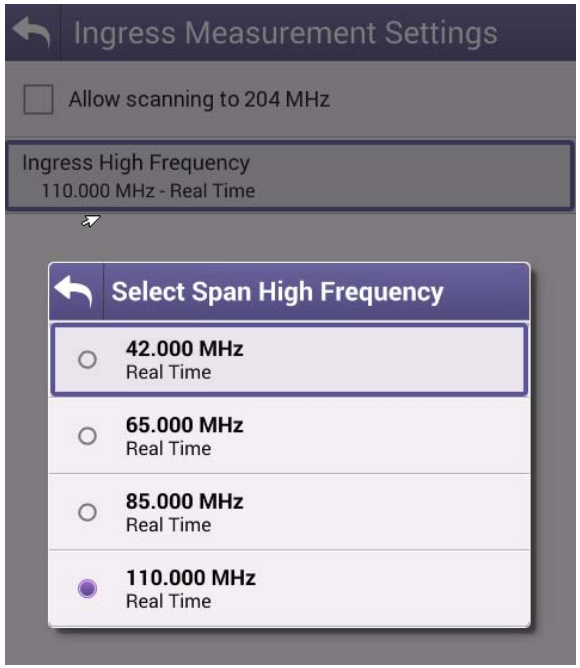
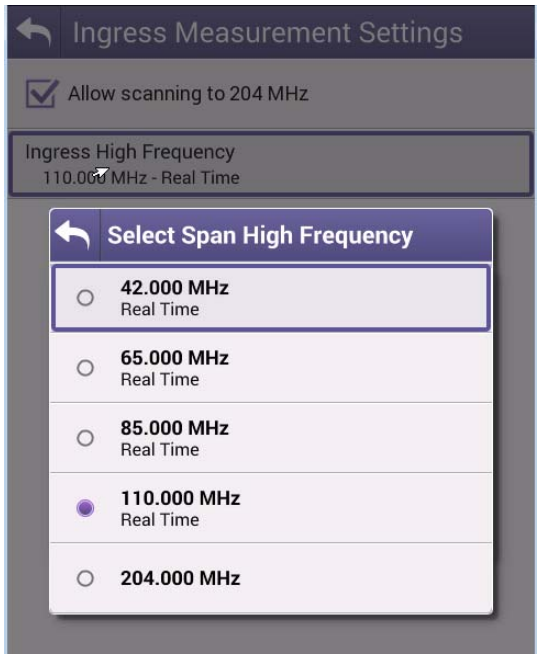
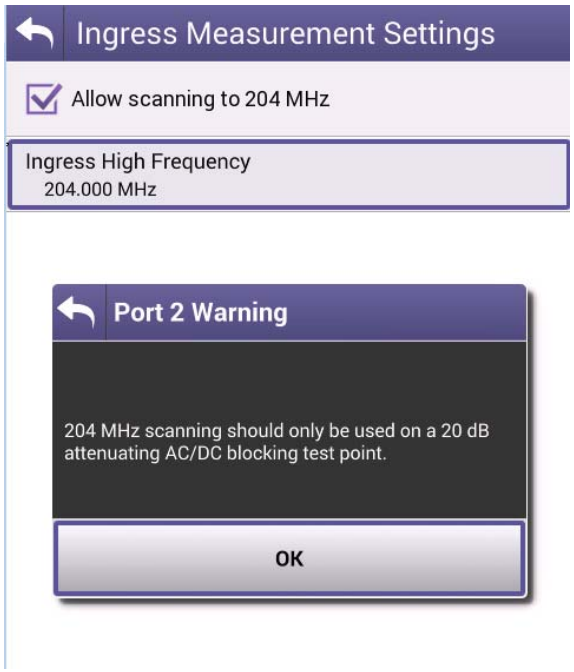
CATV settings: Ingress Measurement settings

- **CATV Settings** now provides the possibility to select **Ingress Measurement settings** (65, 85, 110, 204 MHz)
- Allow scanning to 204MHz can be selectable
- Warning message added : 204MHz scanning should be only used on a 20dB attenuating AC/DC blocking test point.







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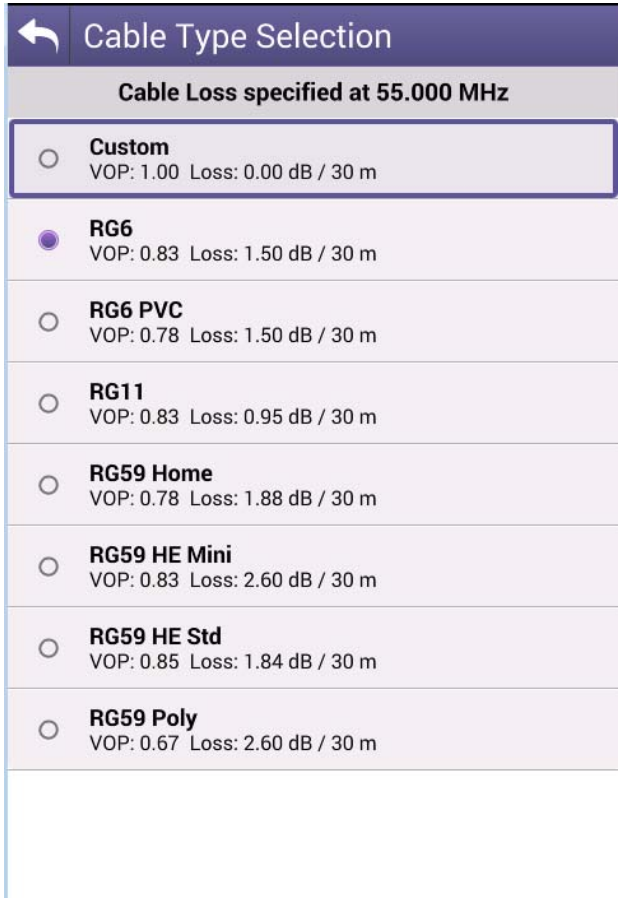
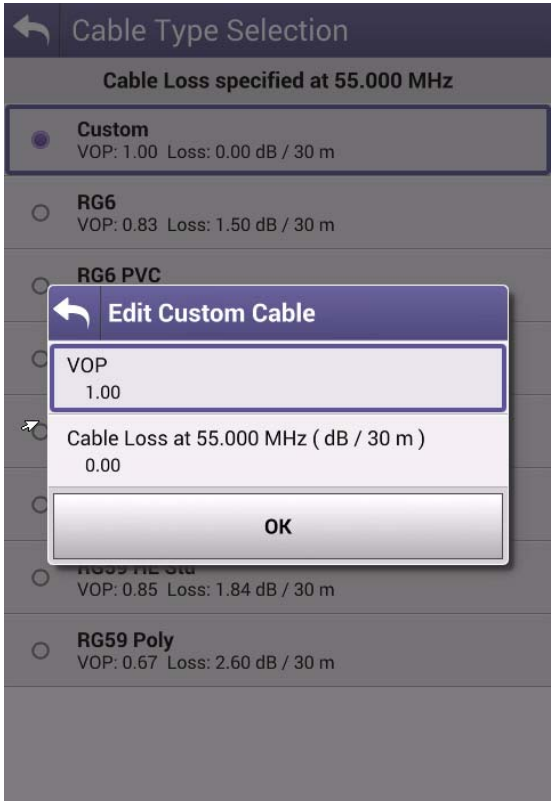
CATV settings: Cable Type selection

- **CATV Settings** now provides the possibility to select Cable Type for **Ingress Measurement & TDR** (list of pre-defined cables)
- Allow custom Cable, with VOP & Cable loss at 55MHz





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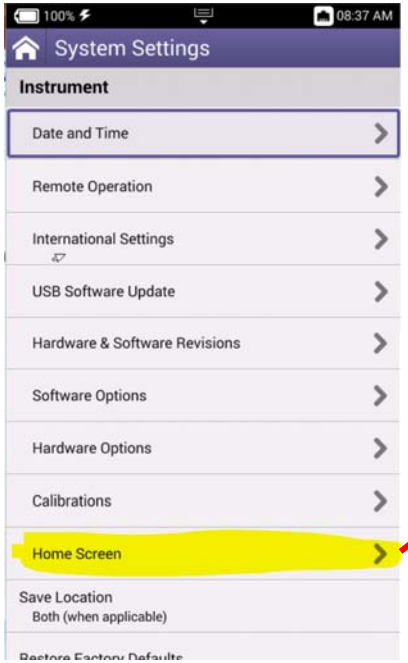
System settings – home screen settings

- Hide unused top level menus to simplify operation according to specific tech procedures
- System settings → home screen settings → Enable / disable Home screen Categories



Check only the boxes that pertain to measurement categories that will be used

Technicians can focus on relevant test categories

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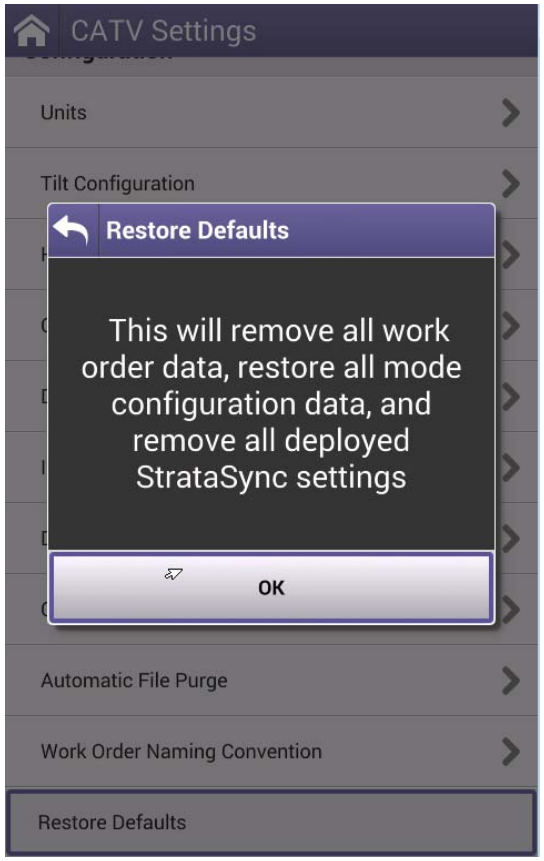
CATV settings: Restore Defaults



- **Restore Defaults :**
  - Remove all work order data,
  - restore all mode configuration data, and
  - remove all deployed StrataSync settings

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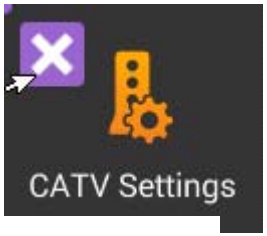
- ✓ 30 – Configure CATV Settings via StrataSync

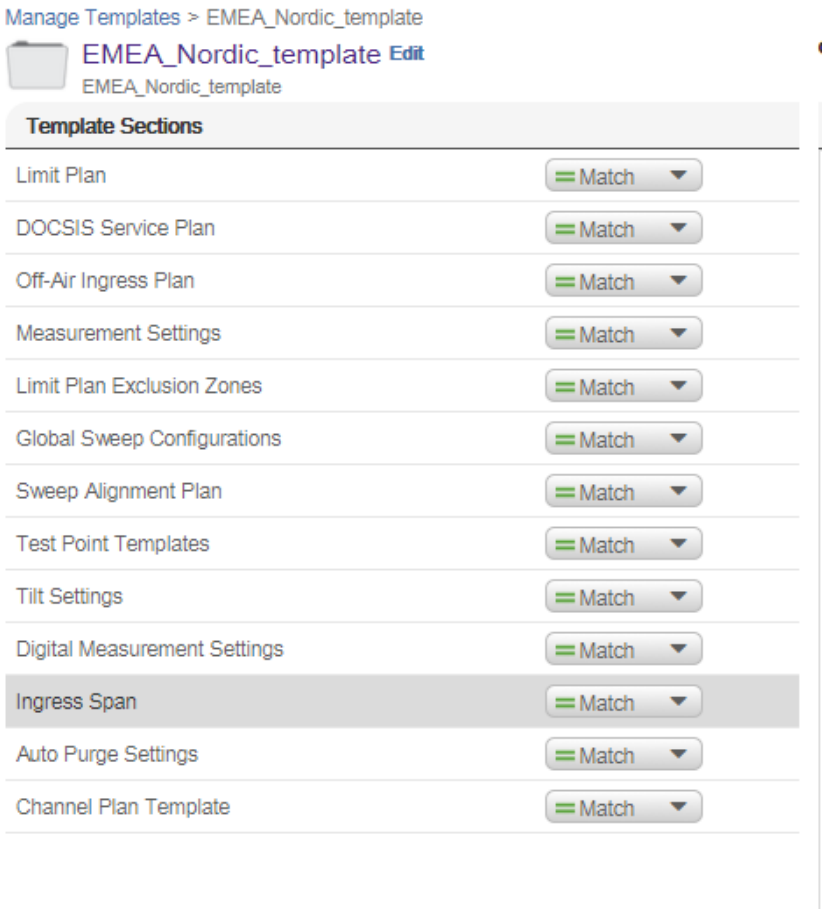
  -Manage Templates

CATV Settings



Capability to configure some CATV measurements directly via StrataSync

- **Tilt:** selection of low & high frequency (range 85-1218MHz)
- **Digital Measurement settings:**
  - **OneCheck:** Measure BER 1.0e-9 setting can now be locked. BER dwell multiplier configuration has been added to make BER dwell time 1 -10 times as long as normal.
  - **ChannelCheck:** Measure BER 1.0e-9 setting has been added to ChannelCheck.
- **Ingress Measurement settings:** now provides the possibility to select Ingress Measurement settings (65, 85, 110, 204 MHz)
- **Automatic File Purge:** StrataSync Workflow - **Auto-purge** functionality is now supported



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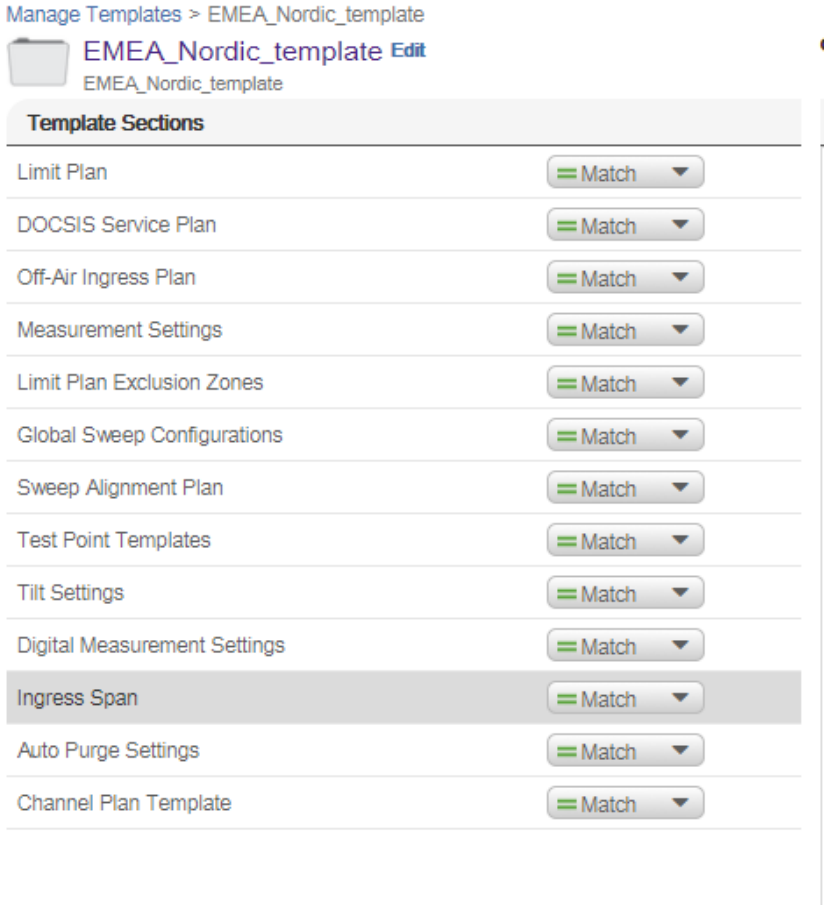
Manage ONX-CATV Templates via StrataSync

Templates for the ONX-620

- **Limit Plan**: Limit Plan, to set levels for different type of alarms
- **DOCSIS Service Plan**:
- **Off-Air Ingress Plan:** Ventilation Plan
- **Measurement Settings**:
- **Limit Plan Exclusion zones**: Restriction Plan Exclusion zones
- **Tilt settings** (CATV Settings)
- **Digital Measurement Settings** (CATV Settings)
- **Ingress span**(CATV Settings)
- **Auto-Purge Settings**(CATV Settings)
- **Channel Plan settings**

Templates for ONX-630 - (NTX, SWX)

- **Global Sweep Configuration:** Sweep Configuration
- **Sweep Alignment Plan**
- **Test Point Template** (NTX)



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- ✓ 33 – ADVANCED SETTINGS
  - Engineering mode
  - Simulator mode
  - BIST
  - note about AGC

ONX Demo mode (Simulator Settings)

Enable Demo mode:

1. The unit is switched off
2. Press and hold the Tray key
3. Press shortly the Power on key
4. Hold the Tray key until the for top led are orange (takes about 3sec)

5. Release the Tray key
6. Go to CATV settings and select Engineering Utilities
7. Select “Use Simulator”
8. Reboot the unit

IMPORTANT: NEVER UPGRADE AN ONX WHILE IN Demo Mode!

Disable Demo mode:

1. The unit is switched off
2. Press and hold the Tray key
3. Press shortly the Power on key
4. Hold the Tray key until the for top led are orange (takes about 3sec)
5. Release the Tray key
6. Go to CATV settings and select Engineering Utilities
7. Unselect “Use Simulator”
8. Reboot the unit

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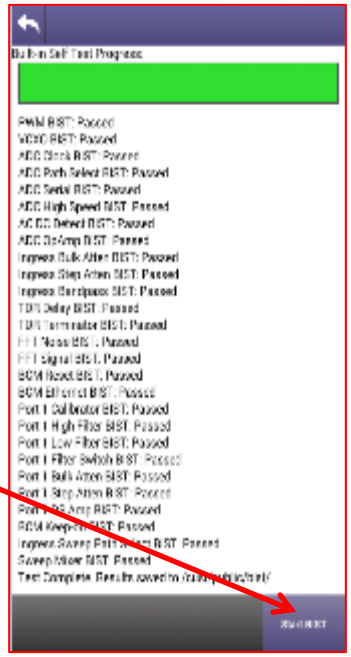
ONX Engineering Mode and Build-in Self Test (BIST)

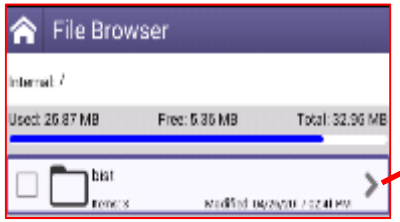
Enable Engineering mode and run a BIST:

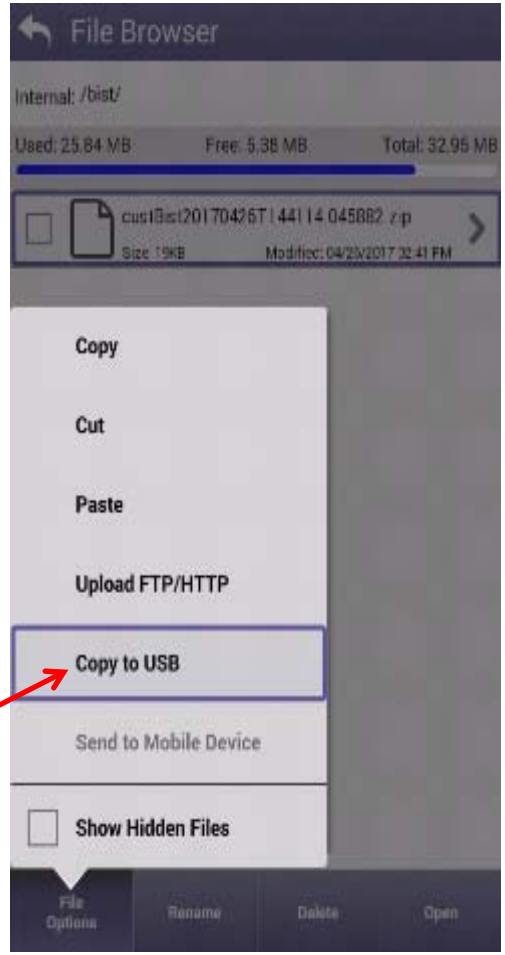
1. The unit is switch off
2. Press and hold the Tray key
3. Press shortly the Power on key
4. Hold the Tray key until the for top led are orange (takes about 3sec)

5. Release the Tray key
6. Go in CATV setting and select Engineering Utilities
7. Select “Built-in Self Test” and Start BIST :



8. Go to File Browser and copy the custBist*.zip file to a plugged USB memory stick :





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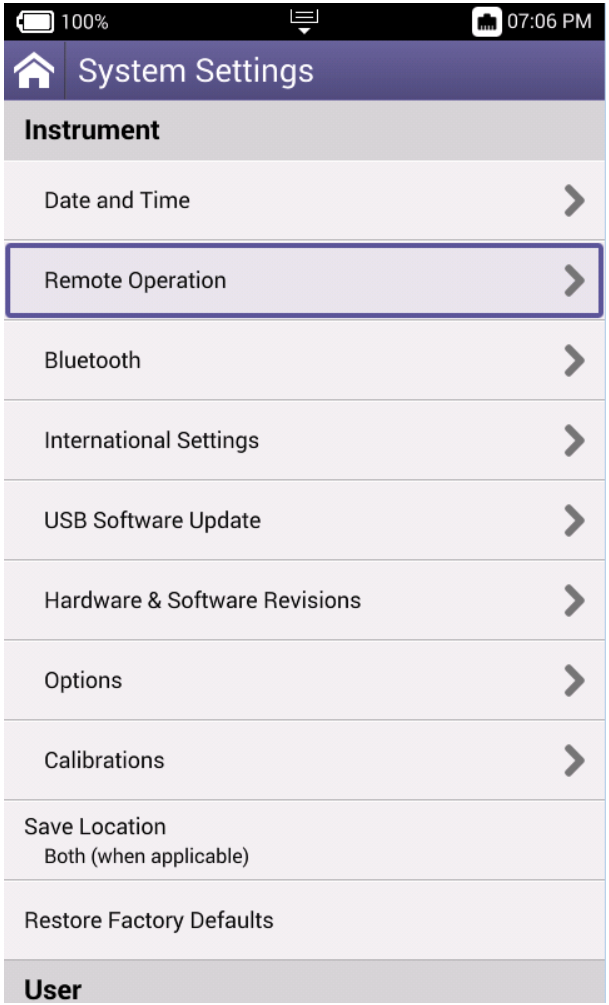
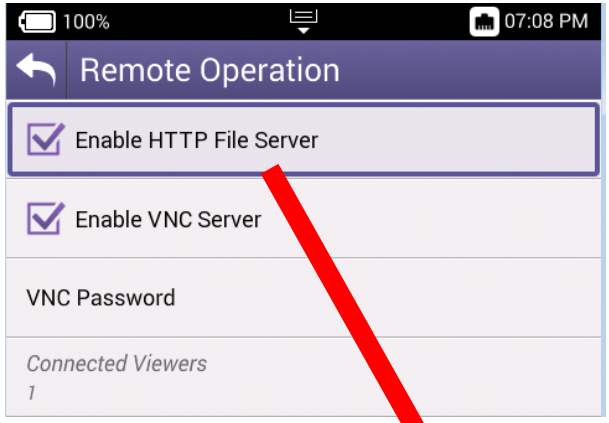
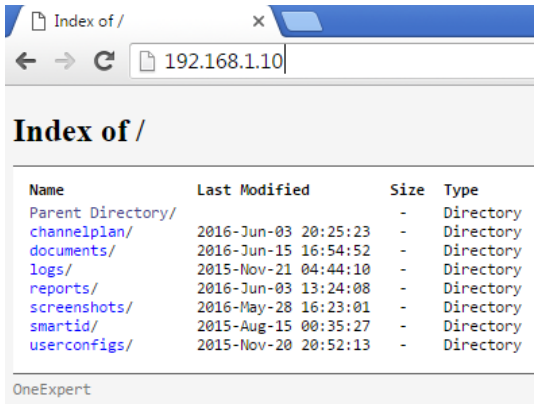
System Settings – Remote Operation



- The ONX CATV supports interoperability via IP connection such as Tight VNC or VNC Viewer
- Under Systems Settings is **Remote Operation** allowing IP connection and control and also remote file browsing over HTTP





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Notes about AGC

AGC – at the start of the measurement

- Channel check/expert, DOCSIS check/expert and One Check currently only perform AGC at the start of the measurement.
- It is advised that the user restart the measurement if changing connections.
- that is important to Stop and Start the measurement when connect/disconnect the Coax cable on Port 1 and 2 using following procedure:
  - Plugging in
  - Start the measurement
  - Stop the measurement
  - Disconnect the connector and move to next test

AGC – after start of the measurement

- Ingress scan/expert, RSG loopback Rx, quick check, full scan and spectrum modes have some level of AGC after start.
- Ingress scan/expert and RSG loopback RX can only add attenuation during AGC.
- Full scan, Spectrum and quick check can adjust attenuation up or down during AGC while the mode is running.

Note:

- Maximum input power range for ONX RF Port 1 input: 55 dBmV (115 dBµV) for a single channel.
- We recommend keeping the total integrated power around 50 dBmV (110 dBµV). ONX limit is 60 dBmV (120 dBµV) total power

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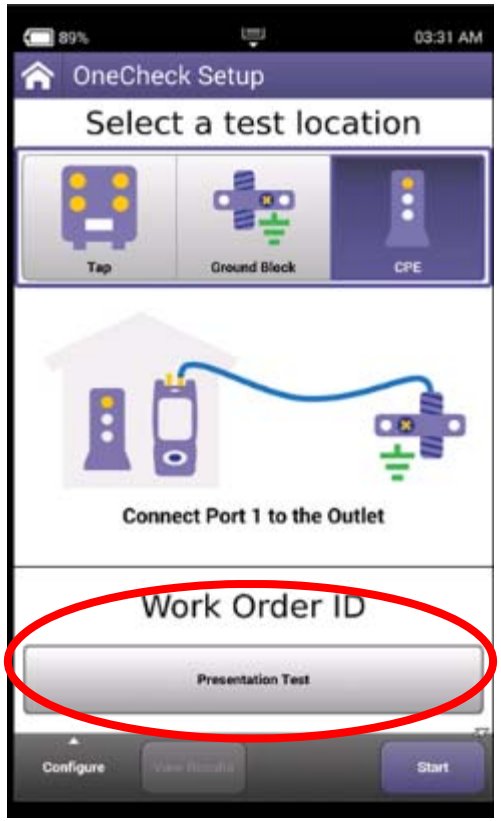
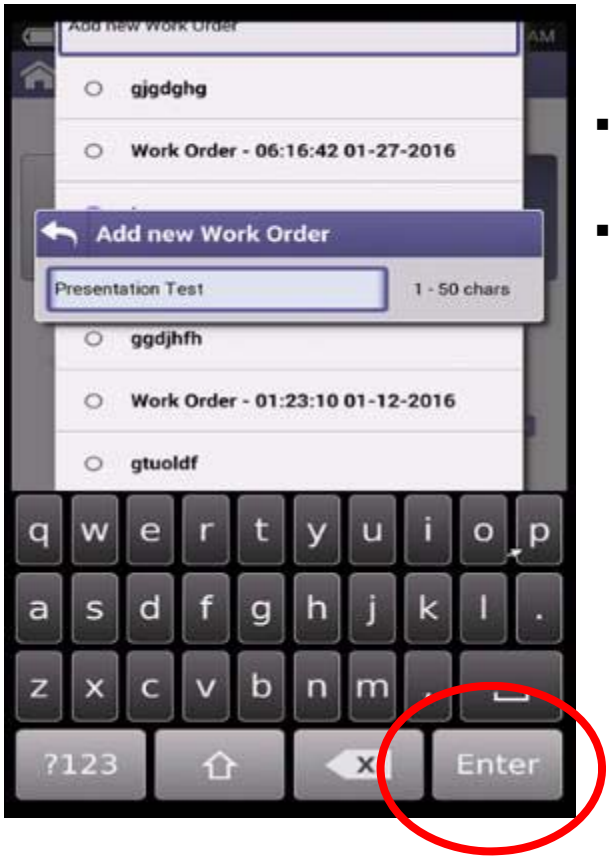
- ✓ 38 – ONX-CATV Testing
  - Quick check
  - Spectrum
  - Channel Check
  - DOCSIS Check
  - OneCheck
  - Ingress Scan

Work Order ID Creation and Management





- Entering Work Order ID enables test correlation and faster Auto channel plan build functionality
- Entering a Work Order ID is optional
- If Work Order ID is not entered before a test is started in a new location (different channel plan area), the unit will display an error. Press Clear Session to ignore and run test.

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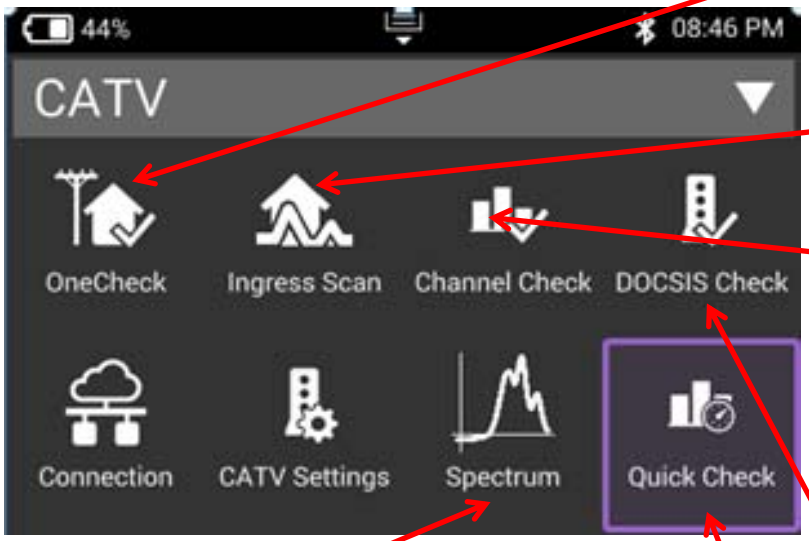
CATV Testing on the OneExpert CATV



OneCheck
- Comprehensive and automated testing of Ingress, Downstream & DOCSIS with Session Expert™ to help resolve problems

Ingress Scan
- Comprehensive testing of Ingress, home network
- Session Expert to help resolve problems

ChannelCheck
- Real-time analysis and powerful troubleshooting of downstream carriers
- Analyze OFDM carriers including analysis of multiple DS profiles
- Use ChannelCheck to quickly check levels and signal performance

DOCSIS Check
- Real-time analysis of DOCSIS services
- Only shows the DOCSIS carriers to allow you to focus on HSD services
- Troubleshoot and analyze Downstream and Upstream DOCSIS carriers including OFDM and channel bonding

QuickCheck
- Use QuickCheck to see a small number of manually added channels and quickly determine if signal is present

Spectrum
- Real-time downstream spectrum analyzer up to 1218MHz
- Powerful troubleshooting

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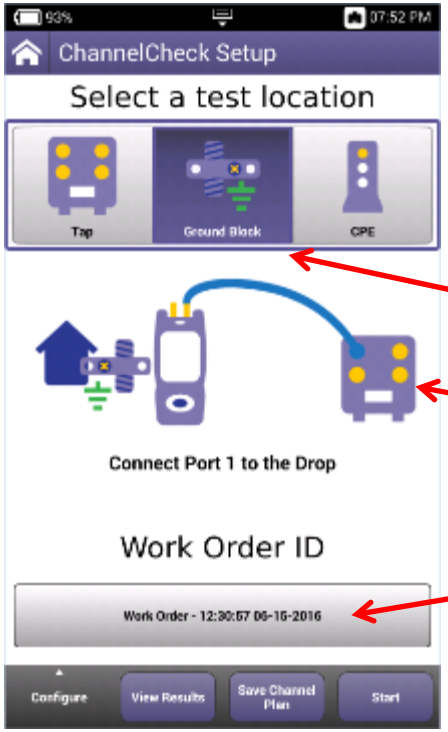
Testing Workflow with the OneExpert CATV

Test Flow

Choose test to run:
Each test asks for basic information prior to running



Choose current test location

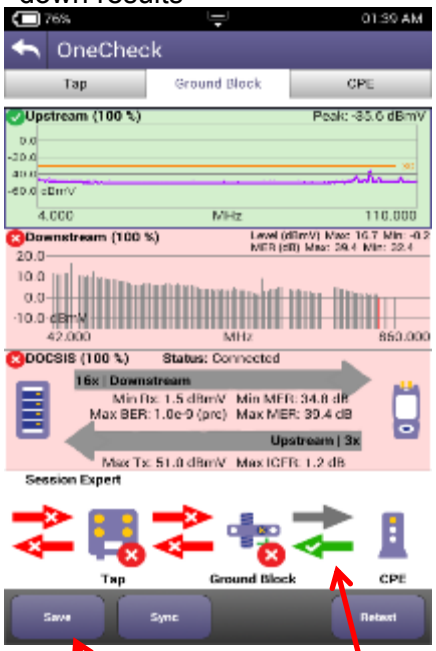
Connect the meter properly

Input a unique Work order/job identifier for each household
This is important since ONX uses test data at each location for data analysis (Default will be current date and time stamp)

Important!

Test Results

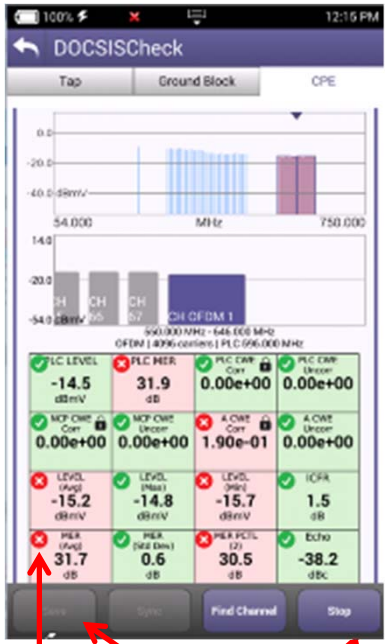
OneCheck
Provides dashboard with drill down results



OneCheck will automatically save the last run test. Hit Save and give a new name if you want to capture a specific result prior to Retesting

Tap on a panel to drill down to detailed results

ChannelCheck & DOCSIS Check
Provides live analysis



Hit Stop and then Save if you want to capture live data results

Based upon limit set downloaded into the ONX through StrataSync determines a Pass or Fail, at each test location Session Expert determines downstream or upstream issue.

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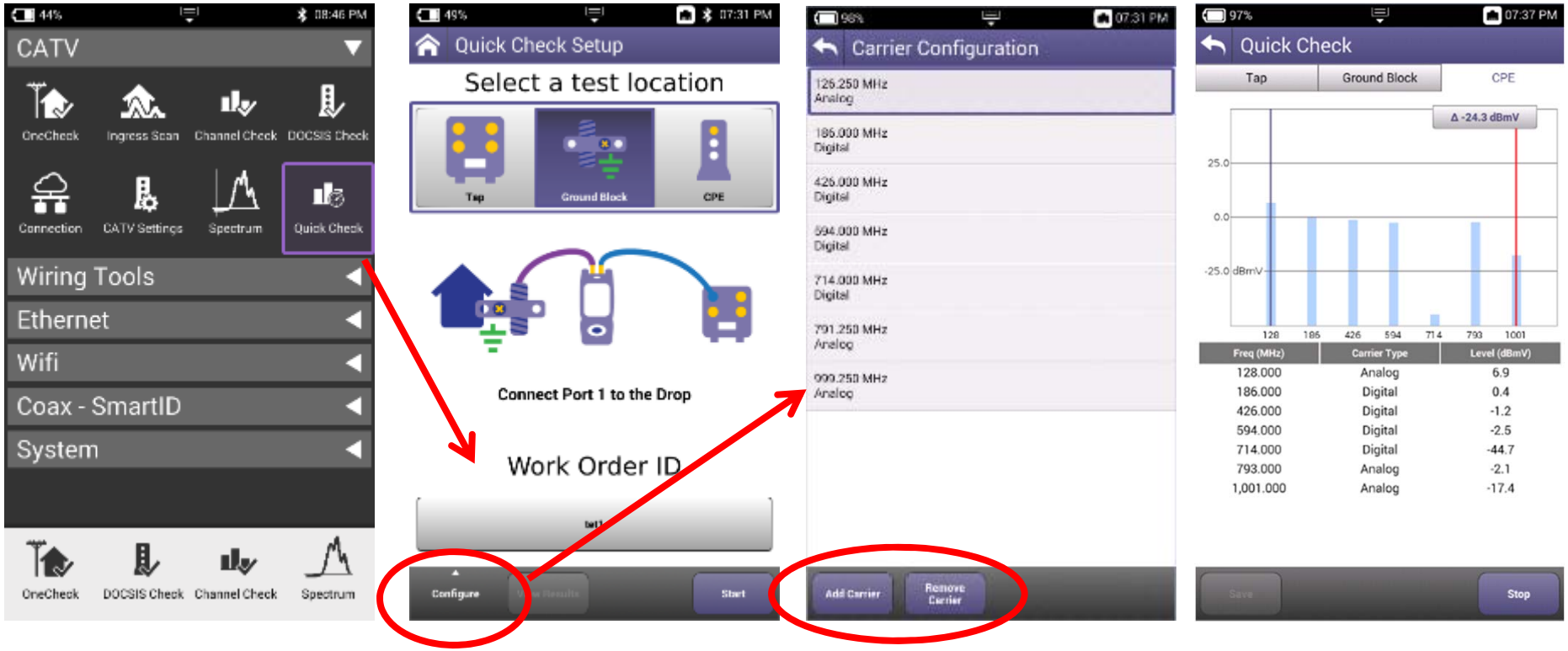
✓ 42 – QUICK CHECK

Quick Check Setup

Use **QuickCheck** to see a small number of manually added channels and quickly determine if signal is present

- Enter Work Order ID and choose demarcation point and press Start
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons



- Add/remove frequency and type of carrier

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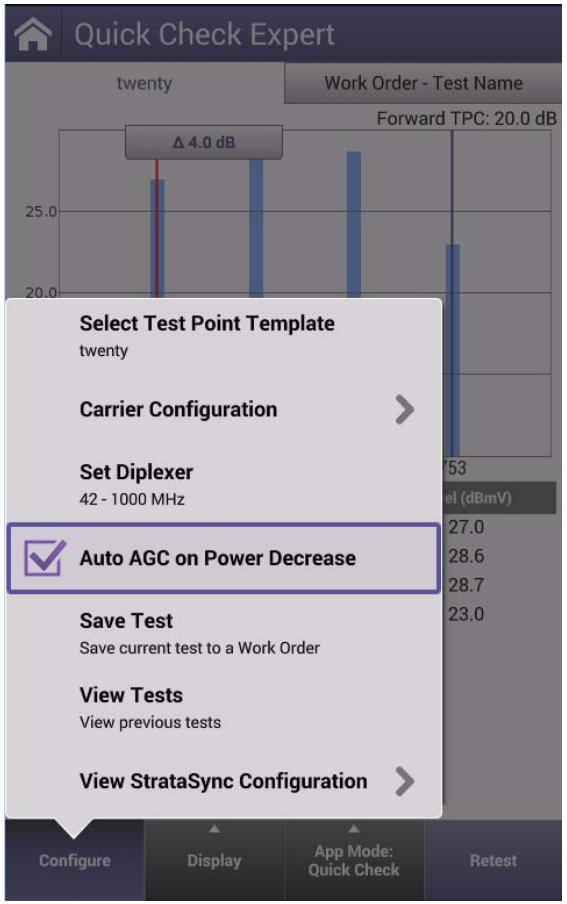
Quick Check and Quick Check Expert
Setting the ONX to AGC Down when Input Levels are Lower

- In Quick Check and Quick Check Expert, when signal levels change, the ONX will adjust its internal attenuation to optimize the measurement range
  - Previously the ONX would only adjust upward as increasing signal levels were detected, resulting in a level measurement that would show as higher when the signal was very low or disconnected
  - To measure these significantly lower levels the user would have needed to Stop and Retest
- Now, when the new “Auto AGC on Power Decrease” box is selected, the ONX adjusts its internal attenuation down as well when these low level signals, or no signal, is detected.
  - Improves level measurement accuracy for these low level situations when previously measuring higher levels



Note: Enabling this setting may result in longer wait times for the higher signal levels to be measured again (a few seconds longer)

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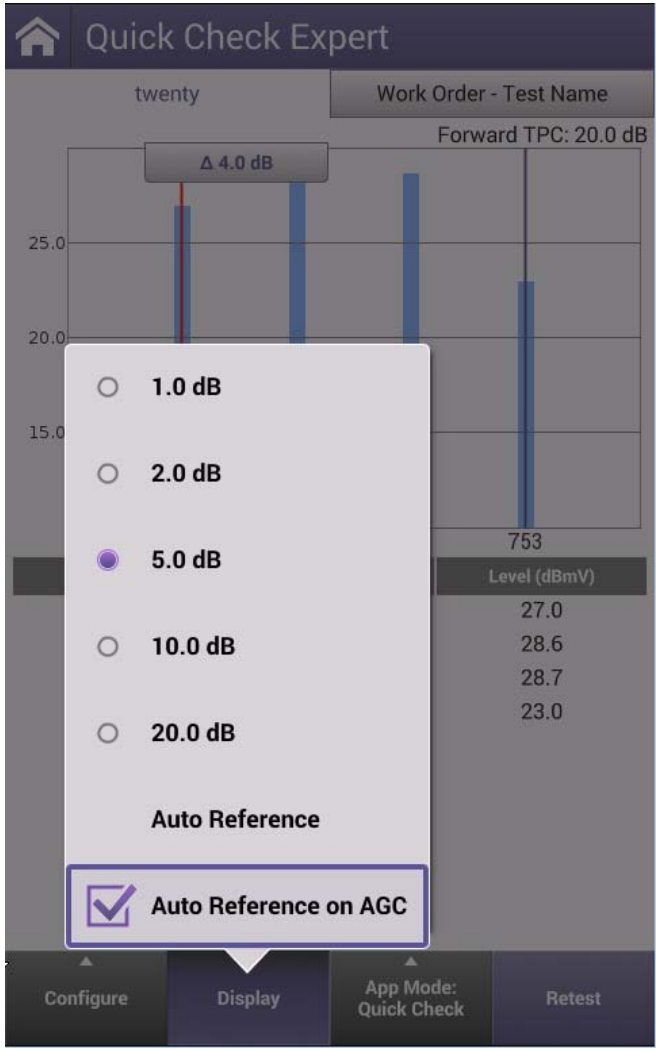
Quick Check and Quick Check Expert
Setting the ONX to Auto Reference after AGC

- Previously the ONX would only adjust the bar graphs when the test was initialized
  - Subsequent level tests, when the levels are significantly higher or lower, would result in the bar graphs disappearing from the display
  - The user would have to press the Auto Reference button to readjust the bar graph
- Now the ONX allows for the user to enable the “Auto Reference on AGC” which will automatically adjust the bar graph whenever an AGC event has occurred keeping the bars graph within the display



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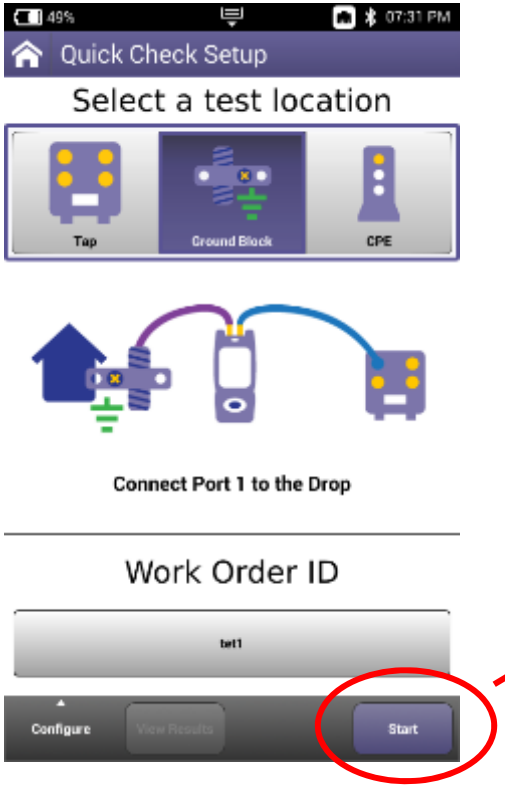
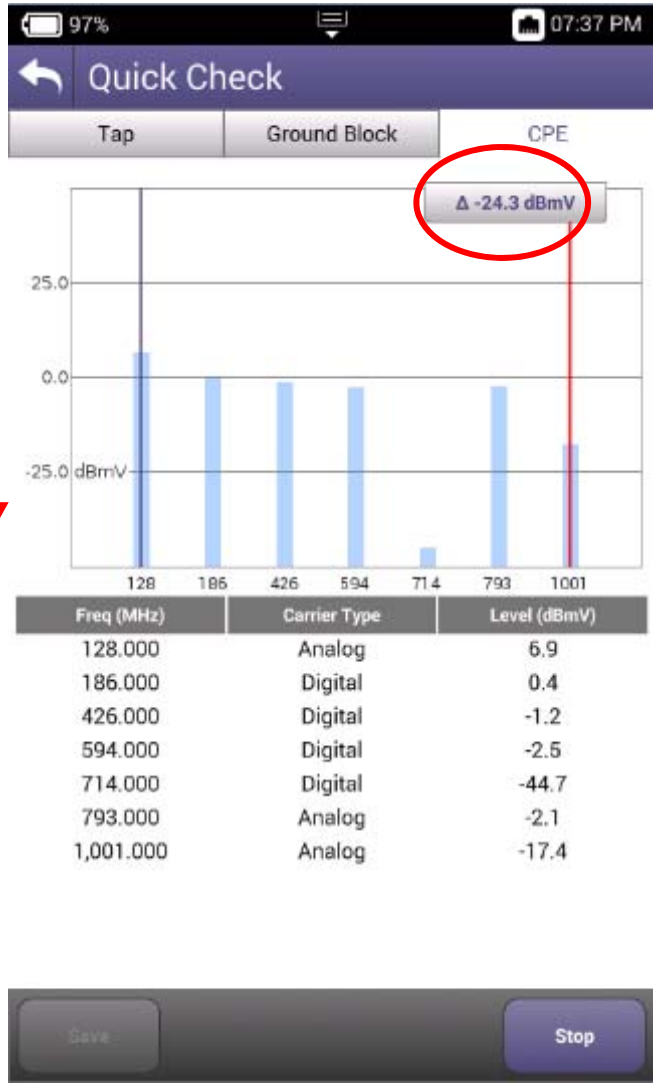
QuickCheck Results





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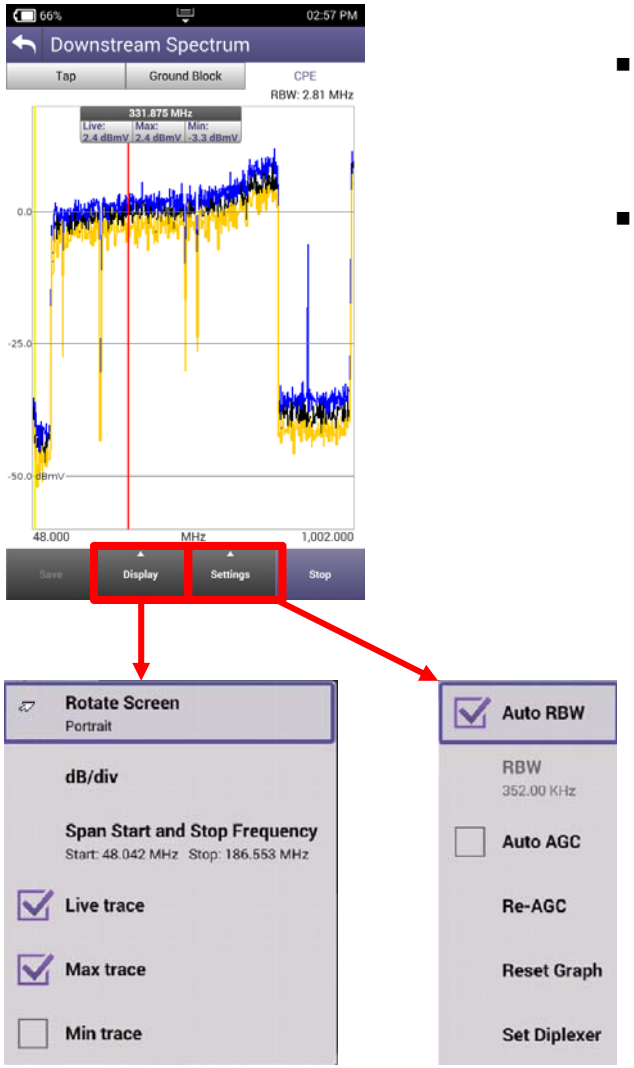
✓ 47 – SPECTRUM

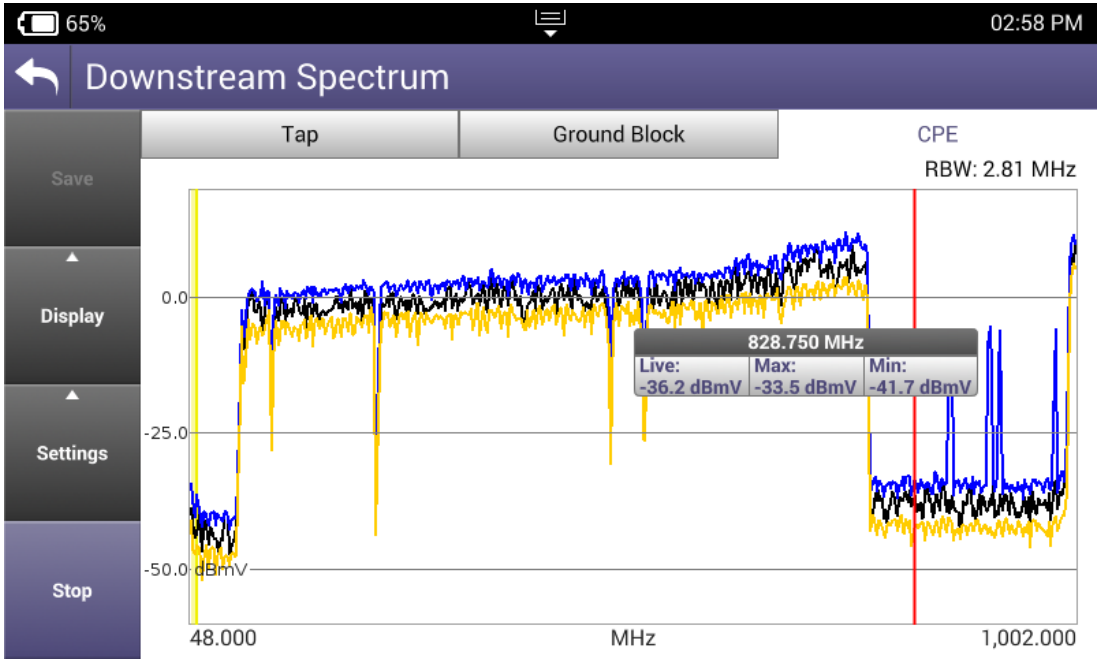
Spectrum Setup

- Enter Work Order ID and choose proper demarcation point
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons

Spectrum Results

- Navigate the results screen (shown to the right) using touchscreen (pinch and zoom like tablet or smart phone) or directional buttons
- Choose “Display” to change to landscape view or manually change graph division size, span and toggle Live/Max and Min traces
- Choose “Settings” to change RBW and AGC settings





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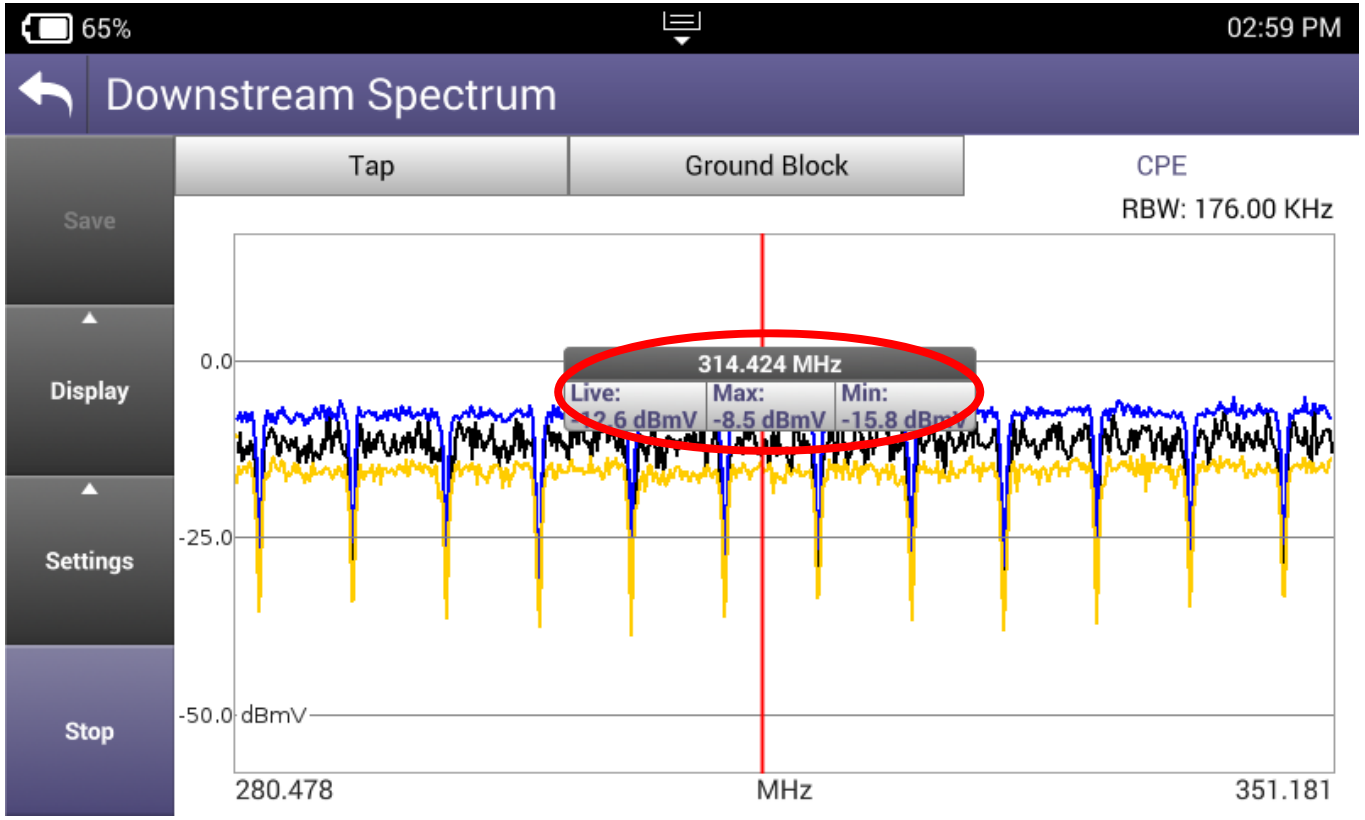
Spectrum Results

- Drag or use Directional buttons to move marker
- Double tap on the marker to display Delta between second marker which will appear



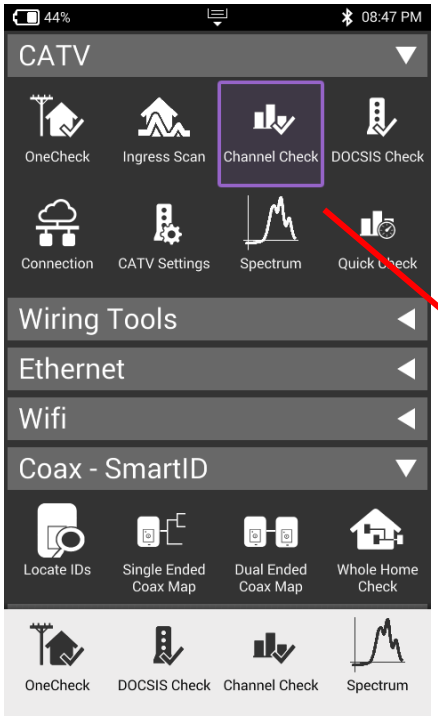
✓ 51 – CHANNEL CHECK

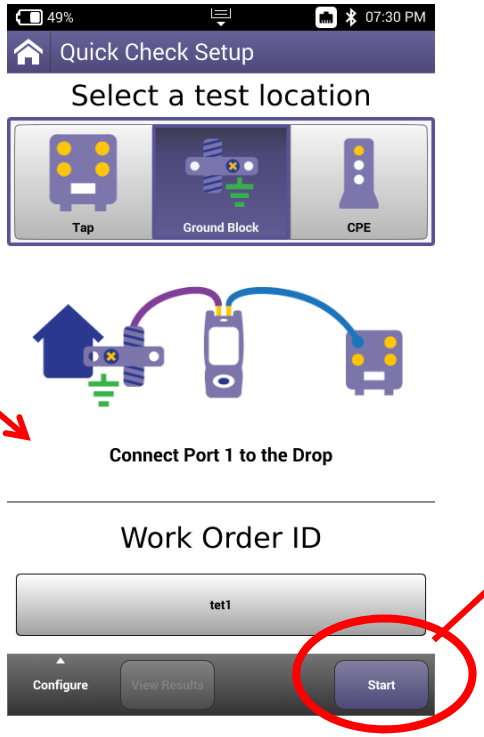
Channel Check Setup

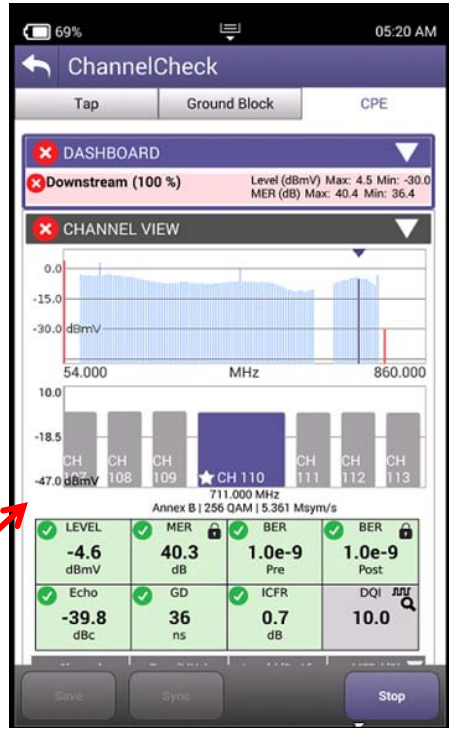
Channel Check

- Real-time analysis and powerful troubleshooting of downstream carriers
- Analyze OFDM carriers including analysis of multiple DS profiles
- Use **ChannelCheck** to quickly check levels and signal performance

- Enter Work Order ID and choose demarcation point and press Start
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons







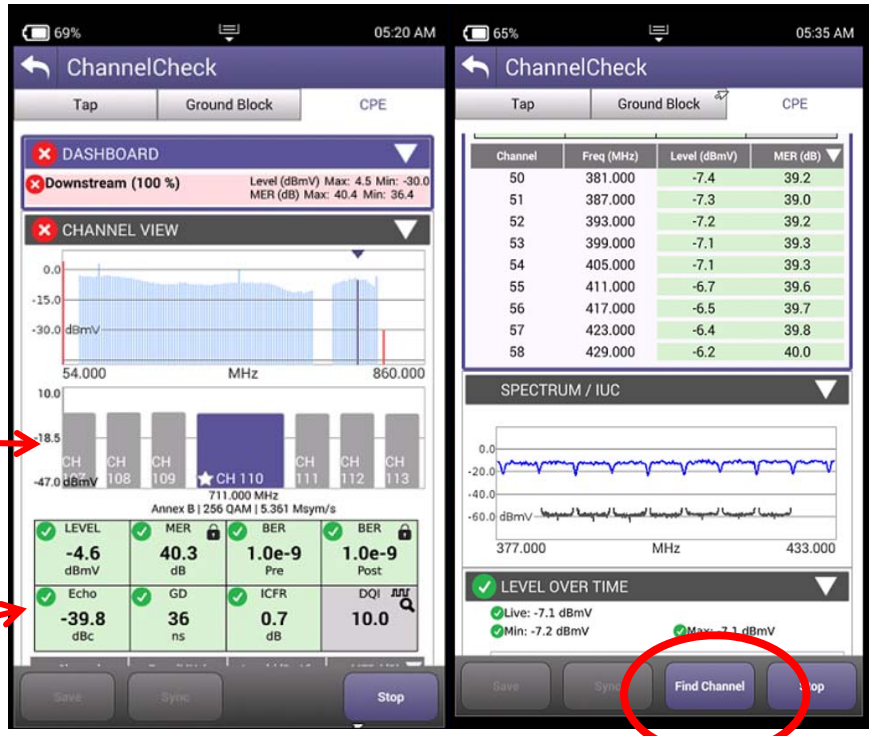
Channel Check Results

Dashboard
Level, MER, Deviation

Full Scan

Adjacent channels
and channel under test

Measurements



Adjacent channels table

Live spectral data including **Ingress under channel**

Find channel

Note: Find Channel should be entered as “4” and not “04”
Note: All results are live updated every time channel under test is changed

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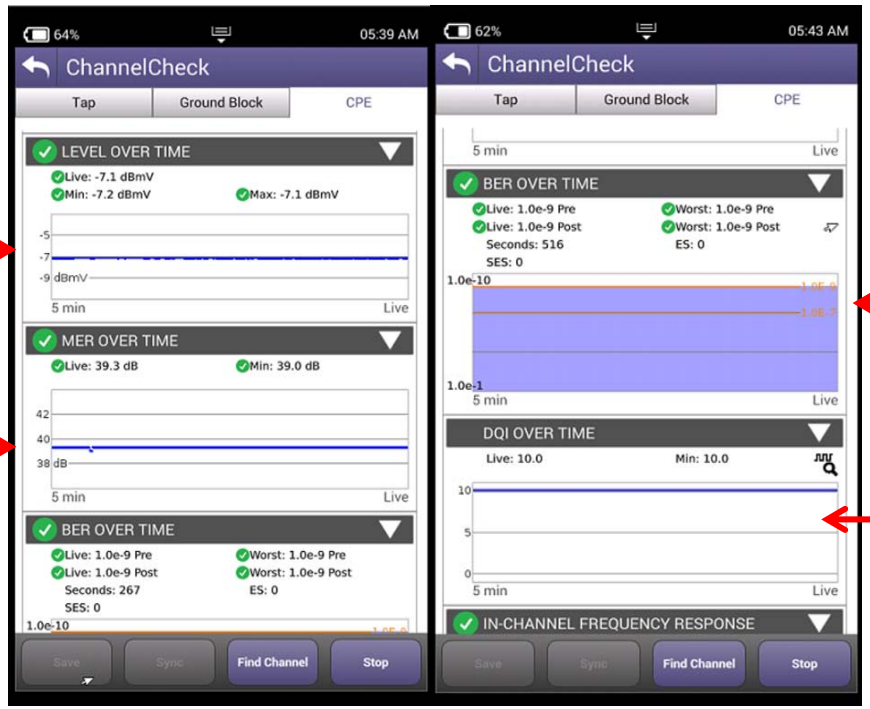
Channel Check Results

Level Over Time

MER Over Time



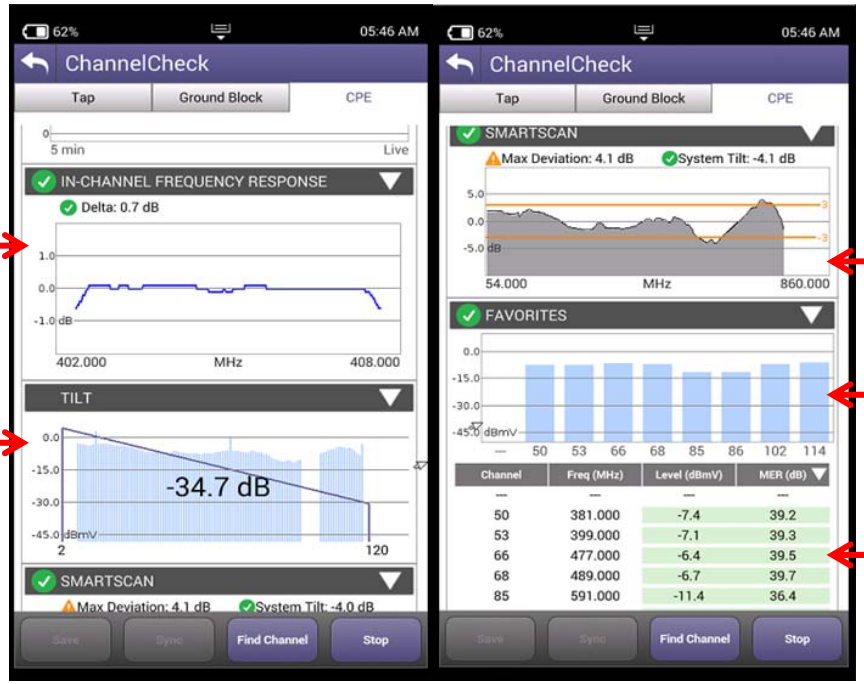
BER, Pre and Post, over Time

DQI Over Time

Channel Check Results

ICFR

Tilt



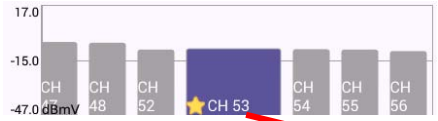
Smartscan

Graph View of **Favorites**

Table View of **Favorites**

Channel Check Results

Favorite selection in **Channel View**



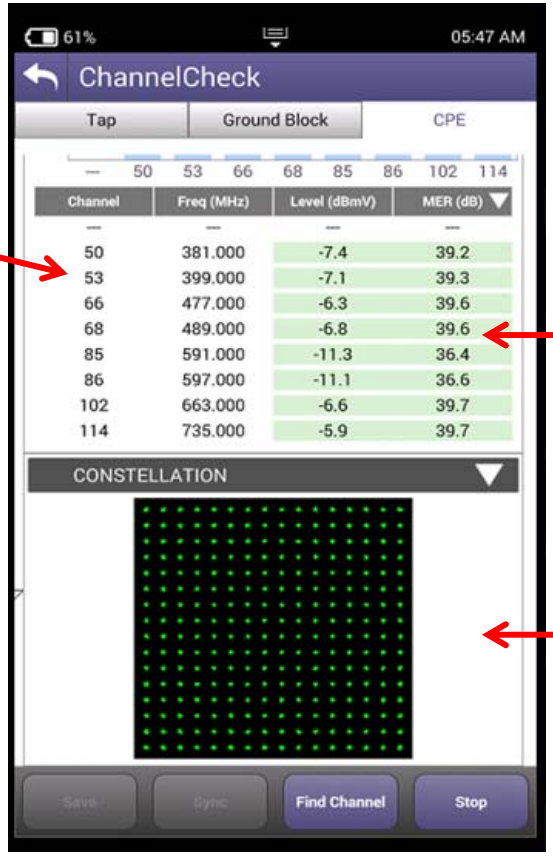


Table View of **Favorites**

Constellation

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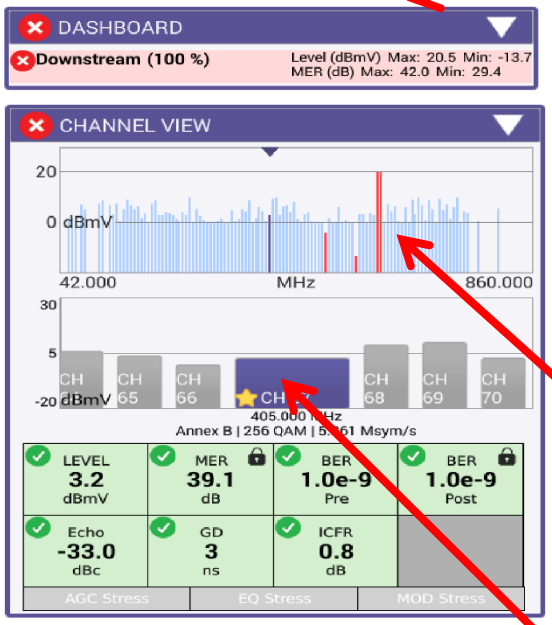
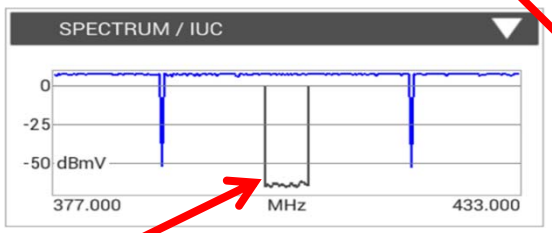
Channel Check™ Details

Dashboard shows progress and key metrics of best and worst carriers



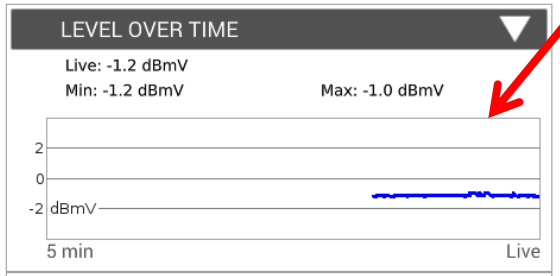
Full Scan view highlights problems in the lineup. Touch Screen capability allows quick access to troubled carriers

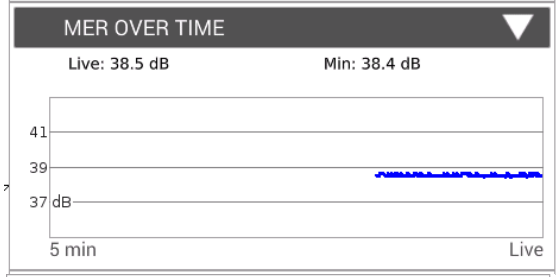


Familiar “swipe” navigation provides access to individual channel details

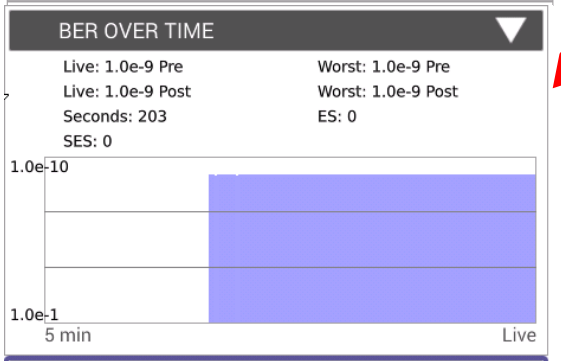
VIAVI Exclusive **Spectrum view** with embedded **Ingress Under the Carrier** trace

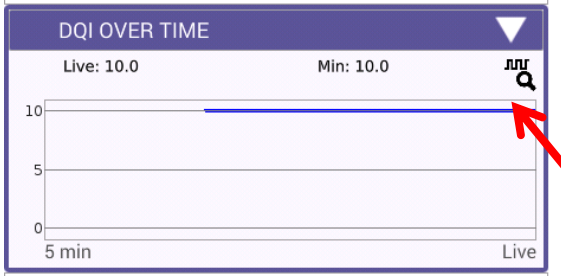
Level over time shows plant fluctuations





MER & BER over time identify traditional carrier performance issues





DQI over time identifies intermittent issues

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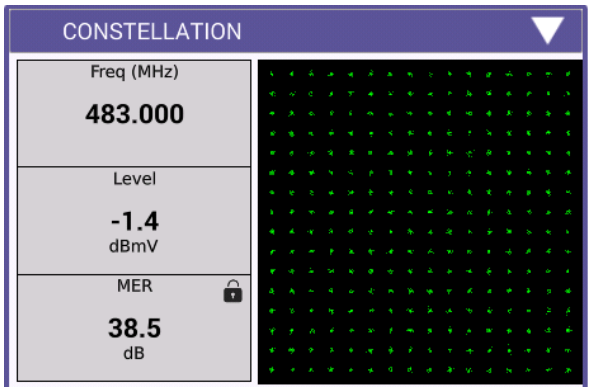
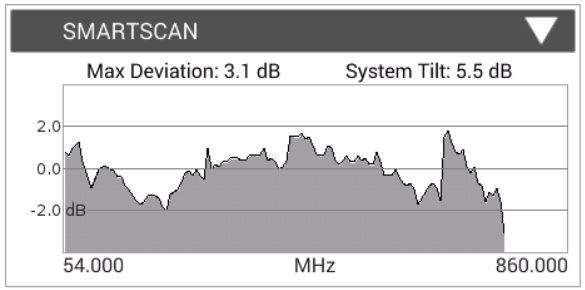
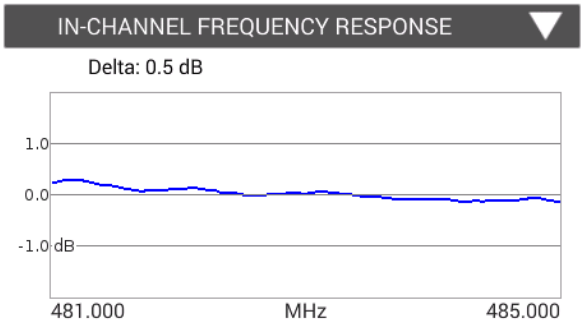
Channel Check™ Details



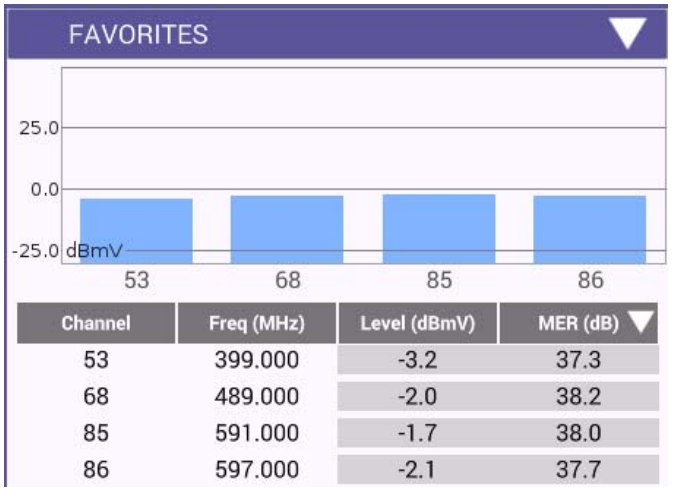
Constellation measurement helps identify noise problems and interferers



SmartScan simplifies system analysis by taking out the effects of tilt and different carrier types at TAP, GB and CPE



ICFR highlights roll-off and suck-out problems within a downstream carrier



Channel	Freq (MHz)	Level (dBmV)	MER (dB)
53	399.000	-3.2	37.3
68	489.000	-2.0	38.2
85	591.000	-1.7	38.0
86	597.000	-2.1	37.7

Favorites view provides technicians with a quick mini-scan of critical carriers

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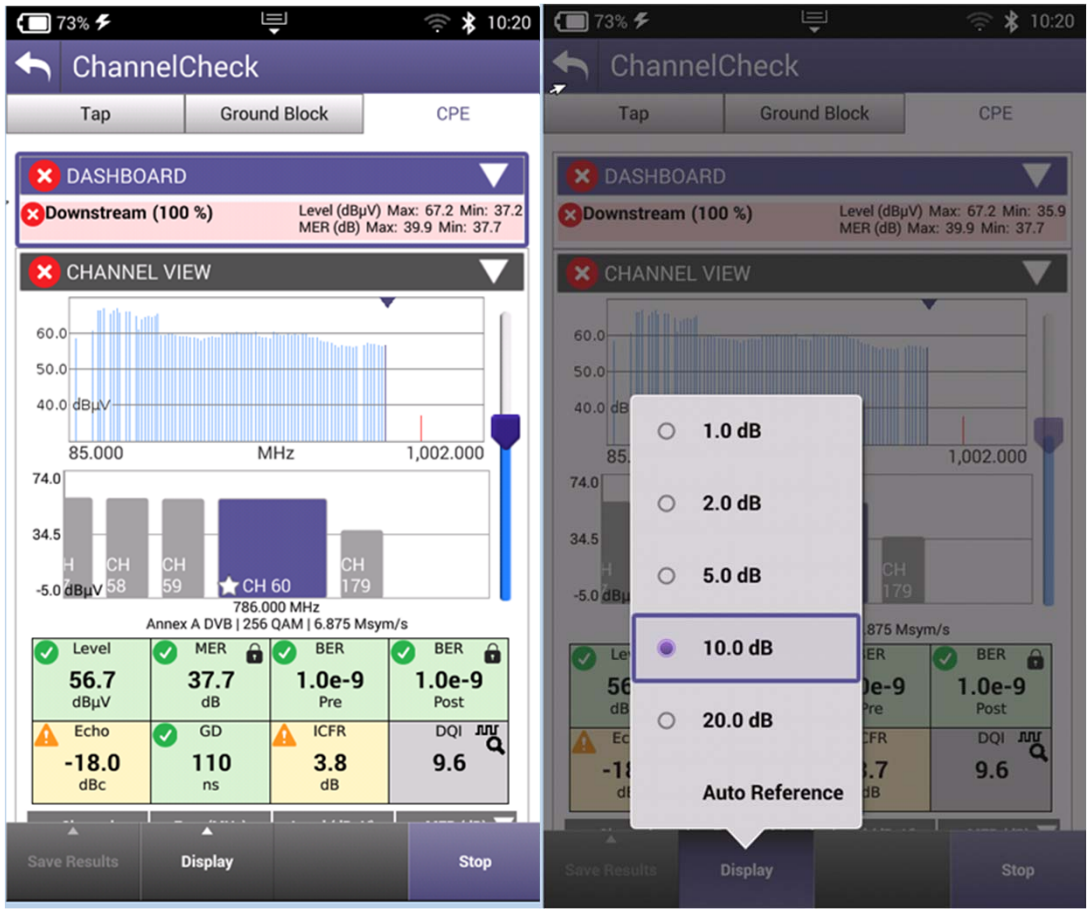
Channel Check

Channel Check/Expert

- dB/div selection on Channel View widget.
- Setting also used in StrataSync reports

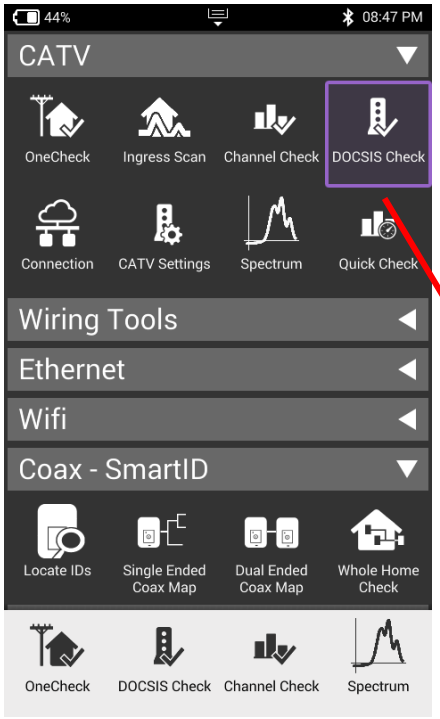


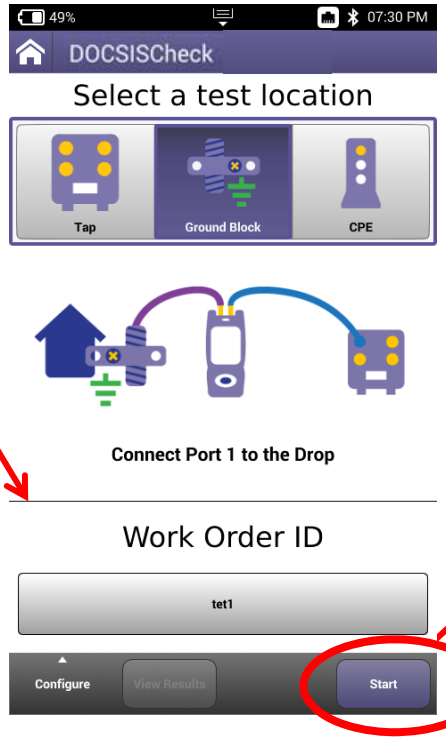
✓ 60 – DOCSIS CHECK

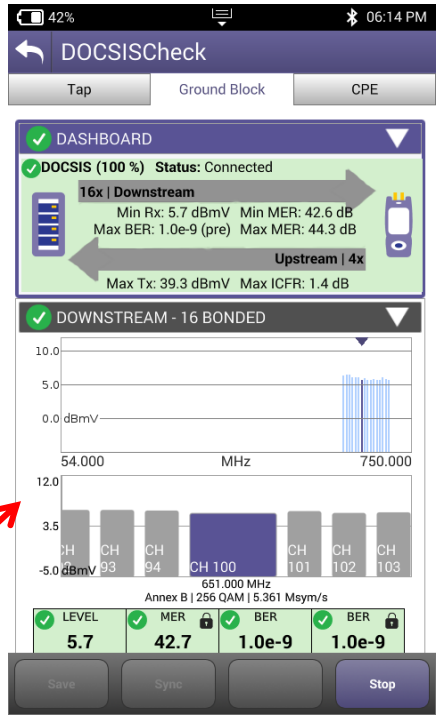
DOCSIS Check Setup

DOCSIS Check

- Real-time analysis of DOCSIS services
- Only shows the DOCSIS carriers to allow you to focus on HSD services
- Troubleshoot and analyze Downstream and Upstream DOCSIS carriers including OFDM and channel bonding
- Enter Work Order ID and choose demarcation point and press Start
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons

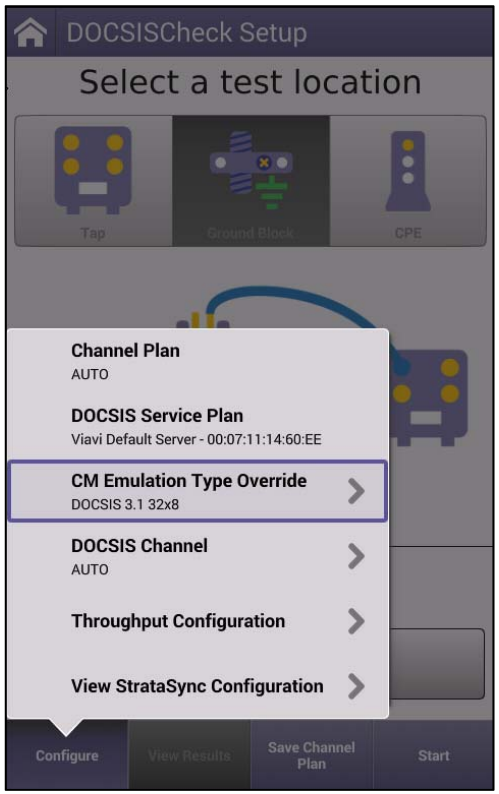


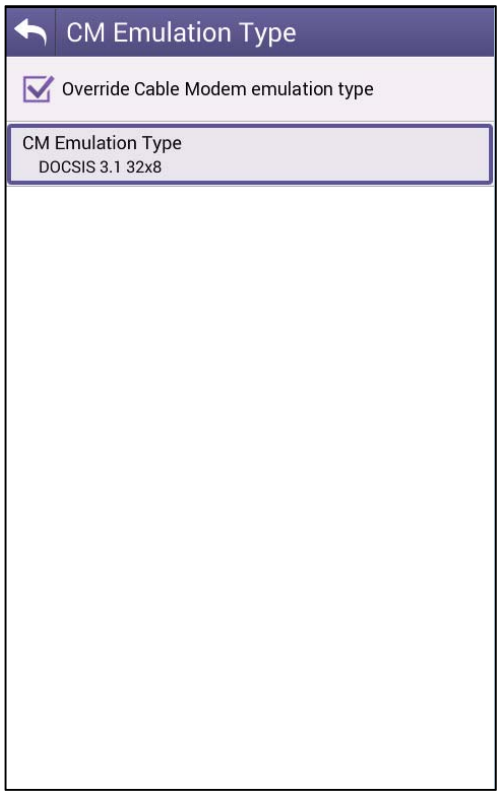


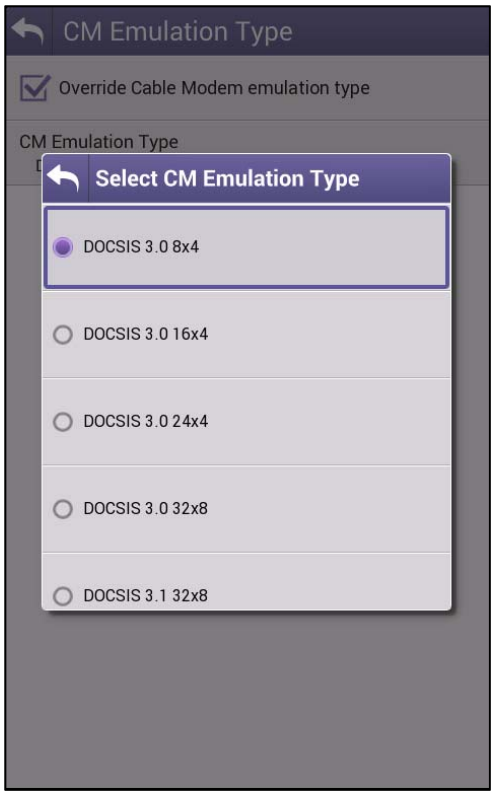


CM Emulation Selection

- Allows users to change ONX cable modem type emulation for session to match subscriber service/hardware for comparison
  - DOCSIS 3.0 (8x4, 16x4, 24x4, 32x8)
  - DOCSIS 3.1 (32x8 + 2 OFDM)
- Defaults to DOCSIS Service Plan settings







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DOCSIS Check Results

Dashboard

Downstream bonded DOCSIS Channels

Adjacent Channels and channel under test

Level Over Time

MER Over Time

Note: All results are live updated every time channel under test is changed

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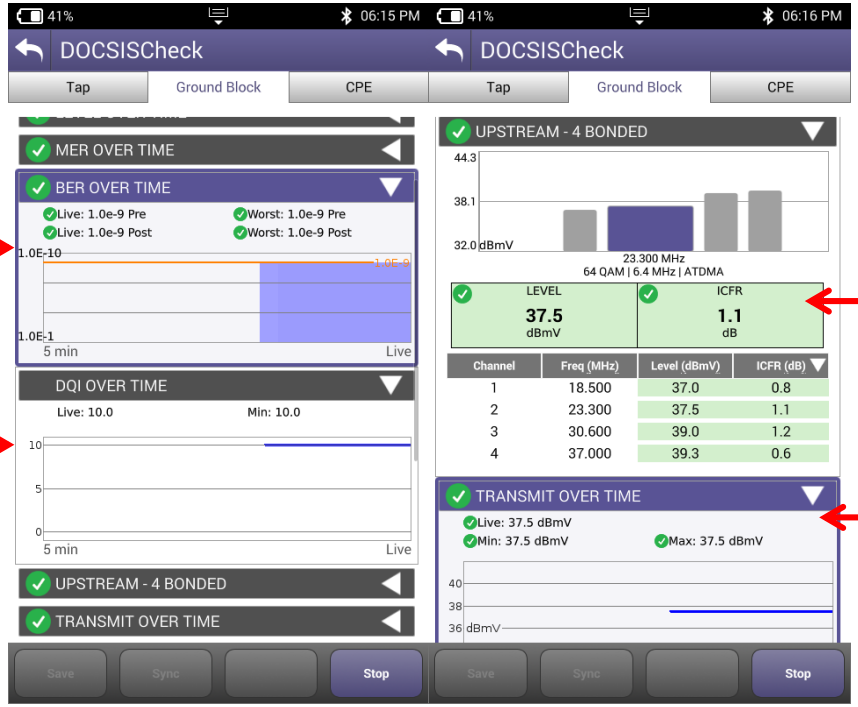
DOCSIS Check Results

BER Over Time

DQI Over Time



Upstream bonded
DOCSIS Carriers

Transmit Over Time
(based on Upstream carrier under test)

Note: All results are live updated every time channel under test is changed

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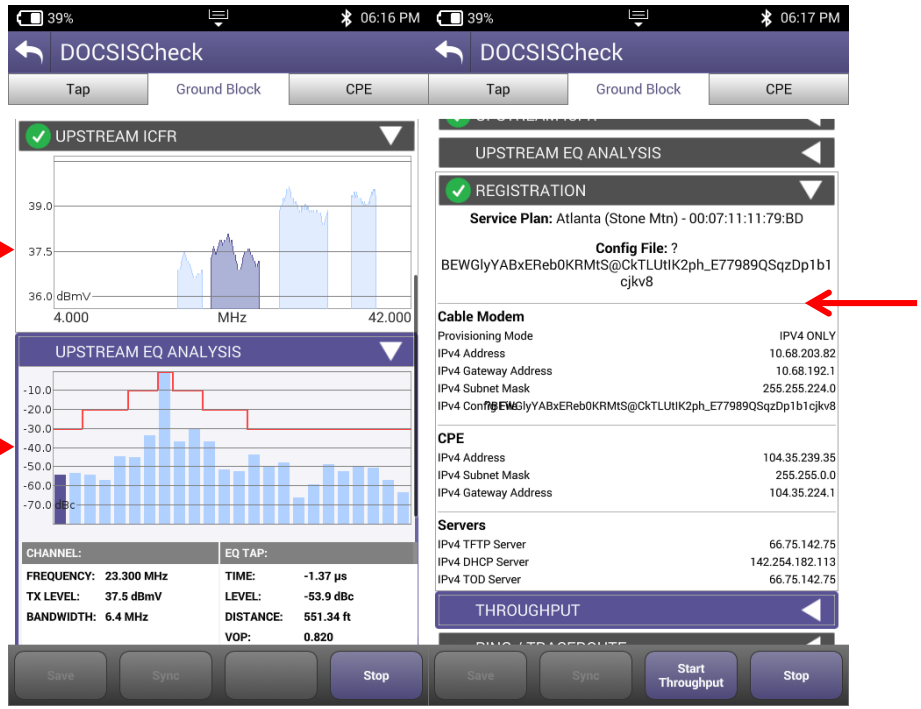
DOCSIS Check Results

Upstream ICFR Across all Bonded Carriers

Upstream EQ Analysis with Footage to Impedance Mismatch



DOCSIS Registration and Config File Info @IP

- ✓ Cable Modem
- ✓ CPE
- ✓ Servers

Note: All results are live updated every time channel under test is changed

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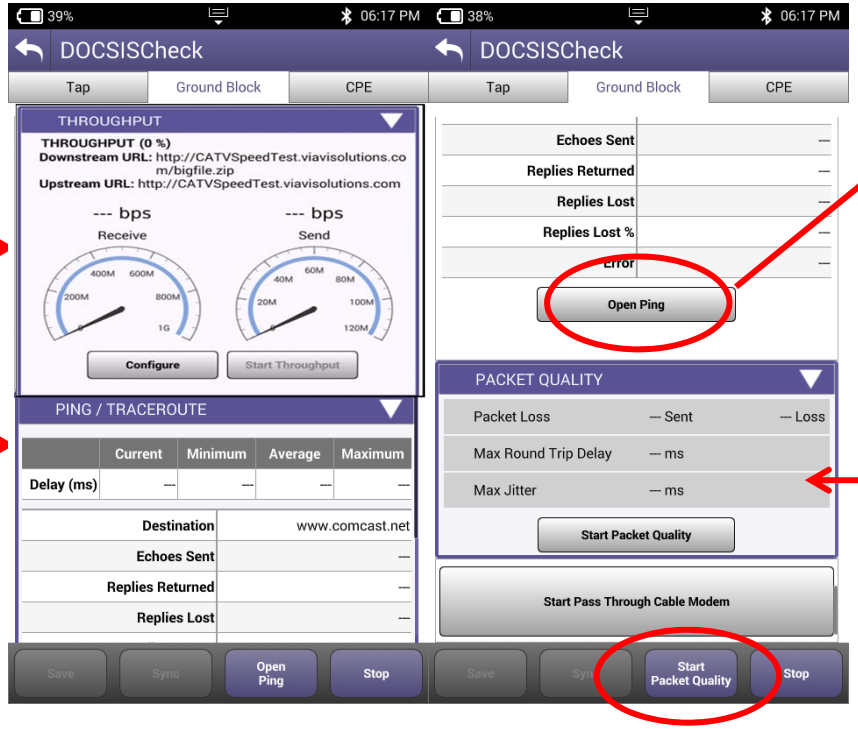
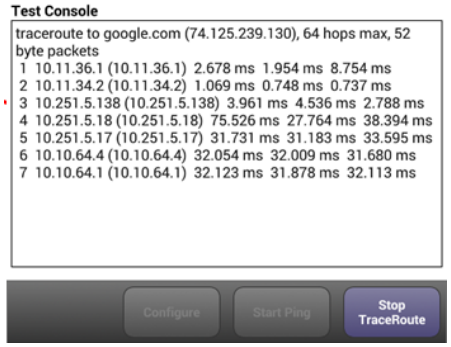
DOCSIS Check Results

DOCSIS Throughput
Setup configuration
via StrataSync

Ping/Traceroute
Test over
DOCSIS





	Current	Minimum	Average	Maximum
Delay (ms)	134.98	153.43	98.00	320.21

Destination	
Echoes Sent	50
Replies Returned	48
Replies Lost	2
Replies Lost %	4.00%
Echoes Received	48
Message	OK

Packet Quality
- Packet Loss
- Max Round Trip delay
- Max jitter

Note: Throughput and Packet Quality requires config in StrataSync,
Refer to Administrator Settings section for details

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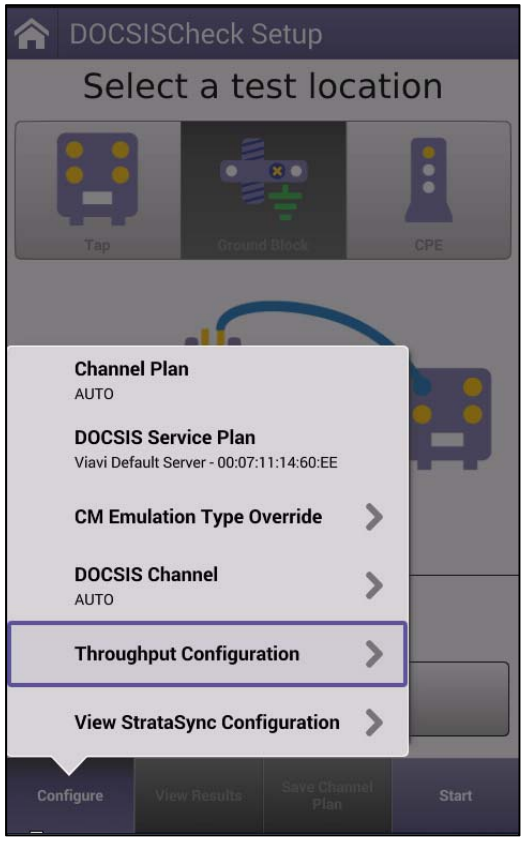
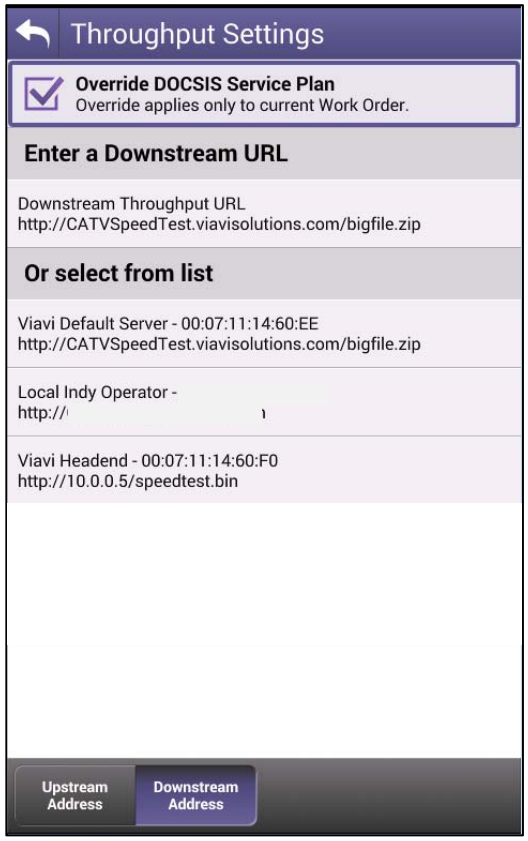
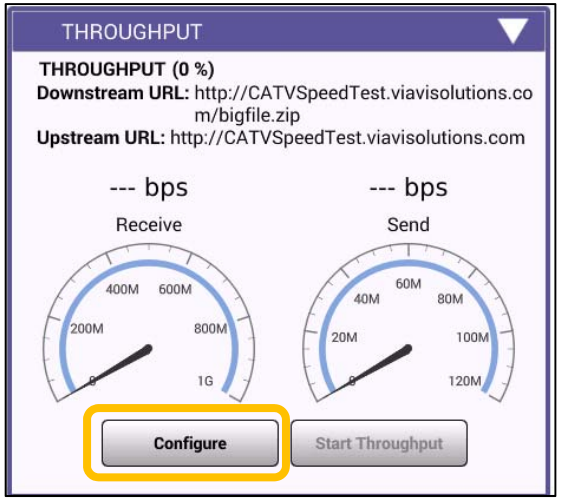
Throughput URL Selection

- Enables selecting from 5 preconfigured URLs in DOCSIS Service Plan
- Selection can be made prior to OneCheck or DOCSIS test, or on the fly during a live DOCSIS test







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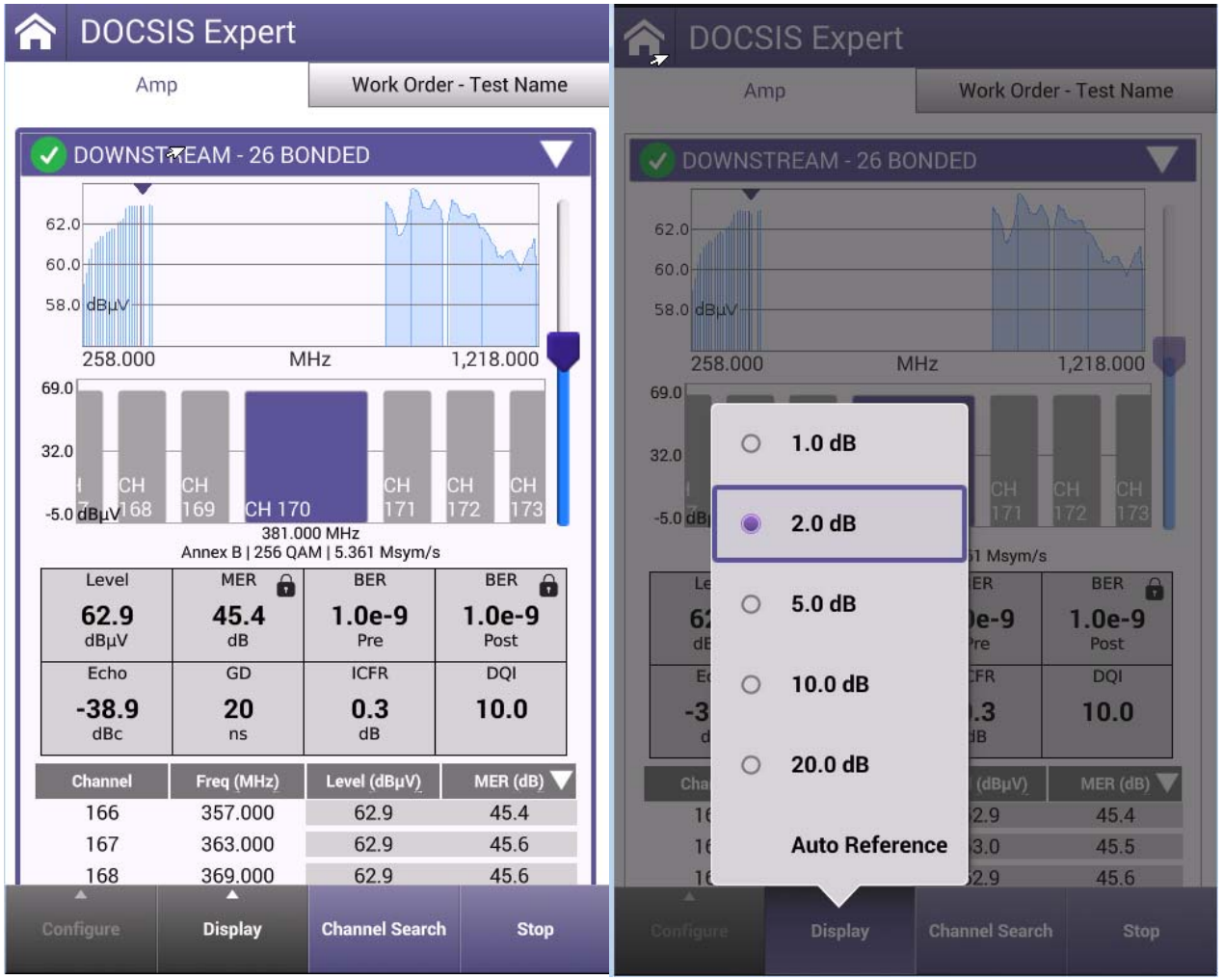
DOCSIS Check

DOCSIS Check/Expert

- dB/div selection on Channel View widget.
- Setting also used in StrataSync reports



✓ 69 – ONECHECK

OneCheck Setup

OneCheck is designed to conduct **Upstream** and **Downstream** testing from a chosen demarcation point, including an **ingress scan**, utilizing both ports on the ONX 620 in under 2 mins

- Enter Work Order ID and choose demarcation point and press Start
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons

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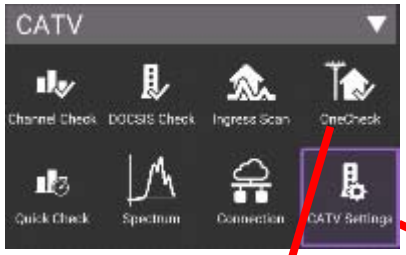
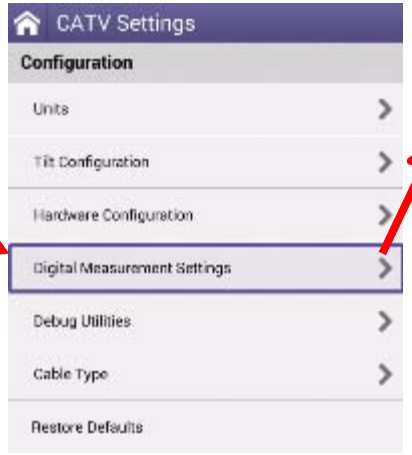
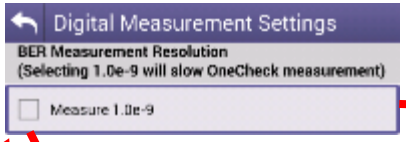
OneCheck BER Measurement Resolution Setup

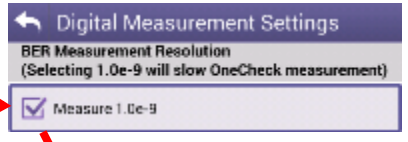
1.0E-8 or **1.0E-9 BER** can be configured in the CATV Settings in order to define the BER Measurement resolution in Downstream Channel Details view.



