VIAVI

# OneExpert CATV 620

**Extended Quick Start Guide v10** 

August 2018



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### **ONX CATV - Overview**

#### **ONX Controls keys**



#### **ONX Interfaces**

#### Port 2 – RF Ingress Port

Connect to upstream from house for Ingress Scan Port 1 – RF US/DS Analysis DOCSIS, QAM



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



e o the Laur 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.



# 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%.

# **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.

#### <u>Hint:</u>

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.

#### **User interface**

NAVIGATING THE 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.

# **Home Screen**

<b></b> 67%			02:52 PM
CATV			•
CATVN	letwork		
Wiring <sup>-</sup>	Tools		
Etherne	et Test		
Wifi			
HPNA (	Coax - Sn	nartID	
Full Sw	eep Coa>	< - Smar	tID ┥
System	I		
Ť			ıl,∕
OneCheck	Quick Check	StrataSync	Channel Check

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



# **System Settings**

55% 📮	💼 07:10 PM
🟫 System Settings	
Instrument	
Date and Time	>
Remote Operation	>
Bluetooth	>
International Settings	>
USB Software Update	>
Hardware & Software Revisions	>
Options	>
Calibrations	>
Save Location Both (when applicable)	
Restore Factory Defaults	
User	

#### 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 and
- complete USB Software updates

	<ul> <li>120250</li> </ul>			C 24	▲ 0111 PM
<ul> <li>Options</li> </ul>				🏫 System Settings	
Options	Activation			Instrument	
IPX Packag	e Enabled			Bata and Time	~
ONX BLUETOOTH SW OP	Enabled			bar are me	
ONX DOCSIS 3.1 OFDM	C 65%	🖵 💼 07:13 РМ		Remote Operation	>
ONX DOCSIS 32x8 BONDING ONX IPVIDED SW OP1	Screen & I	Power Management		Diuricofn	>
ONK MOBILE SW OP	Becklight			International Sections	>
ONX MoC/	а	6 1899			
ONX TRUESPEED SW OP1	Backlight Timeout			1893 Software Update	>
TSX PACKAGE	5 minutes	Hardware &	software Hevisions	Hardware & Software Revisions	>
NOT MUS	10 minutes	Meter Model: ONX-	620		
		SW Bundle ONXCB		Options	>
		Base		Calibrations	>
		3.7.86		Save Location	
		Cable		Bath (when applied b)	
		2.2.86		Restore Factory Defaults	
		DOCSIS Cable Modern 3 1.3.54	385	Uner	
		APO Processor			
		Processor ID RRP20042850013			
		Assembly ID 22078732-002			
		OneExpert Cable			
		Unit ID RRQA0023450029			
		Assembly ID 22069324			
		MAC Address - Ethernet 00:07:11:10:09:DE	1		

#### **System Settings – Remote Operation of ONX**

<b>(</b> ] 100%	💼 07:06 PM
🟫 System Settings	
Instrument	
Date and Time	>
Remote Operation	>
Bluetooth	>
International Settings	>
USB Software Update	>
Hardware & Software Revisions	>
Options	>
Calibrations	>
Save Location Both (when applicable)	
Restore Factory Defaults	
User	

- The ONX CATV support 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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O RG59 (VOP 0.660)

# **CATV Settings**

		OneCheck	been added to make BER dwell time 1
CATV Settings		Measure BER 1.0e-9 (will slow OneCheck)	ChannelCheck
Configuration		BER Dwell Multiplier	<ul> <li>Measure BER 1.0e-9 setting has been added to ChannelCheck.</li> </ul>
Units		Channel Check	Automatic File Purge
Tilt Configuration	>	Measure BER 1.0e-9 (will slow Channel Check)	Purge synchronized files
Hardware Configuration	>	1	Minimum age of data before purging (Days)
Channel Plan Build Settings	>/		7
Digital Measurement Settings	>		Manual file purge Purge all work orders and report files.
Debug Utilities Cable Type	>		<ul> <li>Auto-purge</li> <li>Configuration through StrataSync is now</li> </ul>
Automatic File Purge	>	S New Work Order Name Co	onvention
Work Order Naming Convention	>	New Work order naming convention Use Last selected Work Order Name	CATV Settings
Restore Defaults			<ul> <li>Provides the option for default work order ID to be the last selected work order instead of "Work Order" with</li> </ul>
		Select New Work order nar convention	date/time stamp.
		Use Current Date	
		Use Last selected Work Order Name	

Digital Measurement Settings

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**OneCheck** 

be locked.

Measure BER 1.0e-9 setting can now

• BER dwell multiplier configuration has

# ONX CATV - SW Upgrade and Data Synchronization

### **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 StrataSync and USB Stick
- All ONX units should be upgraded to the latest production software release available through StrataSync (or your Viavi representative)
- 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.

### **USB Upgrade Process**

1.	StrataSyn	с™						ilt	1	
						Notific	tions Pre	terences	System Settings	
	UPDATE FIRM	WARE - Choose a	in update packag	,				•		
ashboard 🛛 🗛	When download	ing a firmware pa are Version	ckage,please unz	ip and follow	v instructions in	the "readme" file			_ ≤	— Неір
	Package Name	Version	Release 🔺 Date	Statua	Language	Comments	Release Notes	Downloss Firmware		
urrent Eillere	2.1.10	2.1.10	3/22/18	GA		ONXCBL.002.001.010.000	E (	≛		
arrent riners ir	2.1.9	2.1.9	3/3/16	GA		ONXCBL.002.001.009.000		<b>Ž</b>	d Comica	d Report
avorite Views									N A Page	1 0 1 1
/ Saved views									Tech ID	Tech Nam
lault View										
and ulawa									tr610620	9610
ISTOU VIEWS									tr610620	9610
ow the view list O									tr610620	tr610
									tr610620	9610
									1/810620	9610
									∢ ∢ Page	1 of 1 →
				blast	•			Cancel		_
_				14500				Candel	Assistance Cor	nomie klome

Click here to download the newest firmware

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

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

# **USB Upgrade Process**

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

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File Browse

System

Settings

108

CATV

Wiring Tools

Coax - SmartID

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Ethernet

.....

Ethernet

System

StrataSync

1.

