VIAVI Solutions



Brochure

Cable Network Maintenance and Service Test Guide

The cable network outside plant is subject to a variety of environmental challenges, including weather changes through the seasons, damage from critters and humans, and the impact of enduring over the years. The plant is robust and reliable enough to withstand a lot, but it does need to be tested periodically to ensure that it is working as designed and built. Determining which parts of the plant need service can be directed by customer calls (not a good practice) or more recently developed systems that leverage the diagnostics built into network components. These systems can list nodes that need attention, and give the operator a heads-up on the nature of problems in the node, the severity based on customer impact, and even probable location of the root cause. The following is a short list of cable network maintenance and service use cases.

Use Case 1. Node Activation Performance Verification, Alignment, Troubleshooting

Problem: As nodes are activated, the fiber connection must be tested with a power meter to verify that proper levels are being received. If there are concerns or problems, a dark fiber in the bundle can be tested with an OTDR to verify that it reads the expected length, and that there are no "events" on the trace to indicate any form of damage. If there is damage, or a break, the OTDR trace will indicate the distance.

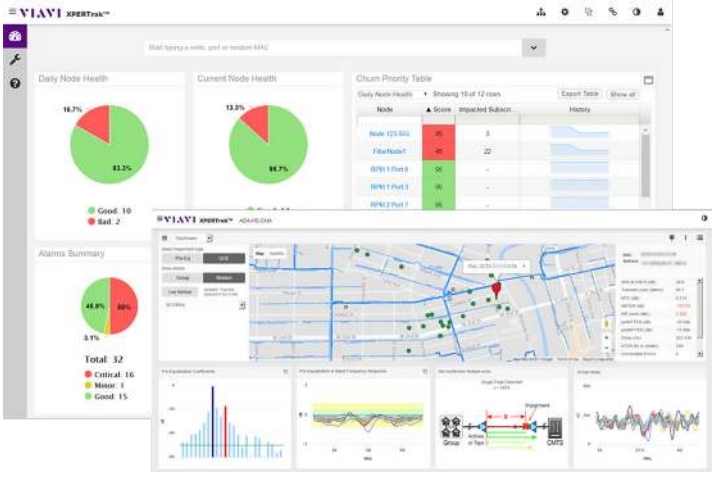
Before any fiber connection is made, the fiber face should be cleaned and "scoped" to make sure it's clean, as dirty connections are the primary cause of reliability issues in fiber networks. The fiber node converts the optical signal on the fiber to RF, and the RF signals must be tested to ensure that they are at the right levels and working with about the same performance that they had in the headend. Levels are set so they'll reach their destination at the proper level, so some alignment may be needed (up and downstream). The quickest, easiest way to test and align RF levels is with a sweep, which is especially critical at node activation, as it tests the full frequency band, including spectrum areas where there may not be active carriers operating yet.

Solution: The OneExpert CATV ONX-630 performs most of the tests required at the node, including all RF and any service verification analysis required. With optional accessories, it can also measure optical power and perform a microscopic inspection of the fiber face. An OTDR TB-2000 or 4000 with an OTDR module can be used to perform the fiber analysis. Sweeping is also handled quite well with the ONX-630, and the headend/hub rack-mounted SCU-1800 Sweep Control Unit transmits and receives sweep signals for analysis.

Use Case 2. Network Maintenance/Service Prioritization and Direction

Problem: Pressure to keep operating costs down is forcing cable operations to do more with less, and at the same time there is pressure to improve the customer experience. Management needs to be able to properly direct the workforce to ensure optimal plant reliability and service that meets customer demands. This is not just to address plant quality degradation over time, but to quickly and efficiently fix problems that are impacting customers and could lead to churn.

Solution: XPERTrak from VIAVI offers a complete system for analyzing return path performance, and downstream performance at individual CPE. Algorithmic node analysis provides a listing of nodes that most need attention, and enables the operator to drill down using a variety of analytical tools to see where the problem is and offer a suggested location of the probable cause. Imagine how much troubleshooting time this will save you. Techs can go to locations as directed and test with their field gear (OneExpert CATV), to find and fix issues, and verify performance; keeping downtime at a minimum and customers satisfied.



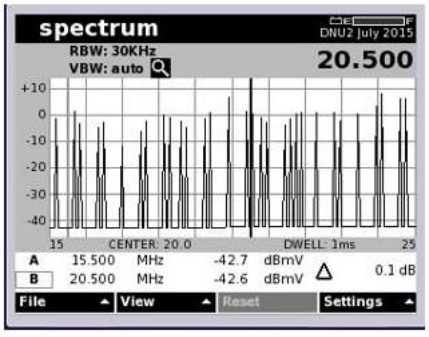
At a glance XPERTrak enables the operator to determine worst performing nodes based on adjustable QoE thresholds; node quality vs. time and nodes violating performance thresholds. By drilling down, using a mobile or desktop device operators can: determine the root cause of a QoE problem; map impaired subscribers with plant map overlay; trend problems over time; generate live displays to resolve an issue, and verify fix.