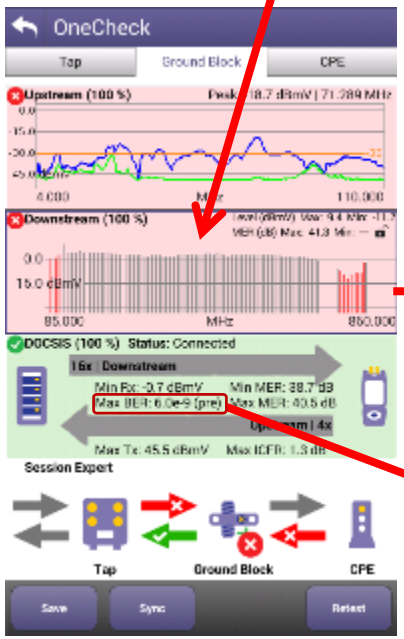




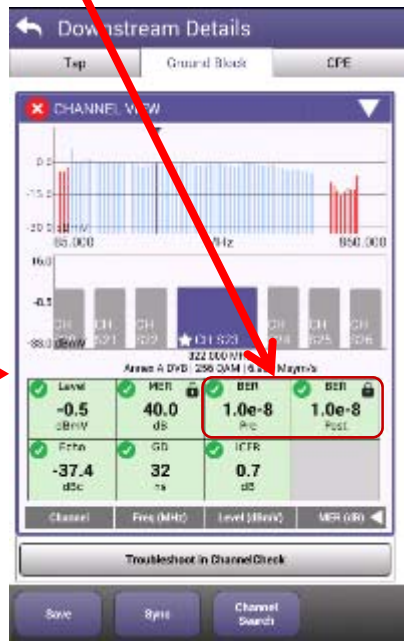
1.0E-8 BER → less accurate, faster test time

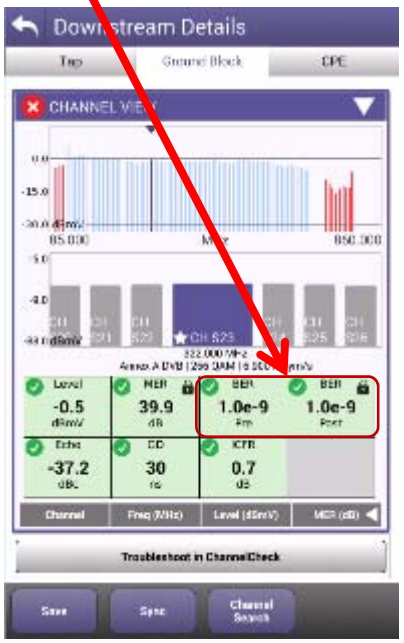


1.0E-9 BER → more accurate, longer test time



After test completion, push OK key to get more details





Even if Settings are setup to 1.0E-8 the **DOCSIS channels** will display **1.0E-9 BER** as DOCSIS test duration allows to get better BER resolution.

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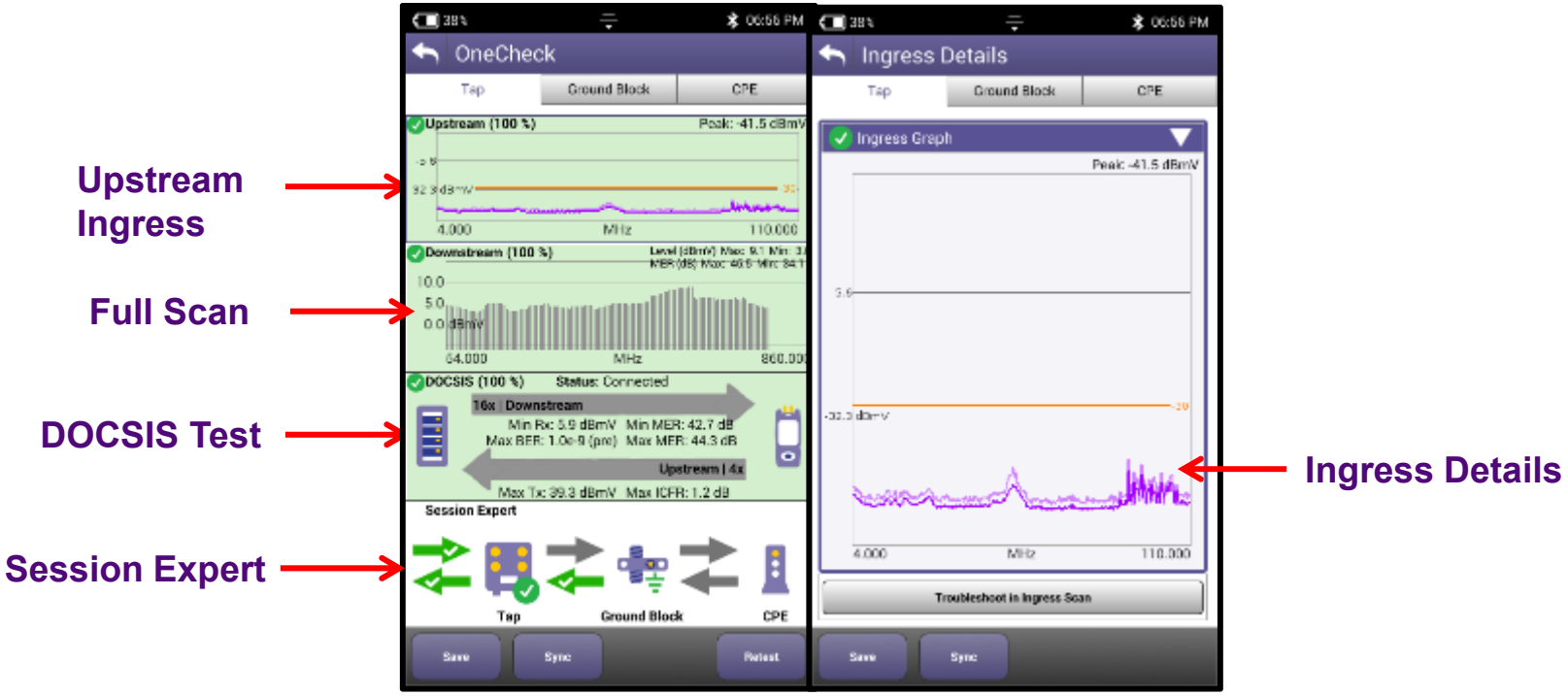
OneCheck Results



Note:

- Double tap on each section of the OneCheck dashboard for Details

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OneCheck Results – Downstream Details

Full Scan

Adjacent Channels and channel under test

Measurements

Adjacent channel table

Note: Troubleshoot in **ChannelCheck** Button available for live measurements

Similar Measurements to ChannelCheck, but **NOT LIVE**

Off Air Ingress Configuration via StrataSync

Notes:

- Double tap on each section of the OneCheck dashboard for Details
- Troubleshoot in **ChannelCheck** Button available for live measurements
- Off-Air Ingress configuration available through StrataSync

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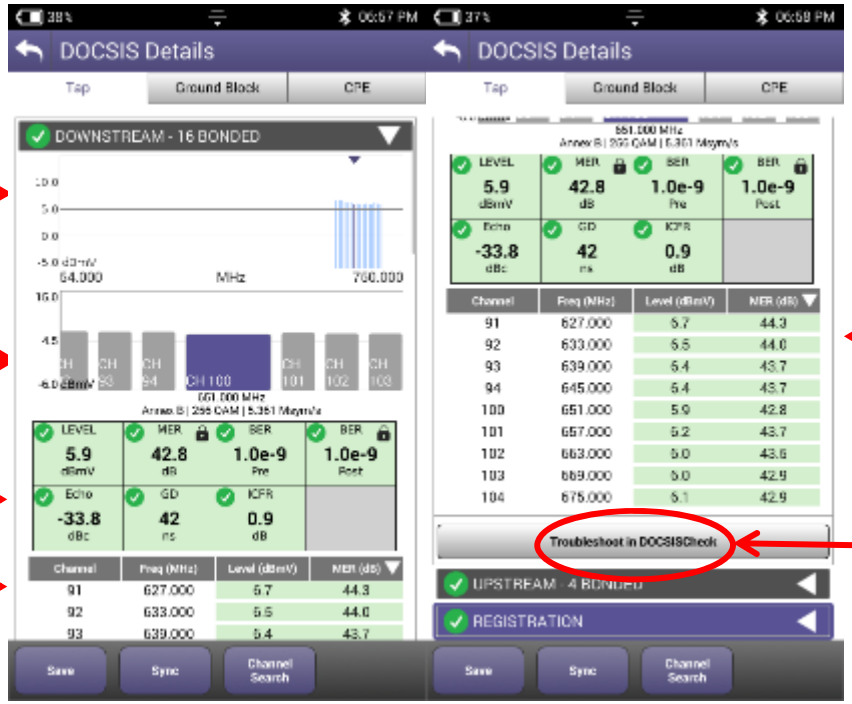
OneCheck Results- DOCSIS Details

Downstream DOCSIS Channels

Adjacent Channels and channel under test

Measurements

Adjacent channel table



Similar Measurements as DOCSISCheck, but **NOT LIVE**

Note: Troubleshoot in **DOCSISCheck** Button available for live measurements

Notes:

- Double tap on each section of the OneCheck dashboard for Details
- Troubleshoot in **DOCSISCheck** Button available for live measurements

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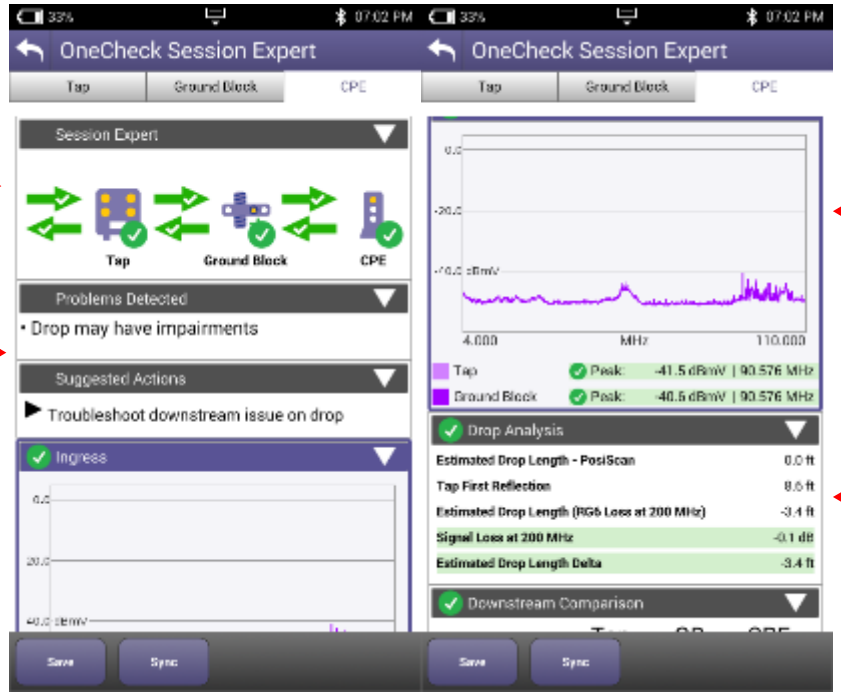
OneCheck Results- Session Expert

Typical Tap-CPE Network Diagram

Problems Detected

Suggestions



Ingress Scan snapshot and comparison to GB and CPE

Drop Analysis

- Session Expert is designed to point the technician toward a successful resolution to any network impairments
- Upstream and Downstream analysis is compared against Limit Plan (configurable in StrataSync)
- Based on results, Session Expert displays where it believes the network issues are located

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OneCheck Results- Session Expert

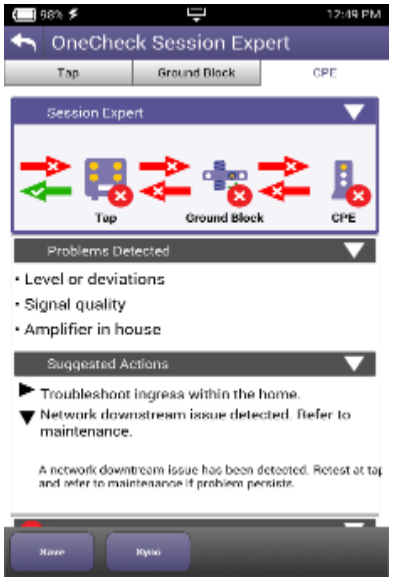
- Tap to switch test location and view results
- start a test at another location (Tap, GB, CPE).

Downstream Comparison

Smartscan Comparison

Off Air Ingress Comparison

DOCSIS Comparison



- Troubleshooting between demarcation points made easier
- Test Location aware helps guide technicians to problems
- Session awareness (tests within the current Job) uses data at the demarcation points to suggest next actions
- Side by side comparison helps technicians prove they have fixed the problems

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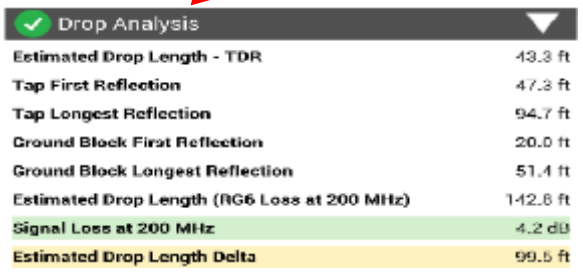
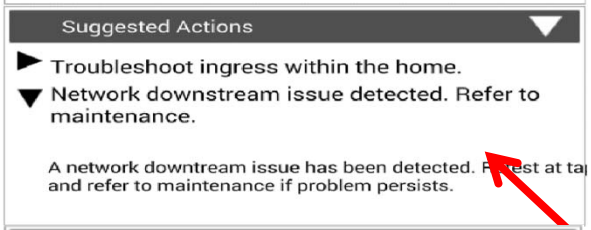
OneCheck Session Expert Details

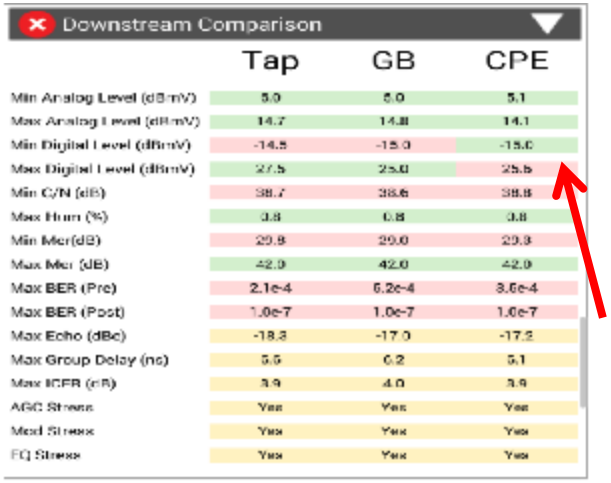
Arrows indicate the status of the upstream and downstream between locations

Drop Analysis helps technicians identify if there is a problem in the Drop between the Tap and GB that needs to be looked into.



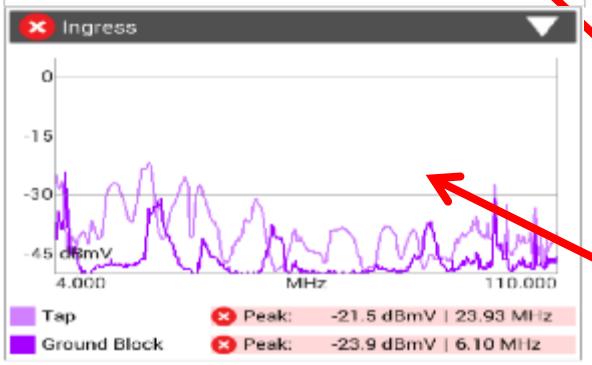
Background intelligence looks at the test data and identifies core problems that were present in the network





Technicians are with prioritized suggested next steps to find and fix problems based on industry wide best practices

Side by side comparisons of measurements between TAP, GB, and CPE speeds up technician analysis time and reduces call backs



Overlaid comparison of Ingress Scans between the TAP and GB help highlight where ingress is getting in

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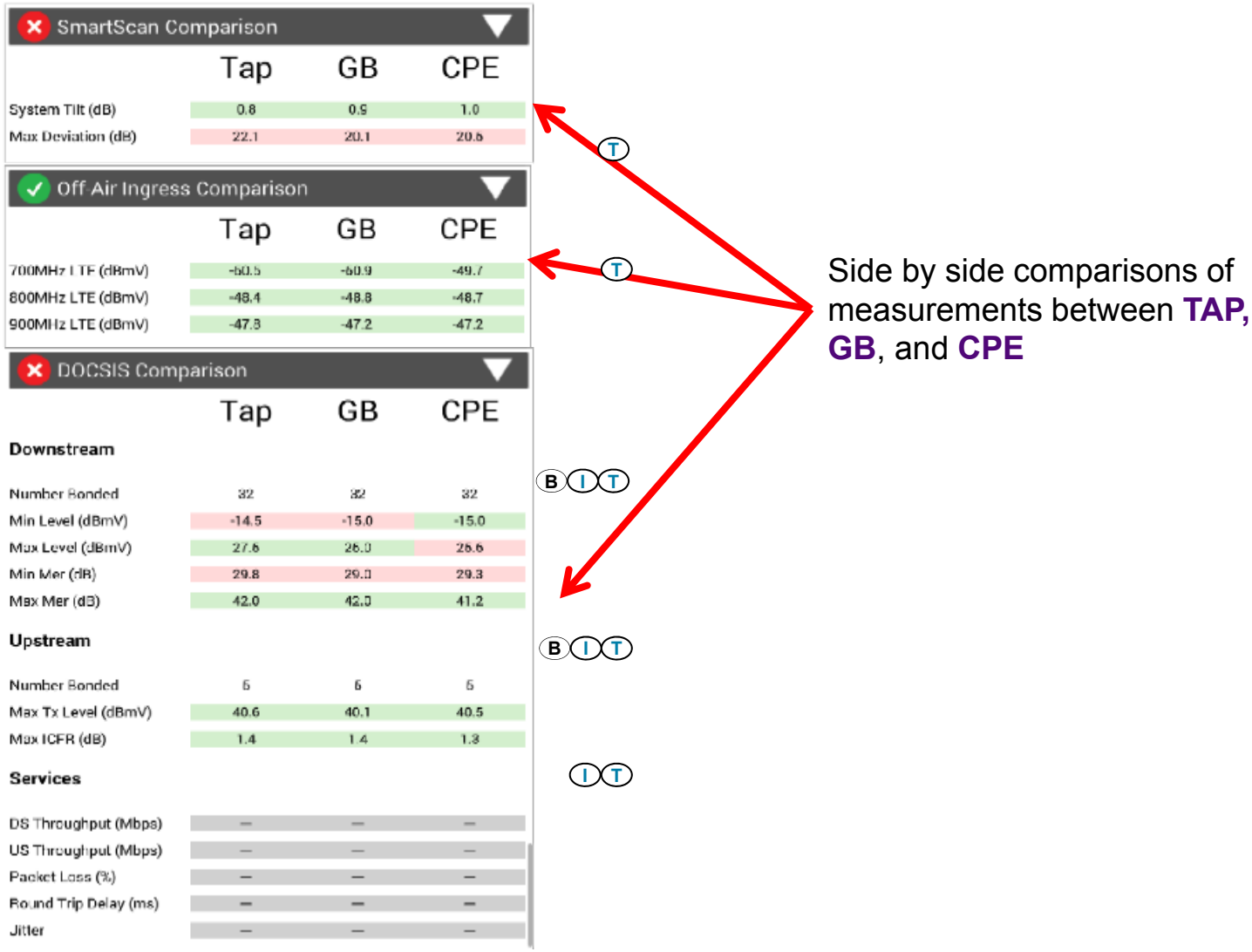
OneExpert CATV – OneCheck Session Expert Details



SmartScan Comparison

	Tap	GB	CPE
System Tilt (dB)	0.8	0.9	1.0
Max Deviation (dB)	22.1	20.1	20.6

Off Air Ingress Comparison

	Tap	GB	CPE
700MHz LTE (dBmV)	-50.5	-50.9	-49.7
800MHz LTE (dBmV)	-48.4	-48.8	-48.7
900MHz LTE (dBmV)	-47.3	-47.2	-47.2

DOCSIS Comparison

	Tap	GB	CPE
Downstream			
Number Bonded	32	32	32
Min Level (dBmV)	-14.5	-15.0	-15.0
Max Level (dBmV)	27.6	26.0	26.6
Min Mer (dB)	29.8	29.0	29.3
Max Mer (dB)	42.0	42.0	41.2
Upstream			
Number Bonded	6	6	6
Max Tx Level (dBmV)	40.6	40.1	40.5
Max ICFR (dB)	1.4	1.4	1.3
Services			
DS Throughput (Mbps)	—	—	—
US Throughput (Mbps)	—	—	—
Packet Loss (%)	—	—	—
Round Trip Delay (ms)	—	—	—
Jitter	—	—	—

Side by side comparisons of measurements between **TAP, GB**, and **CPE**

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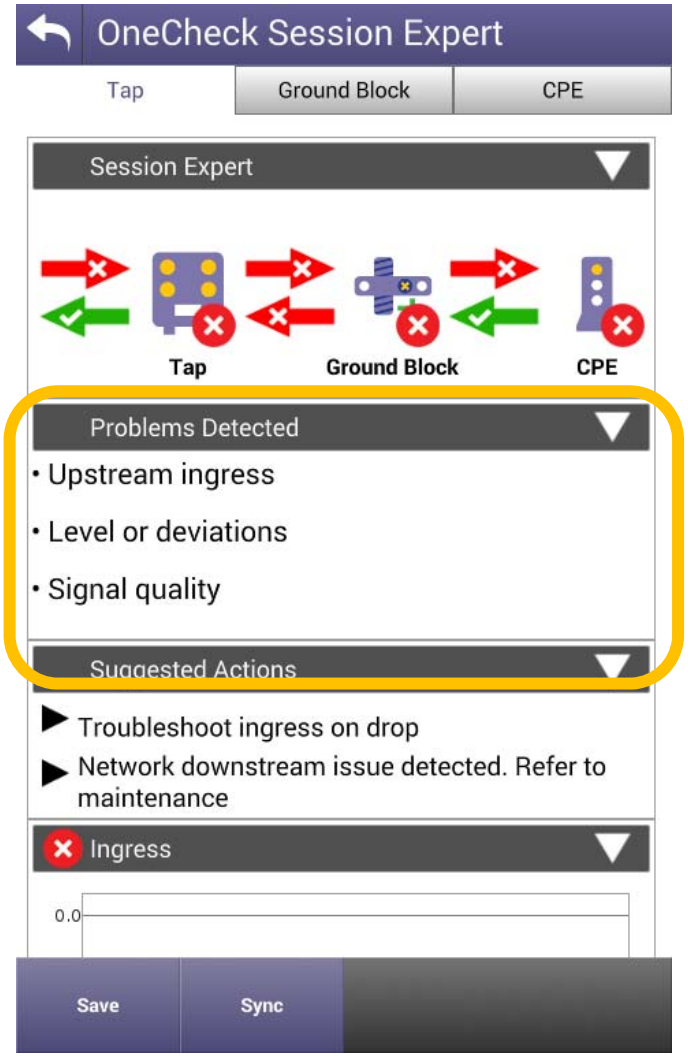
15 Failure Item categories Available in 3 groupings

- Downstream Problems
  - Signal Quality
  - Level or Deviations
  - Distortions / Echo
  - Downstream Ingress
  - Downstream Bonded Channel Differences
- Upstream Problems
  - Upstream Ingress
  - Upstream TX Level
  - Upstream ICFR
  - Upstream Bonded Channel Differences
- Service Layer Problems
  - Downstream Throughput
  - Upstream Throughput
  - Downstream Packet Loss
  - Upstream Packet Loss
  - Packet Jitter
  - Packet Round Trip Delay



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Failures listed by group & location (Tap, GB, CPE)
If multiple failures, listed in failure group by location

- Failures Detected 3 separate locations (Tap, GB, CPE), each with 3 Failure Groupings
  - 9 total columns – 1 for each Failure Group at each location
  - Tap Downstream, Tap Upstream, Tap Service Layer, GB Downstream, GB Upstream, GB, Service Layer, CPE Downstream, CPE Upstream, CPE Service Layer
- Each detected failure group, at each location, has its own metadata column with individual categories to be placed into their respective group failure column, with each specific problem category separated by a pound/hashtag symbol (#)
  - Each column can contain multiple failures listed per group at that location
  - Allows for identifying failures per location and per failure group
  - Groups individual failures together for high level review (Downstream, Upstream, Service Layer)
  - Columns can be filtered by specific failure(s) detected
  - Individual items can be parsed for custom use
    - For Test Data API, these four new columns will be added to the <info> field

CPE Downstream Failures Detected	CPE Service Layer Failures Detected	CPE Upstream Failures Detected	GB Downstream Failures Detected	GB Service Layer Failures Detected	GB Upstream Failures Detected	Tap Downstream Failures Detected	Tap Service Layer Failures Detected	Tap Upstream Failures Detected
			levelOrDeviations#					
levelOrDeviations#...			levelOrDeviations#...			levelOrDeviations#...		upstreamIngress#
levelOrDeviations#			levelOrDeviations#		upstreamIngress#			

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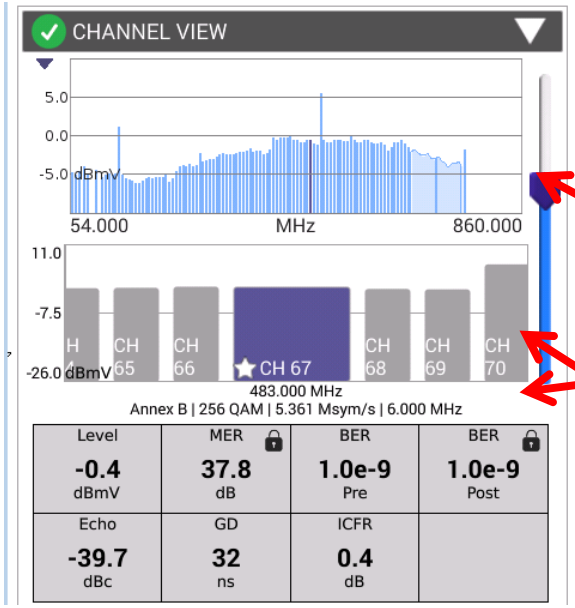
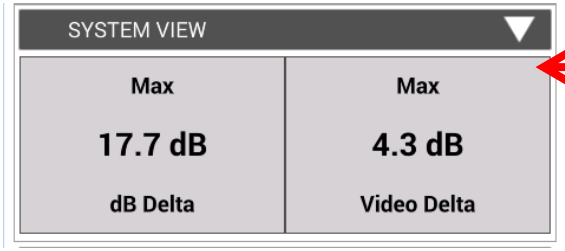
OneCheck Downstream Details

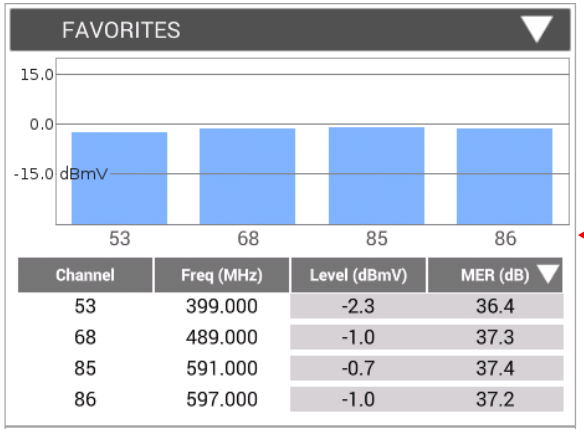


System wide view of channel performance

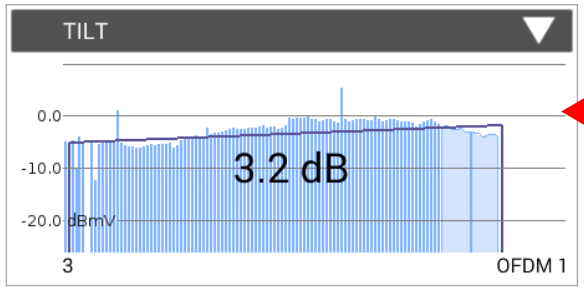
Individual channel details



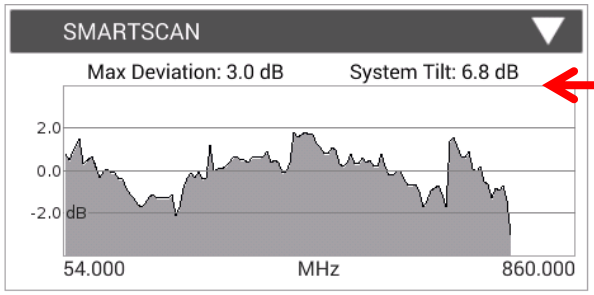
System summary view



Favorites view provides technicians with a quick mini-scan of critical carriers



Tilt identifies if system is within spec at TAP, GB or CPE



SmartScan simplifies system analysis by taking out the effects of tilt and different carrier types at TAP, GB and CPE

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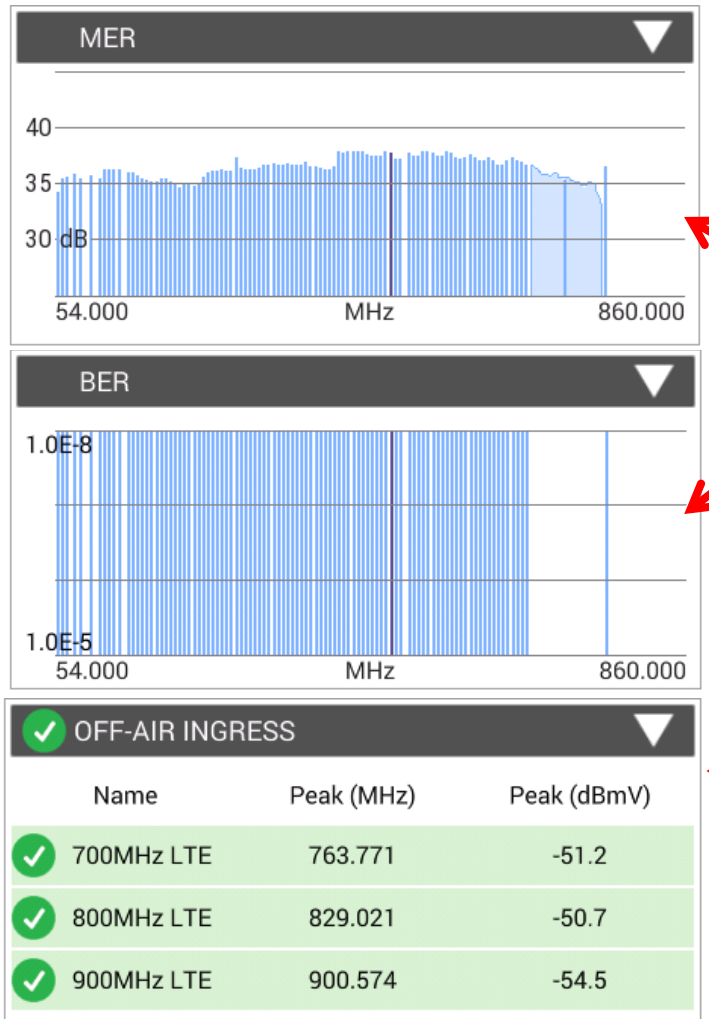
OneCheck Downstream Details



System wide view of **MER** and **BER** performance

Identification of **Off-Air** interferers that are infiltrating the downstream (user definable frequencies – configuration by StrataSync)

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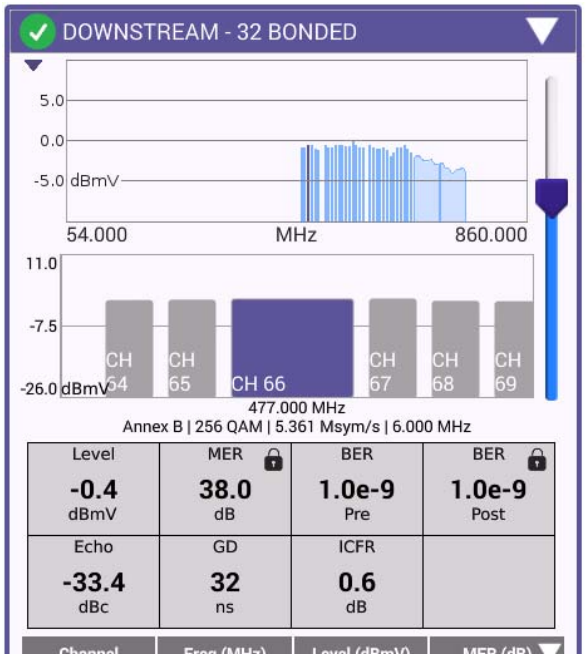
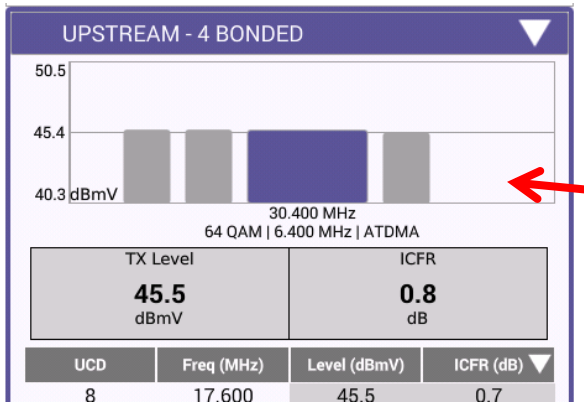
OneCheck DOCSIS Details

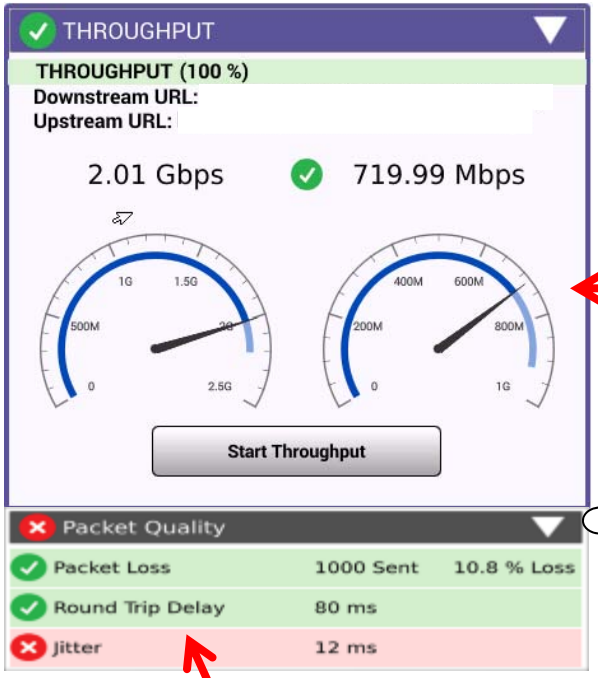


Scan view of **DOCSIS carriers** highlights problems. Touch Screen capability allows quick access to troubled carriers



Upstream view allows easy viewing of each upstream carrier including TX level and ICFR value

Registration details identifies if the internal modems status and helps identify if there are server issues



Throughput testing is available over the DOCSIS connection to test to the max capacity of a 32x8 system

Packet Quality identifies if packets are being lost over the RF portion of the data layer which may be caused by a physical layer problem.

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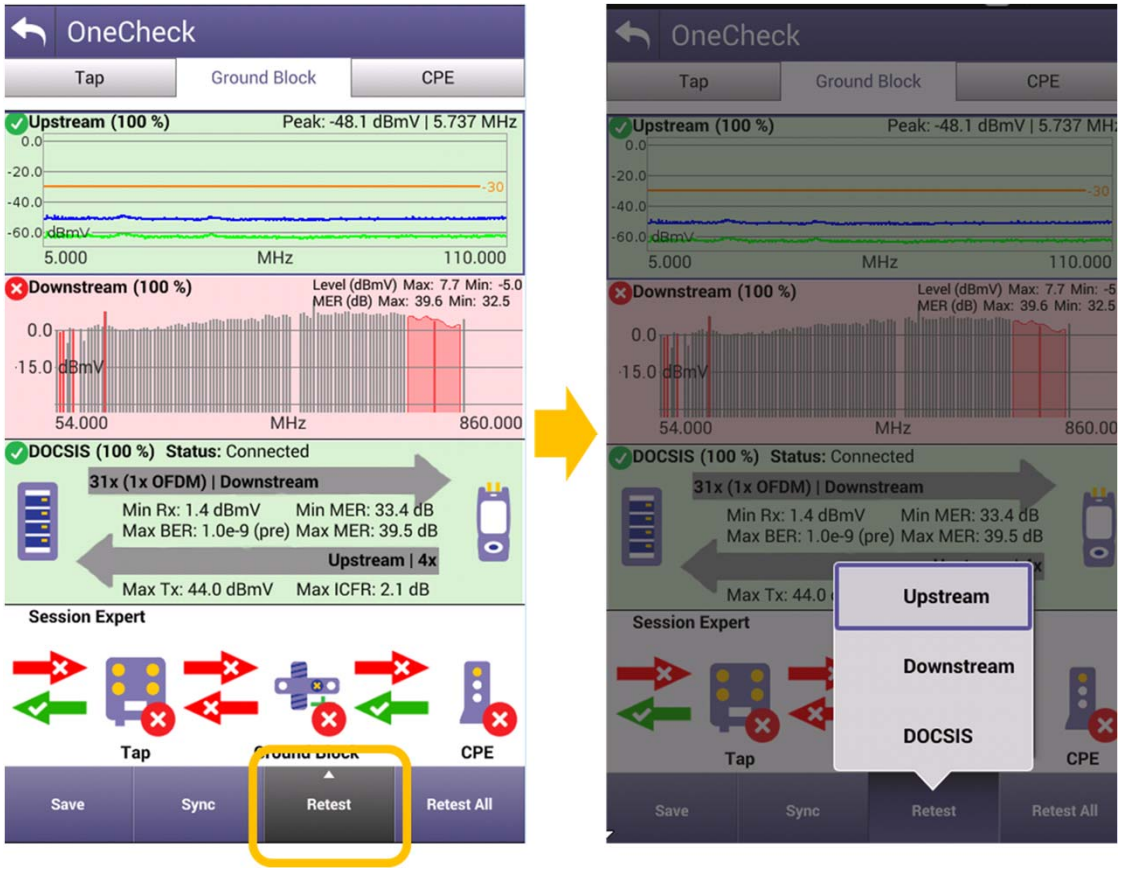
Retest Specific OneCheck Sections



- OneCheck: Allows independent retest specific section(s)
  - Saves time when only 1 or 2 sections failed
  - DOCSIS is typically longest test portion due to range and registration process and interaction with CMTS
    - Can be 1-2 mins long depending on various factors
  - Downstream all channels section can take about 30-35 seconds
    - When testing BER to 1E-8 (without multipliers enabled) on a 110 digital channel lineup
- If only Downstream channel testing fails, retesting only that section saves user 1-2 minutes as no need to retest DOCSIS
  - Continued failing for same reason indicates a persistent problem

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OneCheck Ingress Testing

- The ONX-CATV is designed to simultaneously measure ingress from the subscriber premises wiring at the same time it is making level and quality measurements from the CATV network
- Ingress testing is performed on the ONX on Port 2 while the plant measurements are performed on Port 1
- When connecting the subscriber premises to Port 2 it is recommended that the whole home remain connected, so the entire home can be tested with the same configuration that will remain after the job is complete
  - At the Tap, this includes the drop cable as well as all in-home wiring
  - At the Ground Block, the drop is disconnected and now all the in-home wiring is to be tested
  - There is no need to disconnect CPE devices as these should stop upstream DOCSIS communications once the downstream signals are disconnected
  - Also it is not recommended to terminate any cable ends that will not remain terminated after testing is complete – Terminators absorb the TDR pulses described later in this document

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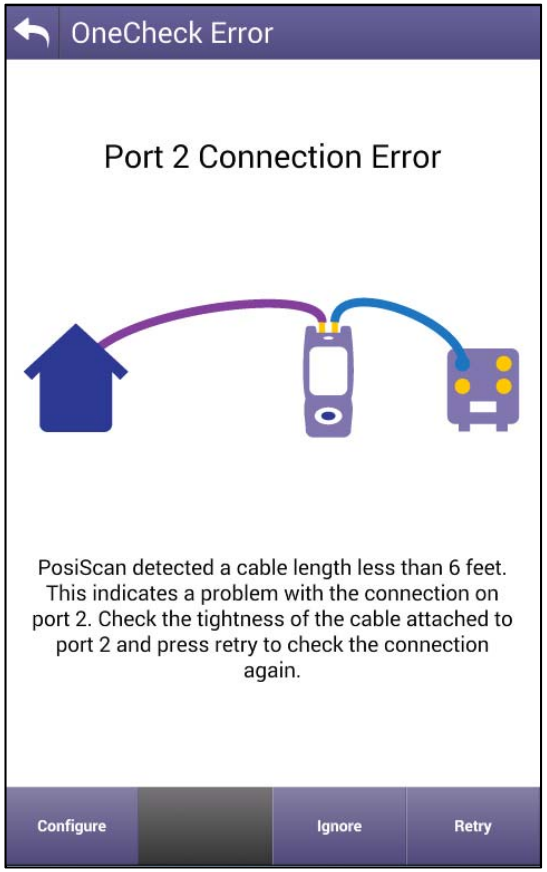
Port 2 Connection Error - Overview

- Prior to beginning a OneCheck test at the Tap or Ground Block, the ONX attempts to determine whether it is properly connected on Port 2 to a valid coaxial network, such as home wiring, which will then measure ingress coming from the subscriber premises
- The ONX validates the connection by utilizing its built-in TDR, sending a TDR pulse out of port 2 of the ONX, and looking at the measured TDR reflections
- If the detectable reflections are greater than 6ft in length then the ONX proceeds with OneCheck testing, however, if the TDR reflections are less than 6ft, or no reflection is detected, the Port 2 Connection Error (pictured right) is shown
- This displayed message serves two purposes:
  - Warn the user in case a connection was not made properly so a valid test can be performed
  - Ensure users always connect to the subscriber's coax network, for proper ingress testing of the prem, and discourages performing ingress testing on a clean short coax jumper
- After checking the connection press "Retry" to attempt the test again or press "Configure" to go back to the main OneCheck display



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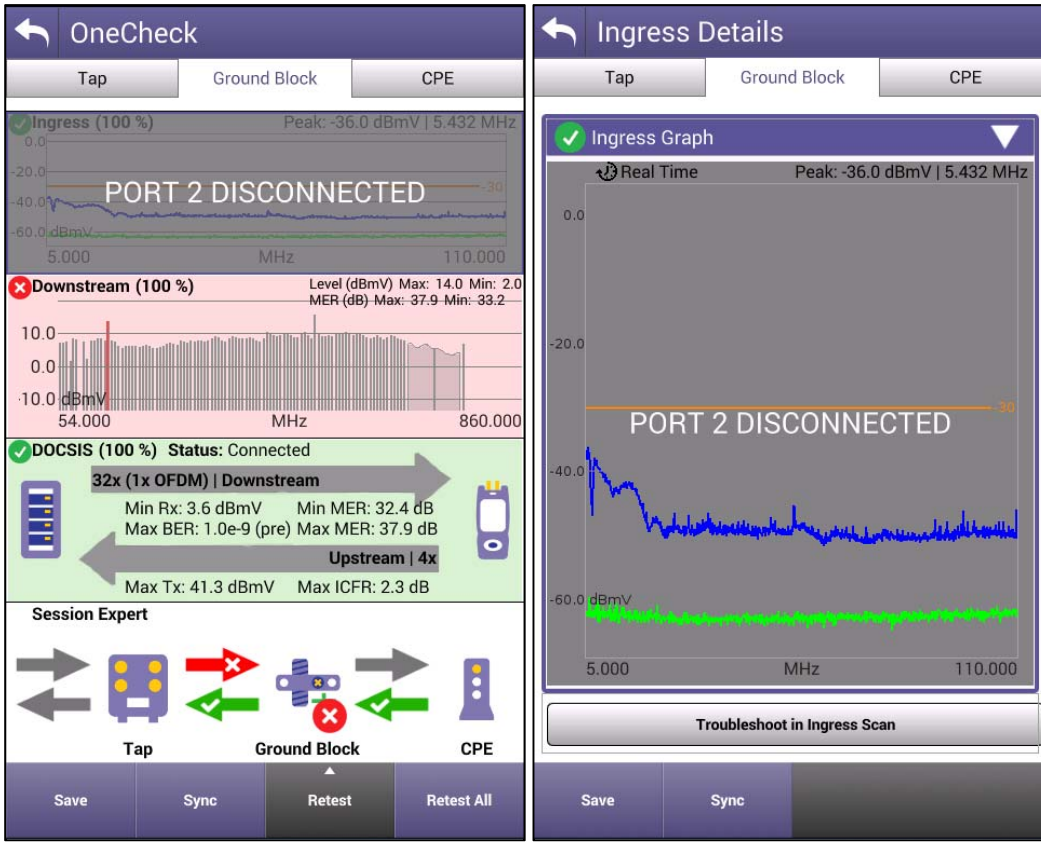
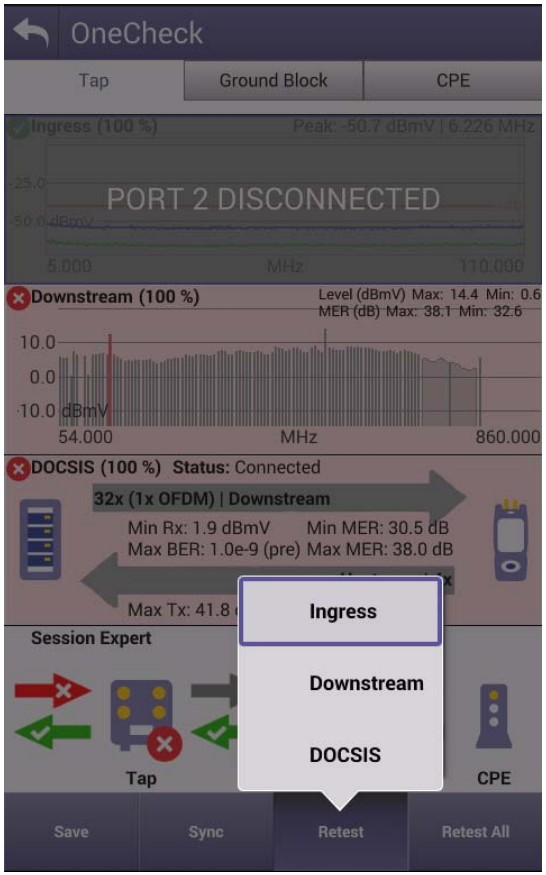
Port 2 Connection Error – Pressing Ignore

- If the user is confident that the wiring is properly connected, but the warning persists, pressing the Ignore button will continue with the testing but will show the Ingress Scan section greyed out with the message displayed “PORT 2 DISCONNECTED”
- Ingress is still being tested in the background and will be saved in the OneCheck test report
- Clicking on the Ingress section will still reveal the Max and Average Ingress traces for further evaluation



Retesting Ingress Only

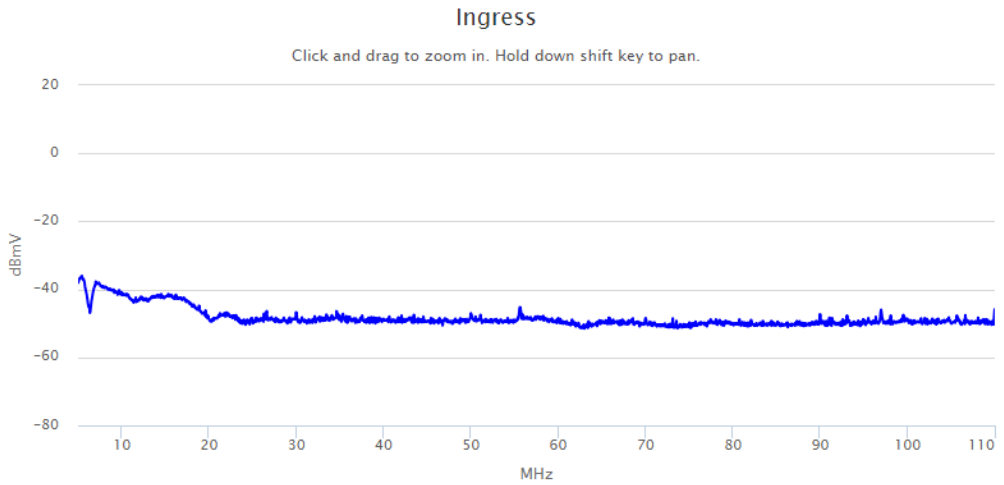
- After the OneCheck test has completed if the Ingress section has failed, and corrective action has been made, users can retest just the Ingress section (and/or other sections too) by pressing the “Retest” softkey then selecting the “Ingress” section
- This will begin ingress testing again, including making sure the ONX is connected properly, but can save time by not requiring all 3 sections of the OneCheck be retested



Port 2 Connection Error – OneCheck Report in StrataSync

- When the Port 2 Connection Error is displayed and the Ignore button is pressed, again, this does not cause the test to fail
- The Ingress scan data is still saved and upon a successful sync to StrataSync will be available to review and archive

Overall Ingress Limit	
Over Range	false
Peak Frequency (MHz)	5.432
Peak Value (DBMV)	-36.0



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Port 2 Connection Error – OneCheck Metadata

- If the Port 2 Connection Error is displayed and the Ignore button is pressed, this is noted in the OneCheck testing via the test report's metadata
- If the Test Data view is configured to include "GB Connection Status" or "Tap Connection Status" and a Port 2 Connection Error has been ignored, this will show as "IGNORED" under the GB/Tap Connection Status columns
- The "GB Ingress Scan Status" or the "Tap Ingress Scan Status" metadata can also be reviewed showing the ingress specific status, Pass or Fail, of that OneCheck test

GB Connection Status	GB Ingress Scan Status	Tap Connection Status	Tap Ingress Scan Status
IGNORED	PASS	NONE	NONE
IGNORED	PASS	NONE	NONE
NONE	NONE	IGNORED	PASS
NONE	NONE	IGNORED	PASS
CONNECTED	PASS	CONNECTED	PASS
CONNECTED	PASS	NONE	NONE
NONE	NONE	CONNECTED	PASS
NONE	PASS	NONE	NONE

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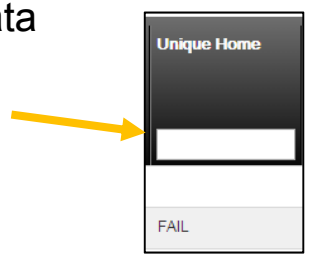
Non-Unique Home - Explained

- When running a OneCheck test the ONX sends the TDR pulse into the subscriber's premises wiring and attempts to validate that the TDR reflections measured are not similar to any other previously measured TDR reflections
- This warning is presented when the TDR reflections are very similar to previously measured TDR reflection in a previous OneCheck test result that is still present on the ONX
- The purpose of this warning is to ensure users always connect to the current subscriber's coax network and discourages performing repeated ingress testing on a known clean coax network
- This warning does not cause the OneCheck Ingress test to fail
- If the user is certain the coax network is unique, and the warning has appeared, pressing the Ignore button will allow the OneCheck test to continue as normal
- This "Unique Home" warning is noted in the metadata of the OneCheck test and can be reviewed in StrataSync



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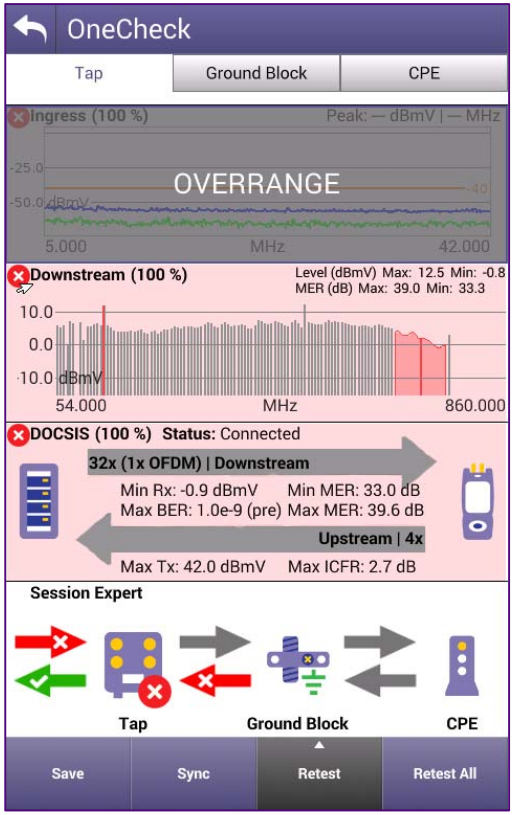
OneCheck Overrange – Description

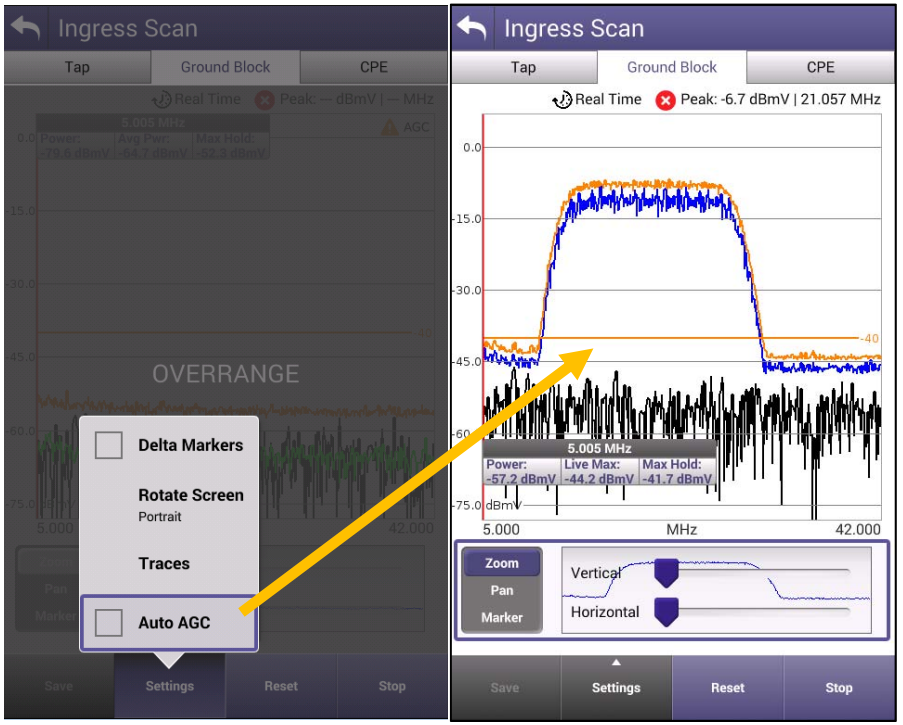
- When performing a OneCheck test if the Ingress section says “Overrange” this is an indication that excessive noise, or some other high powered signal, has been detected that is overdriving the ONX’s Port 2 circuits – Once the measurement circuits are overdriven, further measurements are unreliable so the Overrange warning persists for the duration of the test
  - NOTE: The ONX’s Port 2 is always measuring from 5MHz to 110MHz, even if the selected view is set to view 42MHz, 65MHz, or 85MHz spans
  - It is not recommended to set your frequency span above 110MHz unless your plant utilizes a 204MHz return band
- In the OneCheck test the ONX does not automatically adjust the internal attenuation, known as Auto AGC, to accommodate for very high level noise signals.
  - This is due to the fact that all noise should be very low coming from the home anyway. Therefore, adjusting the internal attenuation, potentially adding several seconds to each test, would waste time adjusting for the very high signal and still show as a failed test
  - The ONX has a 50dB dynamic range, which is the lowest to highest level the ONX can measure and display. Meaning OneCheck Ingress test can measure signals up to about 0dBmV before causing an Overrange.
- This excessive noise, or other signal, should not be a transmission from the subscriber modem or set top box since the subscriber premises wiring should be disconnected from the CATV network
  - DOCSIS standard mandates all CPE to stop communications when downstream signals have been removed



OneCheck Overrange – Next Step – Ingress Scan Mode

- Once an Overrange situation has occurred it is recommended to leave the OneCheck test and go into the stand alone Ingress Scan mode

- In this mode, only ingress will be measured on Port 2 so there is no minimum cable length measurement performed
- If while in Ingress Scan, Overrange is still showing, open the Settings menu and be sure to check the Auto AGC box
  - "Auto AGC" automatically adjusts the amount of internal attenuation so the signal can be measured. When enabled the peak of the noise detected, from 5-110MHz, will be set at the top of the display
  - Note: If Auto AGC needs to add attenuation, the display will adjust to the top of the noise signal. Due to the ONX's 50dB dynamic range, the Ingress Scan mode will show the noise floor about 50dB lower than the top of the signal



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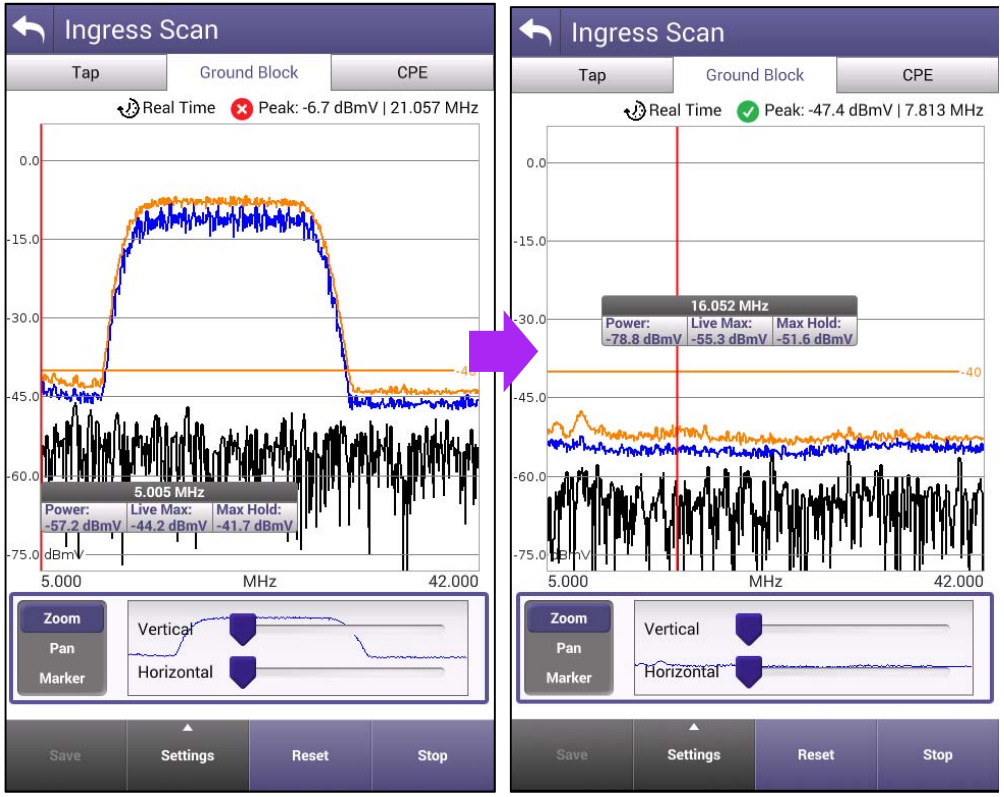
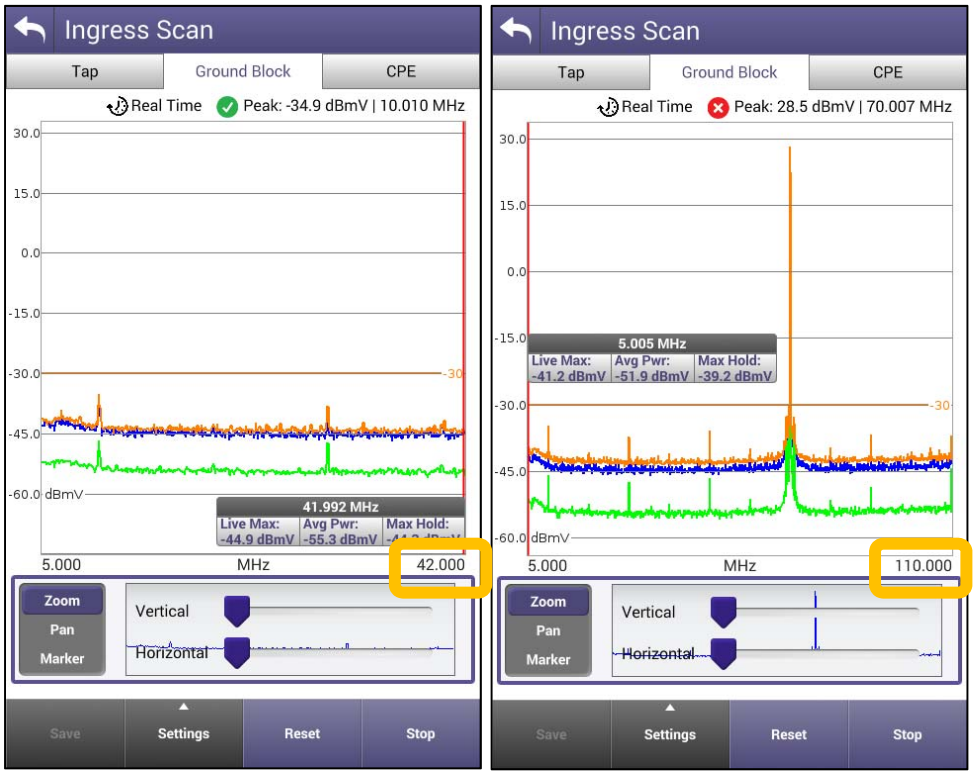
OneCheck Overrange – Next Steps – Ingress Scan Mode

- If noise is present, use typical noise mitigation procedures to clean up the return path
- Validate that the noise is has been minimized using the Ingress Scan mode
- Once confirmed, return to the OneCheck test and Retest



OneCheck Overrange – Noise Not Visible below 42MHz

- If the excessive noise causing the Overrange is not seen and the view is set for either 42MHz, 65MHz, or 85MHz change the frequency span to 110MHz so you can see the whole ONX upstream measurement span
  - The frequency span can be changed by pressing the Configure button, available from the test location selection screen (Tap, Ground Block, CPE selection screen)
- Signals at these higher frequencies, if present, have the potential to impact other services operating at those frequencies
- **NOTE:** Using a Low Pass Filter, one which allows frequencies lower than 42MHz but blocks signals up to at least 110MHz, could be used to avoid a failure caused by these signals, and which are frequently present at high levels causing an Overrange during OneCheck testing (often data or cable modem service only filters have worked)
- When the noise has been mitigated and validated, return to the OneCheck test and retest



Ingress Scan at a 42MHz span appears to show as passing despite an Overrange in OneCheck. Expanding the visible frequency span shows a very high noise spike about 70MHz

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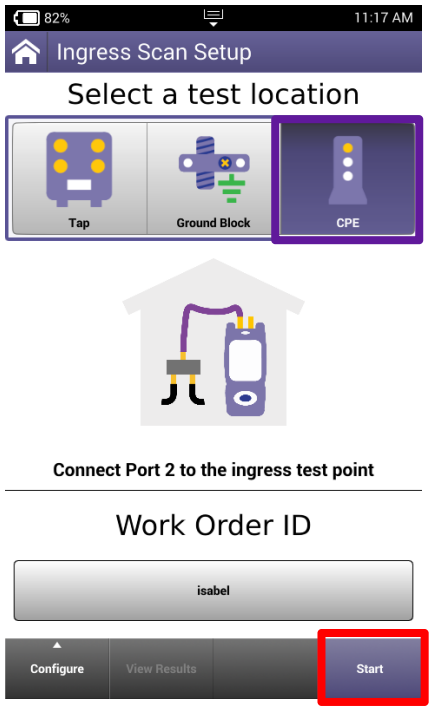
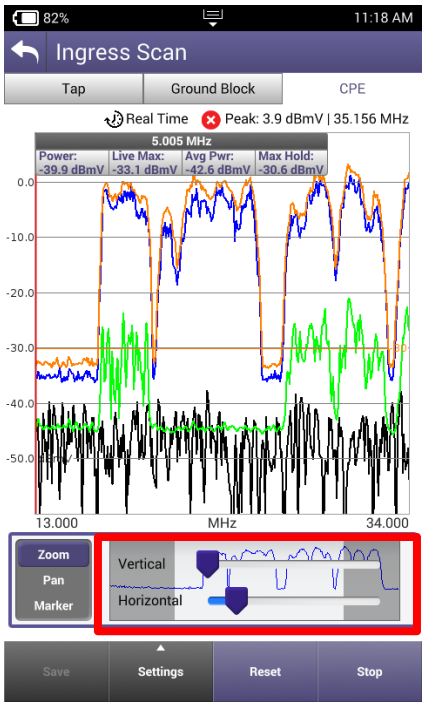
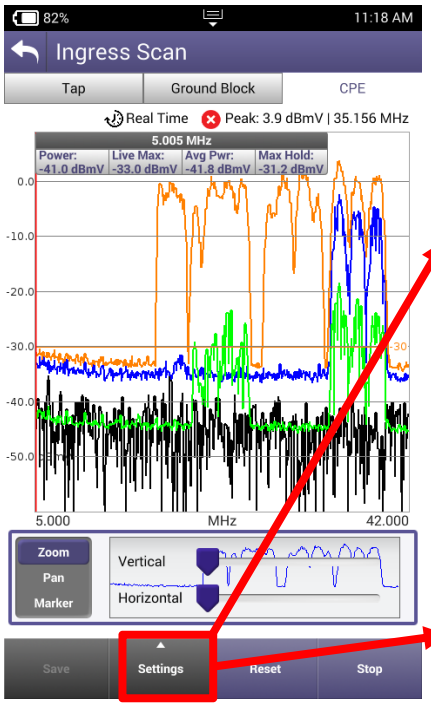
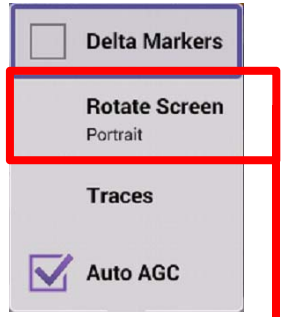
✓ 96 – INGRESS SCAN

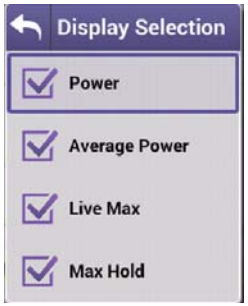
Ingress Scan

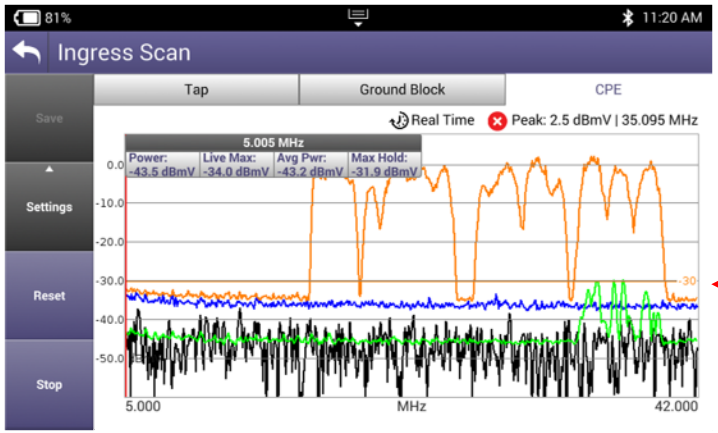








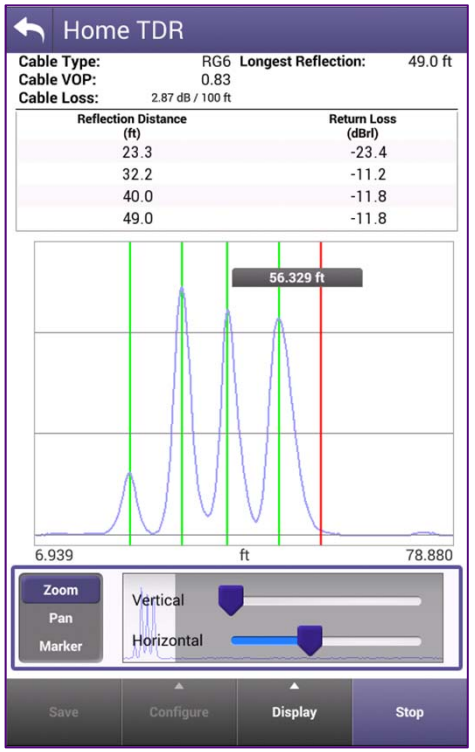




- ✓ 98 – TDR
  - Home TDR (option)

Introducing the Home TDR

- Optional on all ONX models
- Uses a shaped pulse technology to work through splitters and passive devices
- Test, and understand cable lengths and in-home coax topologies
- Transmits short pulse into coax network, measures returned pulse echoes, calculates length to reflections
- Displays reflections graphically and in table
- Save and sync TDR results to StrataSync



Home TDR Attributes

- Maximum distance → ~210m
- It will have a dead zone of about 2meters so it may be best to use a 2m test lead if a user is trying to find something behind an outlet
- TDR displays are continuously updated to quickly see adjustment updates
- Graph initially adjusts to maximum reflection detected
- Pinch and Zoom to see reflections with higher or lower resolution
- Use a marker to determine distance to any graphed point or use delta marker to compare graphed distances
- Select one of several different cable types, or enter a custom cable type with cable VoP and cable loss values
- Velocity of Propagation (VoP): how fast a signal traverses coax cable relative to speed of light - modifications to VoP affect calculated distance
- Cable Loss: degradation of signal amplitude over distance – modifications to cable loss adjust TDR's cable compensation value and affect calculated dBrl value

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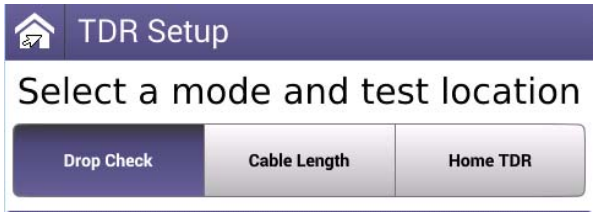
Introducing the Home TDR



Drop Check TDR:

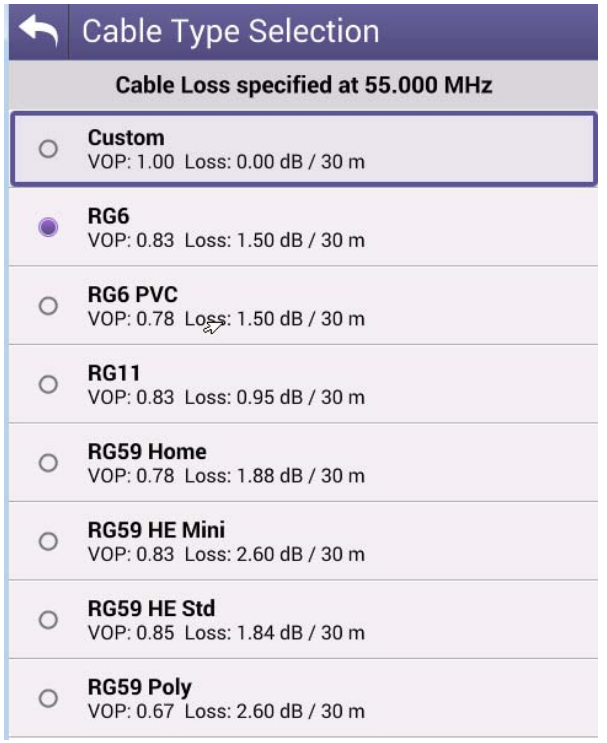
- Drop Check for identifying drop quality & length
- Measure **Drop Length** & **Drop integrity** by analysis of reflections according to selection of cable type – selection of both sides - Ground Block to Tap, Tap to Ground Block

Cable Length:

- Measure **Cable Length** & **Cable integrity** by analysis of reflections according to selection of cable type.

Home TDR:

- Live TDR mode for troubleshooting
- Measure **Longest reflection** & **Return Loss** analysis of reflections according to selection of cable type.
- Choice of test location (Tap, Ground Block, Other)



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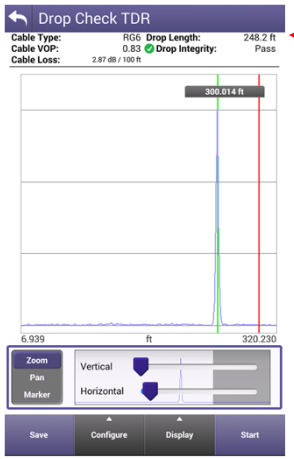
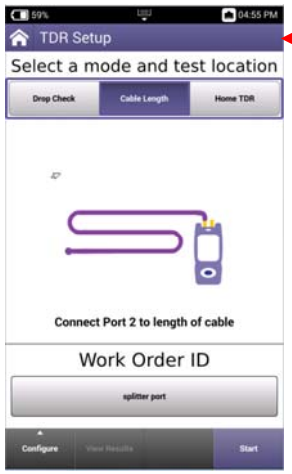
TDR overview (option)

TDR - Time domain reflectometer mode for cable length check, home network component and cable damage location

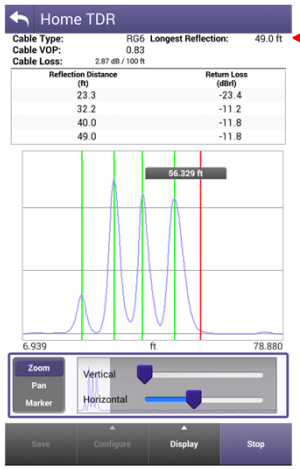
Test disconnected drop example



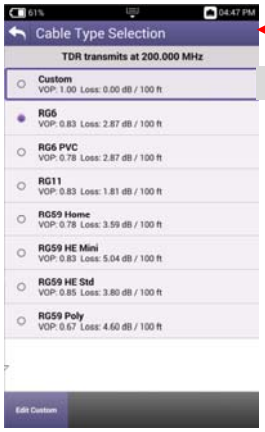
Drop Check for identifying drop quality and length



Cable Length mode

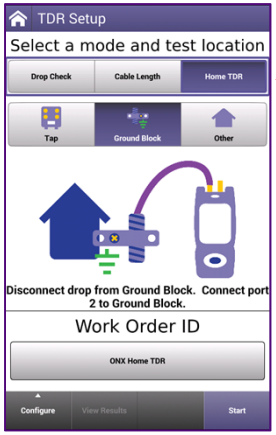


Live TDR mode for troubleshooting



Cable Loss calculated

Flexible VOP including custom



Home TDR mode

- Home TDR Analyzes a home coax network and identifies several reflections
- Automatically identifies up to 4 reflections and lists in reflection table with distances and return loss amplitudes
  - Longest reflection and 3 next highest return loss reflections greater than -25dBrl are listed in reflection table
  - Any reflection detected is shown graphically but may not be listed in table

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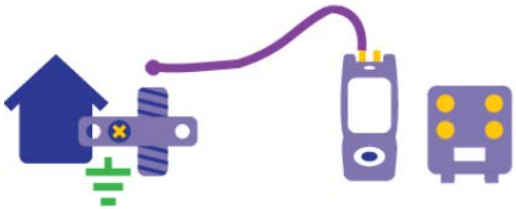
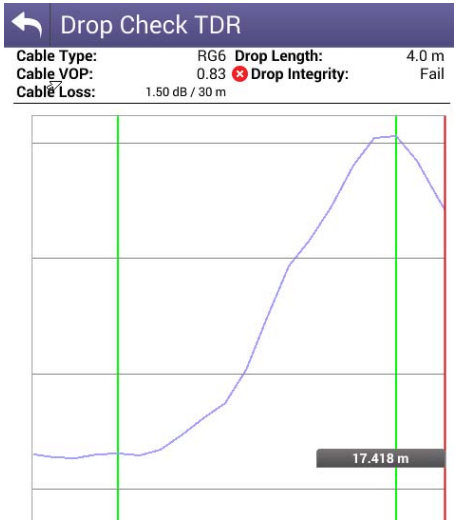
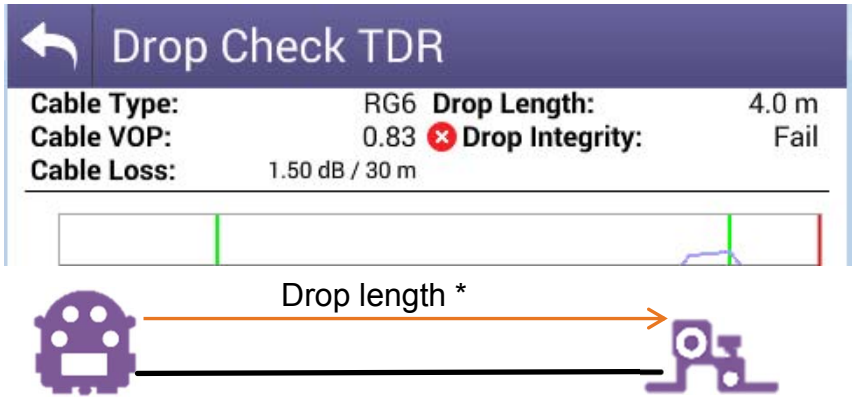
Drop Check TDR



Disconnect drop from Tap and Ground Block.
Connect port 2 to Drop

Disconnect drop from Tap and Ground Block.
Connect port 2 to Drop





Drop Check TDR:
Measure **Drop Length** & **Drop integrity** by analysis of reflections according to selection of cable type – selection of both sides - Ground Block to Tap, Tap to Ground Block

Drop: RF cable running from Tap to Ground Block
Ground Block: (US) demarcation point - barrel

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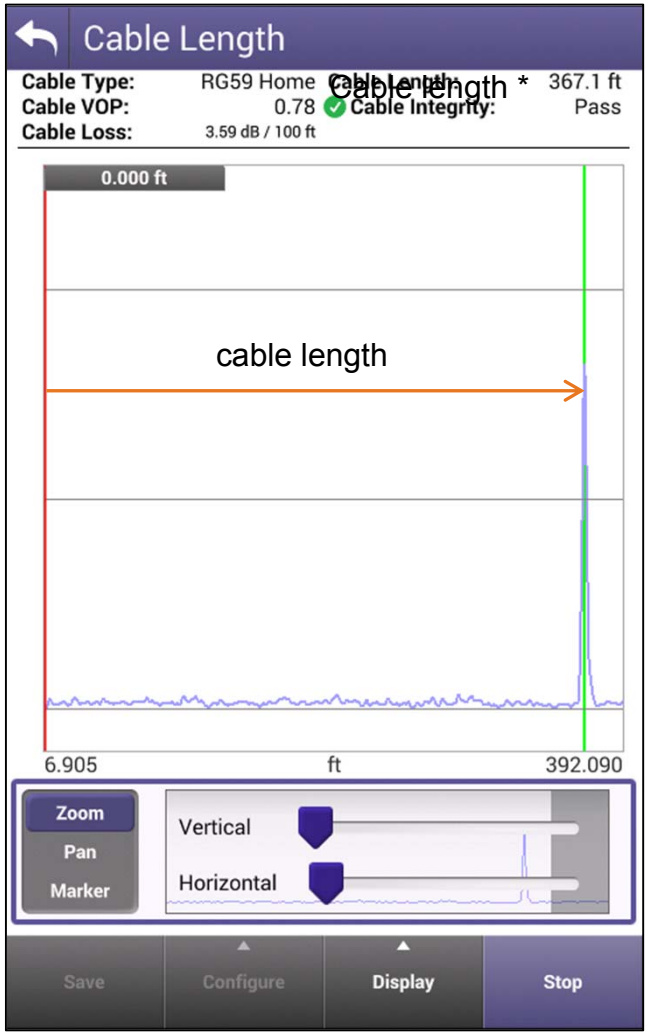
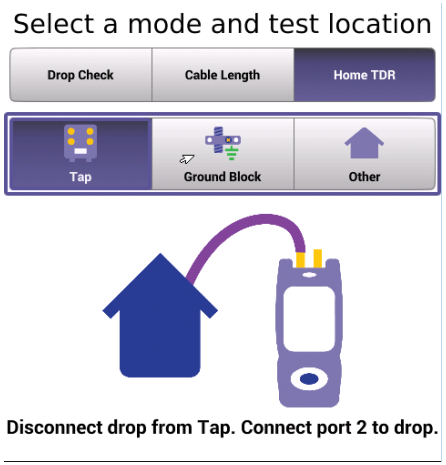
Cable Length - TDR

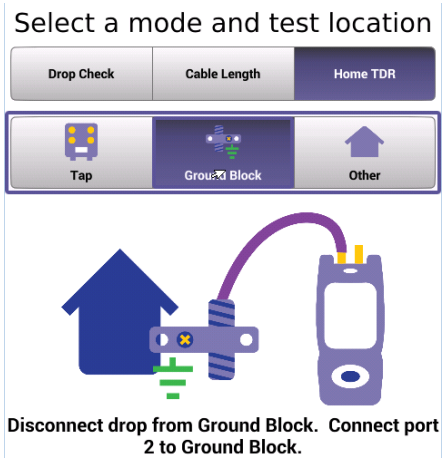
Connect Port 2 to length of cable

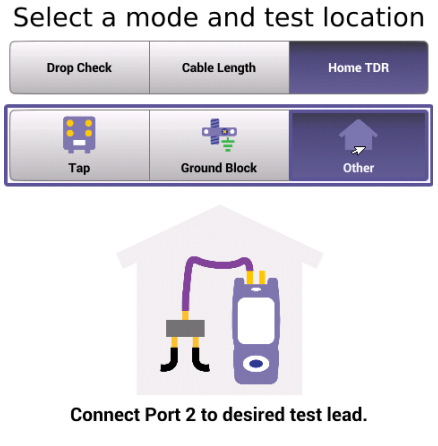
Cable Length:
Measure **Cable Length** & **Cable integrity** by analysis of reflections according to selection of cable type.

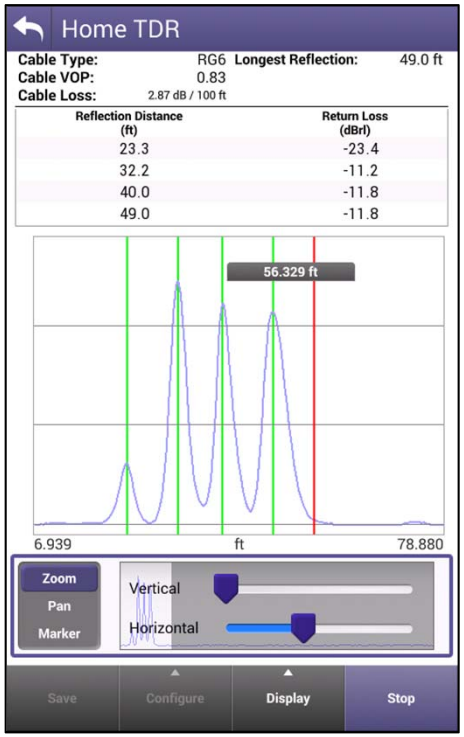


Home TDR









Home TDR:

- Live TDR mode for troubleshooting
- Measure **Longest reflection** & **Return Loss** analysis of reflections according to selection of cable type.
- Choice of test location (Tap, Ground Block, Other)

Markers show distance to any point in graph
Use “delta” markers to see distance differences between any 2 graphed points

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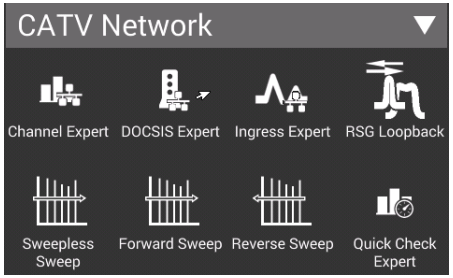
- ✓ 105 – EXPERT MODE
  - QUICK CHECK EXPERT
  - CHANNEL EXPERT
  - DOCSIS EXPERT
  - INGRESS EXPERT

CATV Network - Features



Channel Expert

- Real-time analysis of Downstream QAM and Analog Carriers, user-defined TPC
- Multiple simultaneous measurement simplifies troubleshooting

DOCSIS Expert

- Real-time analysis of DOCSIS services and DOCSIS Carriers, user-defined TPC
- Powerful troubleshooting

Ingress Expert

- Comprehensive testing of Ingress, including Heatwave & SNR under UCD for troubleshooting noise

Quick Check Expert

- Full Scan Mode, build-in channel plan

RSG Loopback

- Return Signal Generator & Loopback capabilities
- Powerful troubleshooting

Sweep mode

- **Sweepless Sweep** (with downstream carriers)
- **Forward / Reverse Sweep** associated with Headend Sweep unit (SDA55x0/ SCU-1800)
- Powerful troubleshooting

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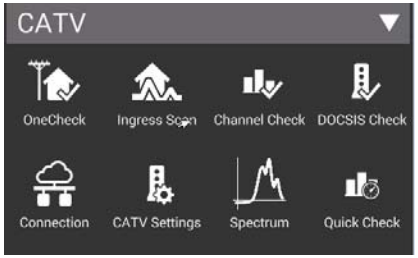
CATV - Features



OneCheck

- Comprehensive and automated testing of Ingress, Downstream & DOCSIS with Session Expert™ to help resolve problems
- Comprehensive testing of Ingress, Downstream & DOCSIS
- Session Expert to help resolve problems

Channel Check

- Real-time analysis and powerful troubleshooting of downstream QAM and Analog carriers
- Analyze D3.1 OFDM carriers including analysis of multiple DS profiles
- Use ChannelCheck to quickly check levels and signal performance
- Multiple simultaneous measurement simplifies troubleshooting

DOCSIS Check

- Real-time and powerful analysis of DOCSIS services and DOCSIS Carriers
  ➔ Downstream and Upstream DOCSIS carriers including D3.1 OFDM and channel bonding
- Only shows the DOCSIS carriers to allow you to focus on HSD services

Ingress Scan

- Comprehensive testing of Ingress, home network
- Session Expert to help resolve problems

Spectrum

- Real-time downstream spectrum analyzer up to 1218MHz
- Powerful troubleshooting

QuickCheck

- Use QuickCheck to see a small number of manually added channels and quickly determine if signal is present
- Real-time analysis of up to 8 user-defined subcarriers

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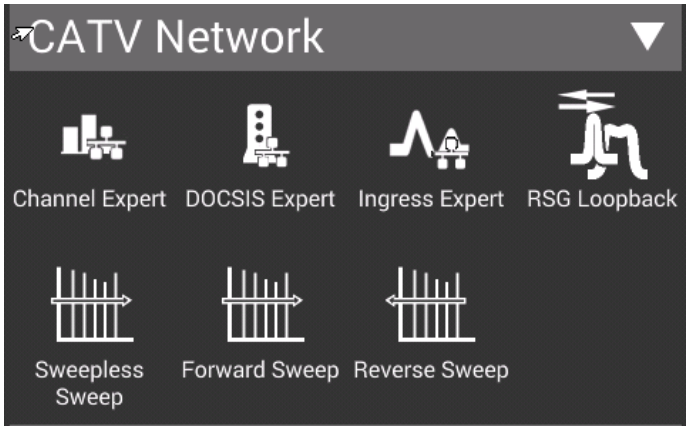
CATV Network Section

- **SWX & NTX software** packages reveal the CATV Network session, RF features designed for advanced services and maintenance use

- **NTX package** (ONX-620/630) includes:
  - Channel Expert
  - DOCSIS Expert

  } Location specific tests, bypass preliminary steps in "non-expert" modes, allowing test point compensation and custom limits
  - Ingress Expert
  - RSG / RSG Loopback (optional in 620)
  - Test Point Compensation (TPC)
  - Custom Limits
  - Sweepless Sweep



- **SWX package** (ONX-630 only) adds NTX plus:
  - Forward Sweep & Alignment
  - Reverse Sweep & Alignment
  - Associated with Headend Sweep Control Units (SDA55x0, SCU-1800)

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Channel Expert / DOCSIS Expert (NTX, SWX)

- For advanced users
- Same functionalities as Channel Check / DOCSIS Check

- Quicker to launch
  - Launched directly with the last used Test Point Template, and Limit Plan
  - (no work order process), test can be saved on work order afterwards
- Can use **Test point Template TPC** to adjust level display with
  - Forward TPC or
  - Reverse TPC
- Save Test - save current test to a work Order
- Launch previous Tests – compared to previous results

- Possibility to **create new limit plan , with dedicated name & limits** – (others than the pre-defined plans for Tap, Ground Block, CPE..)