Channel Check DOCSIS Check

Wifi

Image: Second Sec

Network Software Update

Hardware & Software Revisiona

USB Software Update

Options

Calibrations

Save Location

Both (when applicable)

Destore Fontony Defouits

Update

2)

Select USB Software

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

🖬 🖈 01-03 PA

DNX-ARGADOUT190001;0.0

100% 🖈

USS Update Path

USB:/ONXCEL.002.001.010.0xu

Force Software Update

Select Update File

ONXCBL 002.001.009.oxu

DNXCBL.002.001.010.com

ONXCBL 002.001.010 production.exu

ONXCBL.001.000.001 RC6.oxu





5) 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



# **StrataSync Synchronization - ETHERNET**

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

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Wifi

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



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



# **StrataSync Synchronization - 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.
- 1) Connect with WiFi from an active internet connection (Cable Modem or router/gateway)



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



## **StrataSync Synchronization - RF**

- 1) Make sure that CM MAC 1 is provisioned in the billing system
- 2) Select the CONNECTION APP from CATV

97% 🗲	Ę		🕽 💲 09:39 PM
CATV			▼
``[	∞.	d,	<b>₽</b> ∕
OneCheck	Ingress Scan	Channel Check	DOCSIS Check
Connection	CATV Settings		Quick Check
	HL Leakage		

3) Once CONNECTION STATUS reports a GREN Check mark and INTERFACE: RF; IP ADDRESS is shown



# StrataSync Synchronization – ETHERNET, WIFI and RF

 After IP Address verification, navigate to the System Menu and select StrataSync 2) StrataSync Account ID = xxxxxxxx Server Address = stratasync.jdsu.com (stratasync.viavisolutions.com also works) Server Port = 443







 Download VIAVI MOBILE TECH v2 app



 On ONX620 or 630, enable BLUETOOTH by going to SYSTEM SETTINGS->BLUETOOTH SETTINGS





 Select SCAN FOR DEVICES, select mobile phone and PAIR mobile phone to ONX



 Accept the PAIR request on the mobile phone



Open VIAVI Mobile Tech app

 Connect to ONX now identified in BLUETOOTH SETTINGS on mobile phone





 LOGIN using STRATASYNC LOGIN and PASSWORD credentials. If user doesn't have login credentials – please reach out to local STRATASYNC ADMINISTRATOR



 If ONX is not connected, choose CONNECT



 Select the \*\*\* in the upper right-hand corner for SETTINGS



 In SETTINGS, users can select the number of minutes between automatic SYNCRONIZATION of test data



 Return to the main screen and select INSTRUMENT SYNC



- Once saved on ONX, the test data will appear in the SYNC folder and will automatically sync to STRATASYNC at the chosen time interval. The sync from MOBILE TECH to STRATASYNC will occur regardless of whether the tech views this screen
- Test data will appear in STRATASYNC after a few minutes (3-5 minutes based on the number of files)



#### Last Synced: 12:55 PM 6/1/2018



# Firmware Update Via StrataSync

#### Available" - Select OK. 💼 🗶 10:53 AM 🔲 100% 🗲 -🔲 100% 🗲 ŀ 💼 😫 10:54 AM StrataSync StrataSync 🖸 ≵ 14:1 008. 🗲 Sending Last Sync 😭 StrataSync Files IP Address: 10.11.21.50 IP Address: 10.11.21.50 Software packages 7) O Ο Last Sync will be confirmed -Select Update StrataSync Account ID StrataSync Account ID 1234557890 1234557890 StrataSync Tech ID/User ID StrataSync Tech ID/User ID 🖴 Software Update Available ar610620 ar610620 Click OK to accept the update Interface Interface Ethernet Ethernet Server Address erver Address OK stratesync viavisolutions.com stratasync.viavisolutions.com Server Port Server Port 443 443 Ethernet Unit ID Unit ID Server Address RR040054750501 RR040054750501 stratasync.viavisolutions.com Server Port Start

5) Select Start

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

Currently installed Packages:

base.003.006.009

cable.002.001.009

Packages To Be Installed:
base.003.006.009
cable.002.001.009
Structure to the installed:
base.003.006.009
cable.002.001.009
Structure to the installed:
base.003.006.009
Structure to the installed:
Structure to the installed:
Structure to the installed:

**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 will require that it is plugged into AC power or above 50% battery life prior to updating

# **Troubleshooting the ONX FW/SW Upgrade Process**

#### IF ONX Displays NO IP ADDRESS or "IN USE BY APPLICATION ERROR"

2)

- Confirm the Ethernet port is turned on by selecting the *Network* option at the bottom
- If the IPv4 State = "In Use By Application" – From the Home Screen and navigate to the *Network* menu – Select *Network*
- Select the Network Stop button at the bottom – This disassociates the Ethernet port with the Ethernet testing function
- 4) 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

# **System Settings – Remote Operation of ONX**



Select VNC and enter Password (Any free version of VNC will work)

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Network Mode IPv4 IPv4 Address Mode

## ONX CATV - Engineering Mode

#### **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 :



P¥	W BIST: Pacced
Ŵ0	20 BIST: Passed
AD.	C Clicck RIST: Paysed
AD.	C Parts Select FIST: Passed
AD,	C Serial RIST: Passed
ΔD,	C High Speed NST Passed
80	EC Detect RIST: Passed
AD,	C OpAmp D ST. Passed
In	pesa Bulk Atten BIST: Passed
n.	peas Step Arten SIST: Passed
n,	peak Bandpace SIST: Packed
TU	N Delay BIST: Passed
1 D	1 Incrementor BIST: Parcoad
P)	1 Noise BIS . Panavel
66	Lisignal BIST, Passed
BC	M React BIST, Passed
BQ	M Ethernet BIST, Passed
Pø	rt 1 Calibrator BIST: Passed
Pø	it 1 High Filter BIST, Pussed
PØ	nt Low Filter BIST: Passed
P)	rt I Filter Swhoh BIST: Passed
P0	rt I Bulk Atten BIST Passed
20	rt 1 Step Atten BIST: Packet
Ph	n 1 DS Arry RIST: Record
SC.	W Keepen, HST Passed
P.	pers Sarep Paint, Just BIST Passed
SA	weptylow NST Pessed
T,	t Complete Retuits swedin (day, juid

NUMBER



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



6	4 MB	Free: 5,38 MB	Total: 3	2.95
	CustBist20 Size 1968	170426T   441   4 Modified	045882 zip :04/25/2017 02 411	m
C	opv			
C	ut			
Pa	aste			
U	pload FTP/HT	TP		
70	opy to USB			
1	end to Mobile	Device		
S				

# **ONX CATV - Ethernet Testing**



### **Ethernet – Tests and Settings**





50% ÷ 🏂 07:28 PM 94% Ethernet System Network Link Down 2 Address 255.255.255.0 Netmask .... -Link Up 192,168.0.1 Gateway 1 Up/1000M/Full Link Up DNS. 209.18.47.62 Link Network Packets Ethernet \$ Network Up MAC Address 00:07:11:10:09:e0 Test IPv4 Up Address 192.168.0.17 Netmask 255.255.255.0 Ping Traceroute Gateway 192.168.0.1 Primary DNS 209.18.47.62 Video SPEEDTEST Connection Details Tests & Connection Details Tests & Settings Network Stop Settings

