

SPIRENT TECH-X FLEX

CABLE SERVICES MODULE WITH DOCSIS

Spirent's Cable Services Module with DOCSIS provides the complete test capability to test the breadth of the services provided by a Cable MSO. Comprehensive DOCSIS 3.0[®] testing as well as QAM and Signal Level Analysis in a single platform enable reduced time and capital equipment costs.

FEATURES & BENEFITS

- Measures and analyzes frequencies between 5 MHz and 1542 MHz
- Support for 4x1 through 4x4 DOCSIS testing
- Measure DOCSIS 1.1, 2.0, 3.0 signal quality and report quality metrics such as signal level, MER and BER
- Advanced high-speed data services testing with ping, Traceroute, throughput testing, packet loss tests and a full-featured web browser
- Return path continuous waveform, QPSK and 16/64 QAM signal generator with multiple simultaneous carriers and forward error correction support
- Comprehensive analog and digital signal level measurement including single channel tests, tilt and scan
- Full forward and return path QAM analysis with MER, Pre/Post FEC BER and constellation diagrams
- User-friendly downstream and upstream spectrum analysis with zero span mode

The Tech-X Flex™ Cable Services Module with DOCSIS provides the complete range of measurements needed to fully test, analyze and assure the quality of analog and digital television, high-speed data and voice services delivered via cable systems. And, combined with Tech-X Flex's advanced testing capabilities, adaptability and ease-of-use, the Cable Services Module is the ideal tool for field engineers and technicians installing and maintaining next-generation cable services.

ANALOG RF CHANNEL MEASUREMENTS

Analog channel quality tests include video and audio carrier signal level measurements, video—audio signal level difference, carrier/noise ratio and hum modulation. The tests are completed using a single button push and metrics are reported based on user-defined locations and thresholds with clear pass/fail results.



DIGITAL RF CHANNEL MEASUREMENTS

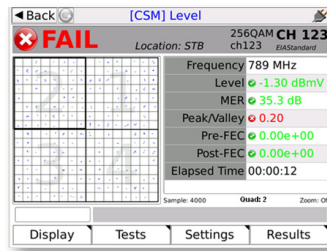
Cable Services Module 64/256 QAM digital channel quality measurements include average power levels, MER, Pre/Post FEC BER, errored seconds and severely errored seconds. All of the reported metrics are presented on a single screen allowing field engineers and technicians to quickly verify digital channel performance. Additionally, the display includes a dynamic constellation diagram with adjustable zoom and sample rates which facilitates the rapid resolution of digital channel quality problems including excessive noise, interference, phase jitter, or gain compression.



SPIRENT TECH-X FLEX CABLE SERVICES MODULE WITH DOCSIS

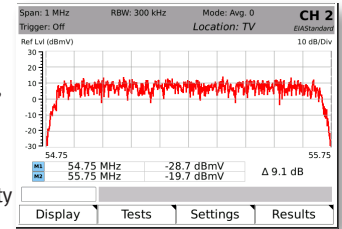
CONSTELLATION ANALYSIS

The Constellation display is an invaluable tool for the technician when trying to measure the quality of the QAM modulated signals. By visually inspecting the size and shape of the dots within the constellation matrix, the technician can easily identify the nature of the problem such as noise, interference, phase noise, gain issues. Tech-X Flex can measure both 64 QAM and 256 QAM modulated systems as standard ensuring multiple transmission systems can be maintained.



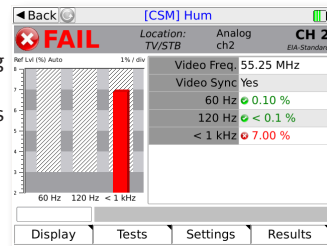
SPECTRUM MODE

The Cable Services Module's 5 MHz/1542 MHz spectrum analyzer provides field engineers and technicians a simple and effective tool for identifying and locating noise, interference, ingress and other waveforms that may be affecting cable services quality. Measurement settings including center frequency, span, resolution bandwidth, display averaging and peak hold are available to allow for quick signal level comparisons. And, zero span mode is supported to measure bursty digital signals in the return path.



