



Acterna HST-3000 Option for DSL Services

Network operators and service providers are faced with a variety of test challenges to install and maintain robust and cost-effective DSL services.

DSL has been developed to make full use of the existing, and typically poor quality, copper network. Physical layer problems including attenuation, crosstalk, the presence of bridge taps or load coils, and physical faults (shorts, grounds, opens, or wet sections) can have a detrimental impact on DSL service performance and quality. Therefore, it is essential that these problems are identified and rectified quickly.

Reliable operation of DSL service is not restricted to physical layer testing of the copper network. Connectivity of the service to the DSLAM in the local exchange must also be assured. Beyond the DSLAM, connectivity and routing, both to the ATM network and ultimately to the service provider, need to be verified to ensure that the customer's expected level of service is validated.

There is also the challenge of provisioning and maintaining different DSL variants simultaneously - ADSL over POTS, ADSL over ISDN and G.SHDSL - to meet the demands of both residential and business customers.

To complicate matters, all of these challenges must be achieved within an operating environment constrained by reduced budgets, smaller workforces, and tighter deadlines.

Acterna's HST-3000 provides an effective DSL test solution to meet all of these key challenges. The HST-3000 delivers comprehensive physical layer copper testing and service testing at the DSL, ATM, IP and PPP layers. It also supports multiple DSL variants. In addition, it is capable of delivering the process improvement features that are required to enhance productivity and efficiency.

Highlights

- All-in-one DSL tester
- Complete copper testing including DVOM, TDR, Wideband TIMS and Resistive Fault Location
- ADSL over POTS, ADSL over ISDN and G.SHDSL support with xTU-C/-R modem emulation
- All layer testing of the network including DSL, ATM, PPP and IP
- Built-in 10/100BT Ethernet allows the HST-3000 to surf through the customer's modem, isolate the PC or CPE and isolate the customer's modem in Through mode
- On-board Internet browser and FTP-download feature
- Modular hardware and software architecture is flexible and easily upgraded, allowing for the testing of multiple services
- CE Marked

Test the Copper

The HST-3000 offers extended copper testing to pinpoint physical layer problems quickly and easily. Features include:

- DVOM measuring AC and DC voltage, current and resistance
- Opens measurement
- Noise, balance and power influence
- Cable fault location with the graphical TDR or RFL
- Load coil detection
- Wideband TIMs
- Caller ID (CLID) testing
- POTS calls

Test the Service

The HST-3000 can quickly confirm synchronization on the physical layer and measure link layer performance by emulating different DSL modems. Comprehensive performance statistics are provided including the actual DSL signal rate for the current connection. The connection's maximum possible rate is also determined. Additionally, SNR-per-tone and bits-per-tone are checked and displayed graphically to evaluate line quality.

xTU-R/-C modem emulation is provided by optional Service Interface Modules (SIMs). These modules are available for ADSL over POTS (AoP), ADSL over ISDN (AoI) and G.SHDSL.

ATM is the most common transport network for DSL networks. If there are problems at the ATM layer, the service will not work. It is important to identify the ATM layer as a source of any problems. ATM loopback analysis is provided. This ensures that any virtual circuit routing problem can be determined and correct end-to-end connectivity at the ATM layer can be

established. Additionally, incorrect DSLAM and ATM mappings can be quickly identified and rectified to ensure customer connection to the network.

Routing connectivity across the network to an IP host or server can be verified using the IP PING mode. Packet loss rates and packet delay to and from the PING destination can be assessed to determine whether delays or slow service are due to provider error or CPE problems.

Authentication of PPPoE/PPPoA with PAP/CHAP is also included, making it possible to look past the DSLAM to verify correct mapping and connectivity to the ISP Gateway.

The HST-3000 has an optional on-board Internet browser allowing for the display of any Web page to demonstrate Internet access. Internet download testing is also available using the optional FTP-download feature, allowing for the determination of true download speeds as well as identifying delays.