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

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Netmask

Gateway

Load

FTP/HTTP

Web Brows

Save

VoIP

💼 ≵ 10:57 PM

Delete

TrueSpeed

Speed Chec

Network Start

Network Up

Address 192,168,1,10
#### **Ethernet – Speed Check**



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

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### **TrueSpeed Setup**

94%	🖳 🛤 🗱 10:57 PM
System Netw	vork
_	Network Up
2 Link Down	Address 192.168.1.10
<b>.</b> +	Netmask 255.255.255.0
1 Link Up	Gateway 192.168.1.1
	DNS 192.168.1.1
Ethernet Settings Save	Load Delete
Ping Tracerout	te FTP/HTTP TrueSpeed
Video VoIP	Web Browser Speed Check
SPEEDTEST	
Connection Tests & Details Settings	Network Start

42%	i <u></u> ∎i	💲 01:17 PM
👆 TrueSp	beed	
	Select profile	Primary Server
Default Upload: 2M	Download: 10M	
Default Upload: 25M	Download: 150M	
matt Upload: 20M	Download: 200M	
Default Upload: 10M	Download: 10M	
300mbps Upload: 20M	Download: 300M	
New		

<b>(</b> ]] 4	3%	<b>—</b>	🕏 11:53 AM
◆	TrueSpeed	d Servers	
Prin	nary Server		
Dest IPv	ination Type 4 Address		
Serv 143	er Address 2.129.0.65		
User vts	name user		
Pass ***	word		
Fall	back Server		
☑	Enable Fallbac	k Server	
Dest IPv	ination Type 4 Address		
Serv 142	er Address 2.129.0.67		
User vts	name user		
Pass ***	word		

- 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

## **TrueSpeed Results**

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



Upl	oad	Down	load
11.	8M	118.	.3M
▲ Profiles	Server Settings	Results	Start

#### **CATV Measurements**

- QuickCheck
- Ingress Scan
- Spectrum
- TDR
- OneCheck

### CATV Measurements– QuickCheck



#### **QuickCheck Setup**

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

- Enter WORK ORDER IDand choose demarcation point and press Start
- Navigate the Results Screen (shown to the right) using touchscreen or Directional Buttons





Carrier Configuration          126.250 MHz         195.000 MHz         Digital         425.000 MHz         Digital         594.000 MHz         Digital         714.000 MHz         Digital         714.000 MHz         Digital
126.250 MHz Analog 186.000 MHz Digital 426.000 MHz Digital 094.000 MHz Digital 714.000 MHz Digital
195.000 MHz Digital 425.000 MHz Digital 994.000 MHz Digital 714.000 MHz Digital
425.000 MHz Digital 994.000 MHz Digital 714.000 MHz Digital
594.000 MHz Digital 714.000 MHz Digital
714.000 MHz Digital
791.250 MHz Analog
999.250 MHz Analog

Add/remove frequency and type of carrier

### **QuickCheck Results and Settings**







# CATV Measurements -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 pull 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



#### **Spectrum Results**

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



#### **CATV Measurements - TDR**



#### TDR

- TDR function will allow users to set the Velocity of Propagation (VoP) in various cable types
- Connect to PORT 2 to take TDR traces, selecting the proper demarcation point



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# **HOME TDR**





**VoP Configuration** 

- A TDR measures reflections based on time. Therefore the correct Velocity of Propagation for the cable to be tested must be chosen first.
- VoP is essential for accurate distance measurements

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## **TDR – DROP CHECK and CABLE LENGTH**



- DROP CHECK and CABLE LENGTH tabs are identical tests. The DROP CHECK simply reminds the user to disconnect the other end of the drop.
- Displayed is a 57' cable with a splice.
- The splice is a small reflection at 22' while the open end of the cable is a larger reflection at 57'.

# **TDR - HOME TDR**



- HOME TDR test is designed to display splices, splits and cable lengths.
- Example to the left still shows the splice at 22' with a splitter at 57'and 2 cables connected to the splitter with open ends.
- HOME TDR displays all 4 events.
- Markers can be added for relative distances under from the display button.
- Horizontal Zoom and Pan functions are at the bottom of the display

# CATV Measurements – Ingress Scan

## **Ingress Scan**



Stop

## CATV Measurements – Channel CHECK



# **Channel CHECK - DASHBOARD**

#### 🗙 DASHBOARD

Oownstream (100 %)

Level (dBmV) Max: 4.5 Min: -11.0 MER (dB) Max: 45.3 Min: 29.4

- Dashboard gives an overall status on the test. Because Channel Check is LIVE, measurements will continue to update once the dashboard
- Max and Mins are displayed for MER(dB) and Level (dBmV)

# **Channel CHECK – 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

E O MIGT	and the second	
.0.0		Dises
5.0 dBmV		
54.000	MHz	1,002.000

Level -6.9 dBmV	8 MER 29.7 dB	BER 4.4e-4 Pre	BER 1.1e-4 Post
🕗 Echo	👩 GD	O ICFR	DQI JUU
-35.3 dBc	84 ns	0.5 dB	0.0

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



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



# **Channel CHECK – 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 as CHANNEL VIEW is selected in BLUE



# **Channel CHECK – 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 as CHANNEL VIEW is selected in BLUE



# **Channel CHECK – ICFR (In-Channel Frequency Response)**





 IN-CHANNEL FEEUENCY RESPONSE of the specific carrier selected in CHANNEL VIEW and will continue until stopped

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

Channel Centrol	Search Channel	<ul> <li>Enter Channel Number</li> </ul>
Gnannel Search	Search by Channel Number	8
	Search by Channel Frequency	Find Channel
	ок	

60

# **Channel CHECK – 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
- To rapidly change channels use Channel Searc has long as CHANNEL VIEW is selected in BLUE



# **Channel CHECK - FAVORITES**



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



# **Channel CHECK - CONSTELLATION**



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

 To rapidly change channels use Channel Search has long as CHANNEL VIEW is selected in BLUE

Channel Search	Search Channel	Enter Channel Number
unamici ocardi	Search by Channel Number	8
	Search by Channel Frequency	Find Channel
	ок	

### CATV Measurements – DOCSIS Check



# **DOCSIS CHECK- DASHBOARD**

🔀 DASI	HBOARD	$\mathbf{\nabla}$
ODOCSIS	(98 %) Status: Establishing CPE IP	
2	5x (1x OFDM)   Downstream	
	Forward TPC: 10.0 dB Min Rx: 3.7 dBmV Min MER: 34.1 dB Max BER: 1.0e-9 (pre) Max MER: 45.9 dB	
	Upstream   4x	•
	Max Tx: 41.5 dBmV Max ICFR: 1.3 dB	

• Dashboard gives an overall status on the test. Because DOCSIS CHECK is LIVE, measurements will continue to update once the dashboard indicates 100%

- 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

# **DOCSIS CHECK – 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

10.0	•		Level -6 9	8 MER	BER	BER
10.0		line.	dBmV	dB	Pre	Post
5.0	7		S Echo	GD GD	ICFR	
0.0 dBmV			-35.3 dBc	84 ns	0.5 dB	0.0
54.000	MHz	750.000				

