HST-3000

E1/Datacom Service Interface Module (SIM)

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Global Communications Test & Measurement Company of the Year Award

Key Features

- Datacom (X.21, V.24 (RS-232), V.35, V.36 (RS-449), EIA-530)
- G.703: 2 Mbit/s Testing
- 2 RX/2 TX: E1 Interfaces
- Bulk, n x 64 kbit/s BERT
- G.821, G.826, M.2100
- Audio Monitor
- Signal Level and Frequency
- Round Trip Delay
- Event Log and Histograms
- Pulse Shape
- Frame Relay

The JDSU HST-3000 E1/Datacom Service Interface Module (SIM) delivers the full functionality required for technicians tasked with ensuring and delivering high quality of service (QoS) for E1/Datacom. Part of a comprehensive catalog of modules for the HST-3000 platform, the E1/Datacom SIM provides the complete range of installation, maintenance, and troubleshooting features needed for E1/Datacom circuits and network elements.

Rugged, versatile, and portable, the HST-3000 is the ideal field instrument to test the complete circuit—from the customer premises through the entire network—by analyzing the performance of the digital link in both directions. It also can verify operation or locate network problems by generating bit error rate test (BERT) patterns and by testing frame relay service. In addition to testing the physical circuit, the HST can test the service and the application. The modular plug-in hardware and software architecture can be scaled to test copper, ADSL, ADSL2+, G.SHDSL, IP, Ethernet, VoIP, and IP Video.

Workgroups can rely on this functionality as networks migrate from circuit- to packet-switched infrastructures that support the triple play of voice, video, and data over Ethernet. The HST-3000 is an efficient, economical tool service providers can rely on to simplify processes, expedite task completion, and ensure reliable E1 and Datacom service delivery.

Functional Overview

Dual E1 RX/TX

Two separate receivers (RX) and transmitters (TX) allow for the simultaneous monitoring and evaluation of a wide range of alarms and errors. Different test modes with clock preferences support all of the requirements for ITU-T G.703 frame analysis, BERT, ITU-T G.821, ITU-T G.826, and ITU-T M.2100. This enables operators to validate connectivity and QoS quickly and efficiently.

E1 Pulse Shape Option

Incorrect pulse shape, due to jitter or incorrectly terminated interfaces, causes poor network performance. The Pulse Shape software option quickly assists in identifying network problems during installation, commissioning, or trouble-shooting by comparing the pulse with the ITU-T G.703 pulse mask. The software averages the received E1 pulse and automatically displays the result against the ITU-T mask.

Frame Relay Option

With the Frame Relay software option, technicians can verify that frame relay service is functioning properly by testing LMI activity, PVC/DLCI status, congestion, and lost frames to validate committed information rates (CIR).

Bidirectional Monitoring

The HST-3000 can monitor transmission passively in both directions to confirm physical layer and service level results on E1/Datacom circuits.

Timing Analysis

When using synchronous timing, if the receiving device is not properly synchronized to the clock signal, misinterpretation of bits can cause bit errors and timing slips. The HST-3000 provides internal source options and an external clock adapter cable, allowing technicians to diagnose and correct network timing problems rapidly.