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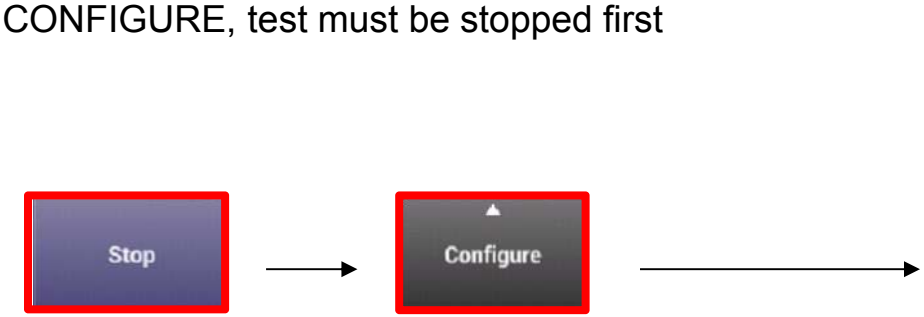
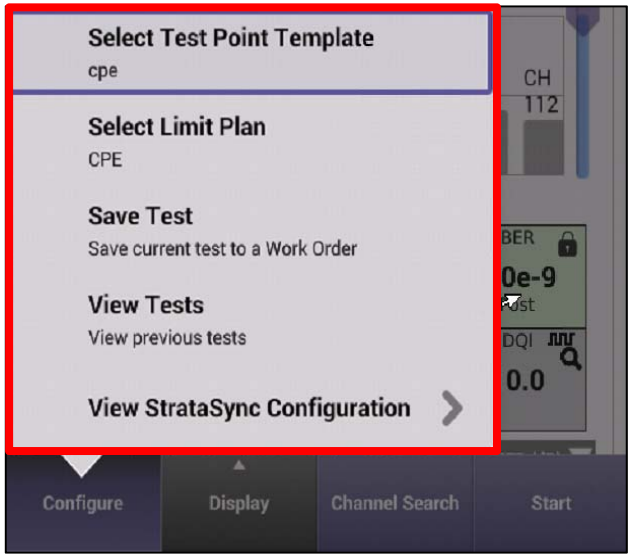
CONFIGURE

- All network test functions feature a CONFIGURE button when the STOP function is pressed
- All network test functions are LIVE tests so to access CONFIGURE, test must be stopped first





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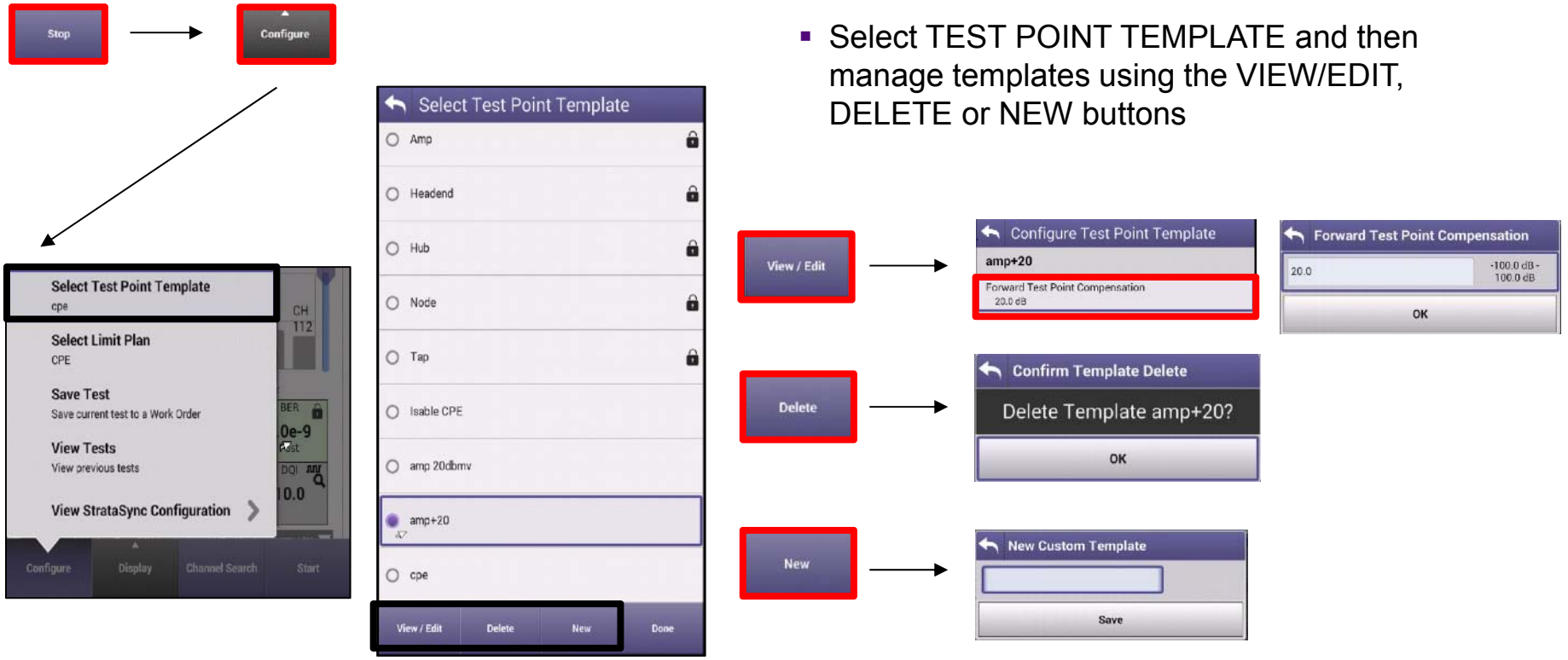
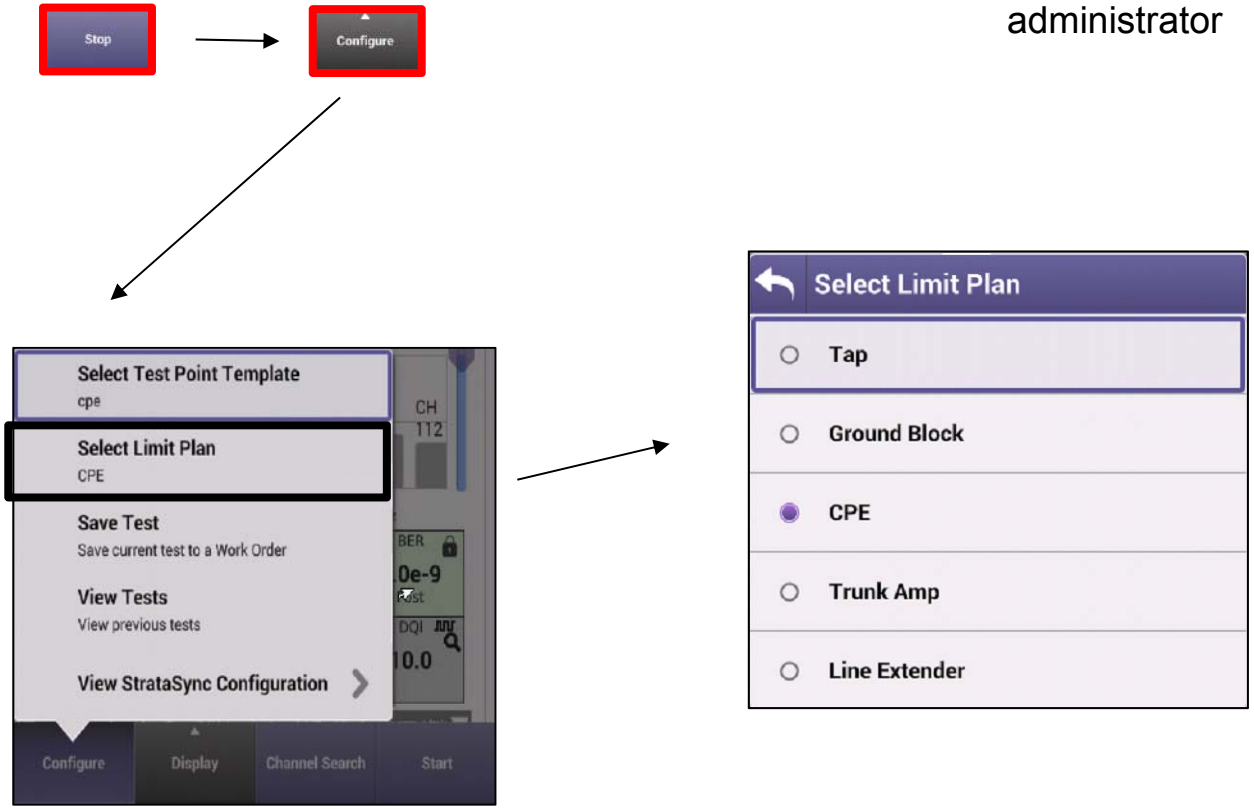
CONFIGURE – TEST POINT TEMPLATE



- Select TEST POINT TEMPLATE and then manage templates using the VIEW/EDIT, DELETE or NEW buttons

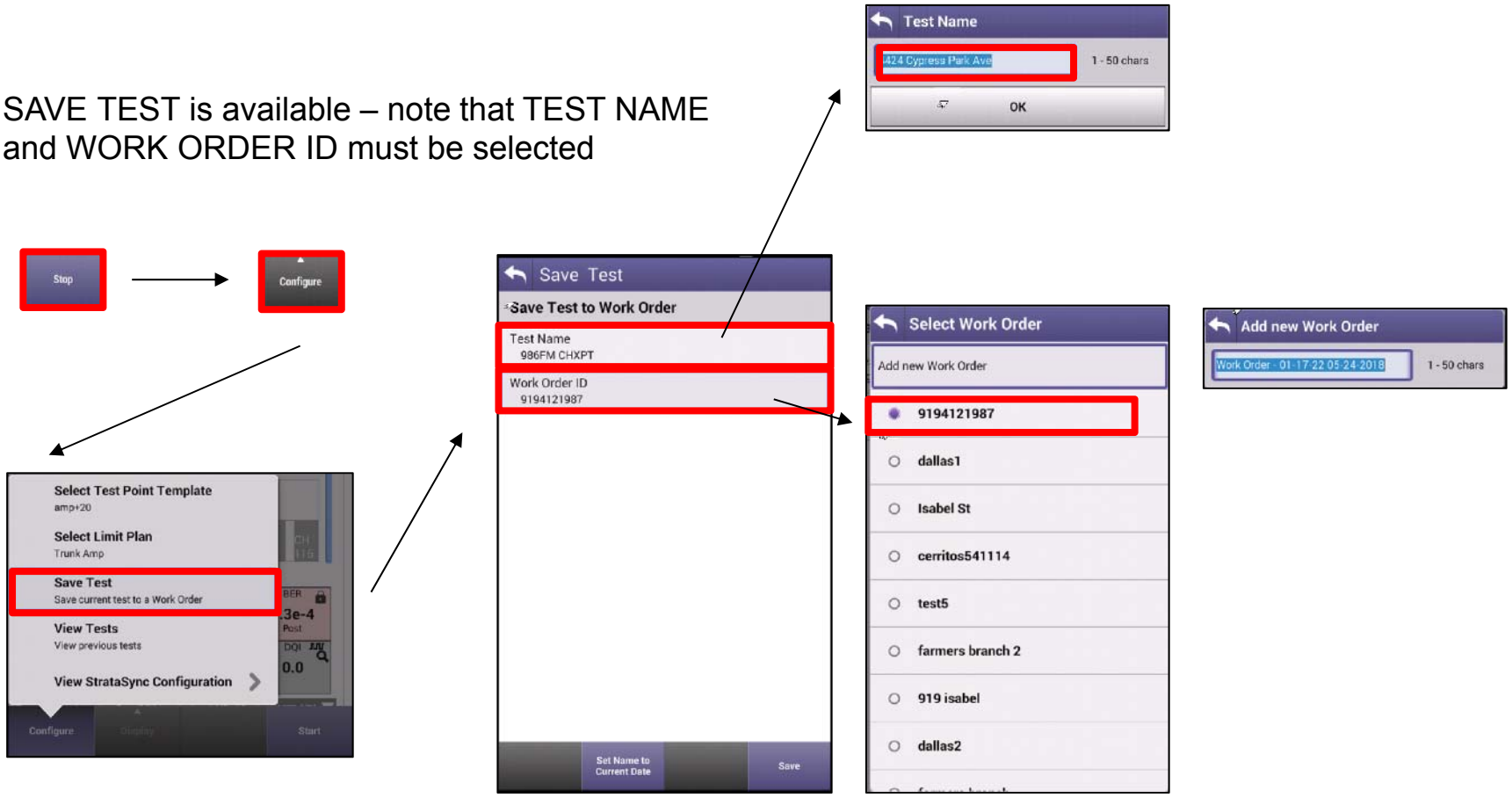
CONFIGURE – LIMIT PLAN

- LIMIT PLANS are set up in STRATASYNC – for help setting up custom LIMIT PLANS see system administrator

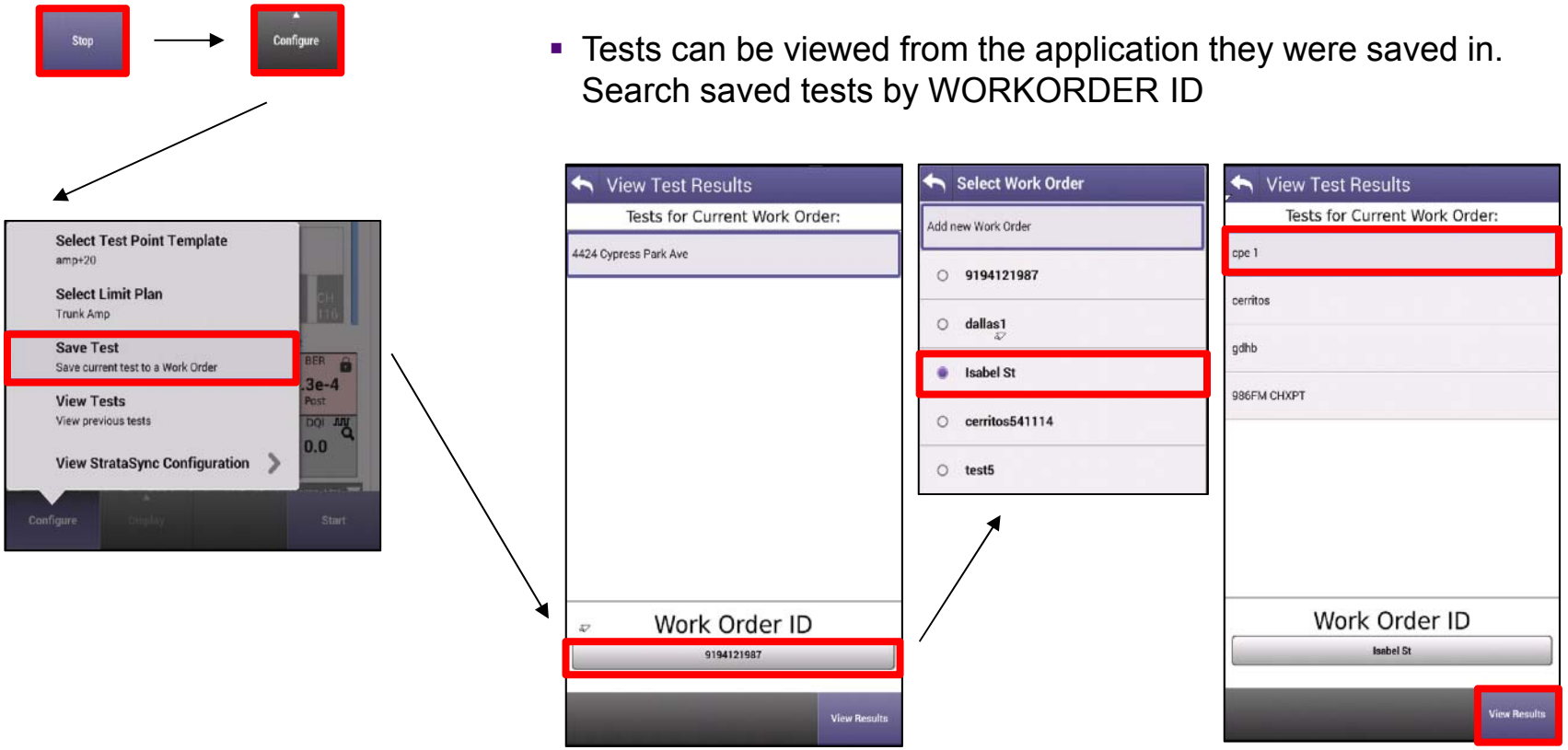


CONFIGURE – SAVE TEST

- SAVE TEST is available – note that TEST NAME and WORK ORDER ID must be selected

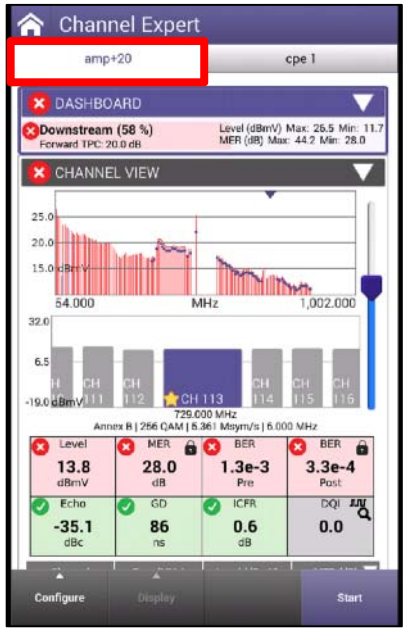


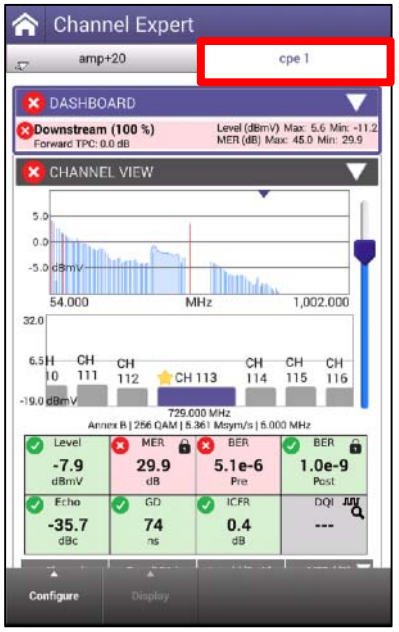
CONFIGURE – VIEW TEST



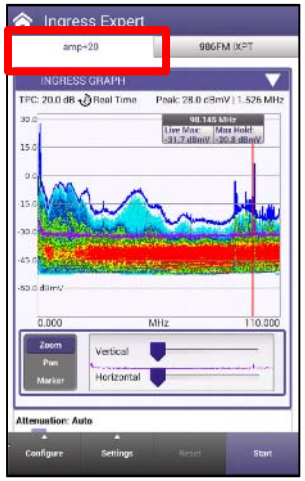
- Tests can be viewed from the application they were saved in. Search saved tests by WORKORDER ID

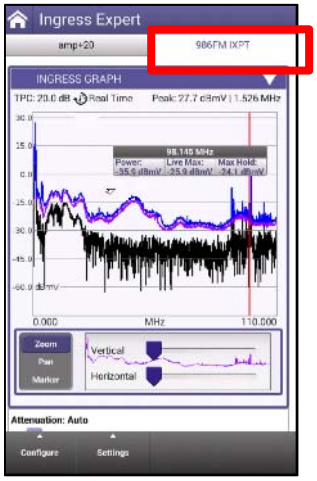
CONFIGURE – VIEW TEST – DELTA TAB





- After loading a saved test file it will appear in the RIGHT HAND TAB
- Users can cycle back and forth between live measurements and the saved test file by selecting the appropriate tab
- Note because the saved test in the RIGHT HAND TAB is not live, there are no START or STOP buttons





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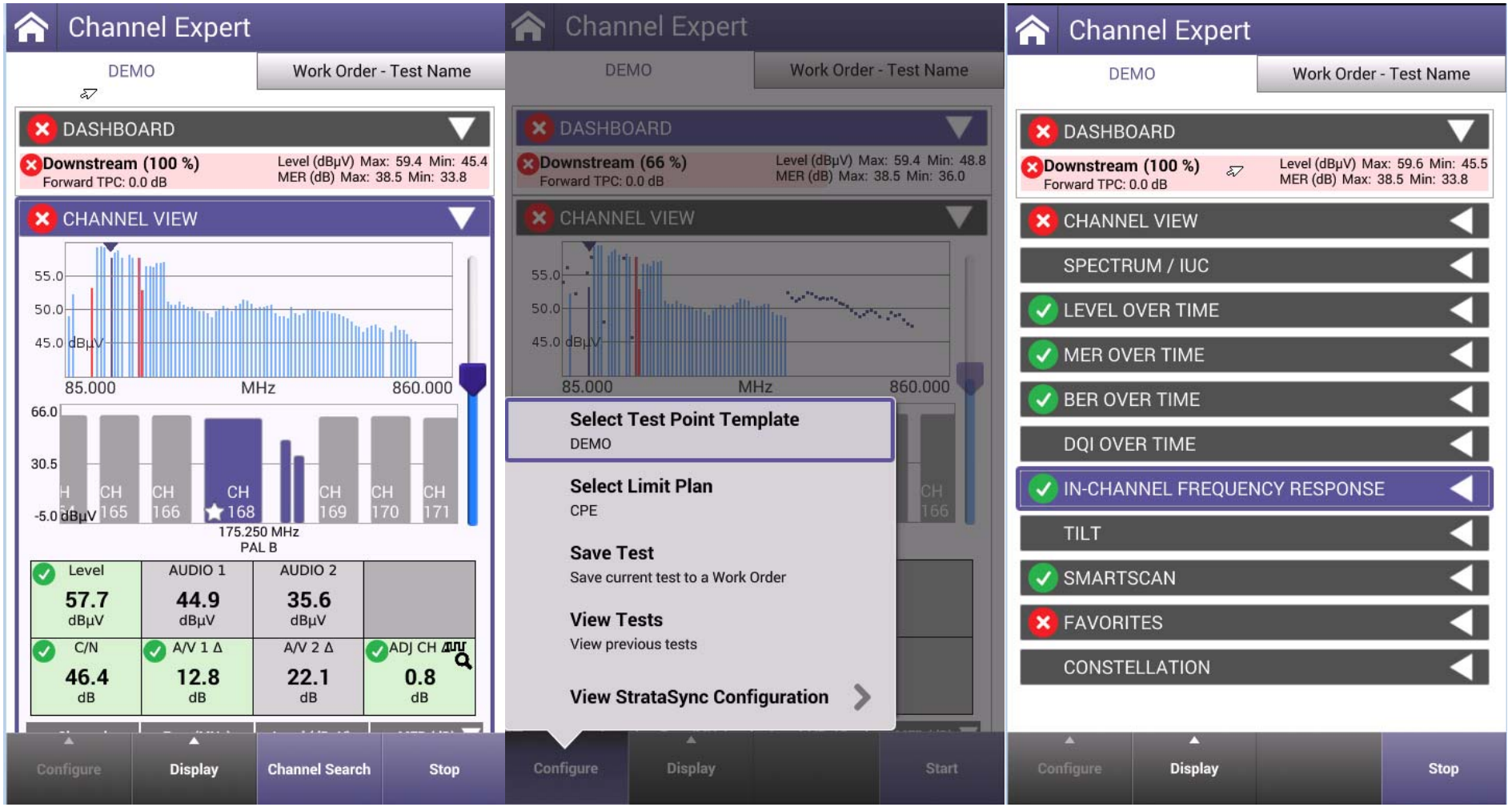
Channel Expert



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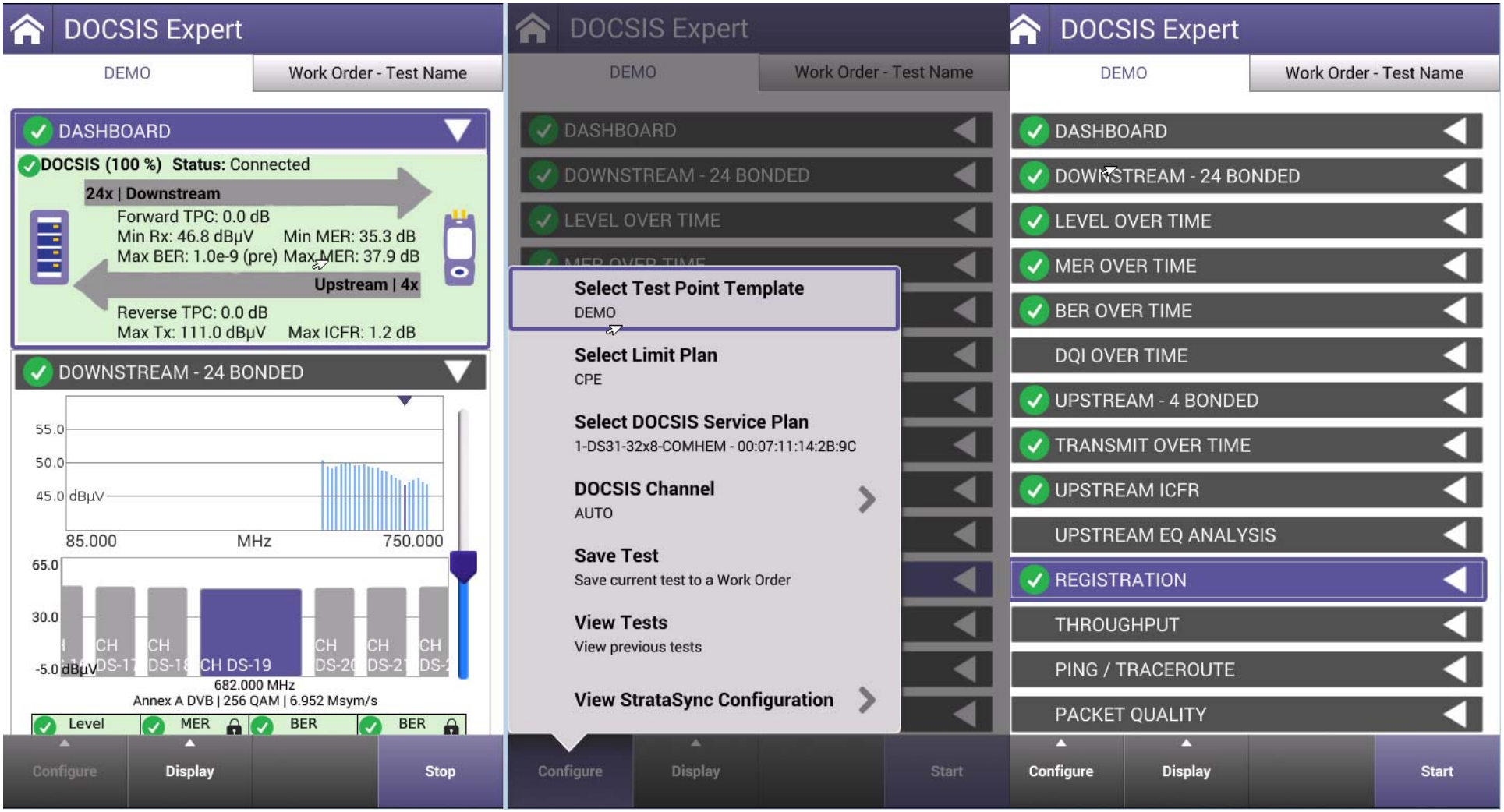
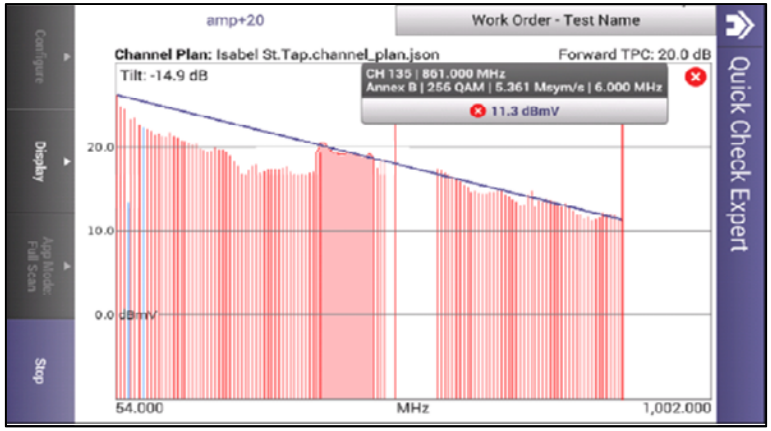
DOCSIS Expert

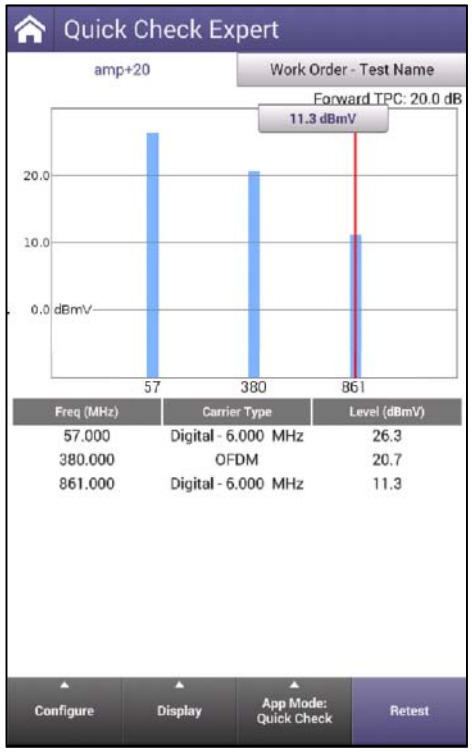


- ✓ 118 – QUICK CHECK EXPERT (Full Scan)

QuickCheck EXPERT

- QuickCheck Expert can be run in two modes
  - Quick Check
  - Full Scan
- To populate the FULL SCAN, user must first save a channel plan in ChannelCheck before loading it in QuickCheck Expert
- To populate the QuickCheck mode with channels, user must add them manually





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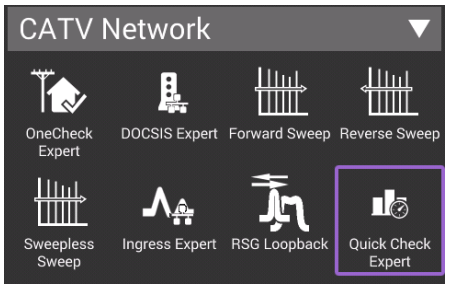
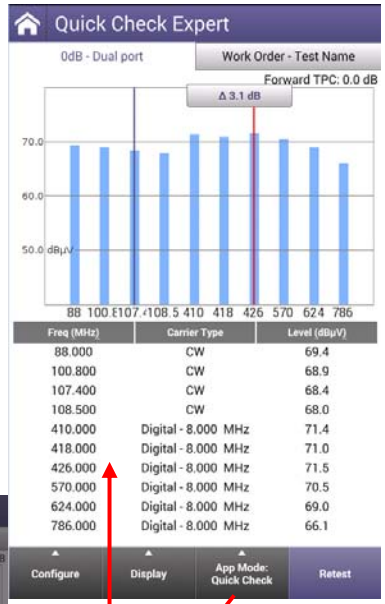
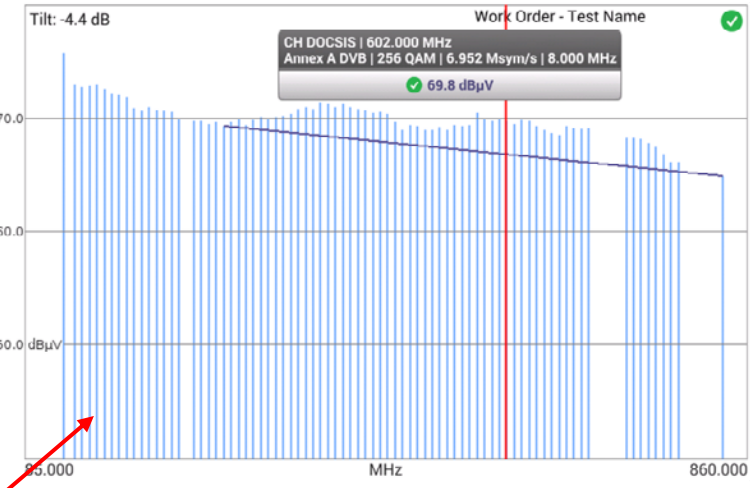
QuickCheck Expert

- **Full Scan** in QuickCheck Expert – toggle from alignment to full scan
- Uses saved channel plan for comparison analysis

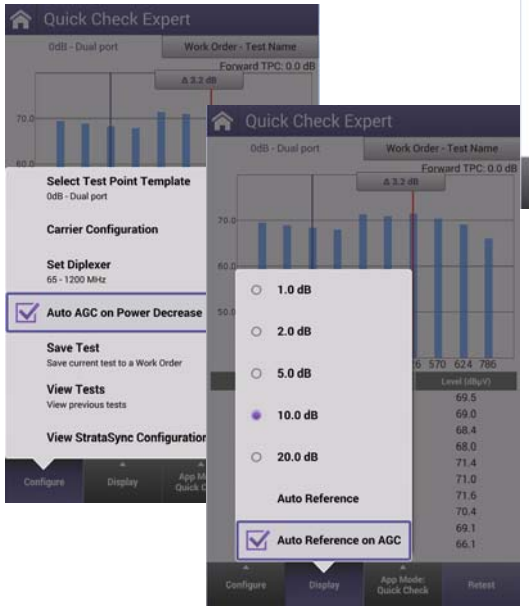


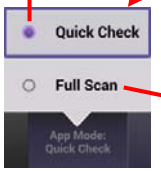




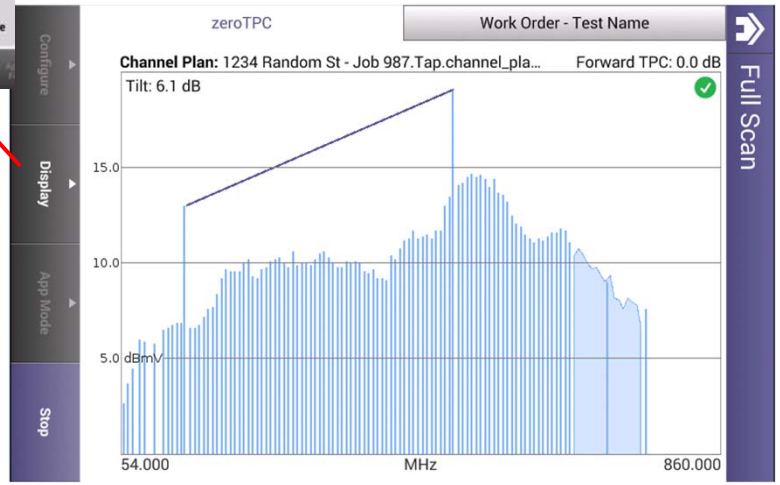
or 2x tap on the display to get Full screen

AGC settings in QuickCheck:

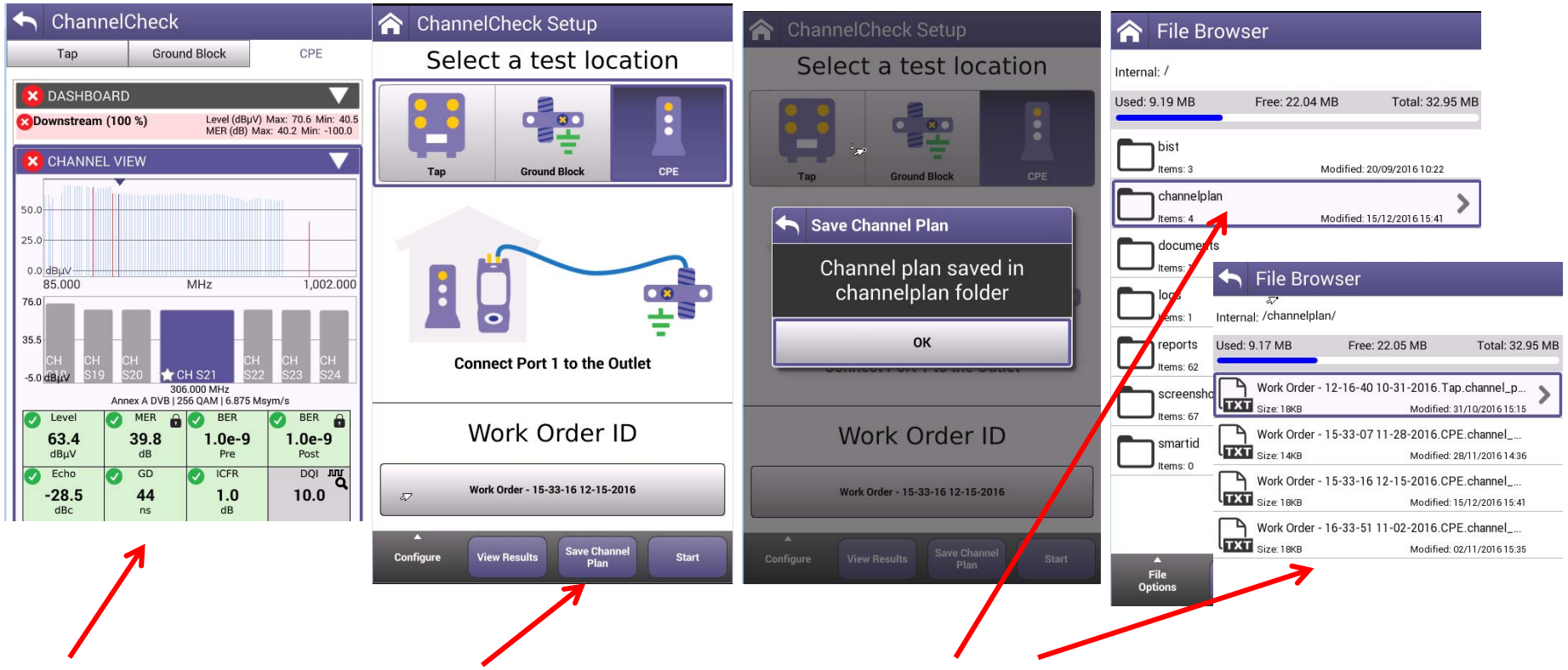




Toggle between Quick Check or Full Scan View



Save Channel Plan with OneExpert CATV



❶ ChannelCheck

❷ Save Channel Plan

❸ Channel Plan saved in channel plan folder

❹ Export channel plan to USB or StrataSync

❺ Retrieve channel plan and import file (json) into SCU-1800 or load it in Quick Check Expert

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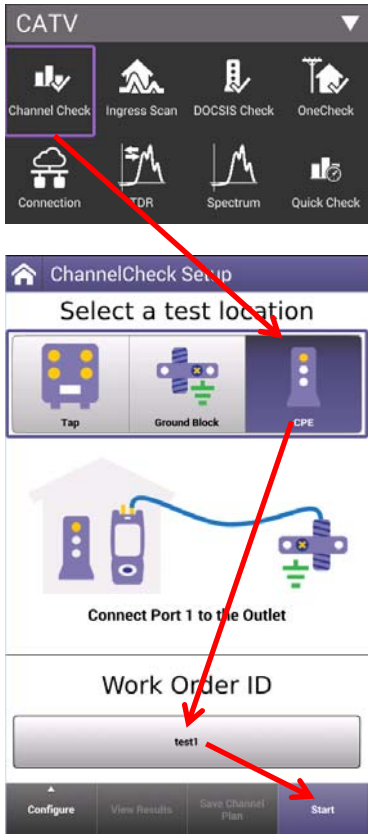
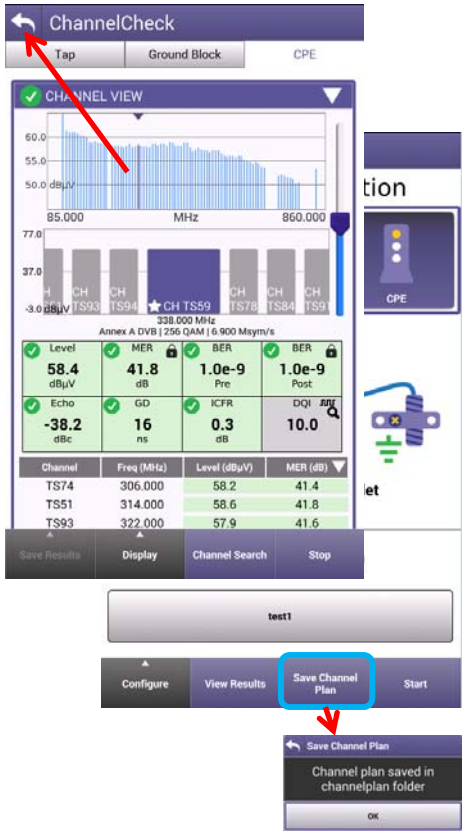
Full Scan - channel plan configuration

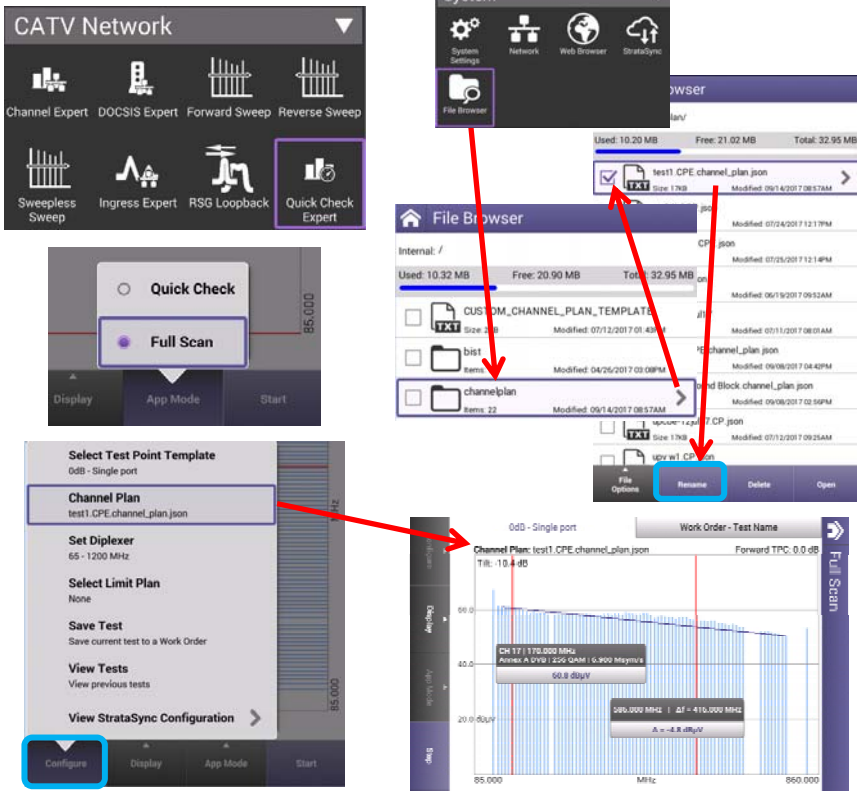
❶ Go to **Channel Check**, select CPE, create a new Work Order and select Start:



❷ When channel are 100% discovered, go back and save the channel plan:



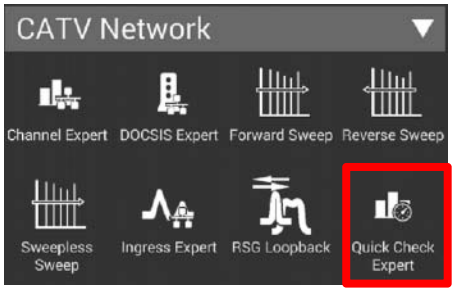
❸ Go to **QuickCheck Expert**, select Stop, select **FullScan** App Mode and load saved channel plan (CP):



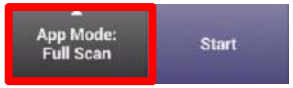
If requested, before to load the CP in Full Scan, it is possible to rename it:

QuickCheck EXPERT – LOADING CHANNEL PLANS

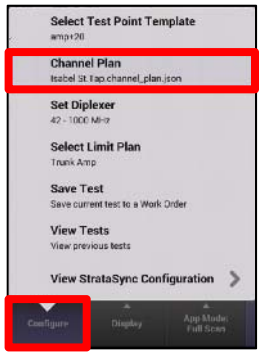
- Return to QUICKCHECK EXPERT under CATV NETWORK



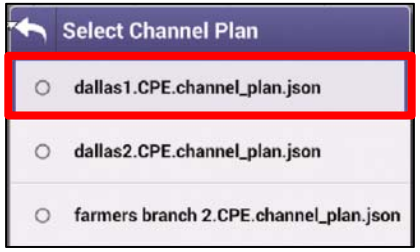
- Test will automatically run, STOP test and change APP MODE to FULL SCAN



- Select CONFIGURE and select CHANNEL PLAN



- Select the appropriate saved CHANNEL PLAN



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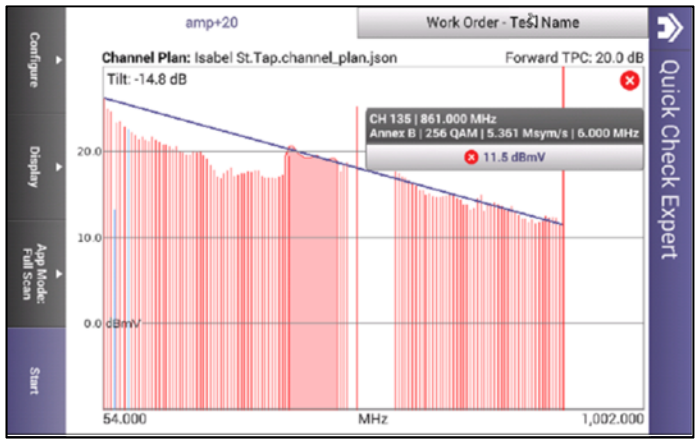
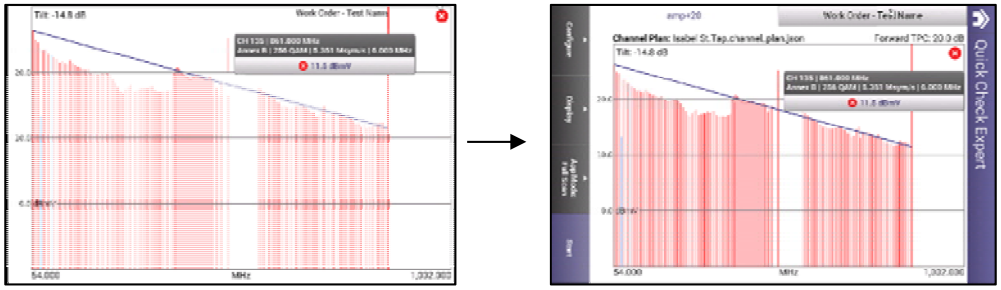
QuickCheck EXPERT – FULL SCAN MODE



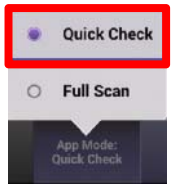
- DISPLAY allows the user customize the following

- To EXIT FULLSCREEN, double tap finger on the FULL SCAN

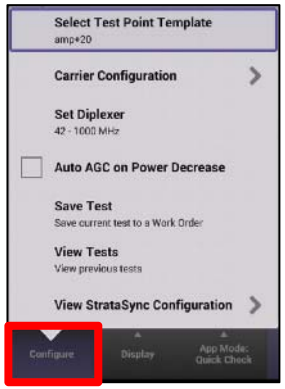


QuickCheck EXPERT – QUICK CHECK MODE

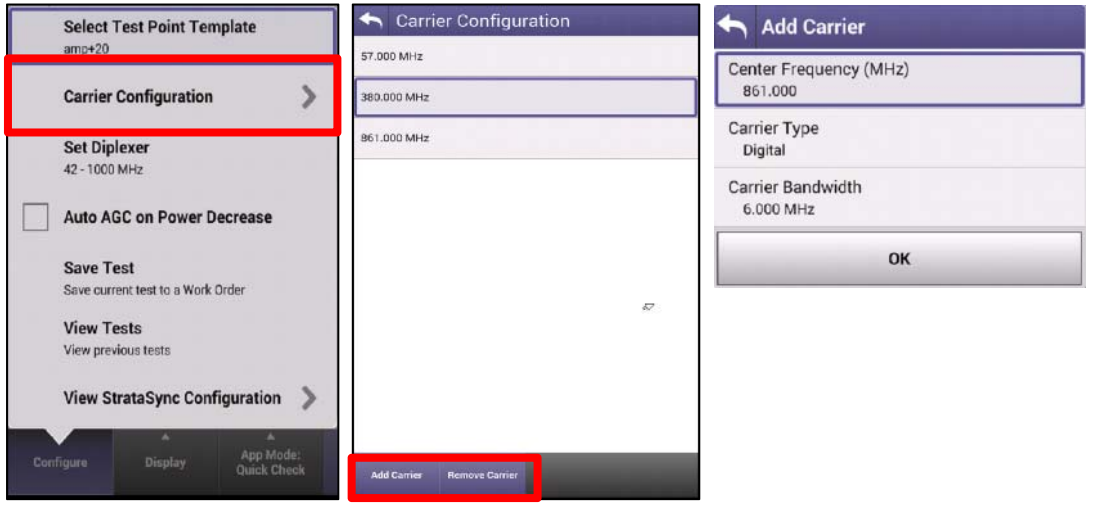
- Select the QUICK CHECK MODE for a more responsive LEVEL/MINISCAN mode



- While test is STOPPED, select CONFIGURE



- Select CARRIER CONFIGURATION and then choose ADD CARRIER or REMOVE CARRIER to customize



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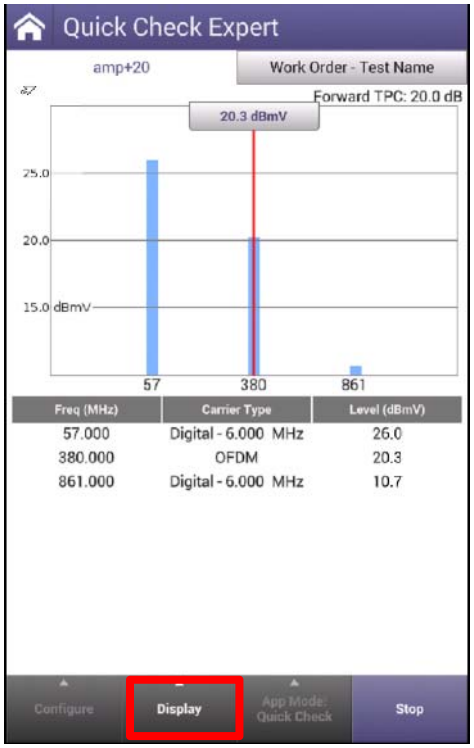
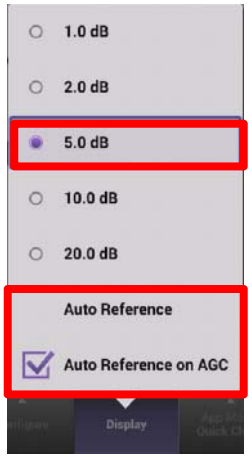
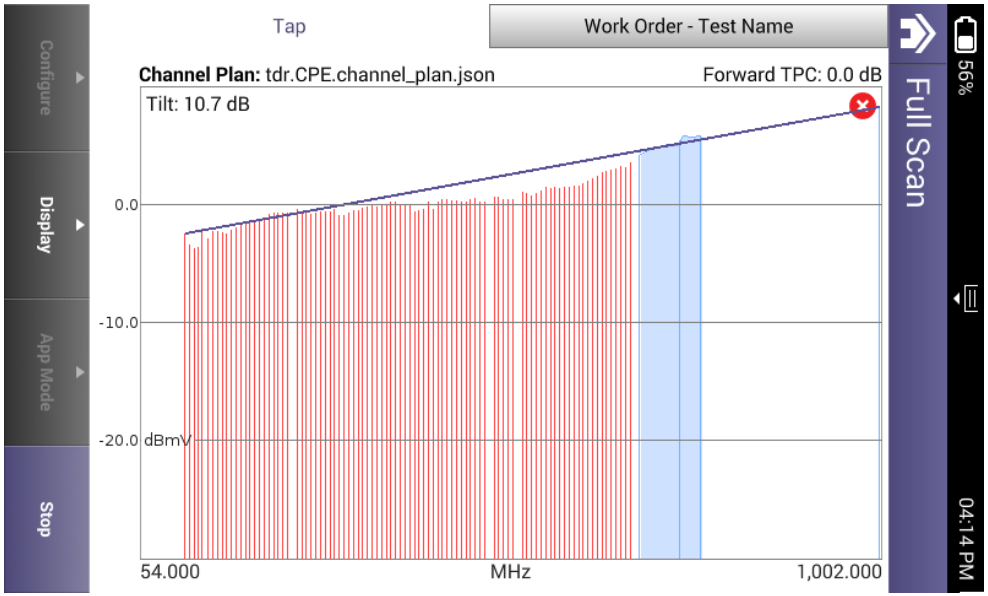
QuickCheck EXPERT – QUICK CHECK MODE



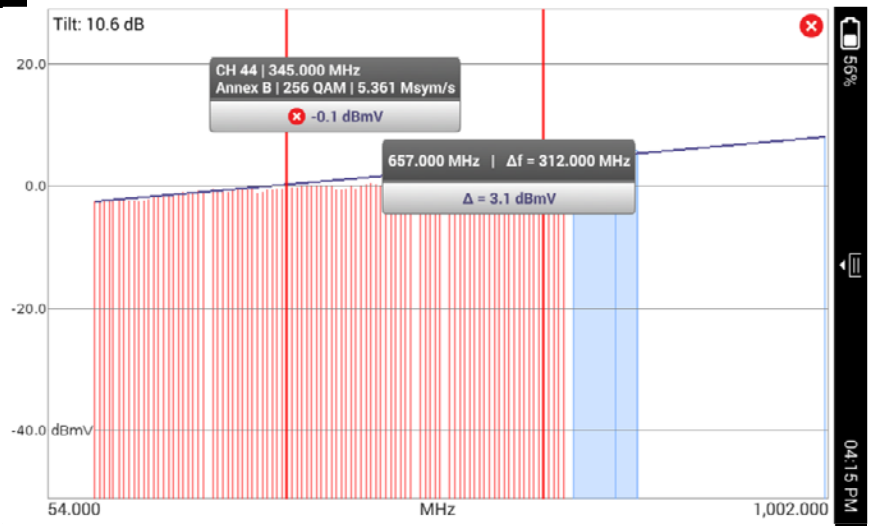
- DISPLAY allows the user to change dB/div and also select AUTO Reference on AGC which better captures the noise floor when signal is not present



QuickCheck Expert Results



- Pop up will request user to select channel plan
- Once selected the QuickCheck Expert will populate a Fullscan in landscape display
- Double Tap middle of the screen or select DISPLAY and choose Fullscreen for a larger view
- Choose Markers to introduce Markers A and B markers to the Fullscan



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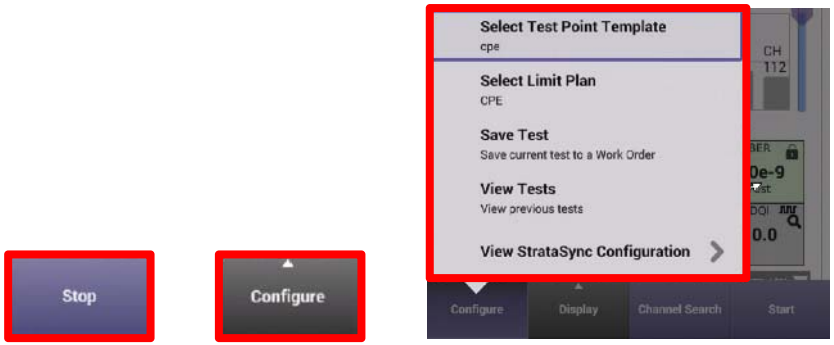
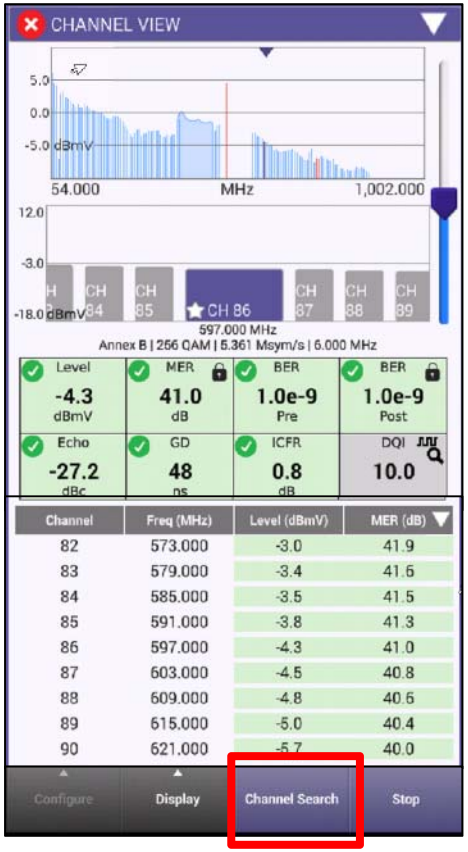
Channel EXPERT - DASHBOARD

- Max and Mins are displayed for MER(dB) and Level (dBmV)

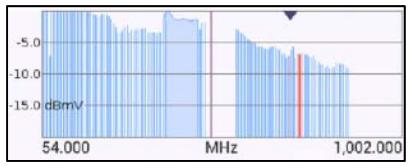
- Dashboard gives overall test status. Channel Expert is LIVE, so measurements will continue to update once the dashboard indicates 100%
- Test Point Compensation (TPC) is shown and can be toggled after users select STOP and CONFIGURE (See Section on TPC Setup)

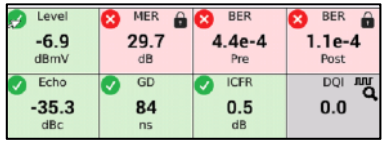


Channel EXPERT – CHANNEL VIEW

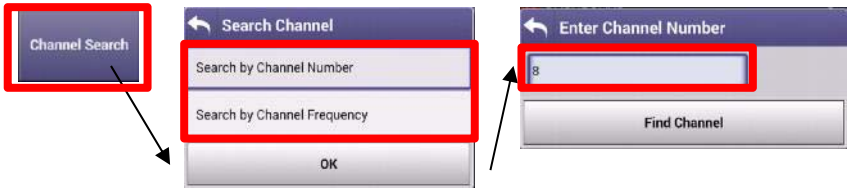


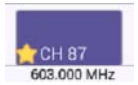
- CHANNEL VIEW allows the user to view the Fullscan, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN





- Users can navigate via touchscreen, D-Pad or Channel Search as long at CHANNEL VIEW window is selected in BLUE





- Users can select their FAVORITES by pressing on the STAR until it is highlighted in Gold

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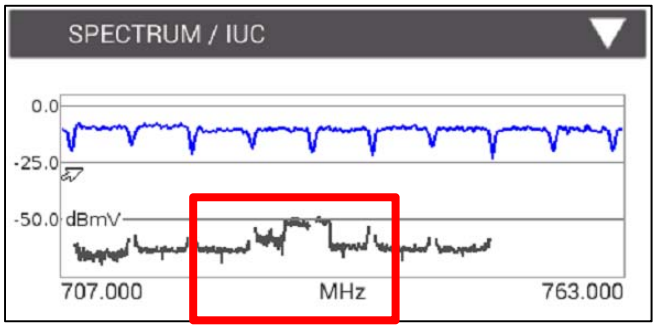
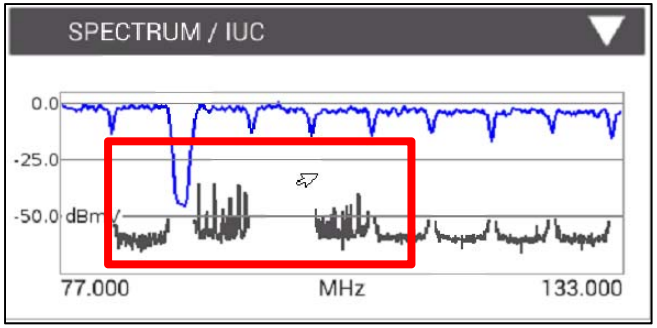
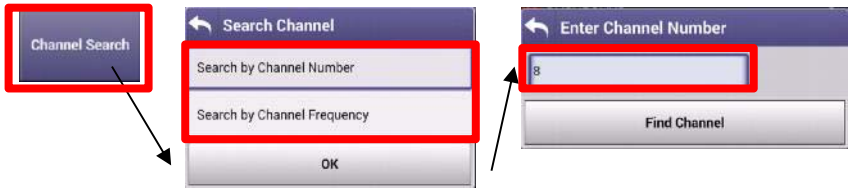
Channel EXPERT – SPECTRUM/ IUC



- SPECTRUM/IUC (Ingress Under the Carrier) allows the user to view ingress under the selected and adjacent QAM carriers.
- Examples below are real world LTE Ingress and FM Ingress



- To rapidly change channels use Channel Search as long at CHANNEL VIEW window is selected in BLUE



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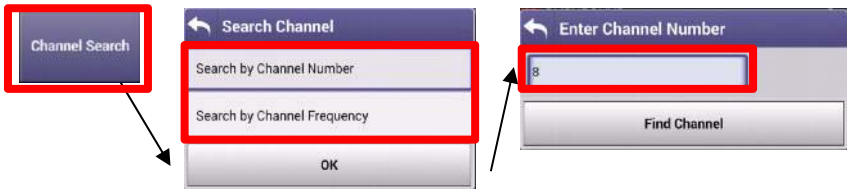
Channel EXPERT – OVER TIME MEASUREMENTS

- Level OVER TIME, MER OVER TIME, BER OVER TIME on all channels in the background and DQI OVER TIME measured on the channel selected in CHANNEL VIEW. These measurements will continue until and be displayed over the last 5 minutes until the measurement is stopped

- To rapidly change channels use Channel Search as long at CHANNEL VIEW window is selected in BLUE



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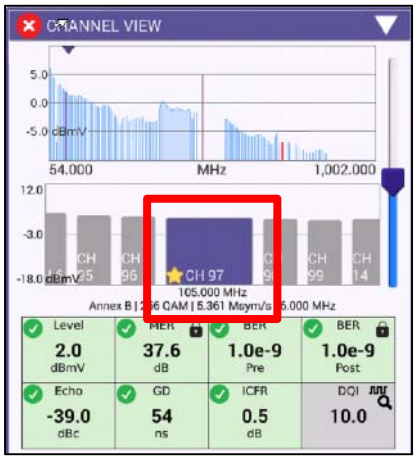
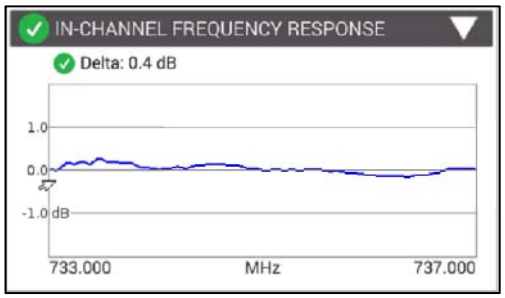
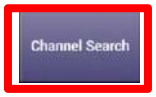
Channel EXPERT – ICFR (In-Channel Frequency Response)

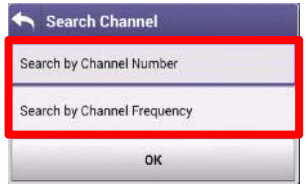




- In-Channel Frequency Response of the specific carrier selected in CHANNEL VIEW and will continue until stopped

- To rapidly change channels use Channel Search as long at CHANNEL VIEW window is selected in BLUE





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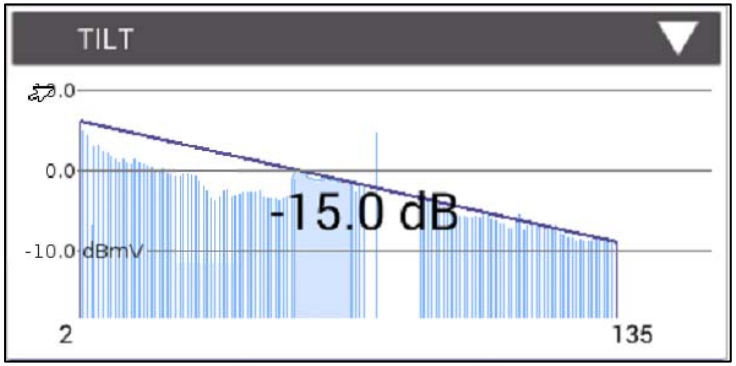
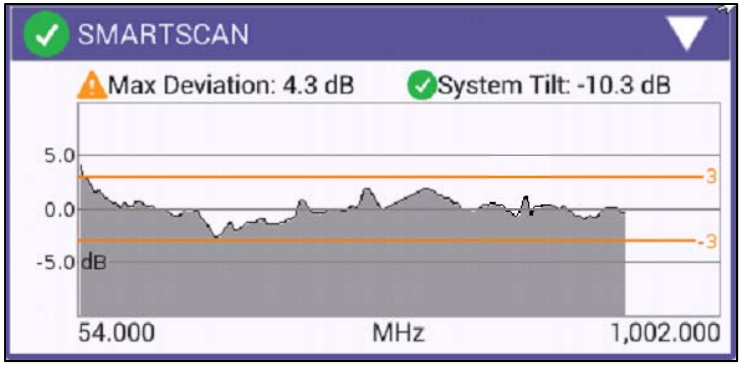
Channel EXPERT – TILT and SMARTSCAN





- TILT of the Fullscan, TILT channels can be toggled in CATV SETTINGS

- SMARTSCAN offers a raw frequency domain response of the Fullscan and measures against a defined thresholds for deviation and tilt

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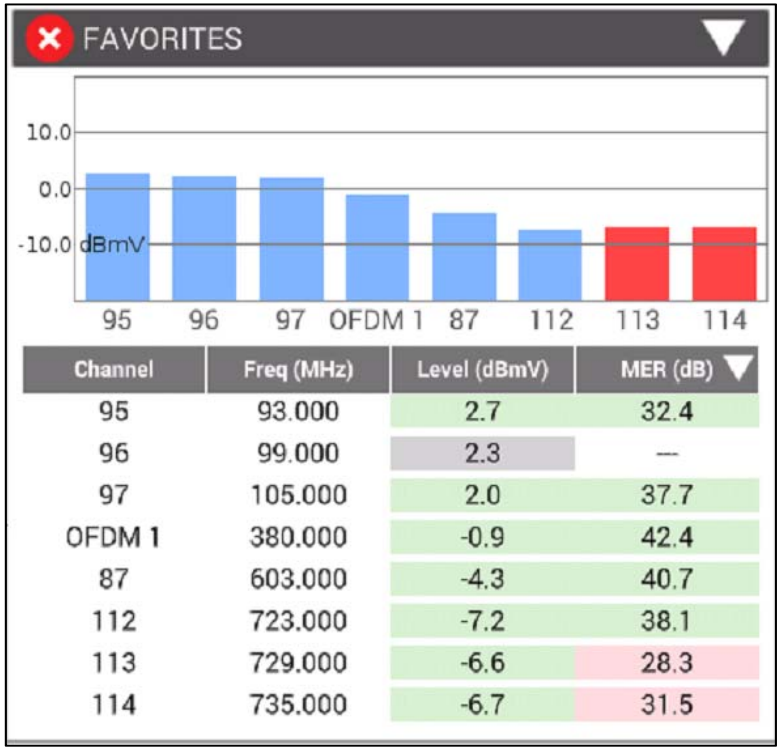
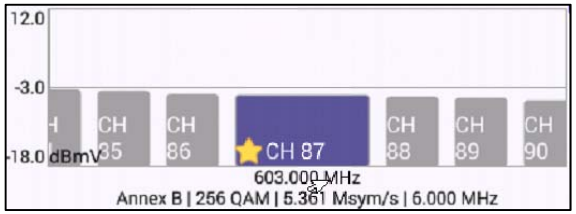
Channel EXPERT - FAVORITES



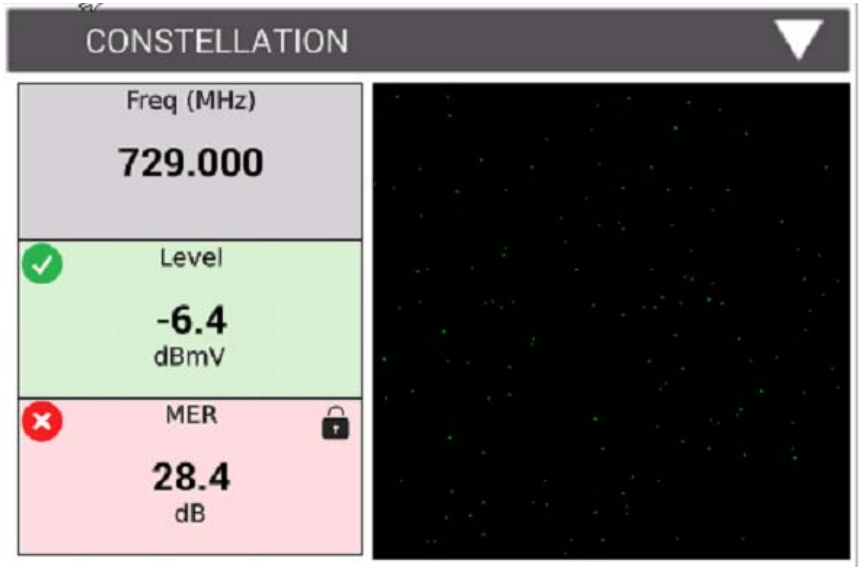
Channel	Freq (MHz)	Level (dBmV)	MER (dB)
95	93.000	2.7	32.4
96	99.000	2.3	---
97	105.000	2.0	37.7
OFDM 1	380.000	-0.9	42.4
87	603.000	-4.3	40.7
112	723.000	-7.2	38.1
113	729.000	-6.6	28.3
114	735.000	-6.7	31.5

- FAVORITES is a user defined Miniscan
- Select favorites channels by highlighting the Gold Star on desired channels in CHANNEL VIEW

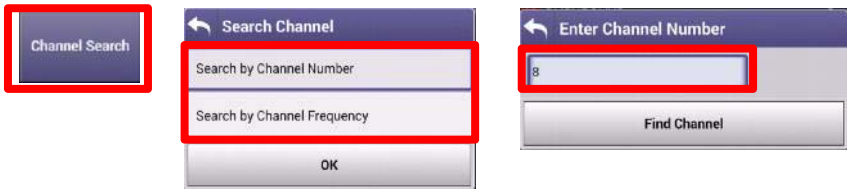


Channel EXPERT - CONSTELLATION

- CONSTELLATION displays Level (dBmV) and MER (dB) as well as plot of the QAM carrier



- To rapidly change channels use Channel Search as long at CHANNEL VIEW window is selected in BLUE



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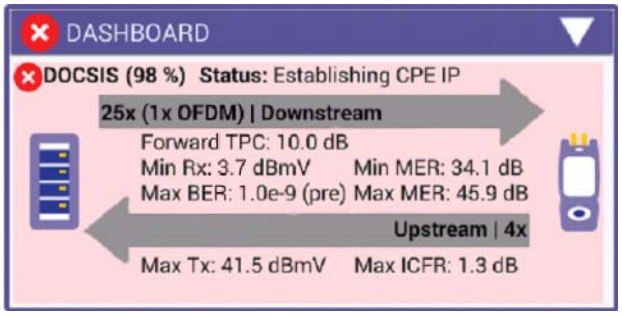
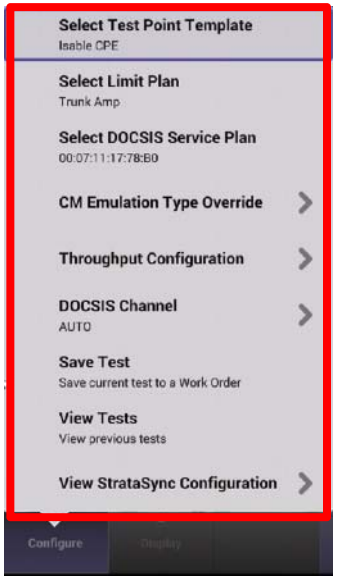
DOCSIS EXPERT

DOCSIS EXPERT - DASHBOARD



- Downstream measurements displayed include Max and Mins for MER(dB) and Level (dBmV) and MAX Rx
- Upstream measurements displayed include MAX Tx and MAX ICFR

- Dashboard gives overall test status. Because DOCSIS Expert is LIVE, measurements will continue to update once the dashboard indicates 100%
- Test Point Compensation (TPC) is shown and can be toggled after users select STOP and CONFIGURE (See Section on TPC Setup)



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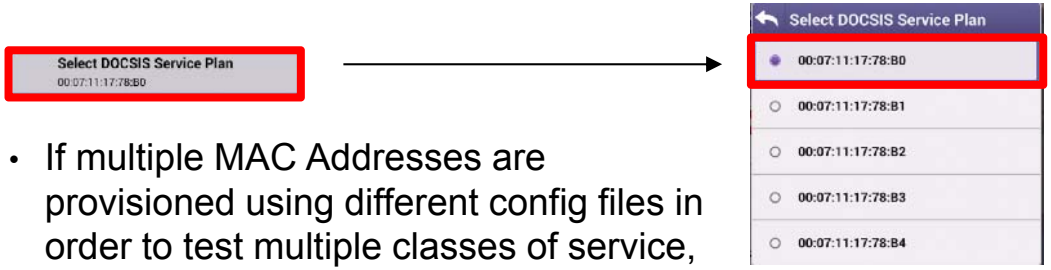
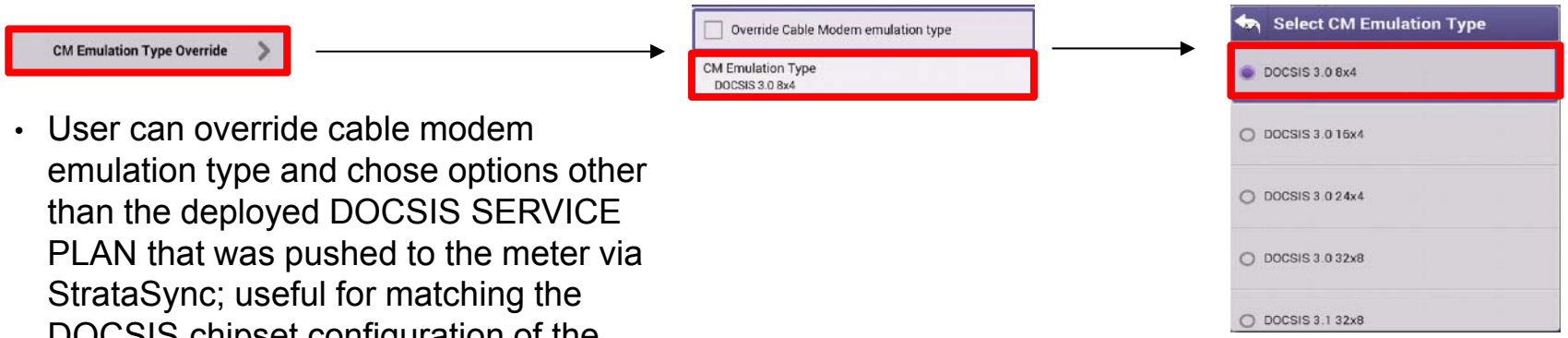
DOCSIS EXPERT - CONFIGURE

- CONFIGURE offers the user the ability to customize DOCSIS configurations on the fly



- If multiple MAC Addresses are provisioned using different config files in order to test multiple classes of service, users can switch between MACs by selecting DOCSIS SERVICE PLAN



- User can override cable modem emulation type and chose options other than the deployed DOCSIS SERVICE PLAN that was pushed to the meter via StrataSync; useful for matching the DOCSIS chipset configuration of the customer's cable modem

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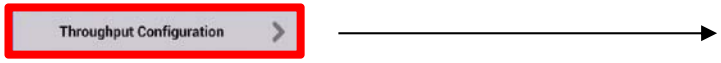
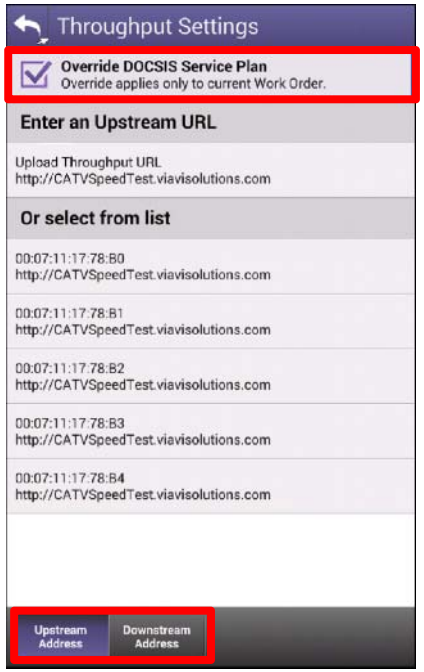
DOCSIS EXPERT - CONFIGURE



- Users can toggle THROUGHPUT CONFIGURATIONS; useful when there are multiple throughput servers to test to at any given time
- Select Override DOCSIS SERVICE PLAN and then choose UPSTREAM or DOWNSTREAM ADDRESS to customize or update



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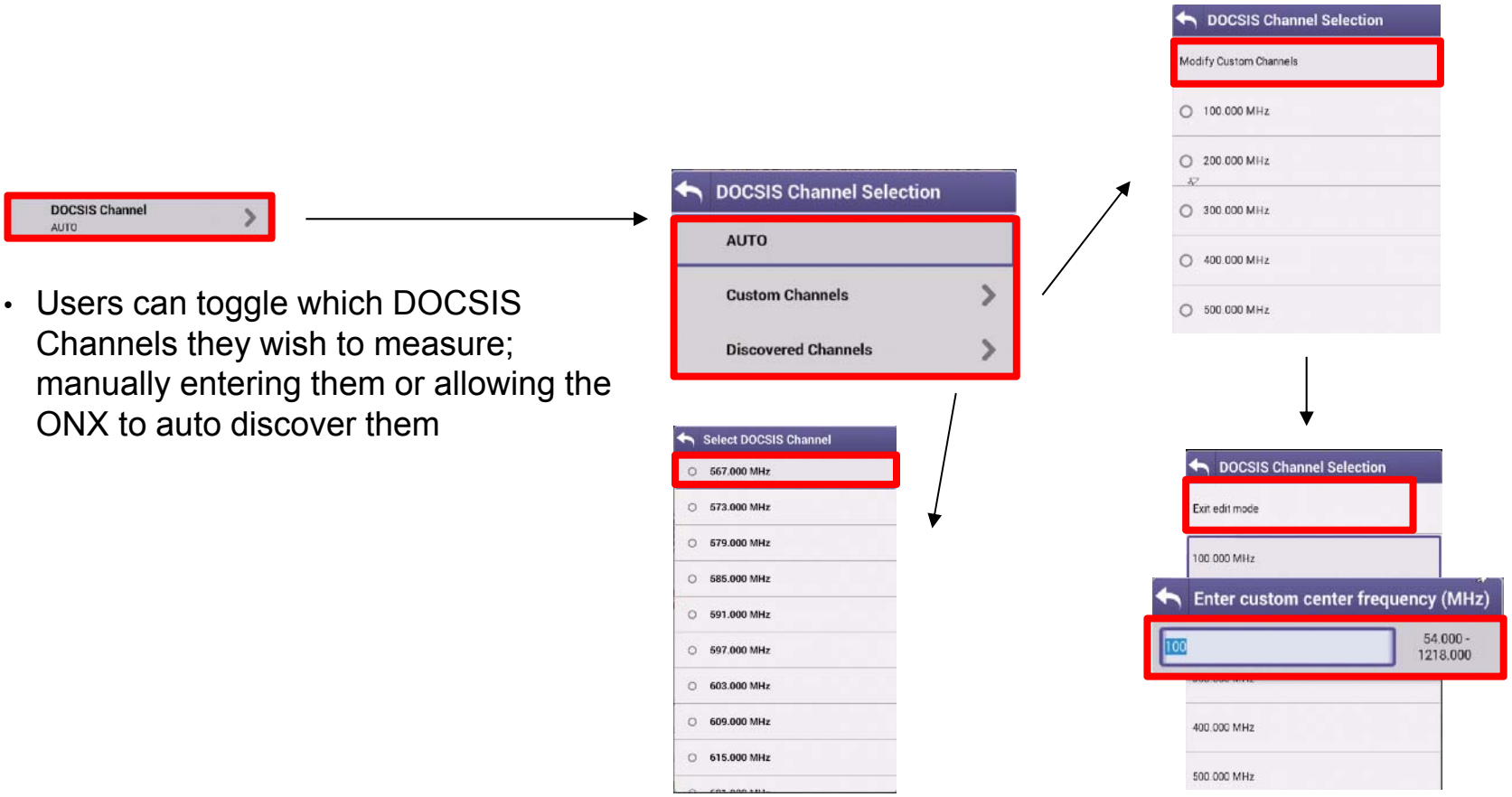
DOCSIS EXPERT - CONFIGURE

- Users can toggle which DOCSIS Channels they wish to measure; manually entering them or allowing the ONX to auto discover them



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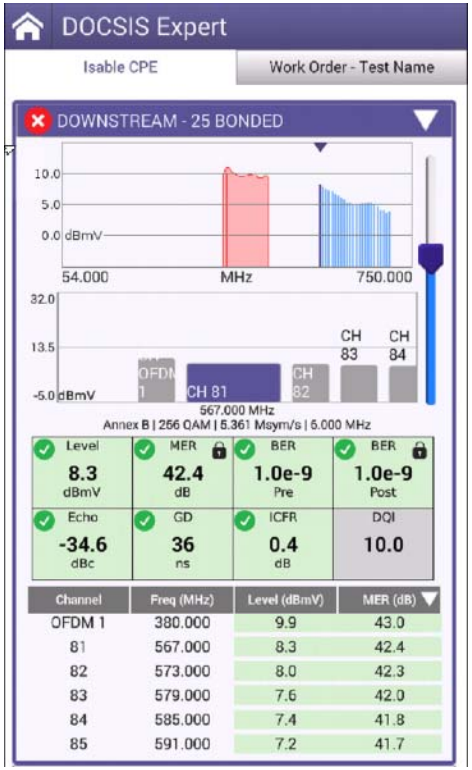
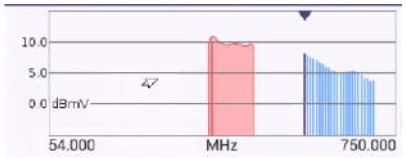
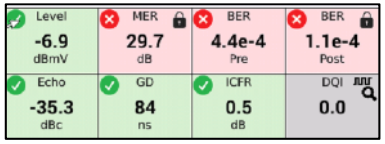
DOCSIS EXPERT – DOWNSTREAM

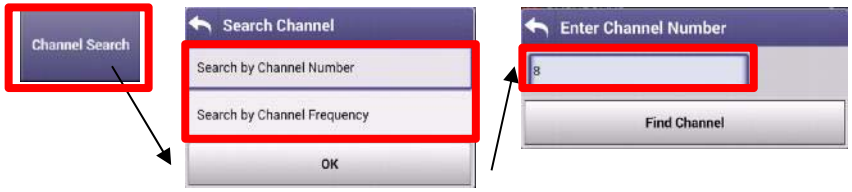


- DOWNSTREAM allows the user to view the DOWNSTREAM DOCSIS CHANNELS, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN





- Users can navigate via touchscreen, D-Pad or Channel Search as long at DOWNSTREAM window is selected in BLUE



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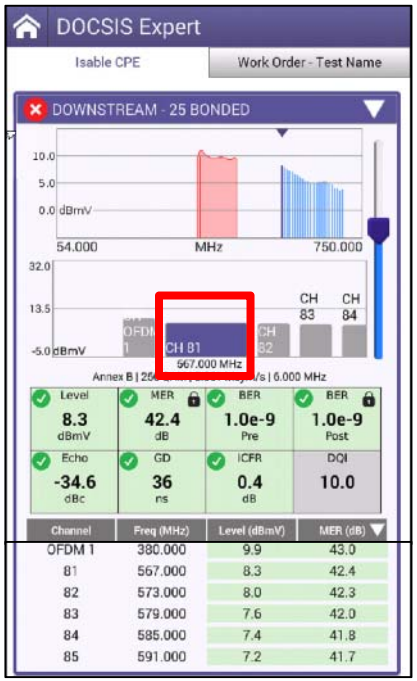
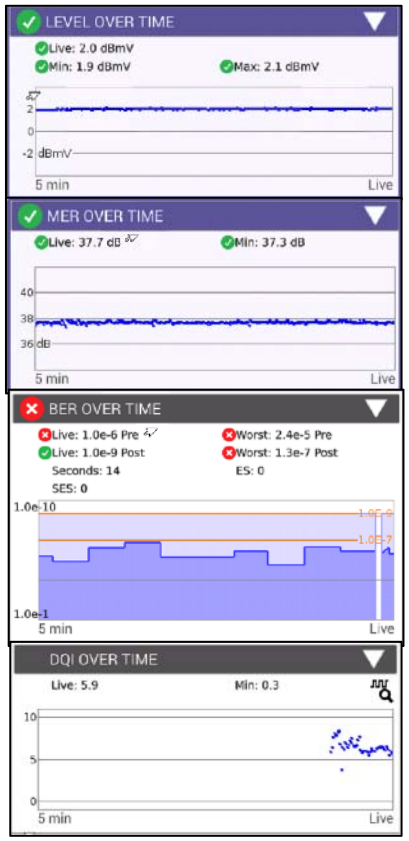
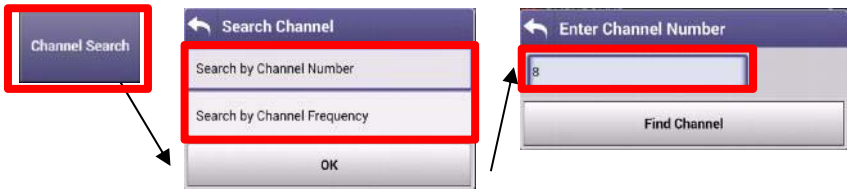
DOCSIS EXPERT – OVER TIME MEASUREMENTS





- Level OVER TIME, MER OVER TIME, BER OVER TIME and DQI OVER TIME measure the channel that is selected in CHANNEL VIEW and will continue until stopped

- To rapidly change channels use Channel Search as long at CHANNEL VIEW window is selected in BLUE



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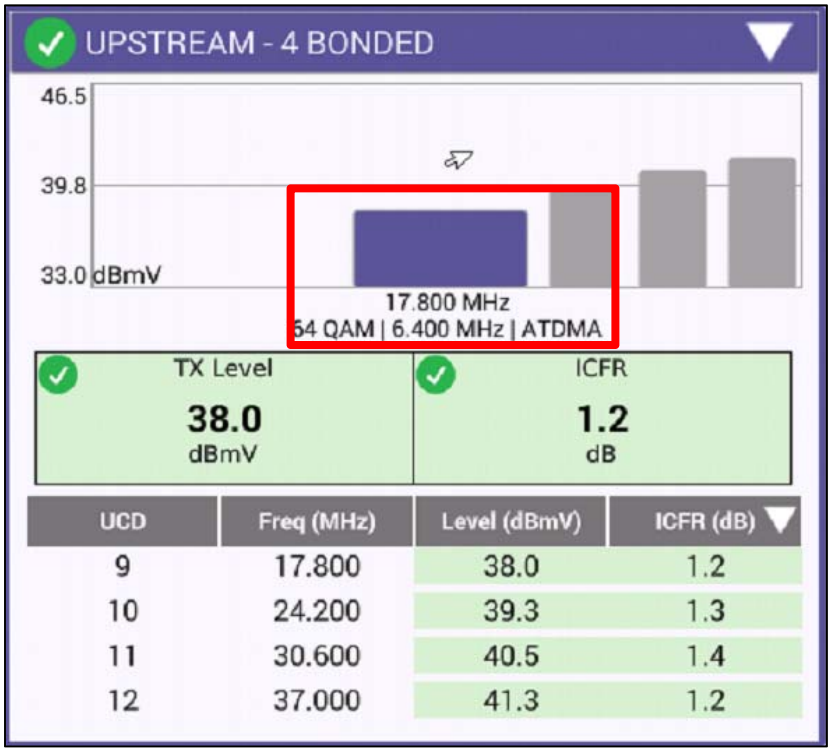
DOCSIS EXPERT – UPSTREAM/TRANSMIT OVER TIME



- UPSTREAM provides the user with verification of the number of upstream carriers; the Upstream Transmit Level (TX) and In-Channel Frequency Response (ICFR)
- TRANSMIT OVER TIME corresponds to the locked upstream carrier (highlighted in blue to the left). To shift upstream carrier, select a different one from the UPSTREAM window (D-PAD or TOUCH to toggle) and the TRANSMIT OVER TIME will update

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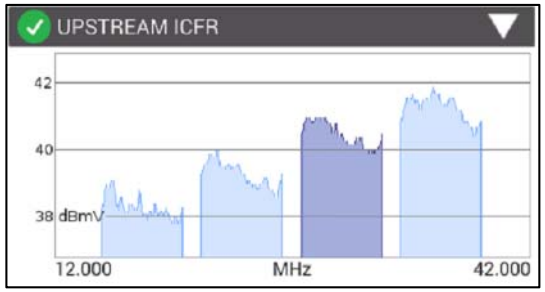
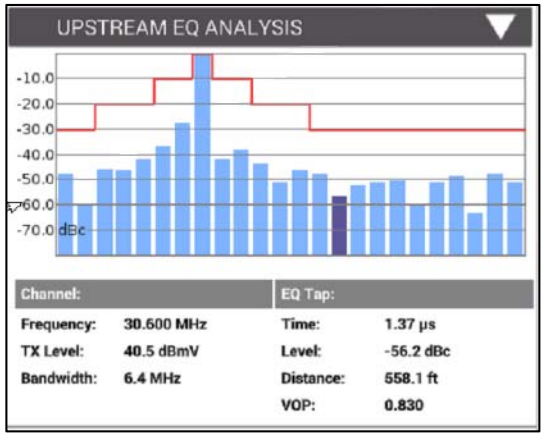
DOCSIS EXPERT – UPSTREAM ICFR and UPSTREAM EQ ANALYSIS





- UPSTREAM ICFR displays each upstream carrier, the darkened carrier is the locked carrier. To toggle, scroll to UPSTREAM and choose a different carrier, UPSTREAM ICFR and UPSTREAM EQ ANALYSIS will update

- UPSTREAM EQ ANALYSIS displays the equalizer graph for 16 QAM and 64 QAM upstream carriers. By highlighting a specific tap, that will indicate the distance to a reflection point in the upstream. This is usually the distance from an amplifier to a reflection caused by an impedance mismatch.

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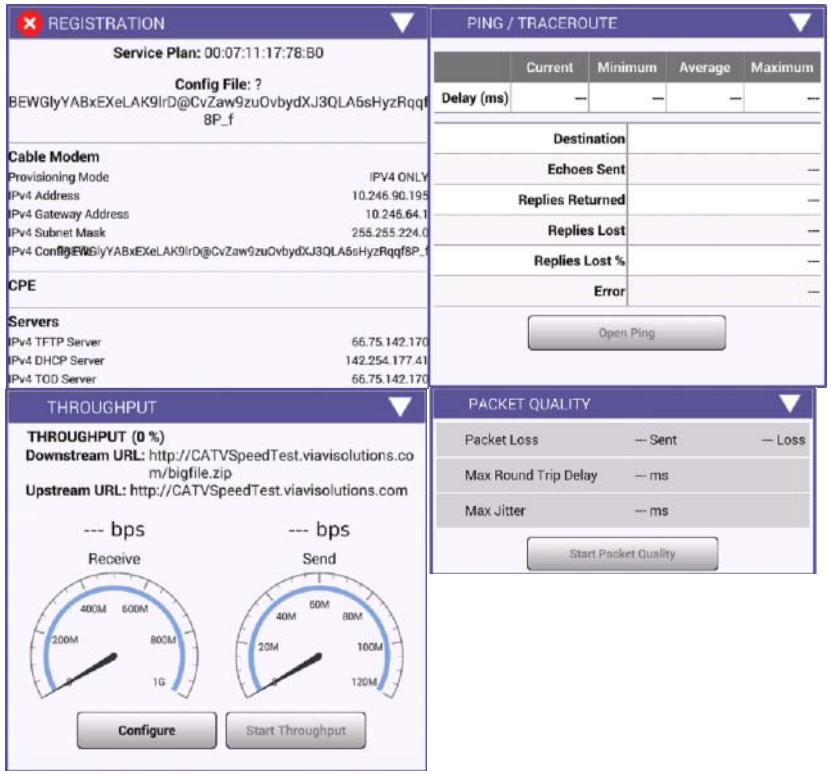
DOCSIS EXPERT – REGISTRATION, THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY



- REGISTRATION displays the configuration file if the CM MAC has been provisioned.
- The THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY functions are greyed-out if the CM MAC is not provisioned. Or if an un-provisioned MAC address is selected in CONFIGURE-> SELECT DOCSIS SERVICE PLAN.
- The throughput test sends a file upstream to a server. The server then sends the file back to the meter. Since the file size is known and the time it takes to download the file is known, the meter can then calculate the downstream speed. The same is done for the upstream.
- The PING/TRACEROUTE function can be configured to send configurable ping packets to a destination. A TRACEROUTE test can also be done to configurable destinations.
- The packet quality test sends ping packets to the CMTS and the meter counts any lost packets, measures latency, (round trip time) and measures maximum jitter. (variations in latency)

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VIAVI

✓ 146- INGRESS EXPERT

Ingress Expert – Advanced Upstream Spectrum Testing

- Upstream ingress/noise issues – much time spent identifying, locating, and suppressing
- As upstream spectrum fills with carriers new test capabilities are needed

- **Ingress Expert** mode offers advanced ingress troubleshooting capabilities
  - Available on already powerful OneExpert CATV
  - Standard in NTX (Network Expert) and SWX (Sweep Expert) feature bundles
  - Optional in other bundles

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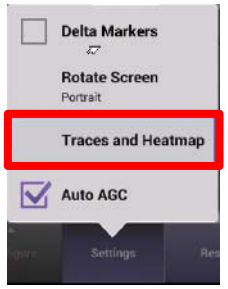
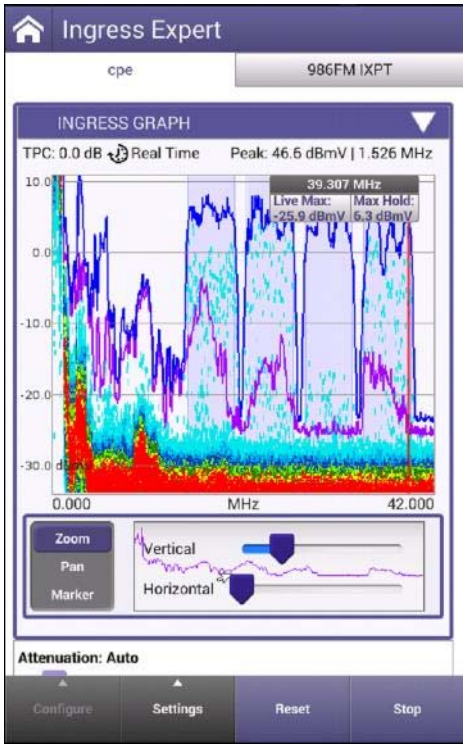
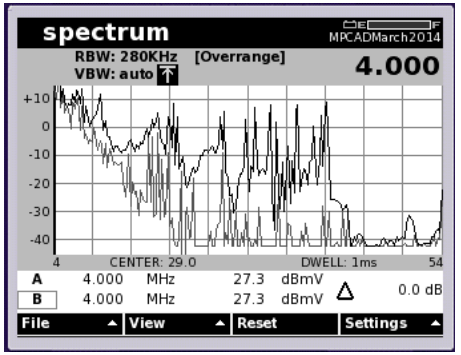
INGRESS EXPERT

- INGRESS EXPERT is based on powerful OneExpert CATV HyperSpectrum technology (Real Time Spectrum Analyzer)
  - Innovative overlapping FFT (Fast Fourier Transform) measures all transient interfering signals
- INGRESS EXPERT is different from Swept Spectrum Analyzers (DSAM and PathTrak) – it's more accurate and has thousands of samples a second resulting in a different
- Overlapping options provide additional detail





ONX630



DSAM6300

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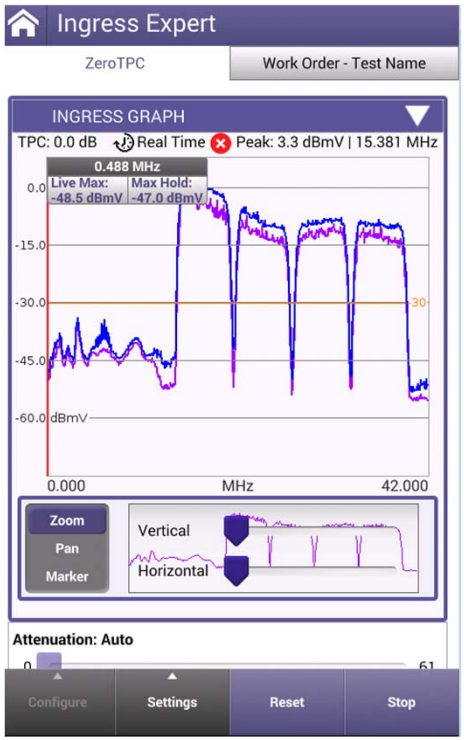
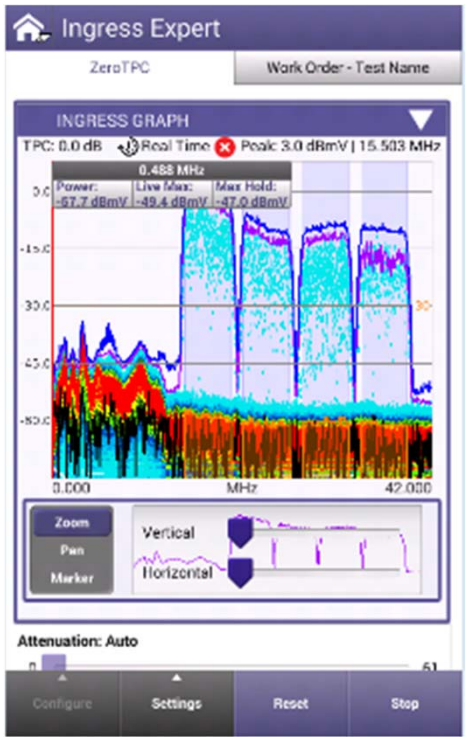
Ingress Expert Overview



Live Upstream Carriers Normal Spectrum Analyzer type view



Use different traces to better visualize the upstream and noise below carriers

- Unprecedented frequency coverage in a handheld gives techs full visibility of all upstream ingress noise
  - 0.5MHz up to a selectable 42, 65, 85, 110, or 204MHz
- Easily configurable, Ingress Expert allows techs to toggle persistence measurement and available traces for best visibility of ingress signals

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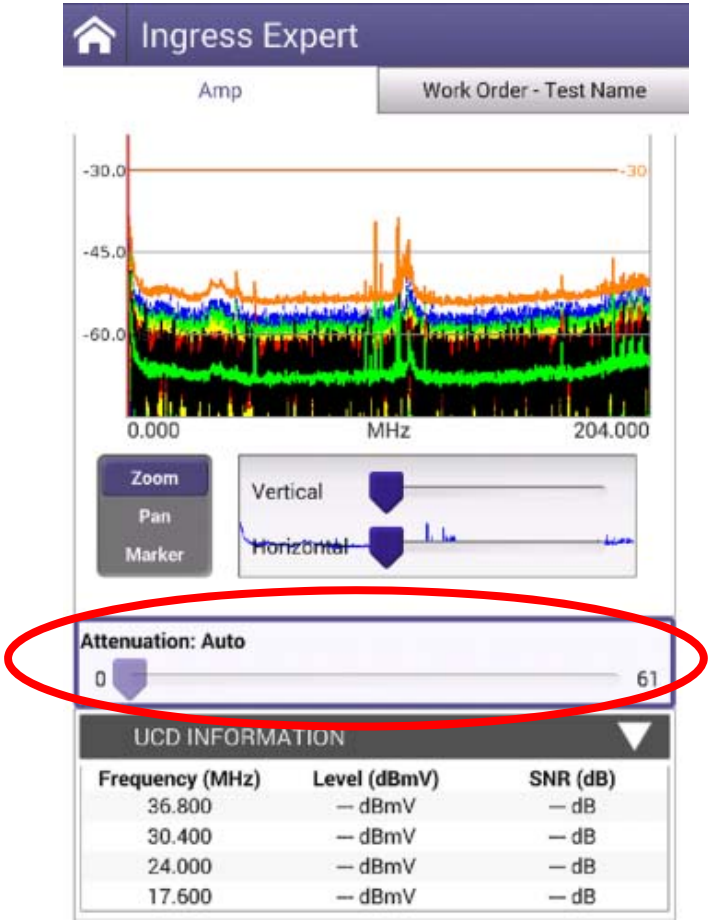
Ingress Expert Update



- Real-Time icon indicates when the RT Analyzer is 100% engaged.
- **Auto-AGC** is selectable. If disabled, user can control port 2 attenuator setting.
- Traces align with VSE.
- **Upstream Channel Information** – average level and SNR values are displayed based for each UCD based on the previous DOCSIS test performed.
- Noise under the carrier trace
- Dynamic range meets desired 60 dB target.