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



# **DOCSIS CHECK – 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 as CHANNEL VIEW is selected



# **DOCSIS CHECK – 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

V	TRANSMIT OVER TIME		
	✓Live: 41.3 dBmV ✓Min: 41.3 dBmV	⊘Max: 41.5 dBmV	
44			
40	dBmV	-	
	5 min		Live

### **DOCSIS CHECK – 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.

## **DOCSIS CHECK** — REGISTRATION, THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY

REGISTRATION V	PING / TRACEROUTE
Service Plan: 00:07:11:17:78:80 Config File: ? BEWGIyYABxEXeLAK9IrD@CVZaw9zuOvbydXJ3QLA6sHyzRqq 8P_f	Current Minimum Average Maximum Delay (ms)
Cable Modem	Destination
Provisioning Mode IPV4 ONLY	Echoes Sent
IPv4 Address 10.246.90.19	Replies Returned
IPv4 Gateway Address 10.246.64.1	Destination
IPv4 Subnet Mask 255.255.224.0	Replies Lost
IPv4 ConfigeWesiyYABXEXeLAK9irD@CvZaw9zuOvbydXJ3QLA5sHyZRqqf8P_	Replies Lost %
CPE	Error -
Servers	
IPv4 TFTP Server 66.75.142.170	Open Ping
IPv4 DHCP Server 142.254.177.41	1
IPv4 TOD Server 66.75.142.170	<u></u>
тнгоиднрит 🗸 🗸	PACKET QUALITY 🗸 🗸 🗸
THROUGHPUT (0 %)	Packet Loss Sent Loss
m/bigfile.zip	Max Round Trip Delay ms
bas bas	Max Jitter — ms
Dps Dps Beceive Send	Start Packet Quality
400M 600M 200M 800M 16	

- REGISTRATION will display the configuration file if the CM MAC has been provisioned.
- The THROUGHPUT, PING/TRACEROUTE and PACKET QUALITY functions will be 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)

Configure

Start Throughput

#### CATV Measurements – OneCheck


# **OneCheck - CONFIGURE**





# StrataSync Configuration Limit Plan File Name ONX630 NTX Limit Plan DOCSIS Service Plan File Name default-docsisprofiles Off Air Ingress Plan File Name default-oaiplans Measurement Settings File Name default-measurementsettings Limit Plan Exclusion Zone File Name default-exclusionzones

- User can verify that configurations are correct and up to date by selecting VIEW STRASYNC CONFIGURATION and verifying most recent config files
- Select START to begin the test

# **OneCheck- RESULTS Dashboard**



- The completed RESULTS screen gives an overall status on the ONECHECK test, broken out in to four categories:
  - Ingress
  - Downstream
  - Upstream
  - Session Expert
- ONECHECK is a snap shot so measurements will not fluctuate like they will in CHANNEL CHECK or DOCSIS CHECK.
- Max and Mins are displayed for MER(dB) and Level (dBmV)
- Users can choose RETEST ALL to restart the whole test or chose RETEST and chose the appropriate category to better determine if a failure was intermittent



 Users can SAVE from this screen, all files saved will have the WORK ORDER ID attached to them for reporting via StrataSync

4	Save File Name	
GB I	Fail	1 - 50 chars
	Save	

# **OneCheck – RESULTS Dashboard**



- Users can double-tap each of the 4 measurements categories to access additional information and deeper analysis
- Users can also select the TROUBLESHOOT... button to switch to LIVE INGRESS SCAN, CHANNEL CHECK and DOCSIS CHECK





# **OneCheck – Downstream Details – 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

Laleen		•
-5.0		Dissell.
-15.0 dBmV		
54.000	MHz	1,002.000

Level	😣 MER 🔒	BER BER	🕴 BER 🔒
-6.9 dBmV	29.7 dB	4.4e-4 Pre	1.1e-4 Post
Echo	GD GD	ICFR	DQI MU
-35.3	84 ns	0.5 dB	0.0

Users can navigate via touchscreen, D-Pad or Channel Search



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



# **OneCheck – Downstream Details –** SYSTEM VIEW and FAVORITES





- SYSTEM VIEW provides the maximum dB Delta between digital carriers and the maximum Video Delta between analog carriers
- To rapidly change channels use Channel Search



- FAVORITES is a user defined Miniscan
- FAVORITES can be configured by pressing on thea given channel until a gold star is highlighted. Channels will not populate this measurements window



# **OneCheck – Downstream Details – 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

# **OneCheck – Downstream Details – MER and BER and OFF-AIR Ingress**



 MER plots each digital carrier against its MER measurements. D3.1 OFDM carriers will appear with more granularity because of the measurement of all the subcarriers

 BER plots each digital carrier against its BER measurements with the maximum of 1.0E-9 available to the user in settings. Default is 1.0E-8.

 OFF-AIR INGRESS can be configured in STRATASYNC and is a measurement of the noise floor at the defined frequencies. This measurement is specifically focused on LTE ingress.

#### VIAVI

# **OneCheck – SESSION EXPERT**



 SESSION EXPERT seeks to educate the user about the next logical demarcation point where network impairments may be located. It also offers suggestions based on the observed impairments

 INGRESS overlays comparisons of Ingress Scans between the TAP and GB help highlight where ingress is getting in

# **OneCheck – Session Expert – DROP ANALYSIS**

💎 🗗 Trop Analysis	$\overline{}$			
Estimated Drop Length - PosiScan	20.0 ft			
Tap First Reflection				
Tap Longest Reflection	20.0 ft			
Ground Block First Reflection	20.0 ft			
Ground Block Longest Reflection	20.0 ft			
Estimated Drop Length (RG6 Loss at 200 MHz)	3.4 ft			
Signal Loss at 200 MHz	0.1 dB			
Estimated Drop Length Delta	-16.6 ft			
Ground Block PosiScan Graph				
100 ft 200 Tap PosiScan Graph	300			
100 ft 200	300			

- SESSION EXPERT utilizes a TDR to automatically analyze the Drop. This helps the user identify if there is a problem in the Drop between the TAP and Ground Block
- Additionally, the user can switch to the standalone TDR measurement to conduct a thorough Drop analysis
  - DOWNSTREAM COMPARISON offers a side by side comparison measurements between TAP, GB, and CPE which speeds up user analysis time

