HST-3000
Option for DSL Services

Key Features

- **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**

The JDSU HST-3000 provides an effective solution to meet all test challenges found in installing and maintaining robust and cost-effective Digital Subscriber Line (DSL) services. The HST-3000 delivers comprehensive physical layer copper testing and service testing at the DSL, asynchronous transfer mode (ATM), Internet protocol (IP), and Point-to-Point Protocol (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.

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

Reliable operation of DSL service is not restricted to physical layer testing of the copper network. Connectivity of the service to the DSL access multiplexer (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, must 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—asymmetric DSL (ADSL) over plain old telephone system (POTS), ADSL over Integrated Services Digital Network (ISDN) and Global.standard High-Bit-Rate DSL (ITU-T) (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. The HST-3000 incorporates a rugged, weather-resistant design and long battery life that are ideally suited for use in the field, and its modularity allows for field upgrades to support new testing requirements. The HST-3000 is easily upgradeable with technologies and advanced options that support the changing needs of service installers. Its dynamic configurability lets different technicians with diverse responsibilities perform a variety of tests. Standard Ethernet, USB, and serial connections offer flexibility to easily download software and offload captured test data.

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Test the Copper

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

– Digital volt-ohm meter (DVOM) measuring AC and DC voltage, current, and resistance

– Opens measurement

– Noise, balance, and power influence

– Cable fault location with the graphical time domain reflectometer (TDR) or resistive fault location (RFL)

– Load coil detection

– Wideband Transmission Impairment Measurement Set (TIMS)
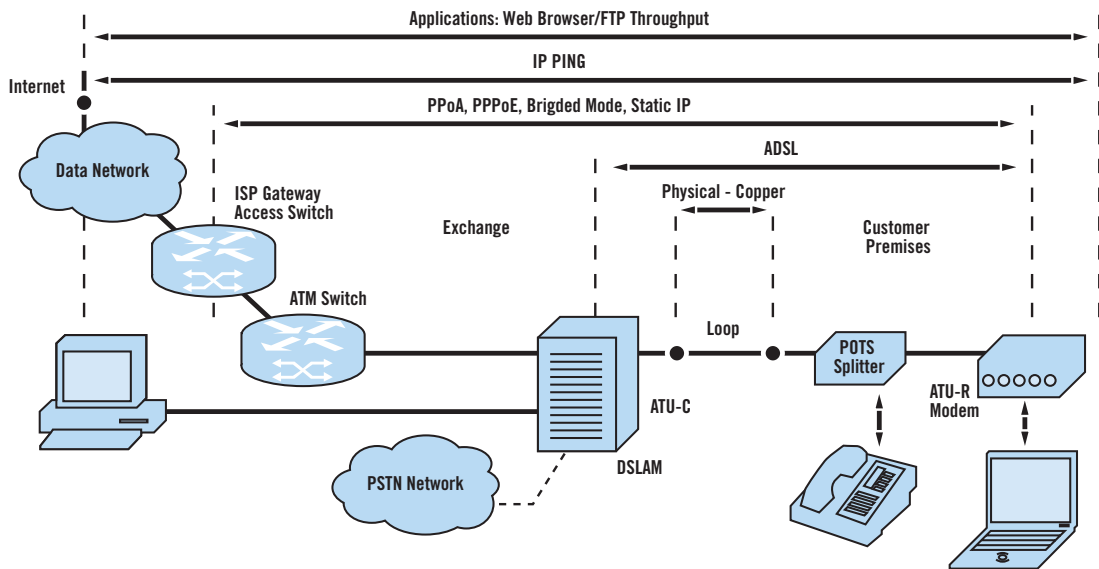
– Caller ID (CLID) testing

– POTS calls

Figure 1   Complete physical and layer testing

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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, signal-to-noise ratio (SNR) per tone and bits per tone (BPT) are checked and displayed graphically to evaluate line quality.

The 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 whether the ATM layer is a source of problems. ATM loopback analysis is provided to ensure that virtual circuit routing problems 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 because of a provider error or CPE problems.

Authentication of PPP over Ethernet (PPPoE)/PPP over ATM (PPPoA) with Password Authentication Protocol (PAP)/Challenge-Handshake Authentication Protocol (CHAP) is also included, making it possible to look past the DSLAM to verify correct mapping and connectivity to the Internet service provider (ISP) Gateway.