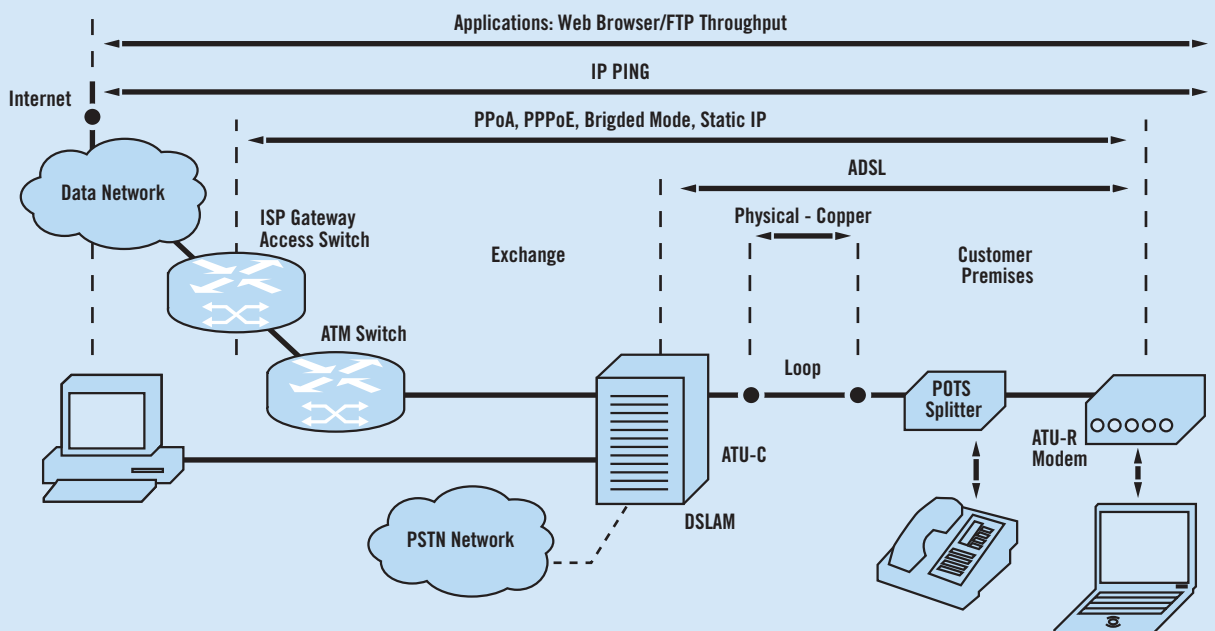


Diagram 1. Complete physical and layer testing.

Improve the Process

The HST-3000 provides a number of powerful features that can greatly improve the DSL installation and maintenance process, reducing costs and improving productivity and efficiency.

With one instrument to support physical copper testing, all layer service testing and multiple DSL modems, the HST-3000 ensures that services are delivered rapidly, efficiently and accurately.

The HST-3000's straightforward graphical user interface (GUI) greatly simplifies the testing process, thus reducing the amount of training required for comprehensive testing.

One-button automatic testing combined with support for all phases of DSL service deployment, reduce the number of technicians required to provision and maintain service. This simplicity also makes it possible for non-experts to operate tests.

In addition, the HST-3000's pre-programmed tests and customized scripts ensure that all technicians follow the same procedures, speeding up service delivery and minimizing installation and testing errors.

Standard Ethernet, USB and serial connections offer flexibility to easily download software and offload stored test results for later analysis.

The HST-3000's modular design not only provides a scalable, all-in-one solution for DSL testing, it can easily be upgraded with new modules and software to test other services, such as VoIP.