# **OneCheck – Session Expert – COMPARISON**

🔀 Downstream Comparison			$\mathbf{\nabla}$
	Тар	GB	CPE
Downstream			
Min Analog Level (dBmV)	2.7	2.5	2.0
Max Analog Level (dBmV)	2.7	2.6	2.0
Min Digital Level (dBmV)	-12.7	-13.0	-13.4
Max Digital Level (dBmV)	4.0	3.9	3.6
Min MER(dB)	28.2	28.5	28.2
Max MER (dB)	43.0	43.1	43.3
Max, 7ER (Pre)	2.4e-3	4.5e-4	2.2e-3
Max BER (Post)	1.5e-3	1.1e-4	1.2e-3
Max Echo (dBc)	0.0	0.0	0.0
Max Group Delay (ns)	1.4	1.3	1.3
Max ICFR (dB)	1.3	1.3	1.4
OFDM			
Min Level (dBmV)	-3.5	-3.6	-4.1
Max Level (dBmV)	-1.2	-1.3	-1.8
Min MER PCTL (dB)	33.8	35.8	-
Max Stddev MER (dB)	2.8	2.2	-
Max ICFR (dB)	0.9	0.9	-
Max Echo (dBc)	-38.7	-38.9	-

🙁 DOCSIS Comparison 🛛 🔍 🔍				
	⊺ар	GB	CPE	
Downstream				
Number Bonded	25	25	25	
Min Level (dBmV)	-9.1	-9.0	-9,4	
Max Level (dBmV)	-4.5	-4.5	-5.1	
Min MER (dB)	38.0	38.0	38.4	
Max MER (dB)	41.7	41.7	41.9	
OFDM				
Min Level (camV)	-3.5	-3.6	-4.0	
Max Level (dBmV)	-1.2	-1.3	-1.8	
Min MER PCTL (dB)	41.1	41.1	41.4	
Max Stddev MER (dB)	0.8	0.8	0.8	
Max ICFR (dB)	0.9	0.9	0.9	
Max Echo (dBc)	-38.5	-37.8	-38.4	
Upstream				
Number Bonded	4	4	4	
Max Tx Level (dBmV)	43.8	42.8	42.8	
Max ICFR (dB)	1.3	1.4	1.4	
Services				
DS Throughput (Mbps)	-	-	-	
US Throughput (Mbps)	-	_		
Packet Loss (%)	-		-	
Max Round Trip Delay (ms)	-	-	-	
Max Jitter (ms)	-	-	-	

- COMPARISON windows offer a side by side comparison measurements between TAP, GB, and CPE which speeds up user analysis time
- Type of COMPARISON measurements in SESSION EXPERT include:
  - DOWNSTREAM
  - DOCSIS
  - PROFILE (for OFDM Carriers)
  - SMARTSCAN
  - OFF-AIR INGRESS

🕑 SmartScan Comparison 🛛 🔍 🗸						
	Тар	GB	CPE			
System Tilt (dB)	-12.1	-12.1	-12.2			
Max Deviation (dB)	3.2	3.2	3.3			
🧭 Off-Air Ingress	s Comparisor	ı				
	Тар	GB	CPE			
700MHz LTE (dBmV)	-49.7	-50.7	-49.6			
800MHz LTE (dBmV)	-59.8	-60.1	-59.2			
900MHz LTE (dBmV)	-58.2	-58.3	-58.2			
🙁 Profile Analysi	is Compariso	n	$\overline{}$			
	Тар	GB	CPE			
Profile A	Fail	Fail	Pass			
Profile B	-	-	-			
Profile C	-	-	-			
Profile NCP	Pass	Pass	Pass			
Profile PLC	Pass	Pass	Pass			

# **OneCheck – DOCSIS Details - DOWNSTREAM**



 DOWNSTREAM allows the user to view all identified DOCSIS downstream carriers as a Fullscan, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN



Level -6.9 dBmV	8 MER 29.7 dB	BER 4.4e-4 Pre	BER 1.1e-4 Post
Echo -35.3 dBc	GD 84 ns	O.5 dB	0.0

Users can navigate via touchscreen, D-Pad or Channel Search

Channel Search	Search Channel	Enter Channel Number
Ghamiel Gearch	Search by Channel Number	8
	Search by Channel Frequency	Find Channel
	ок	

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



# **OneCheck – DOCSIS Details - UPSTREAM**



- Upstream allows the user to view all identified DOCSIS Upstream carriers, with any measurements failing the threshold represented in RED and all measurements passing the thresholds represented in GREEN
- UPSTREAM provides the user with verification of the number of upstream carriers; the Upstream Transmit Level (TX) and In-Channel Frequency Response (ICFR)
- Users can navigate via touchscreen, D-Pad or Channel Search



# **OneCheck - DOCSIS Details – REGISTRATION and THROUGHPUT**

Registration	
Profile: Tier 1 Maint	enance - 00:07:11:11:55:72
Config File:	walledgarden.cm
Cable Modem	
Provisioning Mode	IPv6 Only
IPv6 Address	2001:558:4040:22:210:18ff:fede:ad01/128
IPv6 Gateway Address	fe80::201:5off:fe24:9e41
IPv6 Config File	walledgarden.cm
CPE	
lpv4 Addreas	68.58.155.37
IPv4 Subnet Mask	255.255.255.0
IPv4 Gateway Address	68.53.156.1
Servers	
IPv6 TFTP Server	fe80::201:5cff:fe24:9e41
IPv6 DHCP Server	fe80::201:5eff:fe24:9e41
IPv6 TOD Server	fe80::201:5cff:fe24:9e41
< Throughput	
42.0 Mbps	42.0 Mbps
Contraction of the second	
0.0 bps 350.0 Mbps	0.0 bps 65.0 Mbps
Receive	Sella
🔀 Packet Quality	▼
Packet Loss	1000 Sent 10.8 % Loss
🗸 Round Trip Delay	80 ms
🔀 Jitter	12 ms

 REGISTRATION identifies the internal modems status and helps identify if there are server issues, config file issues with customer CPE or verifies the ONX is provisioned appropriately

- Throughput testing is available over the DOCSIS connection to test. ONX should have at least CM MAC 1 provisioned as a cable modem and DOCSIS SERVICE PLAN should be configured with UPSTREAM AND DOWNSTREAM IP ADDRESSES before THROUGHPUT will display accurate measurements
- Packet Quality identifies if there is packet loss present in the normal course of DOCSIS communication

# ONX DOCSIS 3.1 Measurements



# **Testing OFDM**



# **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

# 40.6 <td

Ground Block

0540 P

OPE

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

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#### **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





# **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

# **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



# **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

# **Physical Measurements (Level, MER)**



OFDM (Avg. power, MER, and noise)

 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.