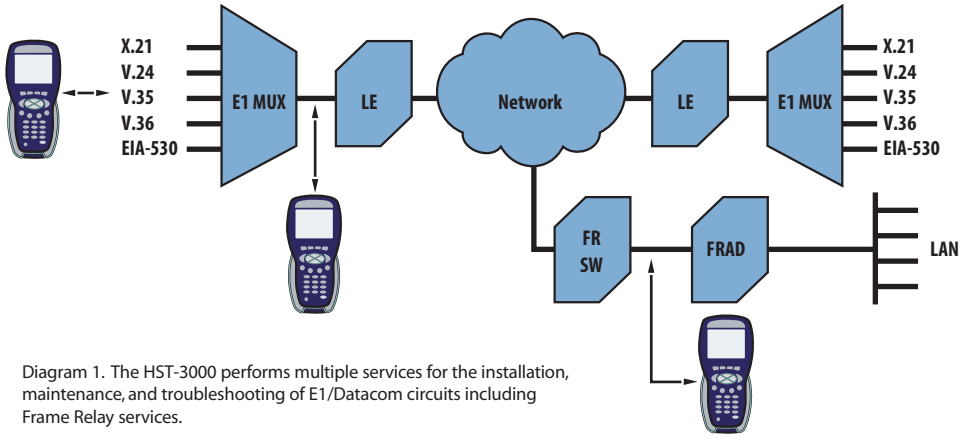

Diagram 1. The HST-3000 performs multiple services for the installation, maintenance, and troubleshooting of E1/Datacom circuits including Frame Relay services.

Datacom DTE/DCE Emulation

The HST-3000 can replace either a DTE or DCE device and can test head-to-head with existing network elements. By emulating the customer premises equipment (CPE), technicians can control handshaking states between DTE and DCE devices to ensure proper transitions and to verify connectivity. Technicians can sectionalize problems in the network by qualifying proper data transmissions and signalling states.

Traffic Generation

With the HST-3000, technicians can send BERT patterns to verify error-free performance by transmitting ANSI, ITU, and user-programmable test patterns. They can test head-to-head with other JDSU equipment or via loopback mechanisms. Performance measurements such as Round Trip Delay, G.821, G.826, and M.2100 allow technicians to verify that all circuit parameters fall within the required level of performance.

Verify End-to-End Connectivity

Technicians can quickly isolate any problem to a specific direction by analyzing the performance of the entire digital link in both directions. After the circuit is installed, the HST-3000 can be used to qualify proper channel routing, delay, and performance over the entire link.

Auto Configure

The Auto Configure feature greatly simplifies instrument setup. For a framed signal, the HST-3000 can determine the framing and test pattern types.

Programmable Timers

The HST-3000 can be programmed to start a delayed test at a specific date and time for a selected duration.

Self-Loop Testing

The HST-3000 provides an internal Datacom self-loop testing feature that connects the transmitter to the receiver without involving external cables. This feature allows technicians to validate the unit settings and the selected test interface on the HST-3000. An external cable test feature verifies both the amplifiers and the current emulation cable.

User-Configurable Set-up

Technicians can select and configure the test interface, timing mode, timing source, data rate, flow control, and test pattern on the HST-3000. In addition to standard software LED result pages, the HST-3000 contains user-defined hardware Datacom LEDs on the module, displaying signal states.

Saved Results

Hundreds of results can be saved on the HST-3000 and can be exported directly to a printer or a PC via serial, Ethernet, or USB ports. The results files can then be e-mailed, printed, or saved onto a PC or USB device.

VT100 Emulation

With the HST-3000 VT100 emulation feature, technicians can access E1 and HDSL network equipment for configuration, performance data measurements, and loopback capabilities without having to carry a PC or laptop into the field.

Flexible and Rugged Design

The HST-3000 incorporates a rugged, weather-resistant design and long battery life that are ideally suited for use in the field. Standard Ethernet, USB, and serial ports offer flexibility for downloading software and offloading captured test data easily. Highly configurable, the HST-3000 can be used by different technicians with different responsibilities to perform a wide variety of tests. The HST-3000 is based on a modular platform, allowing for the addition of upgrades and options in the field. This flexibility also allows for the support of future growth in new technologies and advanced options to accommodate the changing needs of versatile technicians.

