



Acterna HST-3000 Handheld Outside Plant Tester

Improving the installation, qualification, and verification of T1 services

Reduced budgets, smaller workforces, and untrained technicians can limit a carrier's ability to promptly provision T1 service. Overcoming these obstacles requires resources that facilitate the efficient and rapid deployment of T1 services regardless of whether the T1 line uses traditional repeaters, HDSL, HDSL2, or HDSL2 4-wire circuits.

A test solution is needed that reduces repeat rates, failures, and kickbacks and ensures that all tests are performed the same way, every time — the Acterna HST-3000 Outside Plant Tester. The HST-3000 is a modular, handheld test instrument that tests the copper, tests the service, and improves the process. Rugged, versatile, and portable, it is the ideal instrument for testing copper circuits and T1 services. Specifically designed for the outside plant, the HST-3000 can be built to order and quickly and easily upgraded with new modules as application and technology needs change.

Technicians use the HST-3000 copper test features to qualify and troubleshoot the circuit, and the T1 test features to bit-error-rate test (BERT) the line and verify the service. With the VT100 emulation feature, the HST-3000 provides instant access to HDSL/HDSL2 performance statistics. There is no need for technicians to switch instruments; the HST-3000 combines all the tests into one tool with one common interface.

The HST-3000's custom scripting feature automates the testing process, ensuring that tests are done completely and thoroughly every time. The instrument's automation functions help reduce repeat rates and failures by ensuring that the processes used to test are consistent. With the HST-3000, technicians can complete faster service turn-ups, reduce failure rates, and lower costs, which are all key components to surviving in today's competitive environment.

Highlights

- In-depth copper measurements including DVOM, graphical TDR, RFA/RFL, and load coil counter
- Thorough T1 testing including BERT, loopcodes, and NIU/CSU emulation
- VT100 emulation for access to T1, HDSL, HDSL2, HDSL2-4 wire performance statistics
- Lower repeat rates with automated close out tests, scripting, and pass/fail tests loaded with operator specific thresholds for methods and procedures
- Modular hardware and software architecture allows easy upgrades and enhancements
- Intuitive, easy-to-use GUI activates features and functions
- Lightweight, rugged, and battery-powered handheld test instrument
- Water resistant to withstand nature's elements

Test the copper

Testing the physical layer to predict a loop's ability to support T1 service is a critical, time-consuming process. Delayed installation, circuit failures, or future service quality problems can occur if testing is not performed correctly and thoroughly every time.

The HST-3000 copper features enable construction technicians to quickly troubleshoot the local loop for faults and conditions that degrade the T1 service. With the HST-3000, technicians quickly and accurately identify and locate cable impairments: shorts, grounds, opens, crosses, splits, bridged taps, wet sections, and other high resistive faults. These measurements are easy to access with the HST-3000's advanced time domain reflectometer (TDR), precision digital volt/ohm meter (DVOM), and an accurate resistive fault analyzer/resistive fault locator (RFA/RFL).

Other features include tip-to-ring capacitance measurements and a load coil counter. The capacitance feature measures the loop length to ensure the total loop length is within CSA requirements. The load coil counter detects the location and number of load coils on the span.

These copper features make the HST-3000 the optimal instrument for performing tests anywhere on the local loop, including the main distribution frame (MDF), crossbox, aerial splice case, manhole splice canister, or other access points to locate the source of trouble. (See figure 1.)

The HST-3000 is also able to perform wideband transmission impairment measurement set (WB TIMS) loss measurements at predefined and user-selectable tones within a range of 10 kHz to 1.2 MHz. The instrument's WB TIMS meter ensures proper signal levels at equipment inputs for T1, HDSL, HDSL2, HDSL2 4-wire, BRI (basic rate interface), and DDS (digital data service) circuits.