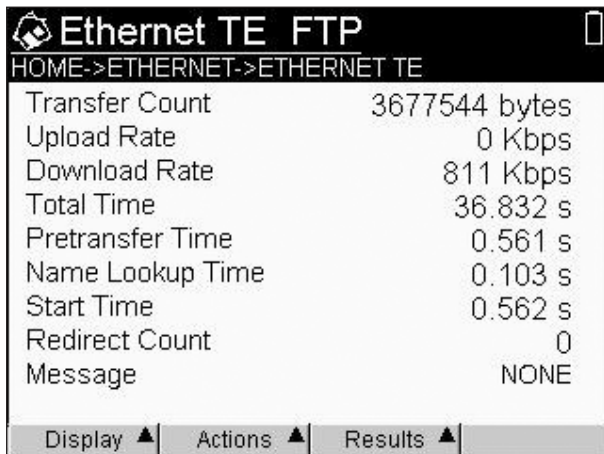


Figure 1. FTP-download analysis

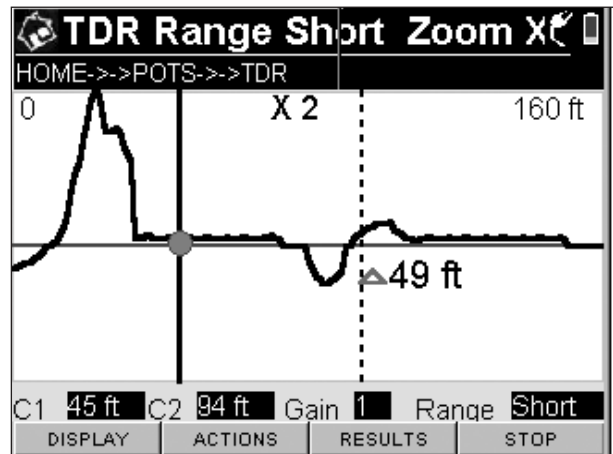


Figure 2. Time domain reflectometer

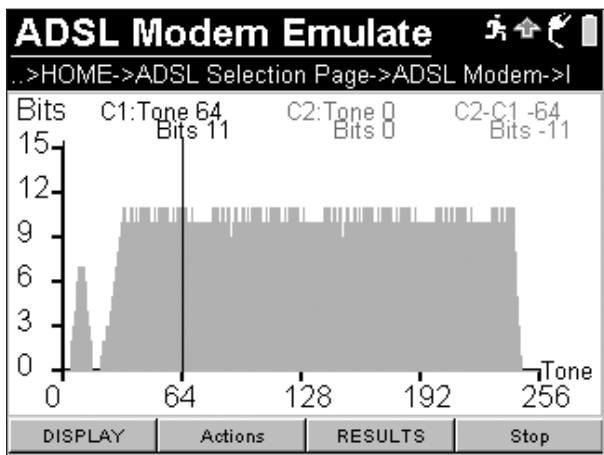


Figure 3. ADSL modem results

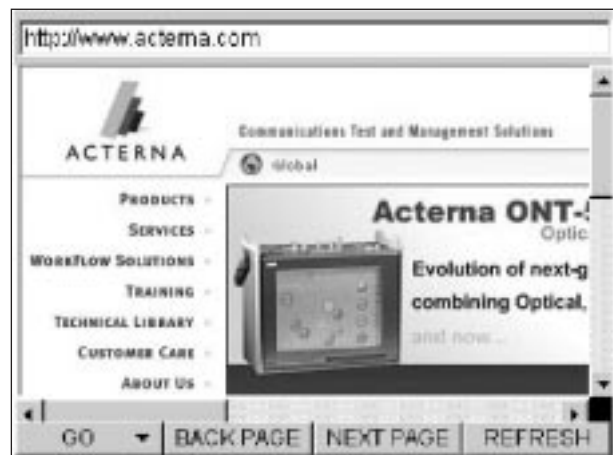


Figure 4. Web page

Specifications

ADSL Specifications:

Standard compliance, ADSL over POTS modem:

- ITU-T G.992.1, Annex A (G.DMT)
- ITU-T G.992.2 (G.lite)
- ETSI ETR 328
- ANSI T1.413-1998, Issue 2

Standard compliance, ADSL over ISDN modem:

- ITU-T G.992.1, Annex B

Types of Service Interface Modules (SIMs):

- ATU-R modem for ADSL over POTS (Annex A)
- ATU-R/C modem for ADSL over POTS (Annex A)
- ATU-R modem for ADSL over ISDN (Annex B)
- ATU-R/C modem for ADSL over ISDN (Annex B)
- STU-R/C modem for G.SHDSL

General settings:

- Switchable settings for Auto Sync, Trellis Coding, and Echo Cancellation

Physical layer feature support:

- Actual and maximum bit rates
- Capacity (% of used bandwidth)
- Noise margin
- Attenuation
- Connection method
- Training time
- Number of syncs
- Interleave depths
- Coding gain
- Modem state
- TX power
- Far vendor ID, revision, name
- Event log
- Graphical display of BPT (bits-per-tone)
- Graphical display of SNR (SNR-per-tone)