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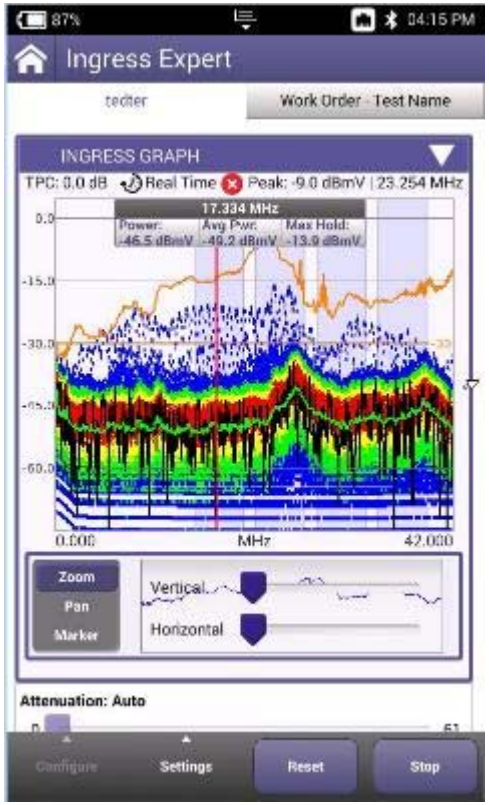
Ingress Expert – Advanced upstream spectrum testing



- Technicians spend much of their time trying to identify, locate, and suppress ingress issues on the plant
- As more of the upstream spectrum is filled with upstream carriers, traditional ingress mitigation processes are being re-written
- The Ingress Expert mode offers advanced ingress troubleshooting capabilities to help fight ingress
  - Included in ONX-CATV - **NTX** (**Network Expert**) package & **SWX** (**Sweep Expert**) package
  - Optional on other ONX-CATV packages

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Ingress Expert - Use Port 2 for Ingress measurement

- Two RF ports on top of unit
  - **Port 1** is for
    - All services testing like Video and DOCSIS tests
    - Downstream Spectrum
    - Bi-Directional Sweep
  - **Port 2** is for Upstream spectrum and Ingress troubleshooting
    - Overlapping FFTs allow for gapless ingress detection

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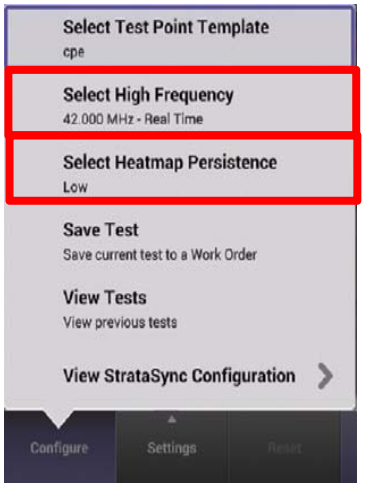
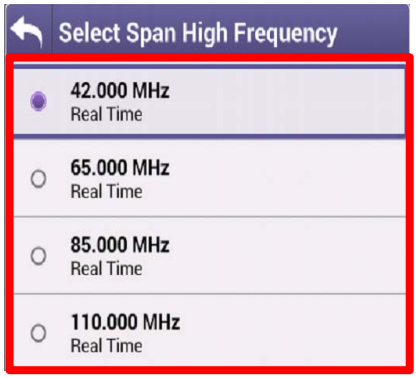
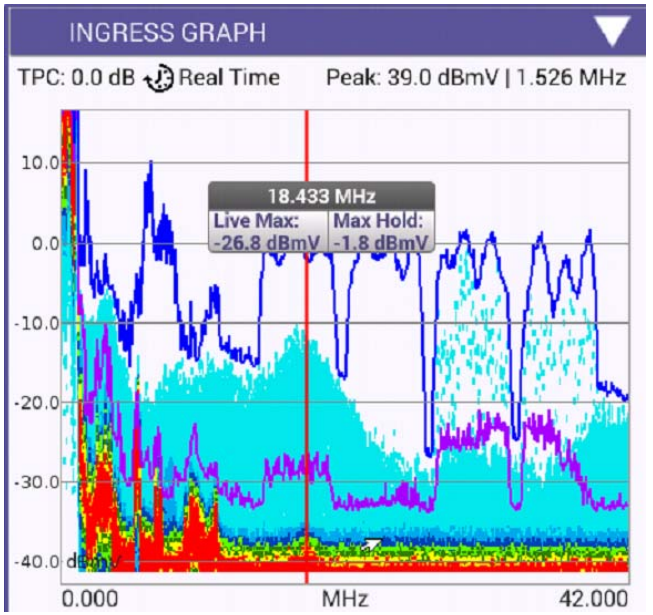
INGRESS EXPERT - CONFIGURE

- Select CONFIGURE and choose SELECT HIGH FREQUENCY to change SPAN
- Some models may have 204MHz as an option

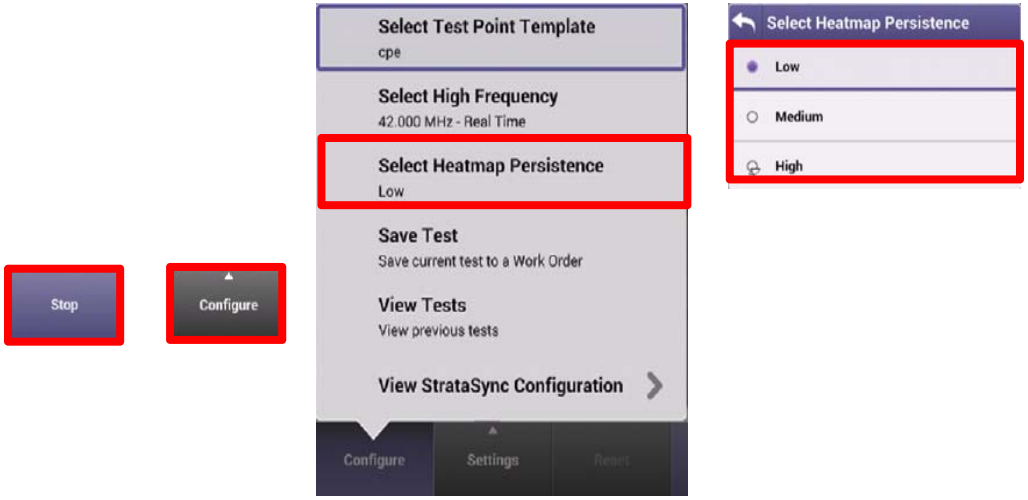


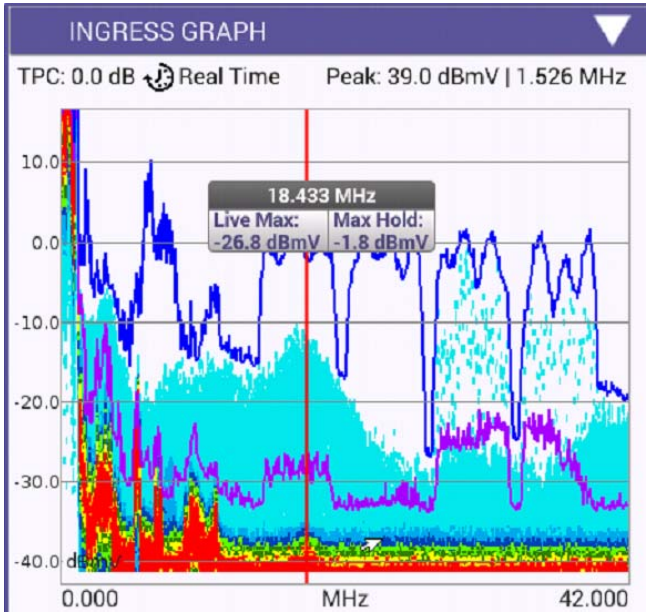




INGRESS EXPERT - CONFIGURE

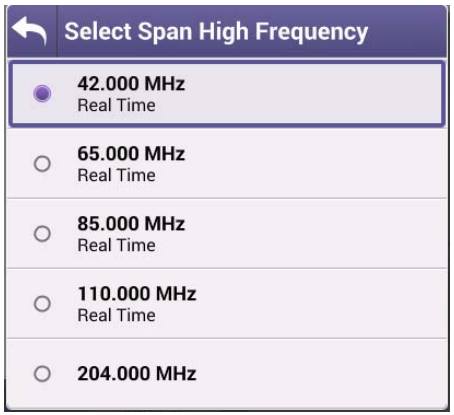
- Select HEATMAP PERSISTENCE to change dwell time of the HEATMAP
  - LOW is best for constant noise
  - MEDIUM is best for transient and constant noise
  - HIGH is best for transient only

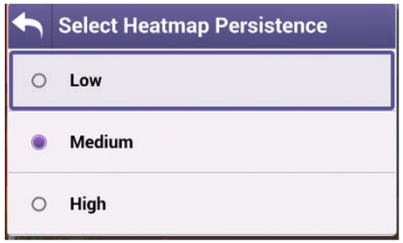


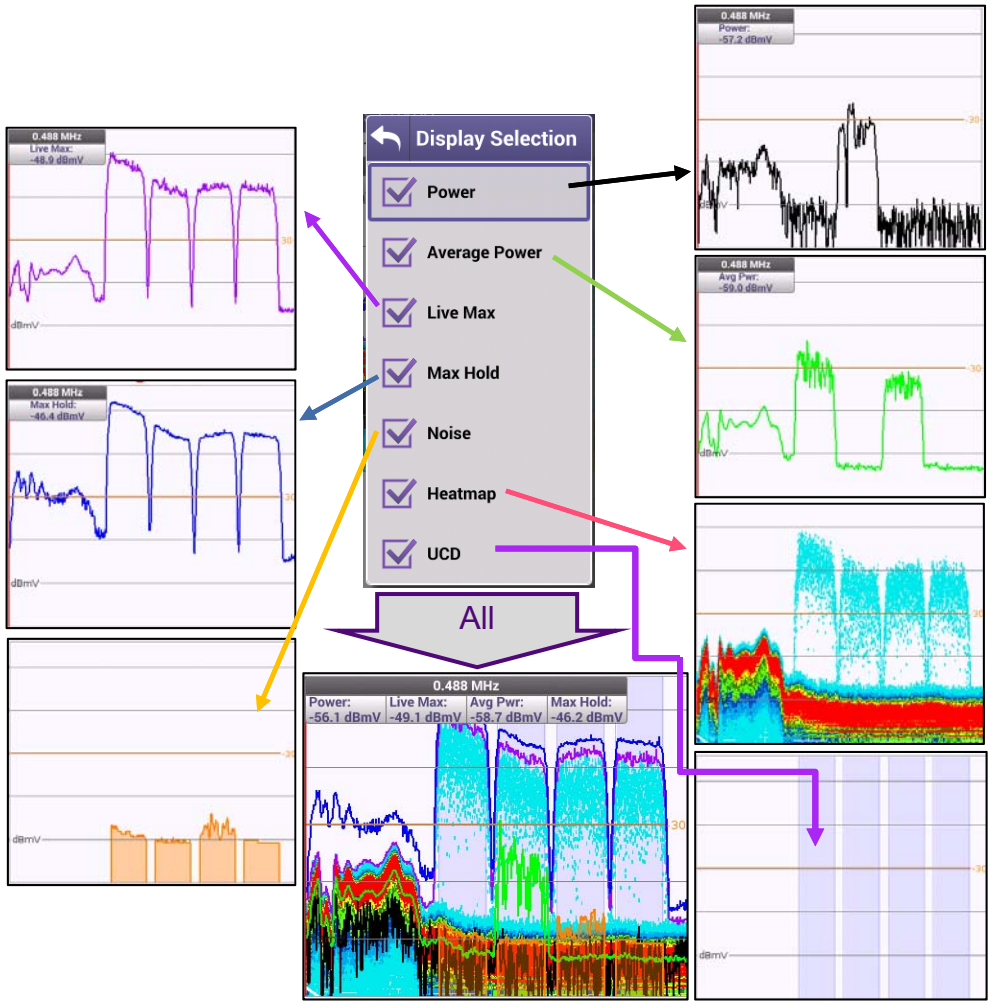


Ingress Expert - Configurable Traces and Frequency Span

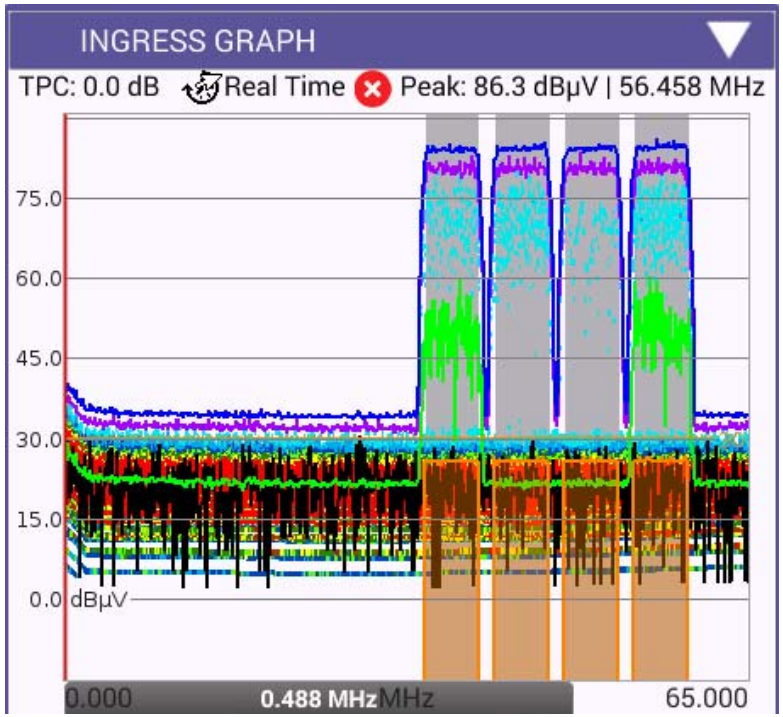
- Adjustable views allow users to select view that works best for troubleshooting situation
- Selectable upstream frequency range and heatmap persistence level







Ingress Expert – traces definition



Ingress Expert has several different traces that each highlight a different way of looking at the upstream noise & carrier information

- **Power** – a single trace randomly selected from the several thousands taken each second by the Real Time Analyzer RTA
- **Average Power** – the average power over the last second
- **Live Max** – the highest power at each frequency over the last second
- **Max hold** – the highest power at each frequency since the beginning of the test
- **UCD** – the Upstream Channels Descriptors are acquired from the last DOCSIS test performed – highlights were upstream carriers should appear and helps the ONX perform additional measurements
- **Noise** – signals within the highlighted UCD frequencies which occur less frequently but are higher than the average noise floor below the carriers

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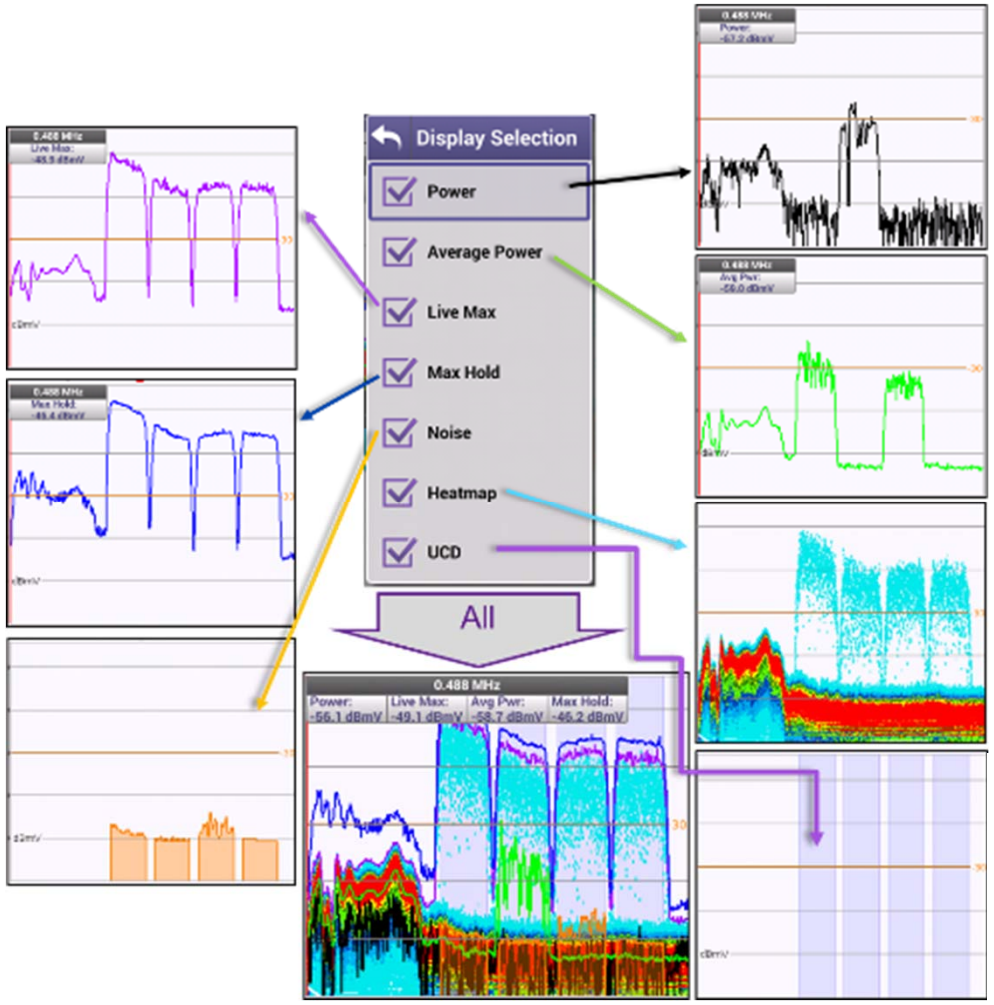
Ingress Expert - Trace Definition

- Highest power at each frequency over the last second
- **Max power** over test period
- Signals within highlighted **UCD** frequencies, occurring less frequently but higher than the average **noise** floor below carriers



- A single trace randomly selected from several thousand taken each second by real-time analyzer
- **Average power** over the last second
- **Persistence** represented by color variation
- **Upstream Channel Descriptors** acquired from last DOCSIS test performed – Highlights where upstream carriers should appear and helps ONX perform additional measurements

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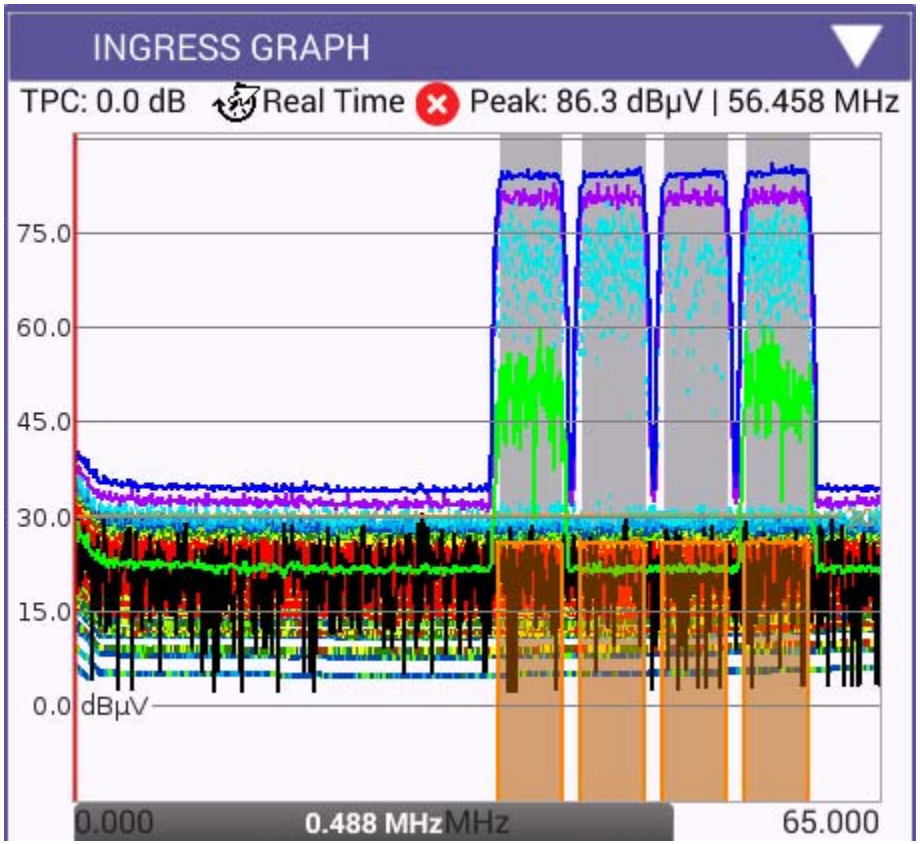
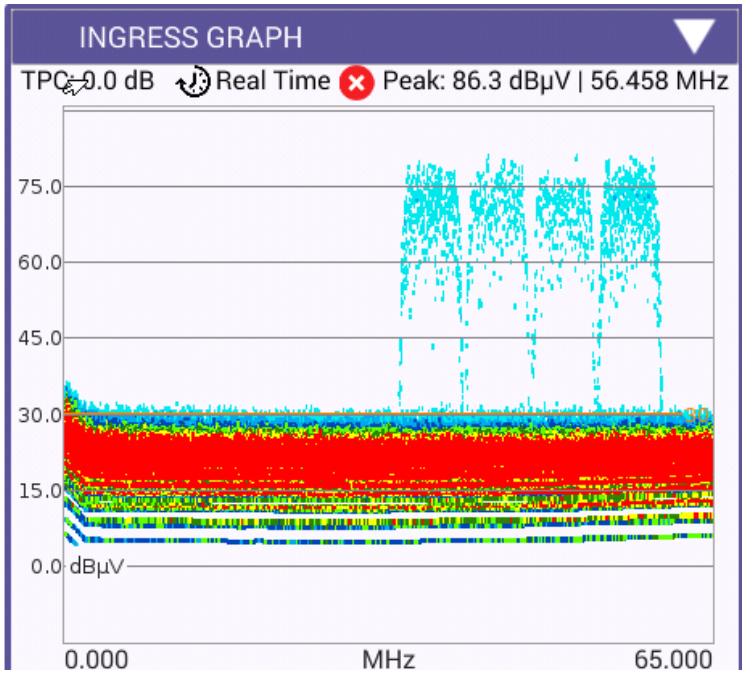
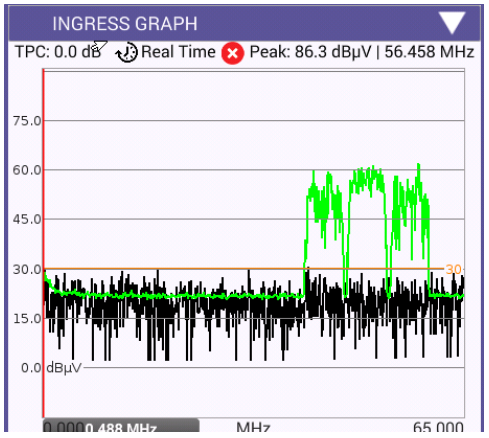
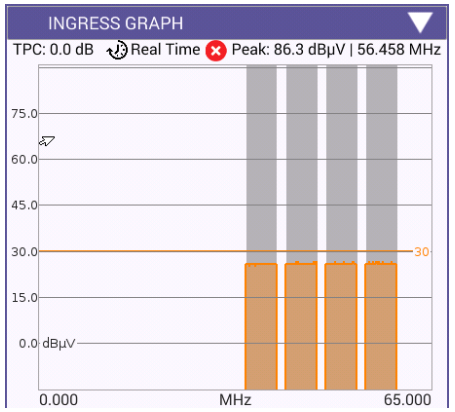




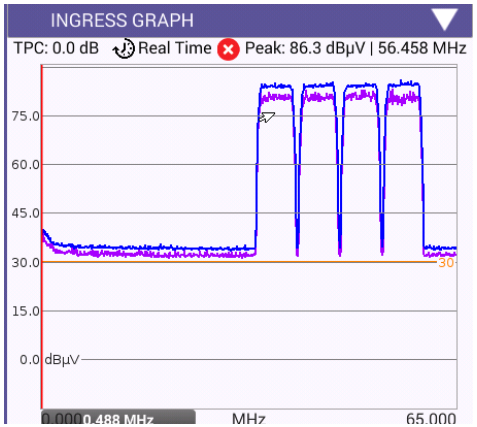
heatmap



Power & average power



UCD & Noise



Live Max & Max hold

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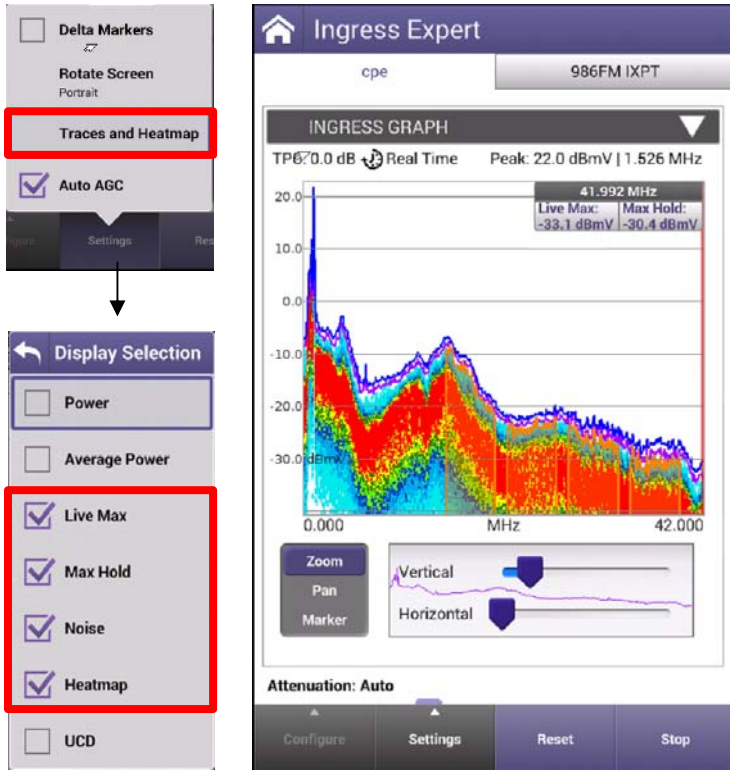
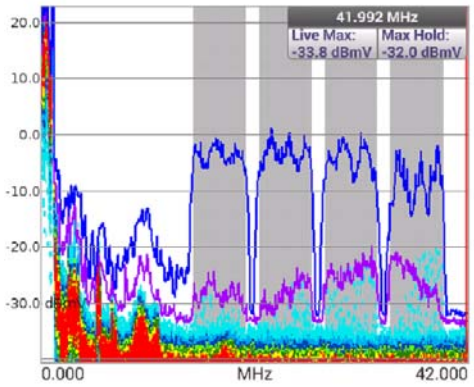
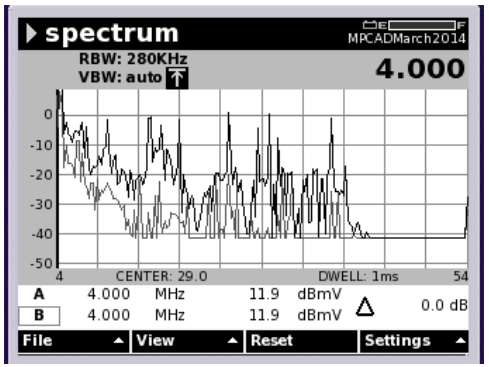
INGRESS EXPERT – RECOMMENDED SETTINGS

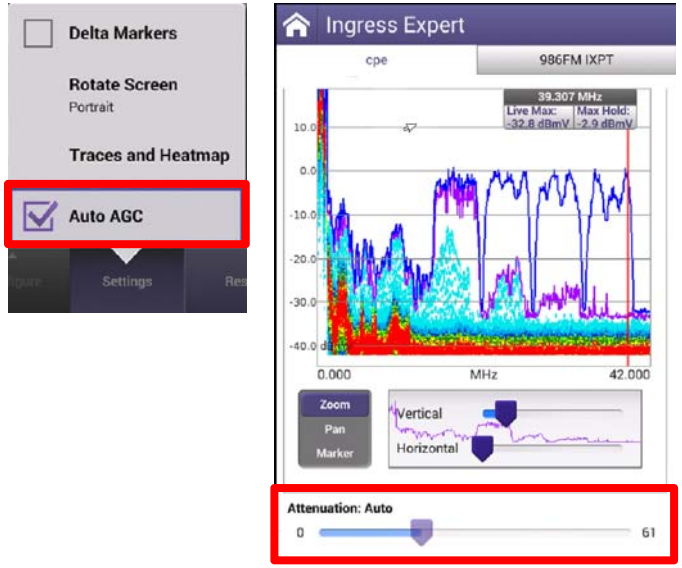


- The live display shows energy changing from constant (Red, Orange) to transient (Yellow, Green, Blue, Light Blue)
- Turning on UCD can lend assistance when noise is obscuring the carrier (see DSAM by comparison)

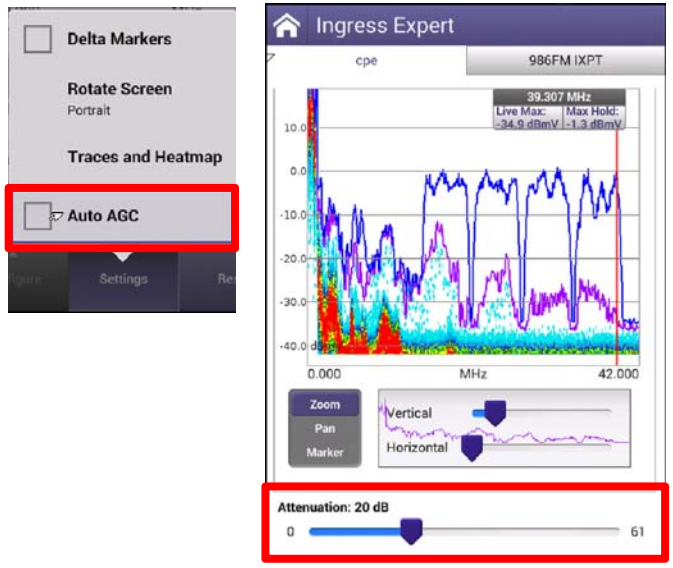




INGRESS EXPERT – AUTO-ACG



- AUTO AGC will attempt keep spectrum view references, up to 60dB dynamic range



- DISABLING AUTO AGC requires the user manually attenuates the signal to prevent OVERRANGE

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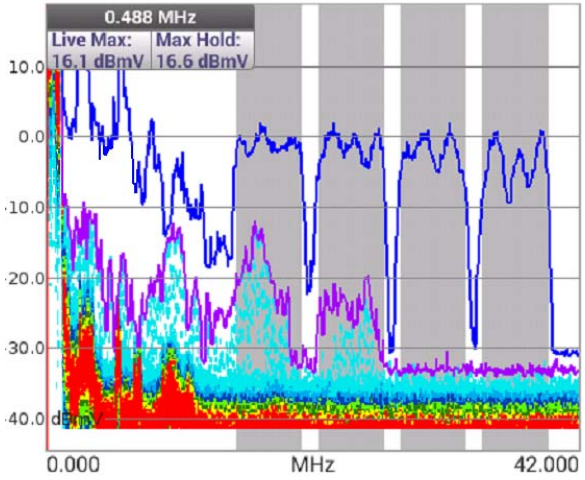
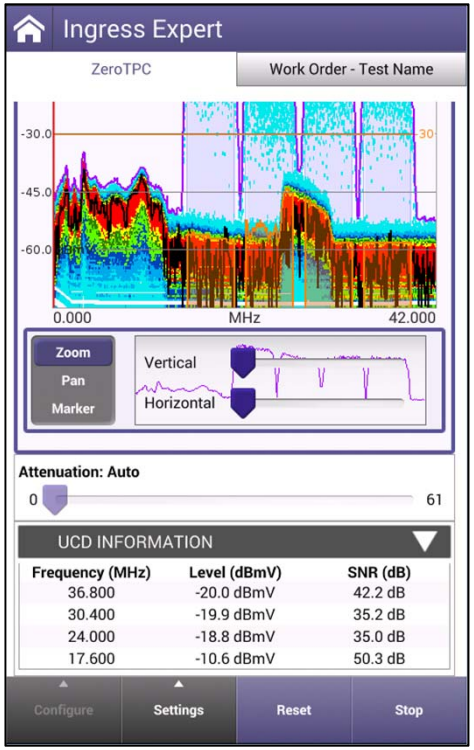
INGRESS EXPERT – SNR and NOISE

- The NOISE setting will allow users to see the noise floor under the upstream carriers
- If the user performs a DOCSIS EXPERT test before INGRESS EXPERT, UCDs will match that of the network and give clear indication of the carriers width and location
- Additionally, UCDs will be demodulated with FREQUENCY, LEVEL and SNR calculated and displayed





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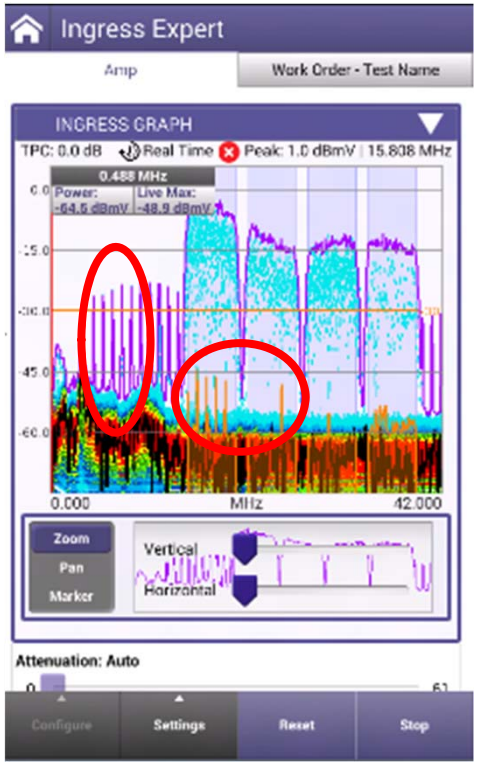
- ✓ **162 – Ingress Expert - finding and troubleshooting Ingress issues**

Find Intermittent Noise



- One of technicians' toughest tasks is to find and fix impulse noise impairments
  - Fast transient noise is difficult to measure and identify
- **HyperSpectrum** easily catches these quick transient impulses, even when below active upstream carriers
  - The various traces make these impairments visible
  - The Noise trace shows reoccurring impulse ingress under active carriers

Traces show interference outside of active carriers
Ingress Expert's Noise trace shows reoccurring ingress inside carriers

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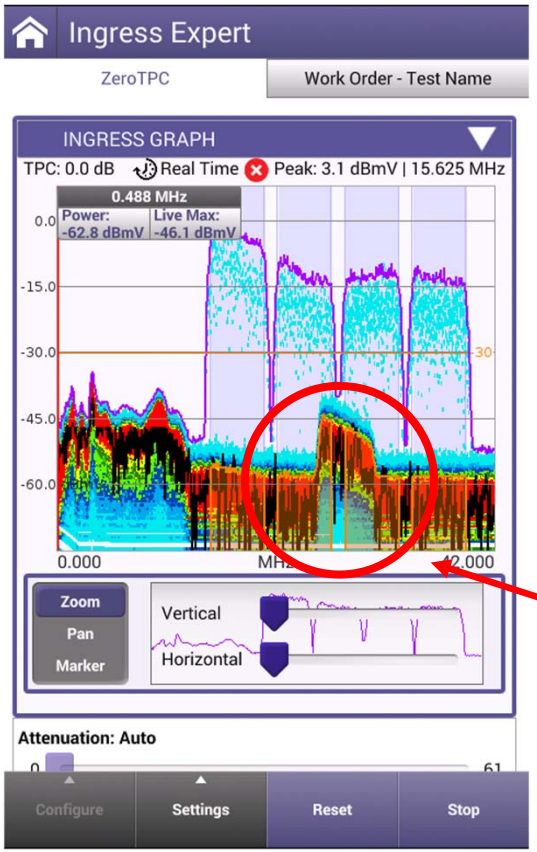
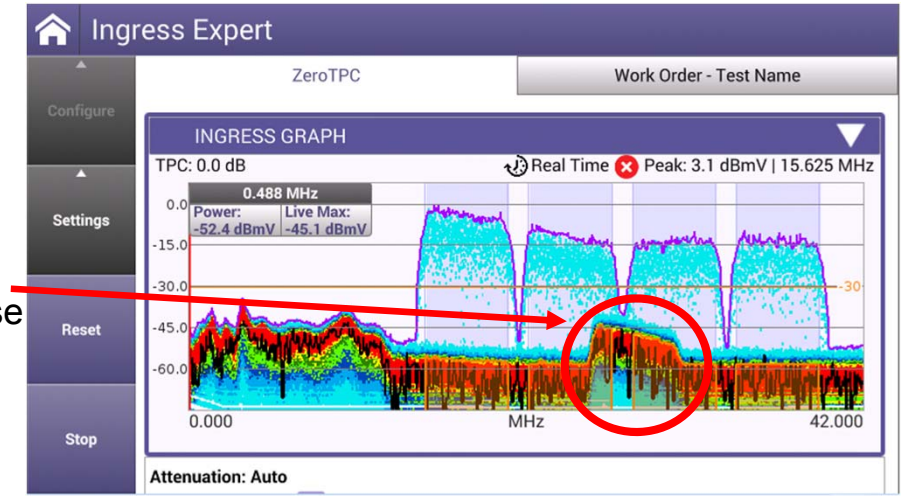
Find Consistent Noise

- Consistent ingress/noise sources have traditionally been easier to troubleshoot, however as vacant upstream spectrum becomes scarce finding and fixing noise under active QAM carriers is more important than ever.
- Ingress Expert mode's **persistence measurement** catches and displays noise even under active upstream carriers



Ingress Expert clearly shows elevated noise under active carriers



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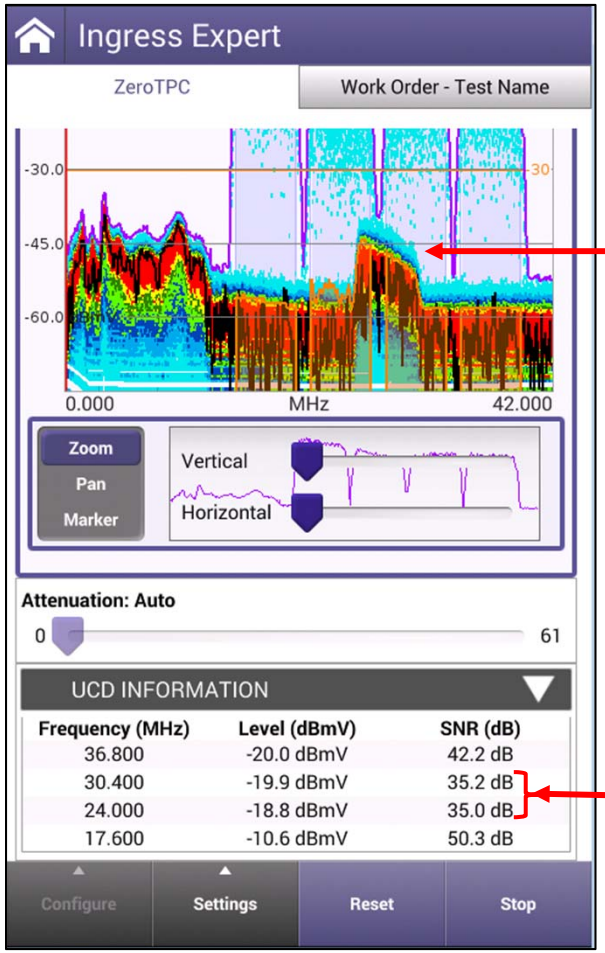
UCD Table – Upstream Channel Descriptor



The impact of the noise floor can be clearly seen in the SNR calculated for the 24 and 30.4MHz carriers

- The ONX will populate the **UCD table** at the bottom of the Ingress expert mode based on its last successful DOCSIS range test performed.

- Knowing exactly where to anticipate the upstream carriers enables additional measurements to be displayed:
  - Carrier Frequency
  - Upstream carrier level
    - [as measured at test point]
  - **Signal to Noise Ratio (SNR)**
    - [as measured for level and noise at test point]

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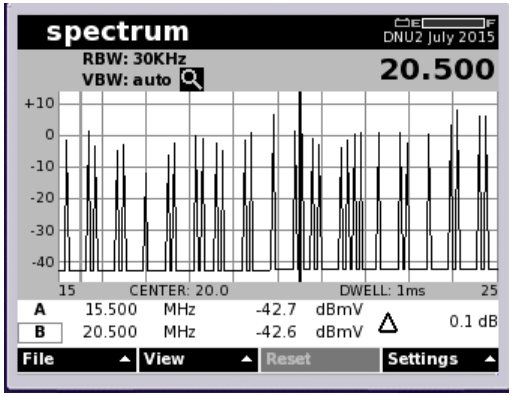
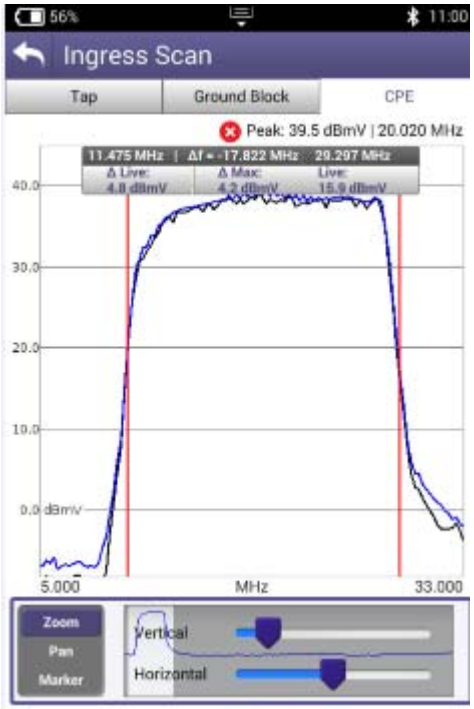
Improved Impulse Noise Detection



- DSAM scanning analyzer catches samples within its resolution bandwidth as it scans spectrum
- Max Hold is needed to capture complete noise “envelope” over time



- **OneExpert FFT** captures the whole noise envelope at once
- No need to wait for multiple scans to see complete interference impact

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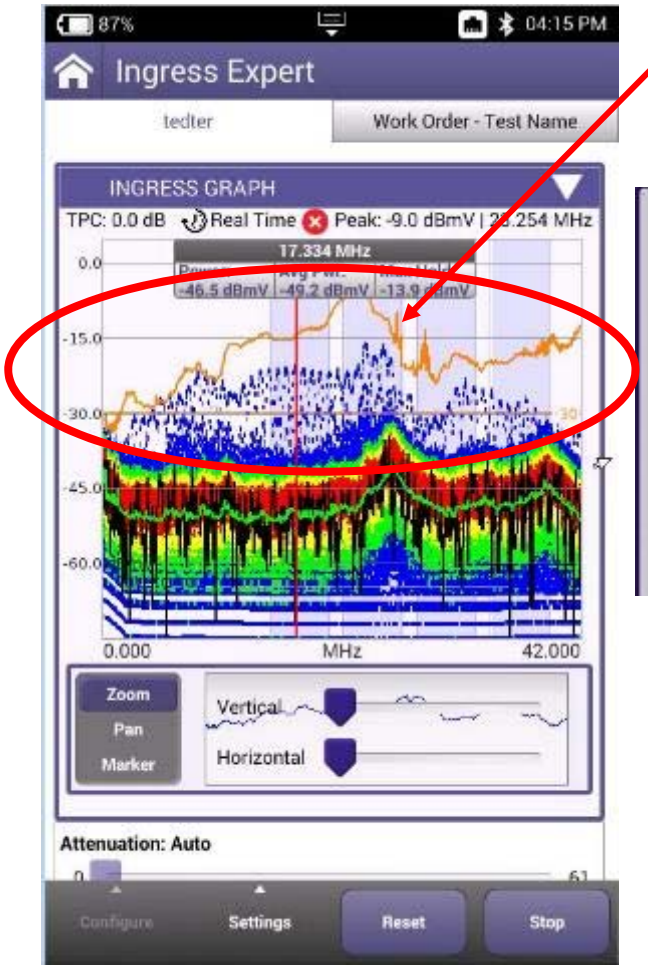
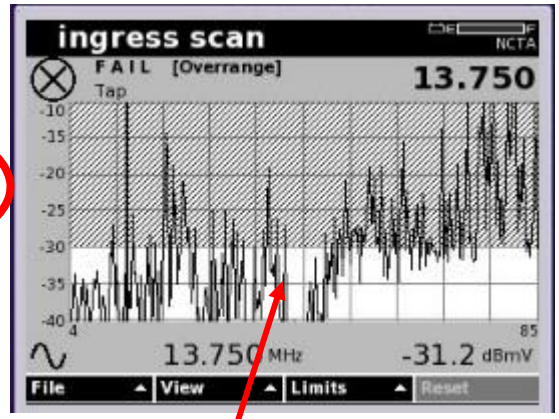
Application Note on Real Time Analyzer

- Problem:
  - DSAM users are accustomed to the “view” they get from a swept spectrum
  - ONX with Real Time analysis (like VSE) capture ENTIRE Spectrum.
  - The signatures look different
  - Perception from DSAM user is that DSAM catches it better
- Solution:
  - **Educate your technician team on the technology and benefits**



ONX shows **“smooth”** Max Hold across whole spectrum



DSAM shows “spikey” Max Hold across whole spectrum

DSAM is actually missing some of the noise

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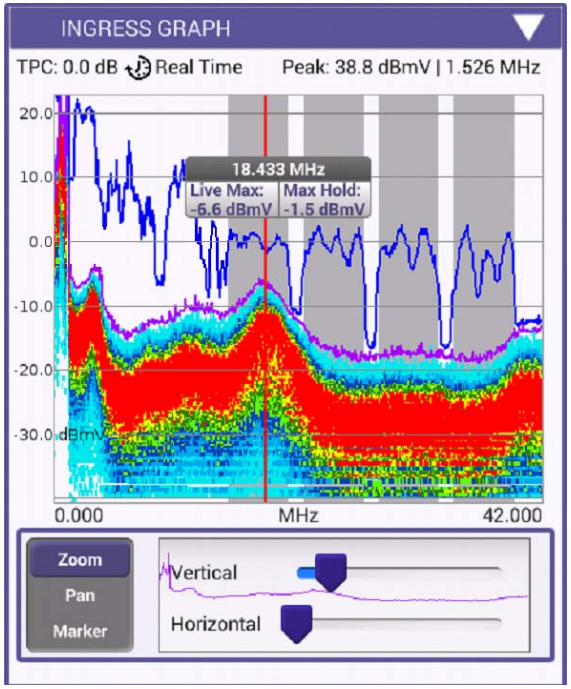
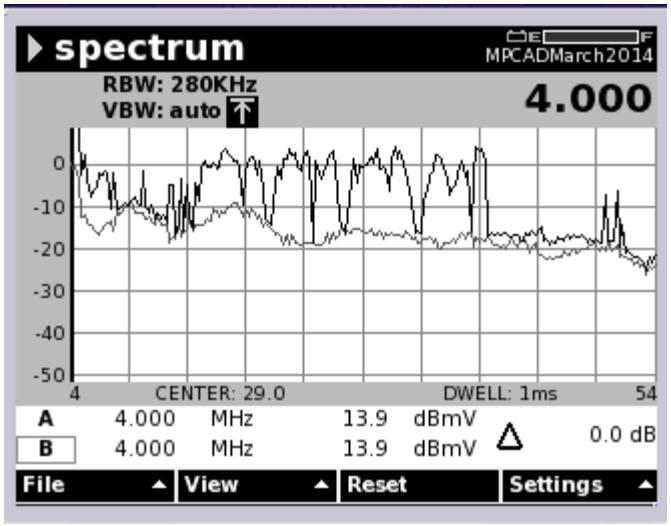
INGRESS EXPERT VS DSAM





- Tracking Impulse Noise on ONX630
- Tracking Impulse Noise on DSAM

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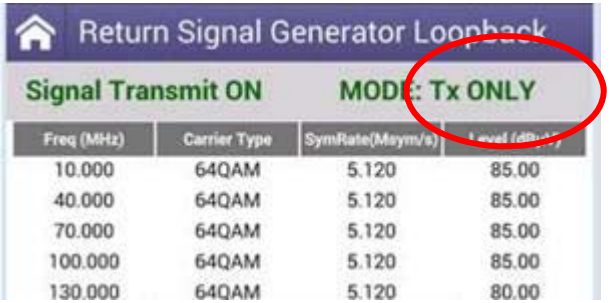
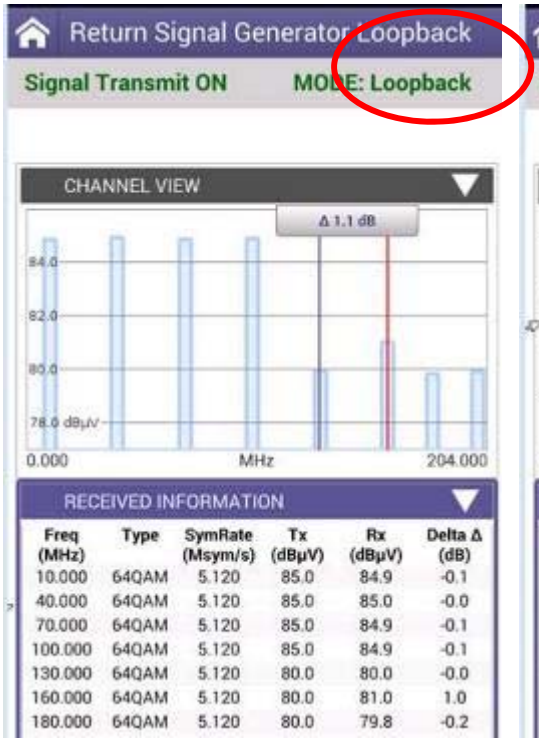
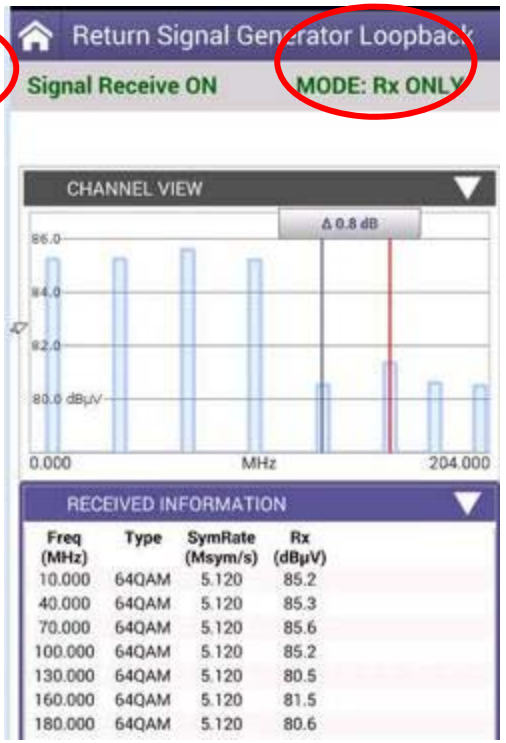
- ✓ 169 – RSG LOOPBACK
  - Return Signal Generator
  - Loopback

Return Signal Generator with Loopback

- Generate up to **8 return band test signals** to test component or network gain/loss
- **Loopback** capability allows normalization and provides a table listing simultaneous, continuously updated measurements of carriers relative to stored reference
- Three modes
  - **TX only** mode (just like RSG mode)
  - **Loopback** Mode – TX and Receive
  - **RX only** mode – receive signals from other source – e.g. 2nd ONX







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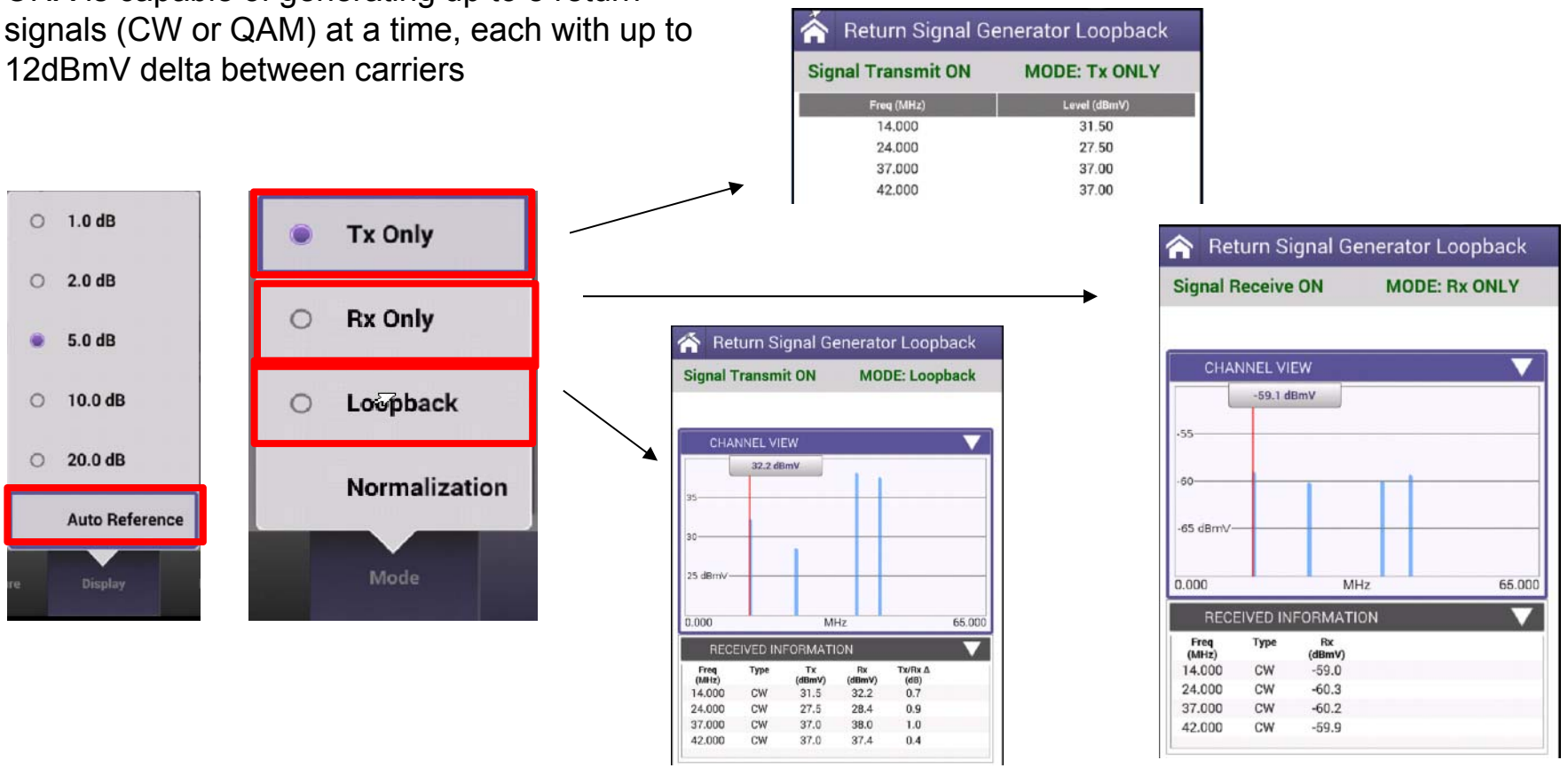
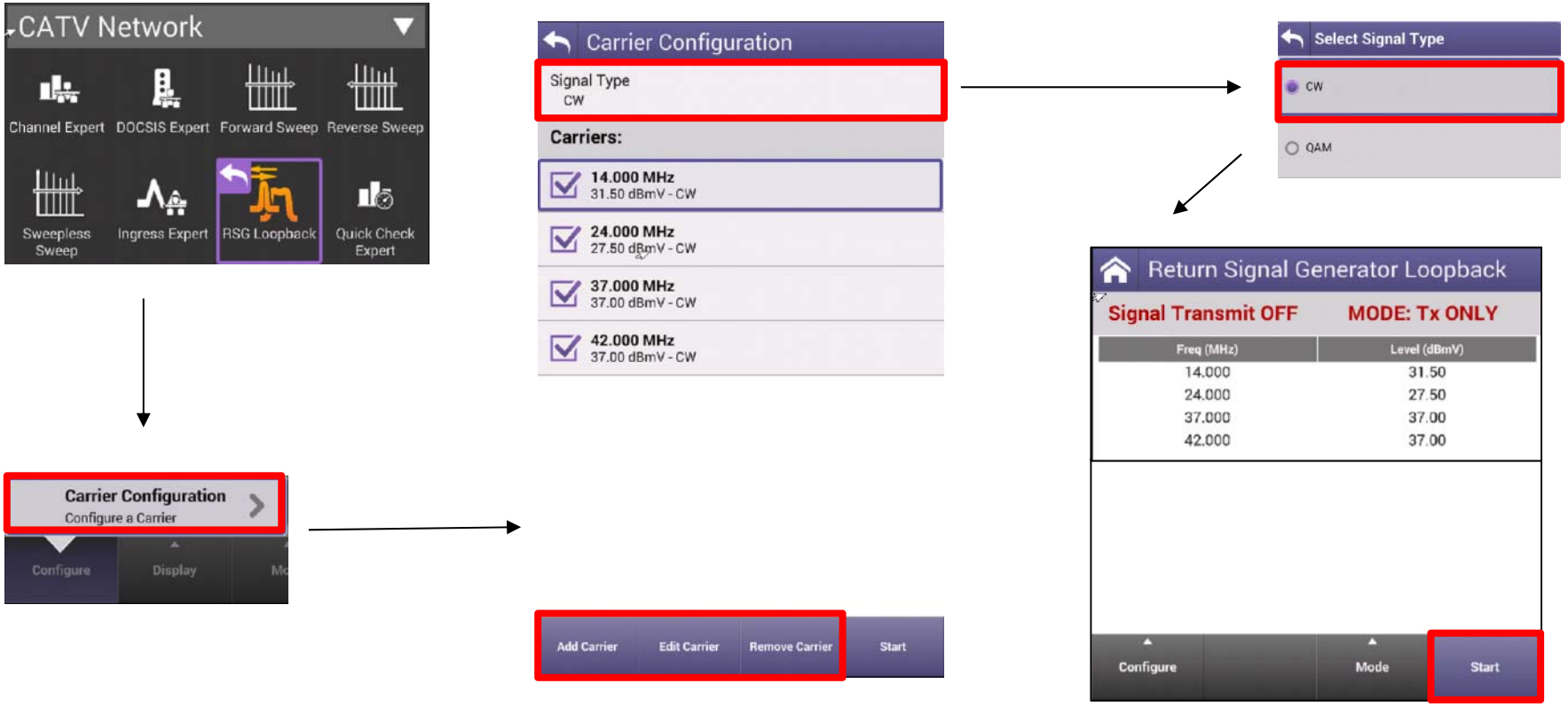
RETURN SIGNAL GENERATOR

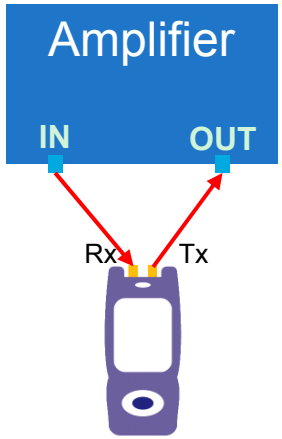
- ONX is capable of generating up to 8 return signals (CW or QAM) at a time, each with up to 12dBmV delta between carriers

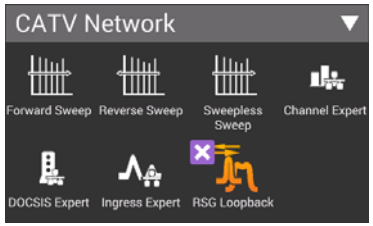


RETURN SIGNAL GENERATOR – CONFIGURATION

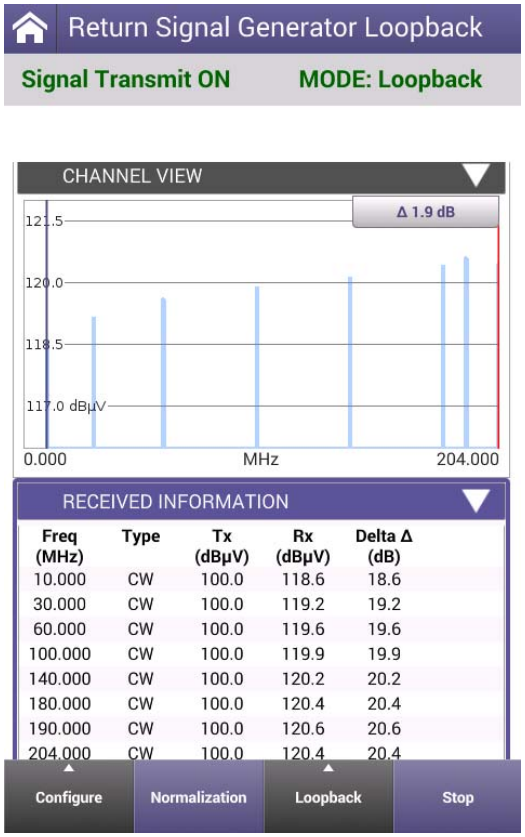


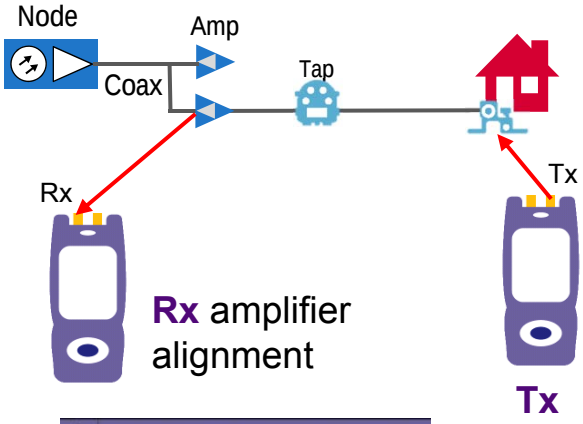
ONX Return Generator and Loopback application with Remote PHY



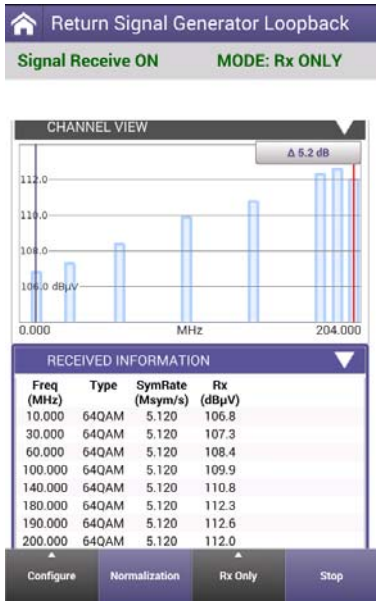


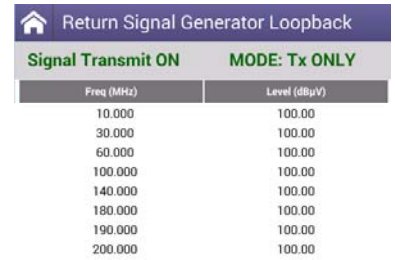
Loopback amplifier alignment





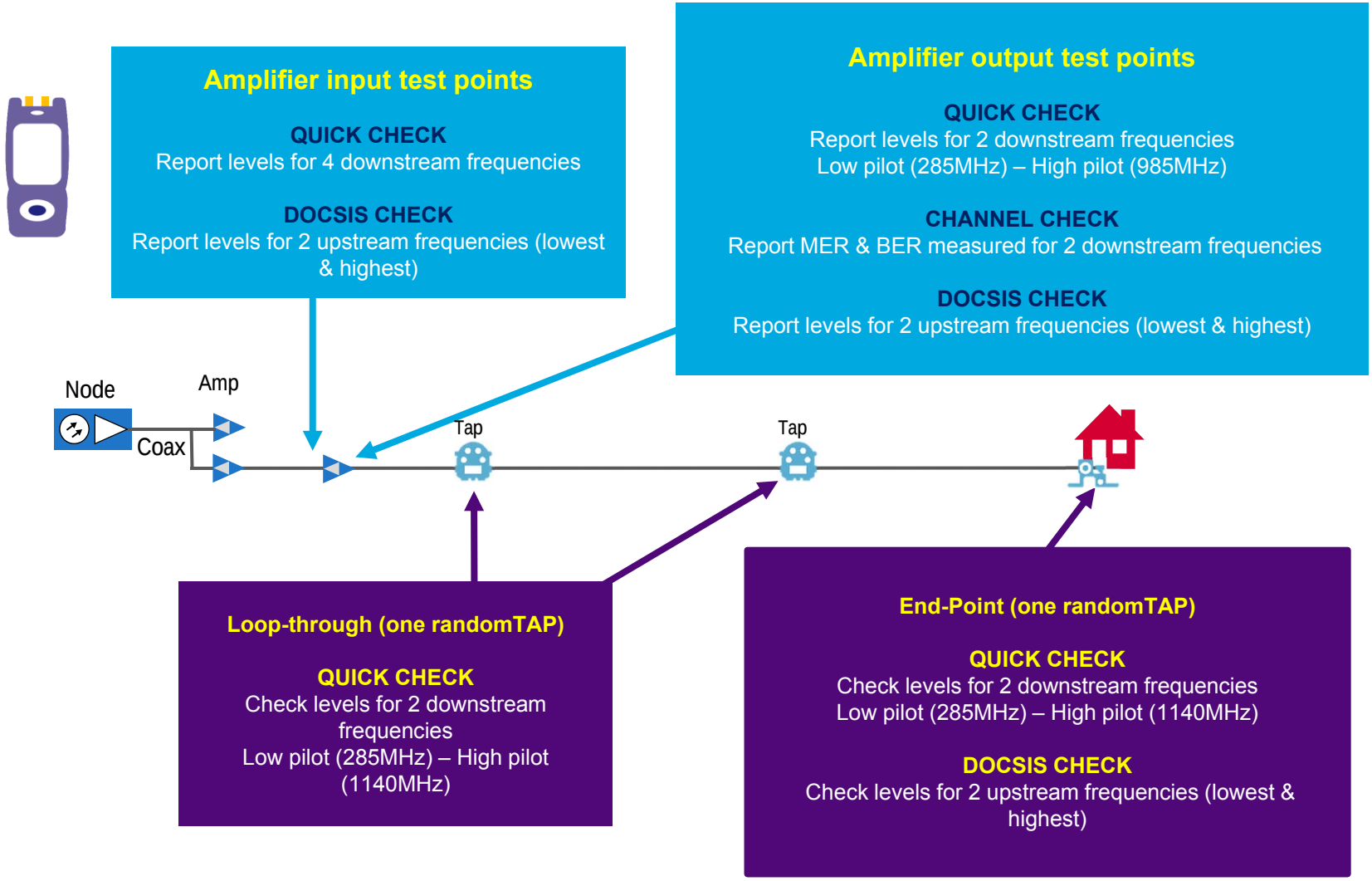
Rx amplifier alignment





Tx

Other test examples in Remote PHY environment



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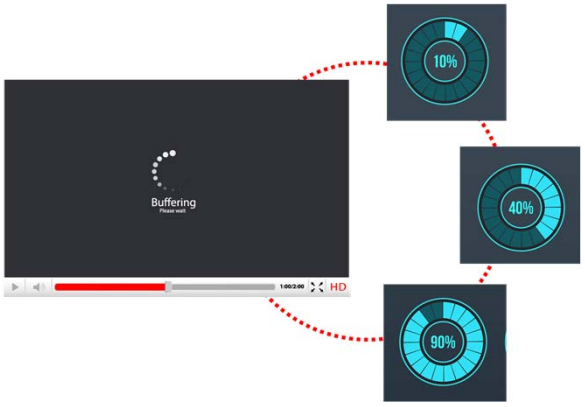
175 – Home Leakage Testing

The “Pressure Test” (option)

The Home Cable Network and Ingress Challenge

- Ambient RF noise in the home caused by a variety of things, including but not limited to cell phones (LTE signals)
- Ingress enters home network where shielding integrity has been compromised
  - Old unshielded devices, connectors, loose connections, damaged cable
  - Ingress disrupts service and can occur intermittently
  - Without an effective way to test for it, there will be service calls
  - Potential service disruption for multiple customers on affected node
- Leaks are potential points of ingress



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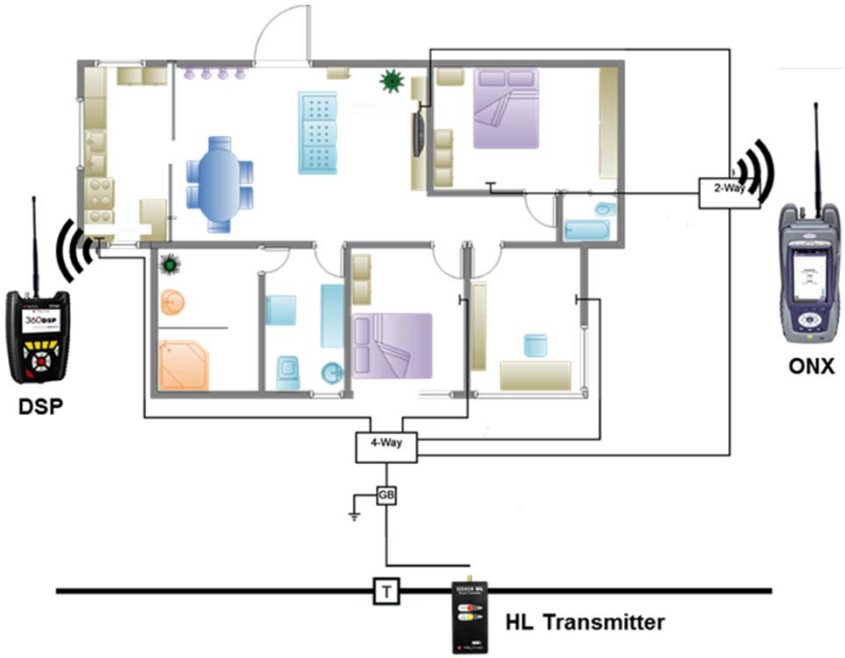
Home Network Pressure Test & Home Leakage Test Kit



- Home Network Pressure Test
  - Inject high signal level into drop, or at ground block and detect with field meter
  - Much higher signal level than from cable network, increasing leak field strength
  - Enables tech to find points of failure, saving time vs trial-and-error methods
  - Ensure home installation meets shielding requirements of today's high tech world
- Home Leakage Test Kit
  - Hand-held transmitter (two frequencies and two output levels)
  - DSP or ONX meter with option and antenna
  - No extra meter to carry

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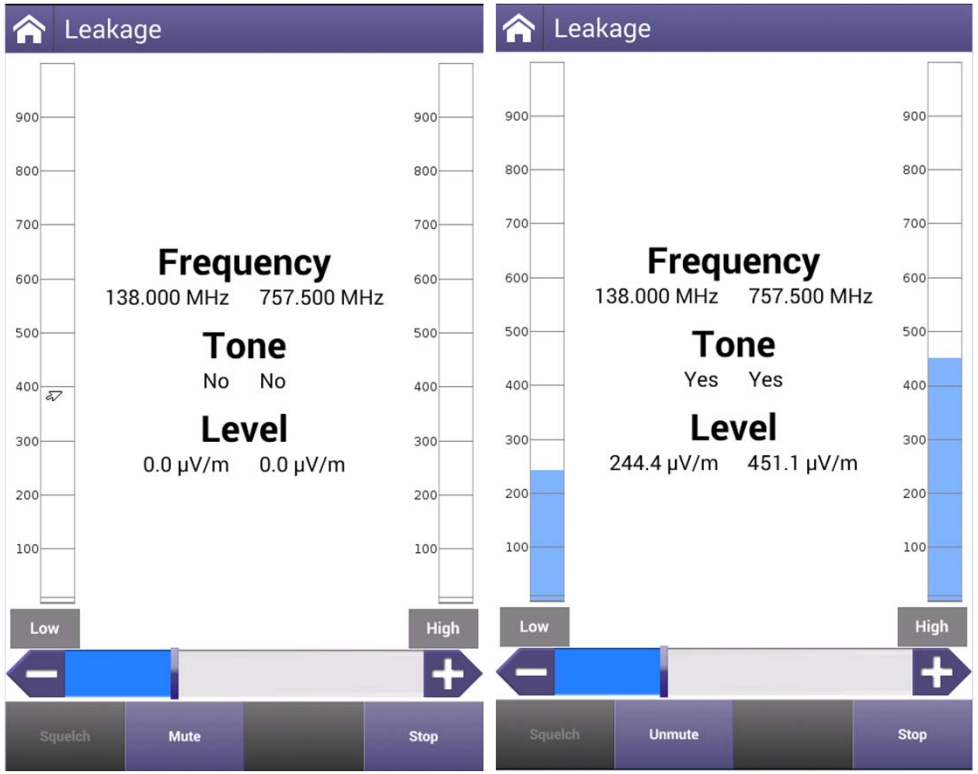
HLTK Components and Screen Examples

Seeker HL Transmitter

Antenna

Leakage Option (DSP or ONX)

OneExpert CATV



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Seeker HL Source Transmitter

- Power On / Off:
  - Green – normal operation
  - Red – Low Battery
  - Blinking Red – Very Low Battery
- Output Level:
  - Green – Low Output (40 dBmV)
  - Red – High output (60 dBmV)
  - Blinking Red/Green – Device Error
- Charge:
  - Green – Done
  - Red - Charging

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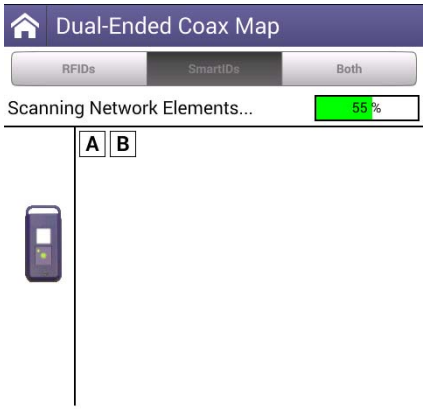
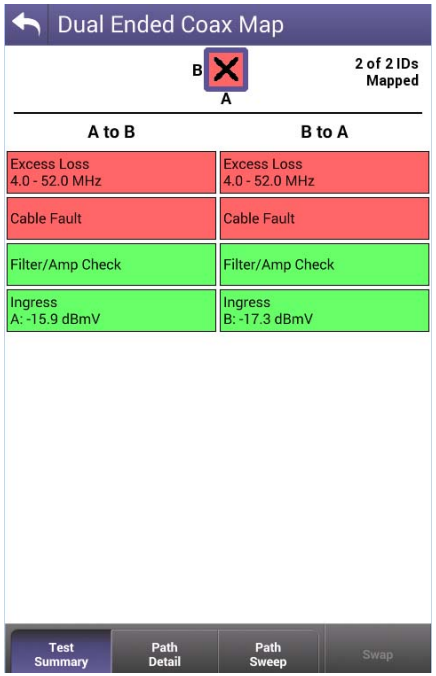
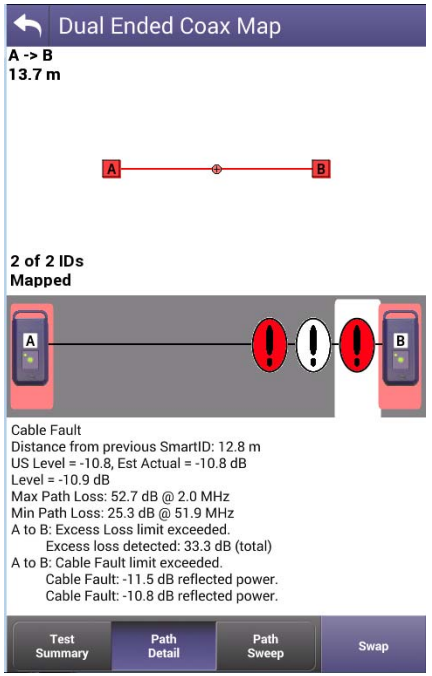
- ✓ **180 – SMART ID - testing**

SmartID Full Frequency Sweep

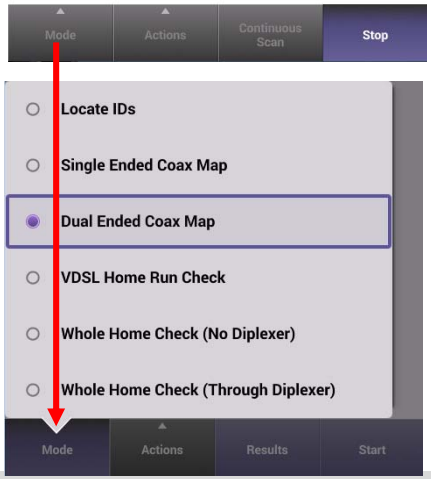
Sweeps local coax network to 1.6 GHz for performance verification and troubleshooting

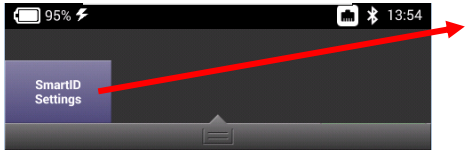


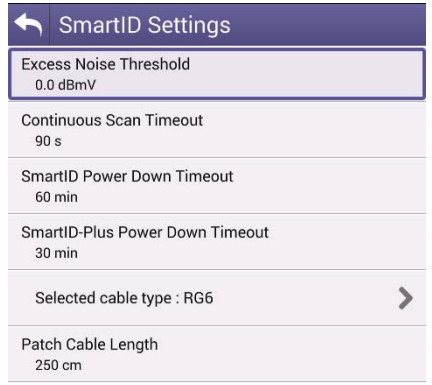




- Two-ended tests, locate splitters, impairments
- Sweep and summary views
- Ingress scan







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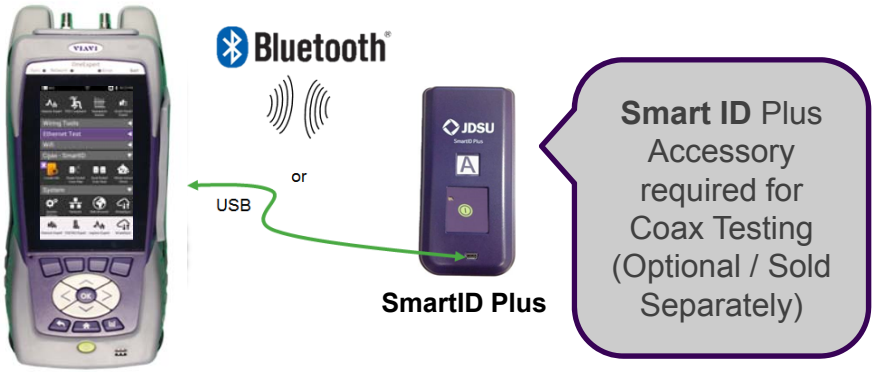
- ✓ **182 – SMART ID – testing SmartID Plus with RFIDs**

Connect SmartID Plus to ONX

Register all SmartIDs with ONX (review the SmartID Starter Kit guide for additional familiarity with the SmartID probes)

1. Press the **Tray** hard key on the ONX to open the tray menu
2. Select the **Bluetooth** icon to turn Bluetooth ON (should be green when ON)
3. Press the **Tray** hard key to return to home screen
4. Select **Locate IDs** to launch coax app from home screen
5. Press **Actions** soft key
6. Select **SmartID Registration**
7. Power ON & connect the SmartID Plus to ONX via the USB cable
8. Select the letter on ONX display that corresponds to the label on the SmartID Plus. The serial number should be auto populated when SmartID is powered ON
9. Check the box for “Bluetooth Master” and press **OK**
10. Disconnect the SmartID Plus and power it OFF
11. Power ON & connect a regular SmartID to ONX via the USB cable
12. Select the letter on ONX display that corresponds to the label on the SmartID. The serial number should be auto populated when SmartID is powered ON
13. Disconnect the SmartID Plus and power it OFF
14. Repeat steps 11 to 13 for each remaining SmartID



RFIDs (ActiveIDs)

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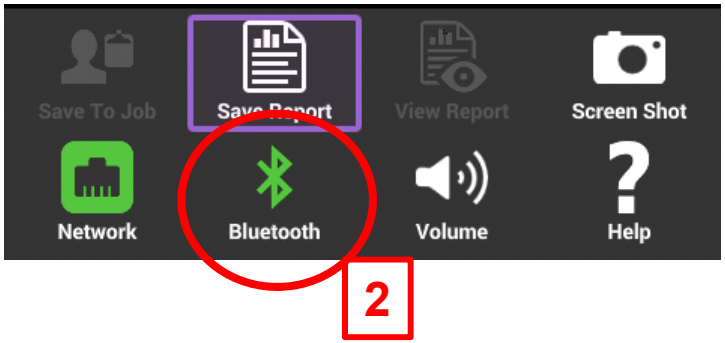
Activate Bluetooth on ONX

1. Press the **Tray** hard key on the ONX to open the tray menu
2. Select the **Bluetooth** icon to turn Bluetooth ON (should be green when ON)
3. Press the **Tray** hard key to return to home screen



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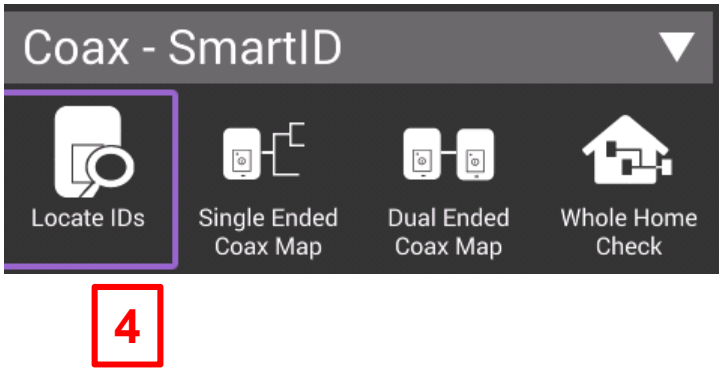
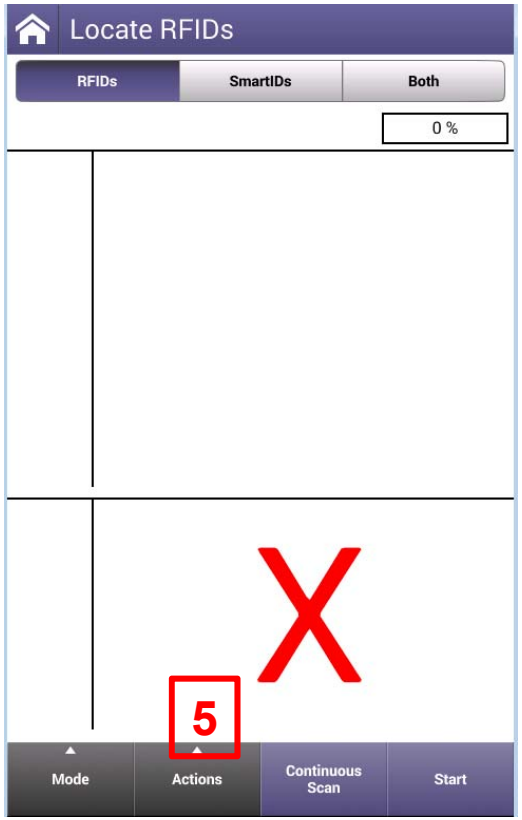
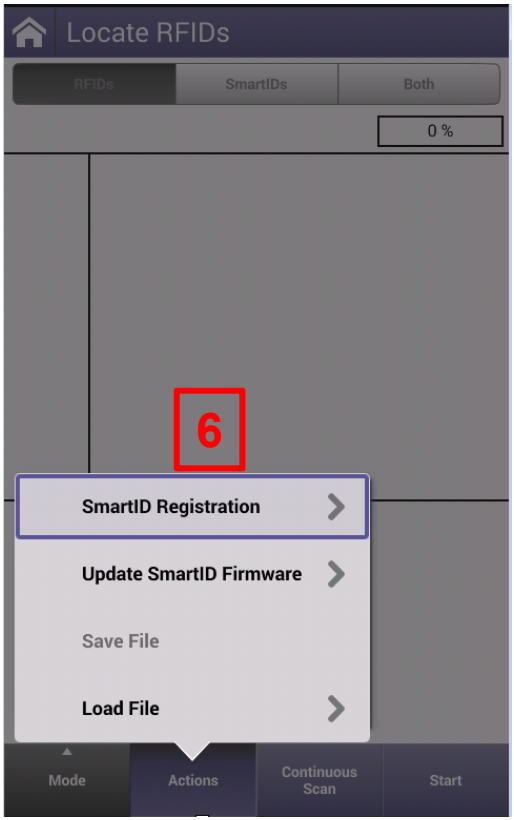
Entering SmartID mode on the ONX



1. Select **Locate IDs** to launch coax app from home screen
2. Press **Actions** soft key
3. Select **SmartID Registration**





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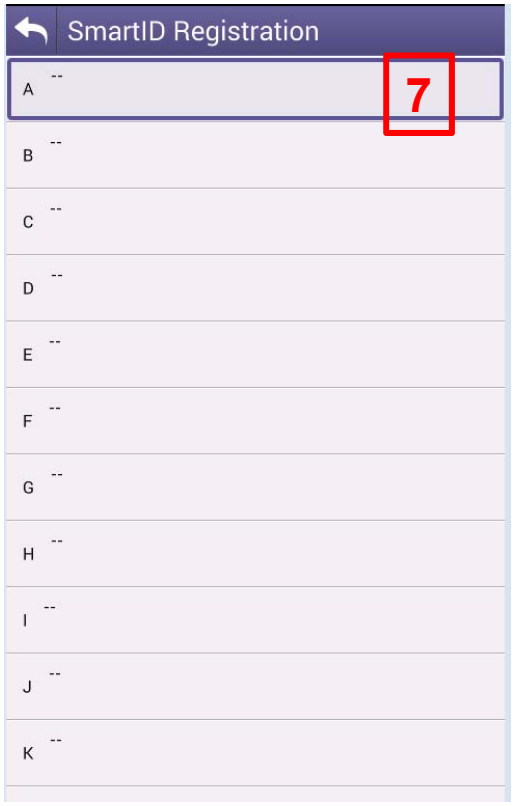
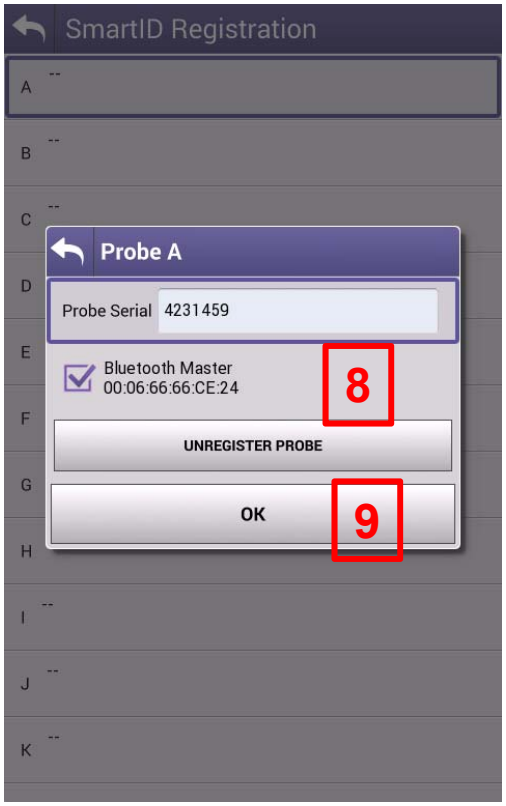
Registering the SmartID Plus

7. Power ON & connect the SmartID Plus to ONX via the USB cable

8. Select the letter on ONX display that corresponds to the label on the SmartID Plus. The serial number should be auto populated when SmartID is powered ON

9. Check the box for “Bluetooth Master” and press **OK**





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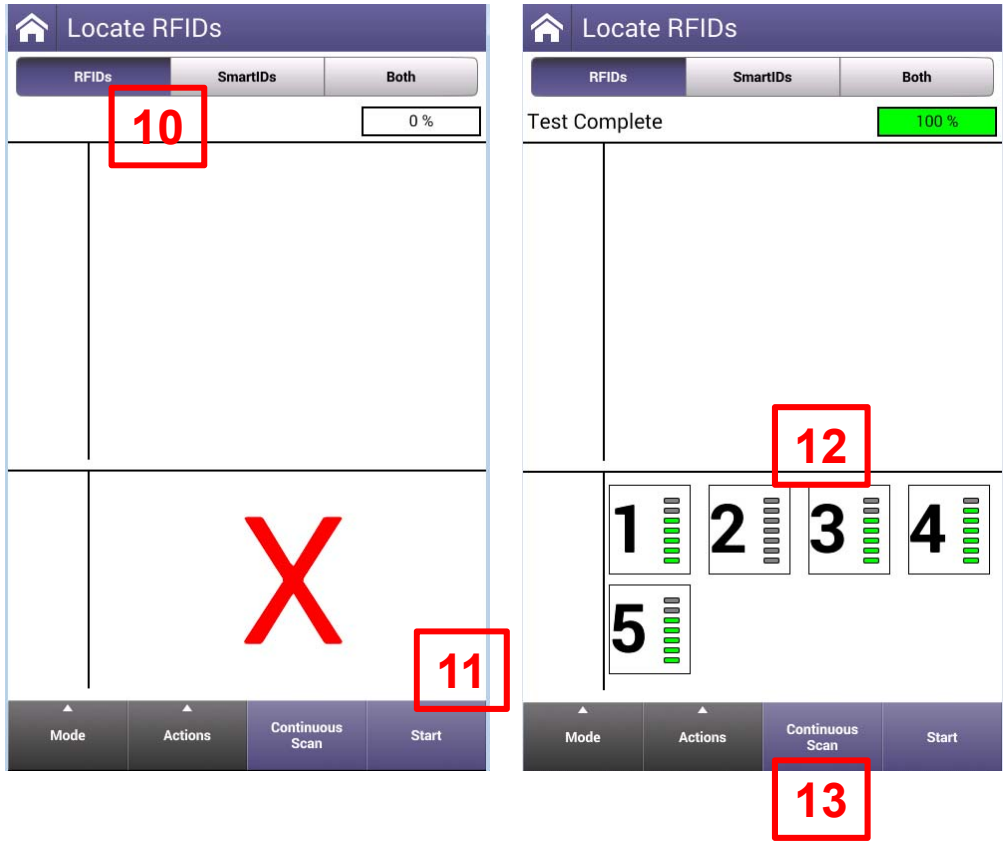
Using SmartID Plus with RFIDs (ActiveIDs)

10. Once the RFIDs and SmartID Plus are properly connected to the coax network, Select the RFIDs tab

11. Press Start and the ONX will connect to the SmartID Plus and begin locating any connected RFIDs

12. Discovered RFIDs will be displayed

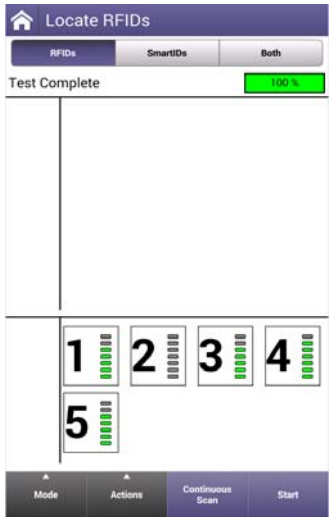
13. Press the Continuous Scan button for make the SmartID Plus continuously scan for RFIDs

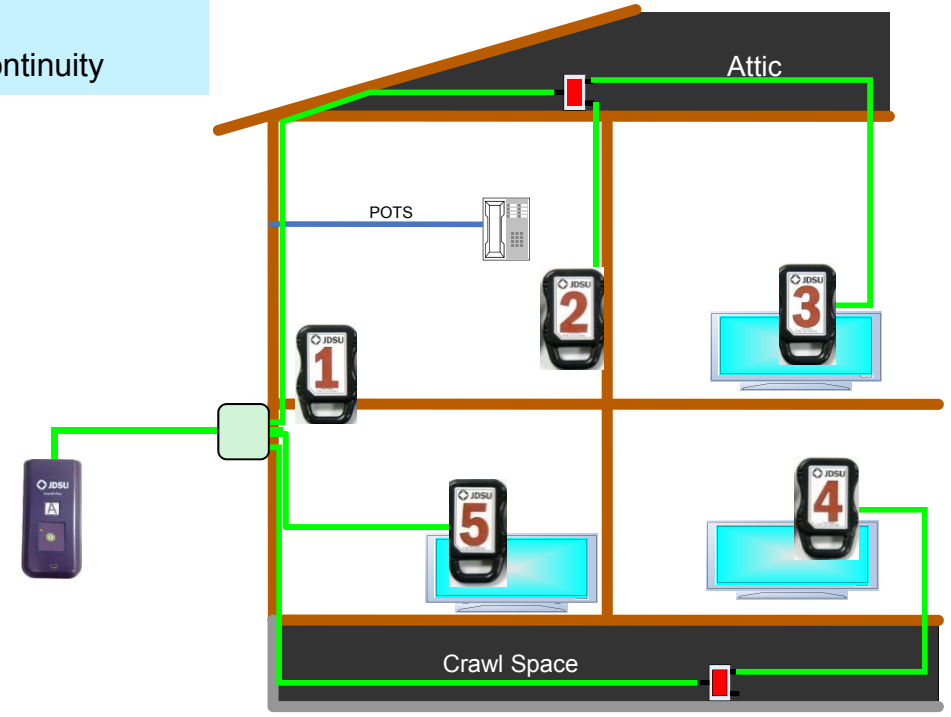


Locate RFIDs example

The VIAVI Advantage

- Easy to use cable ID screen
- Works through splitters
- Quickly identify coax continuity

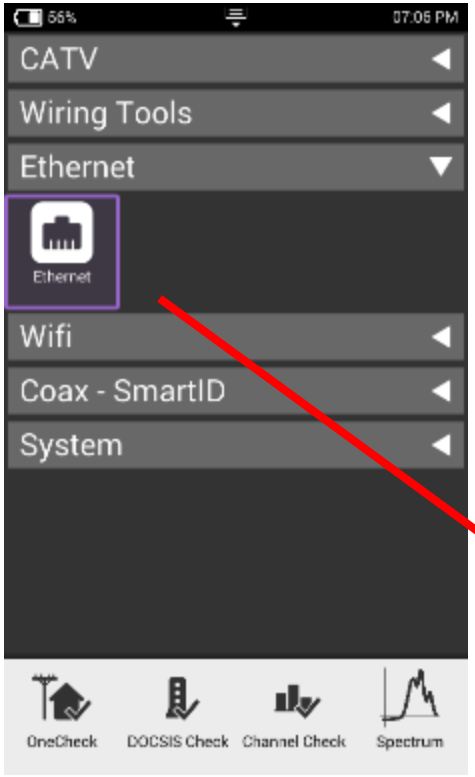


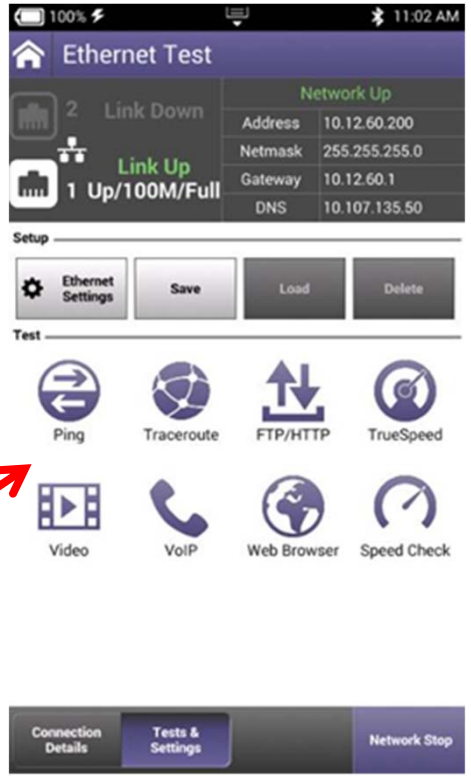


- ✓ 189 – ETHERNET Testing
  - Ethernet – Test & settings
  - TrueSpeed setup
  - Ookla Speedtest

Ethernet – Tests and Settings

- From Home Screen, select Ethernet
- Once Network Up is indicated with green, select Test and Settings





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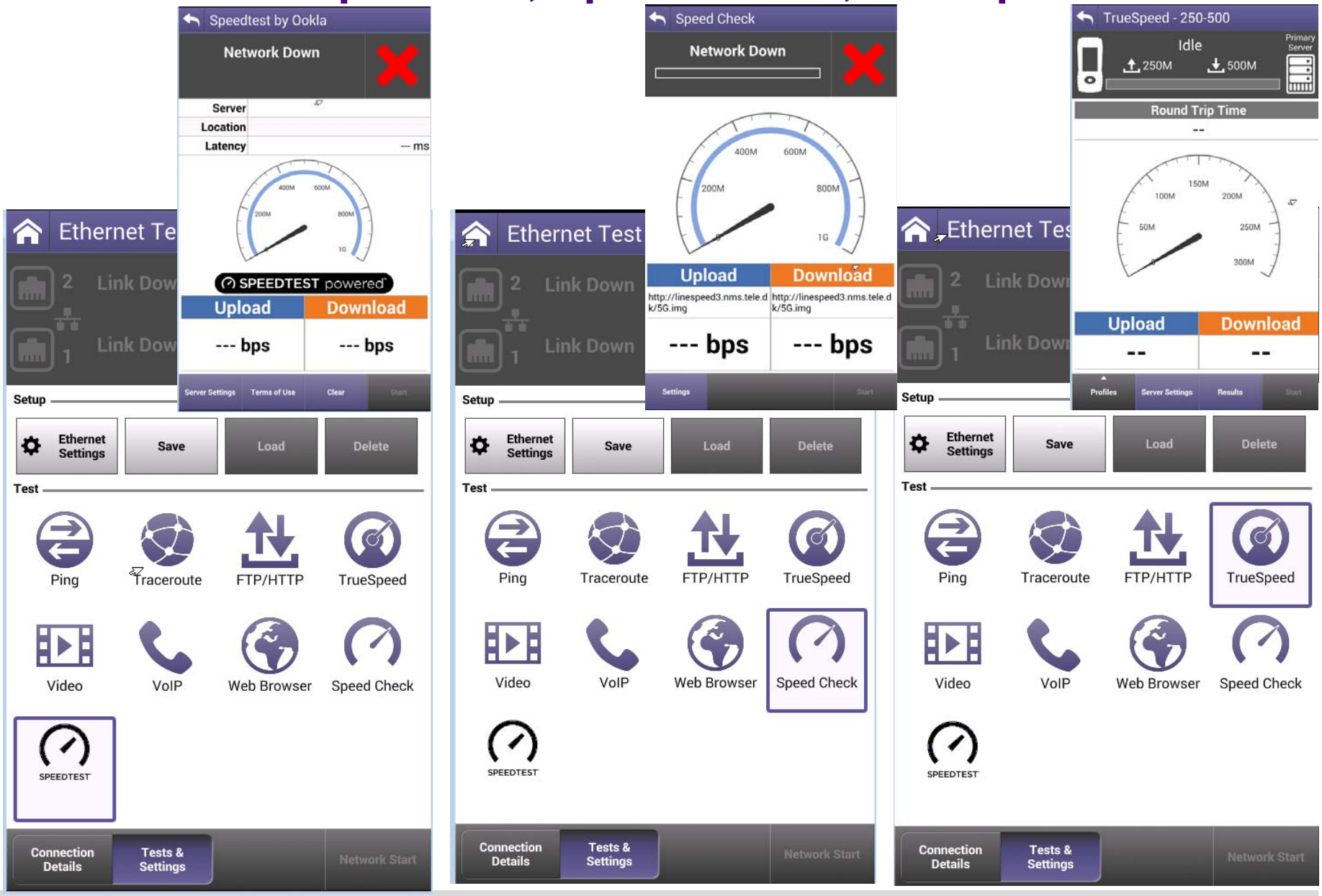
Ethernet Test: Speedtest, Speed Check, TrueSpeed



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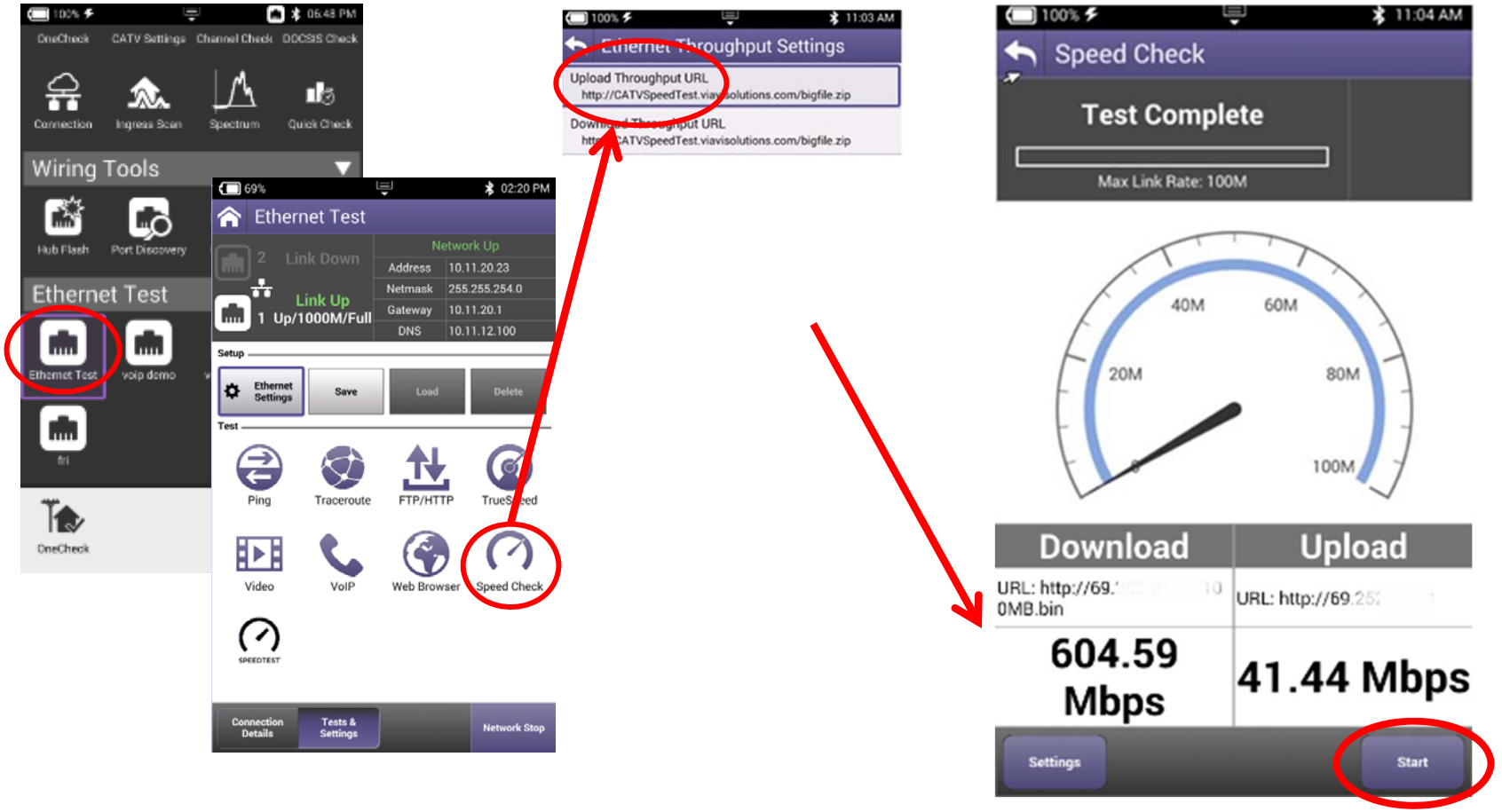
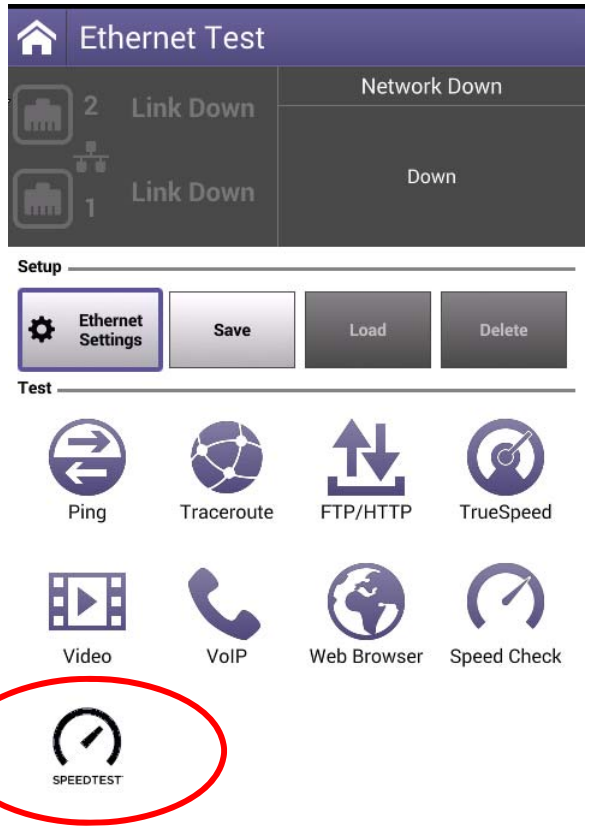
Ethernet – Speed Check

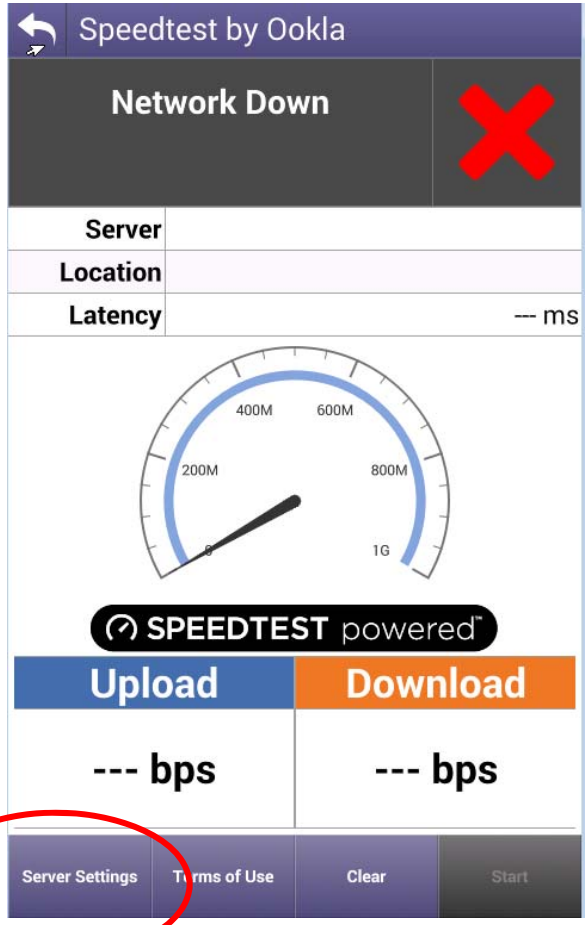


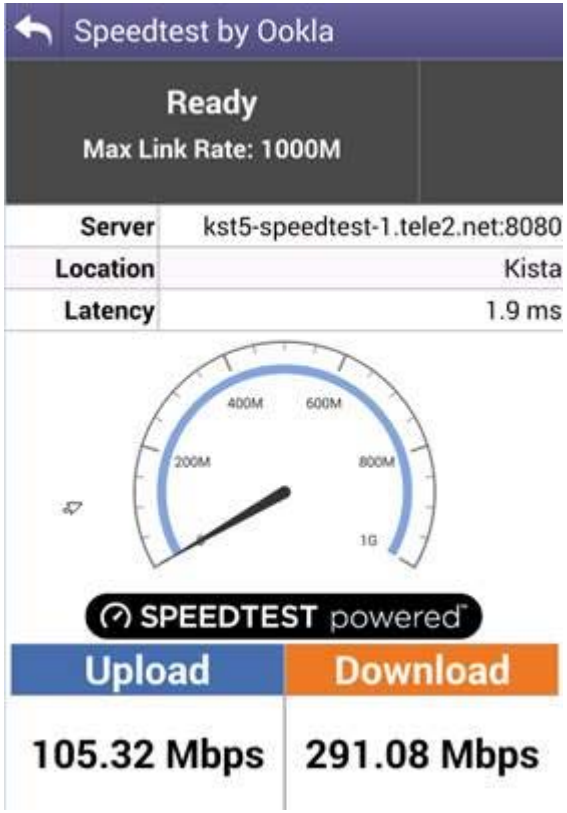
- CATV Ethernet's throughput IP Address/URL is configured in the mode under Settings.
- Default value are for booth Downstream/Upstream the same: http://CATVSpeedTest.viavisolutions.com/bigfile.zip
- If the upstream url change, the file name need to be the same: bigfile.zip

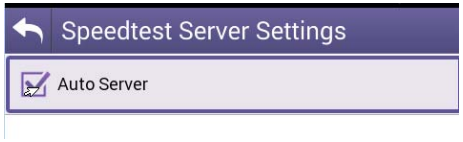
Download	Upload
URL: http://CATVSpeedTest.viavisolutions.com/bigfile.zip	URL: http://CATVSpeedTest.viavisolutions.com/bigfile.zip
4.87 Mbps	648.84 kbps