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





#### 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	Channel Up to 1 GHz Min P <sub>6AVG</sub>							
Modulation	CNR(dB)	dBmV						
4096	4096 41.0 -6							
2048 37.0 -9								
1024 34.0 -12								
512	512 30.5 -12							
256	27.0	-15						
128	128 24.0 -15							
64	21.0	-15						
16	16 15.0 -15							

# **Testing Higher Profiles**

🗙 PROFILE ANALYSIS 🛛 🗸						
PROFILE	LOCKED	CWE (Corr)	CWE (Uncorr)			
A	YES	3.36e-02	0.00e+00			
в	YES	1.00e+00	0.00e+00			
с	NO		<b>4</b> –			
NCP	YES	0.00e+00	0.00e+00	1		
PLC	YES	0.00e+00	0.00e+00			
Lock status: locked						

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:

	тар 🖀		Ground Blo	ock 🖳	Outlet/CPE			
	Profile	Uncorrectable	Profile	Uncorrectable	Profile	Uncorrectable		
	Locked?	CWE	Locked?	CWE	Locked	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		

### 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:

- PLC is working well
- NCP is working well
- Profile A is working well with some correctible (in this case running 256 QAM)
- Profile B (running 1024 QAM in this case) is on the edge: 100% correctable CWE but LDPC is correcting them all!
- 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					
в	YES	4 1.00e+00	0.00e+00					
NCP	YES	0.00e+00	0.00e+00					
PLC	YES	0.00e+00	0.00e+00					

CI	M Minimum (	CNR/MER Performar	nce in AWGN
	QAM	Up to 1 GHz	Min P <sub>6AVG</sub>
M	lodulation	CNR(dB)	dBmV
	4096	41.0	-6
	2048	37.0	-9
Ø	1024	34.0	-12
	512	30.5	-12
	256	27.0	-15
	128	24.0	-15
	64	21.0	-15
	16	15.0	-15

# **DOCSIS 3.1 Signal Testing and Troubleshooting**



**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

# **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.

# 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) + 10log<sub>10</sub>(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  $\rightarrow$  Total Power(96MHz channel) = 5dBmV + 10log<sub>10</sub>(16) = 5 + 12.04 = 17.04dBmV  $\rightarrow$  This is what some spectrum analyzers (like R&S FSW) show

# **DOCSIS 3.1 OFDM Carrier Level Measurements**



Select OFDM



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  $\rightarrow$  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.

ONX CATV - Fiber Testing - P5000i Probe Microscope - MP60, MP80 Power Meters

# **OneExpert CATV Fiber Optics Integration**

#### **Fiber Inspection Scope**

- P5000i via USB
- Auto pass/fail analysis

#### **Optical Power Measurement**

 MP-60/80 Optical Broadband Power Meter



# **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

# StrataSync - Test Results

# StrataSync – ONX CATV Test Results

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210.000 0.0 0.00 1.04-0 1.04-0 -0.01 2.0 0.0

# OneExpert CATV Configuration via StrataSync



# StrataSync – Cloud-Based Meter Management

- All high-level features for StrataSync are accessible from the main landing page
- Asset and Test Data information is displayed and details are available



# **To access Configuration Templates**



# **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 Window**

VIA	Stra	ataSync™	Al Tes Apollo Be	<b>t Group</b> eta	-	Notifi	Account II Cations Preferences	D: 61062000 🗳 al.ruth	@apollo.com
🚳 Dashboard	🗆 Assets 👻	🖹 Test Data 👻	嶜 People 👻	🛔 Organizations 👻	Licenses	א What's New			i 😯 Help
Assets > Manage T Global Ar Current Filters	Templates > Glob Techive: Limit S Remove all	al Archive Plan  Actions  Fo	r <b>0</b> selected record	d(s)				New Lim	it Plan of 2 Þ 🅅
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		CDC NGAN	an.json I.json ision Limit Plan (Tria	/cust/strata /cust/strata I).json /cust/strata	sync/config/limits/Al's sync/config/limits/CDC sync/config/limits/Cen	Limit Plan.json C NGAN.json tral Division	11/30/2015 15:25 a 02/12/2016 13:38 p 09/23/2015 12:09 a	I.ruth@apollo.com eter_hutnick@cable.co I.ruth@apollo.com	mcas
		DKTV_test.j	json an.json	/cust/strata /cust/strata	sync/config/limits/DKT sync/config/limits/JJ_1	V_test.json Fest_Plan.json	03/02/2016 09:19 m 09/15/2015 09:12 jc	natthias.jun@viavisoluti oshua.johnson@jdsu.co	ons.c

Choose from existing Limit Sets or select New Limit Plan

#### **Limit Plan Creation – Name New Limit Plan**

Enter Limit Plan name and Description and select Create

#### Assets > Manage Templates > Global Archive > New

Create Limit Plan		
Details Info		
Name*		
Description		
	Create Cancel	

# **Limit Plan Creation – Editing Limit Values/Types**

- Set Limits for Tap, Ground Block or CPE
- The Type of limit is also selectable -
  - Error = Pass if results meet the limit requirements or Fail if results exceed limit
  - Warning = Pass but No Fail rather the measurement is highlighted to bring attention to it if the result exceeds the limit
  - None = Test result is shown but no Pass or Fail criteria is applied to the result



#### Assets > Manage Templates > Global Archive > Edit Test1.json



# **Limit Plan – Deploy Limits**

- Limit Plans can be deployed to Meter or Copied to Templates
- · Check the box of the limit plan to be deployed, right click or select Actions
  - Click "Deploy" or Copy to Template

Assets > Manage Templates > Global Archive

🕞 Global Archive: Limit I	Plan							
Current Filters Remove all	0						New Limit Pla	an
	Acti	ions 🔻 For	1 selected record(s)				Page 1 of 1	
Global Archives Limit Plan DOCSIS Service Plan	18	Name test		Path		Created On	Created By	Mod
Off-Air Ingress Plan		Test1.json		/cust/stratasync/con	fig/limits/Test1.json	02/19/2016 09:50	rich.russell@apollo.com	
Measurement Settings			View					
			Edit					
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		_ [	Deploy					
			Copy To Template					
			Delete					

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### **Deployment – Meter Selection**

• Check the boxes next to one or more OneExpert and then select Next in bottom right corner of the screen

Acti	For 2 select	cted record(s)				∢  ∢  Paç	je 1 of 1 🕨 🕅
	Asset No	Unique ID	Serial No	Template 2	Template status	Tech First Name	Tech Last Name
<b>*</b>		ARQA0001150110	ARQA0001150110		None	Jeremy	н
		ARQB0001150014	ARQB0001150014		None	Jeremy	Н
		ARQB0001150063	ARQB0001150063		None	Jeremy	Н
•		ARQA0001150066	ARQA0001150066		None	Jeremy	н



#### Access or Create a New DOCSIS Service Plan

- In the Template screen, click on one of the selections in the "Global Archives" bubble on the left of the screen
- Select DOCSIS Service Plans



### **DOCSIS Service Plan Window**

· Choose from existing Limit Sets or select New Limit Plan



#### **DOCSIS Service Plan – Name New DOCSIS Service Plan**

 Enter DOCSIS Service Plan name and Description and select Create

Create DOCSIS Service Plan	
Details Info	
Name*	
Description	
	Create

Assets > Manage Templates > Global Archive > New

# **DOCSIS Service Plan – Configuration**

· Each of the ONX's 5 different Cable Modem MAC addresses can be configured independently