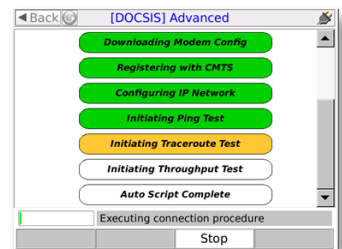
HUM MEASUREMENT

Hum is the modulation of the analog video carrier by the AC and/or DC power which transmitted "in-line" with the audio/video carriers to power the plant's amplifiers. Hum modulation is a measurement describing the percentage of amplitude modulation caused to the analog video carrier by the 60Hz and 100/120Hz interference as well as the <1 kHz harmonics which are present in the video carrier's bandwidth. A Hum analysis of the RF channel using the Tech-X Flex enables the field technician to verify that there are no such disturbances affecting the RF signal.



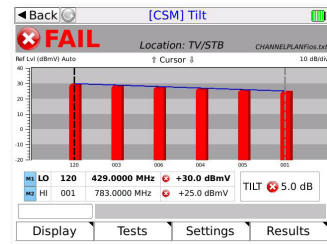
DOCSIS 3.0 AUTO TEST SCRIPTS

Auto Test Scripts provides access to a set of automatic scripts that run a sequence of DOCSIS-related tests, designed to quickly qualify a DOCSIS connection. The test suite guides field engineers and technicians through each of the cable modem initialization states and provides intuitive messages showing the initialization progress. Quick diagnosis for ranging, registration or other initialization issues allows field engineers and technicians to easily identify and repair problems affecting customer's DOCSIS enabled services.



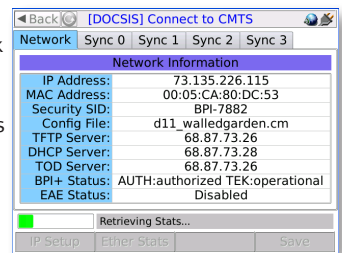
RF - TILT MEASUREMENT

The tilt measurement allows field engineers and technicians to quickly identify signal level differences over a specified frequency range and apply attenuation or equalization to adjust the differences according to the cable system's specifications. Between 2–12 analog, digital or DOCSIS channels can be measured using the tilt measurement. And, the measurement's markers can be used to adjust the display and determine the tilt between any of the channels included in the measurement.



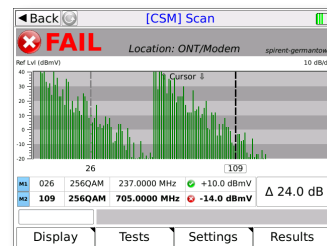
MODEM STATS

This option generates modem and network statistics on the current active DOCSIS connection. The DOCSIS module allows an option for setting user specified thresholds for various synchronization results produced while connecting to a CMTS. Any result that violates a threshold is colored red in the applicable results screen



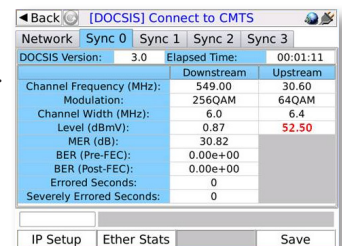
RF - SCAN

Using the scan test, the signal levels of all of the analog and digital channels included in the cable system's channel plan are measured consecutively and the overall frequency response of the system is determined. The scan measurement leverages pre-defined location based thresholds which clearly show whether or not signal levels comply with the cable system's specifications.



DOCSIS 3.0 CHANNEL QUALITY

The Tech-X Flex simplifies DOCSIS 3.0 testing with tabular results for each of the downstream and upstream channels. Using the tabs, Carrier levels, MER and BER for each of the channels can be viewed and quickly compared to verify that the entire bonded service is operating within specifications.