Ethernet Test: Ookla Speedtest









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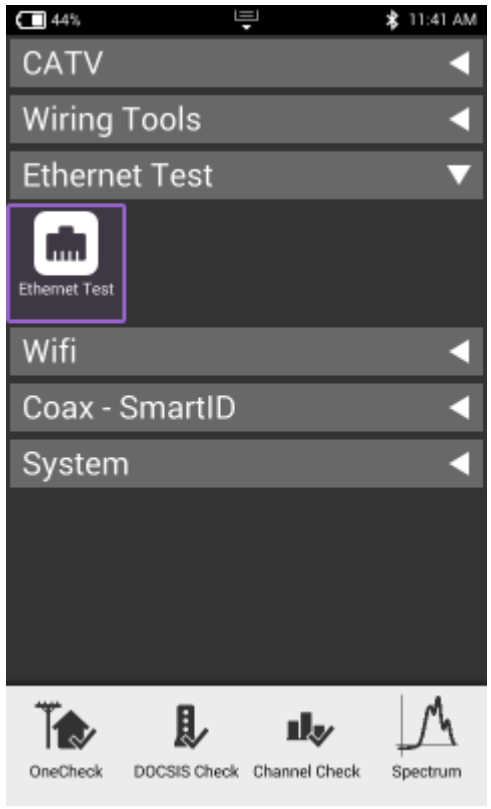
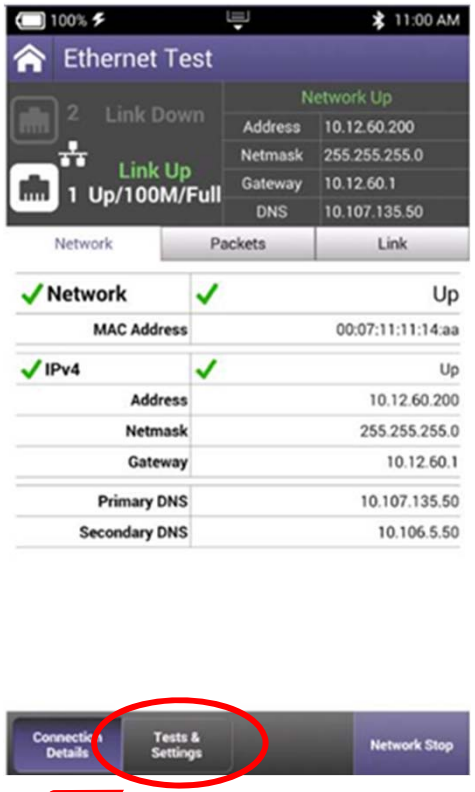
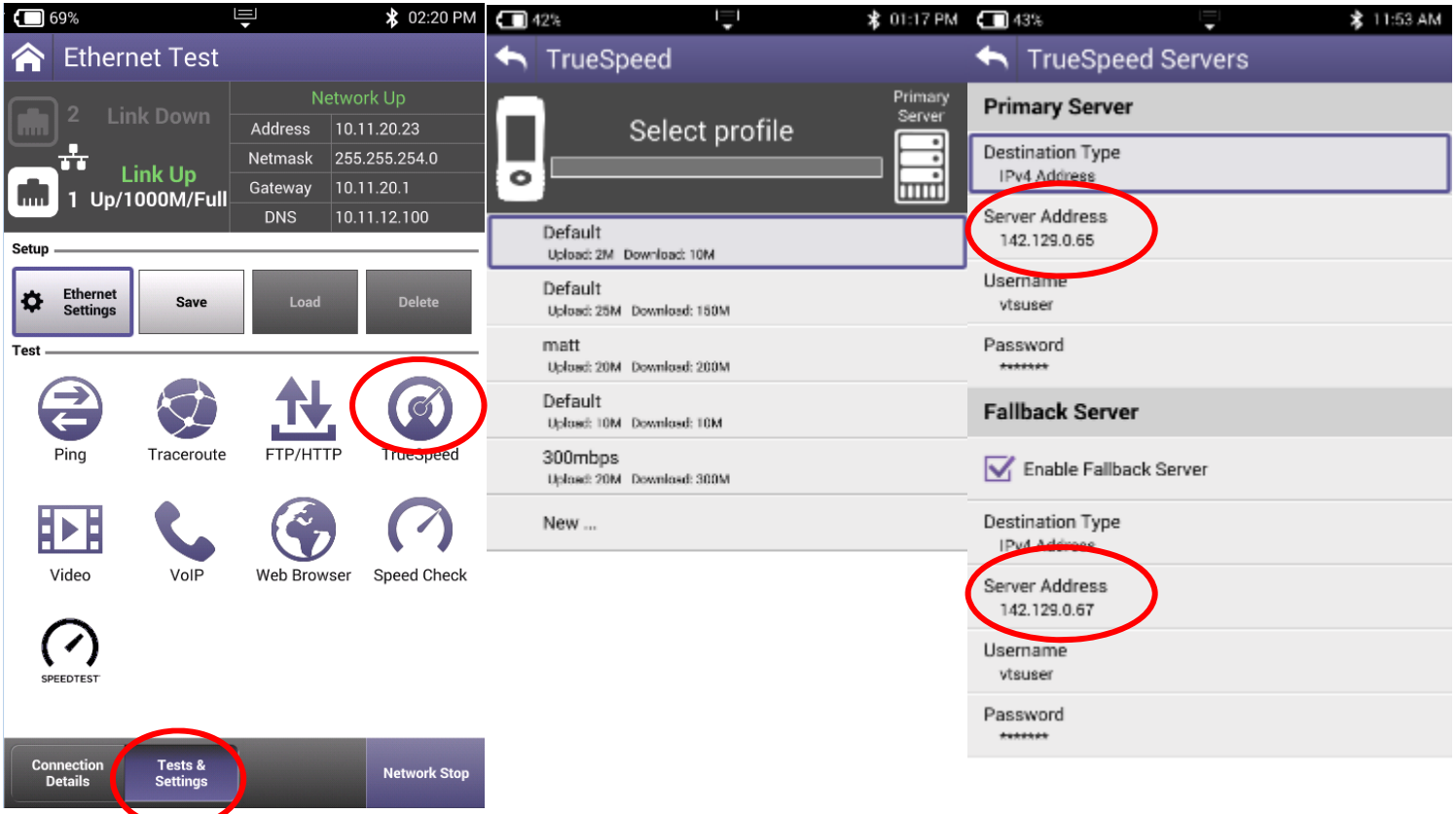
TrueSpeed Setup

- TrueSpeed can be found under Tests and Settings and REQUIRES TrueSpeed VNF Server IP Address





TrueSpeed Setup



- Select Profile or create a new one
- The test will start automatically after Profile is selected.
- Stop Test and choose Server Settings on the bottom and enter the Server IP address and then resume. (Only applicable for first test setup)
- Fallback Server is for second TrueSpeed VNF and can help alleviate queue

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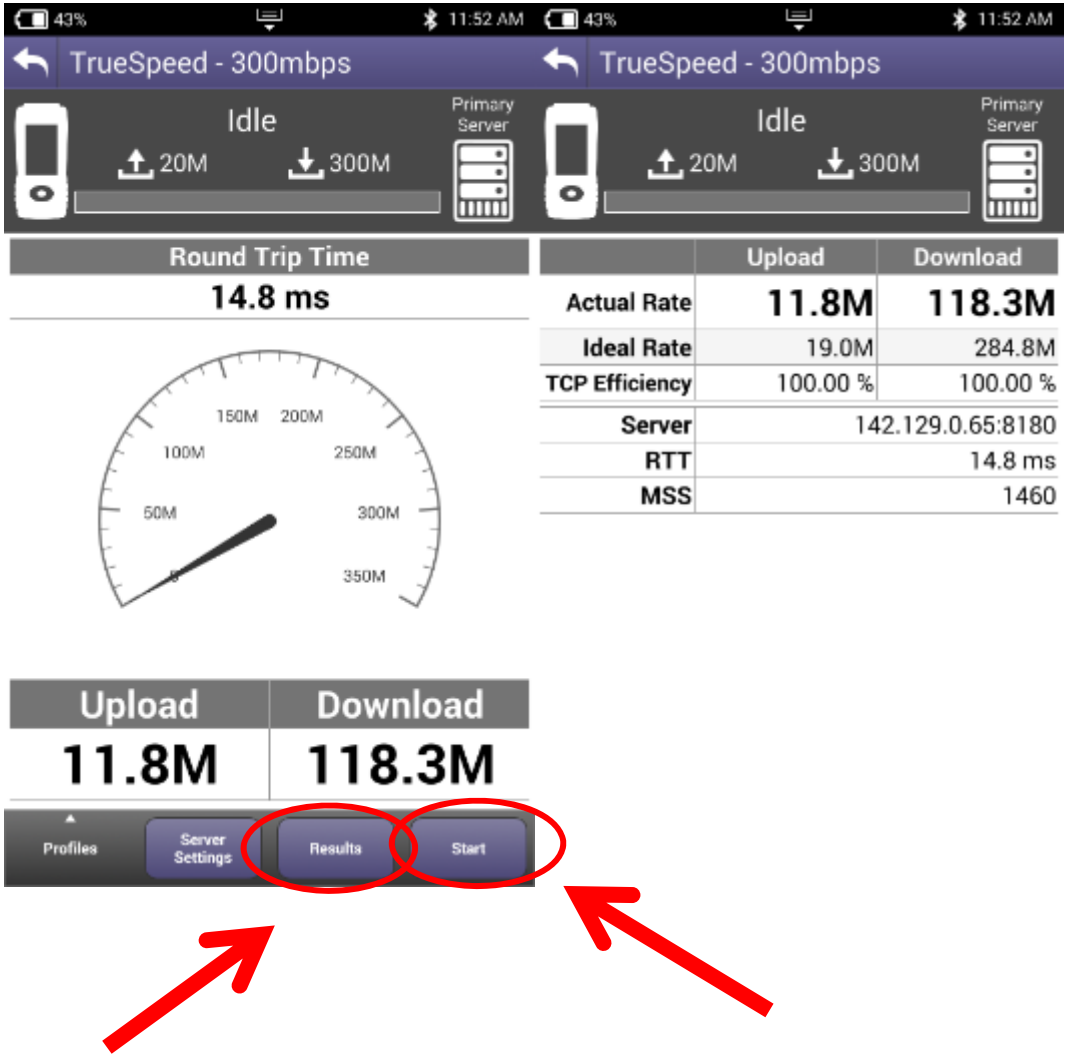
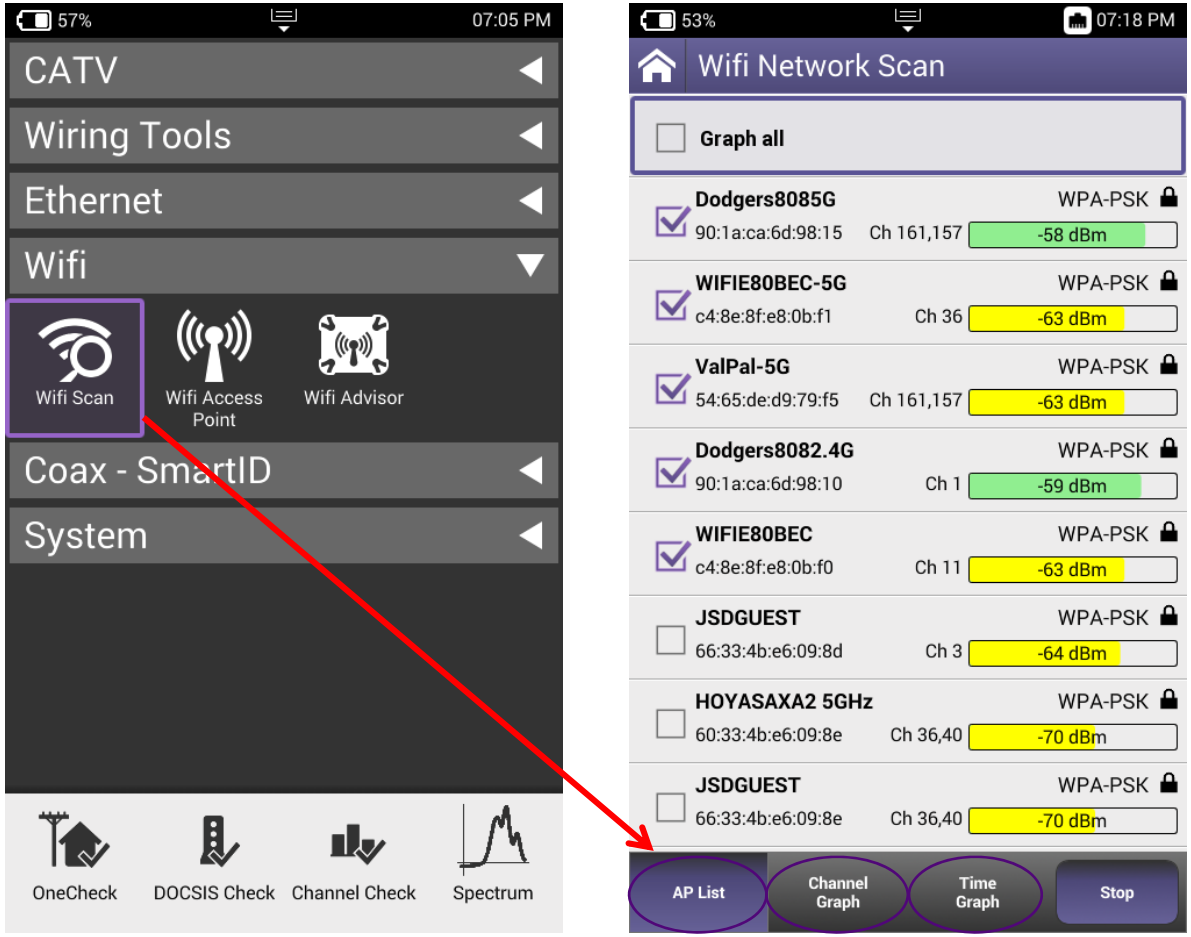
TrueSpeed Results

- After test completes, Results are displayed as either the Speedometer or an a simple list



- ✓ 197 – WIFI Testing
  - WiFi scan
  - ONX as Access Point
  - Testing with WiFi advisor

WiFi Setup



WiFi Network Scan

- Navigate the Results Screen (shown below) using touchscreen or Directional Buttons
- Choose bottom buttons to see AP List, Channel Graph, or Time Graph
- When using the AP List screen, select APs to graph, or choose Graph All

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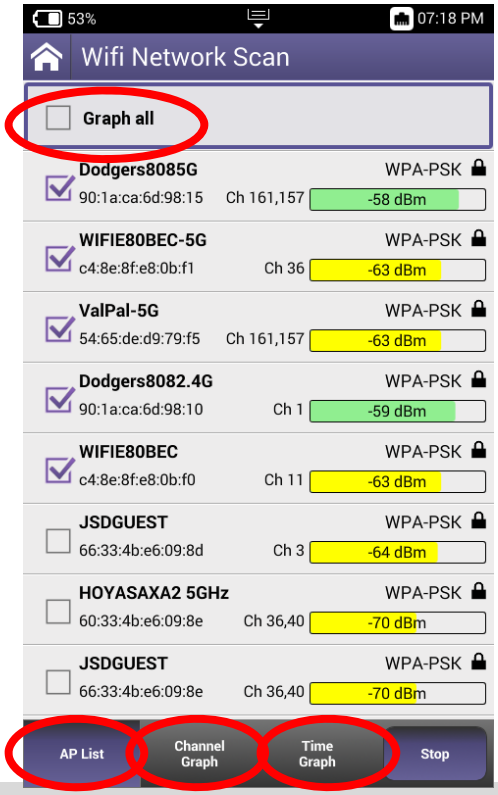
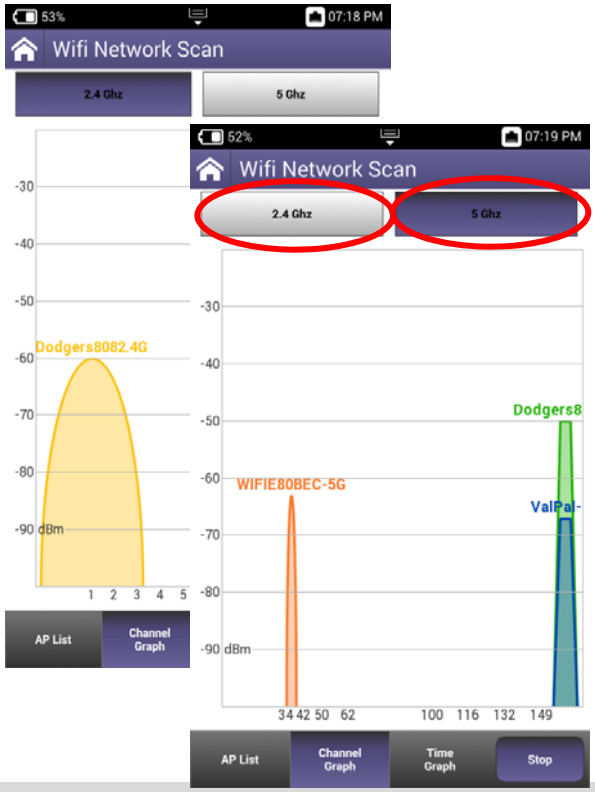
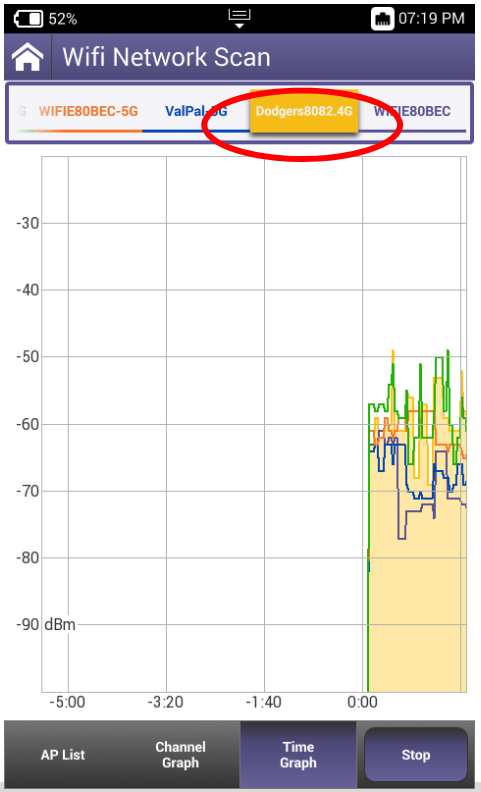
WiFi Results

WiFi Network Scan

- Navigate the Results Screen (shown below) using touchscreen or Directional Buttons
- Choose bottom buttons to see AP List, Channel Graph, or Time Graph
- When using the AP List screen, select APs to graph, or choose Graph All
- Channel Graph allows 2.4Ghz or 5Ghz views
- Time Graph tracks received signal (signal level) over time with ability to select specific AP or view multiple







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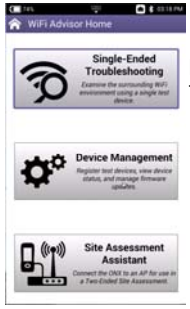
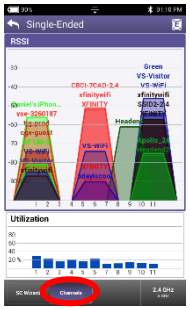
WiFi Advisor Smart Channel Wizard

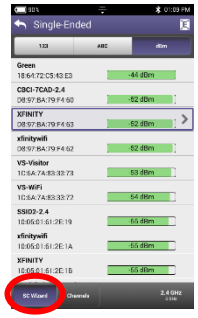
Simplified user interface for easier home WiFi network optimization and troubleshooting



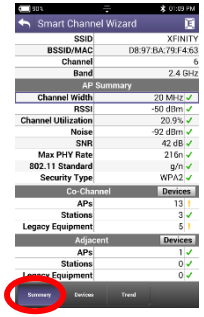
Part of Single Ended Testing



Traditional channel view

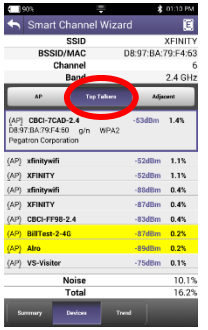


Or SC Wizard view by AP (Access Point)

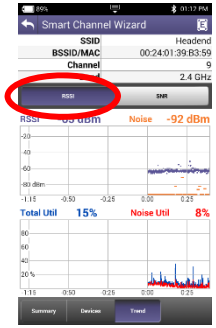


Drill into an AP Summary View

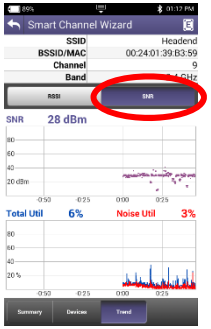
Drill into an AP View



Drill into an AP Top Talker View



RSSI Trending



SNR Trending

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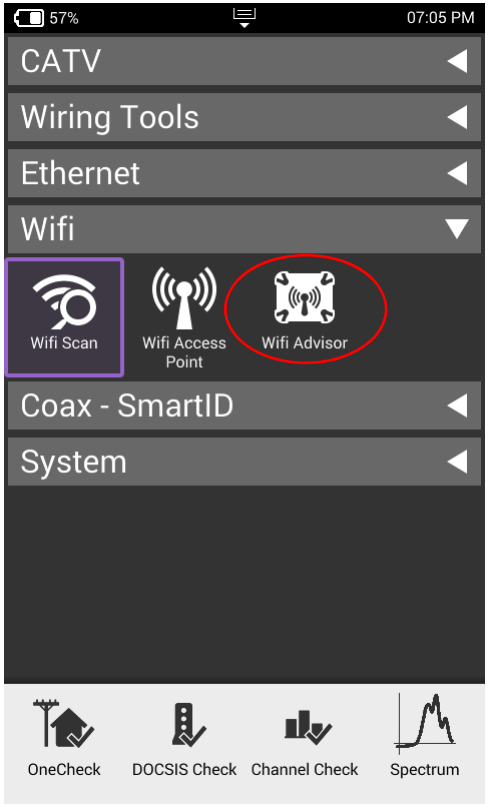
WiFi Advisor on the OneExpert CATV

- OneExpert CATV is interoperable with the **Viavi WiFi Advisor** companion probe
- iPad or Android Tablet is optional, but allows use of the Two-Ended Site Assessment Feature



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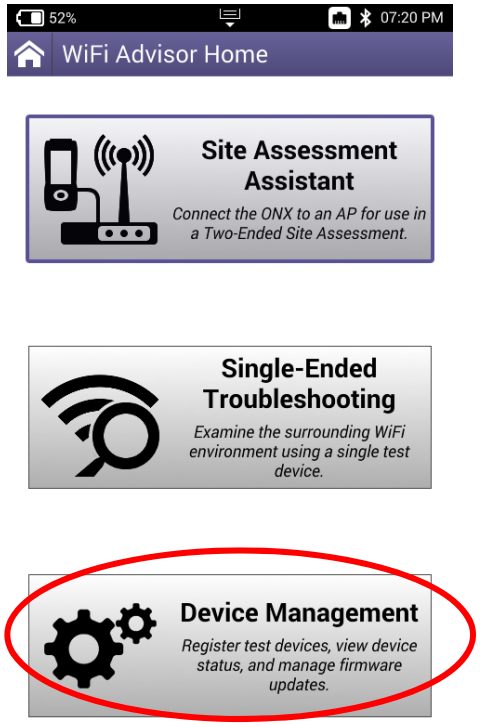
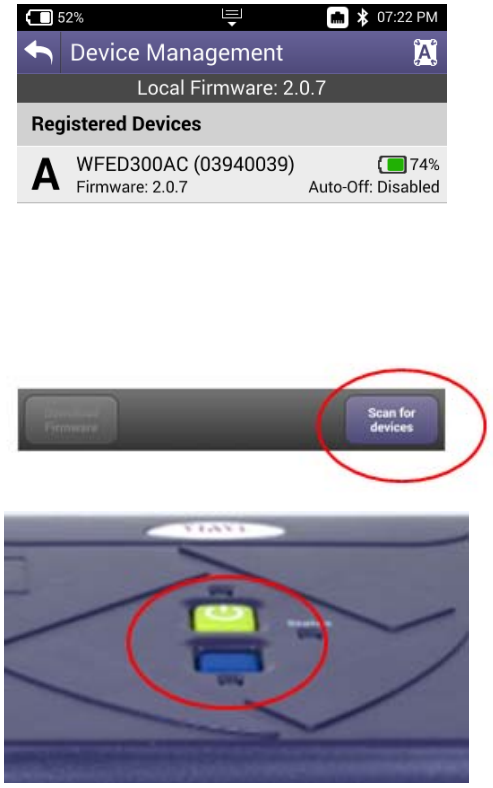
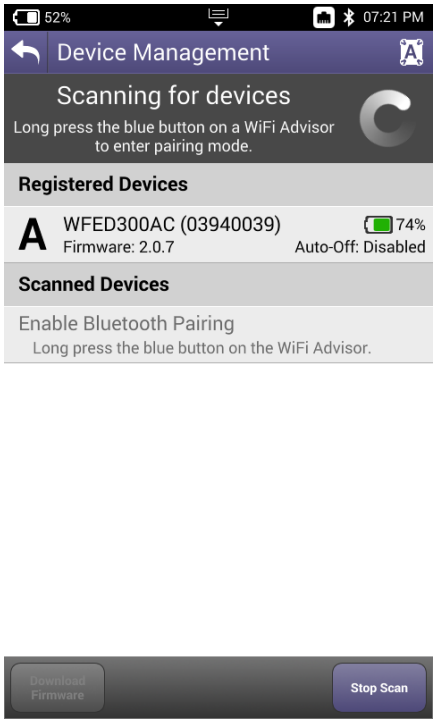
WiFi Advisor Setup – Bluetooth Pairing



Select **Device Management** to add WiFi Advisor Units



Scan for Devices while simultaneously holding the Blur button down and placing WiFi Advisor unit into pairing mode



After WiFi Advisor unit pairs, and it prompts user for label, it is displayed

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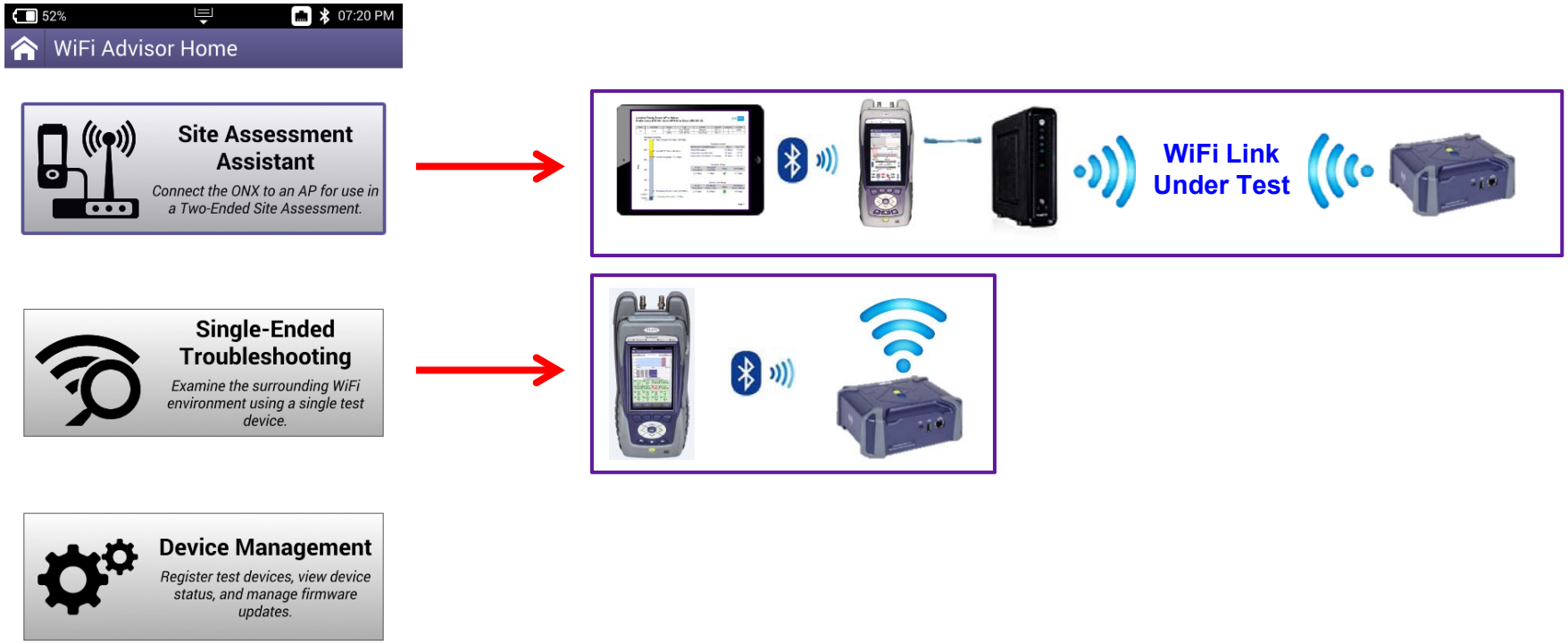
WiFi Advisor Setup – Test Options



NOTE: Site Assessment Assistant requires use of iPad or Android tablet and is not covered in this document

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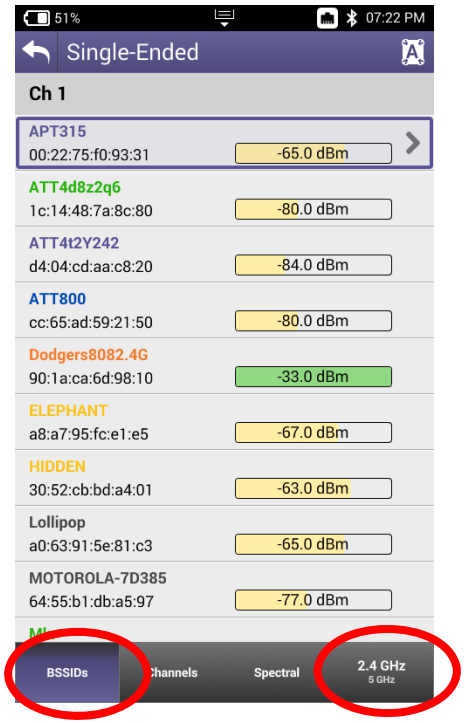
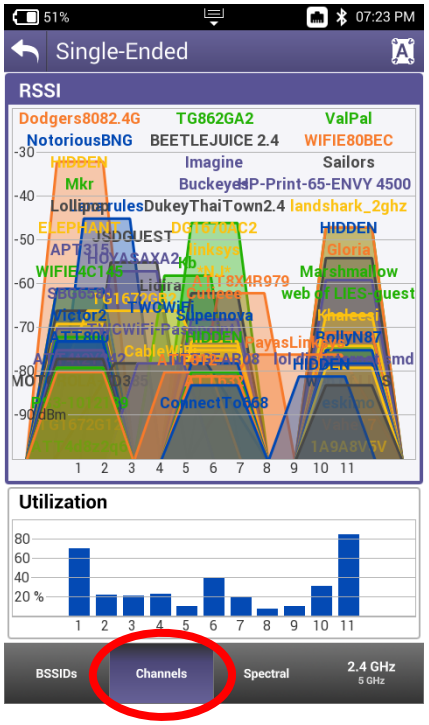
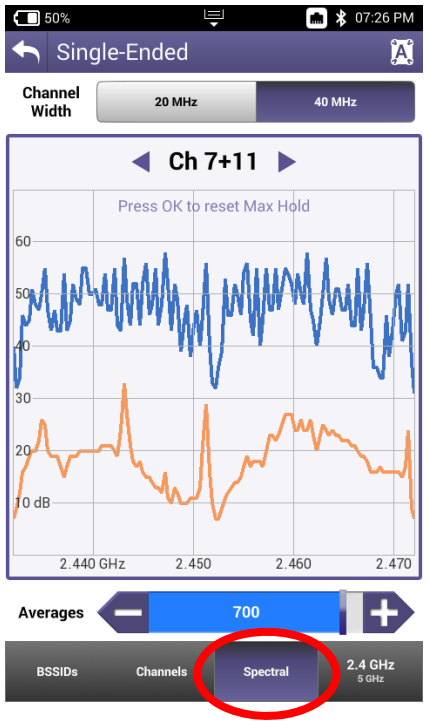
WiFi Advisor Results

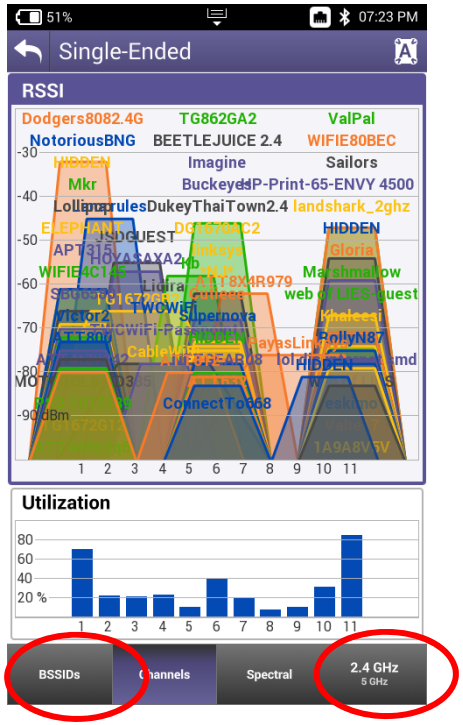


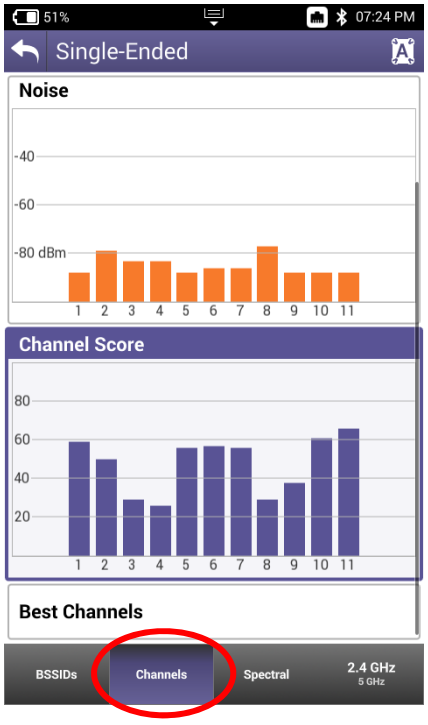


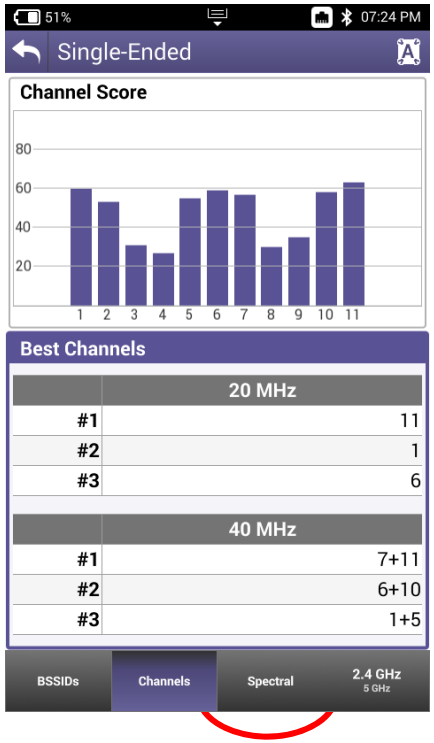


BSSID View shows list of Aps, choosing one shows

WiFi Advisor Results







Scrolling down shows more info; **Noise**, **Channel Score**, **Best Channels**

WiFi Advisor Results

Spectral Button can be toggled to include 2.4G and 5G spectrum, as well as 20/40/80 Channel width

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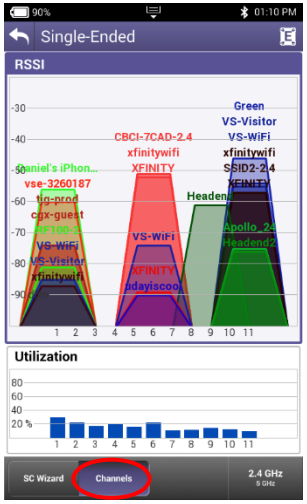
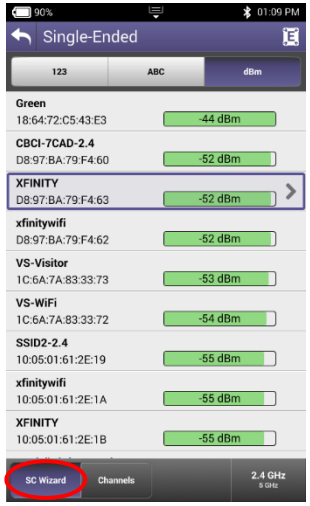
WiFi Advisor Smart Channel Wizard

For easier home WiFi network optimization and troubleshooting

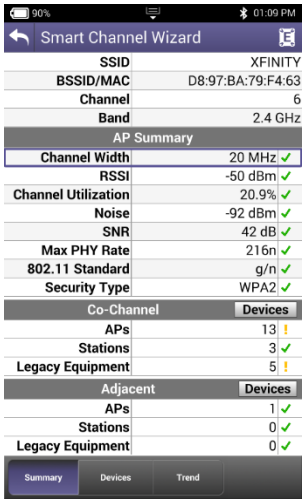
Part of Single Ended Testing



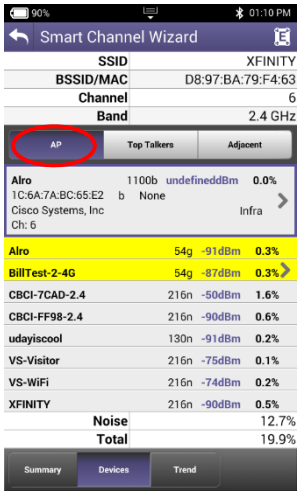
Traditional channel view



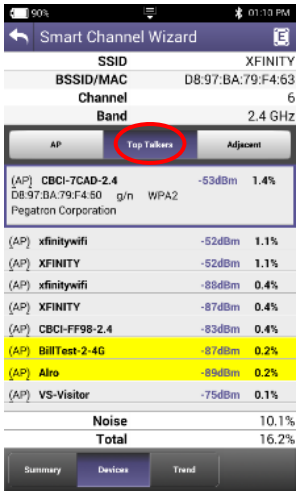
Or SC Wizard view by AP (Access Point)



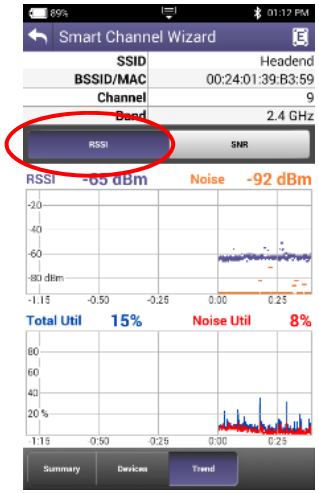
Drill into an AP: Summary View



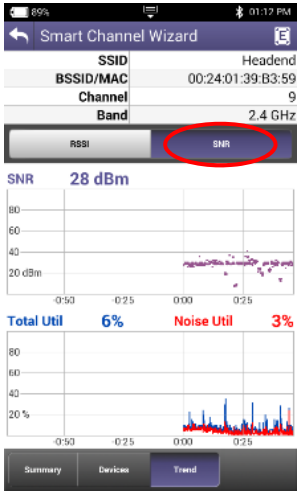
Drill into an AP View



Drill into an AP - Top Talker View



RSSI Trending



SNR Trending

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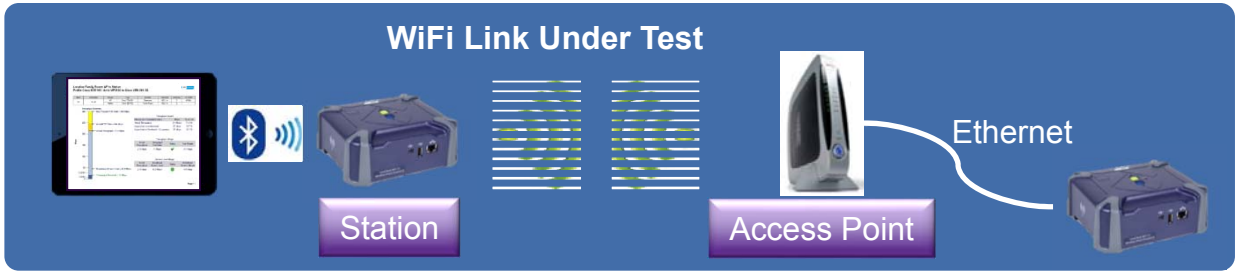
WiFi Advisor Use Models and ONX Integration

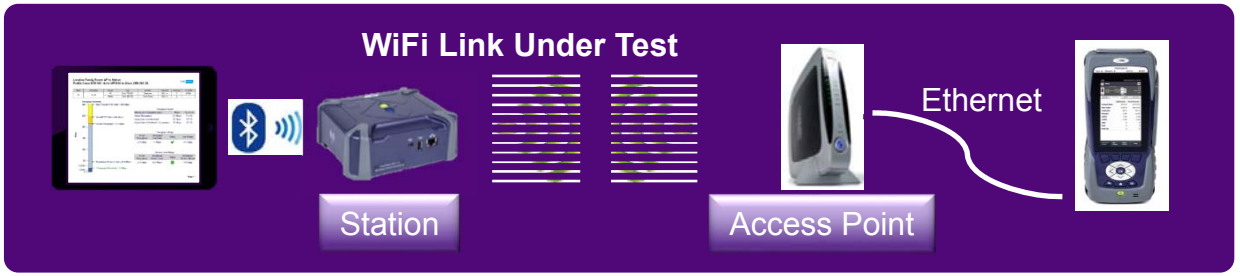
Single Ended Operation

- Troubleshoot common WiFi problems quickly
- SmartChannel Wizard gives WiFi optimization guidance to novice users

Dual Ended Operation

- Whole-Home Performance Testing
- Optimizes AP placement
- Ensures resilient WiFi network installation
- Identifies sources of WiFi degradation
- Educates / sets proper end-user expectations on real WiFi performance





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Additional Features – WiFi Advisor Integration

Two ways to consolidate toolset:

- Control a **single WiFi Advisor** from ONX for BSSID, Spectral and Channel View testing. ONX hosts WiFi Advisor application eliminating need for separate tablet device to host WiFi Advisor Application and reports.
- Conduct **two-ended testing** with single WiFi Advisor, a tablet and OneExpert. Consolidate your tool set and eliminate need for two WFEDs.

OneExpert controls the Wifi Advisor for Single Ended Operation with Best Channel

OneExpert supports the Wifi Advisor Dual-ended mode of operation providing TrueMargin and allows optimization of the Access Point placement

WiFi Test	What It Tests	Why It Is Needed
BSSID details	View information for a specific AP	Determine whether an AP is running in legacy mode or with outdated security settings
BSSID view	View all APs by channel	See the WiFi environment across 2.4 GHz and 5 GHz bands to visually determine crowded channels
Channel view	Displays channel utilization, noise, channel score, and best channels	Quickly determine the best channel for WiFi deployment and troubleshooting
Spectral analyzer	Real time 802.11 and non-802.11 spectrum	Locate interference sources such as Bluetooth devices and microwave ovens
Site Assessment Assistant	Works with WiFi Advisor to determine throughput of a WiFi system	TrueMargin™ is the measure of throughput in the actual environment

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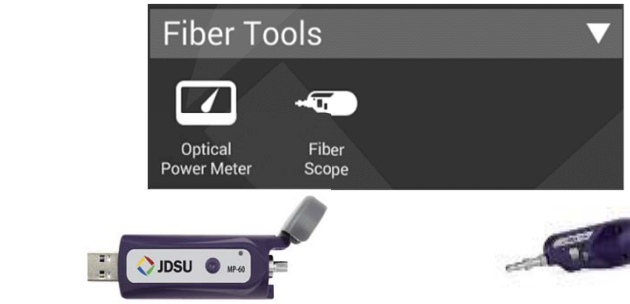
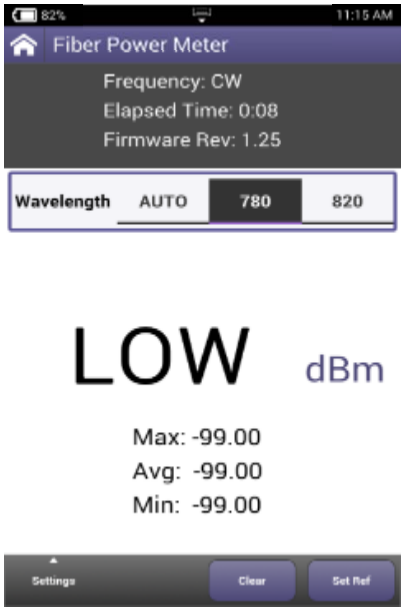
- ✓ 210 – FIBER Testing
  - P5000i Probe Microscope
  - MP60 , MP80 power meters

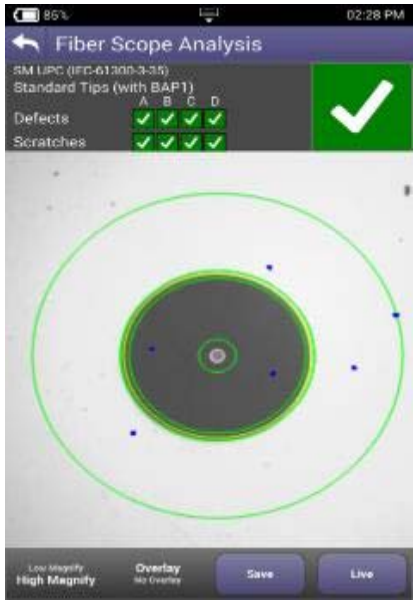
OneExpert CATV
Fiber Optic Testing made easier

Inspect before you connect

- **Fiber Inspection**
  - **P5000i** Automatic fiber scope support
    - Auto Centering
    - Automated testing
    - Simple pass/fail
- **Power Meter**
  - USB power meter support
  - **MP-60 & MP-80**







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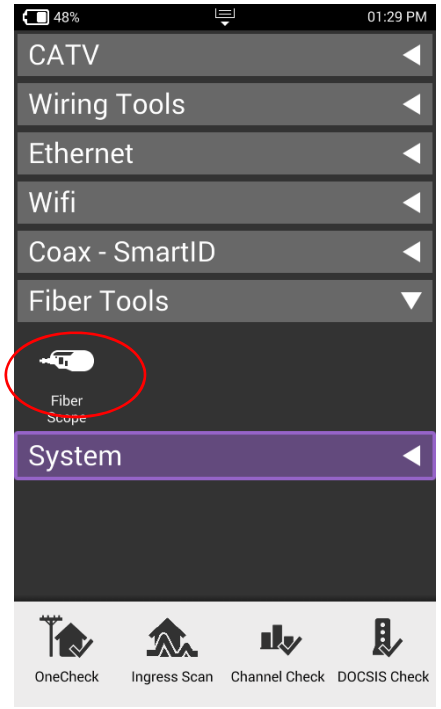
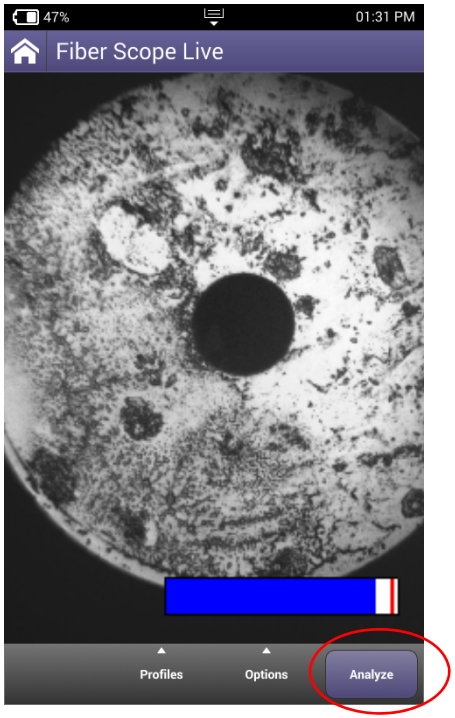
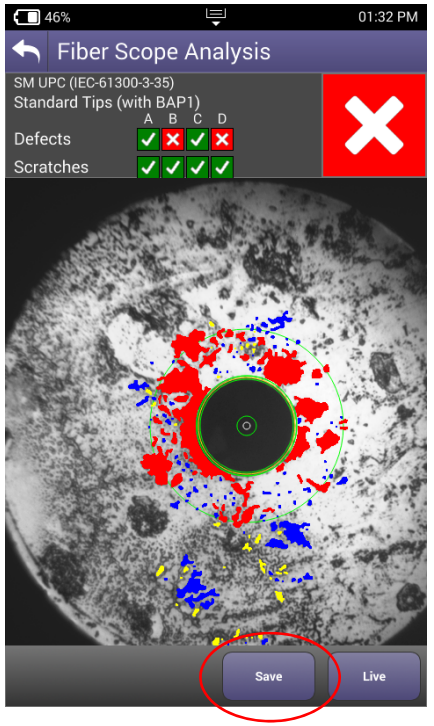
Optical Accessories – P5000i Probe Microscope







When **P5000i Probe Microscope** is attached to ONX through USB, Fiber Tools menu automatically appears

- After plugging in patch cord or inserted probe into bulkhead, fiber end face will appear and can be focused or auto centered using controls on P5000i.
- Autotest can be conducted and results saved from results screen

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✓ 213 – STRATASYNC Synchronization

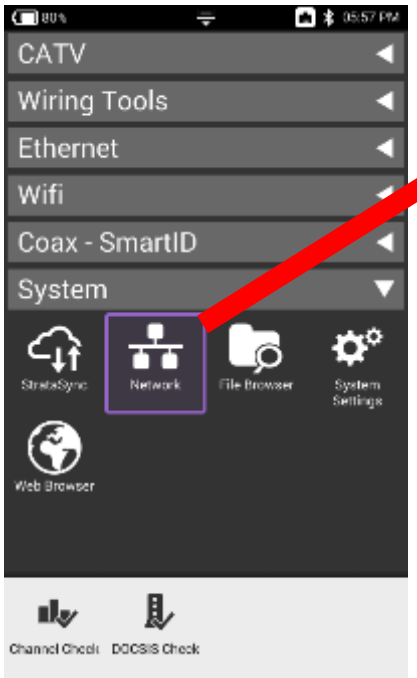
- StrataSync synchronization via
  Ethernet / WiFi / RF DOCSIS /Bluetooth (Mobile Tech App)
- SW Upgrade via USB or StrataSync
- Troubleshooting

StrataSync Synchronization

Note - You can synchronize to StrataSync via RF or WiFi, but this is ONLY for sending test files, receiving configuration information like limit plans, etc. - not for SW/FW upgrades

1) Connect an Ethernet cable from an active internet connection (Cable Modem or router/gateway) to Port 1 on the ONX

2) From the ONX home screen navigate to ***System Menu*** and select ***Network*** **-** Verify the ONX has a valid IP address*



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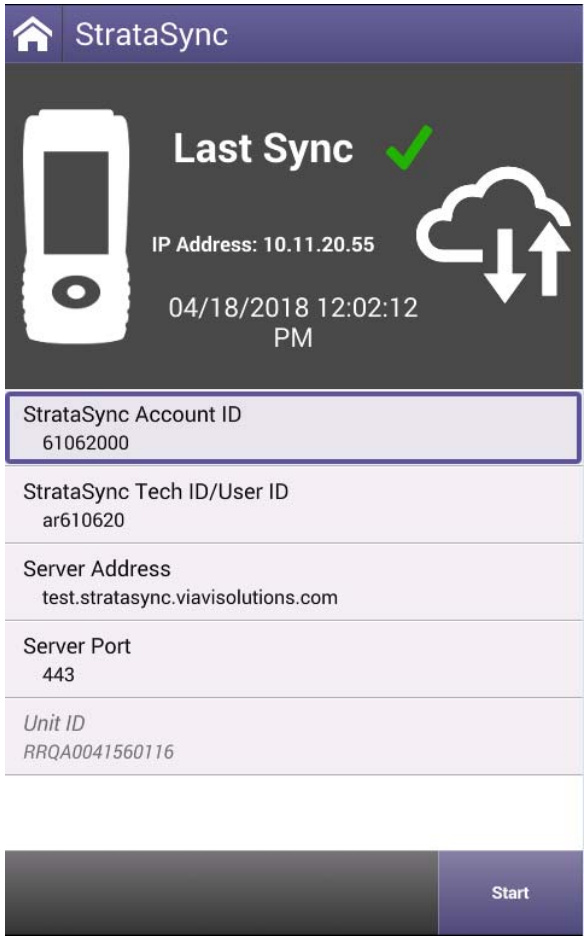
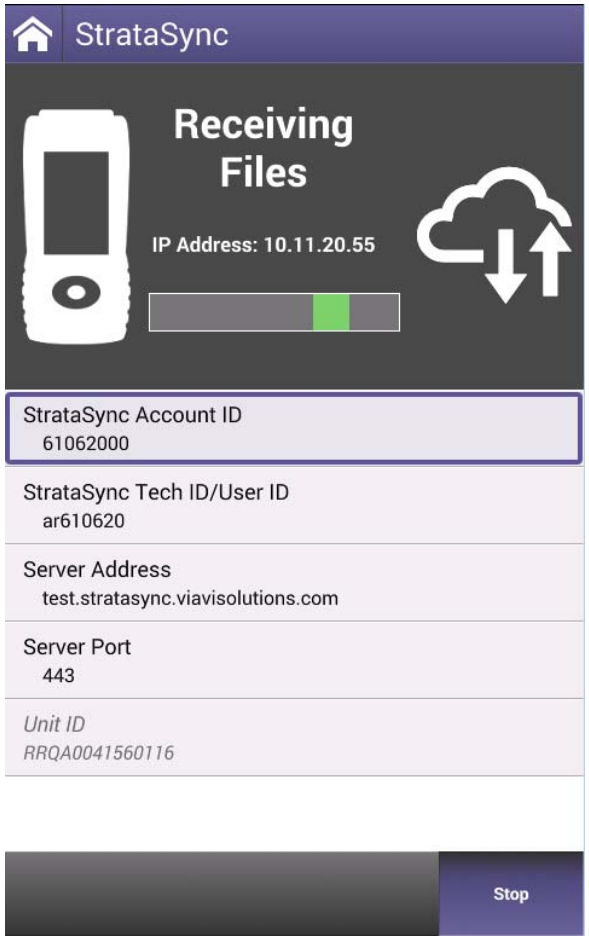
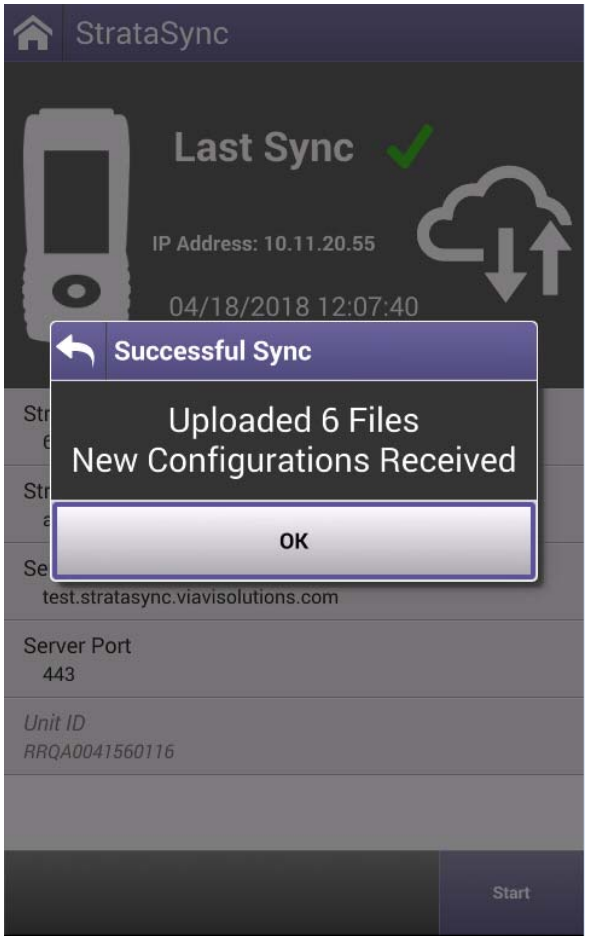
Successful Sync – New Configurations Notification

- New notification added when new, or updated, configurations are deployed to the ONX and successfully received
  - Notifies user of successful configuration deployment; will become active upon creation of new Work Order ID

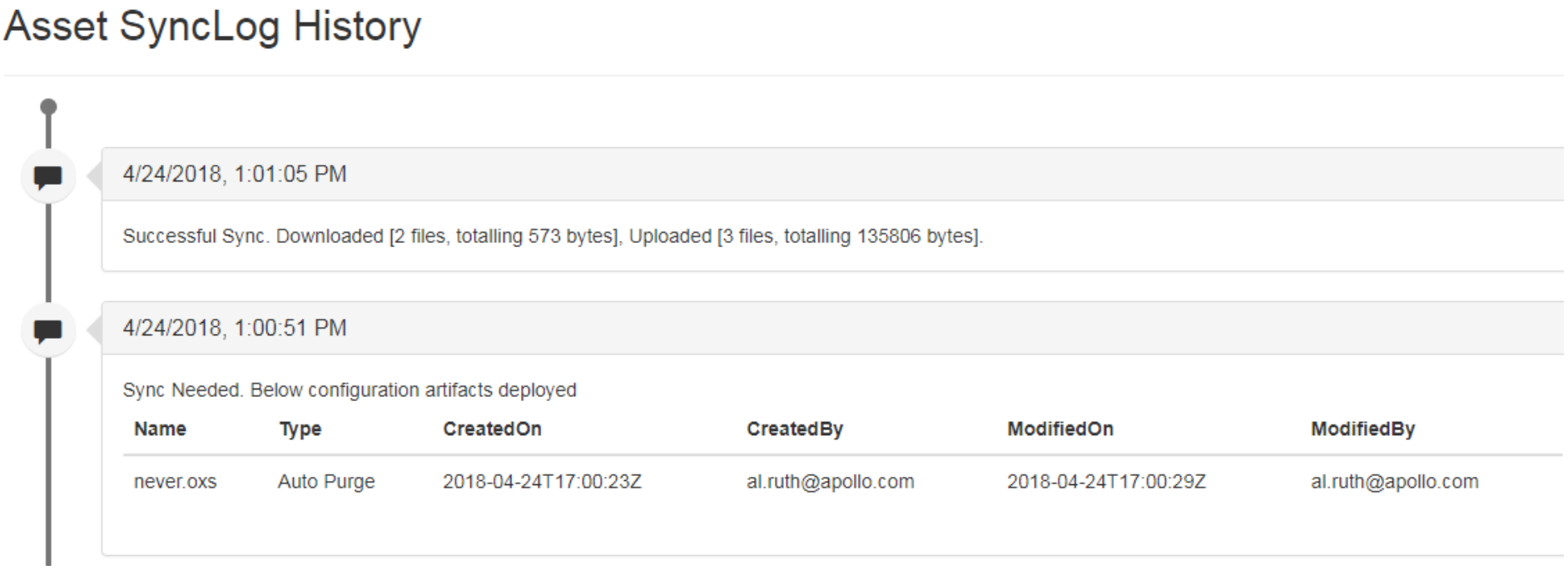






Successful Sync – New Configurations Notification StrataSync Sync Log

- ONX Sync Log on StrataSync lists the new configurations which have been deployed and successfully synced to the ONX
- Allows StrataSync Admins to know the configuration was deployed to the ONX



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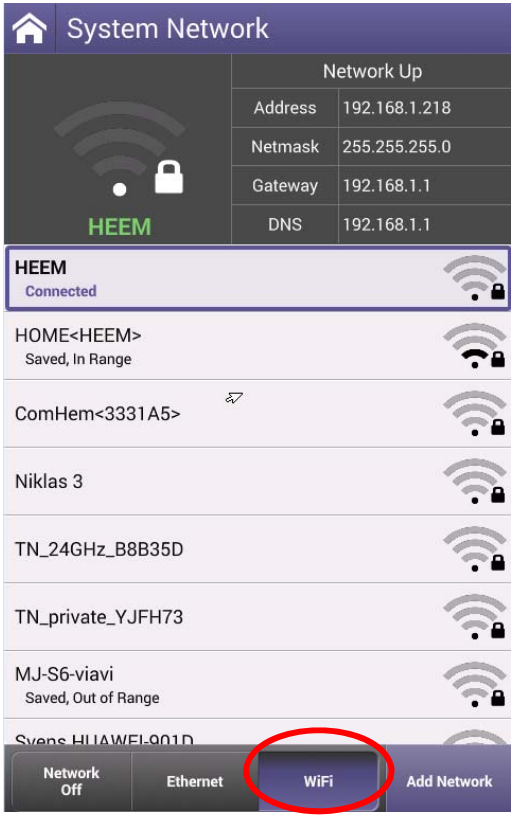
StrataSync Synchronization via WiFi

NOTE: **Sync via WiFi** is now supported. Use Network Settings app to configure and join a WiFi network prior to performing sync. You can synchronize to StrataSync via WiFi, but this is ONLY for sending test files, receiving configuration information like limit plans, etc.

❶ Connect with WiFi from an active internet connection (Cable Modem or router/gateway)

❷ From the ONX home screen navigate to **System Network / WiFi-** Verify the ONX has a valid IP address



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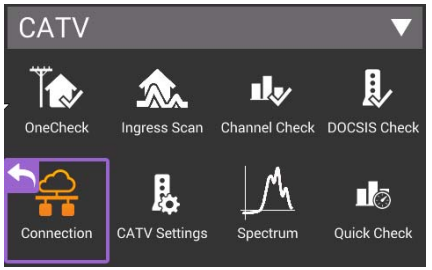
StrataSync Synchronization via RF - DOCSIS

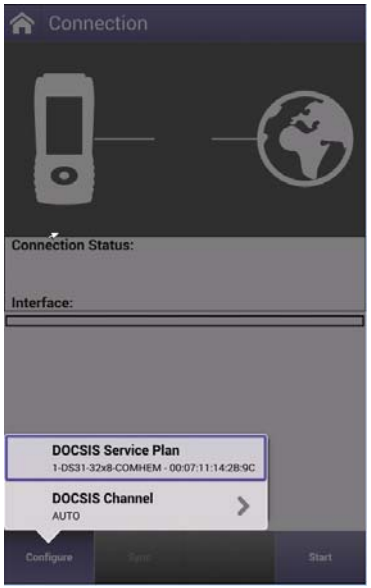
NOTE: You can synchronize to StrataSync via RF or WiFi, but this is ONLY for sending test files, receiving configuration information like limit plans, etc. - **not for SW/FW upgrades**

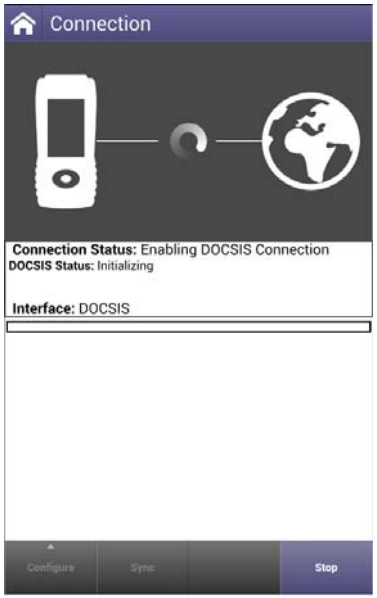
❶ Connect RF cable from an active network connection to RF Port 1 on the ONX

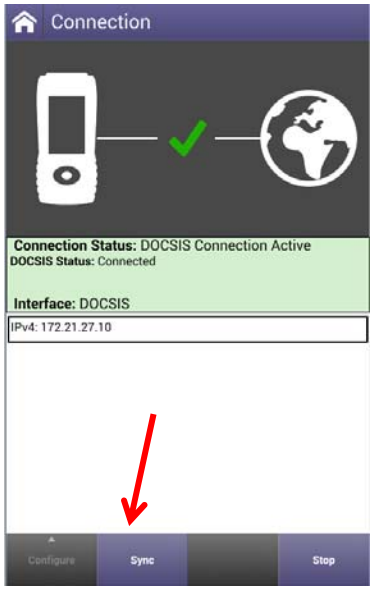
❷ From the CATV menu , navigate to **Connection** and select interface **DOCSIS** – ONX will launch DOCSIS registration process in order to get a valid IP address*.
Once IP address is assigned, , use the **Sync** button to launch directly StrataSync

At the end of process, navigate to **Connection** and **Stop** the network interface.









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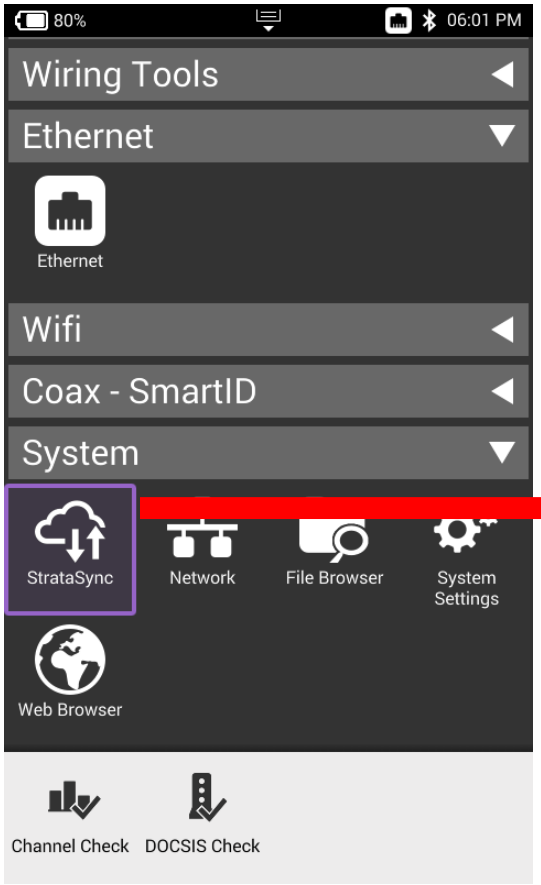
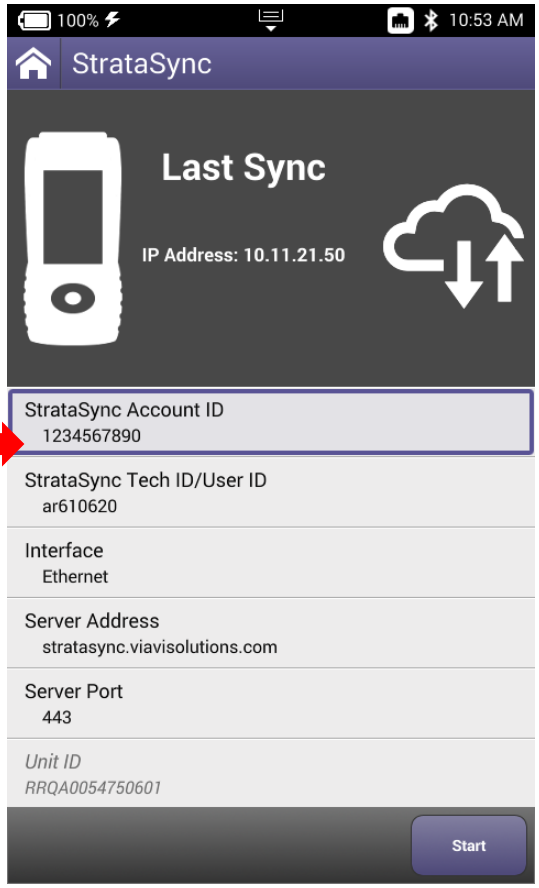
StrataSync Synchronization

❸ Back to the ONX Home Screen – navigate to the ***System*** Menu and select ***StrataSync***



❹ ***StrataSync Account ID*** = xxxxxxxxx
Interface* = Ethernet
Server Address = stratasync.viavisolutions.com
(*stratasync.jdsu.com* also works)
Server Port = 443



*If the "Interface" is set to DOCSIS the firmware update will be skipped with no other warning.

Also this "Interface" selection does not determine if the StrataSync communication is performed over the Ethernet or RF/DOCSIS. To Sync via RF Port 1 please use the "Connection" app in the CATV section at the top of the Home screen to establish a live connection with the CMTS prior to syncing to StataSync.

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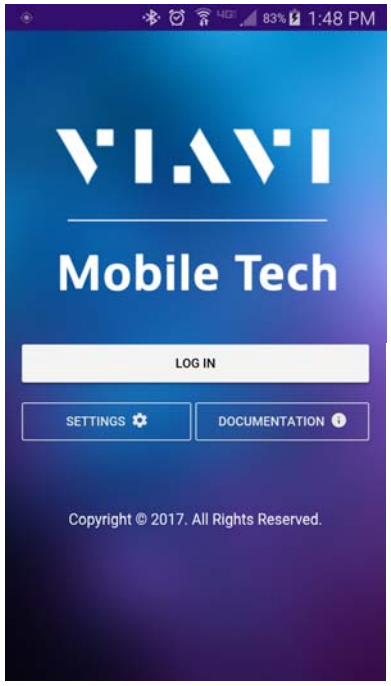
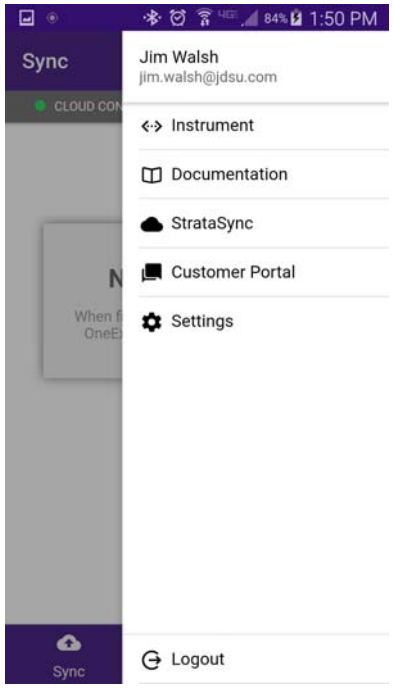
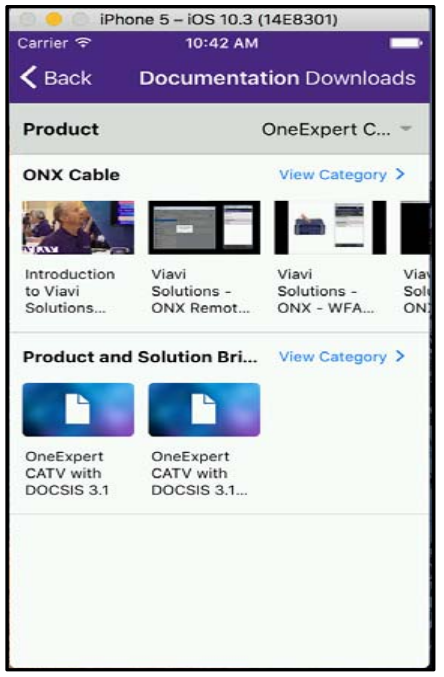
Mobile Tech - How It Works

- **Mobile Tech** License based on # of ONX's - Ensure ONX has ONX-CATV-SW-MOBILE Option and ONX-BLUETOOTH SW OPTION (Most 620/630 packages include this)
- Download free App from iTunes/Google Play Store to mobile device(s)
- Verify Bluetooth pairing to ONX and mobile cellular/wifi connectivity







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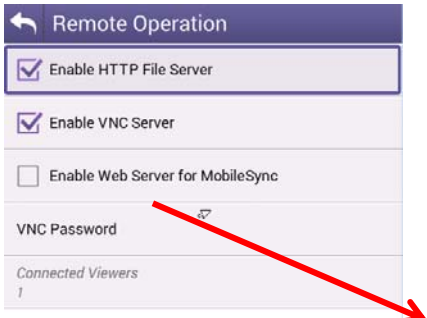
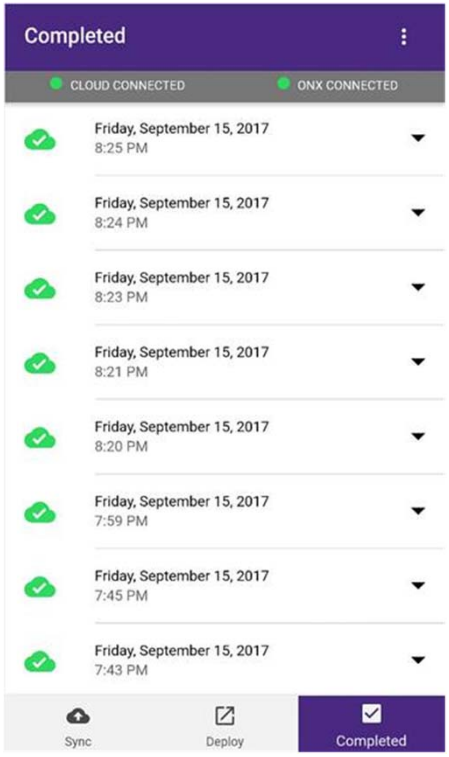
StrataSync Synchronization via Bluetooth & MobileSync App

- The OneExpert CATV support interoperability Via MobileSync app
- Need to **Enable Web Server for MobileSync**



MobileSync App



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ONX Software / Firmware Upgrades

- Software (SW) and Firmware (FW) releases are the best way to ensure your VIAVI OneExpert ONX is functioning at its best.
- VIAVI delivers SW and FW easily via **Ethernet StrataSync** and **USB Stick**
- All ONX units should be upgraded to the latest production software release – available through StrataSync
- New SW Version offer substantial operational improvements and enhancements over earlier software releases including the version that shipped with the units initially.
- The software will be deployed to the units by the StrataSync Administrator, but each unit needs to be configured to connect with StrataSync.
- Follow these steps to ensure your meter is configured correctly and you can connect to StrataSync to receive the latest updates.

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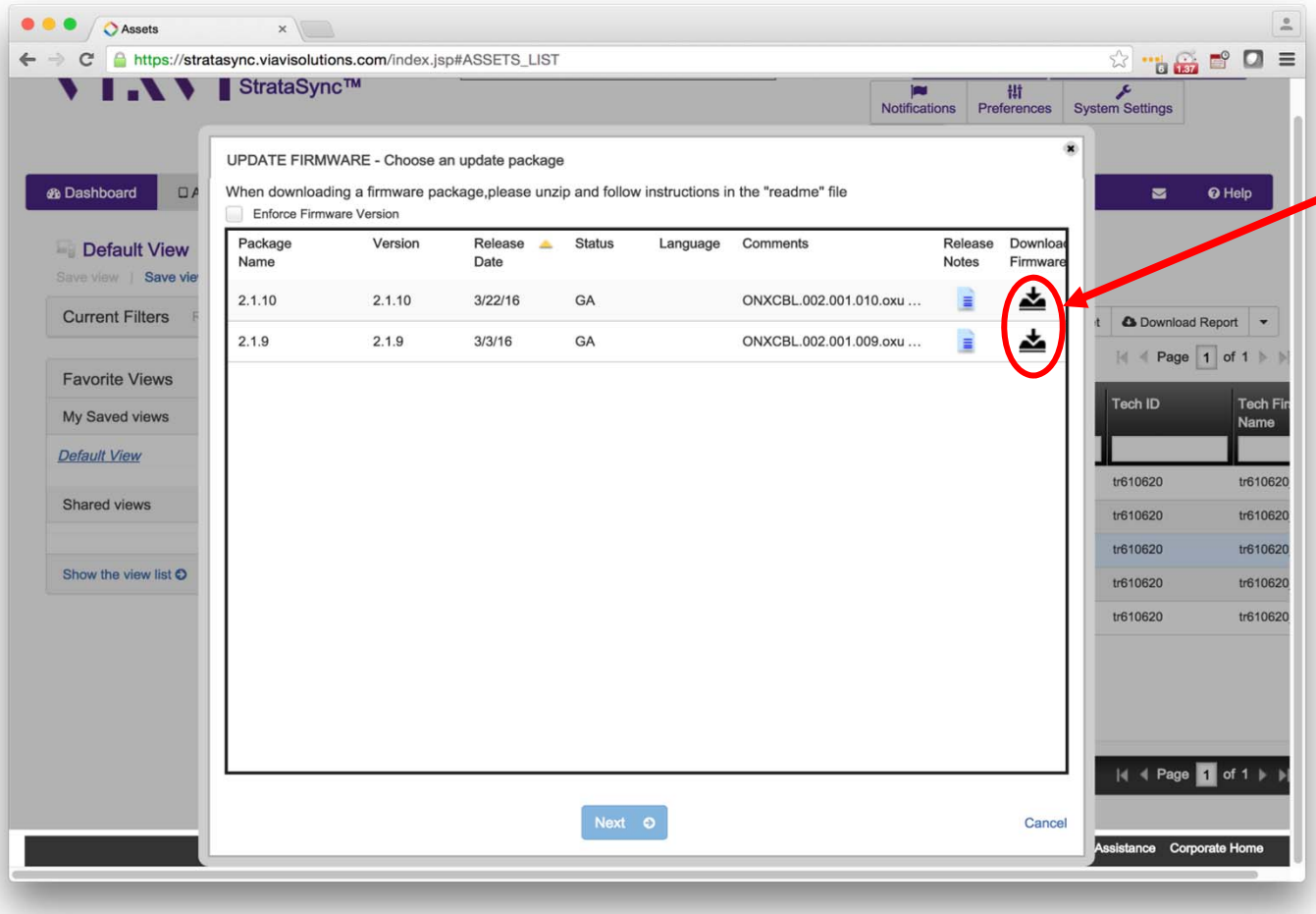
USB Upgrade Process



❶ Click here to download the newest firmware

❷ Copy the downloaded file ONXCBL.xxx.xxx.xxx.oxu to the root directory of a USB thumb drive.

❸ Press Cancel once the download has completed and you have placed the file on the USB thumb drive.

Note: Firmware must be downloaded from StrataSync first

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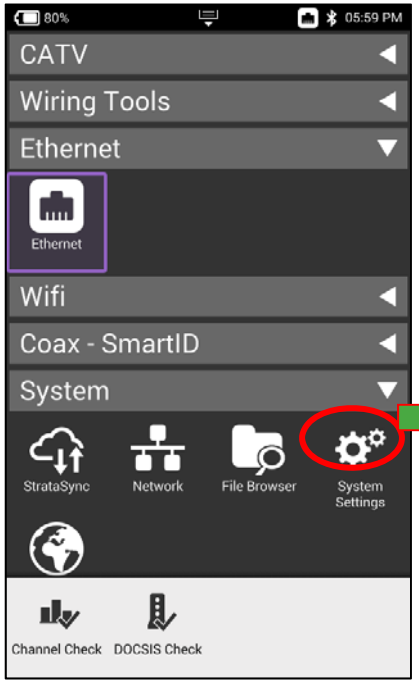
USB Upgrade Process

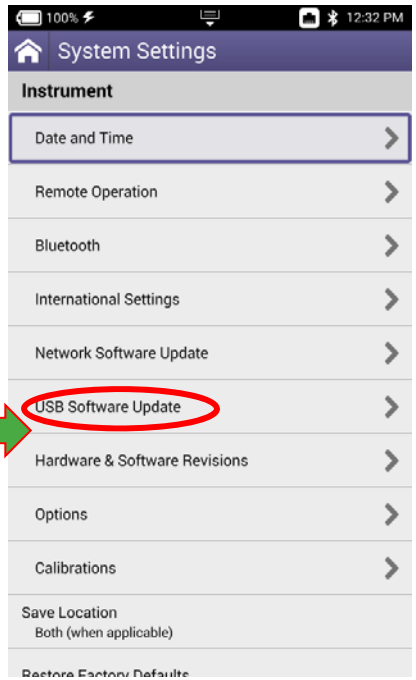
❶ Insert the thumb drive into either USB port on the side of the ONX. Then start System Settings

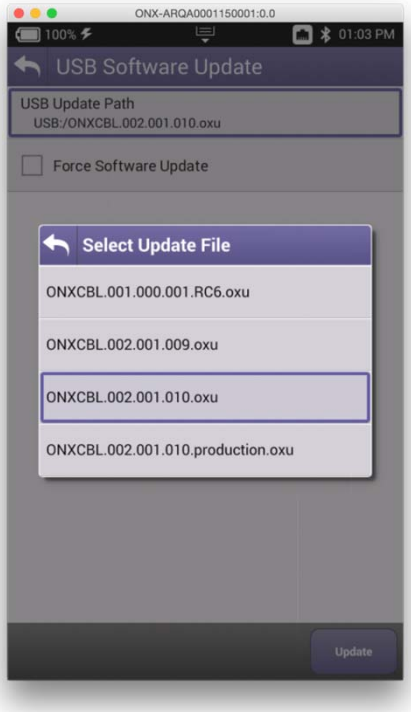
❷ Select USB Software Update

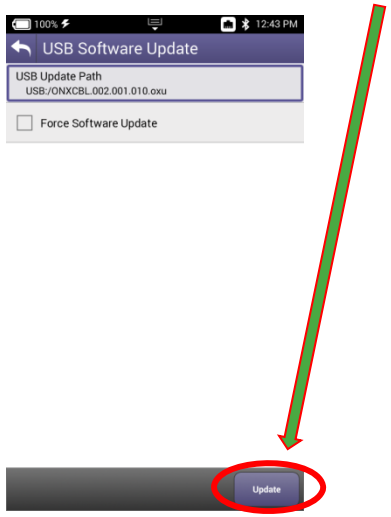
❸ At the popup, select the firmware image you wish to select for upgrade.

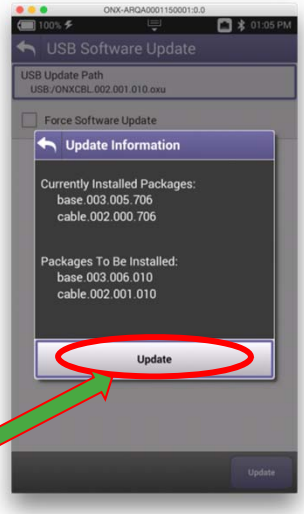
❹ Press Update to start the upgrade











❺ Press Update to confirm and start the upgrade. The meter will power off when the update is complete.

Note: Make sure you do not have an Ethernet cable plugged in when upgrading by USB

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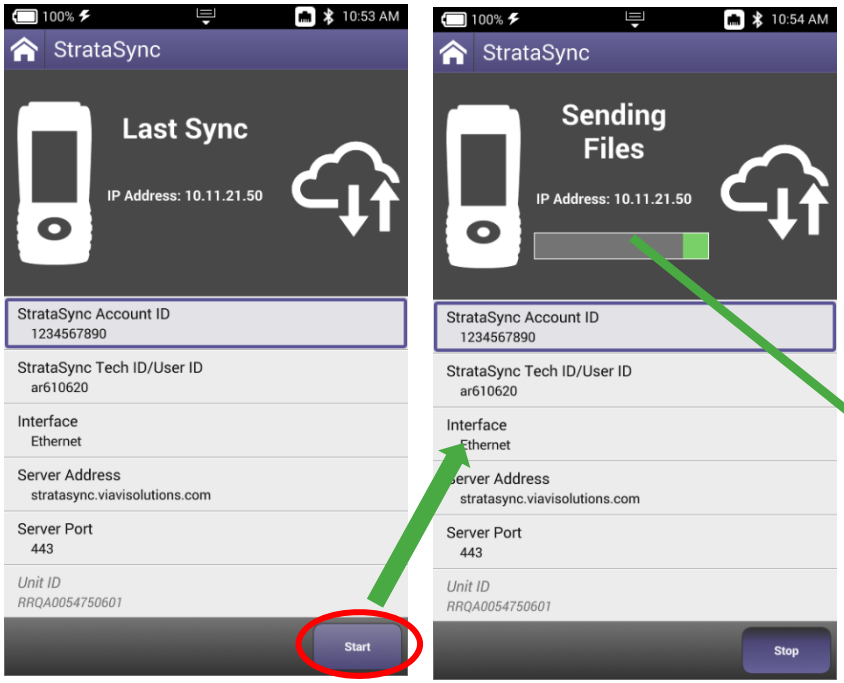
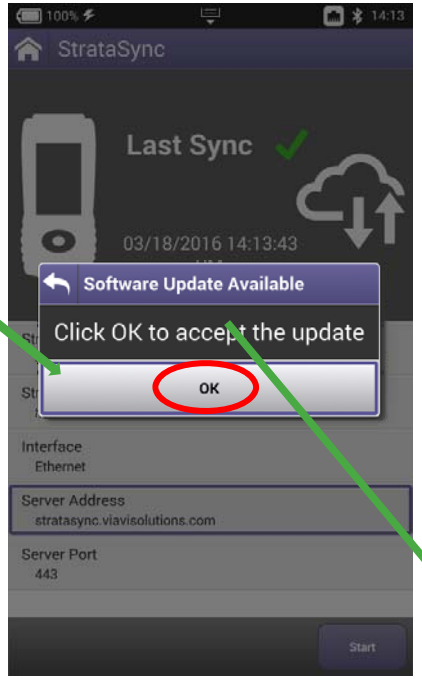
Firmware Update via StrataSync

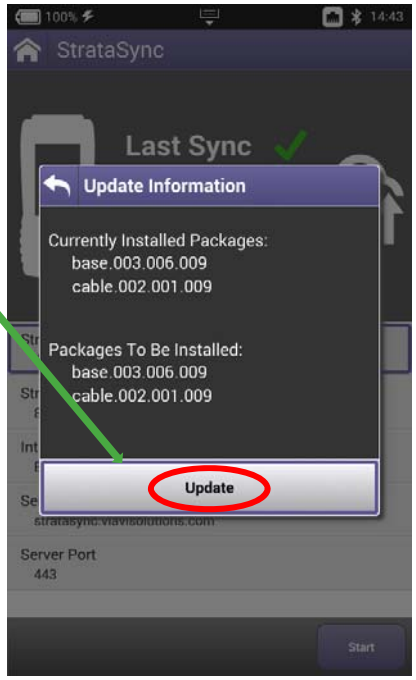
Select **Start**



❺ ONX will connect to StrataSync and determine there is a "Software Update Available" - Select ***OK***.



❻ Software packages will be confirmed – Select **Update**



NOTE: SW update will proceed. The unit will Power off completely after completion. Update process will take 10-15 minutes based on the size of the update file and connection speed

The ONX must be plugged into AC power or above 50% battery life prior to updating

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Troubleshooting the ONX FW/SW Upgrade Process

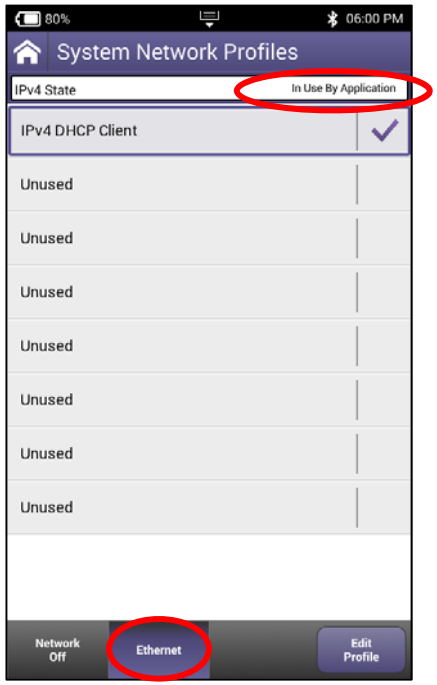
- **No IP address**

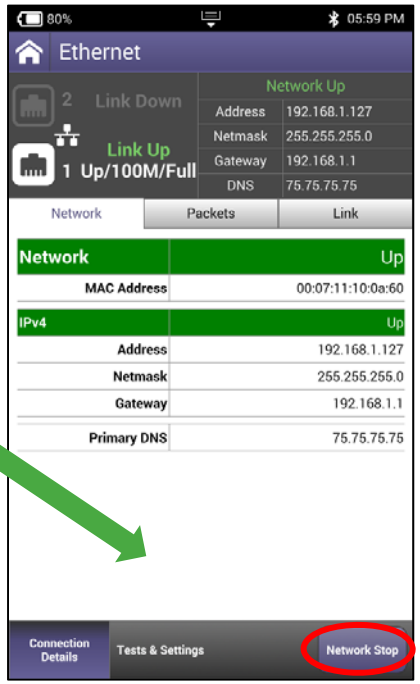
❶ Confirm the Ethernet port is turned on by selecting the ***Ethernet*** option at the bottom

❷ If the IPv4 State = “In Use By Application” – From the Home Screen and navigate to the ***Ethernet*** menu – Select ***Ethernet***

❸ Select the ***Network Stop*** button at the bottom – This dis associates the Ethernet port with the Ethernet testing function

❹ Press the ***Back*** button and Power Cycle the Meter





*When the meter returns to the Home screen start from Step 1 at the beginning of this document

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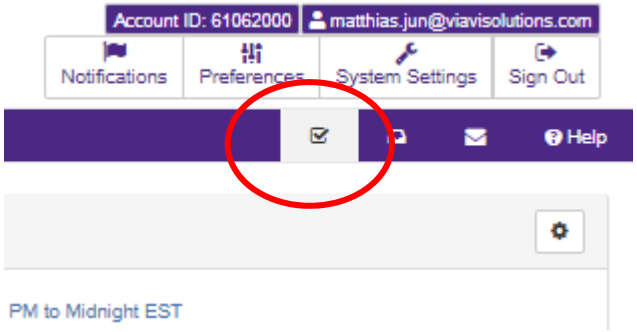
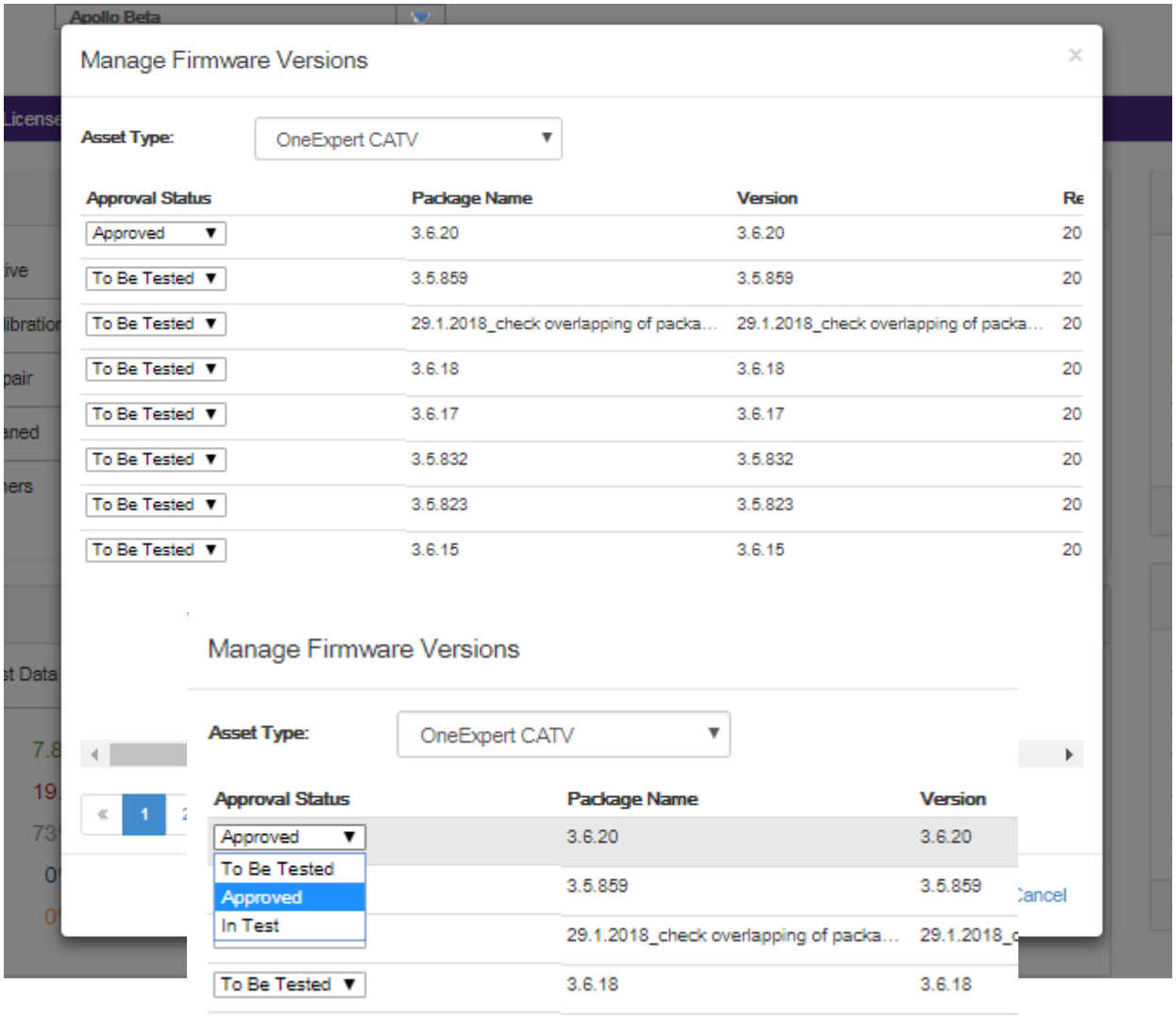
StrataSync – approval of software before dispatch



- **Approved** – can be deployed by anyone with permissions
- **Pre-approved** – tested by tester and ready for "Approval"
  - Word choice is poor
  - "In Test" - Beta
- **Available** – General Availability on StrataSync



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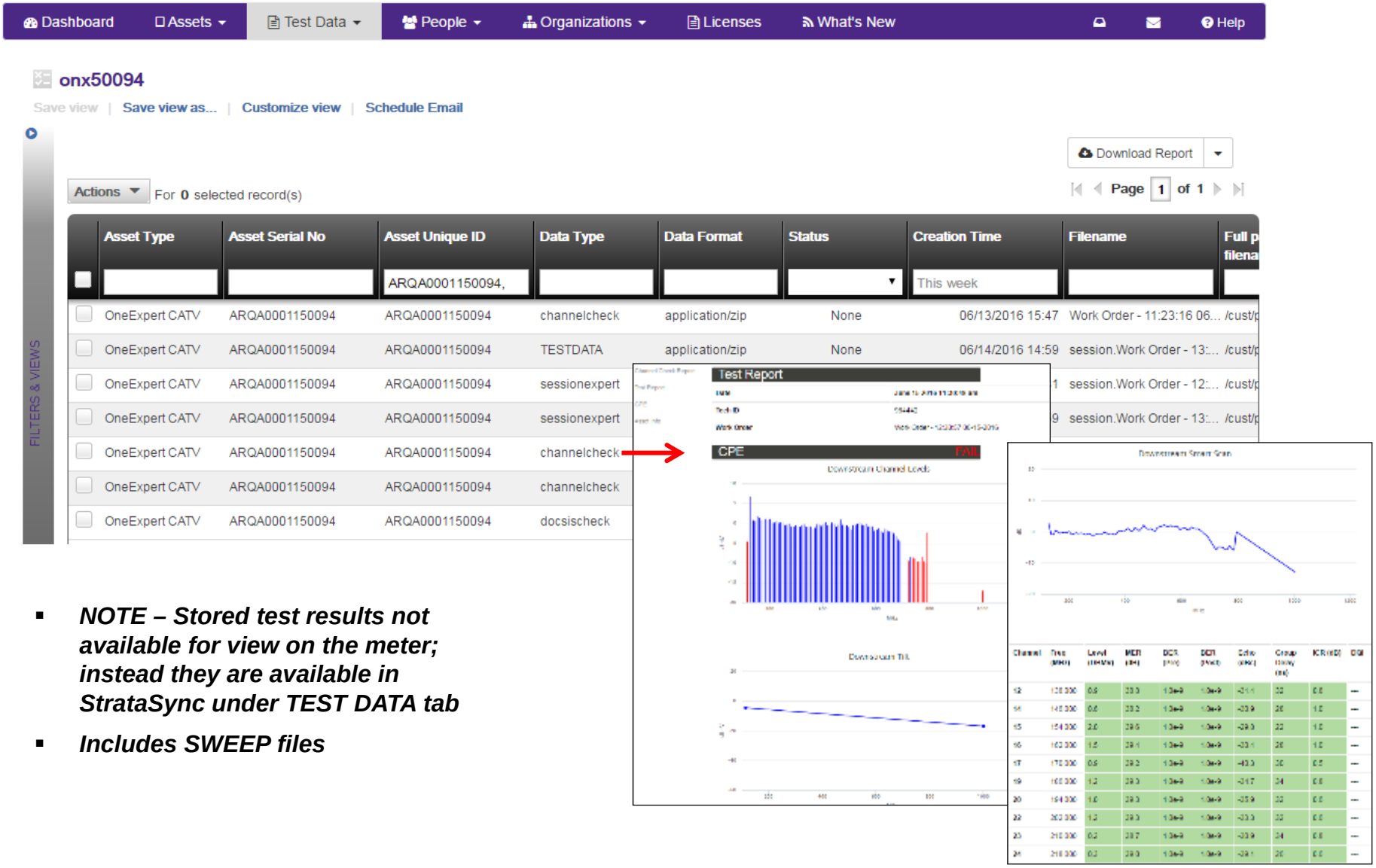
✓ 228 – STRATASYNC - Test Results

StrataSync – ONX Test Results



- ***NOTE – Stored test results not available for view on the meter; instead they are available in StrataSync under TEST DATA tab***
- ***Includes SWEEP files***

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StrataSync CORE / StrataSync PLUS – Data Retention

StrataSync CORE Test Data retention

- In accordance with StrataSync Test Data Retention policy, Test Data records with dates older than 35 days will be deleted.
- This applies to StrataSync CORE subscribers ONLY.
- StrataSync PLUS subscribers Test Data records will continue to be retained for 5 years.
- If you are a CORE subscriber, and require longer Test Data retention, please contact your VIAVI sales representative , Or VIAVI Customer Care immediately, to upgrade to StrataSync PLUS .