Specifications

Physical Interfaces Specifications

Transmitters To G.703

Outputs	2 x balanced RJ-48 jacks Impedance 120 ohms Unbalanced / 75 ohms via adapter cables
Bit Rate	2048 kbit/s, +/- 3 ppm, +1 ppm per year aging
Line Code	HDB3 or AMI
Frequency Offset	+/-100 ppm in 1 ppm intervals
Slip Reference	Opposite RX, External E1 Reference Clock
Clock Source	Internal, Recovered from RX1 or RX2, External E1 Reference Clock (via optional cable)

Receivers To G.703

Inputs	2 x balanced RJ-48 jacks Impedance 120 ohms or bridged (hi-Z) Unbalanced/ 75 ohms via adapter cables
PMP Compensation	20 to 31 dB gain
Bit Rate	2048 kbit/s
Level Measurement	+3 to -37 dBnom
Slip Reference	Opposite RX, External E1 Reference Clock
External E1 Reference Clock	0.5 to 3 V square or sine wave, 2,048 MHz, unbalanced/ 75 ohms (at adapter cable input)

Datacom Port

Interfaces supported (via adapter cables)	X.21, V.24 (RS-232), V.35, V.36 (RS-449), EIA-530

E1 Circuit Testing

Framed and unframed test signal generation
Bulk, n x 64 kbit/s BERT
G.821, G.826, M.2100 analysis
Error and alarm and generation and analysis
Round Trip Delay
Signal Level and Frequency
Audio Monitor
Si, Sa, A-bit, and E-Bit (REBE) monitoring and generation

Test Modes

Terminate, Monitor, Drop and Insert, Line Loopback

Performance Measurement

G.821, G.826, M.2100

Test Patterns

2^6-1 (ITU), 2^9-1 (ITU), 2^11-1 (ITU), 2^15-1 (ITU & ITU INV), 2^20-1 (ITU & ITU INV), 2^23-1 (ITU & ITU INV), QRSS, QBF
Mark (All Ones), Space (All Zeros), 1:1, 1:3, 1:4,1:7
User Bit Patterns 3 to 32 bits
User Byte Patterns 1 to 64 bytes
Live
Delay
Auto (via Auto Configure)

Anomaly (Error) Injection

Bit (TSE)	Single, rate, multiple
Code, CRC, Pattern Slip, E-Bit (REBE)	Single
FAS	Single, 2, 3, 4
MFAS	Single, 2

Defect (Alarm) Generation

LOS, LOF, AIS, RDI/FAS distant, MF AIS (TS-16), MF RDI/MFAS distant

Anomaly (Errors) Counts

Bit (TSE), Code, FAS, MFAS, CRC, E-Bit

Frame Data

Sa4, Sa5, Sa6, Sa7, Sa8, NFAS A-Bit, NMFA

Signal Results

Signal loss (seconds), bit slips, RX level, TX and RX bit rate

BERT Results

Bit errors (TSE), bit error rate, errored seconds, error-free seconds, percentage error-free seconds, pattern slip, round trip delay, pattern loss seconds (LFF)

Audio Monitor

From RX1, RX2, or RX1 and RX2

Round Trip Delay

Range	0-10 s
Resolution	100 µs

Result Categories

Summary, LED, Signal, Frame Data, Timeslot, BERT, Performance (G.821, G.826 ISM, G.826 OOS, M.2100 ISM, M.2100 OOS), Time, Event Table, Event Log, Event Histogram

Datacom Circuit Testing

Interfaces

Via adapter cables	X.21, V.24 (RS-232), V.35, V.36 (RS-449), EIA-530

Data Rates (Emulate and Monitor)

X.21	Sync 50 bps to 10Mbit/s
V.24 (RS-232)	Async 50 bps to 128 kbit/s
V.24 (RS-232)	Sync 50 bps to 128 kbit/s
V.35	Sync 50 bps to 2048 kbit/s
V.36 (RS-449)	Sync 50 bps to 10 Mbit/s
EIA-530	Sync 50 bps to 10 Mbit/s

Datacom specifications

BERT Patterns

Mark (All Ones), Space (All Zeros), 1:1, 1:3, 1:4, 1:7, 3:1, 7:1, 63, 511, 2047, 2047R, 2047R INV, 2^15-1 (ANSI, ITU), 2^20-1 (ANSI, ITU), 2^23-1 (ANSI, ITU), QRSS, QBF1 (FOX), QBF (2,3), User Bit, User Byte, Delay