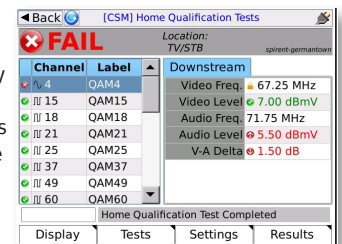


RETURN PATH ANALYSIS

Measuring the characteristics of the return path is critical to ensure the quality of bidirectional cable services. The Tech-X Flex Cable Services Module return path signal generators provide the ability to generate multiple continuous waveform carriers as well as QPSK, 16 QAM and 64 QAM carriers with forward error correction, pre-defined symbol rates and dynamic signal levels so that the health of the return path can be confirmed.

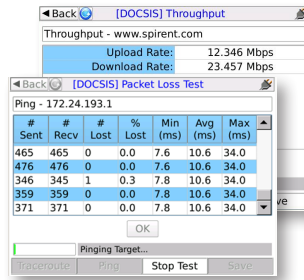
HOME QUALIFICATION TESTS

The Home Qualification Test is a quick one button test to qualify key Analog/Digital/ DOCSIS Channel parameters. Key measurements like C/N, Hum, MER/BER analysis, DOCSIS Throughput/Packet loss etc. can be enabled/ disabled to give the desired results as per the technician's requirement. The Speed of the test and the Flexibility in configuring the key parameters ensure the Home Qualification Test matches the needs of all Field Technicians.



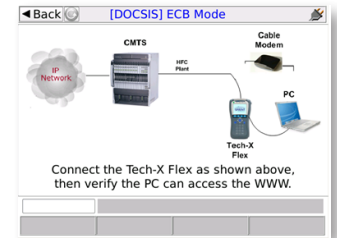
DOCSIS - IP CONNECTIVITY TESTS

IP Connectivity can also be tested over the DOCSIS interface using the Ping, Traceroute, Throughput test or Web browser functionality. Testing across all layers ensures no protocol issues exist, which may not be apparent when it is only DOCSIS level tests that are performed.



DOCSIS - ECB MODE

This function allows the unit to act as a complete cable modem replacement. When this mode is active, you can connect a computer to either of the physical 10/100 ports and attempt to access the provider IP network. It is most useful to verify whether a cable modem is functioning properly. If the network operates correctly with the unit in DOCSIS ECB mode but not when the normal modem is connected, the modem is likely misconfigured or defective.



TECHNICAL SPECIFICATIONS

General Specifications	Frequency Range	5 MHz / 1542 MHz
	Frequency Accuracy	10 ppm
	Signal Level Range	-40 dBmV / +60 dBmV
Analog Channel Measurements	Signal Level Resolution	0.1 dB
	Signal Level Accuracy	±1.5 dB
	Carrier/Noise Ratio Resolution	0.1 dB
	Carrier/Noise Ratio Accuracy	±1.5 dB
	Hum Modulation Range	0% / 5%
	Hum Modulation Resolution	0.1%
	Hum Modulation Accuracy	±0.5%
Digital Channel Measurements	Signal Level Range	-40 dBmV / +60 dBmV
	Signal Level Resolution	0.1 dB
	Signal Level Accuracy	±2.0 dB
	Modulation Types	64 QAM and 256 QAM
	Constellation Diagram	Dynamic zoom and sample size
	MER Range	15 dB / 40 dB
	MER Accuracy	±2.0 dB
Tilt Measurement	Pre and Post FEC BER Range	1.0E ⁻⁰⁹ / 1.0E ⁻⁰⁴
	Additional Results	Errored Seconds and Severely Errored Seconds
Scan Measurement	12 Analog/Digital Channels	
Return Path Signal Generator	158 Analog/Digital Channels + 10 Out-Of-Band Channels	
	Frequency Range	4 MHz / 42 MHz
	Frequency Tuning Resolution	10 kHz
	Signal Level Range	+20 to +60 dBmV
	Signal Level Resolution	0.1 dB
	Signal Level Accuracy	±1.5 dB
	Modulation Types	CW, QPSK, 16 QAM and 64 QAM
	Symbol Rates	160, 320, 640, 1280, 2560 and 5120 ksym/s