With a push of a button, a five-point closeout test (consisting of loop current, circuit loss, power influence, circuit noise, and longitudinal balance) is run automatically. A good pair check comparison between the test results and (stored) preset values is graphically displayed, informing technicians immediately if the line quality is pass, fail, or marginal for T1 service. (See figures 3 and 4.)

With all of the necessary copper test functions and advanced features combined into one tool, the precise location of any copper impairment is easily and quickly detected.

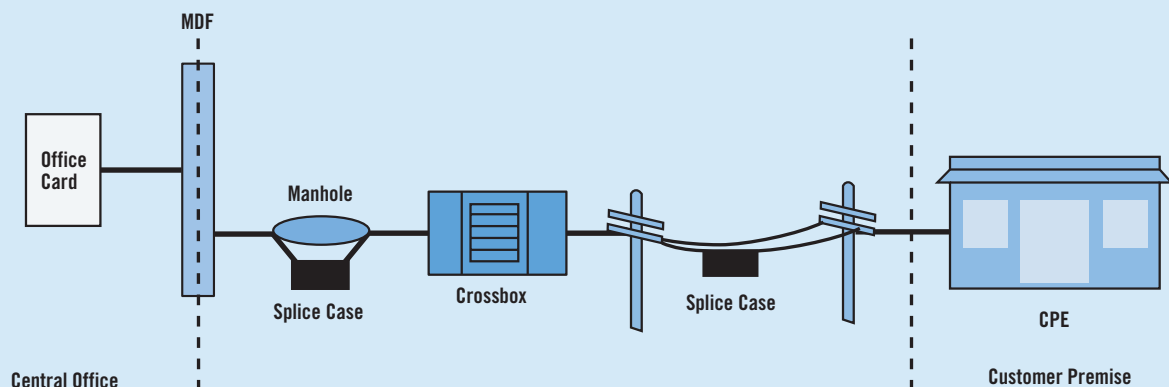


figure 1 Outside Plant Architecture

Test the service

Beginning with the construction of the circuit and throughout the life cycle of the service, operators must verify that customers are receiving the quality they ordered. After qualifying the copper and before handing the circuit over to an installation and maintenance crew, a technician must run a bit-error-rate test (BERT) to prequalify the circuit to ensure that it will run T1 service error free.

To verify proper T1 transmission over a traditional repeatered T1 or an HDSL circuit, a technician needs to supply power to the span at the MDF and test the entire span from the central office to the customer premises. A true end-to-end service test requires stressing the span and verifying the error tolerance of the copper plant and network equipment. (See figure 2.)

The HST-3000 T1 features include a full-span dual T1 transmitter and receiver that identifies marginal troubles with all the standard T1 stress patterns at various output levels. Automatic configuration and results with summary functions immediately identify the presence of T1 pulses, pattern, framing, and error status. The HST-3000 also can qualify T1 spans with automated MULTIPAT™ and BRIDGTAP™ stress patterns in addition to inserting bit errors, frame errors, and BPVs. Technicians, with a push of a button, can use MULTIPAT™ to run customized BERTs with specified durations and patterns.

Preprogrammed HTU-C, HTU-R, doubler, T1 CSU, T1 NIU, and repeater loopcodes enable the HST-3000 to quickly sectionalize transmission problems. In addition, Pairgain,

Teltrend, Adtran, Westell, and ADC equipment specific as well as user configurable loopcodes are supported.

Through the test instrument's VT100 emulation feature, technicians can access HDSL and T1 network equipment for equipment configuration, specific performance data measurements, and loop up capabilities, without having to carry a PC or laptop into the field. With Acterna's repeater extender, technicians also can gain access to the circuit at T1 repeaters.

The test set also can emulate T1 customer premises equipment, simulating a CSU or NIU. CSU/NIU emulation allows the test set to be looped up from the central office to verify T1 service across the entire length of the span.