The HST-3000 has an optional onboard Internet browser allowing for the display of any Web page to demonstrate Internet access. Internet download testing is also available using the optional File Transfer Protocol (FTP)-download feature, allowing for the determination of true download speeds as well as identifying delays.
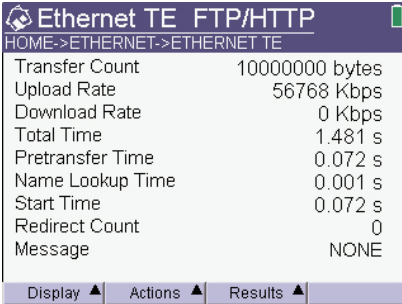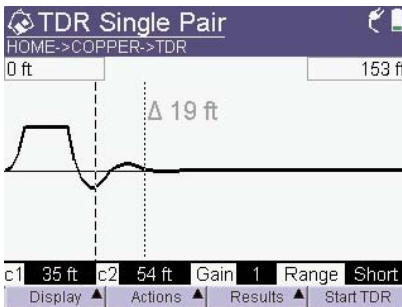
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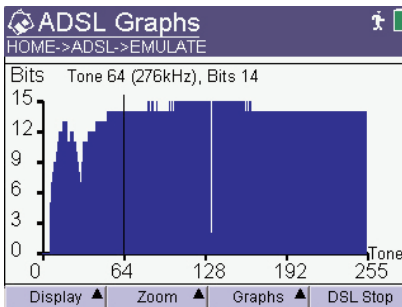Figure 2   FTP-download analysis

Figure 3   Time domain reflectometer

Figure 4   ADSL modem results

Figure 5   Web page

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 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 preprogrammed tests and customized scripts for the HST-3000 ensure that all technicians follow the same procedures, which speeds up service delivery and minimizes installation and testing errors.

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

The modular design of the HST-3000 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.

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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/VCI

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 (4 mm/26 AWG)	Payload Rate (kbps)
2,743 m/9,000 ft	2304
3,048 m/10,000 ft	2112
3,352 m/11,000 ft	1664
3,657 m/12,000 ft	1344
3,962 m/13,000 ft	1088
4,267 m/14,000 ft	832
4,572 m/15,000 ft	704
4,876 m/16,000 ft	512
5,181 m/17,000 ft	384
5,486 m/18,000 ft	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 9999 Ω	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 guage

Opens measurement
Displays the line capacitance or the calculated distance based on selected cable parameters

Distance range	0 to 30 km (0 to 18.6 miles)
Accuracy	0 to 6 km (3.72 miles), ±2%

Noise and balance

Longitudinal balance	28 to 99 dB
Noise (voice band and C filter/psopho)	0 to 50 dBrn (equivalent to −40 to −90 dBm)
Power (mains) influence	40 to 120 dBrnC (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

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Specifications

Miscellaneous

Load coil detection/count	0 to 5 coils (< 9 km/5.59 miles)
Caller ID	name, phone number, raw data
Phone feature	DTMF phone

TDR (optional)

Short range TDR	0 to 700 m (0.4 miles)
Medium range TDR	150 to 3000 m (0.9 to 1.86 miles)
Long range TDR user-selectable pulse width	
	3000 to 6000 m (1.86 to 3.23 miles)
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 MΩ
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

Wide 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 dBrn
	F filter: 40 to 100 dBrn
	G filter: 45 to 100 dBrn
Spectral measurements frequency	4 kHz to 3.8 MHz
Spectral measurements level	+10 to −70 dBm
On-screen display of PSD masks of common disturbers	

Transmission Impairment (optional)

Return Loss

Frequency range	200 Hz to 5 kHz
Measurement range	0 to 50 dB
Accuracy	±1 dB at 1 kHz and 20 dB
	±2 dB from 200 Hz to 5 kHz, 5 to 40 dB
Reference impedance	600 Ω
Wideband Frequency Range	10 kHz to 2000 kHz
Measurement range	0 to 50 dB
Accuracy	±2 dB at 1000 kHz and 20 dB
	±3 dB from 10 kHz to 2000 kHz, 5 to 40 dB
Reference impedance	100 or 135 Ω