- **CORE**
  - Free of Charge
  - 35 days after upload to StrataSync
  - Goes to the “bit bucket” after that
- **Plus**
  - Annual Subscription
    - price/instrument/year
    - 6 yr test data retention
    - Goes to the “bit bucket” after that
- Stated in the StrataSync T&Cs

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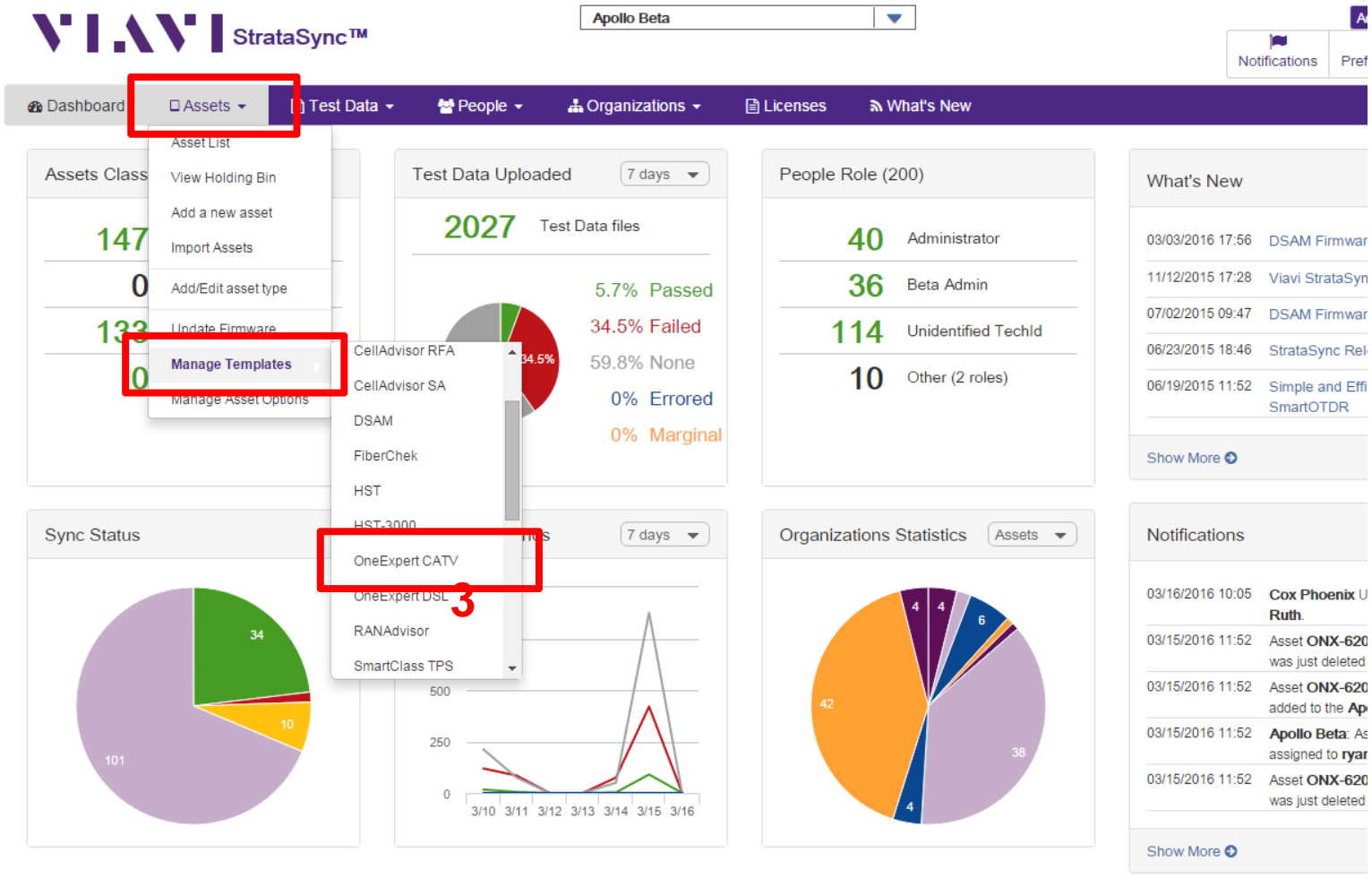
✓ 231 – STRATASYNC (administrator settings)

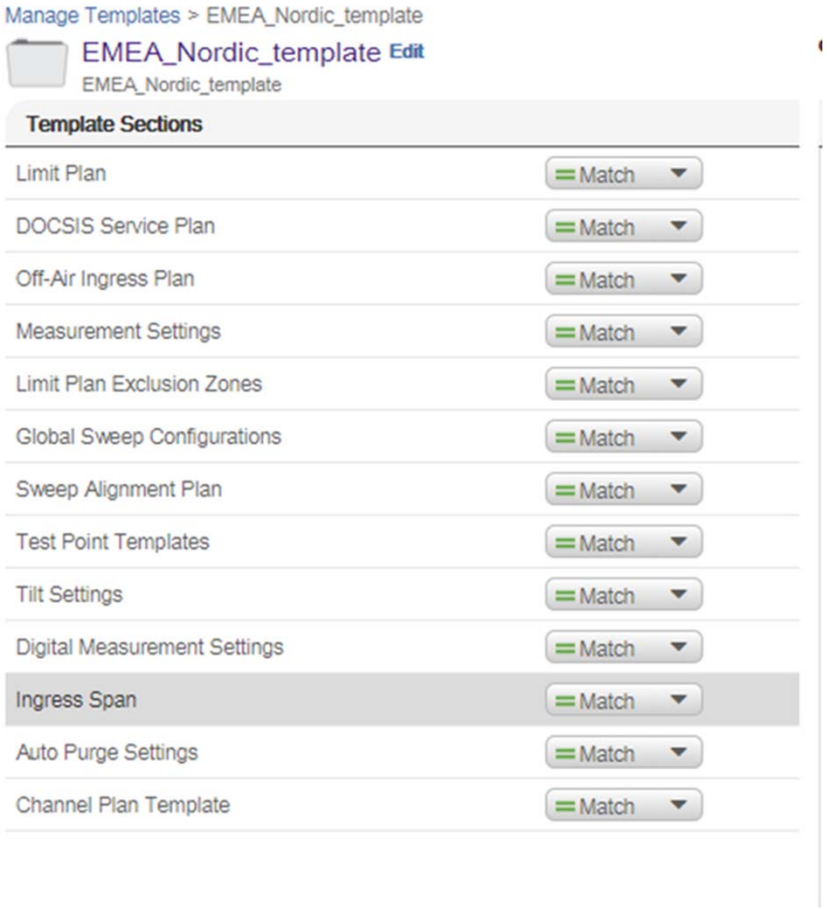
Manage Templates for ONX-620
-Limit Plan
-DOCSIS Service Plan
-Off-Air Ingress Plan
-Measurement Settings
-Limit Plan Exclusion zones
-Tilt settings (CATV settings)
-Digital Measurement settings (CATV settings)
-Ingress Span(CATV settings)
-Auto-Purge Settings (CATV settings)
-Channel Plan settings

Additional Templates for ONX-630
-Global Sweep Configuration (SWX)
-Sweep Alignment Plan (SWX)
-Test Point Template (NTX)

To access Configuration Templates



Manage Templates via StrataSync



Manage Templates for ONX-620

- Limit Plan
- DOCSIS Service Plan:
- Off-Air Ingress Plan:
- Measurement Settings
- Limit Plan Exclusion zones:
- Tilt settings (CATV settings)
- Digital Measurement settings (CATV settings)
- Ingress Span(CATV settings)
- Auto-Purge Settings (CATV settings)
- Channel Plan settings

Additional Templates for ONX-630

- Global Sweep Configuration (SWX)
- Sweep Alignment Plan (SWX)
- Test Point Template (NTX)

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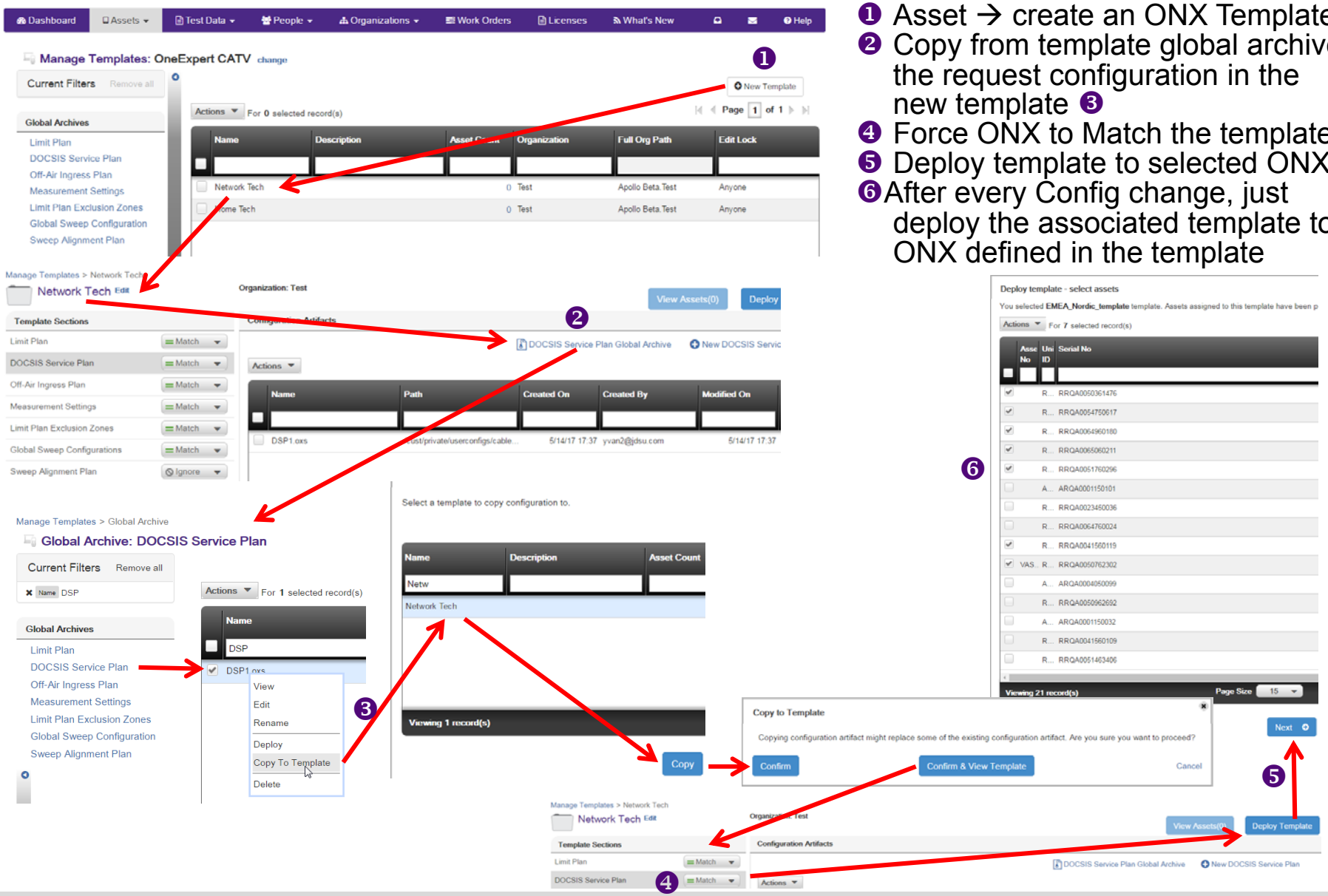
Link ONX config settings to a template – Deploy it to ONXs



1. Asset → create an ONX Template
2. Copy from template global archive the request configuration in the new template 3
4. Force ONX to Match the template
5. Deploy template to selected ONX
6. After every Config change, just deploy the associated template to ONX defined in the template

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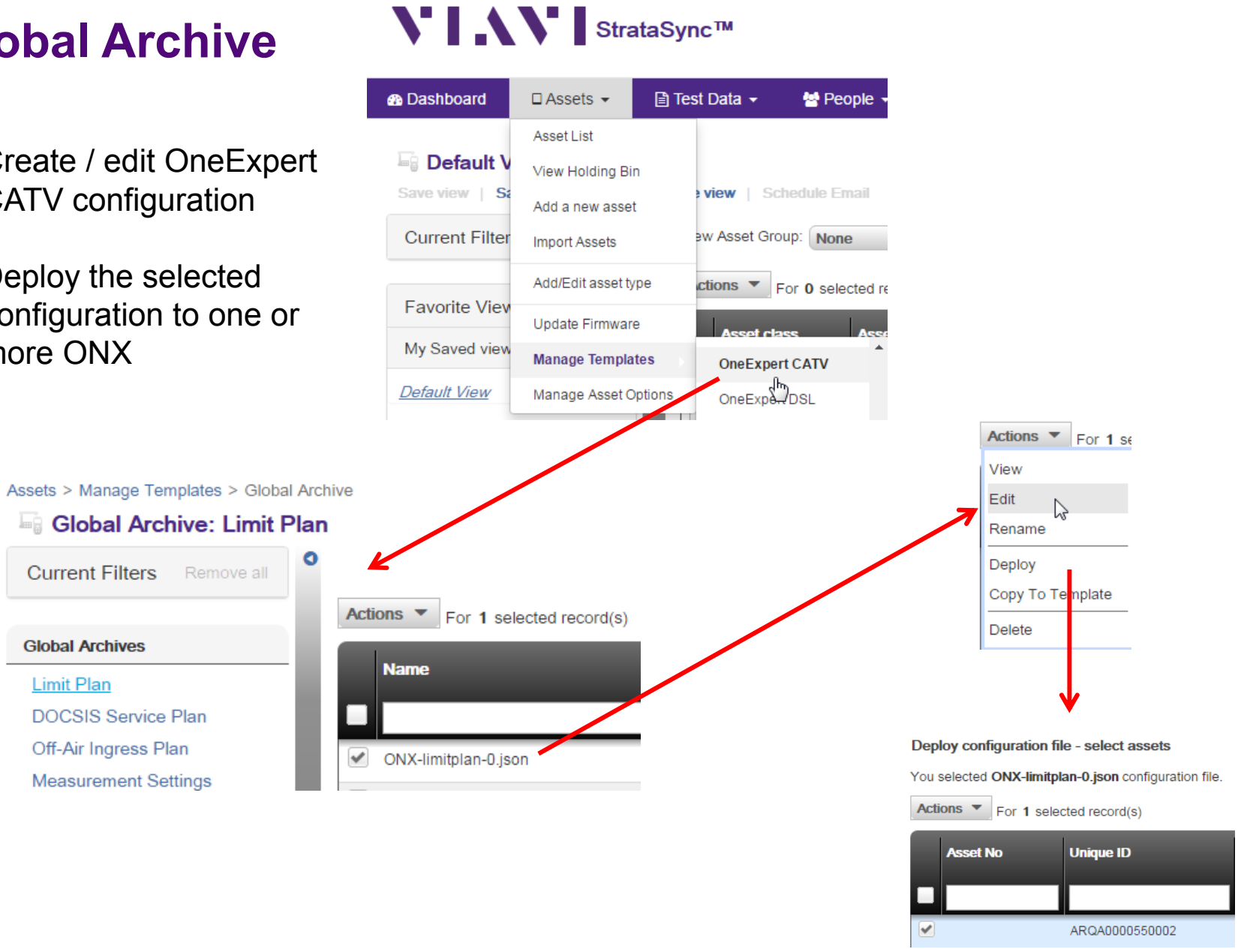
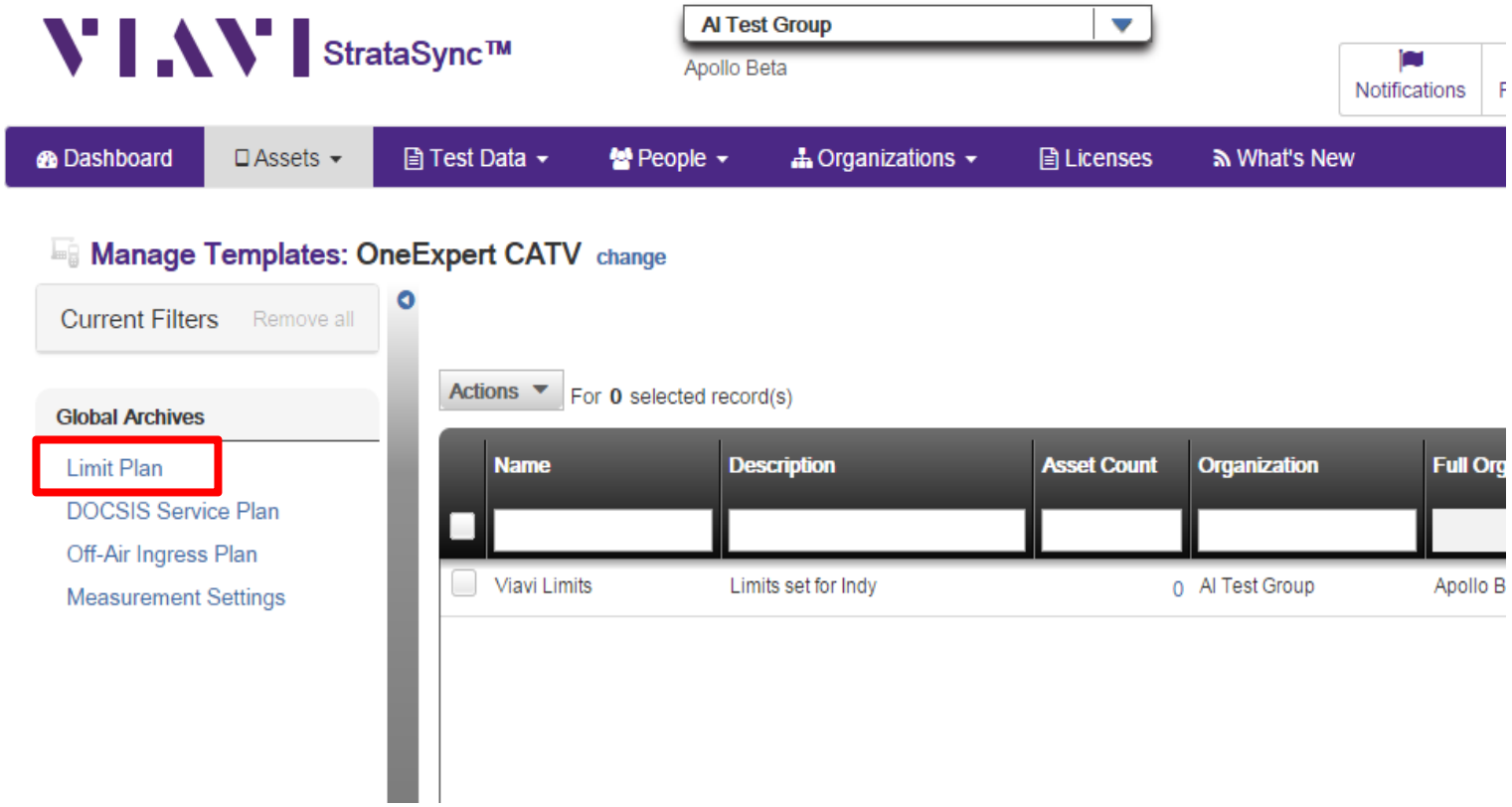
Global Archive

- Create / edit OneExpert CATV configuration
- Deploy the selected configuration to one or more ONX



Access or Create a New Limit Plan

- Limit Plans determine when a test result will end up being a Pass or Fail in relation to thresholds set
- In the Template screen, click on one of the selections in the “Global Archives” bubble on the left of the screen
- Users can create Limit Plans, DOCSIS Service Plans, Off Air Ingress Plans, and default Measurement Settings

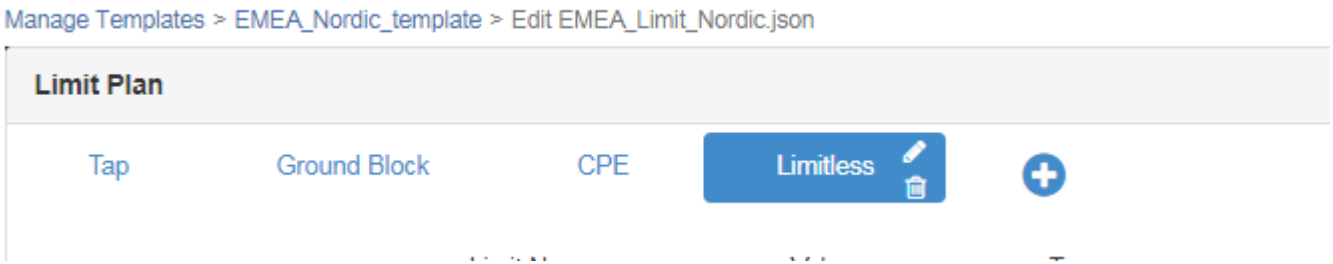


Limit Plan Template

Assets > Manage Templates> OneExpert CATV

- Assets> Manage Templates> OneExpert CATV
- Limit Plan: Limit Plan, StrataSync: Measurement Limit Plan, To Set Levels of Alarming
- Threshold error red
- Threshold warning orange

- **Limit Plan template** (supported by ONX version NTX, SWX), there is the possibility to create custom customized template with names and limits.



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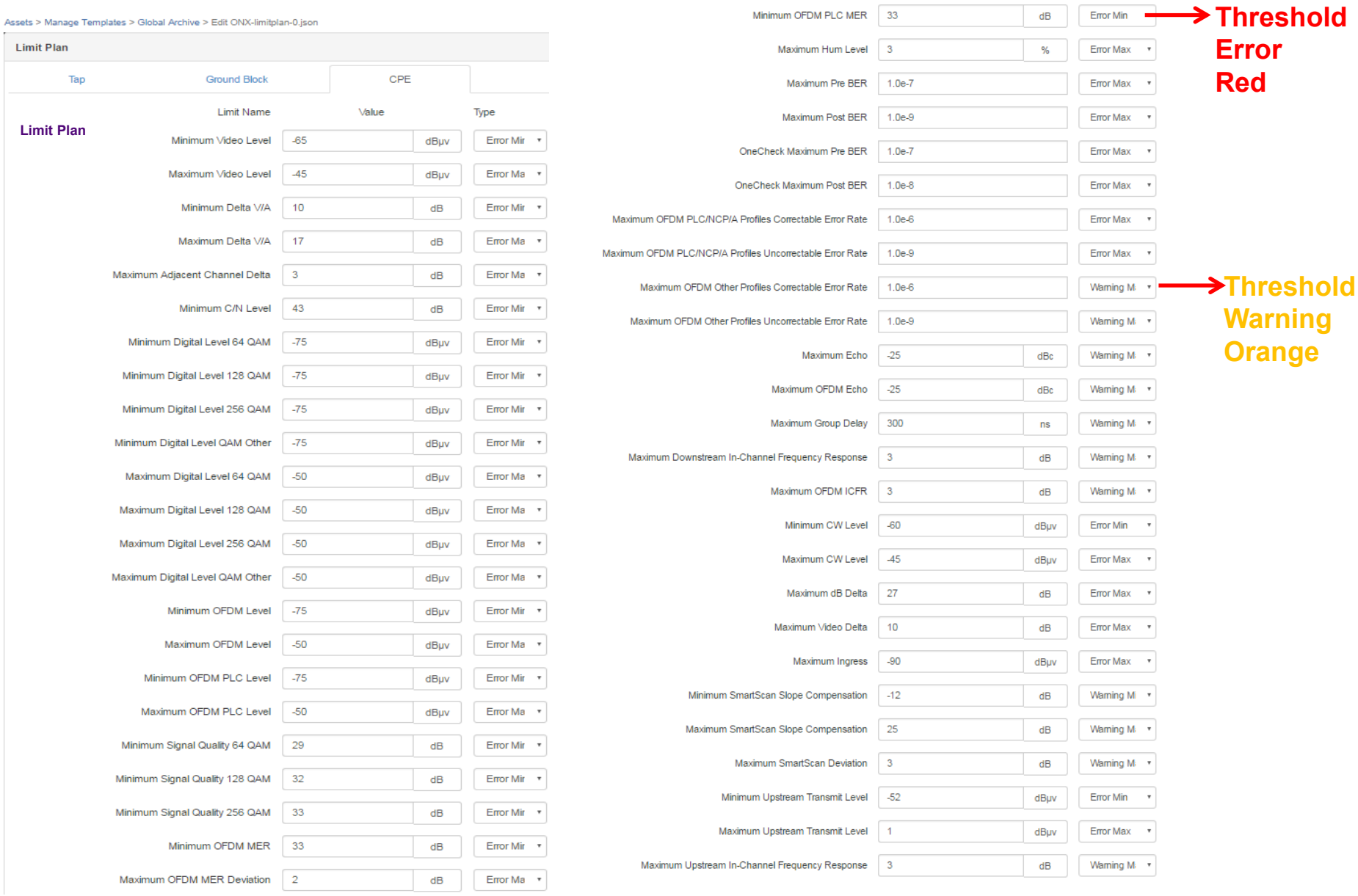
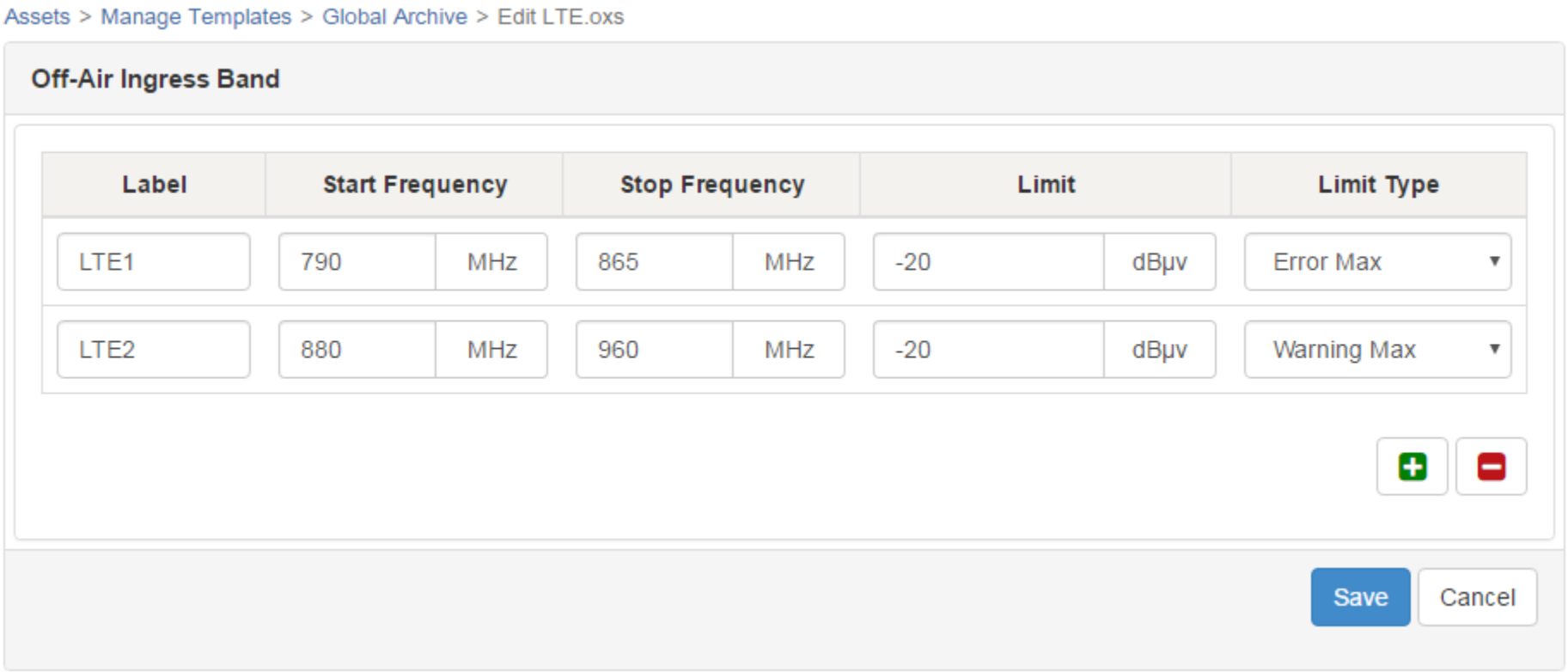
Limit Plan Template



Off-Air Ingress Template

Template Off-Air Ingress Plan for OneCheck test
Select frequency band & limit plan for generating alarms for ingress under carriers



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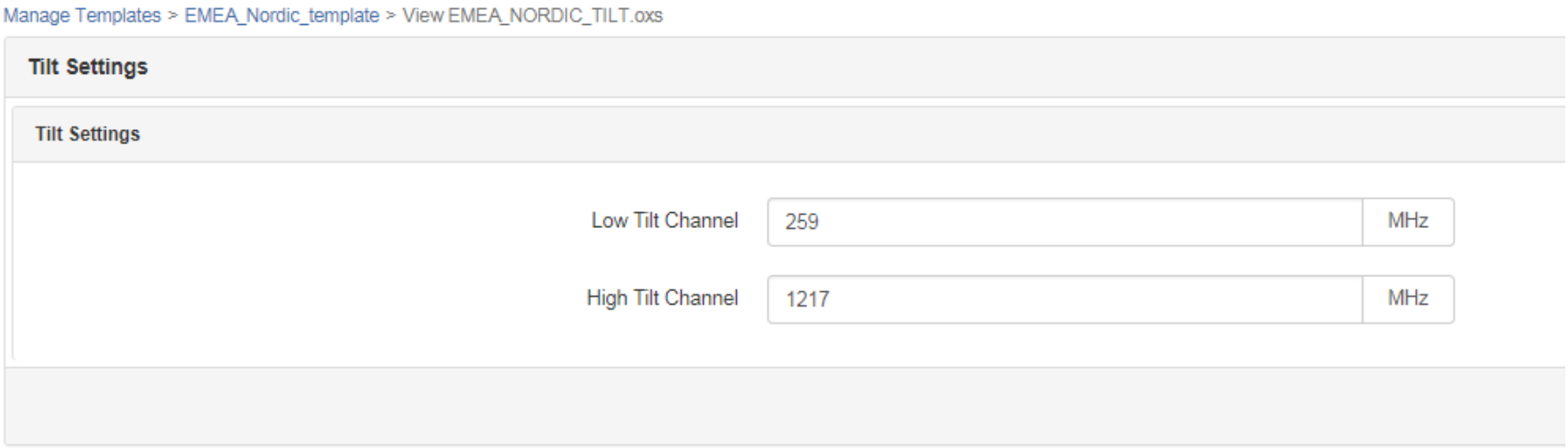
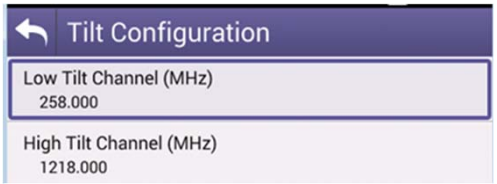
Tilt settings template

Tilt configuration: Select the Tilt Configuration frequency for ONX via StrataSync



This is an OneExpert CATV **settings**



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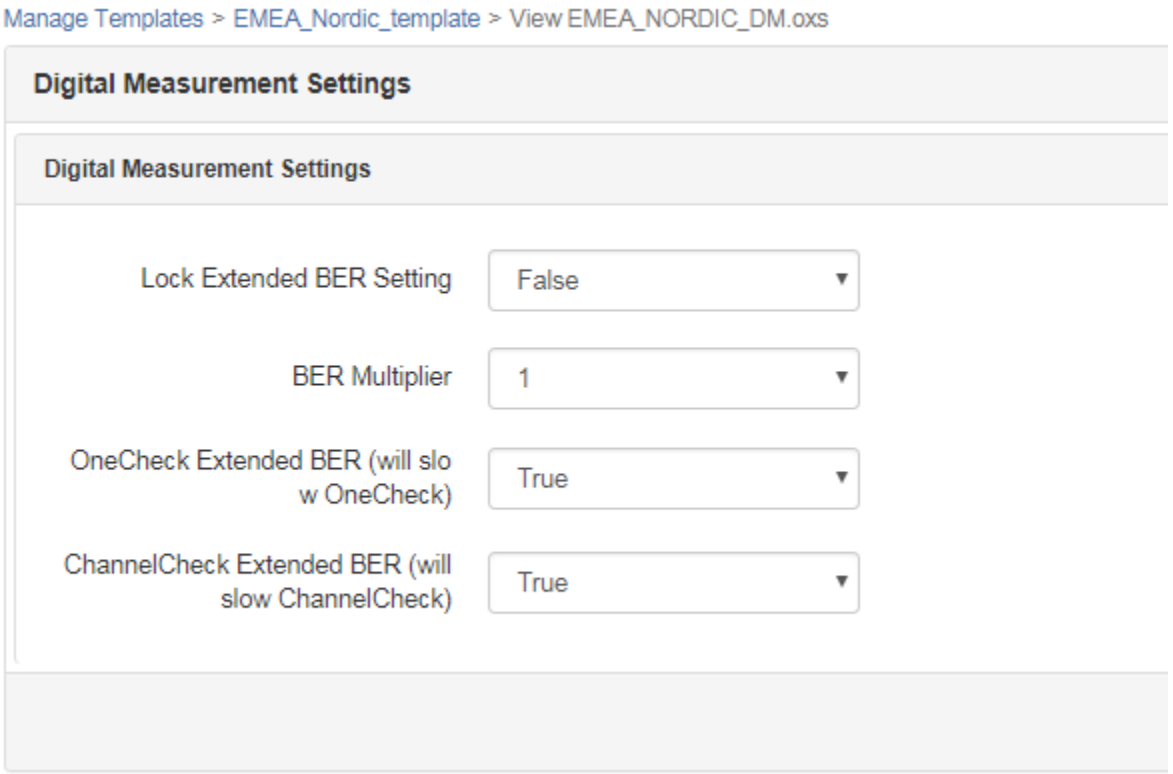
Digital Measurement settings Template

OneCheck

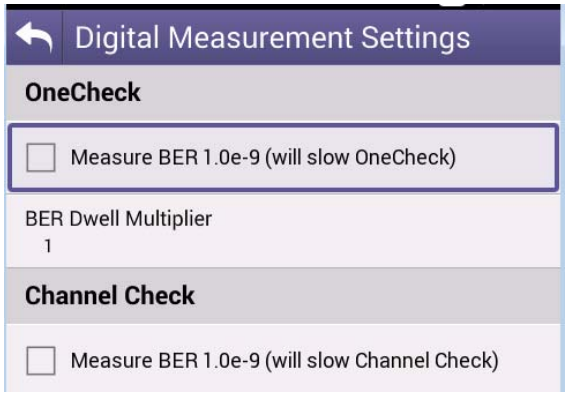
- Measurement – BER 1.0e-9 setting can now be locked.
- The BER dwell multiplier configuration enables setting the BER time 1 to 10 times as long as normal.

Channel Check

- Measurement – BER 1.0e-9 setting has been added to ChannelCheck.



This is a OneExpert CATV **setting**



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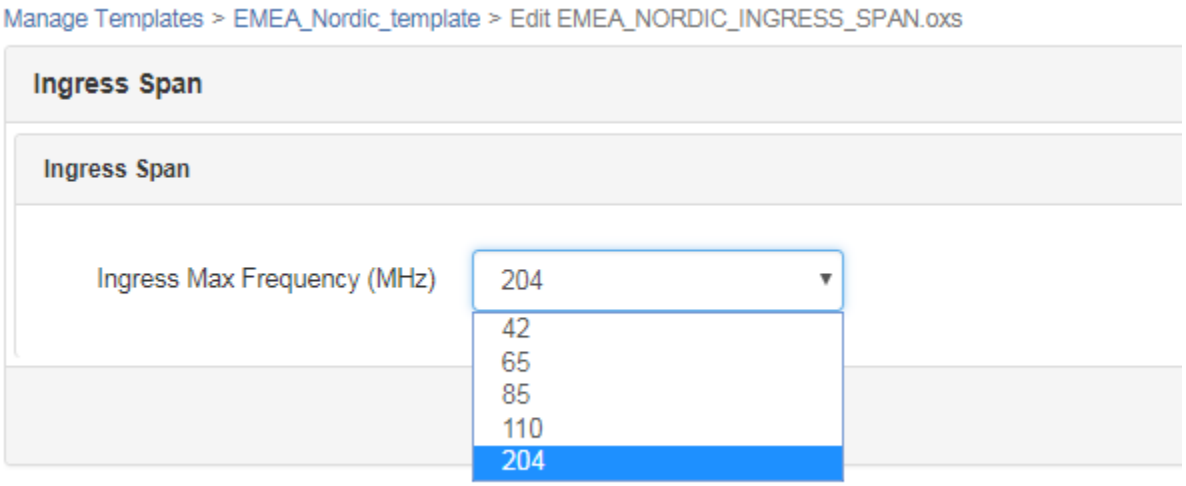
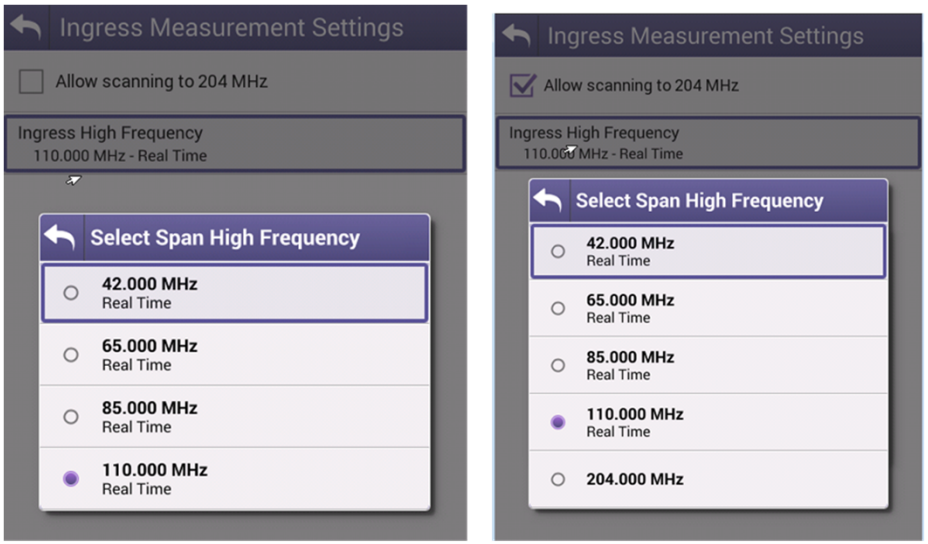
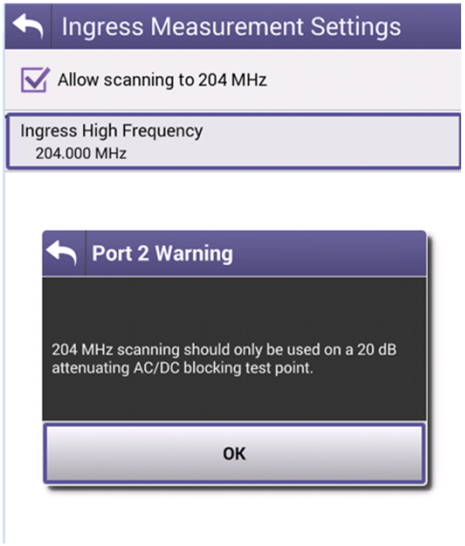
Ingress Span Template

- Ingress Span settings for Port 2 depending on network configuration

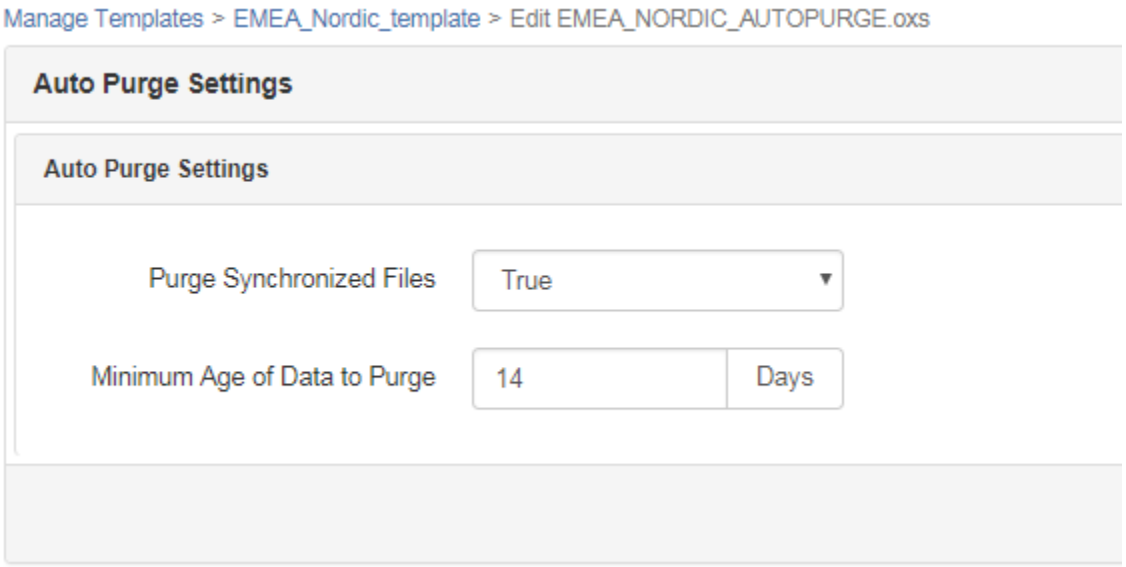


This is a OneExpert CATV **setting**

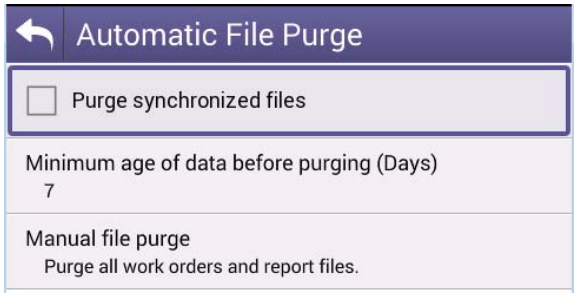




Auto Purge settings Template



This is a OneExpert CATV **setting**



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Channel plan Template

Manage Templates > EMEA_Nordic_template > Edit EMEA_NORDIC_CHANNEL_PLAN_TEMPLATE

Channel Plan Template

Channel Number	Channel Frequency		Channel Name
1	538	MHz	DS-01
2	546	MHz	DS-02
3	554	MHz	DS-03
4	562	MHz	DS-04
5	570	MHz	DS-05
6	578	MHz	DS-06
7	586	MHz	DS-07
8	594	MHz	DS-08
9	602	MHz	DS-09

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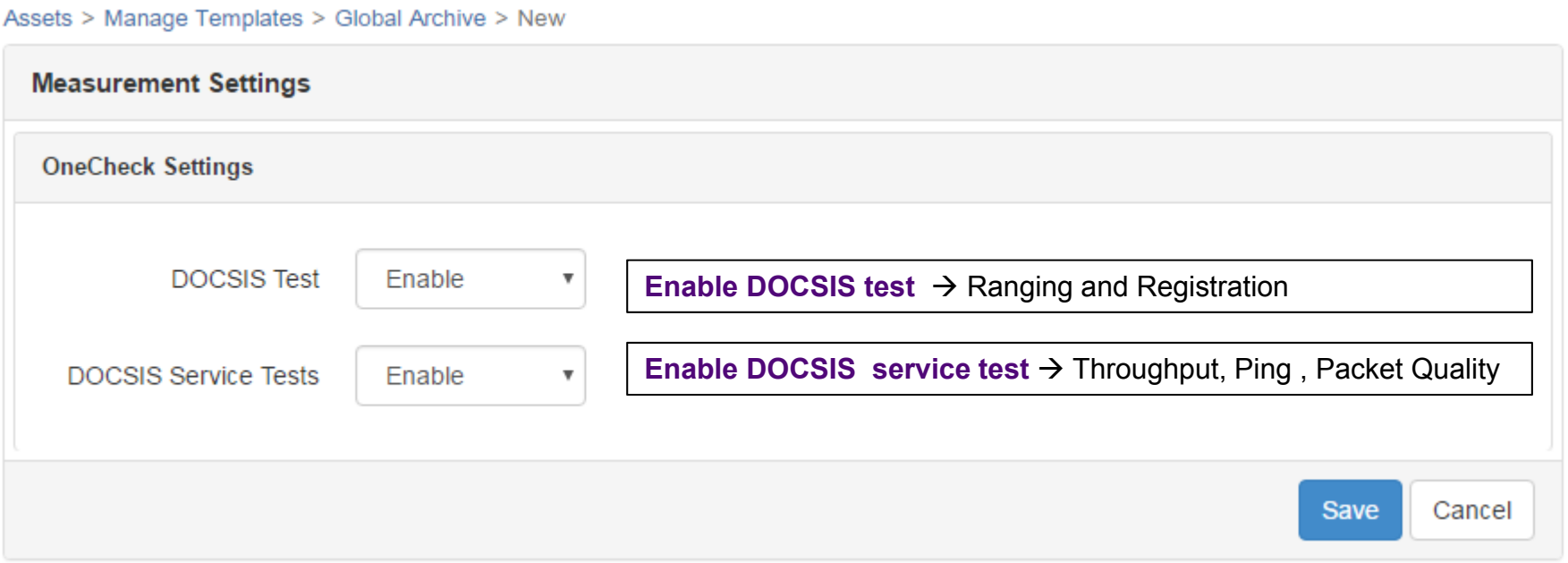
Measurement Settings Template

Measurement Settings for OneCheck DOCSIS setup



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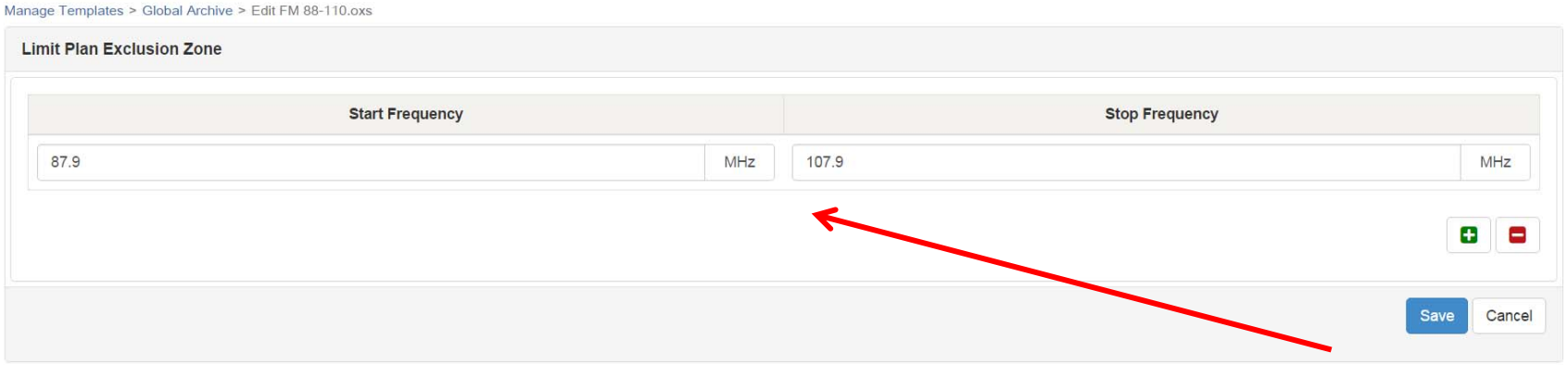
Limit Plan Exclusion Zone Template

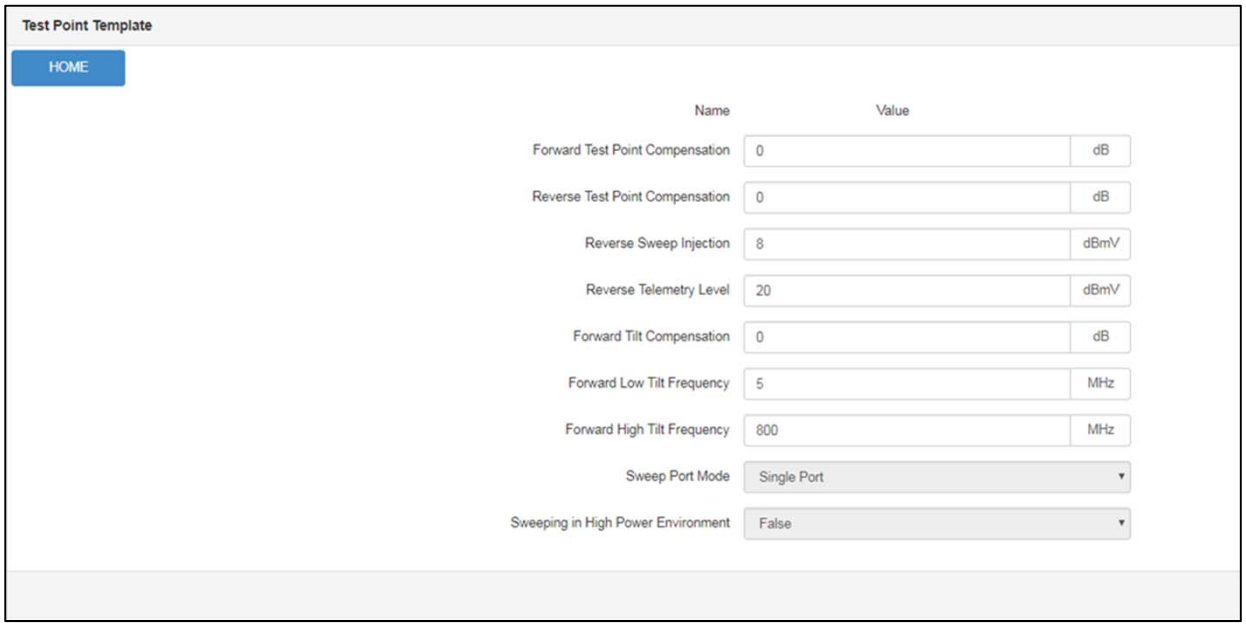
- To create a plan in order to exclude a zone, measurements still active but without Pass/Fail report,
- example FM band 88-108MHz



Test Point Template (NTX)

Test point compensation TPC – can be deployed to ONX with NTX package Expert mode

- Forward test point compensation (dB)
- Reverse test point compensation (dB)
- Reverse sweep injection(dBmV)
- Reverse telemetry level
- forward tilt compensation (dB)
- forward low tilt frequency
- forward high tilt frequency
- sweep port mode (single or dual)
- sweeping in high power environment (true- false)



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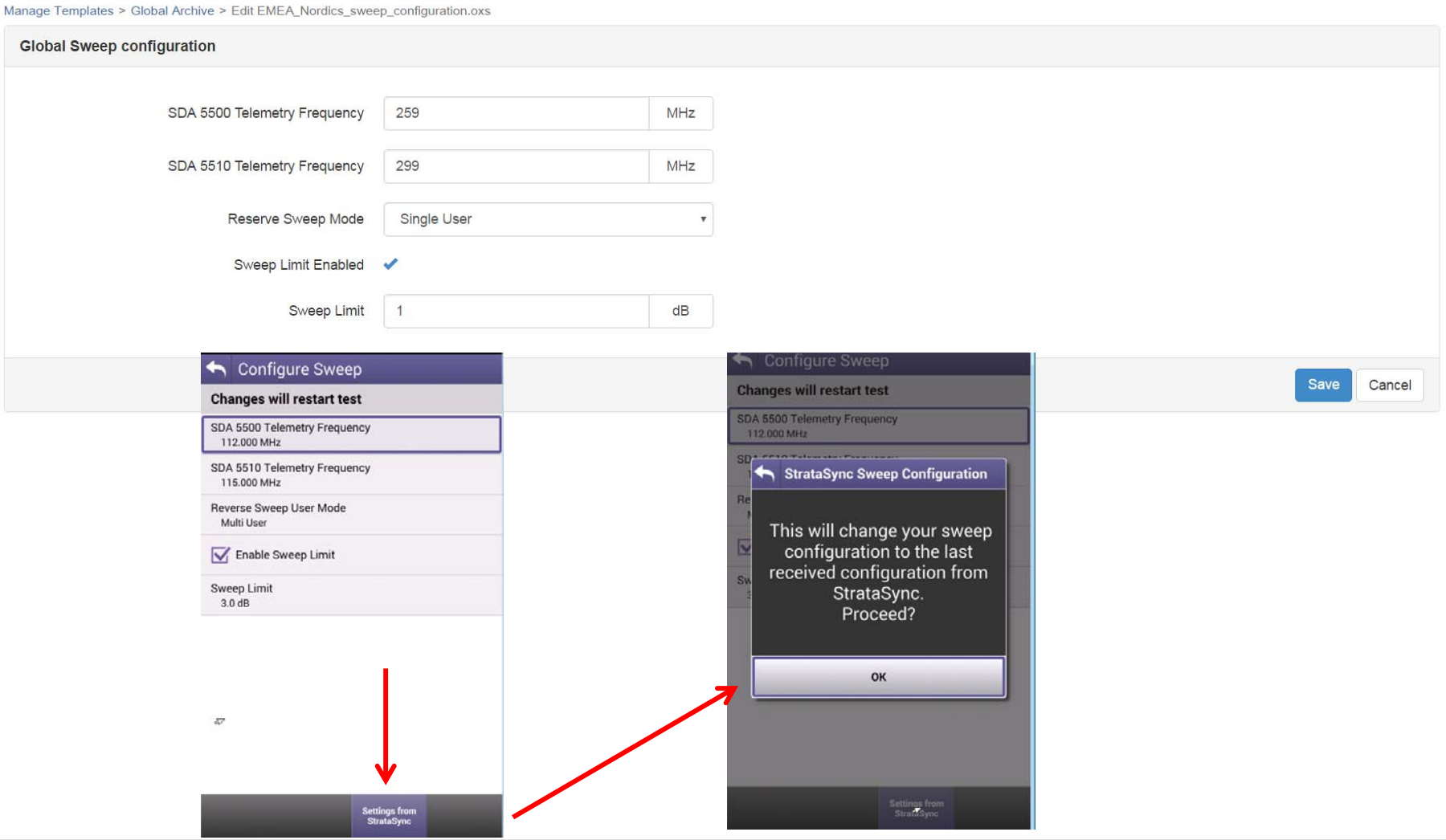
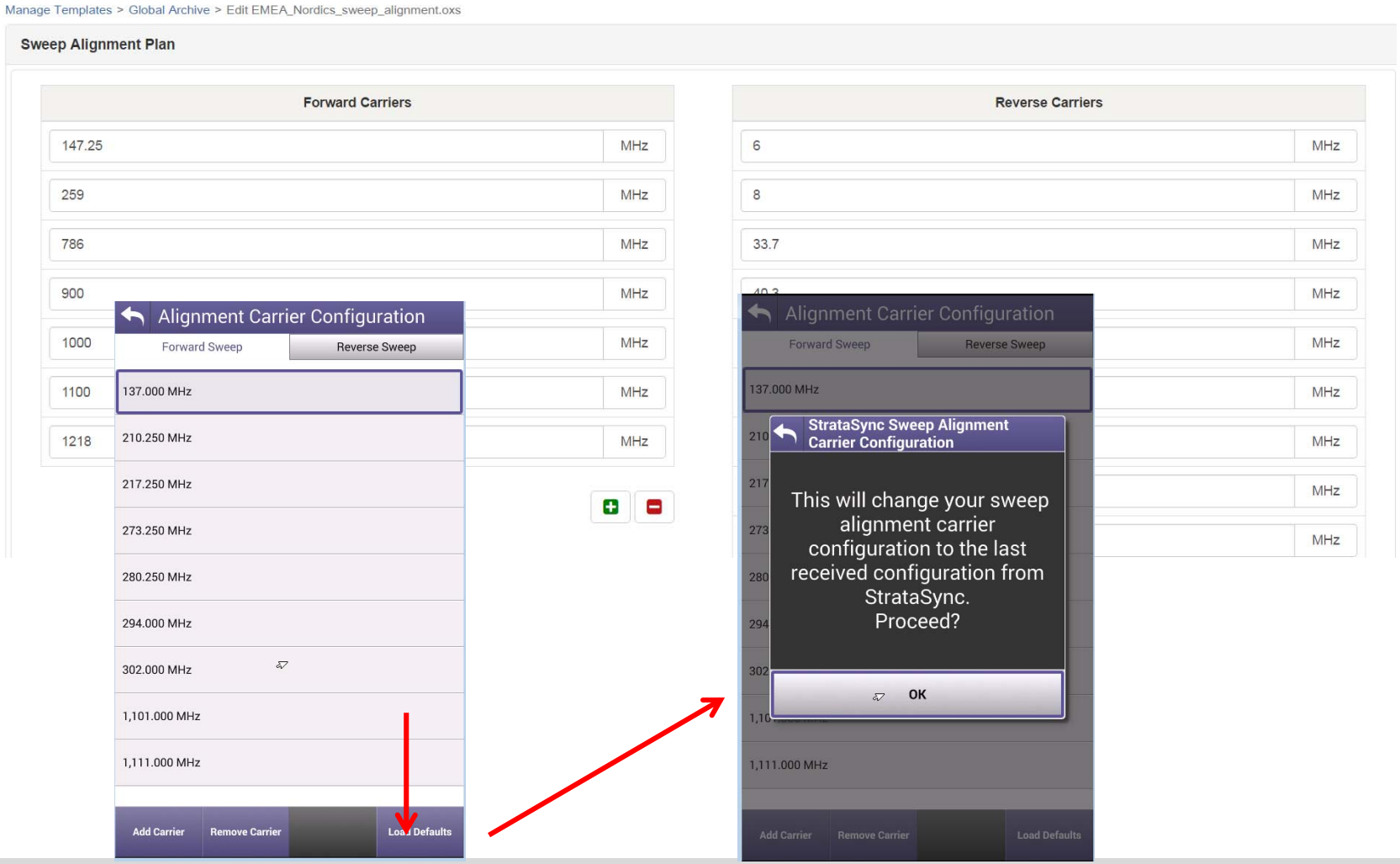
StrataSync: Global Sweep Configuration (SWX)

To create a **Global Sweep configuration** which can be deploy via StrataSync to ONX in the field.



StrataSync: Sweep alignment plan (SWX)

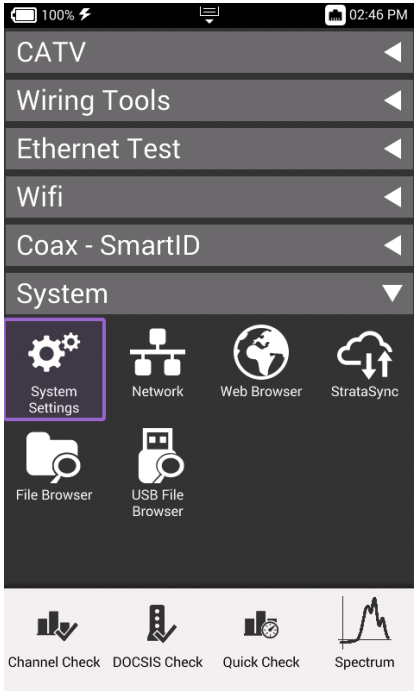
To create a Global **Sweep alignment configuration** which can be deploy via StrataSync to ONX in the field.

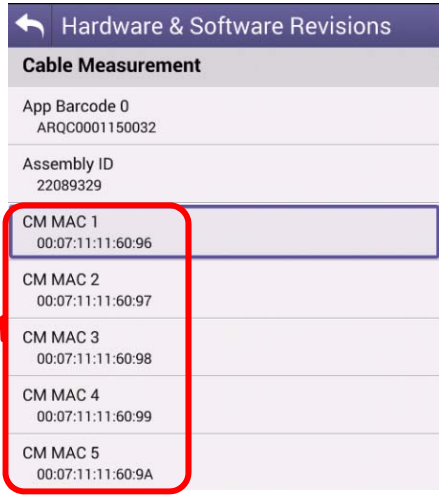


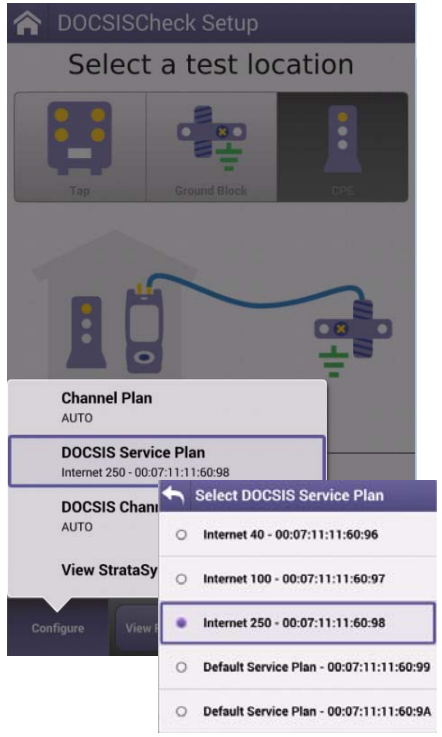
- ✓ 250 – DOCSIS Service Plan
  - DOCSIS Throughput downstream and upstream test
  - StrataSync settings and mechanism
  - Euro BPI+ certificate

ONX CM MAC provisioning

- To perform a DOCSIS throughput test, first the ONX CM MAC have to be provisioned on CMTS.
- ONX has 5 cable modem (CM) DOCSIS MAC address (which can be provisioned for example to 5 different service levels..to match existing CM deployed)
- To see OneExpert CATV CM MAC, select Systems setting under System menu and open Hardware and Software Revisions. The 5x **CM MAC** are listed under **Cable Measurement section**.
- The CM MAC are also listed in the DOCSIS Check setup:



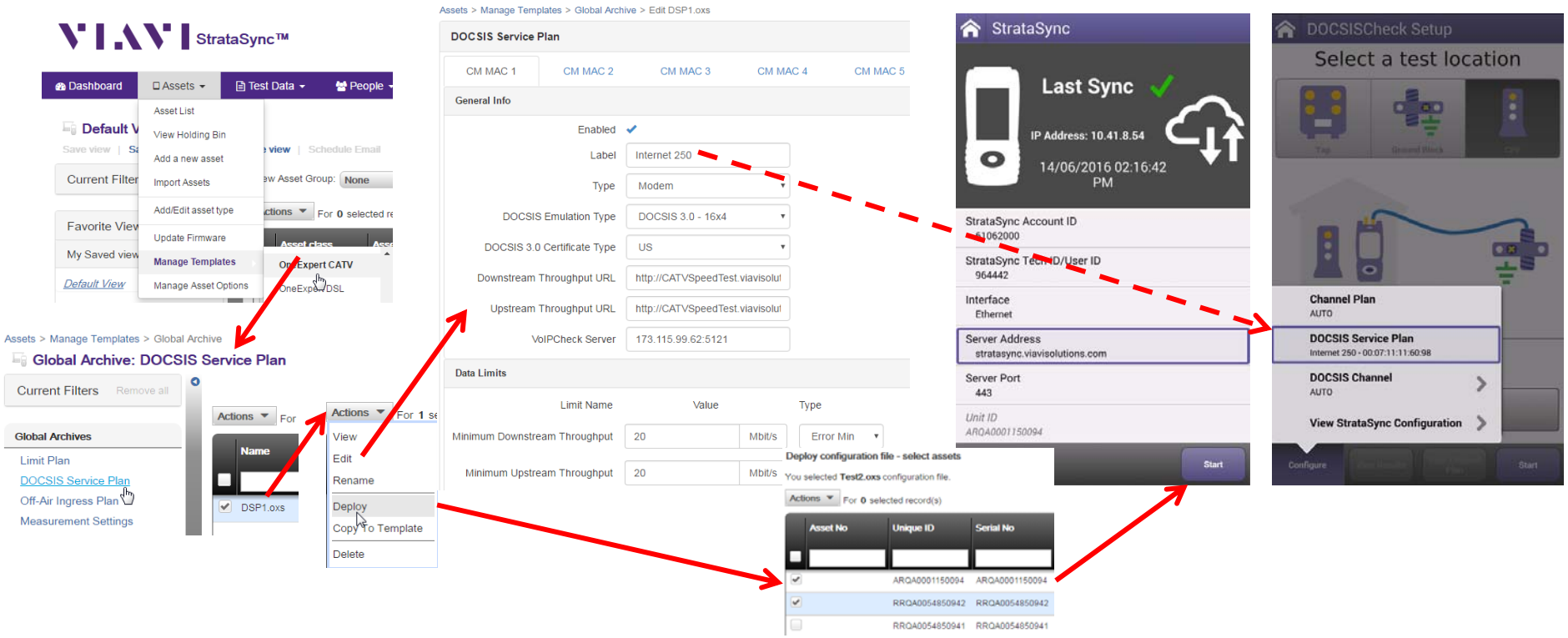




StrataSync Throughput settings and DOCSIS Service Plan deployment

DOCSIS Service Plan: for every ONX DOCSIS MAC@, it is possible to setup:

- A label (will be displayed on ONX DOCSIS test configuration menu),
- The Emulation Type: DOCSIS 3.0 - 8x4, 16x4, 24x4, 32x8 and DOCSIS 3.1 32x8
- The type of DOCSIS 3.0 certificate BPI+ (EURO or US)
- The DS/US throughput URL. The default value is http://CATVSpeedTest.viavisolutions.com/bigfile.zip
- The default URL should be replaced by a local one to get more accurate bitrate measurements.
- A service plan could be deployed to one or multiple ONX. After deploying a new DOCSIS service plan, sync the OneExpert CATV with StrataSync to get the new setting and **create also a new Work Order** on ONX to take in account the new settings.



Notes about throughput test mechanism

Downstream throughput:

- For downstream throughput, ONX download a file from the url provided. The file size should be about 1GB (gigabyte) for 100Mbps and 4-5GB for 500Mbps. ONX don't download completely the file and to avoid multiple download during the test, the file has to be big enough.

Upstream throughput:

- For upstream throughput, ONX attempt to POST a file to the url provided.
  - *(When we say that we need to be able to "post a file" to a throughput server it doesn't mean that we need the functionality/permissions to create a file on the server.)*
- *What we're referring to is the ability to upload a file's contents to the server using the HTTP POST method.*
- It is the transfer of the file contents, not the creation of the file server side, that allow us to measure upstream throughput.
- Following example explains the upload throughput mechanism.
  - *Let's walk through the following example using our throughput test server:*
  - *We've got an Apache 2.4 HTTP server installed on a Windows machine at 10.0.0.225.*
  - *To be sure to place a limit on the maximum size of an HTTP request, we add the following line to the httpd.conf file:*
    LimitRequestBody 2147483647
  - *What this does it configures the server for the largest bounded HTTP request size.*
    This size can be reduced to prevent possible malicious consumption of server size resources (mainly RAM), but must be set large enough for to get a good measurement.
    *Size in Bytes = MaxExpectedThroughput (bit/s) / 8 * 10 (test duration in seconds) * some safety margin (2 or 3) ≈ 3.5 * MaxExpectedThroughput*
  - *From a laptop we can use cURL to do something similar to what the ONX does when testing upstream throughput:*
  - *curl.exe -X POST -d @testfile2.bin –progress bar http://10.0.0.225/dummyuri> cmdOutput 2>&1*
  - *This command is basically having curl send the contents of testfile2.bin to the throughput server, using the HTTP POST method.*
    The URI is unimportant as we'll show next. The output (both stdout and stderr) get logged to cmdOutput.

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Notes about throughput test mechanism

Upstream throughput (continue):

- In our case, testfile2.bin is just a random 40 MB file. It takes a couple of seconds for this command to complete.
  The following is the contents of cmdOutput:

```
##                                                                  3.8%
#####                                                               8.2%
#########                                                        12.6%
###########                                                      16.7%
##############                                                   20.7%
##################                                               25.3%
####################                                             29.5%
########################                                         34.1%
############################                                     38.3%
################################                                 42.6%
####################################                             47.0%
######################################                           51.2%
########################################                         55.3%
##########################################                       59.7%
##############################################                   64.0%
################################################                 68.5%
##################################################               72.8%
####################################################             77.0%
######################################################           81.1%
########################################################         85.3%
##########################################################       89.7%
############################################################     94.0%
##############################################################   98.4%<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">
<html><head>
<title>404 Not Found</title>
</head><body>
<h1>Not Found</h1>
<p>The requested URL /dummyuri was not found on this server.</p>
</body></html>
```

- The server rejected this request because dummyuri doesn't exist, but that doesn't matter. The first several lines show the progress as the file's contents were streamed to the server and that is all that is required to allow us to measure throughput.
- In the ONX implementation allows the file to upload for about 10 seconds while throughput is measured and then closes the socket, killing/resetting the connection.
- As far as ONX configuration: to do exactly what we did above, you can specify http://10.0.0.225/dummyuri as the Upstream Throughput URL in the DOCSIS Service Plan configuration on StrataSync.
  From the example you can see that using this mechanism, the URI is rather unimportant and http://10.0.0.225/, http://10.0.0.225/upload, and http://10.0.0.225/whatever would all work equally as well.

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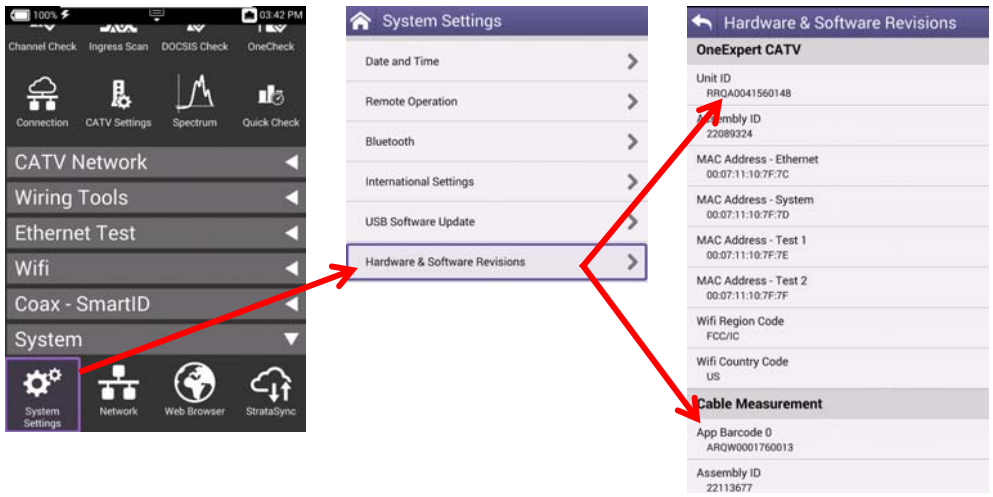
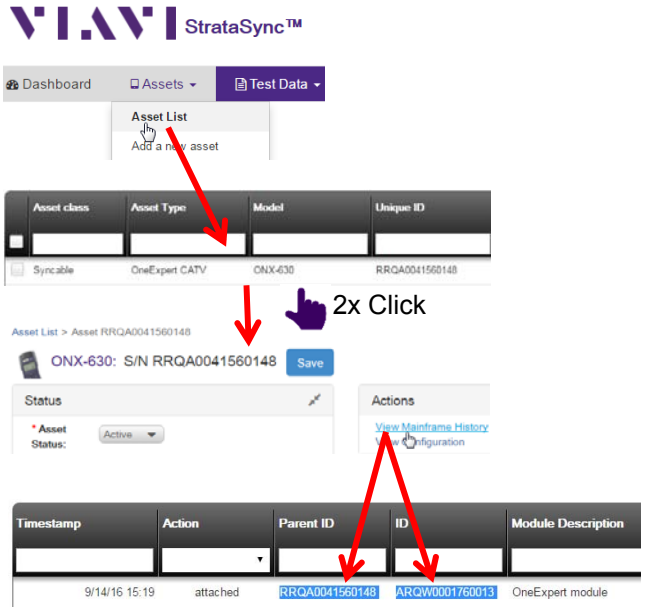
ONX DOCSIS 3.0 Euro BPI+ Certificate

- If you need an **Euro BPI+ Certificate** on the ONX to run a DOCSIS test, you will first have to get it from Viavi. Please provide the ONX base unit and module serial numbers that are listed in ONX Hardware & Software Revision under System Settings:
  - Base unit → Unit ID under OneExpert Cable section
  - Module → App Barcode 0 under Cable Measurement section



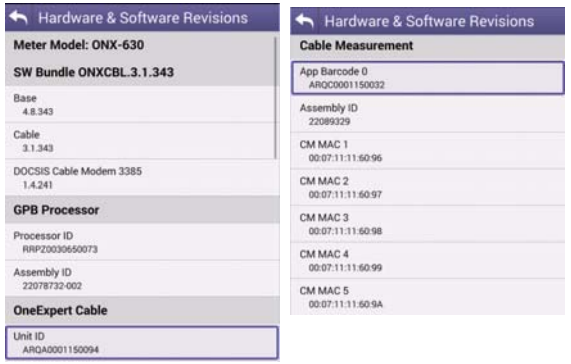
- The ONX base unit and module serial numbers are also listed in StrataSync. From there you could just copy paste it and send it by E-Mail:



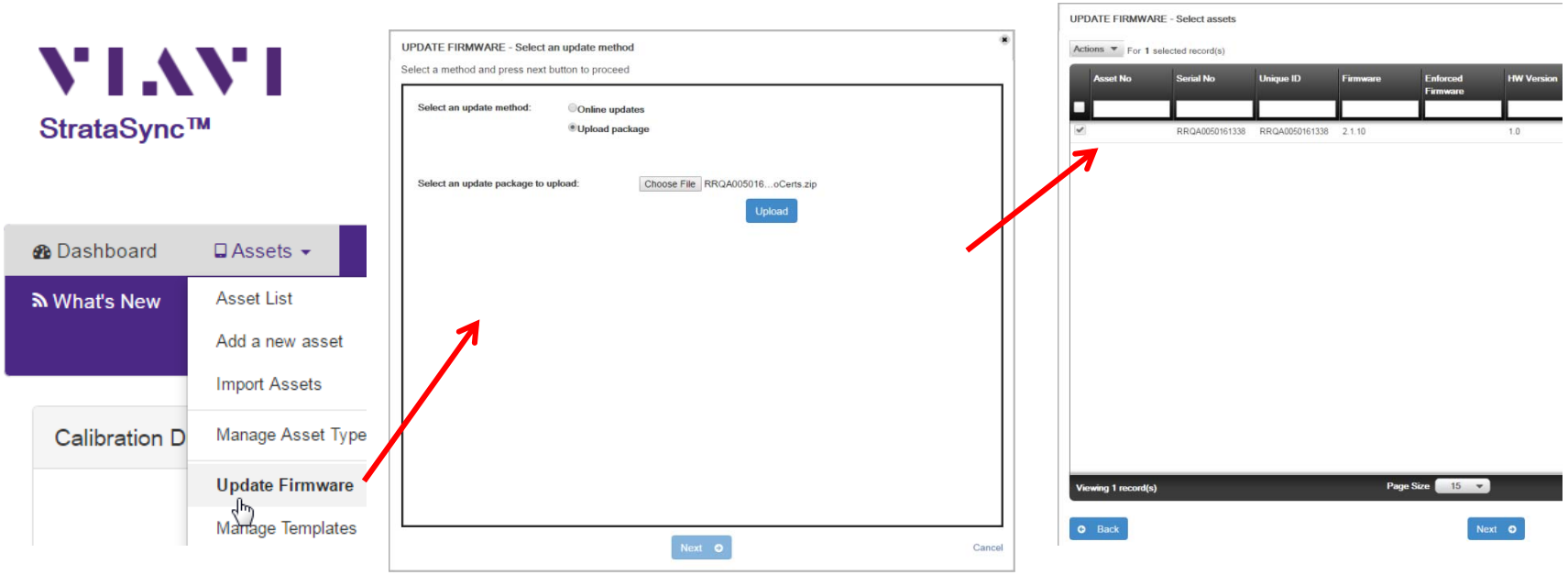
RRQA0041560148 ARQW0001760013

ONX BPI+ Euro Certificate upload via StrataSync

- If you need an **Euro BPI+ Certificate** on the ONX to run a DOCSIS test, you will first have to get it from Viavi. Please provide the ONX base unit and module serial numbers that are listed in ONX Hardware & Software Revision under System Settings:
  - Base unit → Unit ID under OneExpert Cable section
  - Module → App Barcode 0 under Cable Measurement section



- When you get the zip file with the Certificate, you will have to upgrade the ONX via the associated StrataSync account:
  - Select Asset → Update Firmware:
  - Then select upload package, chose the zip file (the att. zip file), upload it and push Next when the upload is marked as Success:
  - In the next view, you will see your ONX, select them and deploy the license following the instruction on the screen.



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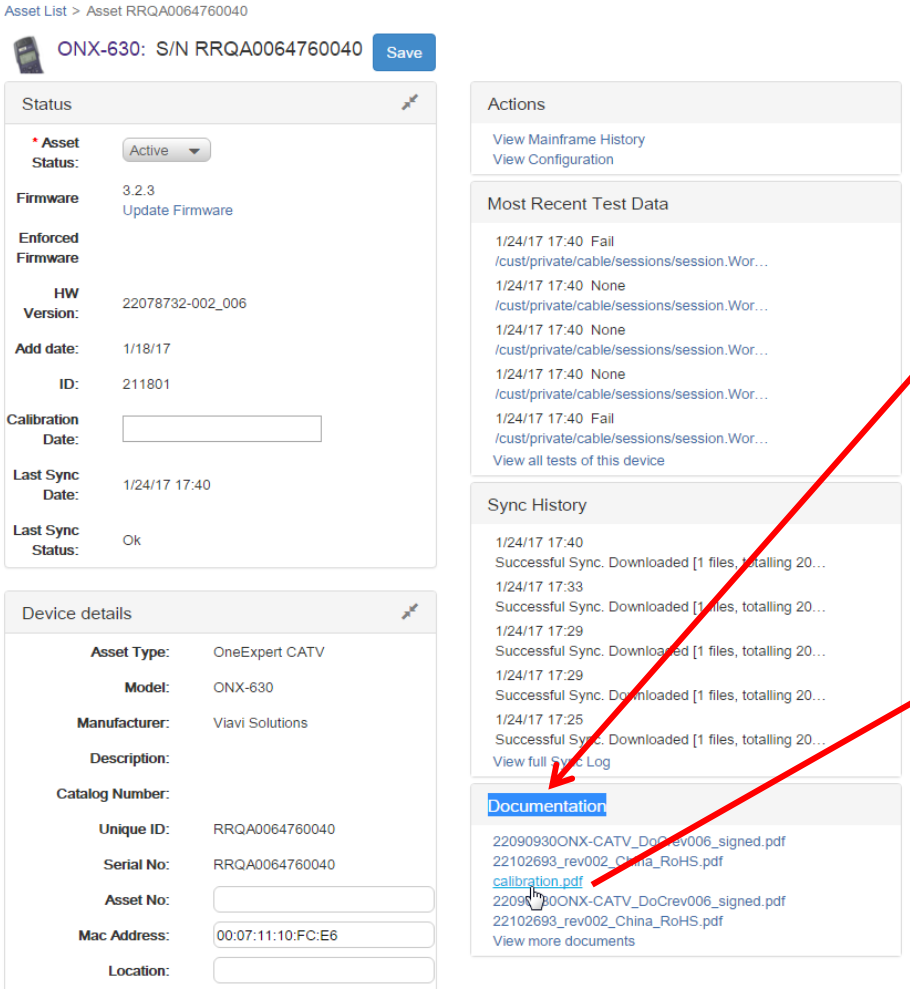
ONX Calibration Certificate (via StrataSync)



VIAVI

Certificate of Calibration

Model Number: ONX-CATV-D31-S-6520-1212;OneExpert CATV-D3.1 Sweep Ready
Serial Number: RRQW0024860095
PO Number: 5960026238/16M175
Calibration Date: 12-02-2016

This certificate certifies that the material furnished, as listed above, has been manufactured and/or serviced to all applicable specifications.

Inspections and/or tests have been performed, as applicable, on both a variable and attribute basis. Equipment utilized for these test has been calibrated in accordance with the requirements of SO/IEC 17025:2005 and ISO 9001:2008. Test and/or inspection equipment used for calibration are traceable to standards set forth, maintained and established by the United States Department of Commerce, National Institute of Standards and Technology (NIST).

The VIAVI recommended calibration interval is one year unless otherwise specified.

VIAVI Solutions
5808 Churchman Bypass
Indianapolis, IN 46203

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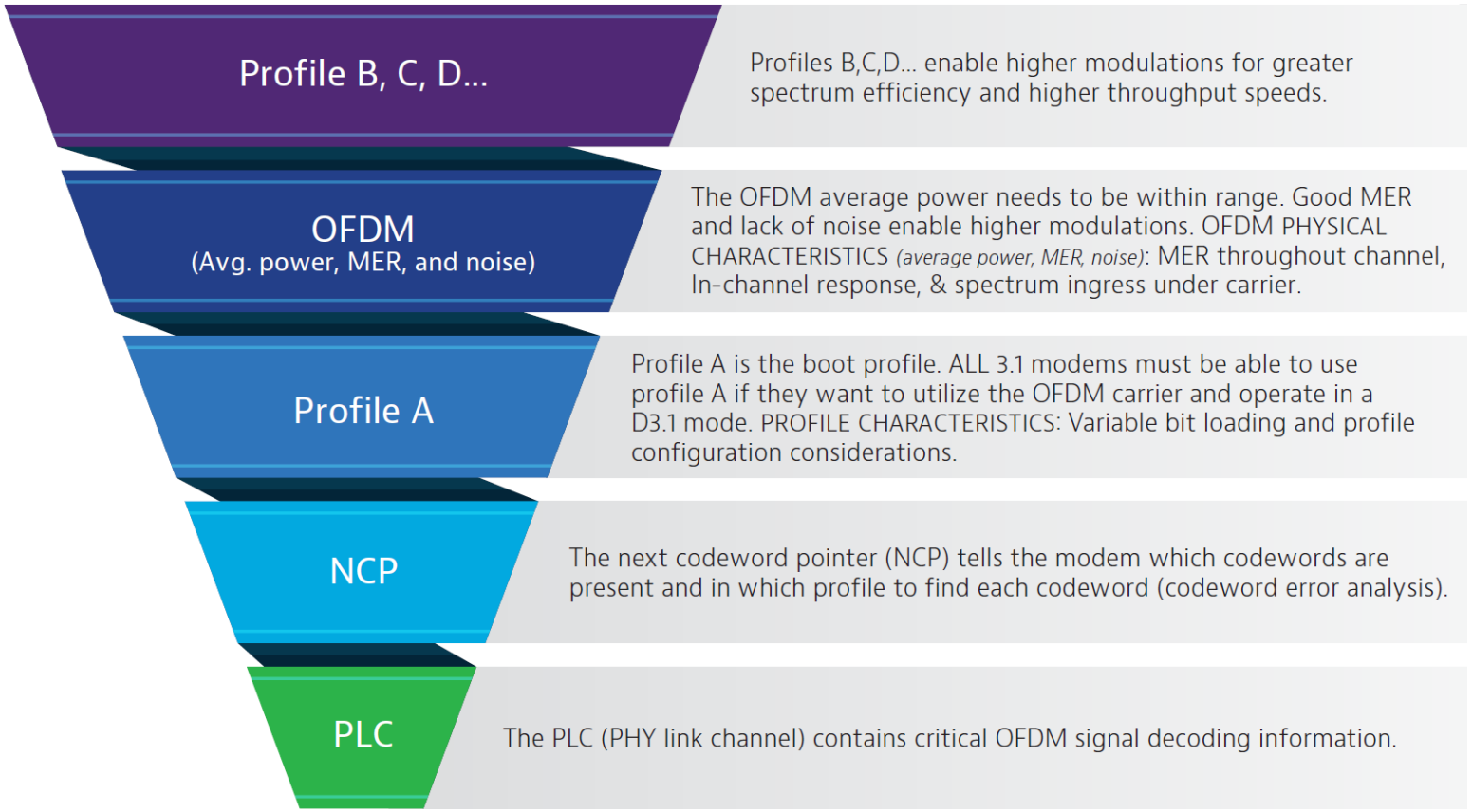
✓ 258 - ONX DOCSIS 3.1 Measurements

Testing OFDM building blocks and results analysis



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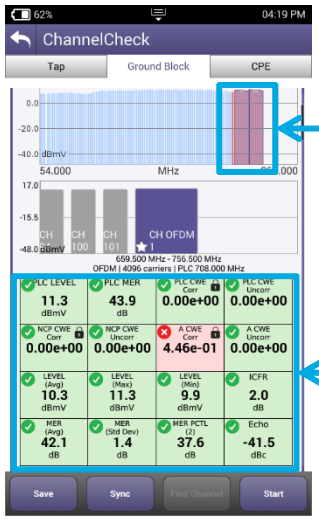
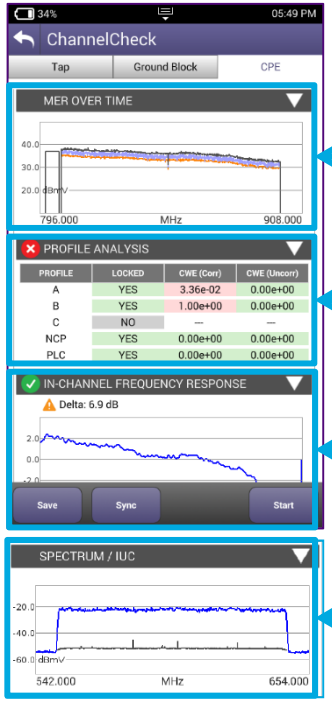
OneExpert CATV DOCSIS 3.1 measurements



Identify OFDM carrier in the lineup: Downstream scan measurement requires no learning curve, same as D3.0 scan, but shows OFDM signal

Overall OFDM carrier performance metrics including best and worst case; simple pass/fail indications



MER over entire OFDM channel provides insight into why higher tier profiles are failing

Analysis of different profiles available and which profiles can be supported at test location

In-Channel Response identifies roll-off and excessive ripple

Spectrum and noise identify portions of carrier where degradation may occur

OneExpert CATV with DOCSIS 3.1

- OFDM demodulation with D3.1 Profile Analysis
- **Full DOCSIS service testing including 32 Bonded + D3.1 OFDM carrier**
- Upstream **DOCSIS 3.1 OFDM-A capable**

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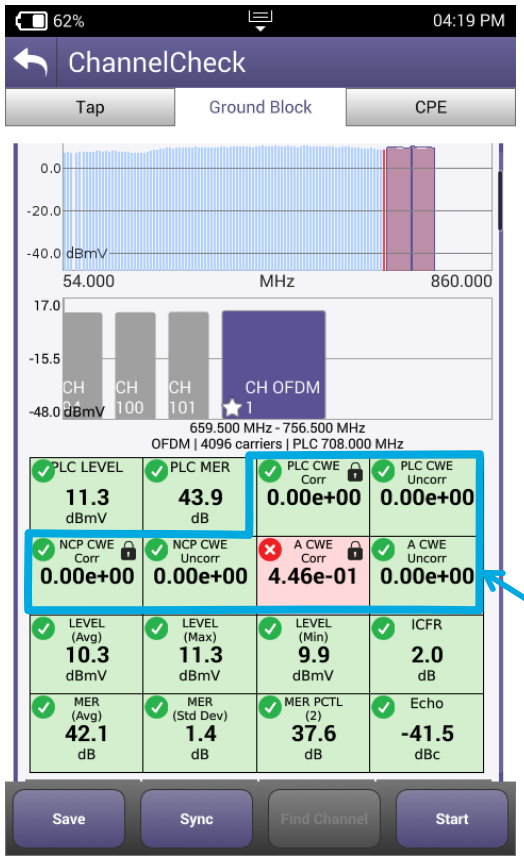
DOCSIS 3.1 Codeword Errors (CWE)



- **Codeword (CW):** a data bucket within a DOCSIS packet
- **CW Error (CWE)**: a byte-level data packet corruption resulting from QAM symbol displacement across constellation decision boundaries
- Correctable vs. Uncorrectable determined by number of corrupted symbols relative to CMTS forward error correction level settings
- If you are having CWEs, you may be losing data
- **Uncorrectable CWEs** indicate dropped packets (think post-FEC BER)
- Retransmit is required for recovery
- There is no recovery from dropped packets for real-time apps like VoIP!
- **Correctable CWEs** are an early warning that the uncorrectable threshold may be near! (think pre-FEC BER)

THINGS TO CHECK:

To make sure there are **no uncorrectable CWE**

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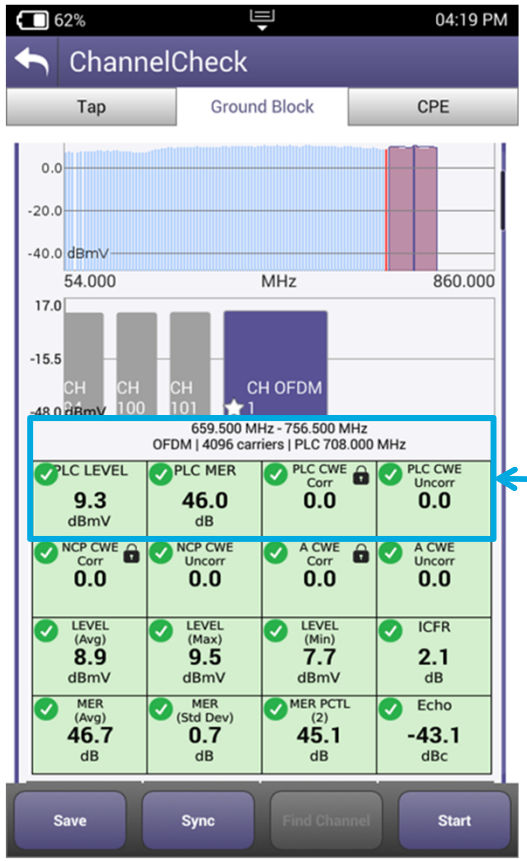
Testing PLC – PHY Link Channel



PLC contains CRITICAL OFDM signal decoding information

THINGS TO CHECK:

Level: >-15 dBmV (6 MHz)
MER: >15 dB (min)
Lock status: locked
Uncorrectable CWE: none
Other info: PLC center frequency

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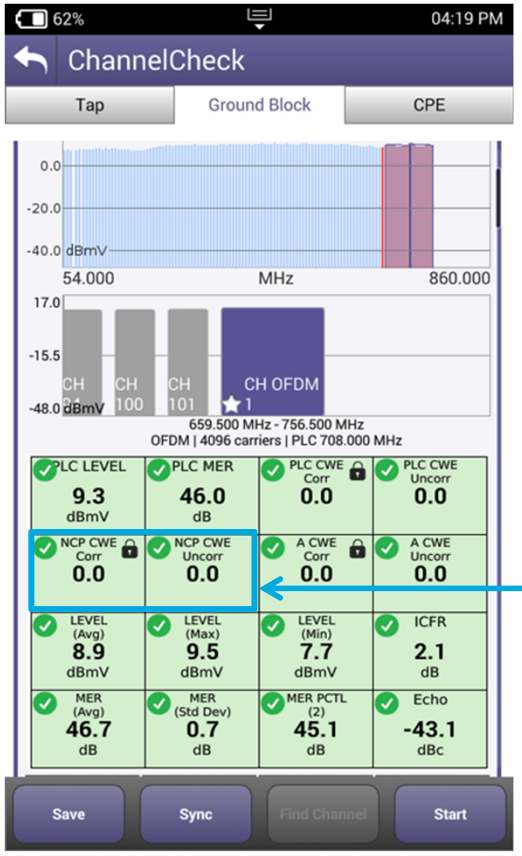
Testing Next Codeword Pointer (NCP)



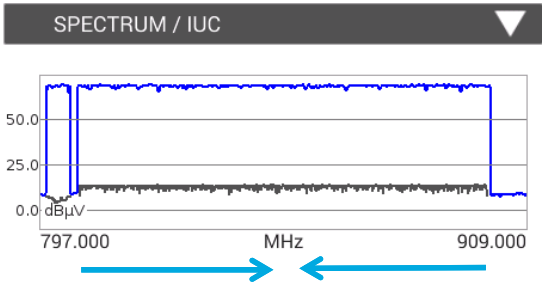
NCP

The **NCP** tells the modem which CW are present and in which profile to find each CW (CWE analysis), it is CRITICAL for proper data communication

Don't disregard OFDM performance at high end or low end. Roll off of either could impair a CM's ability to correctly receive NCP or CWs.

THINGS TO CHECK:

Lock status: locked
Uncorrectable CWE: none



Codewords start at LOW frequencies and populate UP

NCP's start at HIGH frequencies and populate down

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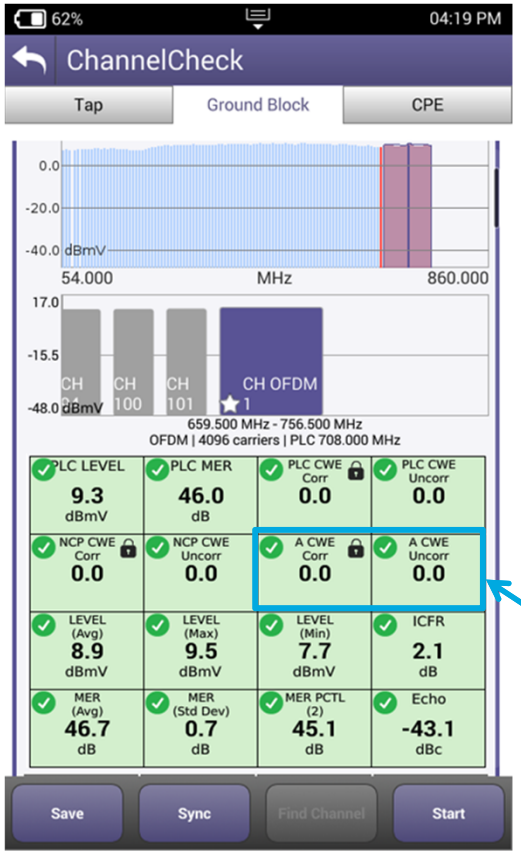
Testing Profile A



Profile A

Profile A is boot profile; ALL 3.1 modems must be able to use profile A

- Profile A is key to D3.1 modem communication via an OFDM carrier. This is where command and control, range, and registration occurs.
- In practice, profile A may be assigned lower mixed modulations, like QAM 64/16, so every D3.1 modem can communicate. Lower modulation profiles can operate at lower MER/CNR and power levels.
- If profile A isn't locked or has uncorrectable CWE, a modem may roll back and use only SC QAMs in 3.0 mode.

THINGS TO CHECK:

Lock status: locked
Uncorrectable CWE: none

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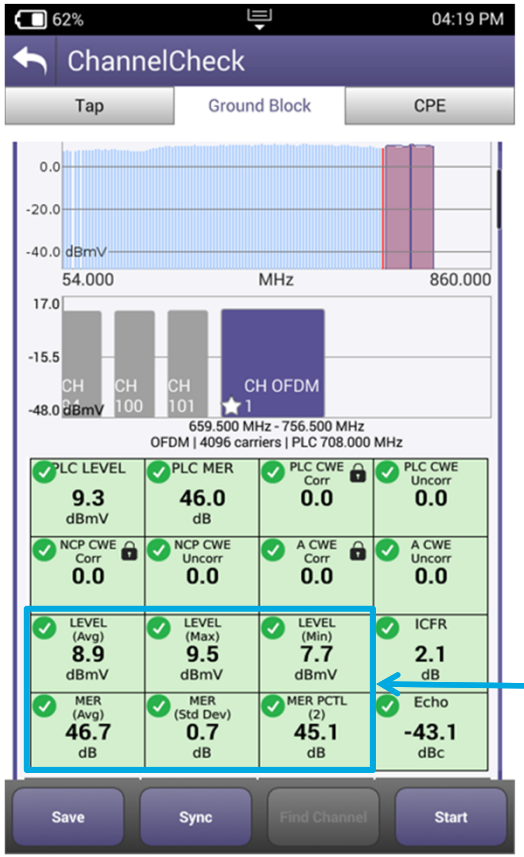
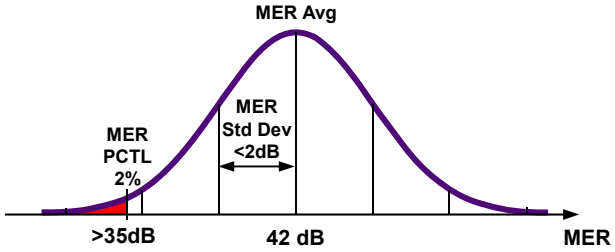
Physical Measurements (Level, MER)



OFDM
(Avg. power, MER, and noise)

OFDM Avg power must be within range. Good MER and low noise enable higher modulations.

MER 2 percentile shows how well 98% of the subcarriers are working and filters out underperforming ones that LDPC error correction will likely clear up.



THINGS TO CHECK:

Avg level, variable: >-6 dBmV recommended
Avg MER, variable: >36 dB recommended
MER at 2 percentile: >35 dB recommended
MER standard deviation: <2 dB recommended

CM Minimum CNR/MER Performance in AWGN		
Channel Modulation	Up to 1 GHz CNR(dB)	Min P_{6AVG} dBmV
4096	41.0	-6
2048	37.0	-9
1024	34.0	-12
512	30.5	-12
256	27.0	-15
128	24.0	-15
64	21.0	-15
16	15.0	-15

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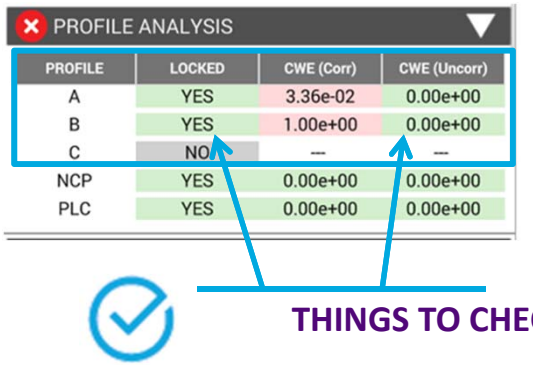
Testing Higher Profiles



Lock status: locked
Uncorrectable CWE: none

Profile B, C, D...

Profiles B,C,D… enable higher modulations for greater efficiency

- Higher profiles improve network efficiency. Optimally, more CM run on higher profiles for overall network efficiency and improved customer QoE.
- Profiles enable tiers of service, and allow best case service when consistent network constraints inhibit maximum performance
- Testing viability of all profiles provides quick assessment of network performance to any given test point (service outlet)
- Tech must be able to troubleshoot failing profiles and identify degradations
- Profile changes highlight drop or home wiring problems:

	TAP		Ground Block		Outlet/CPE	
	Profile Locked?	Uncorrectable CWE	Profile Locked?	Uncorrectable CWE	Profile Locked	Uncorrectable CWE
Profile A	YES	NO	YES	NO	YES	NO
Profile B	YES	NO	YES	NO	NO	YES
Profile C	YES	NO	YES	YES	NO	YES
Profile D	YES	NO	NO	YES	NO	YES

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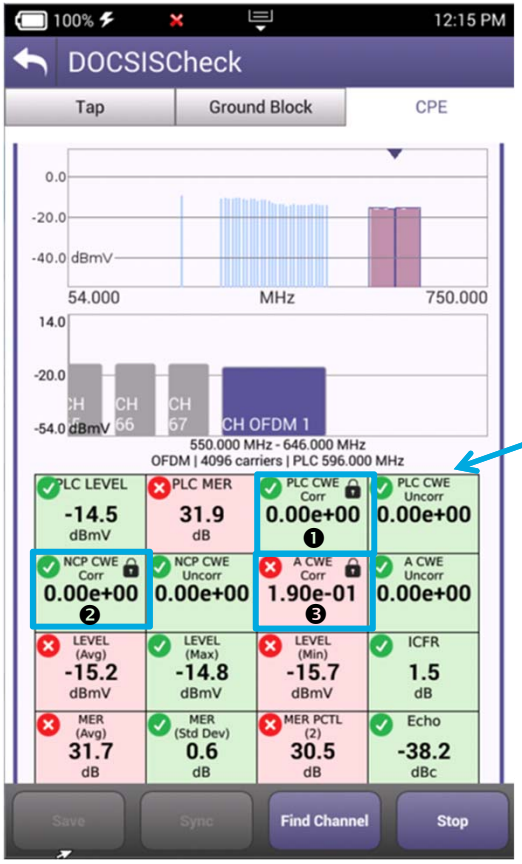
OFDM is DYNAMIC with varying subcarriers and LDPC
MER and Level alone don't tell the whole story

Profiles and CWE analysis are important



Component	Tasks	Importance	CWE expectations and impact
PLC PHY Link Channel	Contains CRITICAL OFDM signal decoding information	Critical	Should have 0 Uncorrectable-CWE otherwise OFDM may not work
NCP Next CW Pointer	Tells modem which CW are present and in which profile to find each CW	Critical	Should have 0 U-CWE otherwise OFDM may not work
Profile A	Boot profile. ALL 3.1 modems must be able to use profile A	Critical	U-CWE will cause poor QOE and possibly make OFDM carrier unusable, forcing data to standard QAM carriers instead of OFDM
Profile B,C,D	Enable higher modulations for greater efficiency	High	U-CWE will affect bandwidth and overall QOE

THINGS TO CHECK:

1. PLC is working well
2. NCP is working well
3. Profile A is working well with some correctible (in this case running 256 QAM)
4. Profile B (running 1024 QAM in this case) is on the edge: 100% correctable CWE but LDPC is correcting them all!
5. This makes sense, 1024 QAM level should be ≥12dBmV and MER > 34 dB

PROFILE ANALYSIS

PROFILE	LOCKED	CWE (Corr)	CWE (Uncorr)
A	YES	9.20e-01	0.00e+00
B	YES	❹ 1.00e+00	0.00e+00
NCP	YES	0.00e+00	0.00e+00
PLC	YES	0.00e+00	0.00e+00

CM Minimum CNR/MER Performance in AWGN

QAM Modulation	Up to 1 GHz CNR(dB)	Min P_{6AVG} dBmV
4096	41.0	-6
2048	37.0	-9
❺ 1024	34.0	-12
512	30.5	-12
256	27.0	-15
128	24.0	-15
64	21.0	-15
16	15.0	-15

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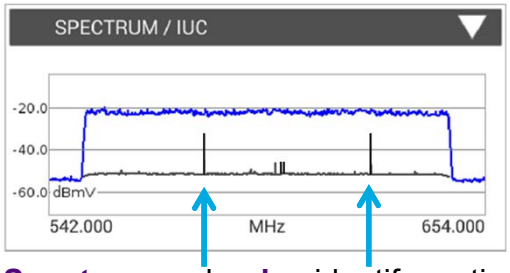
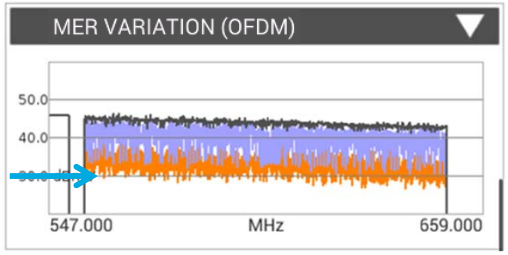
DOCSIS 3.1 Signal Testing and Troubleshooting

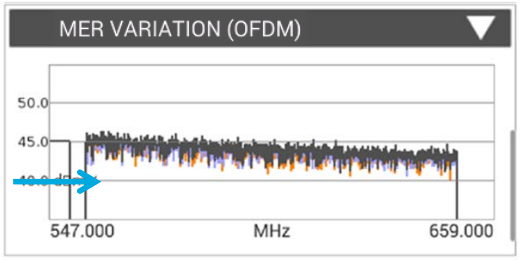
Measuring MER across entire subcarrier list enables identifying potential impairments with impact on higher level profiles



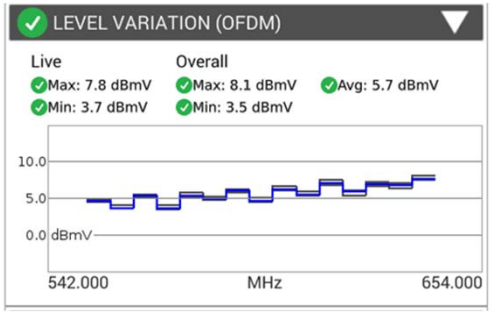
Spectrum and **noise** identify portions of a carrier where degradation may occur and require possible profile adjustment.



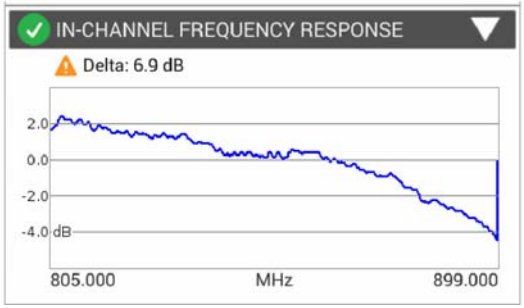
Unstable MER with drops below 30dB means only profiles running 256 QAM or lower will work.



Stable **MER better than 40 dB** means QAM 2048 and 4096 will work.



Level variation within the OFDM channel band provides insight into frequency-response related issues.