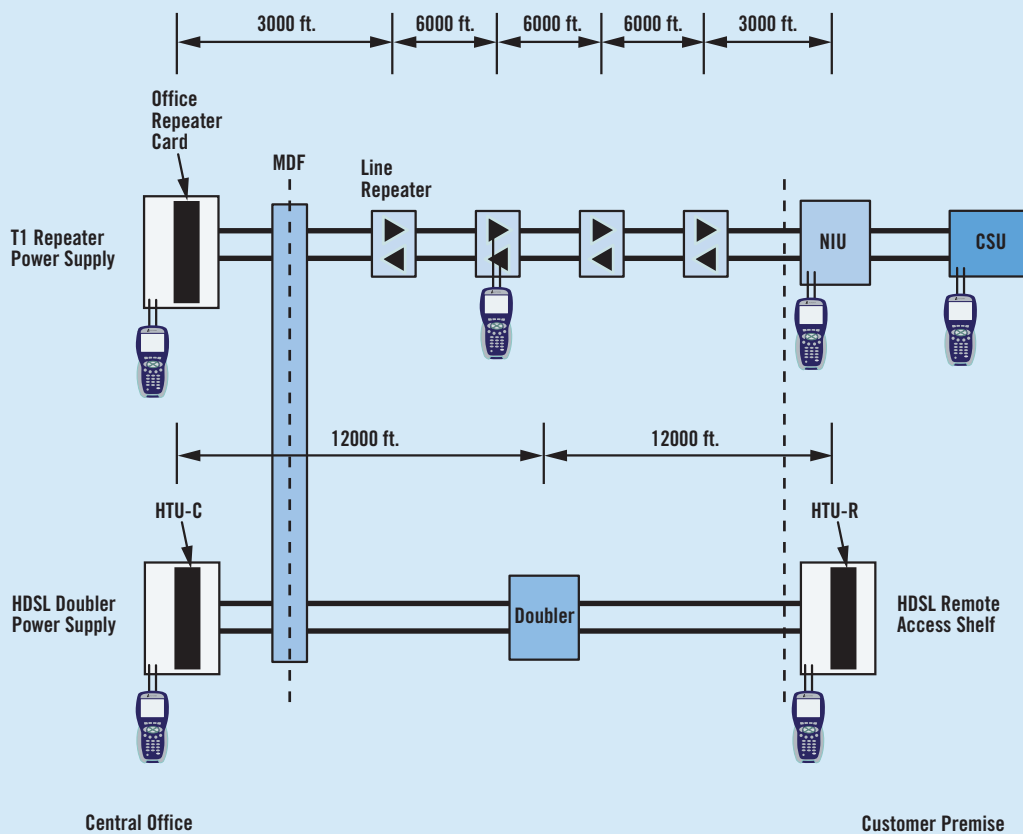


figure 2 T1 BERT on a repeatered T1 and HDSL circuit

The HST-3000 performs fractional T1 (FT1) BER tests on selected channels to verify transmission on contiguous and noncontiguous FT1 bandwidth. This allows the technician to verify circuit performance with VF and 577 Hz ID tones at various output levels. In addition, the HST-3000 uses a variety of advanced stress patterns such as 55 octet, T1-DALY, and other long user patterns as recommended by the ANSI T1.403 standard to stress repeatered T1/FT1 circuits.

With its enhanced T1 features and functions, the HST-3000 is the ideal test instrument for technicians to troubleshoot and qualify the line swiftly and effortlessly.

Improve the process

Maintaining a high percentage of T1 turn-ups means ensuring that testing is consistent and accurate. The HST-3000's automated functions help reduce repeat rates and failures by ensuring that the processes used to test circuits in the local loop are consistent.

With preprogrammed tests and customized scripts, every technician follows the same procedures, thereby eliminating mistakes caused by improper configurations or incorrect testing methods. For example, the HST-3000's standard five-point close out test automatically measures current, loss, noise, power influence, and balance. (See figure 3.)