Noise and Noise with Tone

Voiceband frequency range	200 Hz to 5 kHz
Measurement range	+10 to −60 dB
Accuracy	±1 dB at 1 kHz and −30 dB
	Nominally within ±2 dB across range
Weighting filters	C message, Psophometric, channel, 820 Hz and 1020 Hz notch
Reference impedance	600 Ω and bridging
Wideband frequency range	10 kHz to 2000 kHz
Measurement range	+10 to −60 dB
Accuracy	±1 dB at 1 kHz and −30 dB; ±2 dB nominal
Weighting filters	E, F, G ANSI and ETSI

Impulsive Noise

Voiceband frequency range	200 Hz to 5 kHz
Measurement range	0 to 50 dB
Operation	Nominally as per 0.71
Accuracy	±1 dB at 1 kHz and 20 dB
	±2 dB from 200 Hz to 5 kHz, 5 to 40 dB
Wideband frequency range	10 kHz to 2000 kHz
Measurement range	0 to 50 dB
Accuracy	±1 dB at 100 kHz and 20 dB

Signal to Noise

Voiceband frequency range	200 Hz to 5 kHz
Measurement range	0 to 50 dB
Accuracy	±2 dB within range 5 to 40 dB input signal >30 dBm
Weighting filters	C or Psophometric (820 Hz or 1020 Hz notch)
Wideband frequency range	10 kHz to 2000 kHz
Measurement range	0 to 50 dB
Accuracy	±2 dB within range 5 to 40 dB input signal >30 dBm
Weighting filters	None, E, F, G ANSI and ETSI

NEXT

Frequency range	10 kHz to 2000 kHz
Measurement range	0 to 50 dB at 500 kHz
Accuracy	±2 dB at 1 MHz and 40 dB and +5 dBm launch level
Weighting filters	None, E, F, G ANSI and ETSI
Launch level	0 dBm, −10 dBm, +5 dBm

FEXT

Frequency range	10 kHz to 2000 kHz
Measurement range	0 to 50 dB at 500 kHz
Accuracy	±2 dB at 1 MHz and 40 dB
	If launch level is +5 dBm and line loss <20 dB
Weighting filters	None, E, F, G ANSI and ETSI

FTP-download Feature (optional)

Onboard Internet Browser (optional)

General Specifications

Physical Specifications

Size (H x W x D)	241 x 114 x 70 mm (9.5 x 4.5 x 2.75 in)
Weight, including batteries	1.23 kg (2.7 lbs)
Operating temperature	5.5 to +50℃ (22 to 122°F)
Storage temperature	−40 to +65.5℃ (−40 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	3.8" diagional, 1/4 VGA, Color Active Matrix with backlight (readable in direct sunlight)

General Specifications

Ruggedness	Survives 91 cm (3 ft) drop to concrete on all sides
Water-resistant	Splashproof (may be used in heavy rain)
Languages	English, German, French, Spanish, Italian, Chinese, Turkish
Keypad	Typical 12-button keyboard

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Specifications

Ordering Information

Mainframes

HST3000-NG	HST-3000 Mainframe without Copper (Color)
HST3000-NG-BW	HST-3000 Mainframe without Copper Testing (B&W)
HST3000C-NG	HST-3000 Copper Mainframe (Color)
HST3000C-NG-BW	HST-3000 Copper Mainframe (B&W)

Available SIMs (Modules)