Assets > Manage Templates > Global Archive > Edit Test.oxs

- Label This name will appear on the ONX under the Registration Information presented during a DOCSIS test to ensure the proper Service plan was selected
- Downstream Throughput URL Enter the IP/URL address and file name of the HTTP server and test file that the ONX will use to download and calculate downstream throughput speeds (Ex: <u>http://testurl.com/testfile.zip</u> or <u>http://12.34.56.78/testfile.zip</u>)
- Upstream Throughput URL Enter the IP/URL address of the HTTP server the ONX will use to send data to and calculate upload throughput speeds (Ex: <u>http://testurl.com</u> or <u>http://12.34.56.78</u>) typically is the same IP/URL as downstream
- VoIPCheck Server If a VoIPCheck reflection server is available this can be entered into the VoIPCheck Server field (Note: VoIPCheck is not yet implemented on ONX)
- NOTE\* In a D3.0 network DOCSIS Emulation type must be adjusted to D3.0 32x8; in a D3.1 network DOCSIS Emulation must be set to D3.1 32x8

5 I			
DOCSIS Service Plan			
CM MAC 1 CM MAC 2	CM MAC 3	CM MAC 4	CM MAC 5
General Info			
Enabled	×		
Label	Max Speed Servio	e Plan	
Туре	Modem		<b>'</b>
DOCSIS Emulation Type	DOCSIS 3.1 - 32	<8	7
DOCSIS 3.0 Certificate Type	US	,	<b>'</b>
Downstream Throughput URL	http://CATVSpeed	Test.viavisolutions.cc	
Upstream Throughput URL	http://CATVSpeed	Test.viavisolutions.cc	
VolPCheck Server	173.115.99.62:51	21	

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#### **DOCSIS Service Plan – Configuration Cont.**

- Data Limits can be set in the DOCSIS Service Plan to perform Pass/Fail, Warn, or None for each one of the Limits configured
  - Type, like in the Limit Plans, determine how the test result is presented on the ONX
- The VoIPCheck Limits are also configurable (Note: ONX does not currently perform VoIPCheck testing, these limits can be set for future use)

Data Limits						
Limit Name	Value		Туре			
Minimum Downstream Throughput	10	Mbit/s	Error Min 🔹			
Minimum Upstream Throughput	10	Mbit/s	Error Min •			
Maximum Packet Loss Percentage	0.2	%	VoIPCheck Limits			
Packet Quality Maximum Delay	82	ms	Limit Name	Value		Туре
			Average Packet Loss	0.4	%	Error Max 🔹
Packet Quality Maximum Jitter	7	ms	Maximum Packet Loss	0.5	%	Error Max •
			Average Jitter	5	ms	Error Max •
			Maximum Jitter	7	ms	Error Max •
			Average Delay	40	ms	Error Max •
			Maximum Delay	82	ms	Error Max •



# **DOCSIS Service Plan – Deploy**

- DOCSIS Service Plans can be deployed to Meter or Copied to Templates
- Check the box of the DOCSIS Service Plan to be deployed, right click or select Actions
  - Click "Deploy" or Copy to Template

#### Assets > Manage Templates > Global Archive



### **Deployment – Meter Selection**

• Check the boxes next to one or more OneExpert and then select Next in bottom right corner of the screen





#### **DOCSIS Profile Activation on ONX**

- After deployment screens, re-sync ONX with StrataSync. The DOCSIS Profiles will get pushed to the ONX, but are not yet
  active until a new WORKORDER ID is created.
- To activate the new DOCSIS profile, perform a DOCSISCheck or ChannelCheck (located in the CATV section of the ONX main screen) and *enter a new WORKORDER ID*.
- Complete the DOCSISCheck or ChannelCheck and after completion, REBOOT the ONX.
- Refer to official CM MAC provisioning documents put out by management for specific Throughput URLs and instructions on how to request and provision the meters internal cable modem.
- Once Provisioning is complete, all DOCSIS Expert or DOCSIS Check tests will allow Throughput testing with measurements and results recorded.



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# **Off-Air Ingress Plan Window**

 Choose from existing Off-Air Ingress Plan or select New Off-Air Ingress Plan



# **Off-Air Ingress Plan – Configuration**

- Off-Air Ingress Plans are used to designate which frequencies the ONX will measure during the OneCheck test for ingress
  interferers in the downstream frequency range
  - Find LTE or terrestrial broadcast interferers on the HFC network
  - If a QAM carrier is in the band the ONX uses its Ingress Under the Carrier feature to see the noise floor below a QAM channel, if the spectrum is vacant the ONX will look at the spectral response in the band(s) to see if the limit is exceeded
- Enter the Label, Start, Stop, Limit value, and Limit Type for each Ingress band desired
- Use the green + or red to add or delete Off-Air Ingress bands

Assets >	Manage	Templates >	Global	Archive >	Edit Test	Off-Air Ingress	Plan.oxs
----------	--------	-------------	--------	-----------	-----------	-----------------	----------

Of	f-Air Ingress Band									
	Label	Start Frequenc	у	Stop Frequen	су		Limit		Limit Type	
	LTE Band C1	746	MHz	757	MHz	-20		dBmV	Error Max	•
	LTE Band C2	776	MHz	787	MHz	-20		dBmV	Error Max	•
	LTE Band B1	704	MHz	710	MHz	-20		dBmV	Error Max	•
	LTE Band B2	734	MHz	740	MHz	-20		dBmV	Error Max	T

Press the SAVE button to save the

Off-Air Ingress Plan configuration



# **Off-Air Ingress Plan – Deploy**

- · Off-Air Ingress Plan can be deployed to Meter or Copied to Templates
- Check the box of the Off-Air Ingress Plan to be deployed, right click or select Actions
  - Click "Deploy" or Copy to Template

Assets > Manage Templates > Global Archive

Global Archive: DOCSIS Service Plan

#### Current Filters Remove all New DOCSIS Service Plan I Page 1 of 1 Actions For 1 selected record(s) × Name test Path Created By Name Created On Global Archives Limit Plan test DOCSIS Service Plan **T** - - 4 - 4 10 10/21/2015 13:54 vincent.zipparo@jdsu.com /cust/private/userconfigs/cable/docsisprofile.. Off-Air Ingress Plan View /cust/private/userconfigs/cable/docsisprofile... 11/19/2015 10:58 vincent.zipparo@jdsu.com Edit Measurement Settings /cust/private/userconfigs/cable/docsisprofile... 01/21/2016 09:40 matthias.jun@viavisolutions.c. Roname er.oxs /cust/private/userconfigs/cable/docsisprofile... 01/22/2016 15:47 vincent.zipparo@jdsu.com Deploy Copy To Template 01/27/2016 04:09 shuo.pan@onxbeta.com /cust/private/userconfigs/cable/docsisprofile... Delete