In-Channel Response identifies roll-off and excessive ripple

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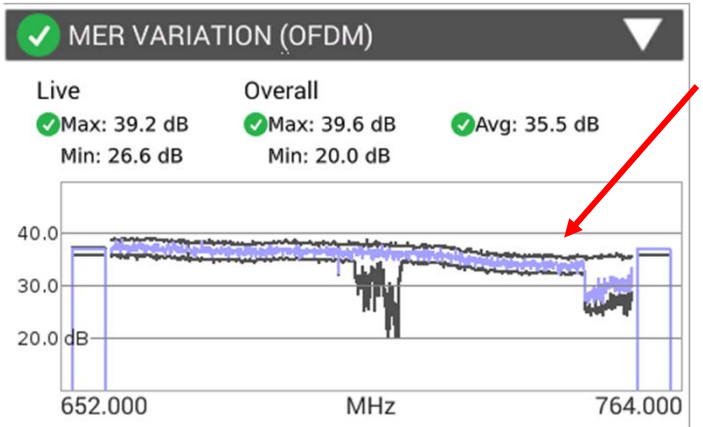
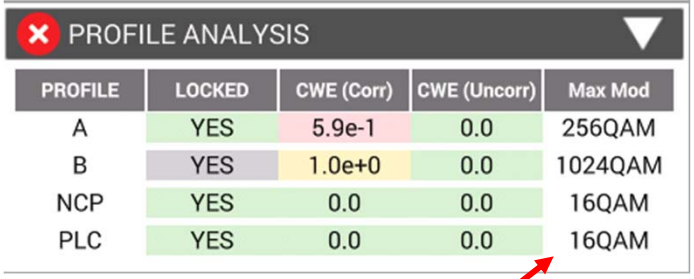
Expert Modes - MER Per Subcarrier and Profile Max Modulation

OFDM measurements - Channel/DOCSIS Expert

- Added MER Subcarrier Plot full screen graph that can be opened from the MER Variations Widget.
- Also added MER Subcarrier plots to HTML report.
- Added OFDM Profile MER Max Modulation to OFDM Profile Analysis widget
- Also added OFDM Profile MER Max Modulation to the HTML report.

Going Deeper into OFDM Subcarriers





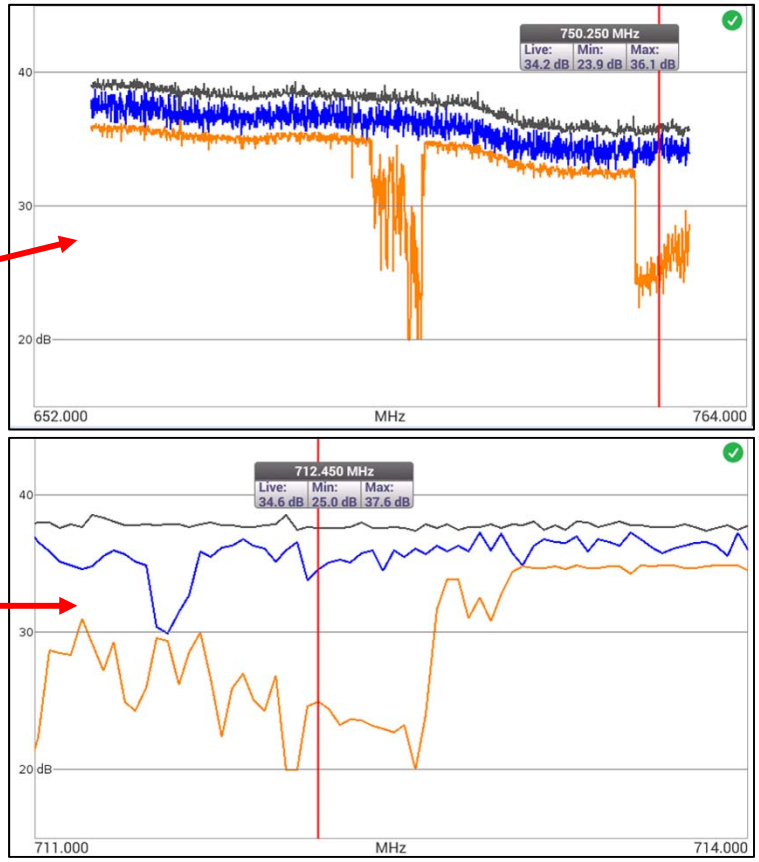
PROFILE	LOCKED	CWE (Corr)	CWE (Uncorr)	Max Mod
A	YES	5.9e-1	0.0	256QAM
B	YES	1.0e+0	0.0	1024QAM
NCP	YES	0.0	0.0	16QAM
PLC	YES	0.0	0.0	16QAM

Max Modulation of each profile is listed in Channel & DOCSIS Expert Modes

MER of each subcarrier is plotted side by side

The view can be expanded and a marker added allowing users to see at which frequencies the subcarriers are degraded

With pinch and zoom capabilities users can get all the way down and see more detail of each subcarrier quality



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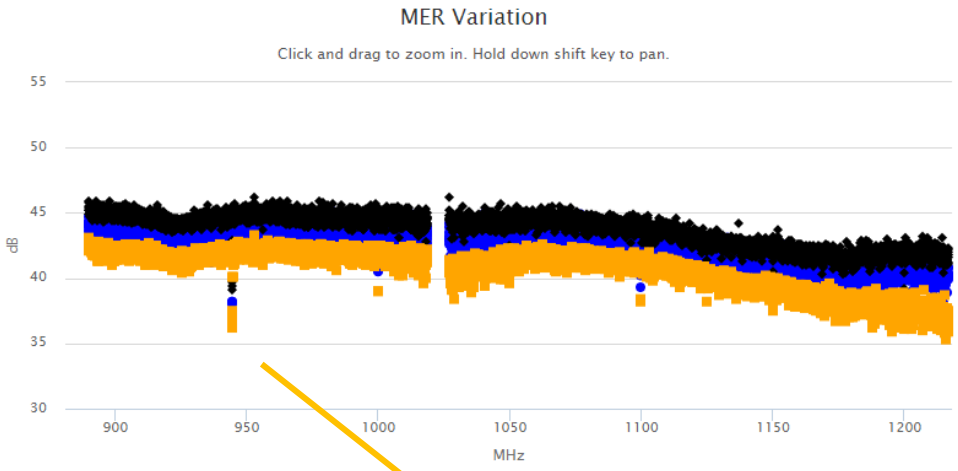
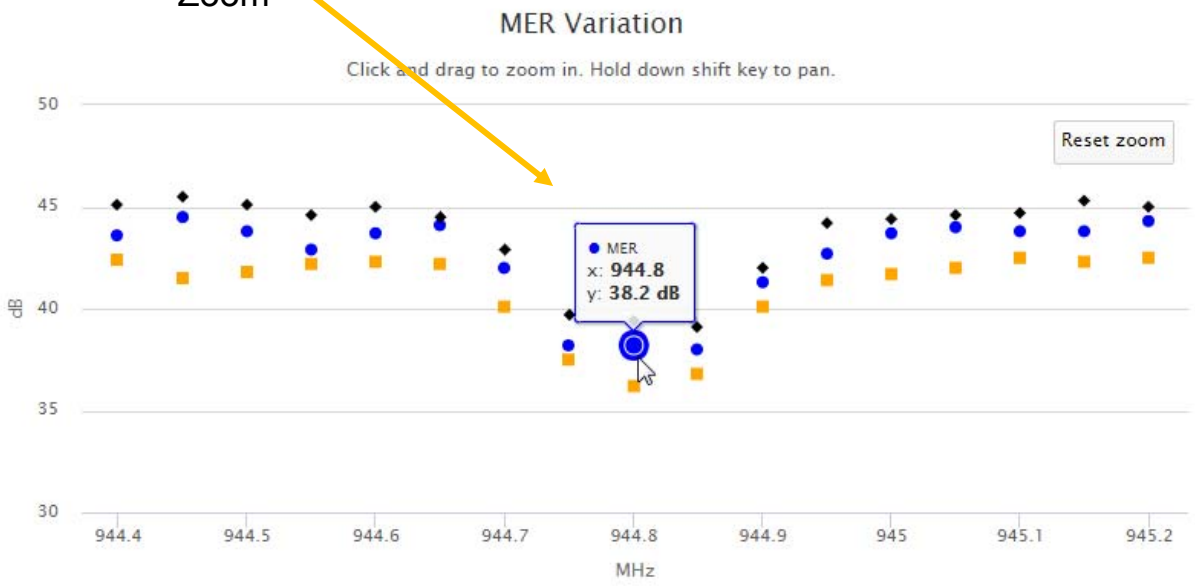
StrataSync view



OFDM Profile Analysis

Channel	Profile	Lock Status	CWE Correctable	CWE Uncorrectable	Max Modulation
OFDM 1	A	Locked	0.0	0.0	16QAM
OFDM 1	B	Unlocked			1024QAM
OFDM 1	C	Locked	1.5e-2	0.0	2048QAM
OFDM 1	D	Unlocked			4096QAM
OFDM 1	NCP	Locked	0.0	0.0	QPSK
OFDM 1	PLC	Locked	0.0	0.0	16QAM

Zoom



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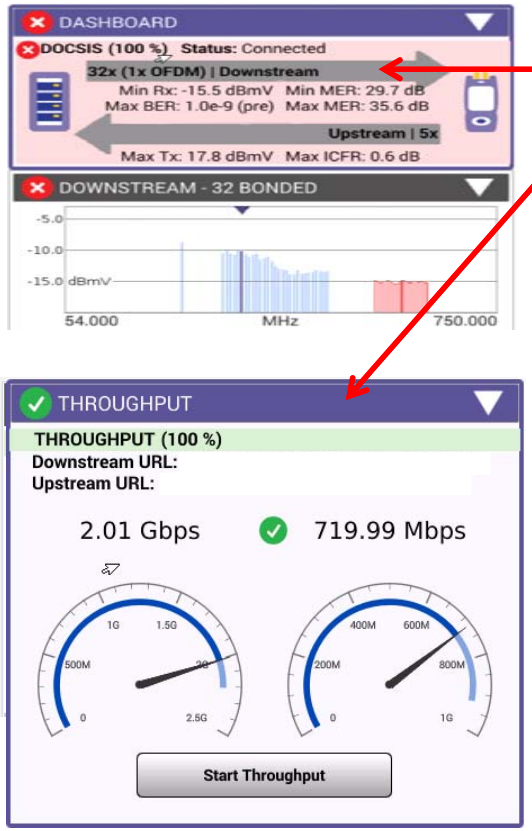
DOCSIS Service Level Testing

DOCSIS 3.1 is backwards compatible – can utilize just 3.0 QAM carriers. Verify bonding with OFDM carriers to ensure that high-tier data traffic is on more efficient OFDM carriers and is not impacting other customers.



THINGS TO CHECK:

Bonding with OFDM, Upstream bonding and Throughput

- DOCSIS 3.1 systems can provide over 1 Gbps throughput
- Validating operation at subscribed rates is important to verify customer experience.
- Testing at DOCSIS physical layer identifies RF related impacts on overall service performance.
- Testing both DOCSIS service and Ethernet helps ensure top customer QoE.
- Consumer-grade PC HW limitations can prevent testing up to 1 Gbps.
  → Testing both DOCSIS and Ethernet layer to 1 Gbps helps distinguish between service problems and equipment problems.

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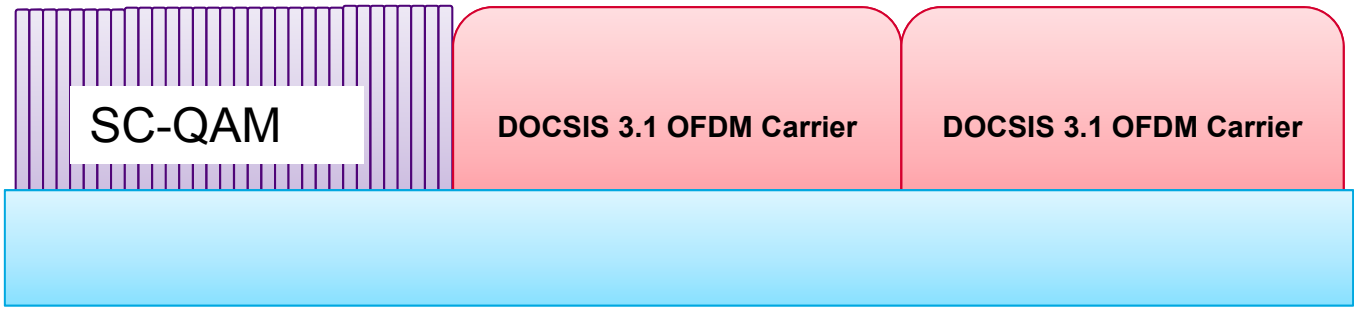
How to set the level of a D3.1 OFDM carrier



DOCSIS 3.1 OFDM carrier power levels should be measured and referenced in comparison to the power in a 6MHz carrier.

In a flat system, the average power of the OFDM, referenced to a 6MHz carrier should be set to the same power level as the adjacent 6MHz QAM 256 carriers.

NOTE: The TOTAL power of the 96 or 192 MHz OFDM carrier is greatly different than the average power in a 6MHz bandwidth.
Total power of 96/192MHz wide carrier: This is not referenced to a 6MHz carrier

Total Power = Total Power PER Channel (6MHz) + $10\log_{10}$(Channel Bandwidth).

Where Channel Bandwidth would be overall OFDM Bandwidth/6MHz channel bandwidth = # of 6MHz Channels :

- ➔ for a 96MHz wide OFDM carrier the TOTAL power will be 12.04dB higher
- ➔ for a 192 MHz wide OFDM carrier the TOTAL power will be 15.05dB higher

NOTE: DON'T USE THE TOTAL OFDM POWER to ADJUST CMTS OUTPUT POWER
(This would be like using the total integrated power of 32 DOCSIS QAM carriers to set the level)

Example: Single 6MHz channel power = 5 dBmV
➔ Total Power(96MHz channel) = 5dBmV + $10\log_{10}(16)$ = 5 + 12.04 = 17.04dBmV → This is what some spectrum analyzers (like R&S FSW) show

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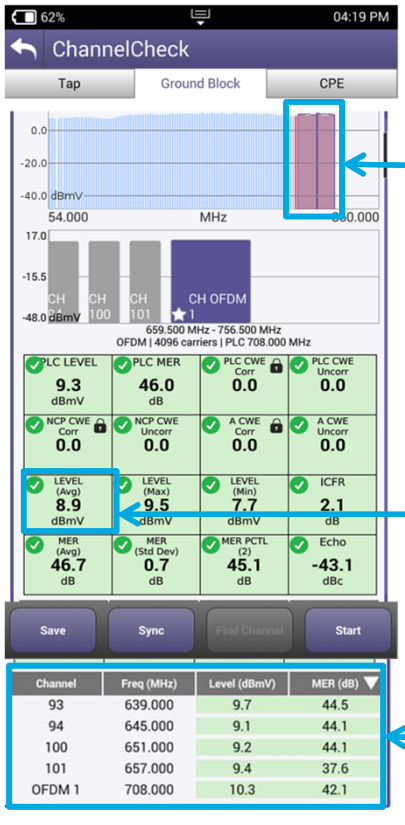
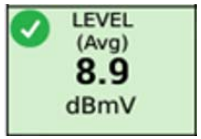
DOCSIS 3.1 OFDM Carrier Level Measurements



Select OFDM carrier in scan



Look at OFDM carrier average level

Level approximates 6MHz QAM power, for example, all at 10dBmV

- Measure and reference OFDM carriers in comparison to power in a 6 MHz bandwidth (CableLabs® recommendation).
- With 8 MHz QAM in Europe → Set the OFDM level (ref. 6 MHz) **1.2 dB below the 8 MHz QAM 256** to maintain the same power/Hz.
- PLC carrier average power will be approximately 0.8dB higher than other carriers due to additional pilots and data patterns
- Total OFDM carrier (up to 192MHz) power is greatly different than average power in a 6 MHz bandwidth:
  - For a 96 MHz wide OFDM carrier, the total power will be 12.04 dB higher.
  - For a 192 MHz wide OFDM carrier, the total power will be 15.05 dB higher
- Do not use the total OFDM power to adjust CMTS output power: this would be like using total integrated power of 32 DOCSIS QAM carriers to set level.

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Summary – Optimizing DOCSIS 3.1 for Gigabit services

- **Levels alone aren't enough**
  - It is important to have a tool that can drill down into the D3.1 mechanisms that ensure good performance and then help to find where the performance degradations are occurring in the plant and home.

- **Testing PLC** – LOCK, Level, Uncorrectable CWE

THINGS TO CHECK:
Level: >-15 dBmV (6 MHz)
MER: >15 dB (min)
Lock status: locked
Uncorrectable CWE: none
Other info: PLC center frequency

- **Testing NCP** – LOCK, Uncorrectable CWE

THINGS TO CHECK:
Lock status: locked
Uncorrectable CWE: none

- **Testing Profile A** – LOCK, Uncorrectable CWE

THINGS TO CHECK:
Lock status: locked
Uncorrectable CWE: none

- **Physical Measurements OFDM**
  - Average Power Level (in relationship to a 6MHz carrier)
  - Average MER & MER 2nd Percentile (Make sure 98% are within spec)

THINGS TO CHECK:
Avg level, variable: >-6 dBmV recommended
Avg MER, variable: >36 dB recommended
MER at 2 percentile: >35 dB recommended
Level standard deviation: <2 dB recommended

- **Testing Higher Profiles**
  - Lock - Uncorrectable CWE within acceptable rates
  - Troubleshoot degradations between demarcation points

THINGS TO CHECK:
Lock status: locked
Uncorrectable CWE: none

- **Optimizing Service Performance**
  - Service Level testing - Bonding - DOCSIS Ranging & Registration
  - Throughput on DOCSIS & Ethernet

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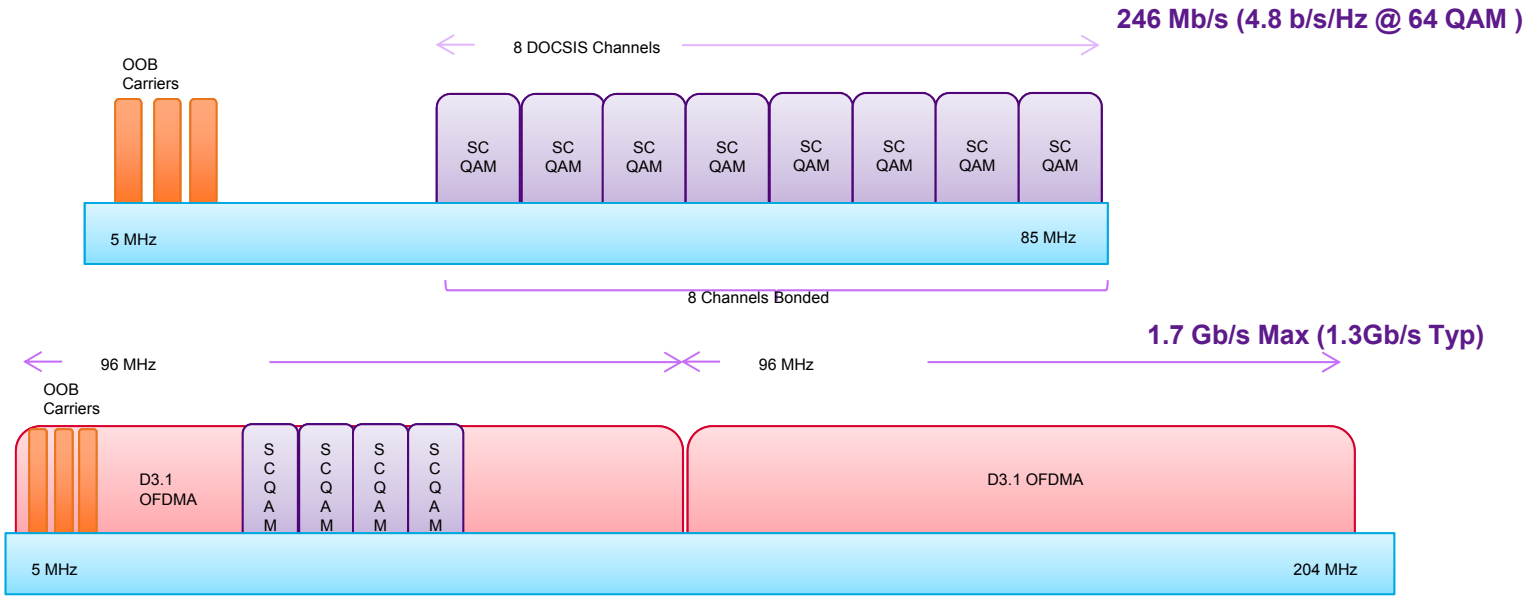
DOCSIS 3.1 Upstream - overview

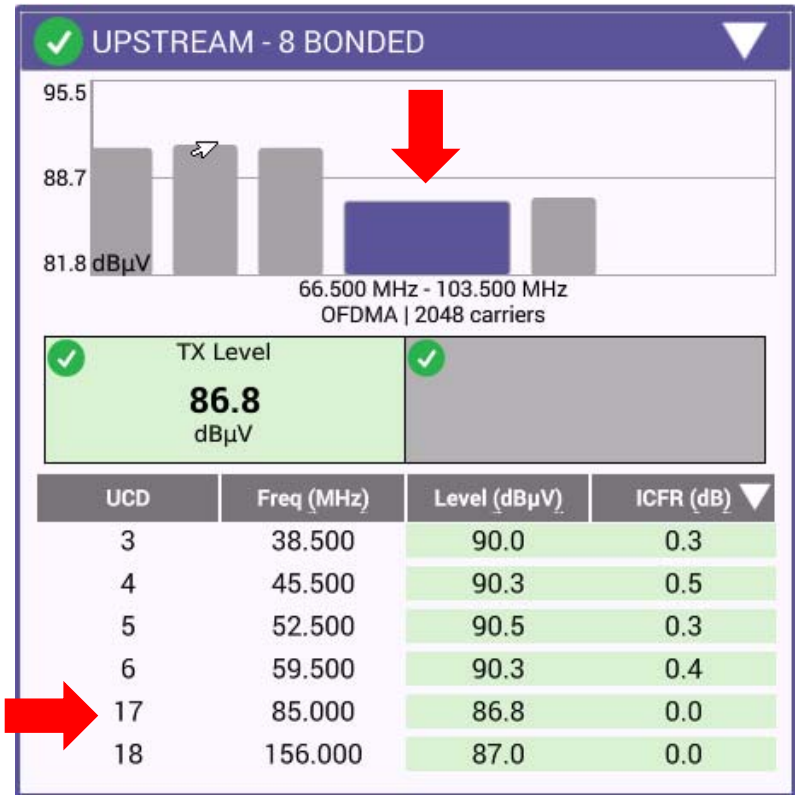
Upstream Bonding:

- DOCSIS 3.1 modem MUST support bonding of 8 SC QAM's
- DOCSIS 3.1 modem must support two (2) 96MHz OFDMA carriers
- DOCSIS 3.1 modem must support bonding between OFDMA and SC-QAM

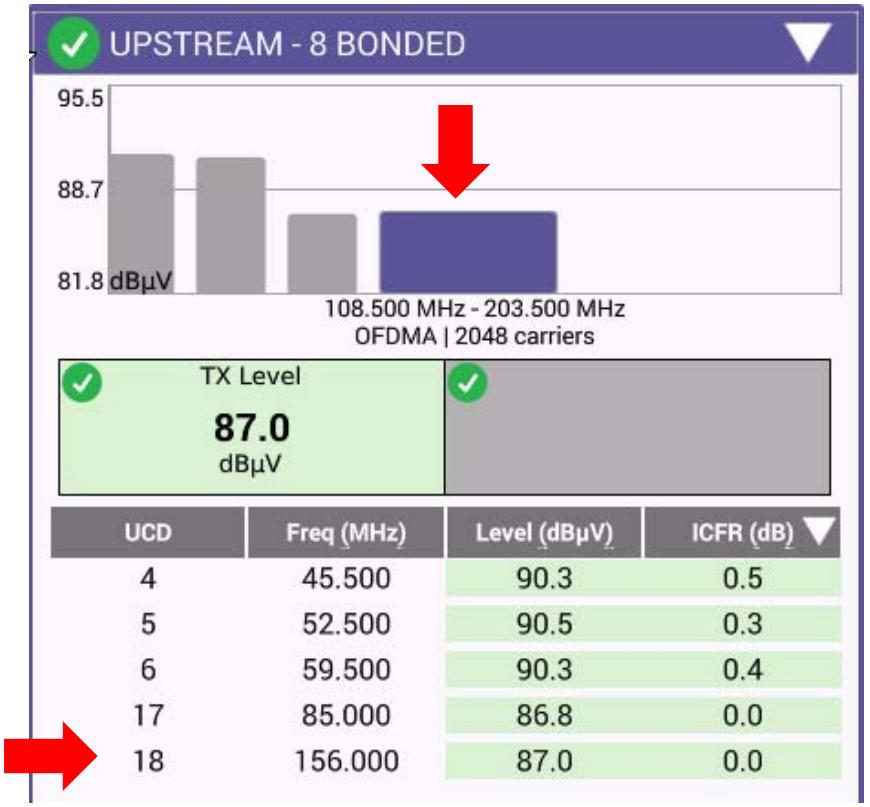


* New layout from 3.4.6

DOCSIS 3.1 – upstream trial measurements



UCD	Freq (MHz)	Level (dBµV)	ICFR (dB)
3	38.500	90.0	0.3
4	45.500	90.3	0.5
5	52.500	90.5	0.3
6	59.500	90.3	0.4
17	85.000	86.8	0.0
18	156.000	87.0	0.0



UCD	Freq (MHz)	Level (dBµV)	ICFR (dB)
4	45.500	90.3	0.5
5	52.500	90.5	0.3
6	59.500	90.3	0.4
17	85.000	86.8	0.0
18	156.000	87.0	0.0

UCD17: OFDMA 1
66.500MHz-103.500MHz

UCD18: OFDMA 2
103.500MHz - 203.500MHz

*Note:

- level for DS3.1 OFDMA is referenced in comparison to power P1.6 in a 1.6 MHz bandwidth (CableLabs®).
- Levels for DS3.0 SC-QAM channels that are 6.4 MHz in BW have a power of P6.4=P1.6r_n + 6 dB

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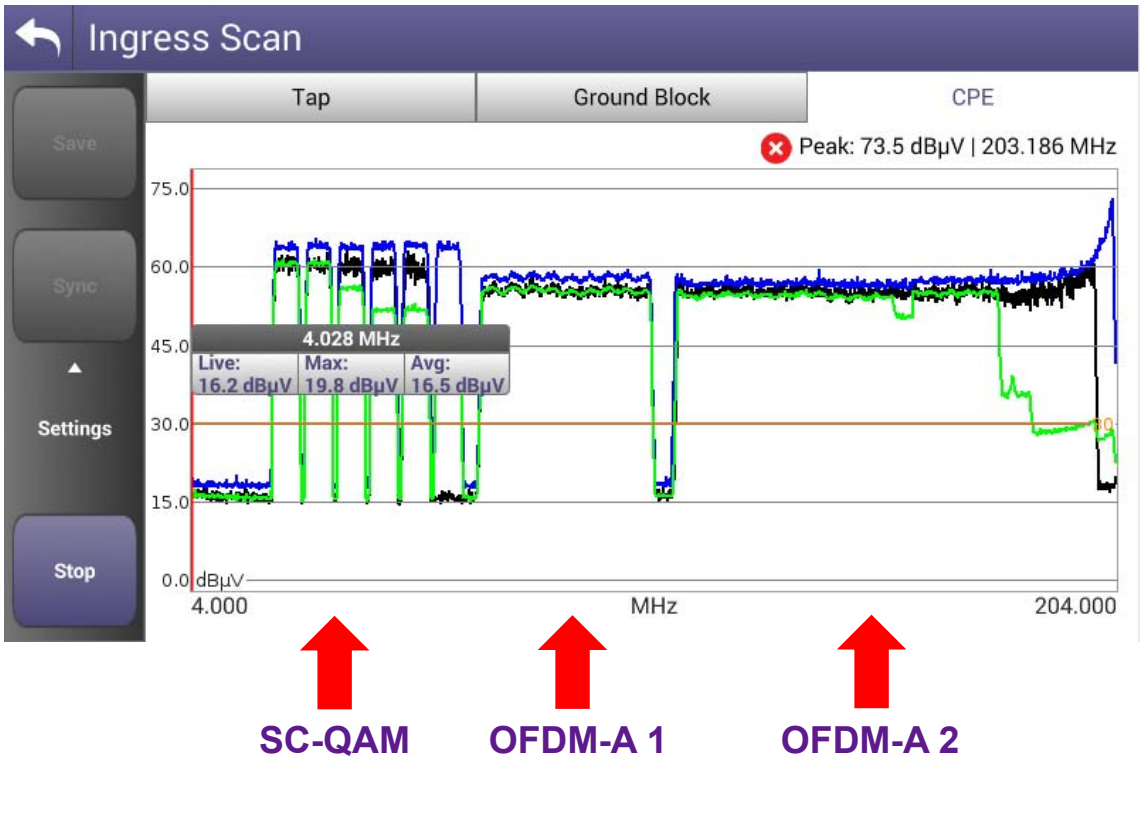
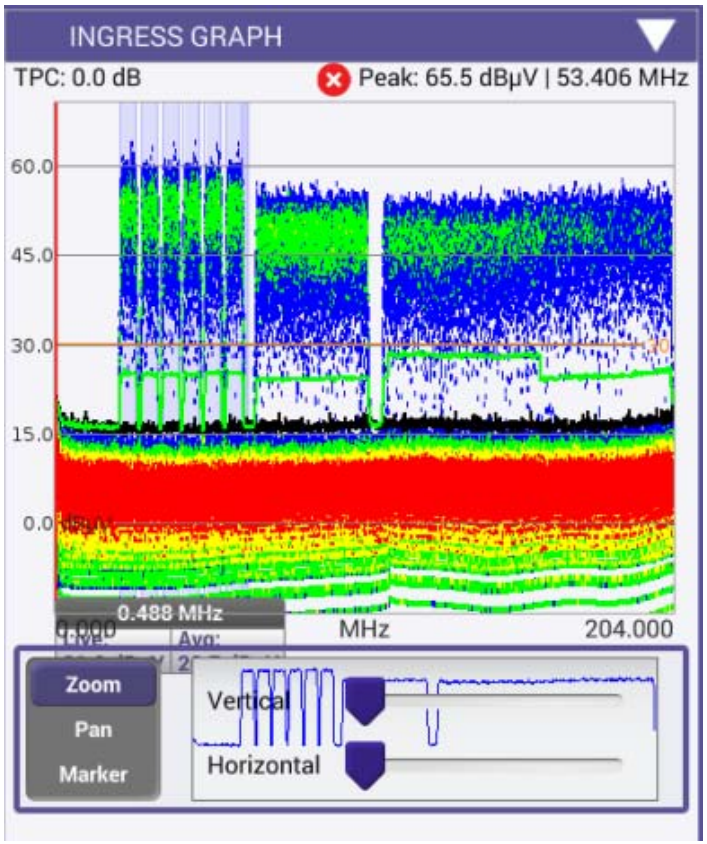
* New layout from 3.4.6

DOCSIS 3.1 – upstream trial measurements





- ✓ 278 – SWEEP & Plant Maintenance System

What is Sweep and Why is it Done

- Sweeping tests cable network frequency response (frequency = x; amplitude = y)
- Shows RF amplitude variation throughout operating frequency range
  - according to design
  - as impacted by aging in environment or damaging event
- Very effective tool for alignment and troubleshooting in
  - new construction
  - as part of scheduled plant maintenance
  - when network is impacted by environmental event

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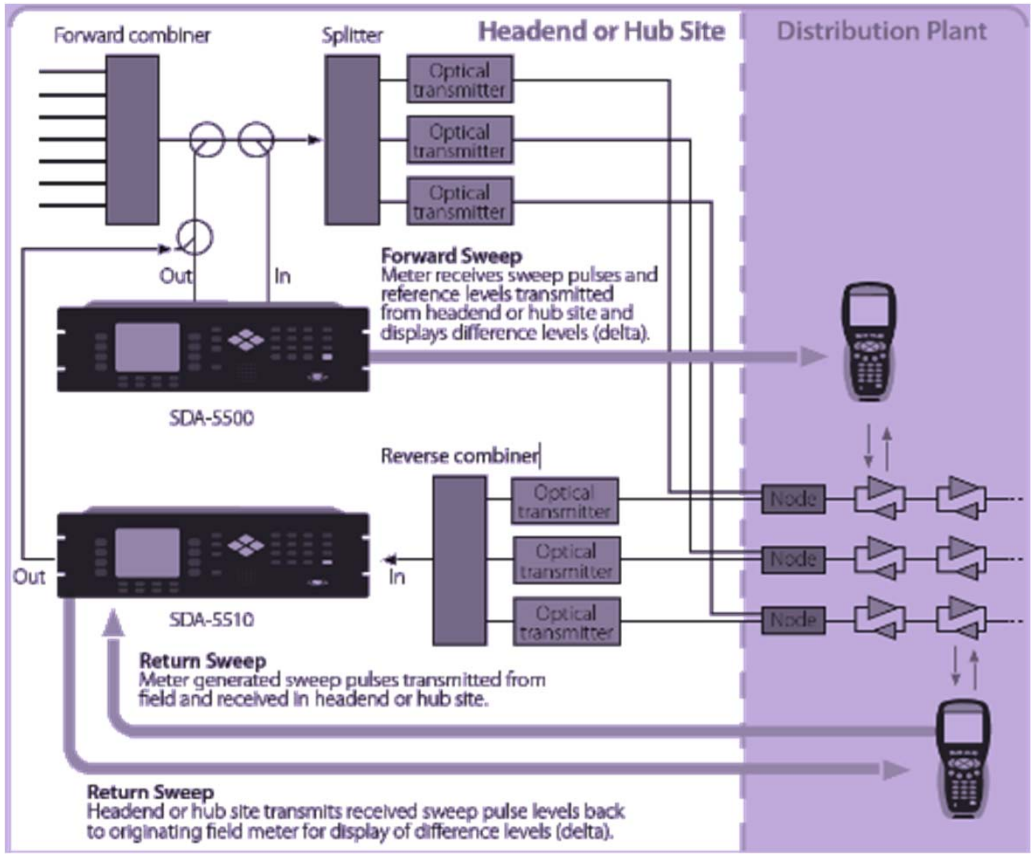
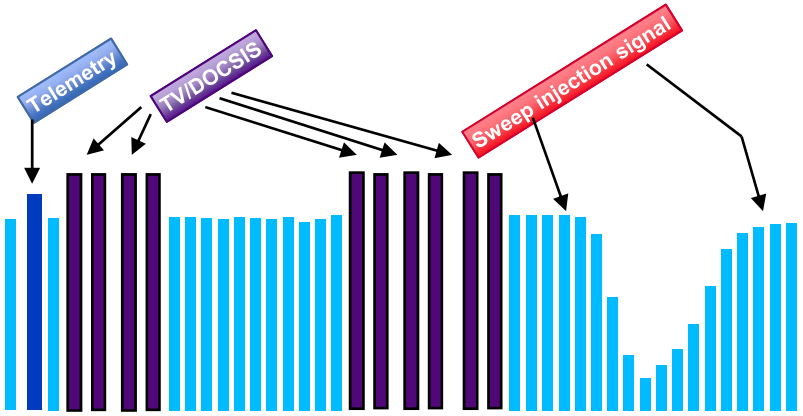
Forward & Reverse Sweep Process - Traditional



- Non-interfering forward and reverse sweep operation
- 4–1000 MHz frequency band
- Continuous updating between headend and field units
- Analog, digital and DOCSIS carrier levels included in response
- References active carriers ensuring no degradation in service quality
- Sweep return path with up to 10 users simultaneously



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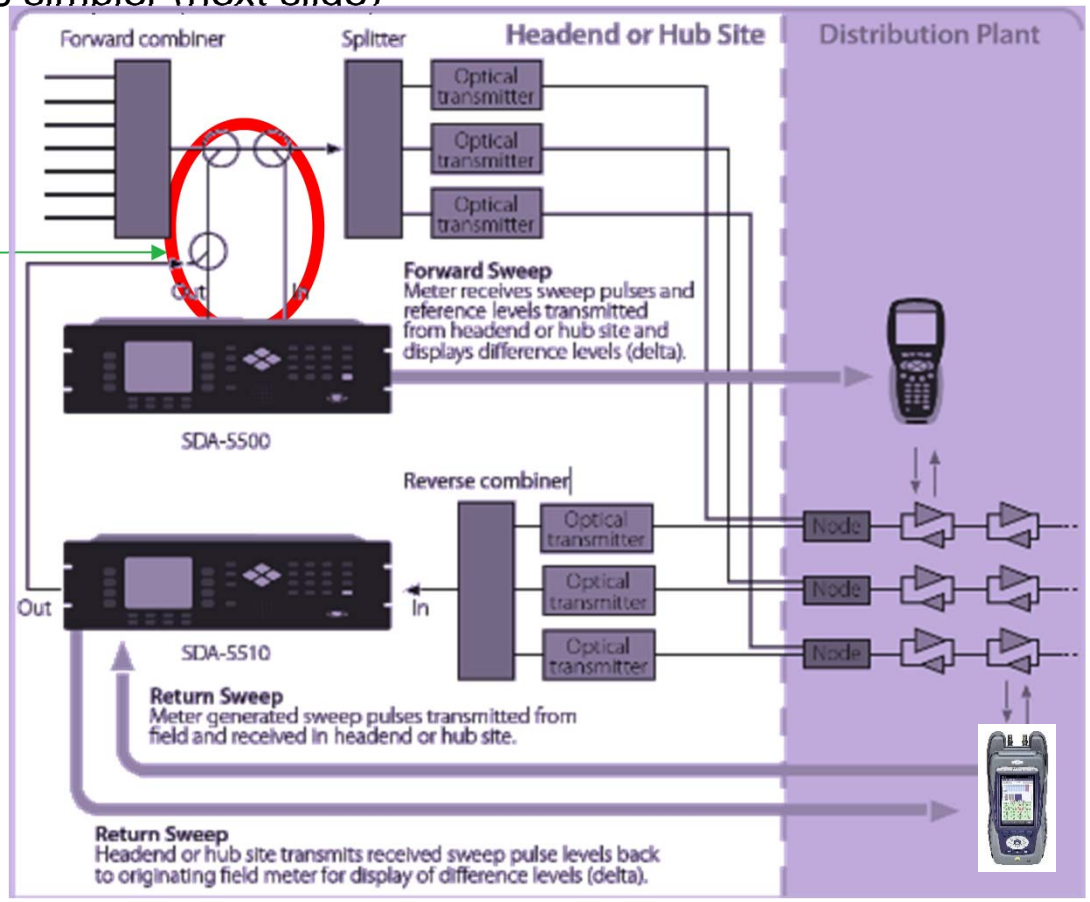
SDA 5500/5510 Network Configuration

- ONX-630 sweep is compatible with SDA
- Application is same as DSAM
- SCU-1800 network configuration is simpler (next slide)

- The SDA required sending a sample of downstream signals, to the receiver to eliminate changes in amplitude at the source from the response measurement.
- This was required mainly due to instability of analog video carriers.



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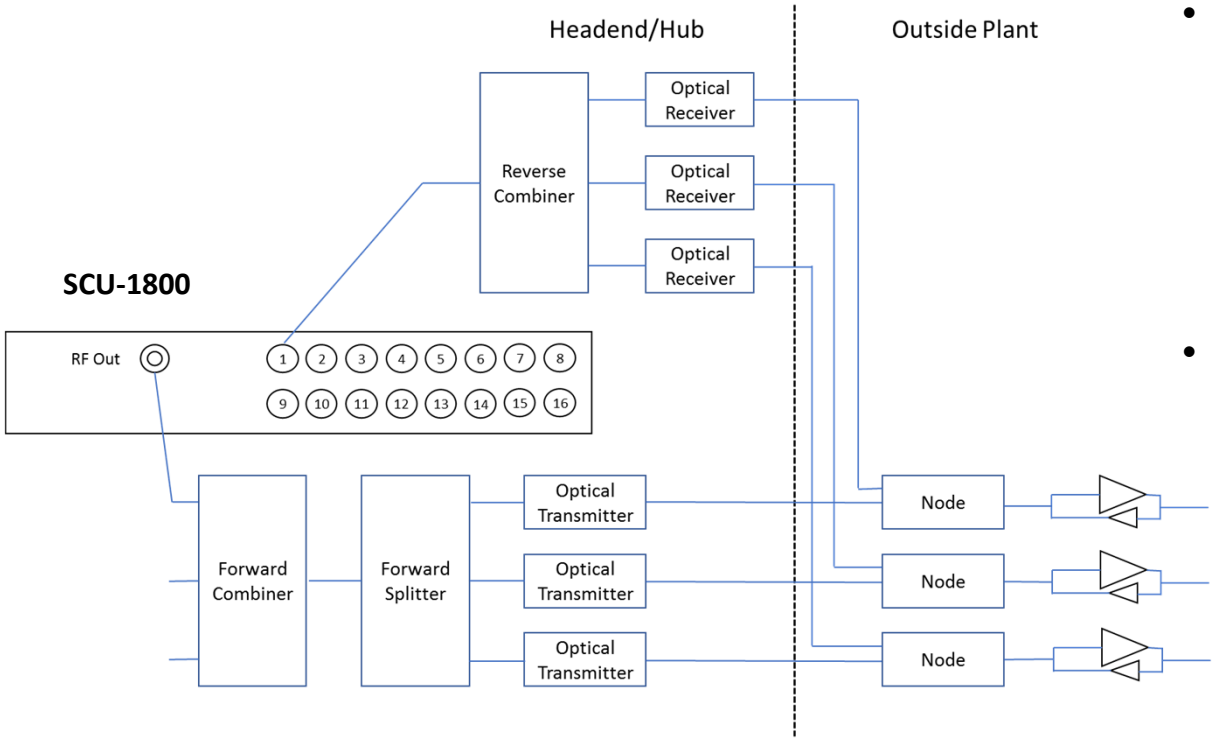
Typical SCU-1800 Connection diagram

- No sample of downstream signals is needed.
- Combined reverse paths can be connected to each of 16 ports (optionally activated)



- Most cable systems have migrated to fully digital content, eliminating the need to continuously reference downstream levels.
- The SCU does not require a sample of the downstream signals, and the network configuration is simpler

- Downstream levels can be verified and adjusted as measured at the sweep test point on the combining network.
- Upstream level from the ONX must be configured such that the signal arriving at the input on the SCU is at around 0 dBmV ±10 dB.

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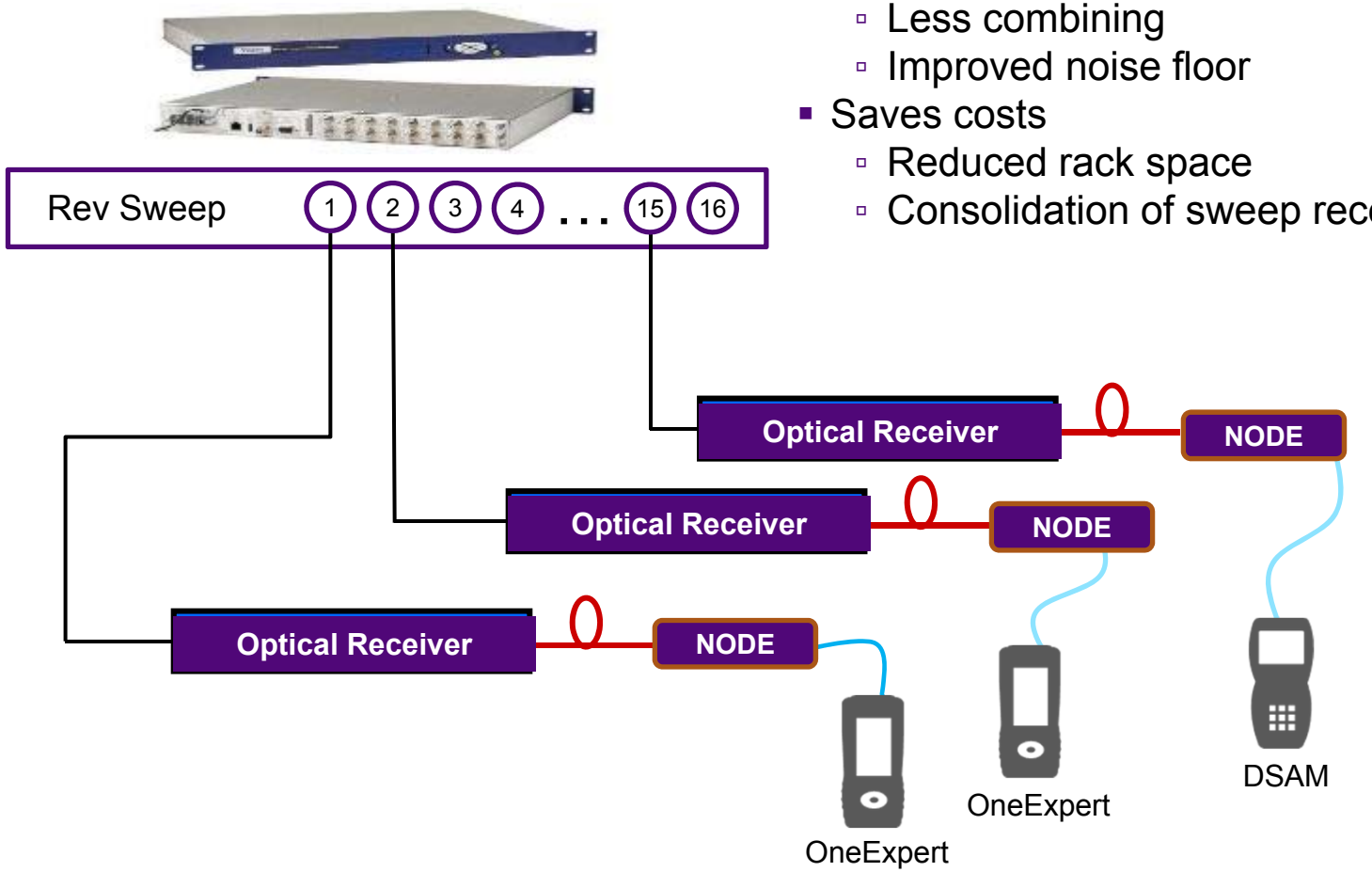
Multiple reverse sweep input ports
Reduces costs and improves performance

- Integrated 16 port capability (SW optional)
- Provides improved performance
  - Less combining
  - Improved noise floor
- Saves costs
  - Reduced rack space
  - Consolidation of sweep receivers



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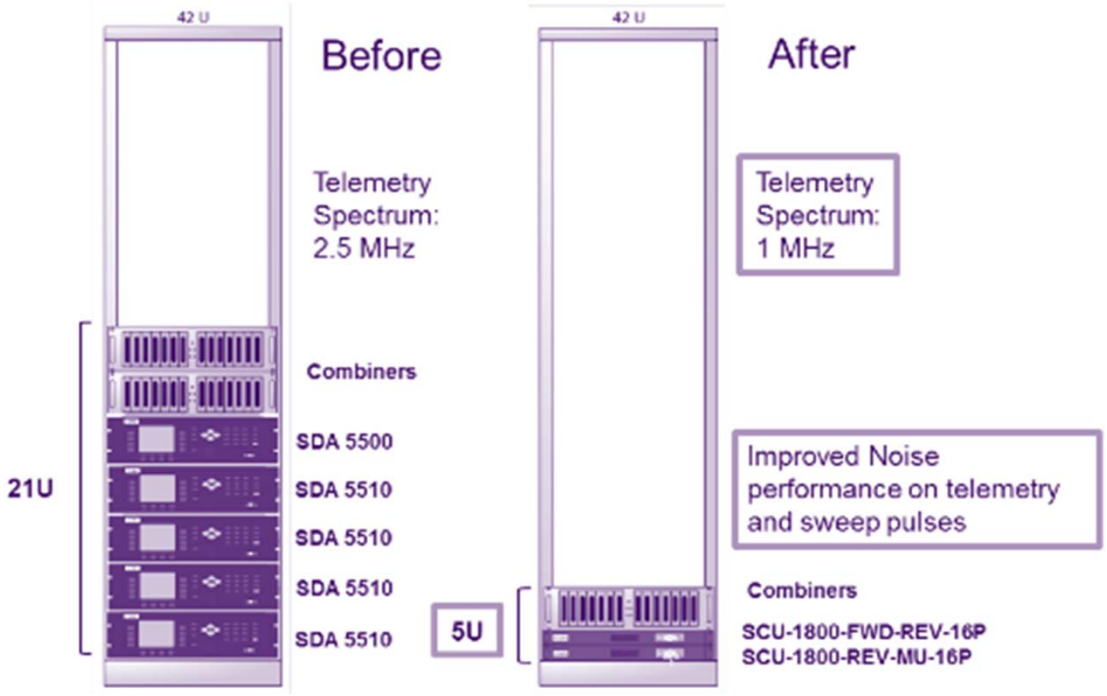
SCU-1800 Features

- **Space conserving 1RU sweep control unit with 16 switchable return sweep ports**
  - Less combining required
  - Improved noise performance
- SCU-1800 Sweep Control Unit provides **non-interfering downstream sweep to 1.218 GHz and upstream sweep to 204 MHz on up to 16 ports.**
- The sweep is remotely configurable via Ethernet and browser, and a **sweep plan** can be built from imported **OneExpert CATV channel plan**



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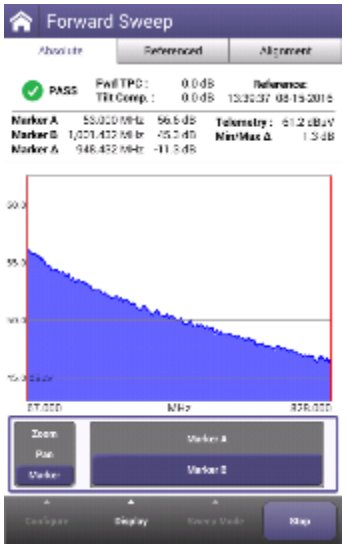
Next Generation Sweep Gear

OneExpert CATV ONX-630

- Field upgradable: Sweep + DOCSIS 3.1 module
- Reverse Sweep capable to 204MHz → compatible with SDA-5500/5510
- Extended Forward Sweep range to 1.2GHz with SCU-1800

ONX-630



SCU-1800

Sweep Control Unit SCU-1800

- 1RU unit with Ethernet interface (web browser/remote)
- Compatible with DSAM-6300
- Forward TX to 1.2GHz with ONX
  - HW capable up to 1.8GHz
  - 50dB Spurious Free Range
  - Narrow Sweep Pulses – fit between carriers
- Sixteen switchable return sweep ports (sw optional)
- Flexible mode of operation
  - Forward Tx only (5500)
  - Forward + Single User Reverse (5500)
  - Multi-User Reverse (5510)

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SCU-1800 Field Unit Compatibility

SDA / DSAM

Forward Sweep

- 50 to 1000 MHz

Reverse Sweep

- 5 to 85 MHz
- Single User Reverse
- Multi User Optional

ONX sweep type

Forward sweep

- 54 to 1218 MHz
- -20 to +20 dBmV input range

Reverse Sweep

- 5 to 204 MHz frequency Range
- -20 to +20 dBmV input level range

SCU - Forward Sweep

- Uses active channels and inserted carriers
- Up to 500 sweep points
- Future proof, 1800 MHz capable hardware
- SDA Protocol

SCU - Reverse Sweep

- **Inputs**
  - 16 isolated inputs
  - Manual select standard
  - Optional Auto input select
- **Frequency Range**
  - 5 to 204 MHz
  - SDA Protocol

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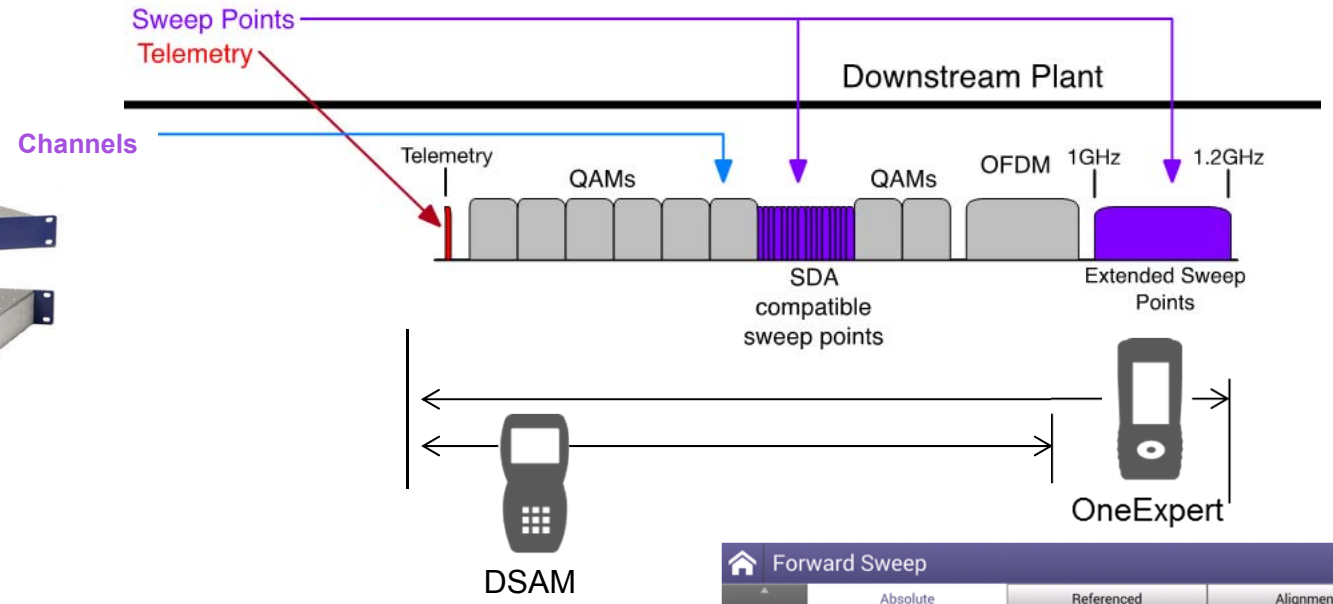
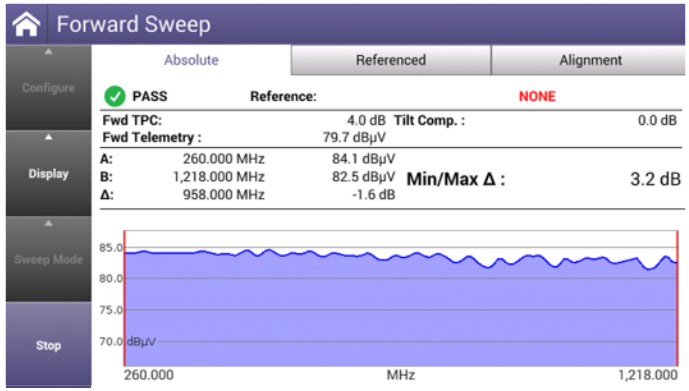
Forward Sweep beyond 1GHz with ONX-630

- ONX coupled with new Sweep Control Unit can provide sweep to 1.2GHz and beyond
- DSAM units on same system are still compatible up to 1GHz.

SCU-1800





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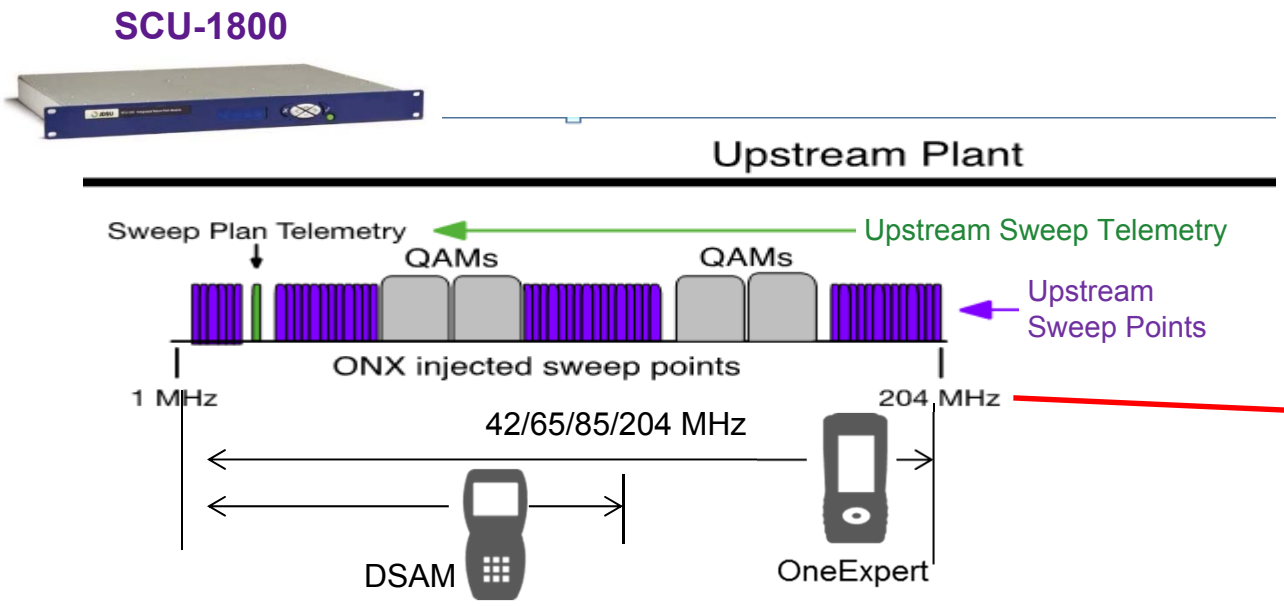
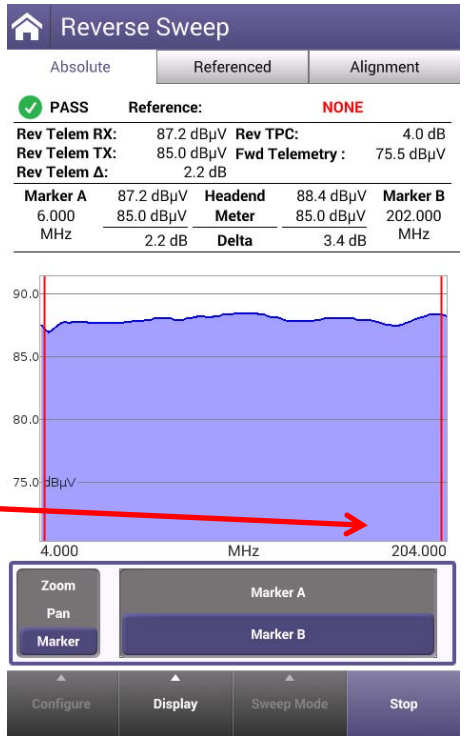
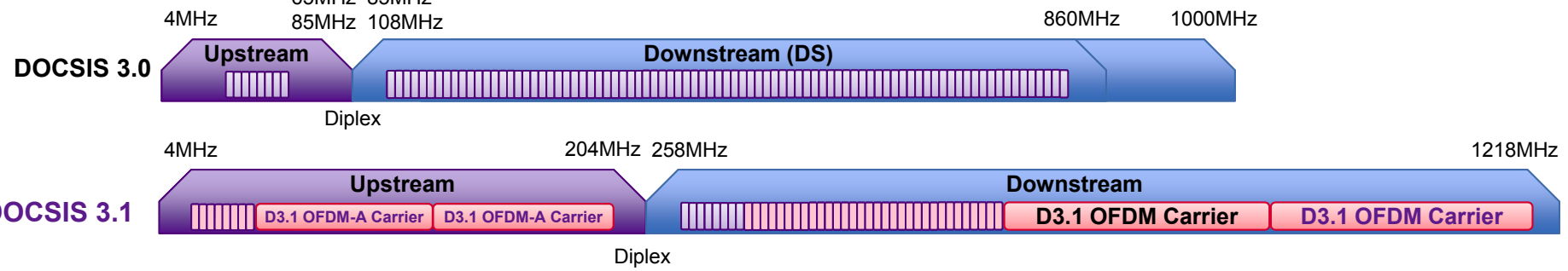
Reverse Sweep to 204 MHz with ONX-630

ONX-630's flexible architecture allows sweeping on existing infrastructure or expanded infrastructure up to 204MHz (or anywhere in between)







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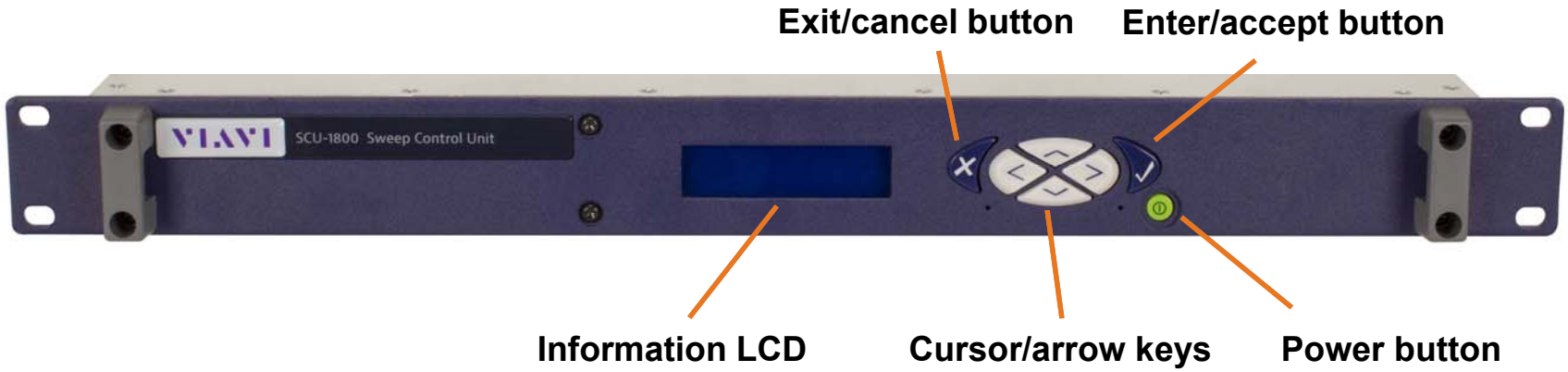
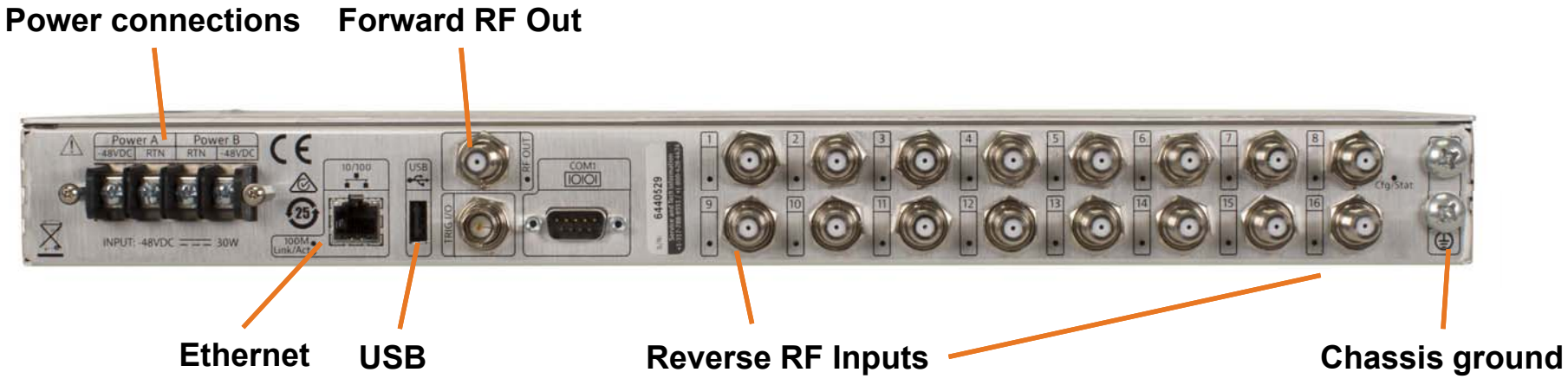
SCU-1800 External Features

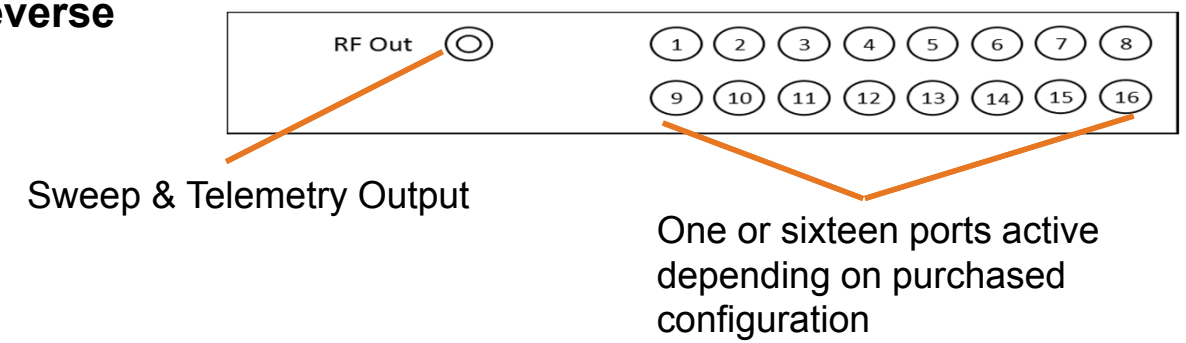




SCU-1800 Sweep Control Unit Configurations

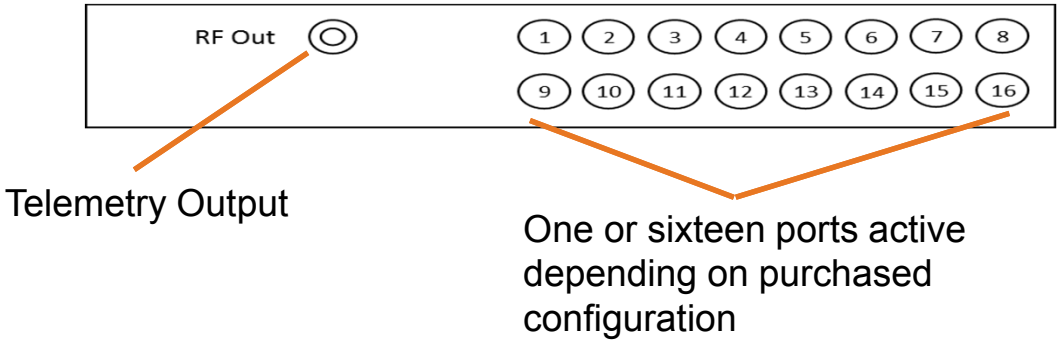
Forward and Single-User Reverse

- 1 active reverse port, or
- 16 active reverse ports



Reverse Only, Multi-User

- 1 active reverse port, or
- 16 active reverse ports



- Downstream telemetry from each SCU must be at a unique frequency.
- Note: on the ONX, forward sweep telemetry is called “SDA 5500,” and “SDA 5510” for reverse only unit.

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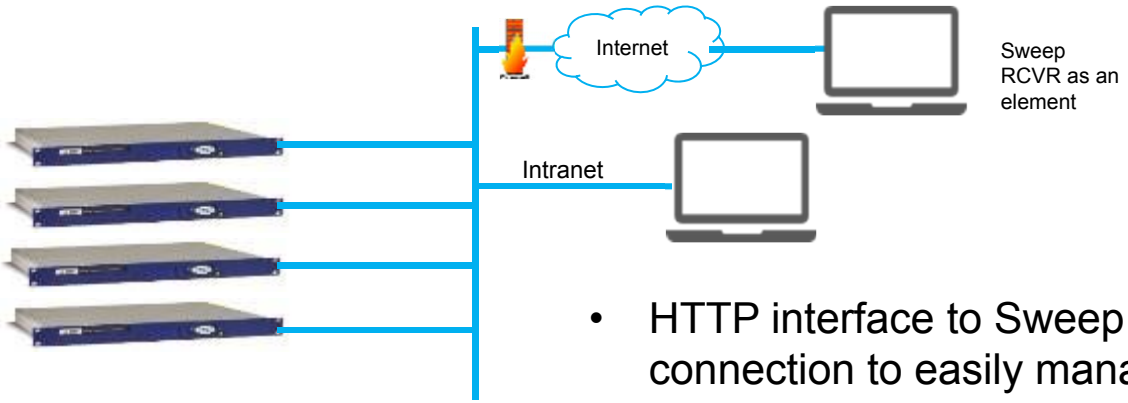
Configure Sweep Remotely



- HTTP interface to Sweep Control Unit provides remote connection to easily manage configurations **remotely**
- Internet access to SCU requires externally accessible IP address or VPN connection.
- Open a browser and enter the IP address of the SCU to go to the configuration page.

Configure Sweep Locally from a laptop

HTTP interface to Sweep Control Unit provides easy access to configurations **locally**

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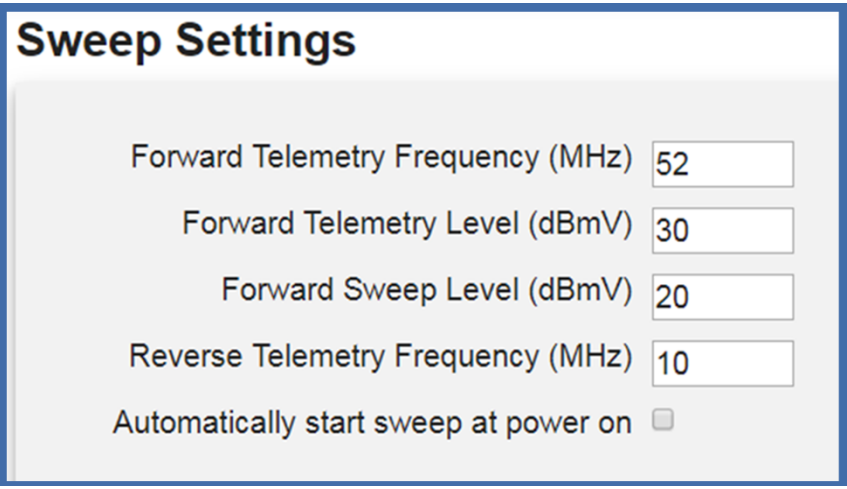
292 – SCU-1800 – Sweep settings

Sweep settings examples:

Settings in ONX should match settings in Sweep Control Units

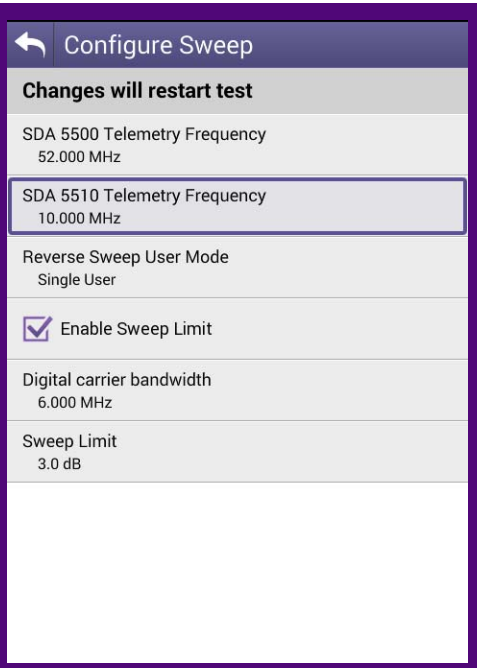
SCU-1800 sweep settings

- ✓ **Forward Telemetry**
  - ✓ Frequency = 52 MHz
  - ✓ Level = 30 dBmV (20-50)
- ✓ **Forward Sweep**
  - ✓ Level = 20 dBmV (20-50)
- ✓ **Reverse Telemetry**
  - ✓ Frequency = 10 MHz



✓ ONX sweep settings

- ✓ SDA5500 Telemetry = Forward Telemetry
  - ✓ Frequency= 52 MHz
- ✓ SDA5510 Telemetry = Forward Telemetry
  - ✓ Frequency= 10 MHz
- ✓ Reverse sweep User mode
  - ✓ Single user (SDA5500)
  - ✓ Multiple user (SDA5510)
- ✓ Sweep limits (0-20dB)



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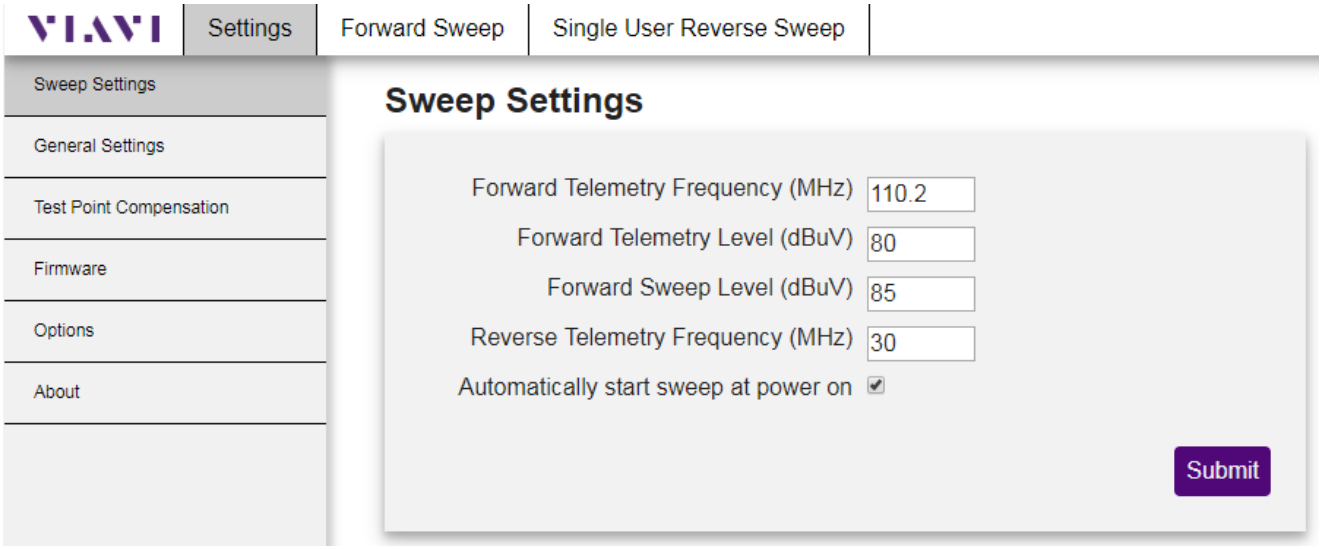
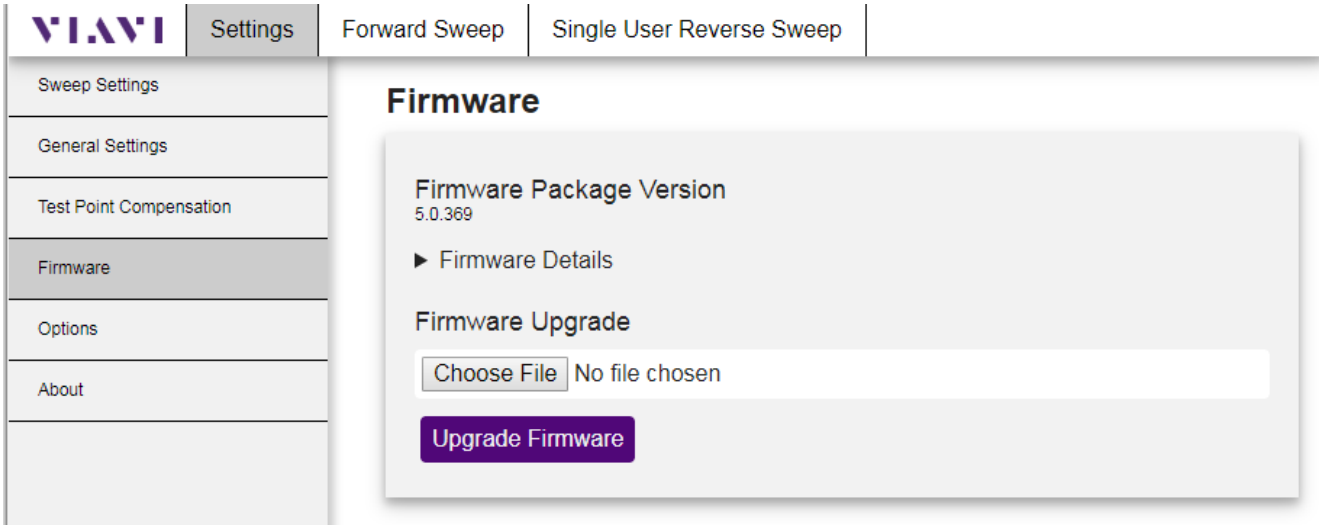
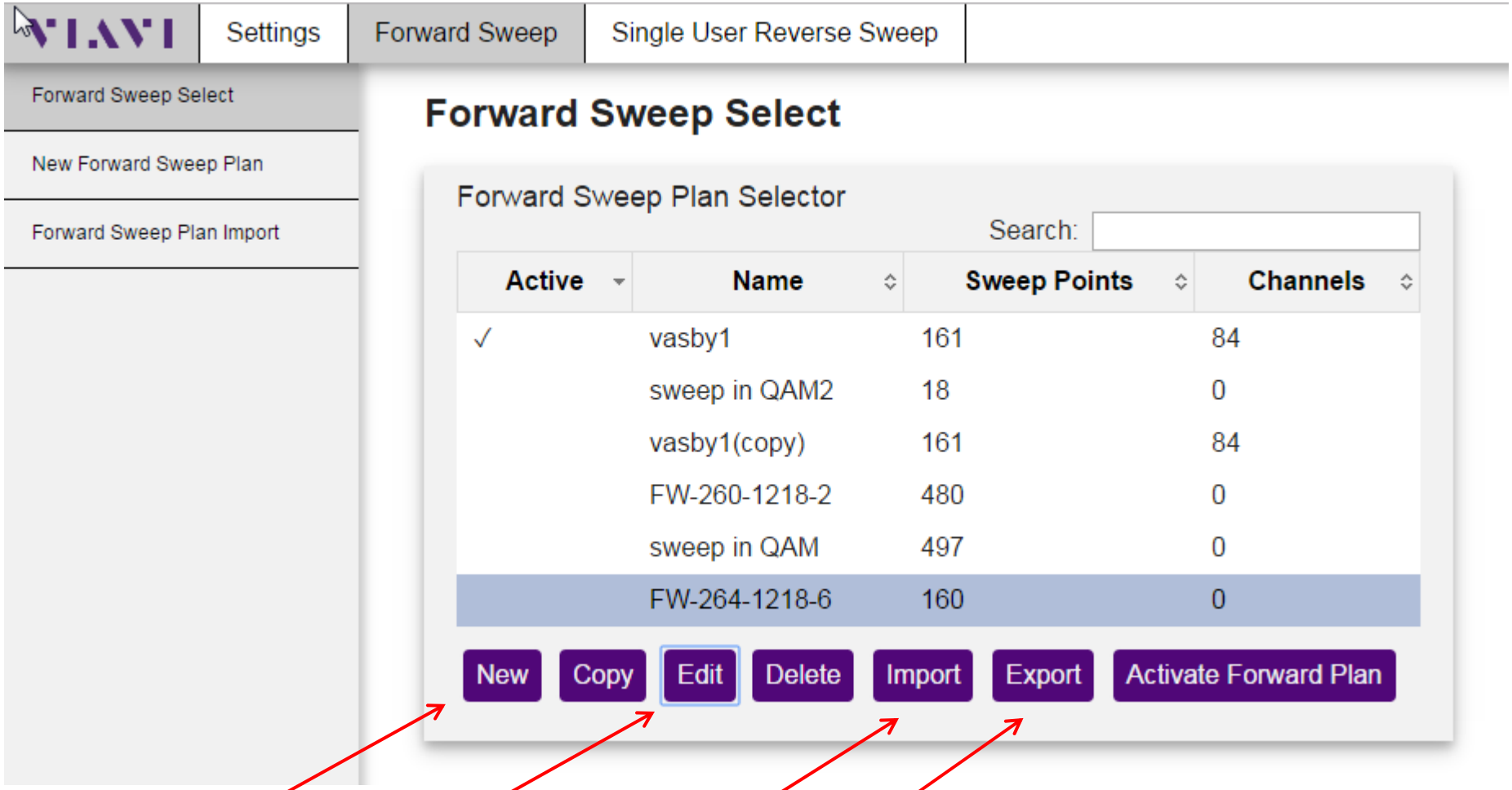
SCU-1800 Settings





SCU-1800 Forward Sweep Configuration

SCU-1800 web access
user: **scuadmin**
password: **scuadmin**



(new) Plan

(edit) Plan

(import) Plan
could be file from other SCU or from ONX

(export) Plan
for sharing to other SCU

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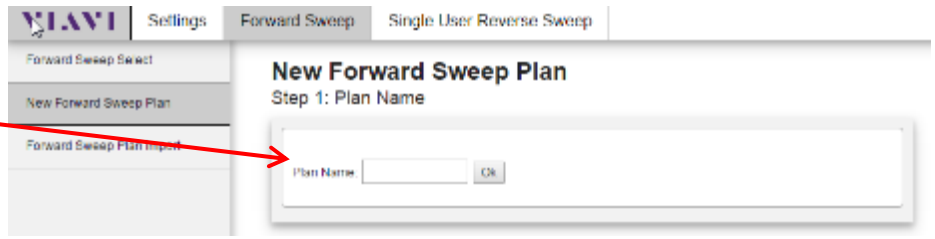
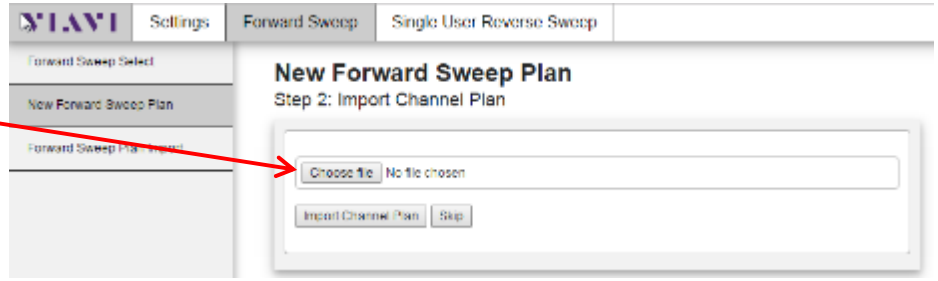
New Forward Sweep Plan

Step1: (new) Plan name



Step2: import channel plan from file or skip



- Channel plan file may be saved on the ONX in the “Channel Check” mode. (see slide coming later showing how to do this on ONX)
- The file can be accessed directly on the ONX via Ethernet if it is on the network and has “HTTP File Server” enabled in System Settings under “Remote Operation.”
- The channel plan can be exported to a USB stick

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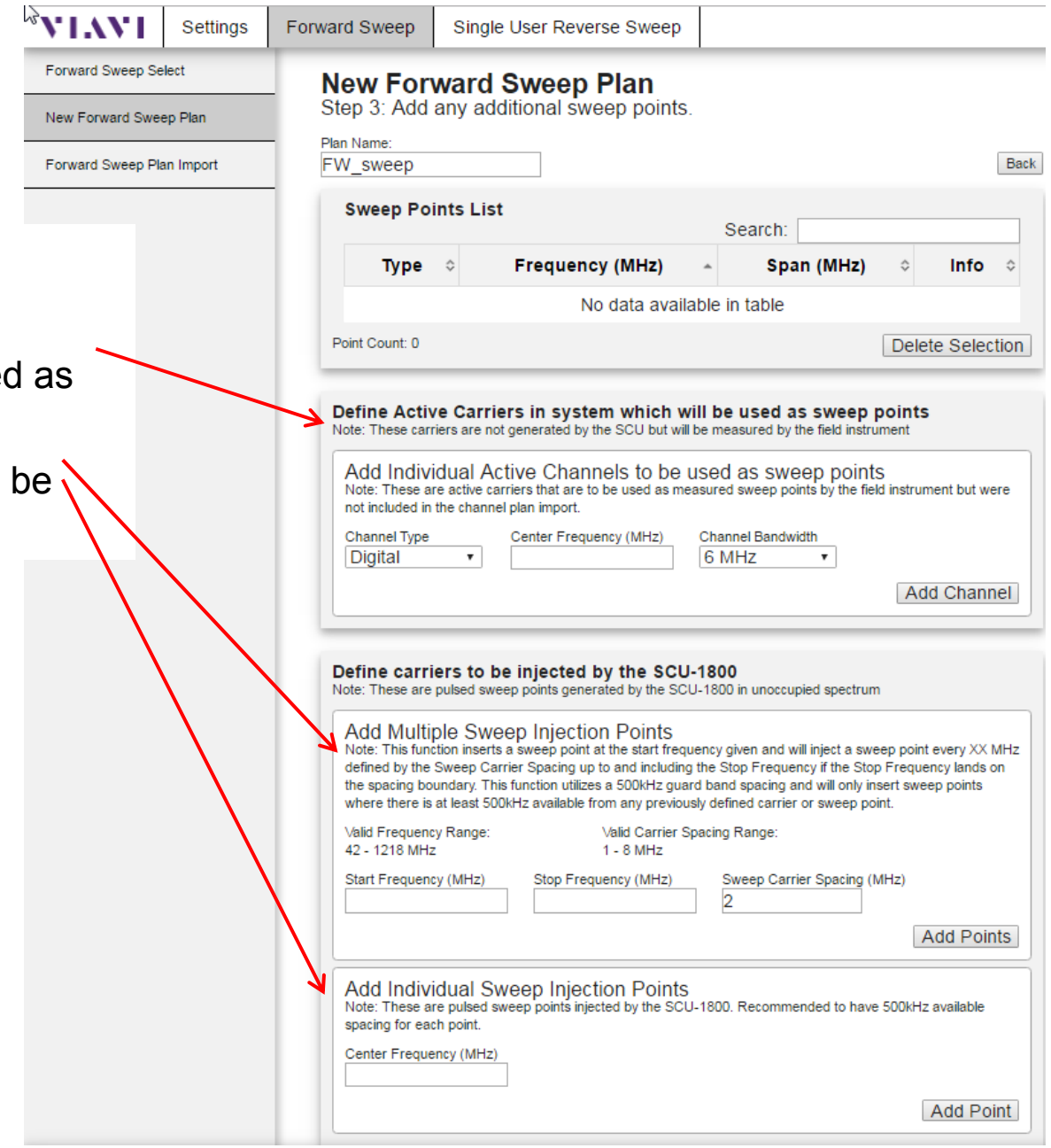
New Forward Sweep Plan

Step3: new forward sweep plan

- ✓ Sweep point list
- ✓ Define active carriers to be used as sweep points
- ✓ Define sweep points carriers to be injected (Multiple or individual)

Sweep points can be placed between active service carriers, in guard bands



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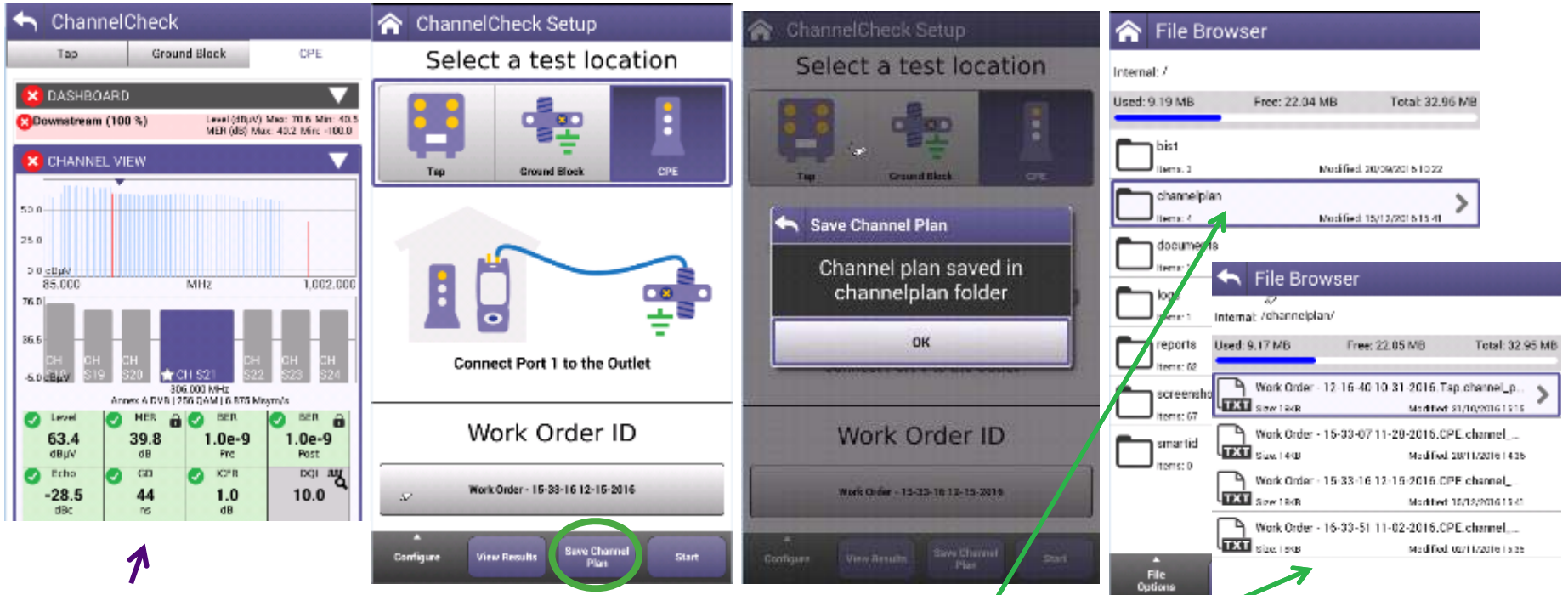
Save Channel Plan with OneExpert CATV



✓ **Step1: ChannelCheck**

✓ **Step2: Save Channel Plan**

✓ **Step3: Channel Plan saved in channel plan folder**

✓ **Step4: export channel plan to USB or StrataSync**

✓ **Step5: Retrieve channel plan and import file (json) into SCU-1800**

The files on the ONX are also accessible via browser if the ONX is on a network accessible to the browser, and the ONX has “HTTP File Server” enabled in System Settings under “Remote Operation.”

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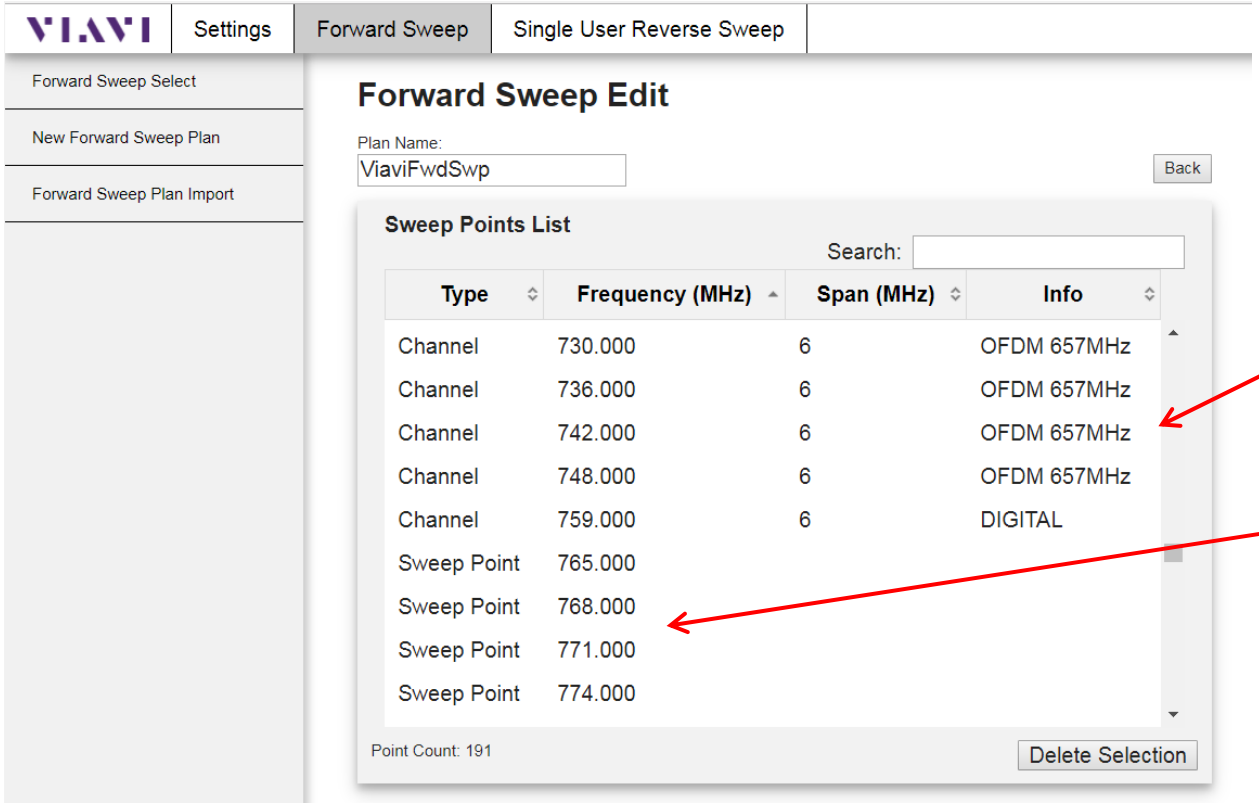
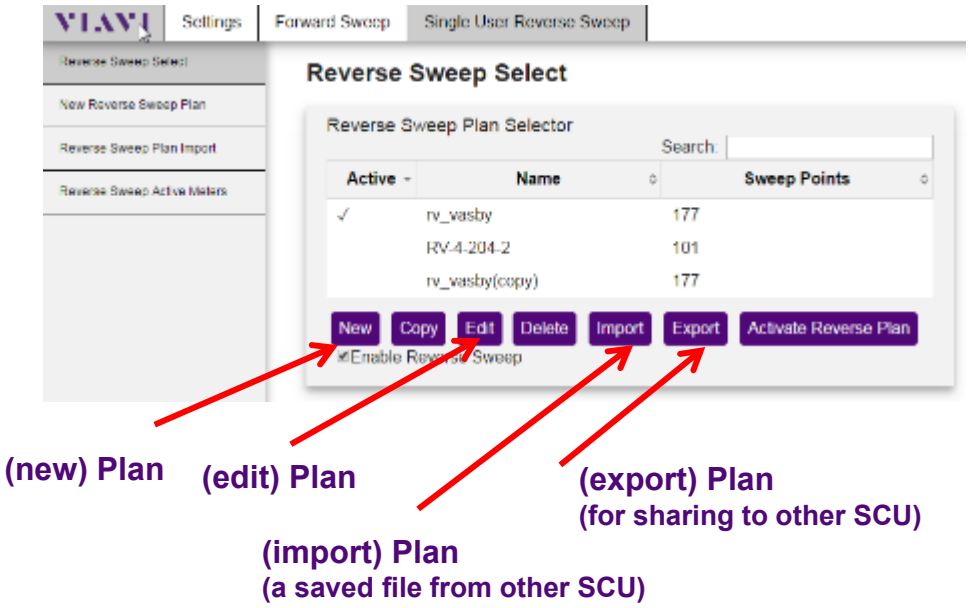
Edit Forward Sweep Plan



Sweep points list

- Define active carriers to be used as sweep points
- Define sweep points (sweep signal) to be injected (multiple or individual)

Build Reverse Sweep Plan

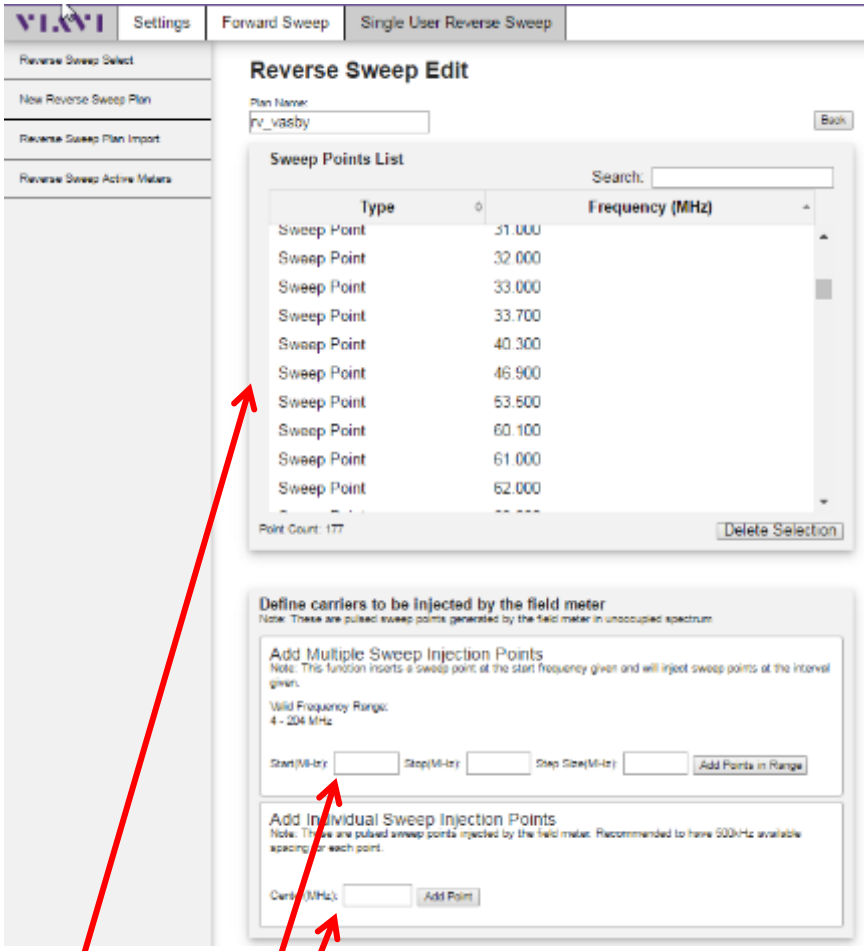


(new) Plan

(edit) Plan

(import) Plan
(a saved file from other SCU)

(export) Plan
(for sharing to other SCU)



- Reverse sweep plan is made up of only inserted sweep points.
- It is recommended that no sweep points be inserted within active return carrier bands.
- A sweep point can be inserted between active service channels.