ADSL errors:

- LOS (loss of signal)
- SEF (severely errored frames)
- RS corrected bytes
- CRC (cyclic redundancy check)
- OCD (out-of-cell delineation)
- HEC (header error correction)
- NCD (no cell delineation)
- Modem errors

PPP/IP connectivity (IP option):

- PPPoA, PPPoE, IPoA Terminate, and Through modes
- Bridged Ethernet Terminate, and Through modes
- Routing functions
- Ethernet TE
- Encapsulation: LLC SNAP, LLC, VC-MUX, HDLC
- Address Modes: DHCP, IPCP, PAP, CHAP
- NAT, DNS

Data features (IP option):

- IP statistics: RX/TX %, lost packets, packet delay
- Single or multiple PING
- Trace route analysis
- ATM OAM analysis

ATM statistics:

- Total RX/TX cells
- TX AAL 5 frames

- RX AAL 5 frames
- TX dropped cells
- RX CRC errors
- RX AAL5 length errors
- RX AAL5 aborts
- Last unknown VPI/VC1

Ethernet statistics:

- RX/TX bytes
- RX/TX frames
- RX/TX errors
- RX/TX dropped
- Collisions

G.SHDSL Specifications

Standard compliance for G.SHDSL modem emulation:

- ITU-T G.992.1, Annex A and Annex B
- ETSI TS101 524-1
- ANSI T1E1 4/99-006R6

Feature support:

- Power back-off feature
- Asymmetric power spectral density feature
- Fixed and adaptive rate modes
- Minimal start-up noise margin for the adaptive mode

User EOC messages:

- Discovery probe
- Inventory request
- System loopback request (initiate)
- System loopback request (terminate)
- Element loopback request (initiate)
- Element loopback request (terminate)
- Element loopback request up to eight elements
- Status request
- Full status request

Expected performance levels:

Line Length (26 AWG/4 mm)	Payload Rate (kbps)
9,000 ft / 2743 m	2304
10,000 ft / 3048 m	2112
11,000 ft / 3352 m	1664
12,000 ft / 3657 m	1344
13,000 ft / 3962 m	1088
14,000 ft / 4267 m	832
15,000 ft / 4572 m	704
16,000 ft / 4876 m	512
17,000 ft / 5181 m	384
18,000 ft / 5486 m	256

The following payload rates are supported (kbps):

64, 72, 128, 136, 192, 200, 256, 264, 320, 328, 384, 392, 448, 456, 512, 520, 576, 584, 640, 648, 704, 712, 768, 776, 832, 840, 896, 904, 960, 968, 1024, 1032, 1088, 1096, 1152, 1160, 1216, 1224, 1280, 1288, 1344, 1352, 1408, 1416, 1472, 1480, 1536, 1544, 1600, 1608, 1664, 1672, 1728, 1736, 1792, 1800, 1856, 1864, 1920, 1928, 1984, 1992, 2048, 2056, 2112, 2120, 2176, 2184, 2240, 2248, 2304, 2312

PPP/IP connectivity (IP option):

- PPPoA, PPPoE, IPoA Terminate and

- Through modes
- Bridged Ethernet Terminate and Through modes
- Routing functions
- Ethernet TE
- Encapsulations: LLC SNAP, LLC, VC-MUX, HDLC
- Address Modes: DHCP, IPCP, PAP, CHAP
- NAT, DNS PPPoA Terminate and Through modes
- IP statistics: RX/TX %, lost packets, packet delay

Copper Measurement Specifications

DVOM measurements:

AC Voltage:	0 to 175 V RMS (1% +/- 0.5 V)
DC Voltage:	0 to 250 V DC (1% +/- 0.5 V)
DC Current:	0 to 90 mA (1% +/- 0.5 mA)
Resistance:	0 to 99 MΩ

Resistance accuracy

0 to 9999Ω:	1% +/- 5 Ω
10 kΩ to 99.9 kΩ:	+/- 1%
100 kΩ to 999 kΩ:	+/- 3%
1 MΩ to 9.9 MΩ:	+/- 3%
Leakage (test voltage 110 V):	0 to 99 MΩ
Distant to short:	distance calculation based on resistance, temperature, or wire gauge.