### **Deployment – Meter Selection**

• Check the boxes next to one or more OneExpert and then select Next in bottom right corner of the screen

Acti	ons  For 2 select	cted record(s)				∢  ∢  Paç	je 1 of 1 ▶ ▶
	Asset No	Unique ID	Serial No	Template 2	Template 1 status	Tech First Name	Tech Last Name
~		ARQA0001150110	ARQA0001150110		None	Jeremy	н
		ARQB0001150014	ARQB0001150014		None	Jeremy	Н
		ARQB0001150063	ARQB0001150063		None	Jeremy	Н
<b>v</b>		ARQA0001150066	ARQA0001150066		None	Jeremy	Н



#### **Access or Create a New Measurement Settings**

· Access or Create a New Measurement Settings



#### Manage Templates: OneExpert CATV change



## **Measurement Settings Window**

 Choose from existing Measurement Settings or select New Measurement Settings

#### Assets > Manage Templates > Global Archive

Current Filters Remove all

#### Global Archive: Measurement Settings

0

Global Archives
Limit Plan
DOCSIS Service Plan
Off-Air Ingress Plan
Measurement Settings

Acti	For <b>0</b> selected record(s)				
	Name	Path	Created On	Created By	M
					L
	No Docsis Service tests.oxs	/cust/private/userconfigs/cable/measurement	09/14/2015 10:4	6 shaun.greene@apollo.com	
	IncludeServiceTests.oxs	/cust/private/userconfigs/cable/measurement	09/14/2015 11:2	9 shaun.greene@apollo.com	
	All Disabled.oxs	/cust/private/userconfigs/cable/measurement	09/22/2015 09:5	3 joshua.johnson@jdsu.com	
	Comcast Trial Measurement Settings.oxs	/cust/private/userconfigs/cable/measurement	09/23/2015 12:4	9 al.ruth@apollo.com	
	upc cc1.oxs	/cust/private/userconfigs/cable/measurement	<b>1</b> 0/21/2015 05:3	0 yvan.frosio@apollo.com	
	Test Measurement Settings.oxs	/cust/private/userconfigs/cable/measurement	11/18/2015 14:0	6 jeremy@onxbeta.com	
	PDX.oxs	/cust/private/userconfigs/cable/measurement	01/26/2016 13:1	5 josh_halbrook@cable.comca	
	Seattle.oxs	/cust/private/userconfigs/cable/measurement	01/26/2016 14:4	4 rich.russell@apollo.com	
	Test1.oxs	/cust/private/userconfigs/cable/measurement	02/19/2016 14:1	8 rich.russell@apollo.com	
	DKTV_test.oxs	/cust/private/userconfigs/cable/measurement	03/02/2016 08:5	7 matthias.jun@viavisolutions.c.	

New Measurement Settings

#### **Measurement Settings – Name New Measurement Settings**

 Enter Measurement Settings name and Description and select Create

Assets > Manage Templates > Global Archive > New

Create Measurement Settings	
Details Info	
Name*	
Description	
	Create

#### **Measurement Settings - Configuration**

- Measurement Settings on the ONX currently determines if a DOCSIS test (range and registration) is performed and if DOCSIS Service tests (throughput & packet loss) is performed when a OneCheck test is ran
  - This applies to All OneCheck tests at all Locations (Tap, Ground Block, CPE)
- DOCSIS Test If a OneCheck test should perform communications with the CMTS then the DOCSIS Test should be enabled If disabled the OneCheck test will only run the Ingress and Downstream channel tests only
- DOCSIS Service Tests If a OneCheck test should also perform IP service tests the DOCSIS Service Tests should be enabled If disabled then the ONX will not perform IP service testing during a OneCheck test
  - Note: To enable DOCSIS Service Tests the DOCSIS Test must be enabled as well

Measurement Settings		
OneCheck Settings		
DOCSIS Test DOCSIS Service Tests	Enable • Enable •	
		Save

Assets > Manage Templates > Global Archive > Edit IncludeServiceTests.oxs

# **Measurement Settings - Deploy**

- · Measurement Settings can be deployed to Meter or Copied to Templates
- Check the box of the Measurement Settings to be deployed, right click or select Actions
  - Click "Deploy" or Copy to Template

Current Filters New Measurement Settings I ≤ Page 1 of 1 ▶ ▶ Actions T For 1 selected record(s) **Global Archives** Path Created On Created By Mod Name Limit Plan DOCSIS Service Plan Off-Air Ingress Plan No Docsis Service tests.oxs 09/14/2015 10:46 shaun.greene@apollo.com /cust/private/userconfigs/cable/measurement. Measurement Settings IncludeServiceTests over 09/14/2015 11:29 shaun.greene@apollo.com /cust/private/userconfigs/cable/measurement.. View All Disa /cust/private/userconfigs/cable/measurement... 09/22/2015 09:53 joshua.johnson@jdsu.com Edit Comcas ings.oxs /cust/private/userconfigs/cable/measurement... 09/23/2015 12:49 al.ruth@apollo.com Rename /cust/private/userconfigs/cable/measurement... 10/21/2015 05:30 yvan.frosio@apollo.com upc c1 Deploy Test Me Copy To Template /cust/private/userconfigs/cable/measurement... 11/18/2015 14:06 jeremy@onxbeta.com PDX.ox: Delete /cust/private/userconfigs/cable/measurement... 01/26/2016 13:15 josh\_halbrook@cable.comca... Seattle.oxs /cust/private/userconfigs/cable/measurement.. 01/26/2016 14:44 rich.russell@apollo.com

#### Assets > Manage Templates > Global Archive

### **Deployment – Meter Selection**

• Check the boxes next to one or more OneExpert and then select Next in bottom right corner of the screen

Actions For 2 selected record(s)							ge 1 of 1 🕨 🕅
	Asset No	Unique ID	Serial No	Template 2	Template status	Tech First Name	Tech Last Name
<b>~</b>		ARQA0001150110	ARQA0001150110		None	Jeremy	Н
		ARQB0001150014	ARQB0001150014		None	Jeremy	Н
		ARQB0001150063	ARQB0001150063		None	Jeremy	Н
•		ARQA0001150066	ARQA0001150066		None	Jeremy	н



### **StrataSync Configuration Activation on ONX**

- To activate any of the previous configuration files after deploying them to the meter, perform a DOCSISCheck or ChannelCheck (located in the CATV section of the ONX main screen) and enter a new WORKORDER ID.
- Complete the DOCSISCheck or ChannelCheck and after completion, REBOOT the ONX.
- Refer to official CM MAC provisioning documents put out by management for specific Throughput URLs and instructions on how to request and provision the meters internal cable modem.
- Once Provisioning is complete, all DOCSIS Expert or DOCSIS Check tests will allow Throughput testing with measurements and results recorded.



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