SPIRENT TECH-X FLEX
CABLE SERVICES MODULE WITH DOCSIS

TECHNICAL SPECIFICATIONS (CONTINUED)		
Return Path Analysis	Signal Level Range	-40 dBmV - +60 dBmV
	Signal Level Resolution	0.1 dB
	Signal Level Accuracy	±2.0 dB
	Modulation Types	QPSK, 16 QAM and 64 QAM
	MER Range	15 dB - 40 dB
	MER Accuracy	±2.0 dB
	Pre and Post FEC BER Range	1.0E ⁻⁰⁹ - 1.0E ⁻⁰⁴
	Errored Seconds and Severely Errored Seconds	
Spectrum Analysis	Frequency Range	5 MHz - 1542 MHz
	Display	6 Vertical Divisions (1 dB, 2 dB, 5 dB or 10 dB)
	Span	1 MHz - 60 MHz
	Resolution Bandwidth	10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz and 3 MHz
	Video Bandwidth	Averaging
	Zero Span Mode	Voltage and Time Triggers
DOCSIS Measurements	DOCSIS Specifications	CableLabs 1.1, 2.0 and 3.0
DOCSIS Measurements (Downstream)	Frequency Range	88 MHz – 1002 MHz
	Modulation Types	64 QAM and 256 QAM
	Maximum Input Power	+17 dBmV
	MER Range	15 dB - 40 dB
	MER Accuracy	±2.0 dB
	Pre and Post FEC BER Range	1.0E ⁻⁰⁹ - 1.0E ⁻⁰⁴
	Throughput Testing	Maximum 4 Channels (152 Mb/s)
DOCSIS Measurements (Upstream)	Frequency Range	5 MHz - 42 MHz
	Modulation Types	QPSK, 8 QAM, 16 QAM, 32 QAM and 64 QAM
	Maximum Input Power	+58 dBmV
	Throughput Testing	Maximum 4 Channels (108 Mb/s)
Advanced IP Quality Testing	Ping and Traceroute	
	Packet Loss Ratio Testing	
	TCP Throughput Testing	
	Web Browser	
	MPEG-2 TS Audio/Video Quality	

ORDERING INFORMATION		
PRODUCT NUMBER	PRODUCT NAME	DESCRIPTION
T5000	Tech-X Flex	With 10/100 Ethernet interface for IP Ping, Traceroute, DHCP/Static Addressing
T5631-1	Cable Services Module–V1 with DOCSIS	Provides DOCSIS 3.0 sync to CMTS, statistics, IP testing (ping, Traceroute, web browser) and support for 5-45MHz upstream and up to 1GHz downstream RF video testing including SLM, MER, BER, Constellation, Spectral analysis, Tilt, HUM and other pertinent RF testing functions
T5632-1	Cable Services Module–V1	Provides support for 5-45MHz upstream and up to 1GHz downstream RF video testing including SLM, MER, BER, Constellation, Spectral analysis, Tilt, HUM and other pertinent RF testing functions
T5633	DOCSIS 3.0 Module	Provides DOCSIS 3.0 sync to CMTS, statistics, IP testing (ping, Traceroute, web browser)

AMERICAS 1-800-SPIRENT • +1-818-676-2683 • sales@spirent.com

EUROPE AND THE MIDDLE EAST +44 (0) 1293 767979 • emeainfo@spirent.com

ASIA AND THE PACIFIC +86-10-8518-2539 • salesasia@spirent.com

© 2010 Spirent Communications, Inc. All of the company names and/or brand names and/or product names referred to in this document, in particular the name “Spirent” and its logo device, are either registered trademarks or trademarks pending registration in accordance with relevant national laws. All rights reserved. Specifications subject to change without notice. Rev. A 06/11

