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HST-3000 Ethernet SIM
Test Electrical and Optical Ethernet up to 1G

Key Features

- **Electrical and optical Ethernet testing in one module**
- **Traffic generation at full line rate or variable loads to test services at layer 2 and 3**
- **'Thru Mode' to measure live traffic**
- **Cable diagnostics to identify and locate electrical faults**
- **Scripted RFC 2544 benchmark testing**
- **Loopback L2 or L3 traffic from any instrument in JDSU's Ethernet portfolio**

As networks migrate from circuit-switched to packet-switched architectures, Ethernet services are being pushed out of the network core and toward the edge. Therefore, service providers must equip their technicians to adequately turn up and troubleshoot this new technology while continuing to support their legacy T/E carrier services.

While the majority of today's Ethernet links carry only data traffic, Voice over IP (VoIP) and IP Video are becoming more common. These triple-play networks, which transmit voice, video, and data traffic, present a unique set of challenges. Service providers for these network environments are now responsible for delivering a layer 7 service, rather than a traditional layer 2 or layer 3 pipe.

The HST-3000, equipped with the Ethernet Service Interface Module (SIM), addresses this requirement for 7-layer testing in a rugged, modular platform that is ideal for field use. It has a full Ethernet feature set for testing both electrical and optical links with data rates up to 1 Gb/s. The HST-3000 also offers multiple stream support for the verification of prioritization schemes and advanced monitoring options for advanced troubleshooting capabilities. In addition, the HST-3000's VoIP and IP Video options allow technicians to emulate the end customer's user experience and objectively measure quality of service.
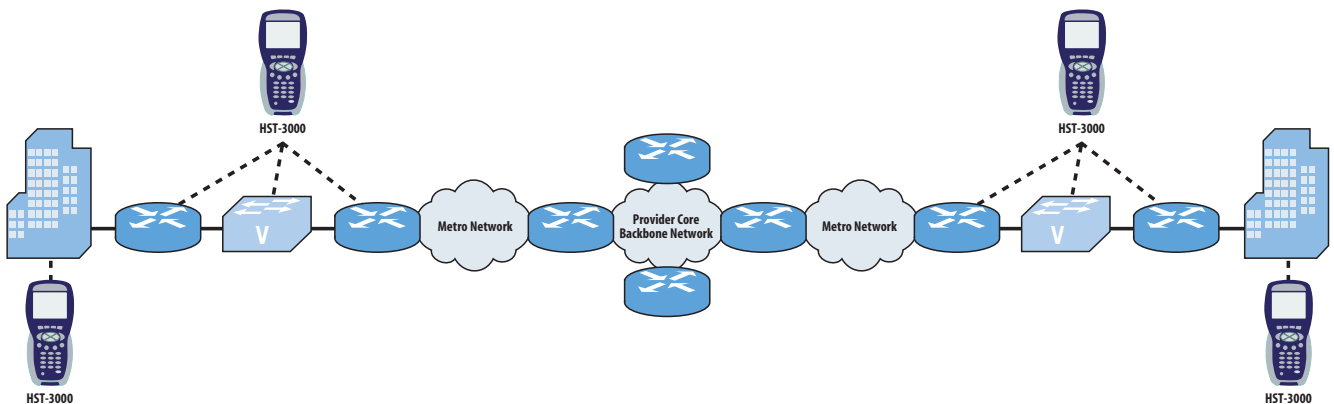
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Figure 1. Testing IP traffic on a Metro network

Product Features

Layer 2 Packet Testing

The HST-3000 Ethernet SIM provides technicians with layer 2 packet testing capabilities, allowing for the generation of Ethernet frames with various configurable parameters, such as bandwidth utilization, frame length, and frame payload. These frames can be generated with constant, ramp, or bursty traffic load settings to fully test the Ethernet service.