Transmit Clock Sources

Internal +/-3 ppm, 1 ppm per year aging
Interface

Signalling Lead Control

Emulate DTE
RTS, DTR, LL, RL
Emulate DCE
CTS, DSR, DCD, TMA
Monitor

Self Loop

Internal
External Cable Test

Result Categories

Summary, Signal, BERT, Data, LED, Data LED, Control LED, G.821, Time, Event Table, Event Histogram

Specifications

Pulse Shape Analysis

Results

Pulse Shape Graph	G.703 mask for E1

Pulse Width

Resolution	2.75 ns
Rise Time	In [ns]
Resolution	1 ns
Fall Time	In [ns]
Resolution	1 ns
Undershoot	Percent of nominal level
Resolution	1%
Overshoot	Percent of nominal level
Resolution	1%
Signal Level	In [V] peak-peak
Pass/Fail Indication	Pass/Fail

Result Categories

Summary, Signal, Interface, Frame Data, BERT, Pulse Shape

Frame Relay Specifications

Test Modes	Terminate and Monitor (UNI-U, UNI-N, NNI)
Link Management	None, ANSI T1.617 Annex D, ITU Q.933 Annex A, LMI Rev 1, Auto
DLCI	0-1023
Link Trace	Simple, Verbose, Text, Hex, Text & Hex
Long Frame	5-9999

Load Test

Test of CIR (load)	Off, Fixed, Burst, Ping
CIR Fixed Rate	1-10,000 kbit/s
Frame Lengths	5-9999
Payload	Sequence, User 1, User 2, Sequence + User
Control Bits	FECN, BECN, DE, C/R
Burst Settings	TX time, Idle time
	FR CRC error, plus E1 or Datacom Anomaly (Error)/Defect (Alarm)

Ping

Settings	Source IP Address, Destination IP Address, Inverse ARP, Ping Length
Encapsulation	NLPID, Ethertype

Result Categories

Frame Relay (DLCI, Link, Ping, LMI, DLCI List, Trace), plus E1 and Datacom

Physical Specifications

Size (h x w x d)	9.5 x 4.5 x 2.75 in. (241 x 114 x 70 mm)
Weight (with battery)	2.7 lbs. (1.23 kg)
Operating temperature	22° F to 122° F (5.5° C to 50° C)
Storage temperature	-40° F to 150° F (-40° C to 65.5° C)
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" diagonal, 1/4 VGA, Color Active Matrix with backlight (readable in direct sunlight)

General Specifications

Ruggedness	Survives 3 feet (91 cm) 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

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-TI	ASDL2+ TI (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-TI	ADSL2+ TI (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-TI	Copper, ADSL2+ TI (ATU-R, Annex A) SIM
HST3000-CAR2B	ADSL1/2/2+ with Copper (ATU-R, Annex B) SIM
HST3000-CAR2B-TI	Copper, ADSL2+ TI (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 SIM
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 Connexant Chipset SIM
HST-3000-VDSL-CNXT-WB2	VDSL and Copper (up to 30 MHz) with Connexant Chipset SIM
HST3000-VDSL-IK	VDSL with Ikanos Chipset SIM
HST-3000-VDSL-IK-WB2	VDSL and Copper (up to 30 MHz) with Ikanos Chipset SIM
HST3000-VDSL-INF	VDSL with Infineon Aware Chipset SIM
HST-3000-VDSL-INF-WB2	VDSL and Copper (up to 30 MHz) with Infineon Aware Chipset SIM
HST3000-WB2	Wide Band 2 (up to 30 MHz) Copper Test SIM

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	Microsoft IPTV Video Analysis Software Option
HST3000-OPTETH	Optical Ethernet Software Option
HST3000-PCMSIG	Signalling (PCM) Software Option
HST3000-PCMTIMS	TIMS (PCM) Software Option
HST3000-PRI	ISDN PRI Software Option (NC Standard)
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
HST3000-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
HST3000S-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

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