It also is essential to properly verify that the parameters and thresholds of all technologies, including the newer HDSL2 and HDSL2 4-wire, are within the operator's specifications. An automated test script from the menu-driven GUI enables a good pair check to measure AC/DC volts, resistance, and opens. Results from these measurements are compared to predetermined parameters and known good thresholds. These results determine whether a circuit passes, fails, or is marginal. (See figure 4.)

By verifying the digital quality of a copper line before service is commissioned, operators avoid repeat truck rolls and poor service once customers are online. And technicians who use the HST-3000, with all of its advanced features and functions, are able to perform more tests with greater accuracy; a powerful advantage in an industry focused on improving productivity and lowering costs.

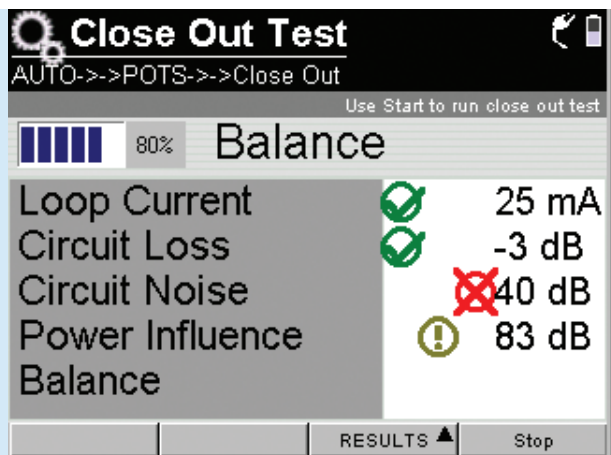


figure 3 Close out test

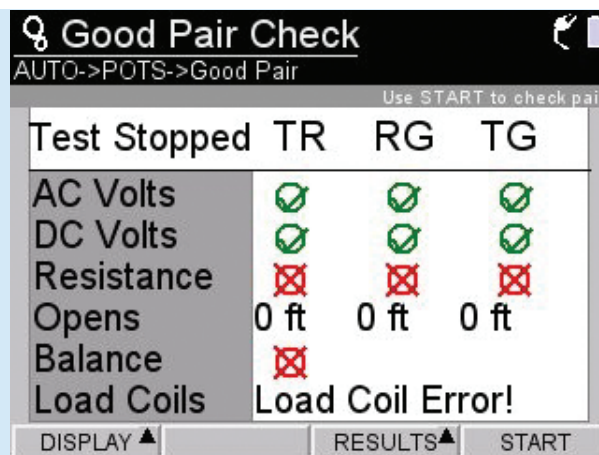


figure 4 Good Pair Check

Interfaces

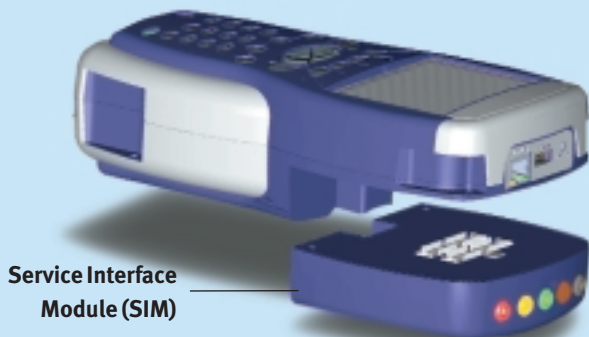
Dual TIP/RING and ground copper	Color-coded, shrouded 2mm "mini-banana" jacks
Dual Tx/Rx T1	Bantam jacks
10/100 BT Ethernet jack	8-pin modular
Serial port	DB9 female via cable (DCE)
USB Host	
USB Device	
Bluetooth short-range wireless	