Layer 3 IP Testing

The HST-3000 Ethernet SIM enables technicians to generate and receive IP packets with its built-in layer 3 testing capabilities. These packets have a valid IP header, containing user-defined fields, such as TTL, TOS/DSCP, source IP address, and destination IP address. Since dynamic addressing is supported, the source IP address can be assigned by a DHCP server, if necessary. Basic domain name service (DNS) testing can be performed to ensure that the DNS server is able to resolve the name to the appropriate address. In addition, traffic load settings can be configured for constant, ramp, and bursty traffic in order to simulate different network traffic conditions and analyze the performance of the link.

One-Button RFC 2544 Automation

To verify that service level agreements (SLAs) are met, service providers must run a full suite of tests at turn-up. This set of standard tests, known as RFC 2544, is wrapped into an easy-to-use auto test on the HST-3000. With one press of a button, the link is configured with the technician's saved settings and tested against customizable thresholds. This ensures that the test is performed the same way every time, providing consistent, repeatable results.

Cable Diagnostics

On electrical Ethernet circuits, the HST-3000 can display the link speed, link status, cable status, MDI/MDIX, and distance to fault with one press of a button. To verify connectivity on fiber lines, the HST-3000 reports the power level of the optical signal. These features allow technicians to quickly sectionalize physical layer problems.

Bi-Directional Monitoring/Thru Mode

The dual ports (both optical and electrical) on the HST-3000 Ethernet SIM enable technicians to gain access to circuits under test in order to perform in-service monitoring in both directions. Not only does this simplify sectionalization of the network, it also allows for the analysis of live customer traffic without the use of a splitter.

VLAN Protocol Support

VLAN tag manipulation allows for the generation of an Ethernet traffic stream with a specific VLAN ID (as per specification 802.1Q) and VLAN user priority (as per specification 801.P). This enables technicians to verify the correct transmission and prioritization of the stream through the network. In addition, VLAN filtering allows technicians to isolate a specific VLAN stream and compare its performance with the total performance of the link. VLAN protocol support is available for both layer 2 and layer 3 traffic frames.

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Multiple Streams Option

Many service providers are beginning to deploy different classes of service in order to offer tiered options to customers or to prioritize traffic to effectively manage triple-play networks. This leads to a new type of problem where the latency and loss may be acceptable for regular traffic, but the higher priority traffic does not meet its required SLA.

In order to test these new networks, technicians can use the Multiple Streams option for the HST-3000 to oversubscribe the switch and determine if the various SLAs are met. This is accomplished by using two or three different traffic streams of differing priorities and sending more traffic through the switch than it can handle. For example, a technician can attempt to send 1000 Mb/s of traffic through an OC-3 SONET ring. The switch should drop the lower priority traffic, but it should allow all of the higher priority traffic to pass through to the far end where another HST-3000 is connected to the receiver.

VoIP Option

The HST-3000 with the VoIP option can validate VoIP service connectivity, feature availability, and voice quality. In addition, it provides a comprehensive set of features, including signaling, IP ping, packet statistic, and traceroute analysis in order to identify, diagnose, and sectionalize VoIP network and equipment problems.

IP Video Option

The HST-3000 IP Video option is a video test suite specifically designed to meet the needs of the field technician who is responsible for the provisioning or turn-up of IP Video services that carry video program content over an Access network. Test access includes the 2-wire ADSL interface or the Ethernet 10/100 interface at the DSL modem or FTTx residential gateway. The test suite includes set top box (STB) emulation with signaling support for broadcast video (IGMP) and VOD (RTSP). Video transport stream analysis is provided as well as video quality of service measurements, including packet jitter, packet loss, IGMP latency, and program clock reference (PCR) jitter analysis.