Opens measurement

Displays the line capacitance or the calculated distance based on selected cable parameters	
Distance range:	0 to 30 km (0 to 100 kft)
Accuracy:	0 to 6 km (20 kft), +/- 2%

Noise and balance

Longitudinal balance	28 to 99 dB
Noise (voice band and C filter/psoph)	0 to 50 dBm (equivalent to -40 to -90 dBm)
Power (mains) influence	40 to 120 dBmC (equivalent to +30 to -50 dBm)

Generator

Frequency range	200 Hz to 5 kHz (resolution of 1 Hz)
Level range	0 to -20 dBm (resolution of 1 dB)
Level accuracy	0.5 dB
Termination impedance	600 Ω or 900 Ω

Receiver

Frequency range	200 Hz to 4 kHz (resolution of 1 Hz)
Level range	+10 to -40 dBm (resolution of 0.1 dB)
Level accuracy	0.5 dB
Termination impedance	600 Ω or 900 Ω

Miscellaneous:

Load coil detection/ count	0 to 5 coils (< 9km/ 27 kft)
Caller ID	name, phone number, raw data
Phone feature	DTMF phone

TDR (optional):

Short range TDR	0 to 700 m (2 kft)
Medium range TDR	150 to 3000 m (0.5 to 10 kft)
Long range TDR user-selectable pulse width:	3000 to 6000 m (10 to 20 kft)
Vp range (velocity of propagation)	0.300 to 1.000
Gain	X axis and Y axis
Graphical display	dual trace display and cursor operation for comparison with stored traces

Resistive Fault Location (optional):

Test methods

	single pair and 2nd pair hookup
Fault identification	0 to 10 M Ω
Fault location accuracy	0 to 99 Ω , +/- 0.1% 99 to 999 Ω , +/- 0.2% 999 to 7000 Ω , +/- 0.25%
Results display	graphical strapping diagram

Wideband Transmission Impairments (optional):

Generator frequency range	10 kHz to 1.6 MHz
Generator level range	+5 to -20 dBm
Receiver frequency range	10 kHz to 1.6 MHz
Receiver level range	+10 to -70 dBm
Termination impedance	100 Ω , 135 Ω
Noise weighting filters	E, F, G, none (IEEE Std 743)
Wideband noise level	+10 to -70 dBm
Impulse noise counter	1 to 15 min or continuous
Impulse noise threshold	E filter: 35 to 100 dBm F filter: 40 to 100 dBm G filter: 45 to 100 dBm

Spectral measurements frequency	4Khz to 3.8MHz
Spectral measurements level	+10 to -70 dBm

On-screen display of PSD masks of common disturbers

FTP-download feature (optional)

On-board Internet browser (optional)

General specifications:

Power supply

Batteries	Lithium Ion, removable battery pack
Operating time	approximately 6 to 10 h of typical usage
Auto switch-off:	1 to 15 min after last action, or off
Charging time, internal:	7 h from empty to full charge

AC line operation via external adapter/charger

Permissible ambient temperature

Nominal range of use	-14°C to +50°C
Storage and transport	-25°C to +70°C
Operating humidity	10% to 80%

Storage humidity	10% to 95% relative humidity
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Physical specifications

Size (H x W x D)	240 x 114 x 70 mm
Weight, including batteries	1.23 kg
Display	1/4 VGA monochrome transfective, 9.6-cm diagonal (readable in direct sunlight)

General Specifications

Ruggedness	Survives 0.9 m (3 ft) drop to concrete on all sides
Water-resistant, splash proof	May be used

Multi-language	English, German, French, Spanish, Italian
Keypad	12-button keyboard with cursor keys and soft keys
CE Marked	

Ordering information

Base units

HST-3000C	HST-3000C base with copper testing
	Requires the purchase of a SIM
	– see separate listing for HST3000-CAR (Ethernet and serial ports included)
HST-3000	HST-3000 base without copper testing
	Requires the purchase of a SIM
	– see separate listing for HST-3000-AR (Ethernet and serial ports included)

SIMS (Modules)