Use Case 3. Ingress Mitigation/Troubleshooting

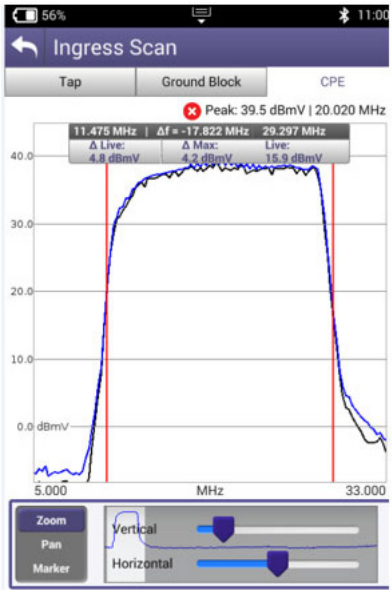
Problem: Upstream noise is a constant challenge for cable network maintenance and service techs. Every tech in the operation tests for ingress, which can come from anywhere in the plant, but most likely the location of a leak, and typically from customer premises. Ingress is very transient as it depends on the source and the point of ingress. Techs need a test tool that detects and displays ingress quickly.

Solution: The OneExpert CATV Ingress Scan mode is an excellent tool for tracking ingress, due to the implementation of HyperSpectrum™ technology in which overlapping FFTs ensure that no transient signals will be missed. Also, as an FFT of a digital capture, broadband noise appears at all affected frequencies at once on the spectrum display. This is an improvement on the noise display of traditional meters, which show noise as random spikes within the affected frequency span.

Example: HPNA Interference

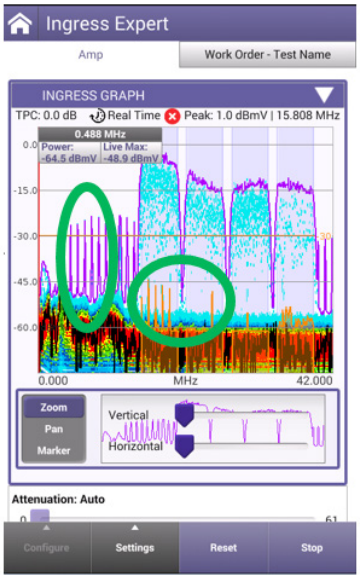


- DSAM scanning analyzer catches samples within its resolution bandwidth as it scans spectrum
- Max hold is needed to capture complete "envelope" over time



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

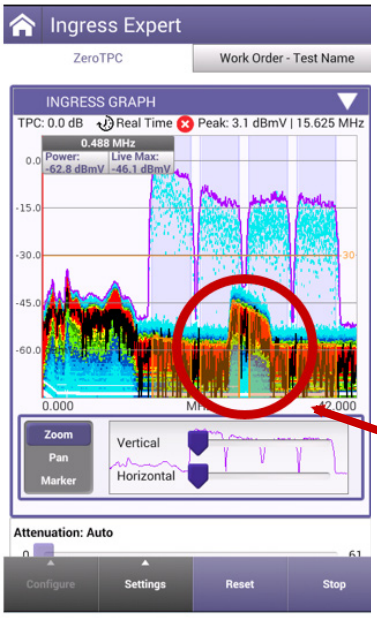
An enhancement on ingress analysis is the Ingress Expert mode (standard on ONX-630, optional on lower tier ONX models). This mode uses heat map persistence, and enables seeing (static or transient) ingress within active service channels. This is especially critical as the upstream frequency band is filled with DOCSIS carriers.



- One of technicians' toughest task 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

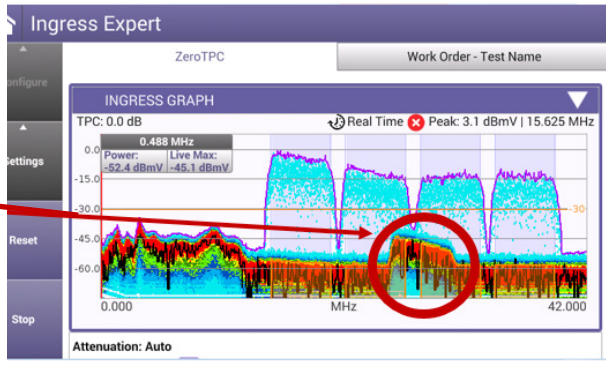
Traces show interference outside of active carriers. Ingress Expert's noise trace shows reocuring ingress inside carriers.

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



Use Case 1. Node Activation Performance Verification, Alignment, Troubleshooting

VIAVI Product	Product Link	Photo
ONX-630	http://www.viavisolutions.com/en-us/products/oneexpert-catv	
SCU-1800	http://www.viavisolutions.com/en-us/literature/oneexpert-catv-sweep-and-maintenance-system-data-sheet-en.pdf	
MP-80A	http://www.viavisolutions.com/en-us/products/mp-60-80-miniature-usb-20-power-meters-fiber-chek-pro-integration	
P5000i	http://www.viavisolutions.com/en-us/products/p5000i-fiber-microscope	
SmartOTDR™ 100A/B Series	http://www.viavisolutions.com/en-us/products/smartotdr-hand-held-fiber-tester	

Use Case 2. Network Maintenance/Service Prioritization and Direction

VIAVI Product	Product Link	Photo
XPERTrak	http://www.viavisolutions.com/en-us/products/xpertrak	
ONX-630	http://www.viavisolutions.com/en-us/products/oneexpert-catv	
SCU-1800	http://www.viavisolutions.com/en-us/literature/oneexpert-catv-sweep-and-maintenance-system-data-sheet-en.pdf	

Use Case 3. Ingress Mitigation/Troubleshooting

VIAVI Product	Product Link	Photo
ONX-630	http://www.viavisolutions.com/en-us/products/oneexpert-catv	

VIAVI Solutions

Contact Us **+1 844 GO VIAVI**
(+1 844 468 4284)

To reach the VIAVI office nearest you,
visit viavisolutions.com/contact

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