HST3000-4WLL	4-wire local loop SIM
HST3000-AR2A-T1	ADSL2+ T1 (ATU-R, Annex A) SIM
HST3000-AR2A	ADSL1/2/2+ (ATU-R, Annex A) SIM
HST3000-AR2B	ADSL1/2/2+ (ATU-R, Annex B) SIM
HST3000-AR2B-T1	ADSL2+ T1 (ATU-R, Annex B) SIM
HST3000-ARB	Annex B ATU-R SIM
HST3000-ARCA	ATU-R/C dual mode SIM, AoPOTS SIM
HST3000-ARCB	ATU-R/C dual mode SIM, AoISDN SIM
HST3000-ARCE	ADSL (ATU-R) SIM
HST3000-BLK	Blank SIM
HST-BRA	ETSI (Euro) ISDN BRA SIM
HST3000-BRI	ISDN BRI SIM
HST3000-CAR	Copper (ATU-R) SIM
HST3000-CAR2A	ADSL1/2/2+ with Copper (ATU-R, Annex A) SIM
HST3000-CAR2A-T1	Copper, ADSL2+ T1 (ATU-R, Annex A) SIM
HST3000-CAR2B	ADSL1/2/2+ with Copper (ATU-R, Annex B) SIM
HST3000-CAR2B-T1	Copper, ADSL2+ T1 (ATU-R, Annex B) SIM
HST3000-CARB	Annex B Copper/ATU-R SIM
HST3000-CARCA	Copper and ATU-R/C dual mode SIM, AoPOTS
HST3000-CARCB	Copper and ATU-R/C dual mode SIM, AoISDN
HST3000-CARCE	Copper and ATU-R (Annex A) SIM, CE marked
HST3000-CSHHV	G.SHDSL, 380V SPAN, DVOM SIM
HST3000-CSH4	Copper, 4-wire G.SHDSL (STU-R/C, Annex A/B) SIM
HST3000-CSHCE	G.SHDSL and Copper SIM
HST3000-CT1	T1 and Copper SIM
HST3000-CU	Dual T/R/G interface to copper test SIM
HST3000-CUCE	Copper only SIM, CE marked
HST3000-CUVDSL-CNXT	VDSL and Copper with Connexant Chipset SIM
HST3000-CUVDSL-IK	VDSL and Copper with Ikanos Chipset SIM
HST3000-CUVDSL-INF	VDSL and Copper with Infineon Aware Chipset SIM
HST3000-DC	Datacom SIM
HST3000-E1	E1 SIM
HST3000-E1-DC	E1/Datacom SIM
HST3000-ETH	10/100/1000 Ethernet SIM
HST-GSH	G.SHDSL SIM
HST3000-GSHCE	2-wire G.SHDSL SIM
HST3000-T1	Dual Tx/Rx bantam T1 interface and T1 SIM
HST3000-T3	Dual Tx/Rx bantam T1 interface, and dual Rx/single Tx BNC DS3 interface/and DS3 SIM
HST3000-VDSL-CNXT	VDSL with with Connexant Chipset SIM
HST3000-VDSL-CNXT-WB2	VDSL and Copper (up to 30 MHz) with Connexant Chipset SIM
HST3000-VDSL-IK	VDSL with Ikanos Chipset SIM
HST3000-VDSL-IK-WB2	VDSL and Copper (up to 30 MHz) with Ikanos Chipset SIM
HST3000-VDSL-INF	VDSL with Infineon Aware Chipset SIM
HST3000-VDSL-INF-WB2	VDSL and Copper (up to 30 MHz) with Infineon Aware Chipset SIM
HST3000-WB2	Wideband 2 (up to 30 MHz) Copper Test SIM

Specifications

Software Options

HST3000-BLUETOOTH	Bluetooth® wireless software option
HST3000-DSL2	ADSL2 and ADSL2+ software option
HST3000-FR	Frame relay software option
HST3000-FTP	FTP software option
HST3000-IPV6	IPv6 software option
HST3000-MPLS	MPLS software option
HST3000-MSTR	Multiple streams software option
HST3000-MSTV	Microssft IPTV Video Analysis software option
HST3000-OPTETH	Optical ethernet software option
HST3000-PCMSIG	Signaling (PCM) software option
HST3000-PCMTIMS	TIMS (PCM) software option
HST3000-PRI	ISDN PRI (NC standard) software option
HST3000-PS	Pulse shape software option
HST3000-REMOP	Remote operation software option
HST3000-RFL	RFL software option
HST3000-SCRIPT	Scripted test software option
HST3000-SPE	Spectral Noise software option
HST3000-ST	Basic rate ISDN S/T (ANSI) software option
HST3000-T1DDS	DDS-T1 software option
HST3000-TCPUDP	TCP/UDP software option
HST3000-TDR	TDR software option
HST3000-TxIMP	Transmission impairments software option
HST-UNISTIM	VoIP signaling call controls for UNISTIM software option
HST3000-VT100	VT100 emulation software option
HST3000-WBTONES	WB TIMS software option
HST3000S-H.323	H.323 VoIP signaling software option
HST3000S-IP	Advanced IP suite – PING and through mode support software option
HST3000S-IP-Video	IP video analysis software option
HST3000S-MGCP	SCCP MGCP VoIP signaling software option
HST3000S-MOS	VoIP mean opinion score software option
HST300S-SCCP	SCCP VoIP signaling software option
HST3000S-SIP	SIP VoIP signaling software option
HST3000S-VMOS	Video MOS analysis software option
HST3000S-VOIP	VoIP software analysis software option
HST3000S-WEB	Web browser software option

Test & Measurement Regional Sales

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