T1 specifications

Operating Mode	Self test, T1 unframed, T1 D4, T1 ESF, FT1 D4 framed, FT1 ESF framed, T1 test Loopback, T1 line loopback
Input impedance	Bridge >1000 Ohms Term 100 Ohms +/- 5% DSX-MON 100 Ohms +/- 5%
Receive level	BRIDGE 0 to -20.0 dBdsx TERM +6 to -35.0 dBdsx DSX-MON +6 to -24.0 dBdsx
Transmitting timing sources	Internal clock Recovered clock
Line codes	AMI, B8ZS
Line build out level	0, 7.5, 15.0, and 22.5 dB of cable loss at 722 kHz
Line build out tolerance	+/- 1 dB at 722 kHz with LBO of 0 dB
Error insert	Logic, BPV, frame

Copper specifications

Main functions	Range
Voltage (DC)	0 to 99.9 V 100 to 300 V
Voltage (AC)	0 to 99.9 V 100 to 300 V
Current (DC)	0 to 110 mA
Resistance (DC)	0 to 9999 Ω 10 K Ω to 999.9 K Ω 1 M Ω to 99 M Ω
With CO voltage	0 to 9999 Ω
Opens	0 to 10,000 ft. 10,000 ft. to 50,000 ft. 50,000 ft. to 100,000 ft.
RFL	0 to 9.99 Ω 10 to 99.9 Ω 100 to 999 Ω
Loss	
With 600 Ω Zin	-40 to +10 dBm, 200 to 4000 Hz
With 100 or 135 Ω Zin	-70 to +10 dBm, 20K to 1.6 MHz
Tones	Select Nyquist Frequencies
With 600 Ω Zout	200 to 4000 Hz, -20 to +1 dBm
With 100 or 135 Ω Zout	20 K to 1.6 MHz, -20 to +5 dBm
PI	40 to 100 dBrc
Noise (600 Ω Zin)	0 to 50 dBrc
Dial Mode	DTMF
Caller ID	Date, time, number, name
Carrier Level	-4 to -32 dBm
TDR	5 to 500 ft. 100 to 10,000 ft. 1 Kft. To 20 Kft.
Load Coil Count	5 out to 27 Kft



Service Interface Module (SIM)

Flexible, modular platform makes technology upgrades or hardware changes easy



HST-3000 Handheld Outside Plant Tester
Actual Size: 9.5 x 4.5 x 2.75 in
Weight: 2.7 lb with battery

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 hours 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 transreflective, 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
Keypad	Typical 12-button keyboard

Ordering information

Base units

HST-3000C	HST-3000C base with copper testing Requires the purchase of a SIM – see separate listing for HST3000-CAR or HST3000-CU (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-CAR or HST-3000-AR (Ethernet and serial ports included)

SIMS (Modules)

HST-3000-CU	Dual T/R/G interface for copper testing
HST-3000-T1	Dual Tx/Rx bantam T1 interface and T1 software option

Software options

HST3000-TDR	TDR software option
HST3000-RFA	RFA/RFL software option
HST3000-WBTones	WB tones/TIMS software option
HST3000-VT100	VT100 option (Includes cable and software option)
HST3000-Script	Scripted testing software option

Accessories

Test leads	POTS - 5 ft. banana plugs to alligator clips, T1 - bantam to bantam, bantam to 310 Weco
Charger Adapter	AC/DC battery charger/adapter 120 VAC (50/60 Hz) input; 12 VDC (1 A) output
Soft Cover	Form fitting nylon glove for test set and leads
Carrying Case	Heavy duty, nylon case for test set, extra SIMs, accessories, and cables
Battery	Lithium ion
41084	T1 repeater power supply
43141	T1 repeater power supply multiplexer
44116	HDSL doubler power supply
44527	HDSL remote access shelf
41157	Repeater extender

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Acterna is the world's largest provider of test and management solutions for optical transport, access and cable networks, and the second largest communications test company overall. Focused entirely on providing equipment, software, systems and services, Acterna helps customers develop, install, manufacture and maintain optical transport, access, cable, data/IP and wireless networks.

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