Figure 2. Class-of-service testing using the HST-3000 Ethernet SIM with the Multiple Streams option

Specifications

Test Interfaces

Optical Ethernet/IP

100/1000 Mb/s	Dual SFP ports

Electrical Ethernet/IP

10/100/1000 Mb/s	Dual RJ-45 ports
Test modes	Terminate
	Monitor
	Thru (bi-directional monitor)

Ethernet (Layer 2) Specifications

Duplex modes	Full, half
Flow control	Supported
Traffic generation	Constant, ramp, bursty
Payload	JDSU, 223-1, Inv 223-1, 231 -1, Inv 232-1, all 1s, all 0s, user-defined
Frame length	64-1522 bytes, user-defined, undersized, jumbo, random
MAC addressing	Configurable source and destination MAC addresses
Frame format	802.3 or DIX
VLAN settings	ID, priority
Bit error testing patterns	PRBS (223-1, 231-1, and inverted selections), all 1s, all 0s, user-defined
Framed pattern test per NCITS TR-25:1999	CRPAT, CJPAT, CSPAT
Traffic filtering	MAC source address
	MAC destination address
	Frame type/length
	VLAN ID, VLAN priority

IP (Layer 3) Specifications

Traffic generation	Constant, ramp, bursty
IP addressing	Configurable source and destination IP addresses, TOS/DSCP
Traffic filtering	Source IP address
	Destination IP address
	Subnet mask
	TOS/DSCP fields

Multiple Streams Option

Number of streams	8
Stream modes	Layer 2
	Layer 3
VLAN settings	ID, priority

Cable Testing

Optical	Power measurement
CAT-5 cable	Link speed, link status, cable status, crossover/straight, distance to fault, pin mapping, pair length, polarity, skew
Power over Ethernet	Indicates if the power supply responds to Class 1 power requests

Key Results

Link status
- Optical power measurement
- Link active
- Frame detected
- Sync obtained

Configuration status
- Auto-negotiation link configuration ACK
- Auto-negotiation link advertisement status
- DHCP lease time
- Destination MAC address when using ARP

Link stats
- Bandwidth utilization
- Frame rate
- Rx/Tx L1, L2, L3 Mb/s
- Round trip delay
- Service disruption time

Link counts
- Total received and transmitted frames, pause frames, VLAN frames, unicast frames, multicast frames, broadcast frames, frame length (bins) Errored counts
- FCS errored frames, runts, jabbers, undersized frames, OOS frames, lost frames, IP checksum errors, JDSU payload errors

Conformance with RFC 2544
- Throughput test
- Latency test
- Frame loss test
- Back-to-back frame test

Physical Specifications

Size	(H x W x D) 9.5 x 4.5 x 2.75 in
Weight	2.7 lb (with battery)
Operating temperature	22°F to 122°F
Storage temperature	-40°F to 150°F
Battery life	10 hrs typical usage
Charging time	7 hrs from full discharge to full charge
Operating humidity	10% to 80% relative humidity
Storage humidity	10% to 95% relative humidity
Display	1/4 VGA monochrome transflective, 3.8-in diagonal (readable in direct sunlight)

General

Ruggedness	Survives 3-ft drop to concrete on all sides
Water-resistance	Splashproof (may be used in heavy rain)
Language	English, German, Spanish, French
Keypad	Typical 12-button keyboard

Ordering Information

Base Units

HST-3000 base unit with copper testing, requires the purchase of a SIM, CE marked	HST3000C-CE
HST-3000 base unit without copper testing, requires the purchase of a SIM, CE marked	HST3000-CE

SIMs (Service Interface Module)

10/100/1000 Ethernett	HST3000-ETH
Dual tip/ring/ground copper test interface, requires the HST3000C base unit	HST3000-CuCE

Software Options

Optical Ethernet	HST3000-OPTETH
Multiple Streams	HST3000-MSTR
IP Video Analysis	HST3000S-IP-Video
VoIP Analysis	HST3000S-VoIP
VoIP Mean Opinion Score	HST3000S-MOS
H.323 VoIP Signaling	HST3000S-H.323
SCCP VoIP Signaling	HST3000S-SCCP
SIP VoIP Signaling	HST3000S-SIP
SCCP MGCP VoIP Signaling	HST3000S-MGCP