HST3000-4WLL	4 wire local loop
HST3000-T1	Dual Tx/Rx bantam T1 interface and T1 software option
HST3000-CT1	Dual T/R/G interface for copper Testing and Dual Tx/Rx bantam T1
HST3000-T3	Dual Tx/Rx bantam T1 interface, and dual Rx, single Tx BNC DS3 interface and DS3 software option
HST3000-BRI	ISDN BRI option
HST-ARCE	ADSL (ATU-R) option
HST-CAR	Copper (ATU-R) option
HST-CU	Dual T/R/G Interface to copper test option
HST-GSH	G.SHDSL option
HST3000-CuCE	Cu only SIM, CE mark
HST3000-CARCE	Cu & ATU-R (Annex A) SIM, CE mark
HST3000-ARCA	ATU-R/C dual mode SIM, AoPOTS
HST3000-CARCA	Cu & ATU-R/C dual mode SIM, AoPOTS
HST3000-ARB	Annex B ATU-R SIM
HST3000-CARB	Annex B Cu/ATU-R SIM
HST3000-ARCB	ATU-R/C dual mode SIM, AoISDN
HST3000-CARCB	Cu & ATU-R/C dual mode SIM, AoISDN
HST3000-CSHCE	G.SHDSL & Cu SIM
HST3000-BLK	Blank SIM

Software options

HST3000S-IP	Advanced IP suite – PING and through mode support
HST3000S-WEB	Web browser option
HST3000-WBTONES	WB TIMS option
HST3000-RFP	RFL option
HST3000S-VOIP	VoIP software
HST3000-FTP	FTP software option
HST3000-SCRIPT	Scripted test option
HST3000S-H.323	VoIP Signaling call controls for H.323
HST3000S-SCCP	VoIP Signaling option for Cisco SCCP
HST3000S-SIP	VoIP Signaling option for SIP call control
HST3000-PCMSIG	Signaling (PCM) software option
HST3000-PCMTIMS	TIMS (PCM) software option
HST3000-T1DDS	DDS-T1 software option
HST3000-PRI	ISDN PRI software option
HST3000-SPE	Spectral Noise software option
HST3000S-MOS	MOS (Mean Opinion Score) Analysis option

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Acterna is the world's largest provider of communications test solutions for telecommunications and cable network operators. A trusted communications test partner for more than eight decades, Acterna offers an unmatched portfolio of award-winning instruments, systems, software and services that help its customers reduce network costs while improving performance and reliability. Headquartered in Germantown, Maryland, USA – with European and Asia-Pacific operations based in Eningen, Germany and Hong Kong – Acterna serves nearly every major communications service provider and equipment manufacturer around the world through a skilled sales and support organization in 31 countries.

Worldwide Headquarters

One Milestone Center Court
Germantown, Maryland
20876-7100
USA

Acterna is present in more than 80 countries. To find your local sales office go to: www.acterna.com

Regional Sales Headquarters

North America
One Milestone Center Court
Germantown, Maryland
20876-7100
USA
Toll Free: 1 866 ACTERNA
Toll Free: 1 866 228 3762
Tel: +1 301 353 1560x2850
Fax: +1 301 353 9216

Latin America
Acterna do Brasil Ltda.
Av. Eng. Luis Carlos Berrini
936 9th Floor
04571-000 São Paulo
SP-Brazil
Tel: +55 11 5503 3800
Fax: +55 11 5505 1598

Asia Pacific
Acterna Hong Kong Ltd.
Room 902, 9th Floor
Bank of East Asia
Harbour View Centre
56 Gloucester Road
Wanchai, Hong Kong
Tel: +852 2892 0990
Fax: +852 2892 0770

Western Europe
Acterna Germany GmbH
Mühleweg 5
Germany
Tel: +49 7121 86 2222
Fax: +49 7121 86 1222

Eastern Europe, Middle East & Africa
Acterna Austria GmbH
Aredstrasse 16-18
A-2544 Leobersdorf
Tel.: +43 2256 65610
Fax: +43 2256 65610-22

Acterna Moscow
Prospect Mira 26,
stroenie 5
RF-129090 Moscow
Tel.: +7 095 937 88 04
Fax: +7 095 775 26 05

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