- **Sweep point** list
- Define sweep points carriers to be injected (Multiple or individual)

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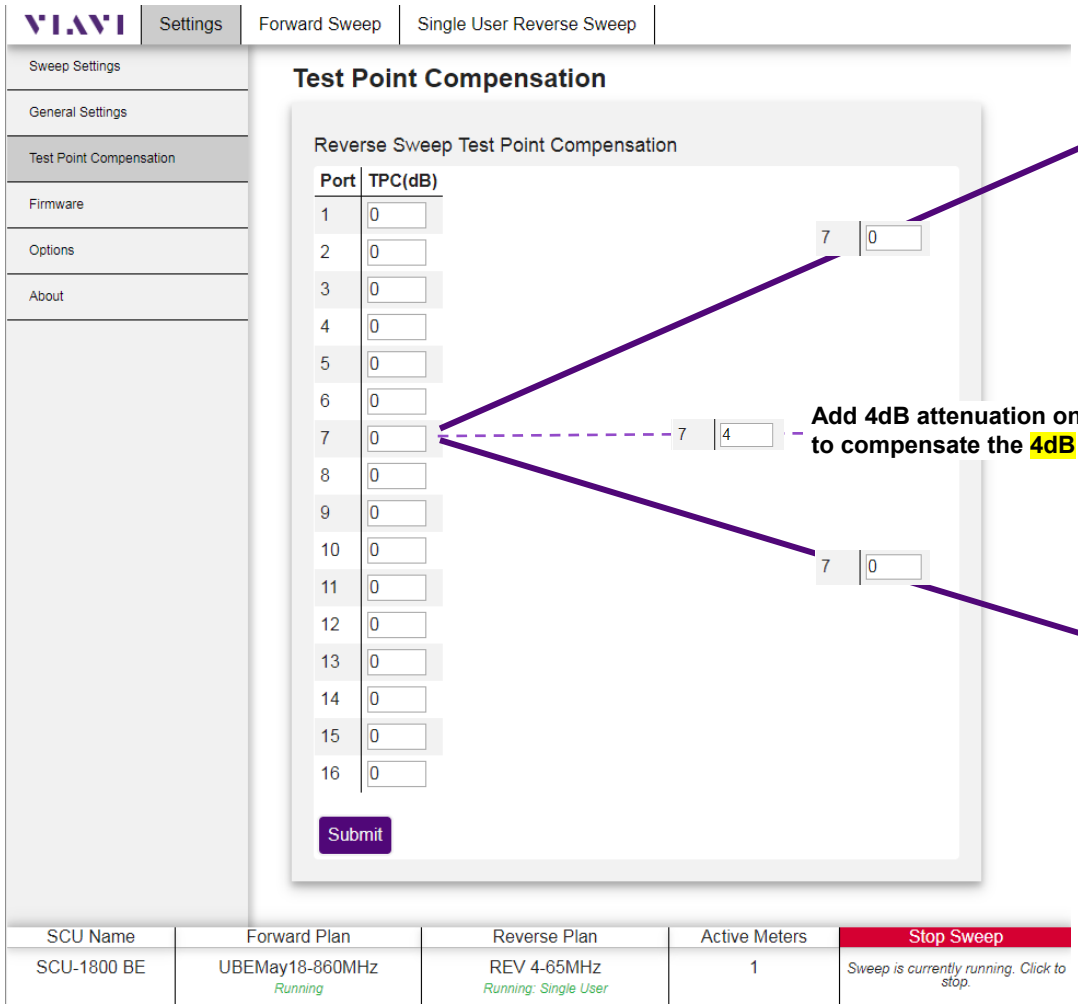
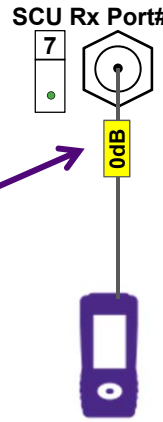
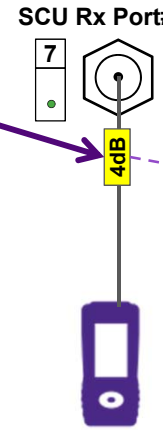
SCU Test Point Compensation (TPC)

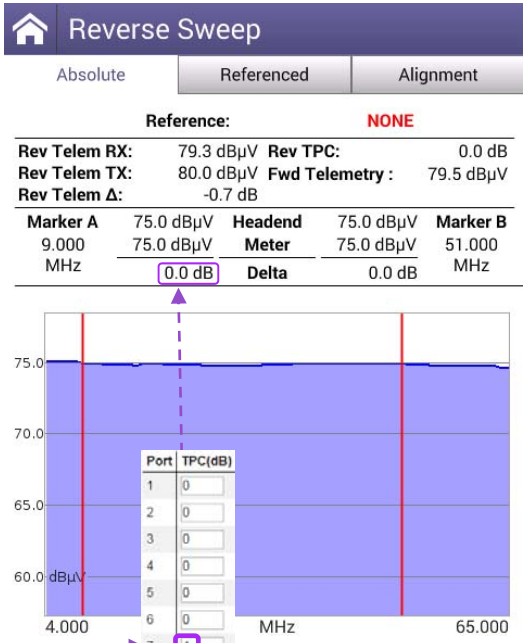
- **Every port can have a different TPC**
- **TPC range: -50 ... +50 dB**

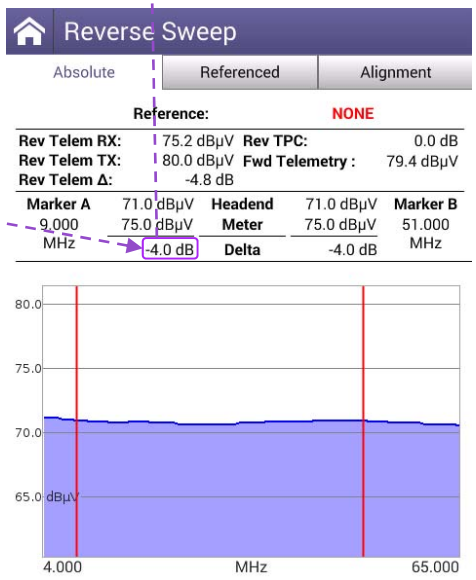




Add 4dB attenuation on Port#7 to compensate the 4dB loss.







Test point compensation configuration is covered in detail later in this document.

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302 – ONX-630 Sweep Analyzer

Introducing OneExpert CATV Sweep: ONX-630

- Maintenance technician focused OneExpert platform enables **sweeping** and **DOCSIS 3.1** test with **simplified** process, to **speed testing** and **documentation**
- **ONX-630** is used **for all DOCSIS 3.1 phases**
  - D3.1 Network **construction** ➔
    Sweep transmission performance analysis
  - D3.1 **Turn-Up** ➔
    Sweep + DOCSIS 3.1 physical and service test capability
  - D3.1 **Maintenance** ➔
    Sweep + D3.1 PHY and Service tests
- **Compatible with existing sweep control unit**
  - SDA-5510/5500: Reverse Sweep up to 204MHz
  - SDA-5500: Forward Sweep up to 1GHz
  - Offers smooth, seamless integration and transition to next generation
- **Documenting performance is simpler with StrataSync,** making detailed sweep results easily accessible via browser

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Advanced System Sweep Analyzer

Fast
Sweep, align, and troubleshoot faster than ever

- Stealth Sweep™ with integrated Tilt/Align quickly validates amps and HFC networks faster than any other test
- Complete downstream scan including MER/ BER in about 60 seconds
- AutoChannel™ instantly identifies channel lineup and eliminates guesswork

Powerful
Designed to find difficult problems

- Combined DOCSIS 3.1 and sweep testing validates complete HFC network
- Ingress Expert with Hyper Spectrum™ catches difficult return noise problems
- Expert modes with advanced parallel processing find hidden problems and root causes

Flexible
Ready for changing network needs

- ONX-630 dual diplexer 42/85 or 65/204 with 1.2GHz supports next generation networks
- ONX-630 is compatible with DSAM-6300 and SDA-55XX providing seamless transition
- Common sweep reporting for ONX-630 and DSAM ensures consistency via StrataSync™

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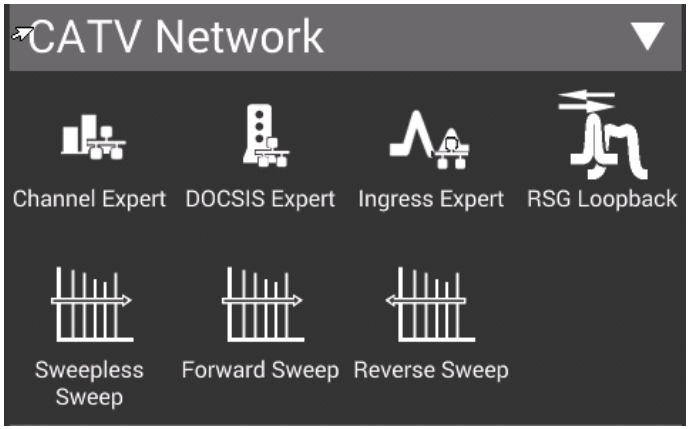
CATV Network Section

- **SWX & NTX software** packages reveal the CATV Network session, RF features designed for advanced services and maintenance use

- **NTX package** (ONX-620/630) includes:
  - Channel Expert
  - DOCSIS Expert

  } Location specific tests, bypass preliminary steps in “non-expert” modes, allowing test point compensation and custom limits
  - Ingress Expert
  - RSG / RSG Loopback (optional in 620)
  - Test Point Compensation (TPC)
  - Custom Limits
  - Sweepless Sweep



- **SWX package** (ONX-630 only) adds NTX plus:
  - Forward Sweep & Alignment
  - Reverse Sweep & Alignment
  - Associated with Headend Sweep Control Units (SDA55x0, SCU-1800)

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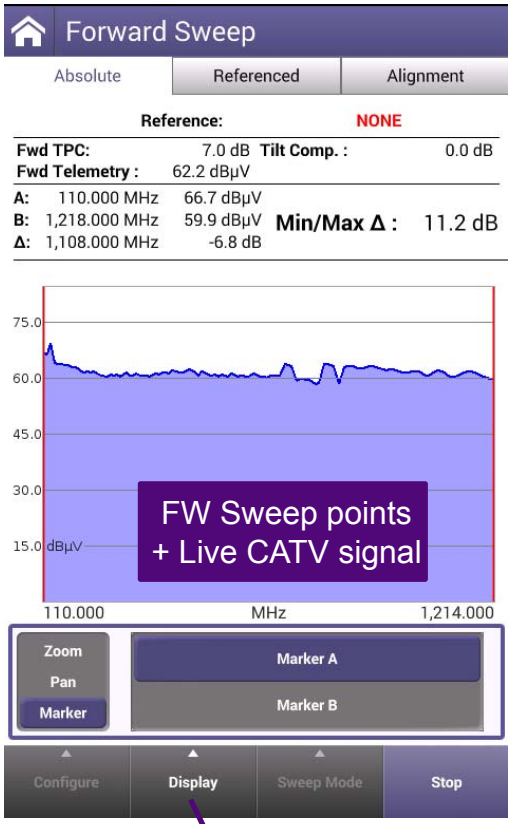
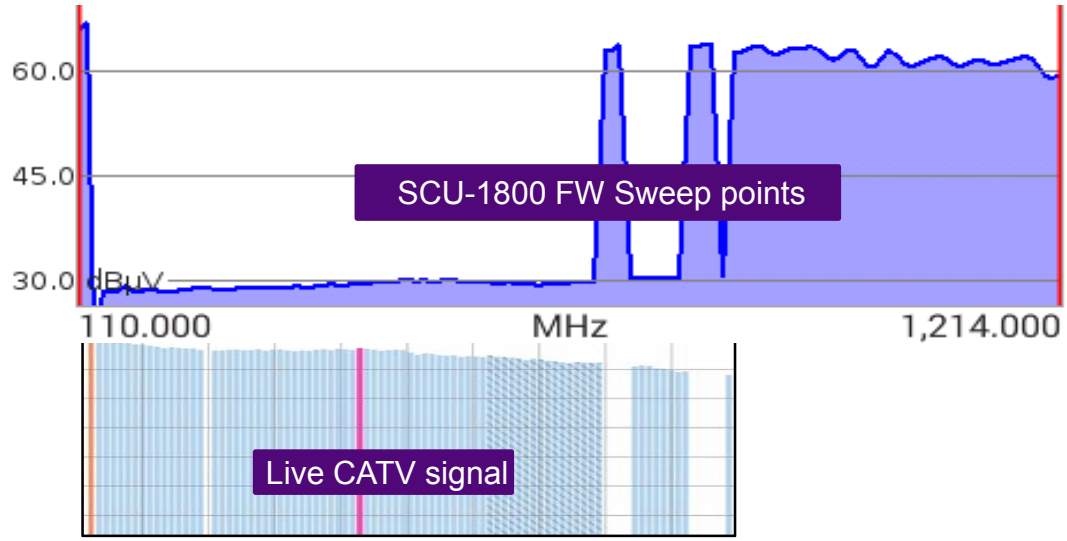
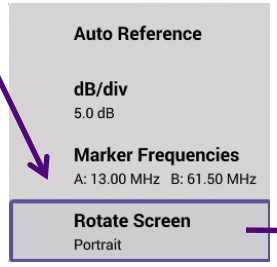
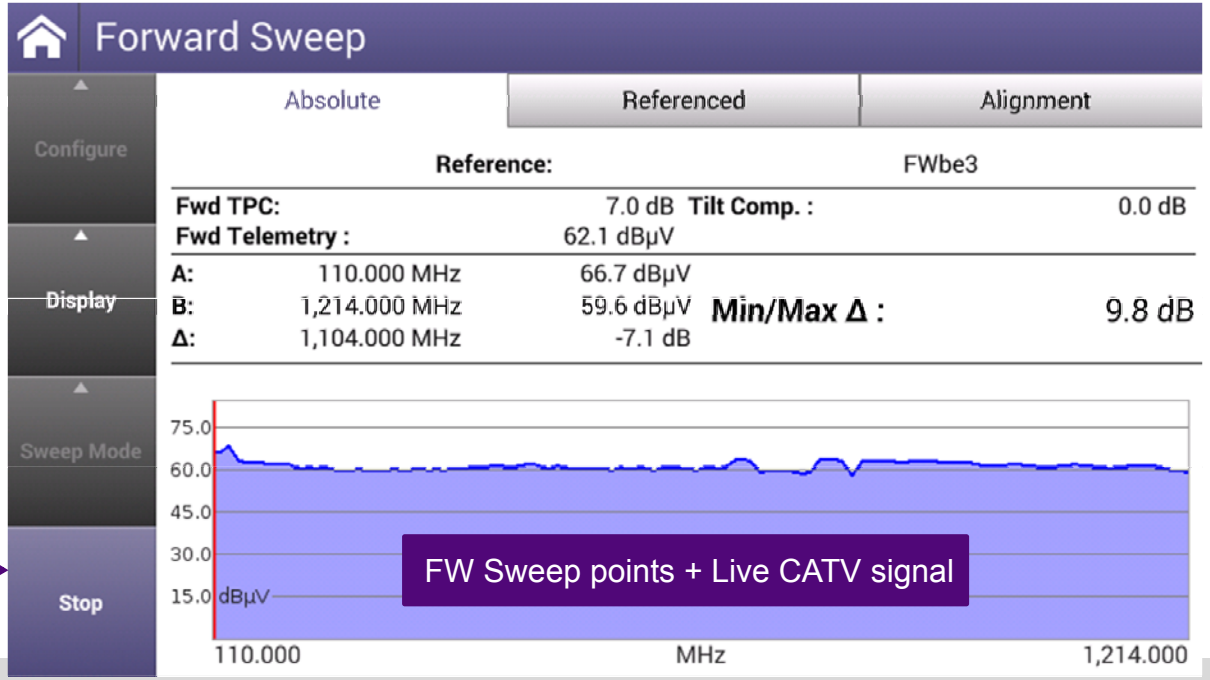
ONX-630 Forward Sweep Principle





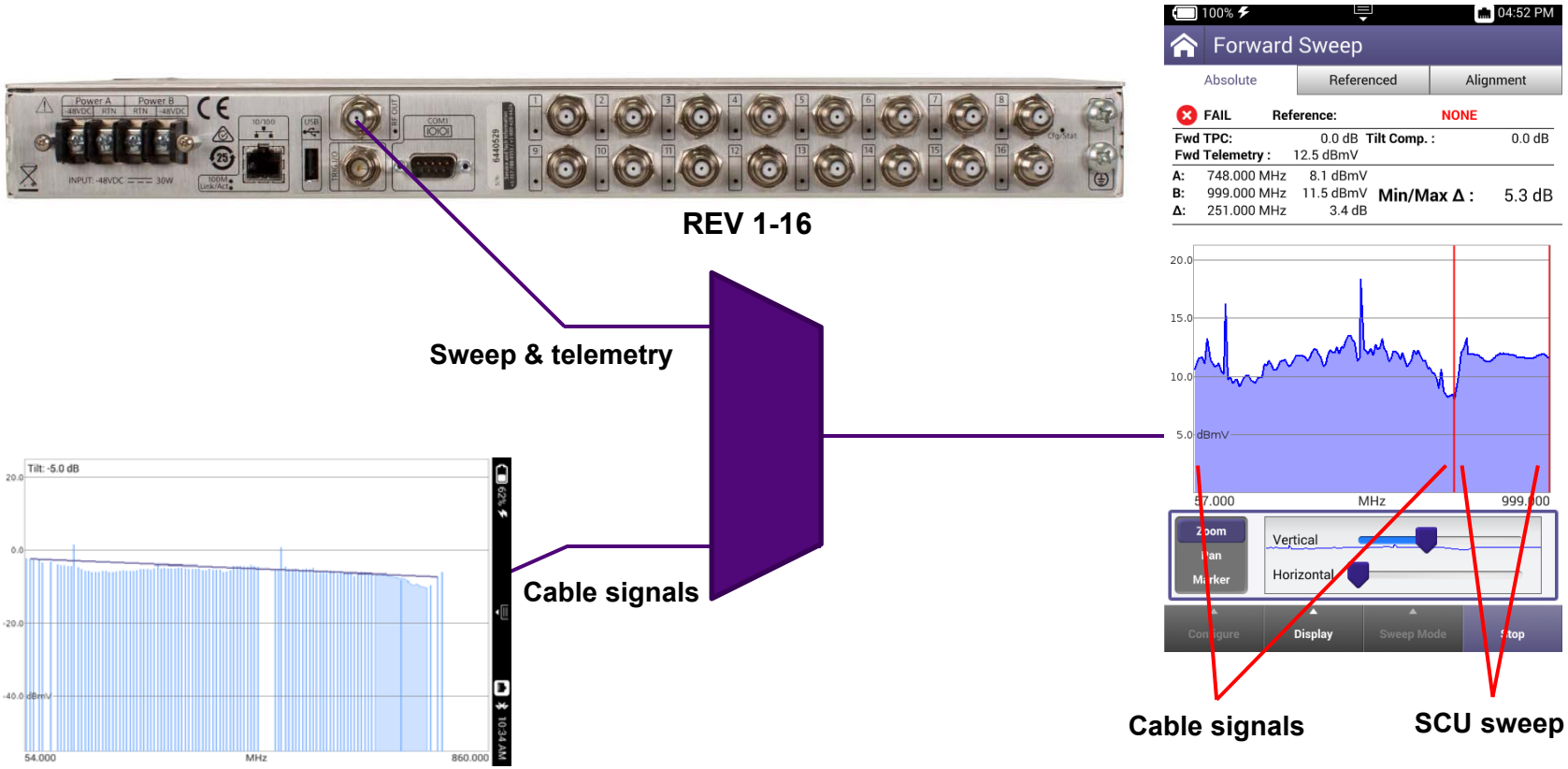
Toggle between Portrait and Landscape mode





Forward Sweep – Absolute

Sweep is configured to step around active channels
Measurement includes active carrier levels and injected sweep points.



Absolute sweep is combined absolute levels from active carriers and SCU sweep

Forward Sweep test setup

SCU-1800 Remote configuration via HTTP interface

FW

RV

REV 1-16

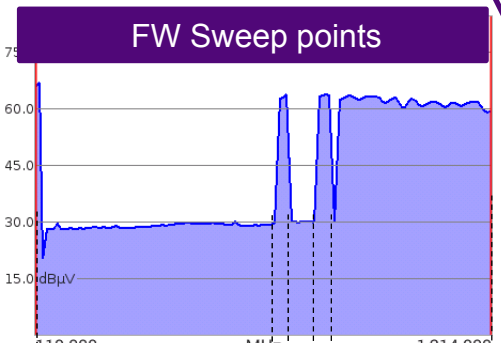
16dB TAP

3.5dB attenuation

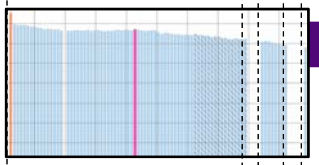
3.5dB attenuation

VNC Remote control

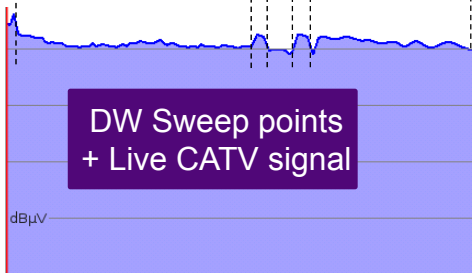
FW Sweep points



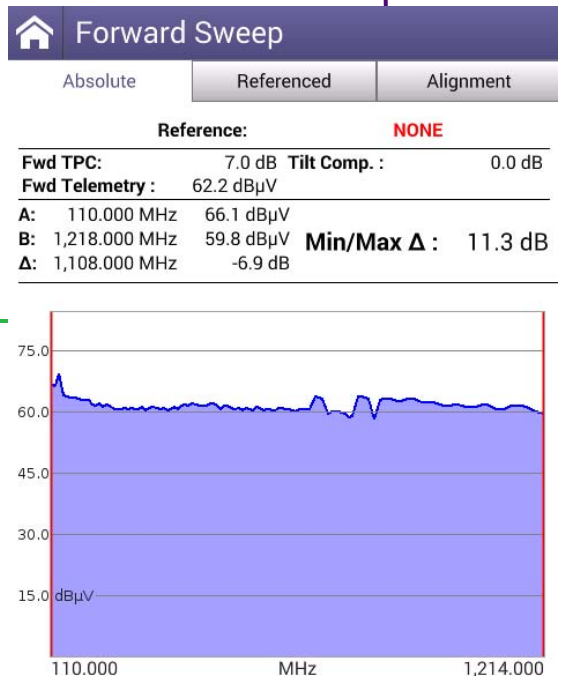
Live CATV signal



DW Sweep points + Live CATV signal



ONX-630



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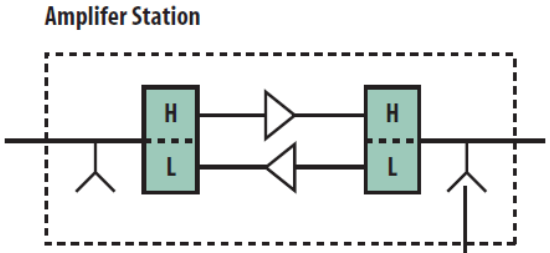
Connecting the ONX-630 to the test point

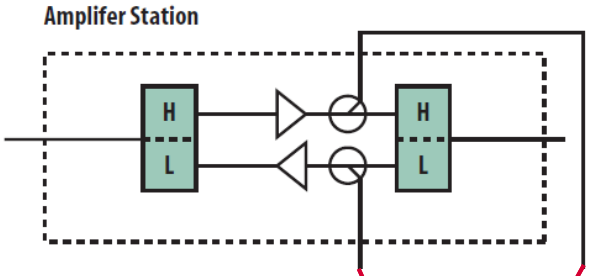
Test point configurations

Bi-directional
Test Point



Forward &
reverse sweep
on ONX port 1

Uni-directional
Test Points



Reverse sweep
on ONX port 2

Forward
sweep on
ONX port 1

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Forward Sweep Process – Before Leaving the Headend

1. Verify the SCU-1800 is in Sweep mode, but this status can be changed remotely
2. Verify proper operation of forward tilt channels in “Alignment” mode
3. The sweep mode is toggled from “forward” to “reverse” by touching or selecting the “Sweep Mode” at the bottom of the screen, and touching/selecting the desired mode (the sweep must be stopped before selecting “sweep mode”)
4. A forward sweep reference can also be saved on the ONX-630 at this time
   a. Stop the sweep measurement (if it’s running)
   b. Press “Configure,” then “Save Test/Reference,” then check “Save as Reference”
   c. In “Configure” select “Choose Reference” to make sure you are using the reference you just saved.
5. Note: Take care with forward fiber optic transmitters in headend. The test point may be aligned for input to “box” or actual input to laser diode. This could give a faulty reference.

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Forward Balancing and Sweeping

1. First, balance signal levels at node amplifier using “Alignment” mode
   a. Make appropriate adjustments before proceeding further.
2. Switch to Referenced mode and verify sweep response.

Note: Do not change in-line pads, test leads, or other RF path elements once a reference has been stored; if a change is required, store a new reference

3. Proceed to next active in line.
4. Use a directional test point on active for forward balancing and sweeping.
5. Most forward balancing is based on unity gain at output.
6. If design slope is different than node design slope, use tilt compensation.

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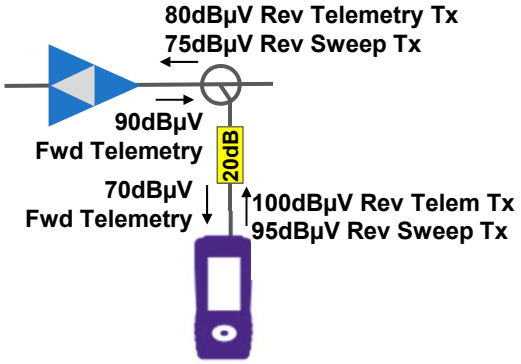
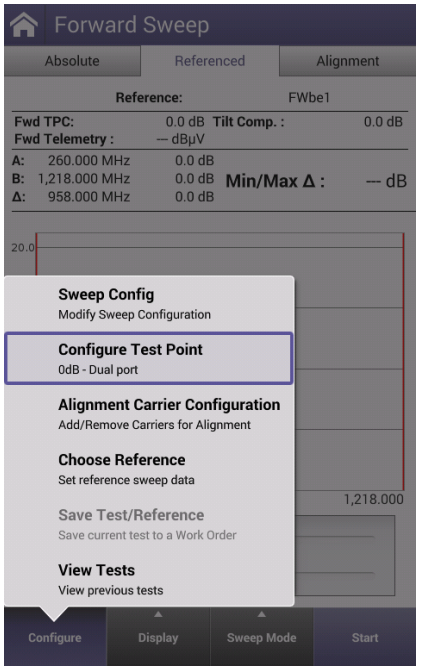
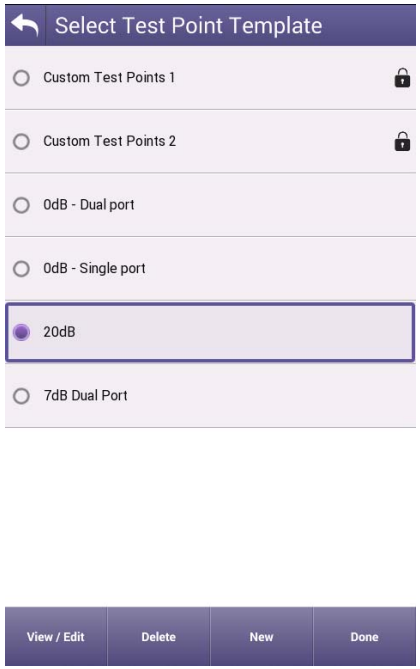
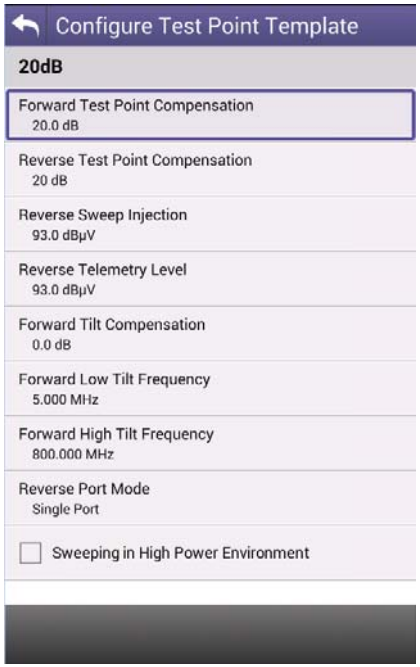
ONX: Templates for Test Point Locations

- Configure Test Points for loss and sweep settings
- Easily switch between Test Points at any test
- Multiple test point locations can be customized and stored









- **Forward TPC (Test Point Comp.)**
  -100, +100 dB
- **Reverse TPC**
  -100, +100 dB
- **Reverse Sweep injection**
  68-113 dBµV
- **Reverse Telemetry Level**
  68-113 dBµV
- **Forward Sweep Tilt Compensation**
  -100, +100 dB
- **Forward sweep Low Tilt Frequency**
- **Forward sweep High Tilt Frequency**
- **Reverse Port mode**
  - Single port: port 1
  - Dual port: port 1=FW, port 2=REV
- **Sweep in High Power Environment**
  Select it when the input power overpass 84dBµV at the test point

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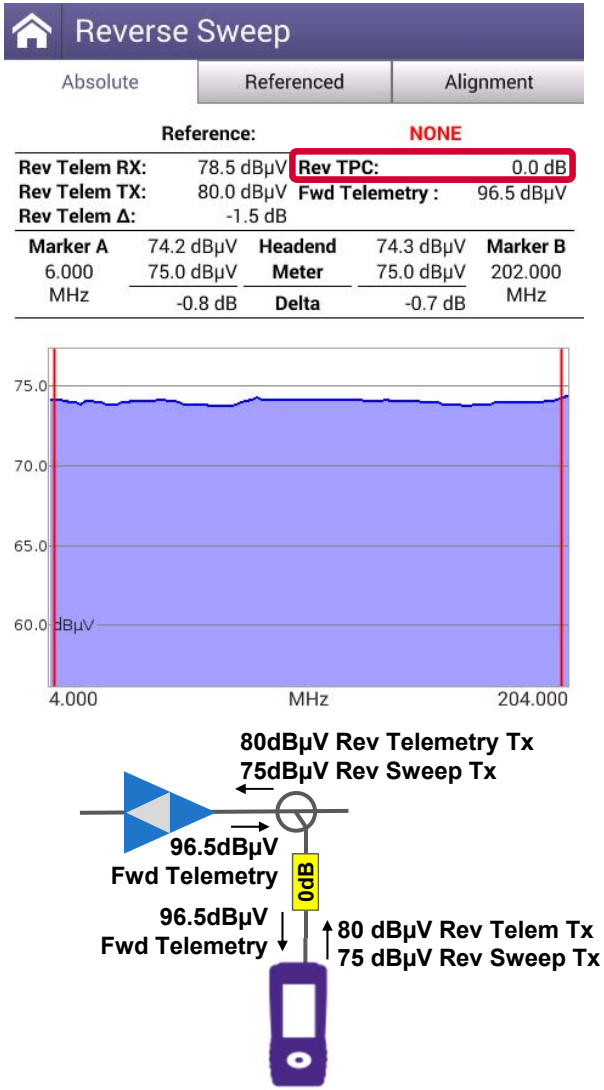
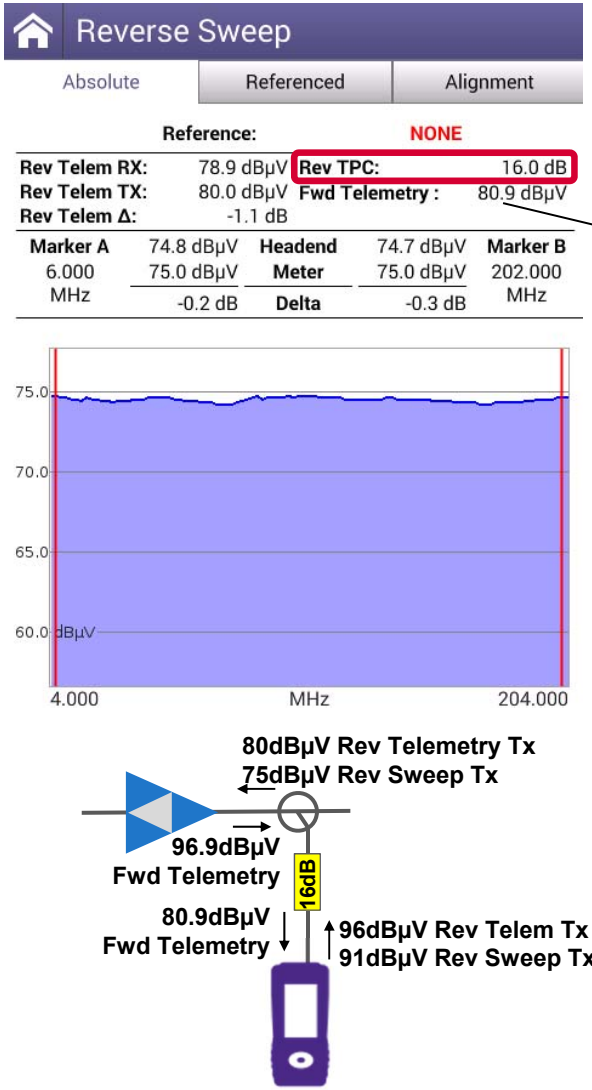
ONX-630 Reverse Sweep – Test Point Compensation

Case#1 → ONX connected without TPC
TPC = 0 dB



Case#2 → ONX connected on 16dB Test Point
TPC +16dB



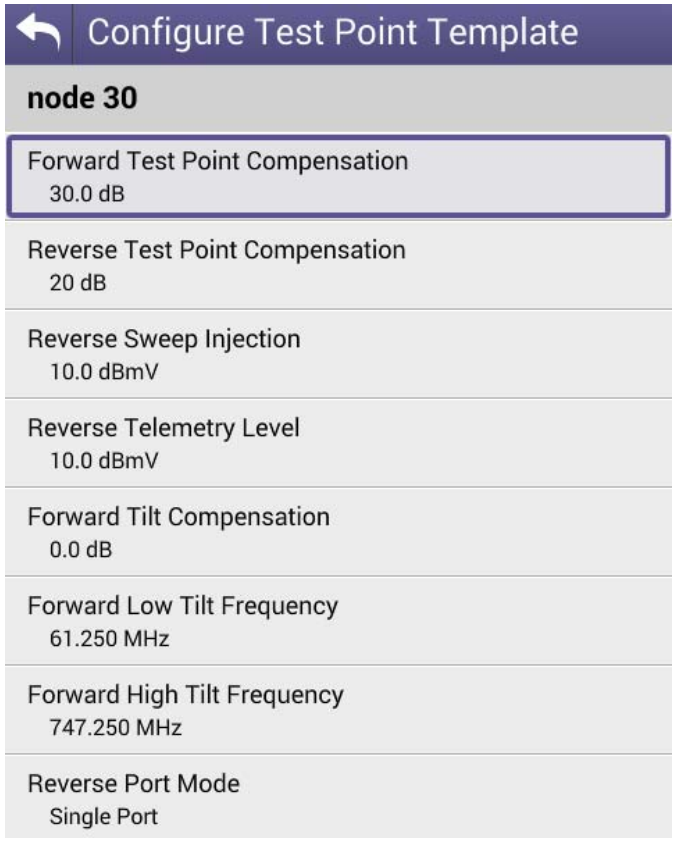
Absolute FW telemetry level at the input of the ONX → 16 dB bellow as Case#1 due to the 16dB test point loss

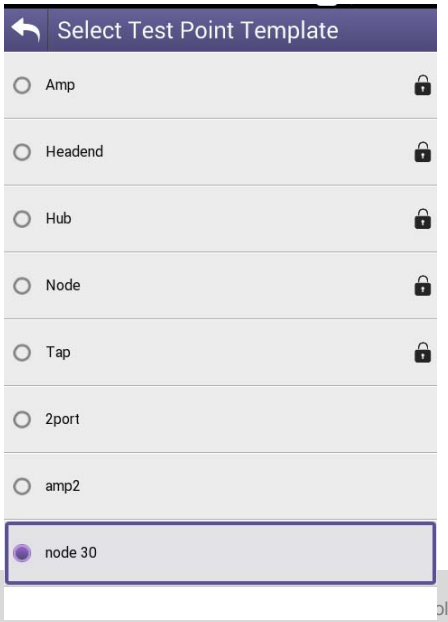
ONX: Test Point Template settings

- **Forward TPC** Test Point Compensation (-100, +100 dB)
- **Reverse TPC** Test Point Compensation (-100, +100 dB)
- **Reverse Sweep injection** (8-53 dBmV)
- **Reverse Telemetry Level** (8-53 dBmV)

- **Forward Sweep Tilt Compensation** (-100, +100 dB)
- **Forward sweep Low Tilt Frequency**
- **Forward sweep High Tilt Frequency**

- **Reverse Port mode**
  - Single port (port 1 – ONX)
  - Dual port (port 1=FW, port 2=RV)

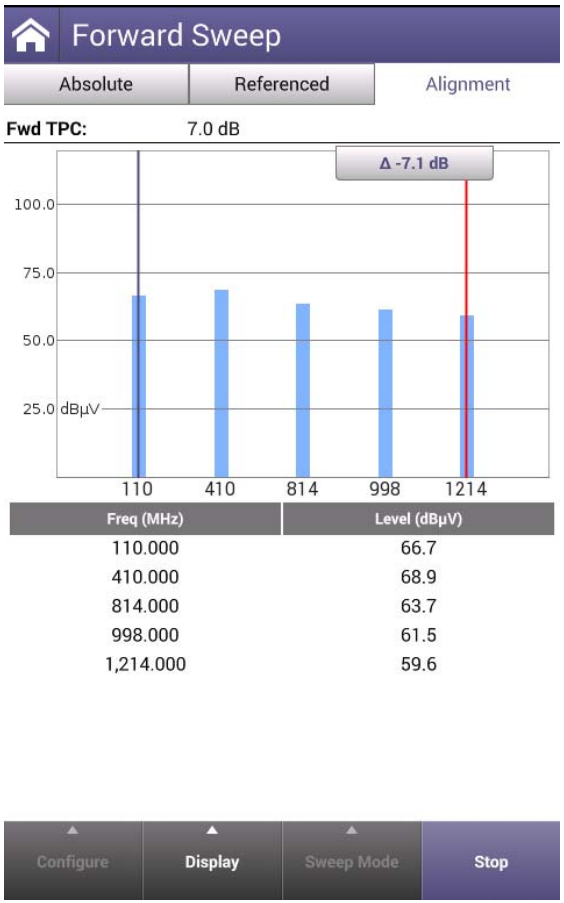




ONX-630 Forward Sweep Mode

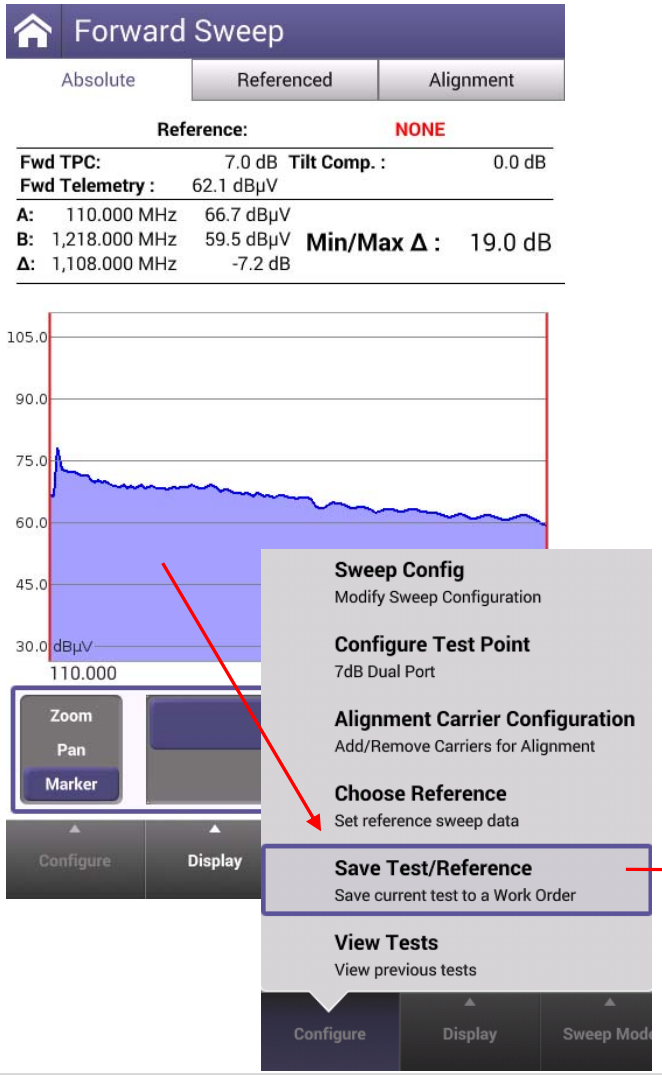
Alignment

Pick tilt carriers for fast gain and alignment check. Sweep points or live carriers



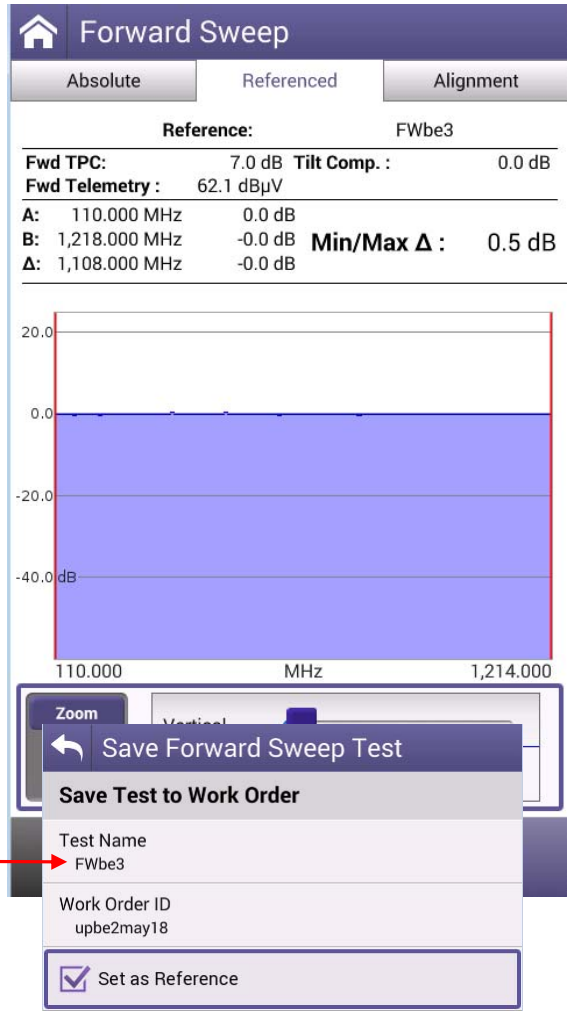
Absolute sweep

View the raw/absolute unreferenced sweep to save as a reference

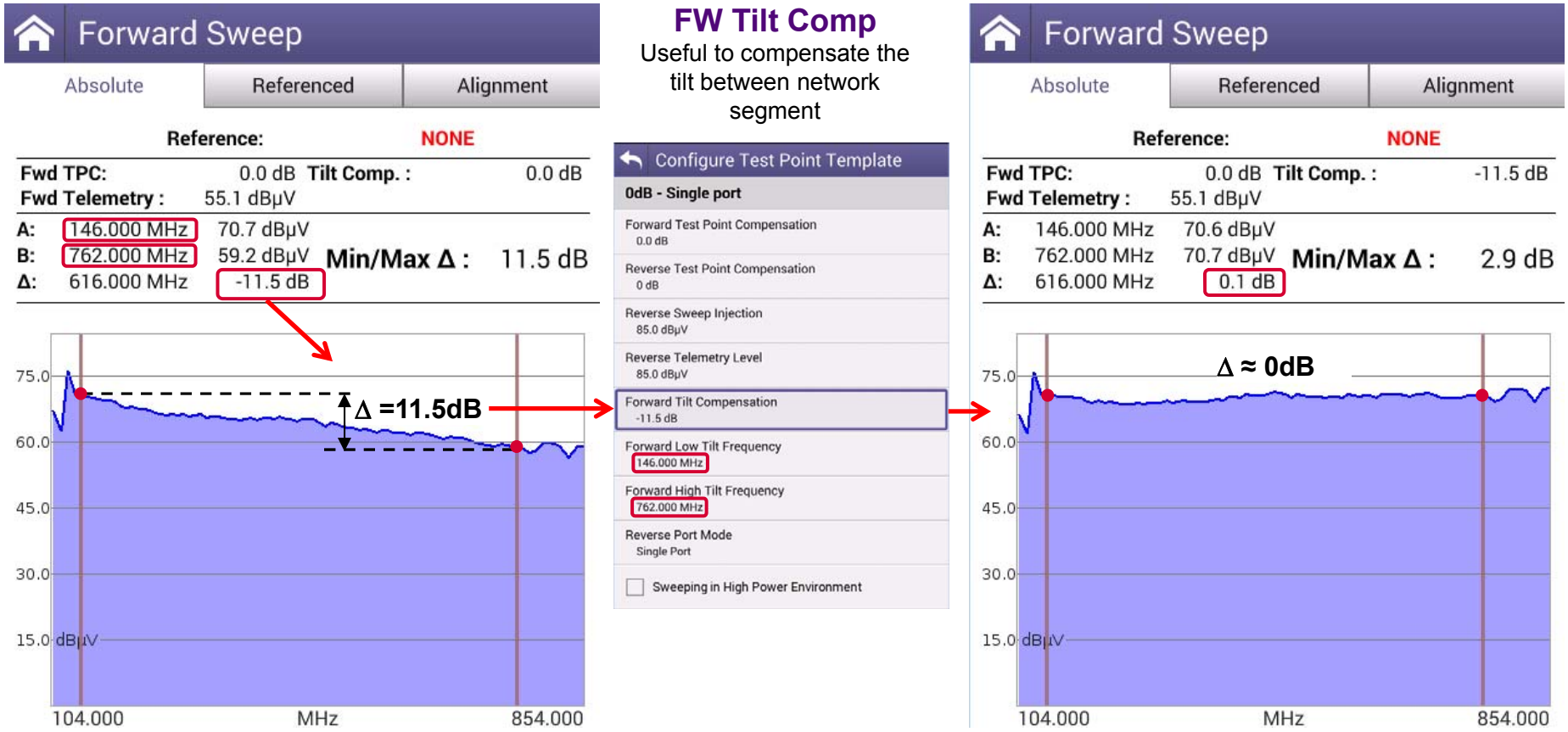


Referenced sweep

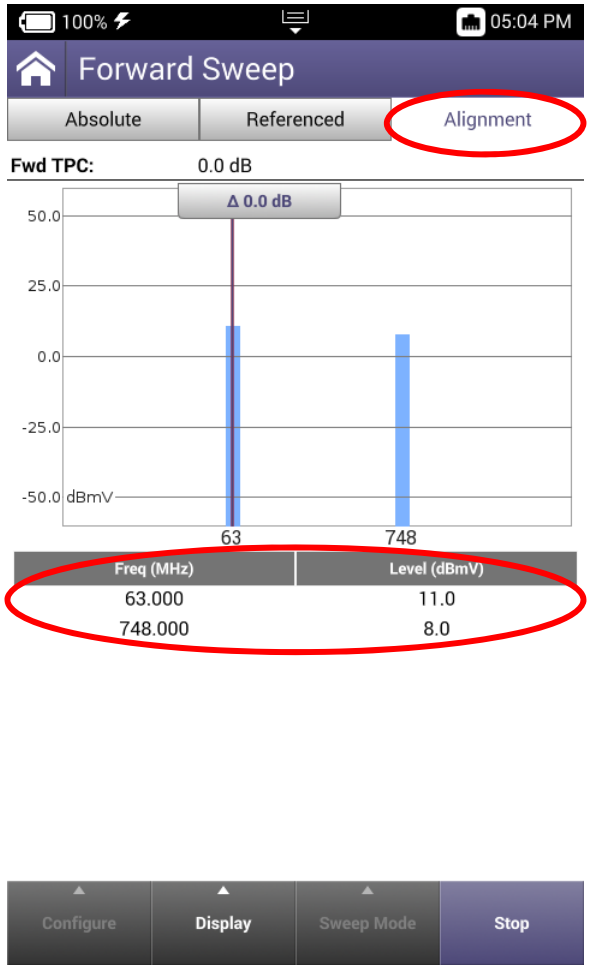
View the normalized referenced sweep to identify issues



ONX-630 Forward Tilt Compensation

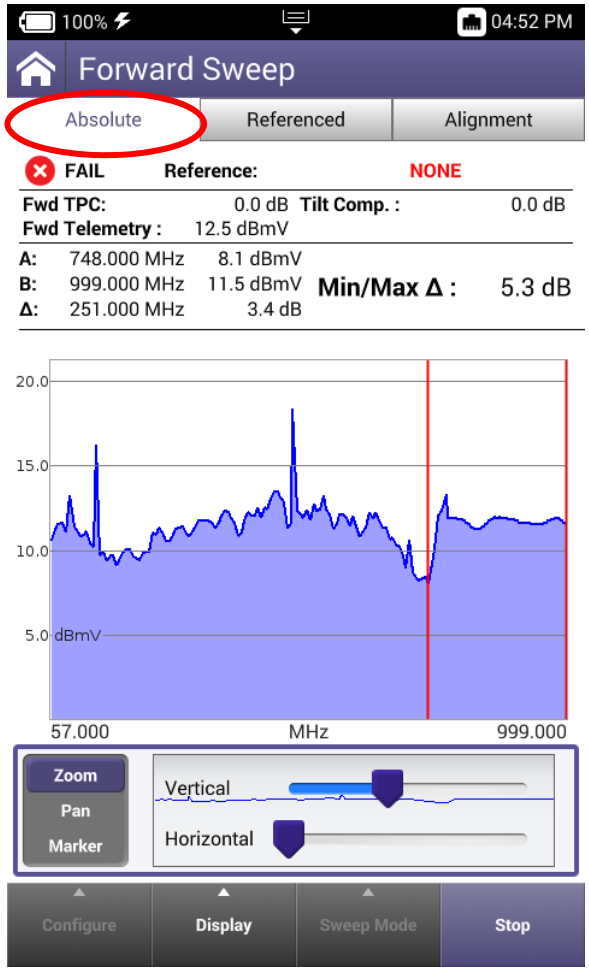


Forward Sweep Example



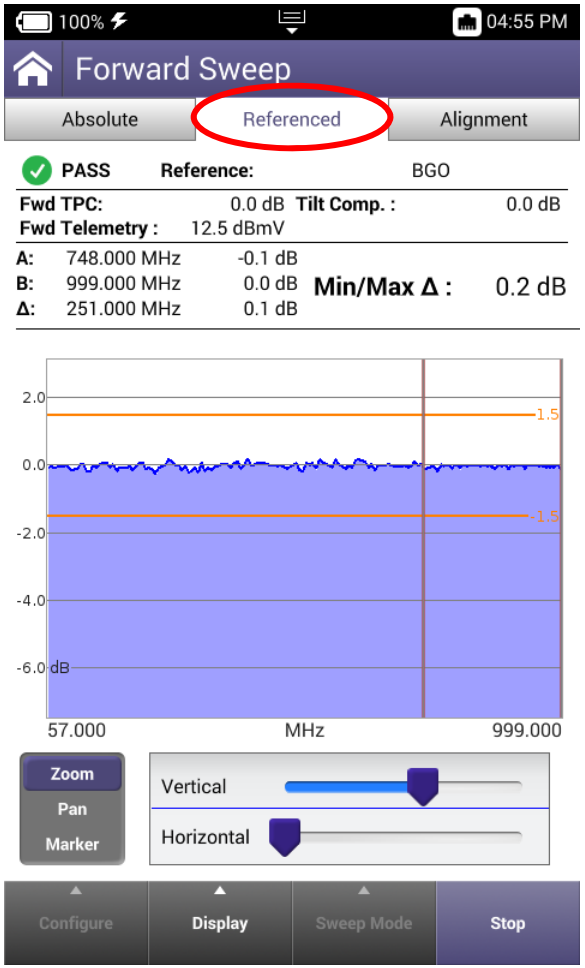
Align

Shows absolute level of designated alignment signals



Store a Reference

Shows absolute level response, cable and sweep signals



Sweep

Shows normalized response, comparing previous w/ current measured levels

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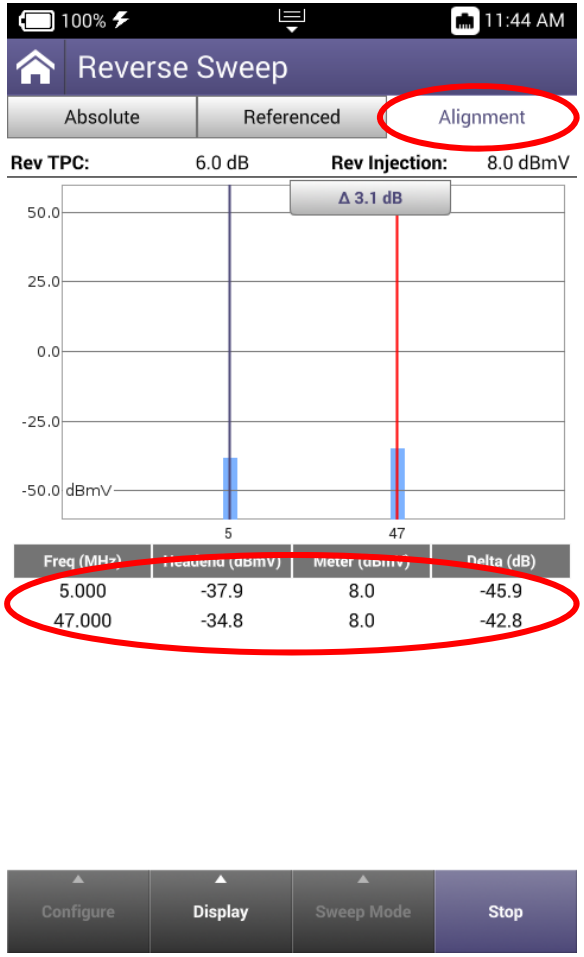
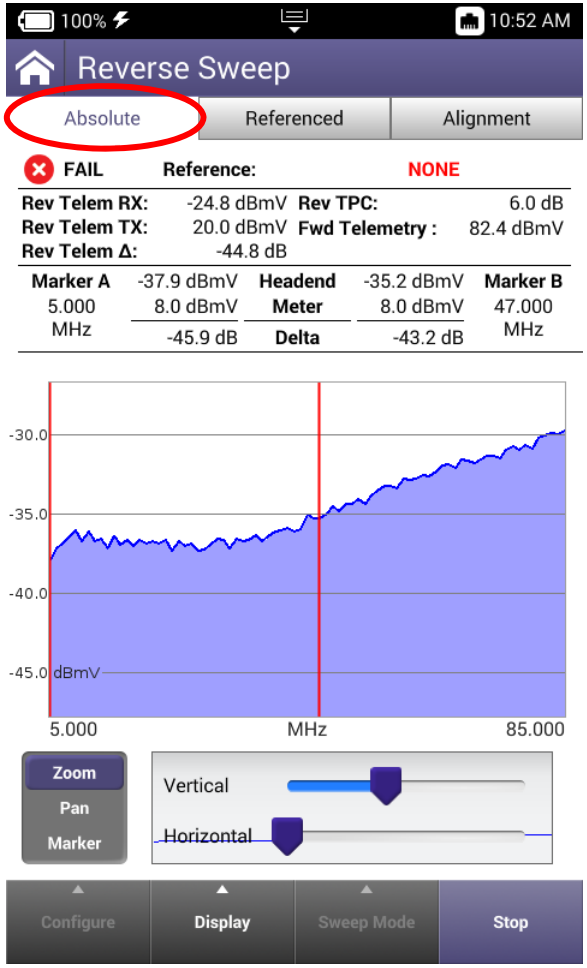
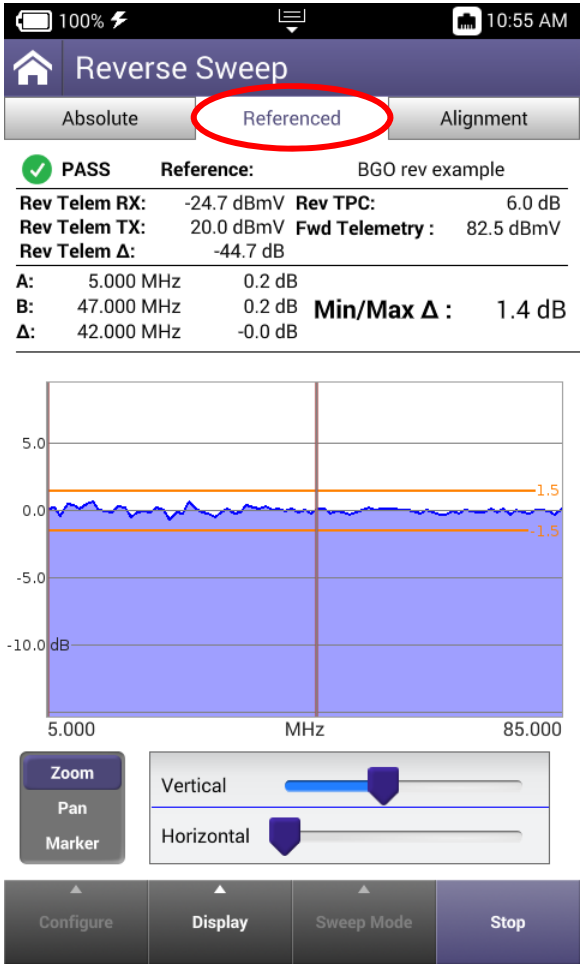
Reverse Sweep Example

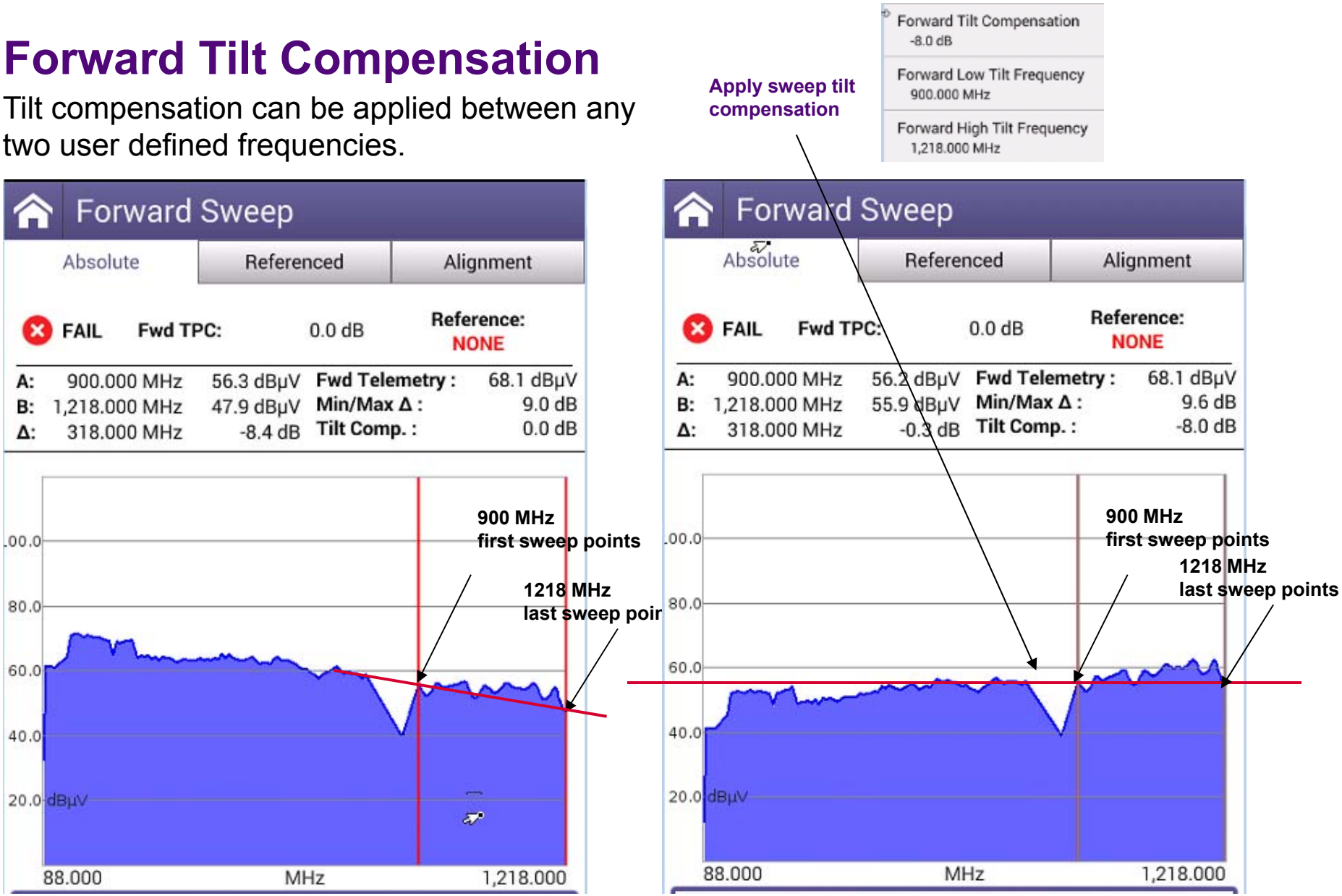






Forward Tilt Compensation

Tilt compensation can be applied between any two user defined frequencies.



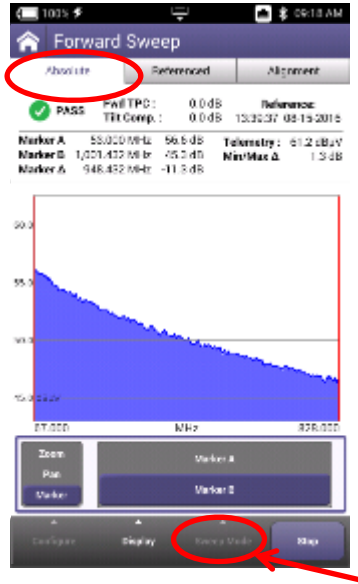
Improved Forward Sweep Workflow

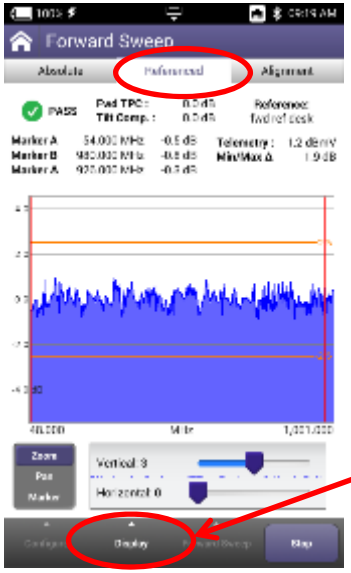
Consolidated sweep screens expedite the test process

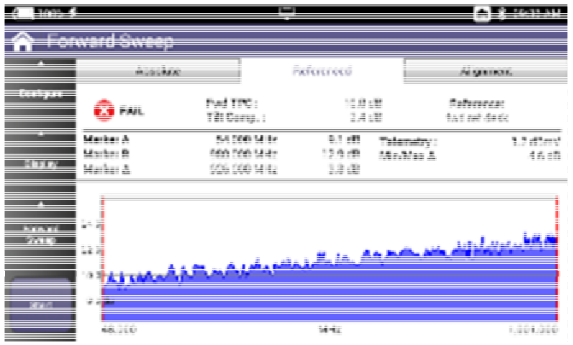
View the raw/absolute unreferenced sweep to save as a reference

View the normalized referenced sweep to identify issues

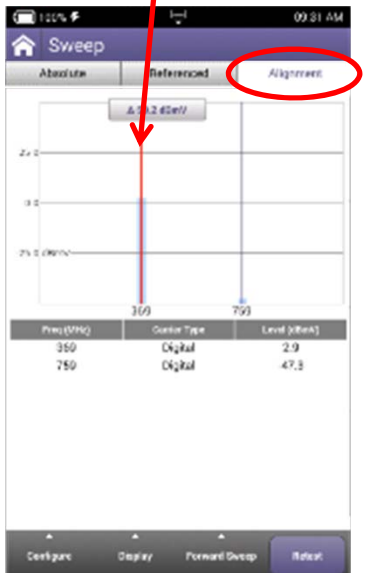
Pick tilt carriers for fast gain and alignment check. Sweep points or live carriers







Toggle between Portrait and Landscape mode



Easily change sweep modes Forward/Reverse

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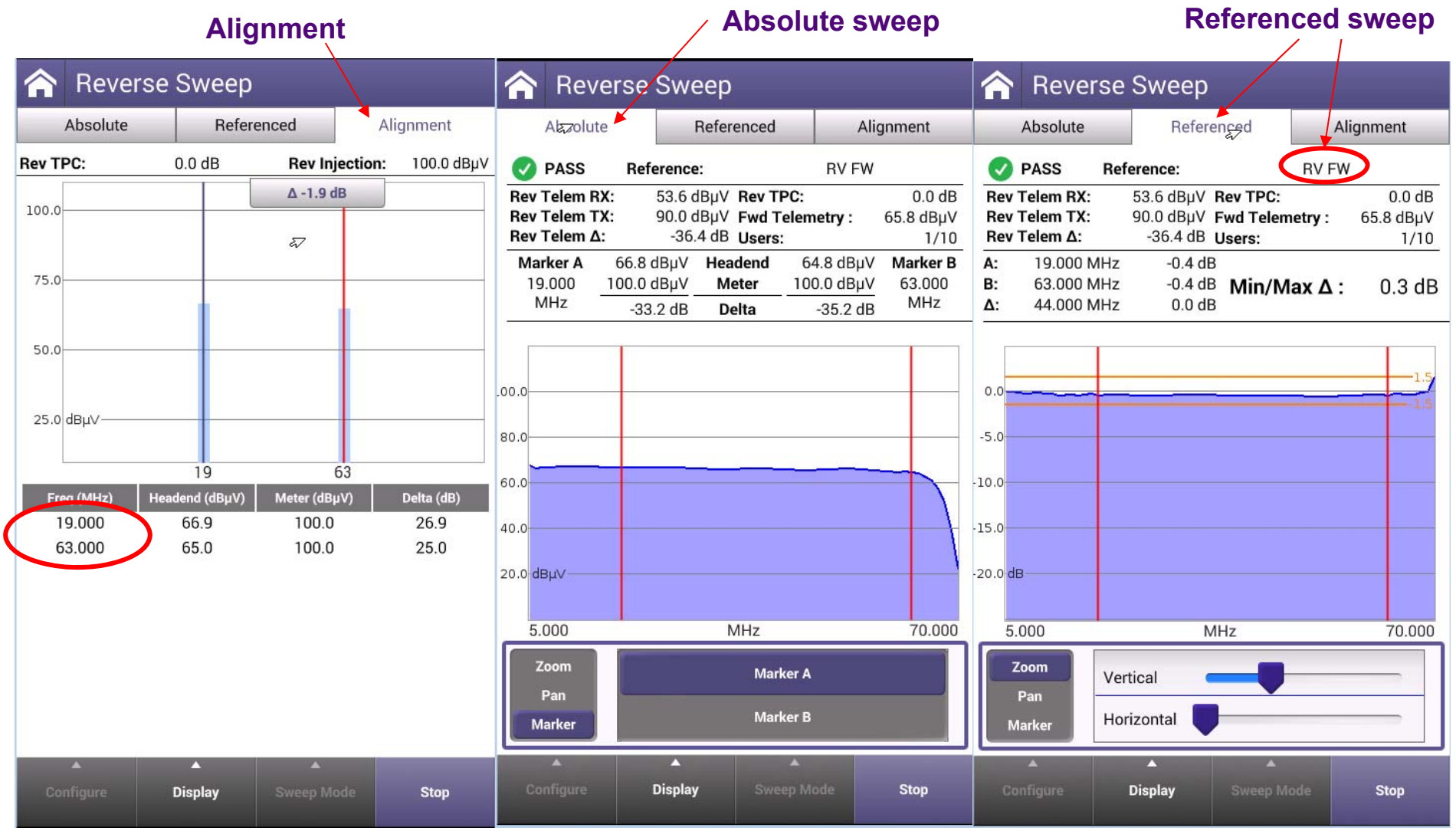
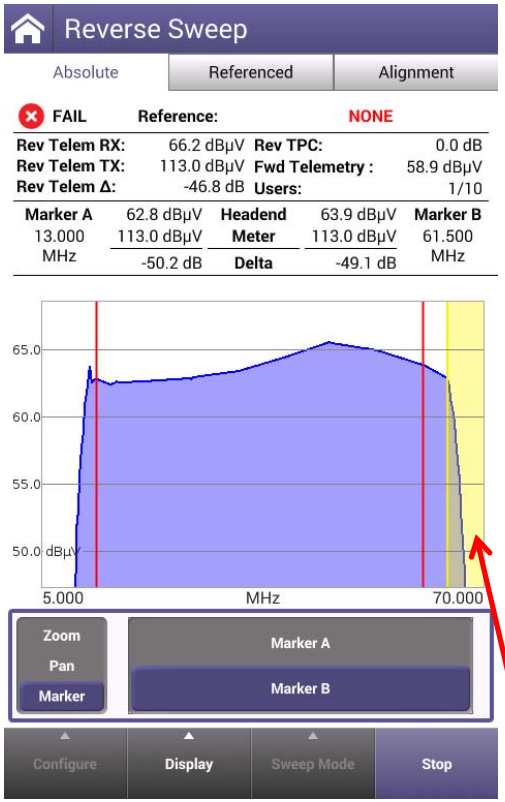
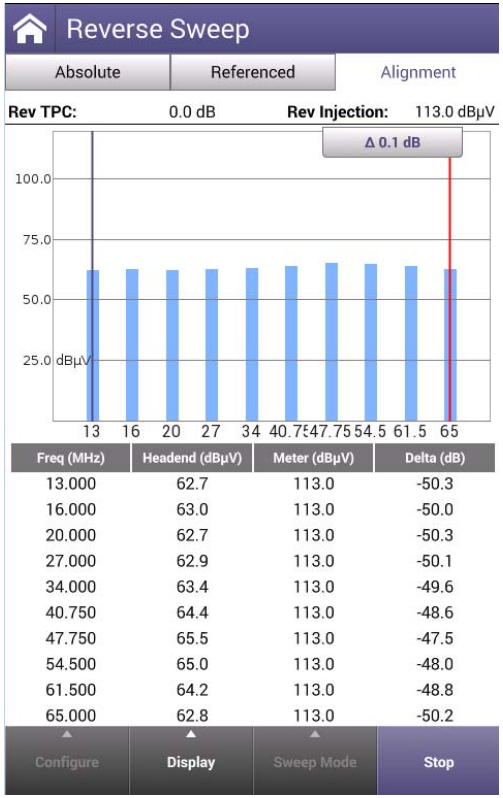
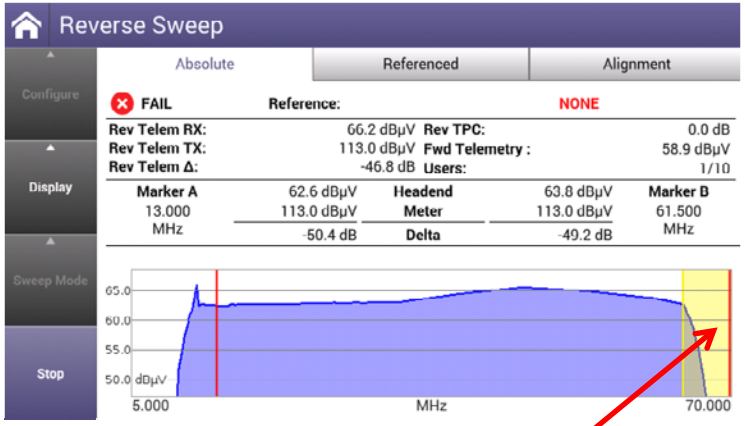
ONX-630 Reverse Sweep example



ONX-630 Reverse Sweep







Yellow highlighted area to the graph to help indicate that the sweep measurement plan is causing the ONX to measure below or above acceptable diplexer frequency ranges.

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Reverse Sweep Process – Before Leaving the Headend

1. Set ONX-630 forward sweep telemetry frequency to match SCU-1800, SDA-5500 and/or SDA-5510.
2. Set reverse sweep insertion and telemetry levels as close to system specifications as possible, considering insertion losses

   Note: Sweep and telemetry levels >15 dB above recommended input could cause return laser clipping and erroneous balancing and sweep traces. This depends upon type of laser and return hybrids used.
3. Put in Single User mode if using SDA-5500 or SCU-1800 with “single user reverse sweep” for reverse sweeping, or in Multiple User mode if using SDA-5510 or an SCU-1800 with “multi-user reverse sweep.”
4. Make sure SCU-1800, SDA-5500 and/or SDA-5510 has sweep activated and reverse is enabled.

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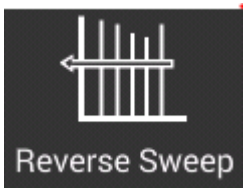
Reverse Balancing and Sweeping



1. First, align and sweep the forward path to verify all is well, then proceed with reverse
2. Sweep mode is toggled from “forward” to “reverse” by touching or selecting “Sweep Mode” at bottom of screen, and touching/selecting desired mode (sweep must be stopped before selecting “sweep mode”).
   a. A reverse sweep reference can also saved at this time
   b. Stop the sweep measurement (if it’s running)
   c. Press “Configure,” then “Save Test/Reference,” then check “Save as Reference”
   d. In “Configure” select “Choose Reference” to make sure you are using the reference you just saved.
   e. Take a reference at each leg if warranted.
3. Record reverse telemetry level, recommended reverse input, and test point loss. See Port Configurations Based On Equipment Test Point Types earlier in this document for more details for correct connections to the test point.

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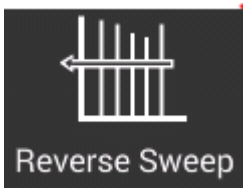
Reverse Balancing and Sweeping



4. If using amplifier internal directional test point it must be an injection test point.
   a. You may be able to sweep in reverse using forward test point if it is outside the diplex filter.
   b. Bi-directional test points can be used, but may give misleading responses due to standing waves
   c. Use a tap, if possible

Note: Turn off automatic level control (ALC), sometimes referred to as automatic gain control (AGC), in reverse rack mount receiver if present. Also turn off ALC in any LAN return amplifiers. Each ALC sensitivity will have to be adjusted after balancing is completed.

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Reverse Balancing and Sweeping

5. Proceed to first amplifier from node and reverse sweep and balance to a flat line using an EQ
6. Use corresponding node reference for leg being balanced.

   Note: Sweep trace displayed on meter will change if someone changes test point compensation on SCU-1800, SDA-5500 or SDA-5510. This also affects Reverse Alignment mode on meter.
7. Consider test point compensation and change injected telemetry level to account for different test points, different recommended injection levels, and extra accessories. They then balance to a 0 dB reference line and same telemetry reading as was achieved at reference.

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327 – Common Sweep Issues

Common Sweep Issues

Standing Waves

- Use a directional test point if available. Standing waves could still occur if a mismatch is severe and close enough.
- Read from a tap. Some lower value taps may still give reflections depending on port-to-port isolation and port-to-output isolation.
- Use a plug-in test point not a probe. Probes will always be bi-directional unless they are in series with the circuit and a directional coupler is used.
- Install a terminating tap (4 port 8 or 8 port 11) if possible (make sure you terminate the spigots). This is an easy way to isolate the system.
- Verify good test leads, connectors, F-81 barrels, etc. Use an in-line pad on your test lead to determine whether the standing wave goes away. If it disappears, a reflection is being created between the field unit and test point.

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Common Sweep Issues (2)

Standing Waves

- Reverse: Keep all proceeding actives terminated for return sweeping. Do not pre-stuff the reverse pad and EQ; noise funneling may hamper your ability to sweep properly. A high value pad or terminator is recommended.
- Reverse: Terminate all low value tap ports. Even an un-terminated splitter in a subscriber's house a few thousand feet away can cause standing waves. Coax attenuation at lower frequencies is slight, which allows the reflected wave to make it back without much loss.
- Reverse: Install a terminating tap (4 port 8 or 8 port 11) if possible. It is an easy way to isolate the system.

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Common Sweep Issues (3)

Spikes

- Keep resolution to approximately 6 MHz for forward sweep
  - Reduces chance of inadvertent, overlapping sweep points and transients
  - A sweep point every 6 MHz is sufficient in most situations for forward sweeping
  - Also means faster sweep update and less memory required for each stored trace
- Verify proper set-up, levels, channel types, no overlapping sweep and actual channels, etc
- Avoid common problem areas such as strong off-air broadcasts (analog and digital) and certain FM channels; (in return band, strong off-air shortwave, ham, and CB at 27 MHz)
- Reverse: Keep the resolution to approximately 1 MHz for reverse sweep

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Common Sweep Issues (4)

No Communication

- Verify telemetry
  - Keep it high and inside passband
  - Look for sharp diplex filter roll-off and older frequency limited passives (below range).
  - Minimum level for telemetry reception is approximately -15 dBmV, and max is approximately +12 dBmV.
- Sometimes communication is lost on input test points due to lack of gain from active and/or test point loss. Use spectrum mode to verify existence of telemetry and level. Make sure test point compensation is 0 or off.
- Verify test equipment connections, amplifier continuity, active gain, and that no terminators are installed. Use Channel Check, or Channel Expert mode verify presence of channels. If channels present, then there is continuity.
- Verify ONX-630 sweep direction. Check upper display label for “Forward Sweep”
- Browse to the SCU-1800 user interface to verify “Sweep is currently running” in lower right corner

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Common Sweep Issues (5)

No Communication – Reverse Path

- Check forward sweep to confirm communication path between transmitters and field unit.
- Put in Single User mode if using SDA-5500 or SCU-1800 with “single user reverse sweep” for reverse sweeping, or in Multiple User mode if using SDA-5510 or an SCU-1800 with “multi-user reverse sweep.”
- Collisions with other technicians conducting reverse sweeps on same SDA-5500 Transceiver may be trouble source. Use dedicated SDA-5510 Return Sweep Manager if warranted.
- Verify appropriate telemetry; keep it high and located in passband. Look for sharp diplex filter roll-off and older frequency limited passives (below range). Minimum level for forward telemetry is approximately -15 dBmV, but can also overload with greater than approximately +12 dBmV. Communication also can be lost on input test points due to lack of gain from active and test point loss. Use spectrum mode to verify telemetry level. Ensure test point compensation is 0.

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Common Sweep Issues (6)

No Communication – Reverse Path (continued)

SCU?

- Check return path continuity. Verify test equipment connections, amplifier continuity, active gain, and that no terminators are installed. Look at noise floor level on reverse input and compare with reverse output. It should be higher by amplifier gain amount, but not necessarily. Noise reading could be affected by the test equipment noise floor. If needed, inject a carrier and read output to verify continuity. Choose RSG Loopback mode to verify continuity and gain. Use diagnostics to send a CW carrier to the headend. Have headend personnel check SDA-5500 reverse carrier level. Return to Sweep mode when finished.

Note: The number of nodes per port on reverse is dependent on the noise characteristics of the return paths. At some point the signal to noise ratio will be too low to enable reliable communication via telemetry. This may also influence where telemetry is placed. Avoid 5-15 MHz due to inherent noisy nature of this passband and upper band because of diplex filter roll-off. Also avoid 27 MHz due to CB ingress as well as any multiple of 6 MHz due common path distortions (CPD).

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Common Sweep Issues (7)

Bad Response

- Verify accessories are operating correctly such as cable, push-ons, pads, etc.
- Low sweep points may get confused with noise floor especially after going through more actives with associated noise figures. This could cause “grassy” effect on sweep display. Increase sweep insertion level on the SCU-1800 to verify.
- Use correct Sweep mode. Selecting wrong mode can lead to problems.
- If input levels are too high, this may cause extreme intermodulation distortions, which can affect the associated sweep points
- ONX-630 or DSAM sweep will function only with SDA Compatible mode selected on SDA-5500 transceiver (SCU-1800 requires no configuration for this)
- High forward levels into meter can cause intermodulation that can affect reverse sweep

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Identifying Frequency Response Issues

Low End Roll-off or Instability and Standing Waves

- Usually caused by loose seizure screws, bad EQs/CSs, diplex filters, or dirty fiber connections.
- Standing Waves may be created from reflections from impedance mismatches
  - Seen when viewing a sweep display from a resistive/bi-directional test point
  - Directional test point isolation blocks reflected wave (depending on severity) from adding in and out of phase with the main wave
  - Can also be created between test point and test equipment, especially on 20 dB test points
  - The formula 492*Vp/f, will yield an approximate distance in feet to fault
    - “Vp” is cable velocity of propagation and is typically .87 for most foam dielectric, hardline cable
    - “f” is separation in MHz between two peaks in sweep response
    - 492 is derived by the speed of light, which is 984 Mft/s and fact that reflection is 180 degrees out of phase for 984/2 = 492.

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Identifying Frequency Response Issues

Suck-Outs

- Caused by grounding issues or multiple impedance mismatches at perfect intervals
  - Sometimes manifests as spikes due to signals adding in-phase
  - Spikes are also caused by oscillations and ingress

High End Roll-Off

- Associated with bad accessories, water, cracked cable sheath, or amplifier band-edge roll-off

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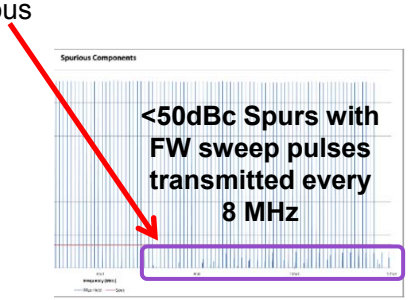
Sweep specifications

Forward Sweep

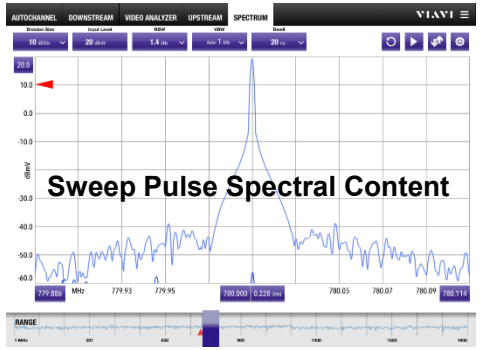
- General :
  - Up to 500 sweep points
    for reference and measurement by the field instrument
  - Supported Sweep Plan Active Carrier types :
    Analog (NTSC, PALB, PAL GH, PAL I, PAL DK,)
    Digital (6 or 8MHz), OFDM (24-192MHz)
  - Recommended FW sweep level:
    10dB below the SC QAM level and 6MHz OFDM level
    14 to 16 dB below analog video
  - Recommended Telemetry level:
    Telemetry level set 10 dB below the nearest analog video carrier (~ 1 MHz needed)
  - Narrow Sweep Pulses – fit between carriers
- ONX :
  - FW frequency Diplexer dependent 5-1,218MHz
  - ONX input range: 40-80dBµV (-20 to +20 dBmV)
- SCU FW Telemetry and FW Sweep pulses:
  - Frequency Range / Resolution: 42-1218 MHz / 10 kHz
  - Output Level:
    - 80-110 dBµV (20-50 dBmV)
    - 1 dB resolution
    - 0.5 dB accuracy typical,1 dB accuracy over temp
  - Spectral purity:
    - 50 dBc harmonics & spurious
    - Sweep pulse Bandwidth:
      < 5 kHz @ 3 dB BW
      < 50 kHz @ 50 dB BW
    - Telemetry Bandwidth:
      < 300 kHz @ 3 dB BW
      < 900 kHz @ 50 dB BW

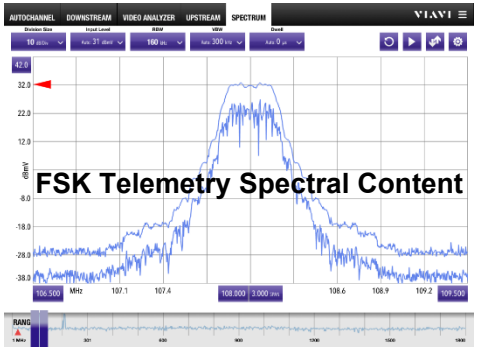


- Telemetry Modulation:
  - FSK ±100 kHz deviation, 65 kbps
  - Recommend 600 kHz space from SC QAM/OFDM edge

Reverse Sweep

- ONX Rev Telemetry and FW Sweep pulse
  - Frequency Range: 4-204 MHz
  - Reverse injection level: 68-113dBµV (8-53 dBmV)
  - REV sweep outputs: Up to 300 sweep points
- SCU input:
  - Recommended input level: 0 dBmV
  - Input range and accuracy: 40-80dBµV (-20 to +20 dBmV); ± 0.75 dB typical; ± 2 dB over temp
  - Minimum SNR at SCU input: 20 dB signal-to-noise ratio required on received reverse telemetry from field meters





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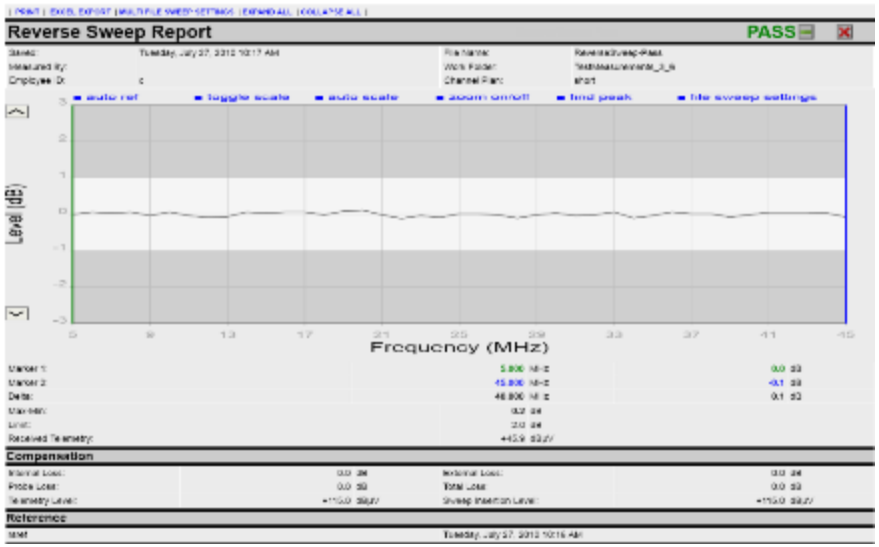
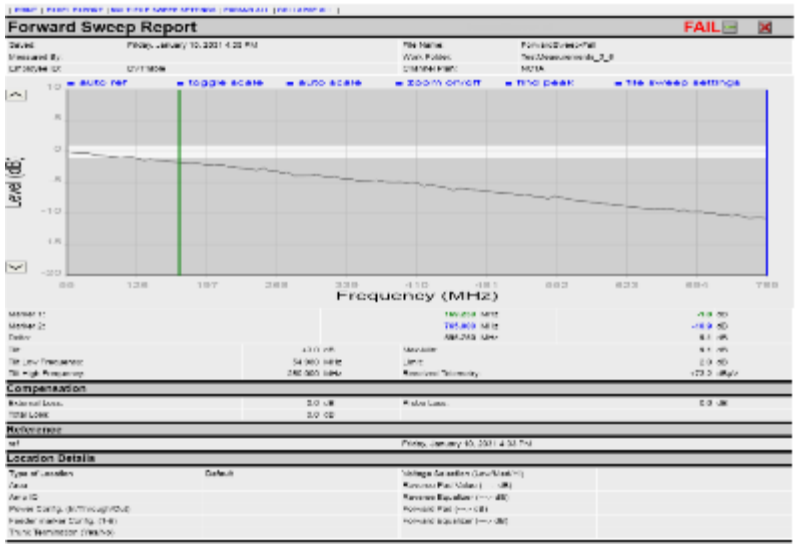
Sweep Reporting – Same reports for ONX and DSAM

Utilize the same sweep reporting tool in **StrataSync** for DSAM and ONX

- Same flexibility
- Same capability
- Same user interface
- Mix and match reports done from DSAM and ONX for sweep reports
- StrataSync cloud management simplifies usage





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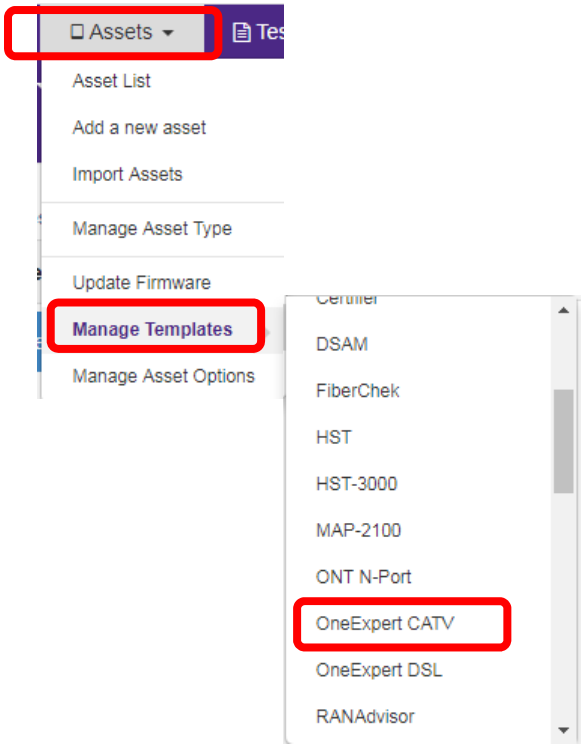
339 – Test Point Compensation Configuration in StrataSync

Locate the Test Point Compensation Configuration

- OneExpert CATV Test Point Compensation (TPC) configuration is found in the Manage Templates section
- To find TPC configuration in StrataSync:
  - Open Assets menu
  - Select Manage Templates
  - Find and select OneExpert CATV
- Find Manage Templates selections



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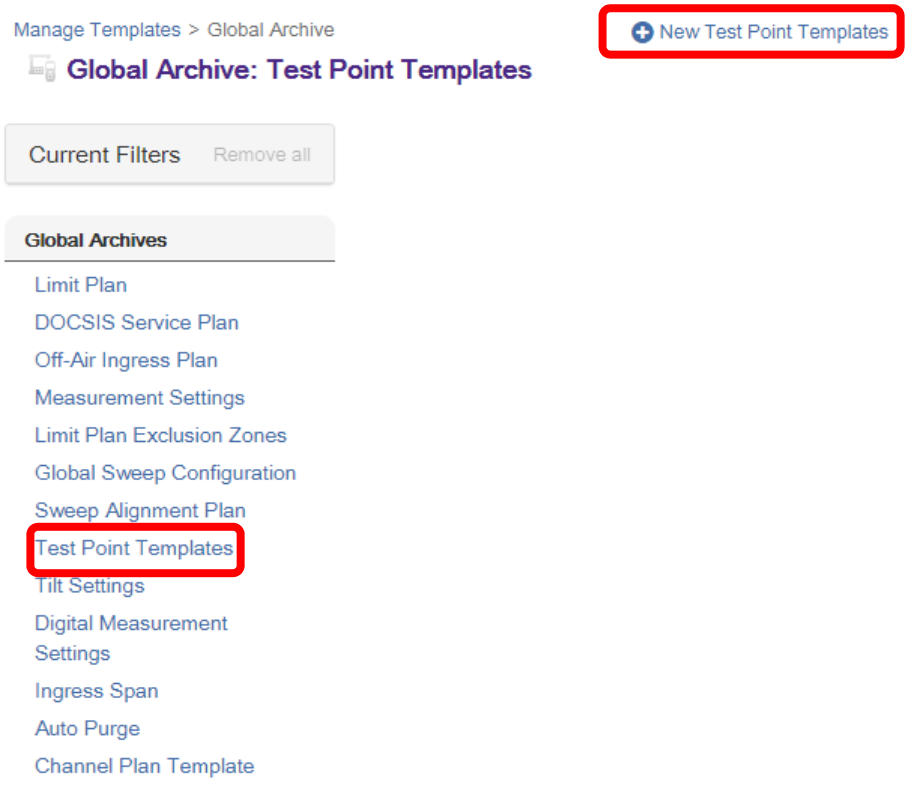
Create a New Test Point Compensation Configuration

- Under Manage Templates for OneExpert CATV, select “Test Point Templates” under Global Archives
- To create a new TPC configuration press the blue plus sign and/or menu labeled “New Test Point Templates”



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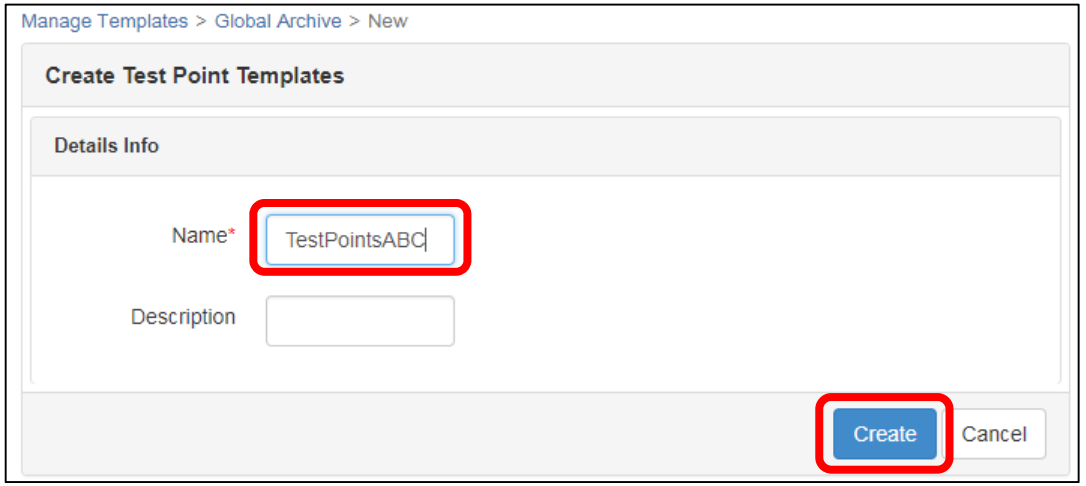
Label the new Test Point Template

- A new box will appear asking you to label the new TPC configuration
- Choose a name that can be easily found later to make configuration deployment easier
- Enter a Name and/or Decryption (optional) and press the “Create” button



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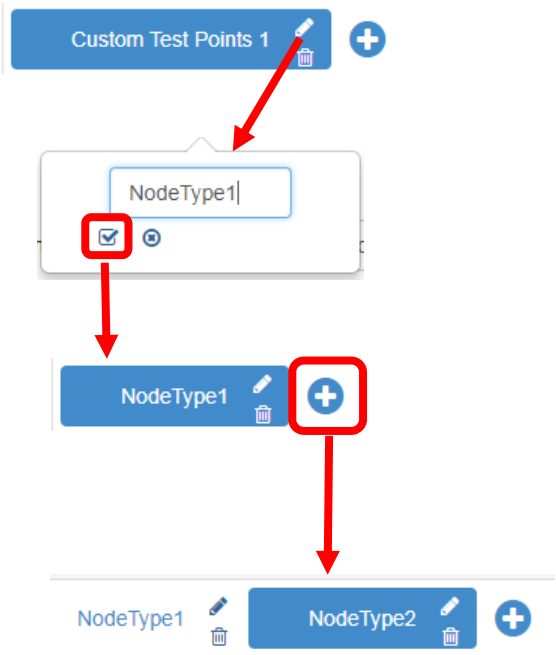
Rename and Add Test Points

- Multiple test point locations can be created under a single TPC template
- By default, the names listed for individual test point locations are “Custom Test Points” and a number index
- Change the “Custom Test Points” label to something more meaningful to a user in the field – press the pencil icon to modify the default name, press the Check Box to accept the new label
- Press the blue and white plus button, to the right of the labeled test point locations to then add more test point locations to the Test Point Template, and repeat the above steps to relabel and add more locations



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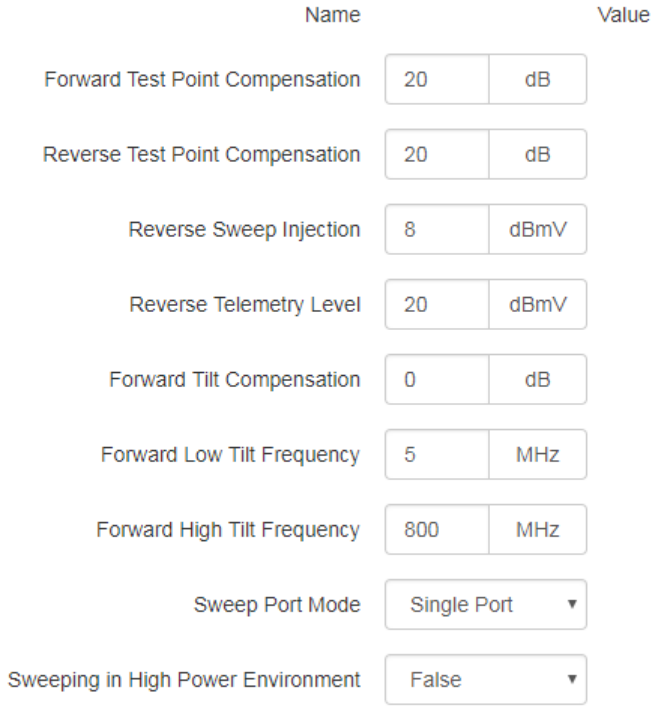
Editing a Test Point Compensation Configuration value



- Forward TPC = level applied to downstream tests involving power levels
- Reverse TPC = level applied to upstream tests involving power levels
- Reverse Sweep Injection = reverse sweep point transmit level*
- Reverse Telemetry Level = reverse sweep telemetry signal transmit level*
- Forward Tilt Compensation = tilt applied to sweep graph between Low and High Tilt Frequencies
- Forward Low Tilt Frequency = starting frequency for Forward Tilt Compensation
- Forward High Tilt Frequency = stop frequency for Forward Tilt Compensation
- Sweep Port Mode = Single Port is for bidirectional test points [all sweep from 1 port], or Dual Port for directional test points where ONX port 2 is used for Reverse sweep and Port 1 is Forward sweep
- Sweeping in High Power Environment = Only if the total integrated power out of the local test point will exceed the ONX spec of +60dBmV – enable by setting to True, otherwise leave as False

*The reverse sweep telemetry and reverse sweep point injection levels must be transmitted so there is an acceptable level for the headed sweep receiver to properly receive and measure the sweep points/telemetry, which should optimally arrive at the headend sweep receiver unit at approximately 0dBmV (+60dBµV) with ±15dB of level margin

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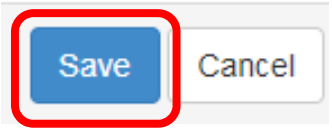
Don’t forget to Save

- Once test point locations have been properly setup, click the Save button at the bottom to save the newly created Test Point Template



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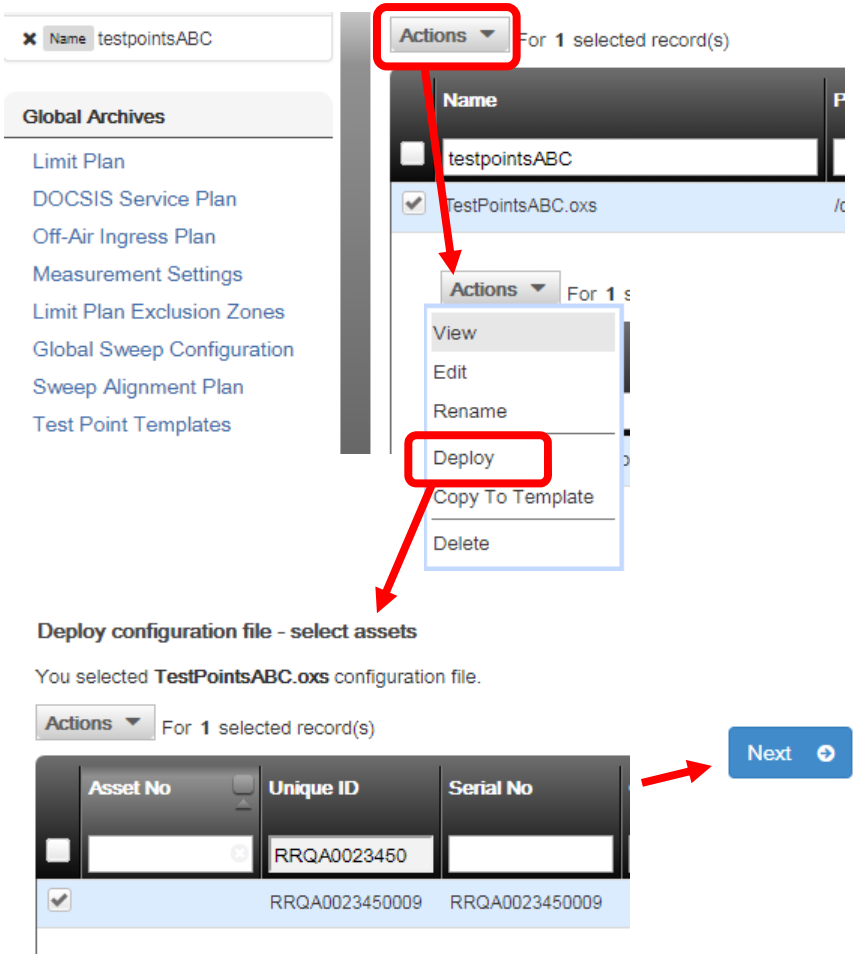
Deploy Test Point Template

- As with all OneExpert CATV configurations setup in StrataSync, the Test Point Template can be added to a Template, or it can be deployed directly to ONX units individually or in a group
- You can search for, or directly select the Test Point Template
- Press the Actions button then press Deploy
- Find the ONX, or group of ONXs, and check the box next to each one, then press Next



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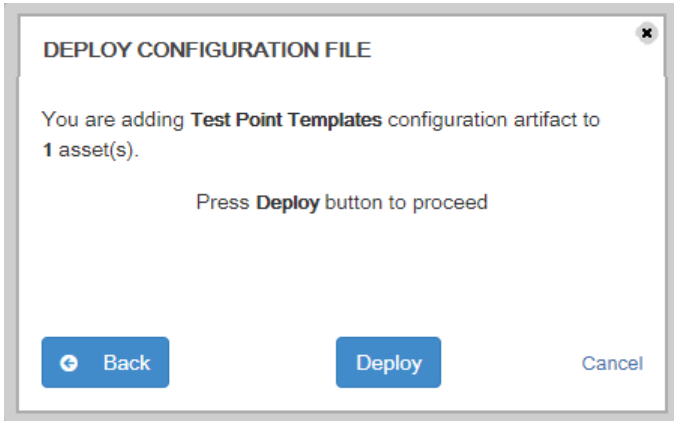
Confirm Deployment of Test Point Template

- Review the summarized deployment and if it is correct, press the Deploy button



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Sync and Verify Test Point Template on ONX-CATV

- Sync the ONX to receive the newly configured Test Point Template
- To verify that the Test Point Template was properly received on the ONX, look under the Configure Test Point menu on the ONX
- The newly configured Test Point locations will appear and be locked from editing on the ONX
- New Test Point Locations can be added on the ONX itself in case local immediate edits are required