

DSL Test Set



Product Highlights

- Field engineered, rugged construction, lightweight design, and battery-powered operation
- Automated testing capabilities minimize training costs and testing complexity
- Immediate validation of customer's Internet or IP service on the first visit

Application Highlights

- Test the customer's PPP connections across the entire network
- Verify the customer's network connection is correctly provisioned
- Test IP connectivity and performance using PING
- Validate the ATM virtual circuit using ATM cell loopback
- Test Ethernet connectivity on a LAN
- Segment and isolate premises' problems with built-in Through mode
- Verify the local loop supports the deployed DSL rates
- Confirm DSLAM translations and ATM mappings with loopback function

With the demand for DSL comes the task of installing, provisioning, and commissioning a broadband network comprised of hundreds of thousands of miles of fiber optic and copper cable, as well as thousands of different cable modems, servers, routers, and applications. DSL service providers are under extreme pressure to ensure that this massive infrastructure continually provides the level of service expected by customers. And this requires the use of testing equipment that performs multiple tests and procedures, validates and confirms proper operation of the network and its various components, and troubleshoots problems on the spot—all at a price that fits a tight budget. The Acterna DSL Services Tester TPI 350+ is designed to satisfy these criteria as well as meet the testing requirements of highly mobile technicians who commission, troubleshoot, and maintain DSL service throughout the network.



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Rugged, lightweight, and compact, the DSL Services Tester is easy for tier one, tier two, and tier three service technicians to learn and use. It is a powerful test set capable of testing and validating customer connections from the lower transmission layer network protocols all the way up through the customer applications, including ISP/Internet connectivity. And with point-to-point protocol, technicians can look past the DSLAM into any network and verify correct mapping and connectivity.

Combined with the SLK, the DSL Services Tester provides a complete solution for DSL service commissioning on the local loop. For further network testing, the DSL Services Tester can be coupled with the Acterna TestPad 2000™ SONET Field Services Module or the Acterna ATM Tester 750A to validate DSLAM mappings.

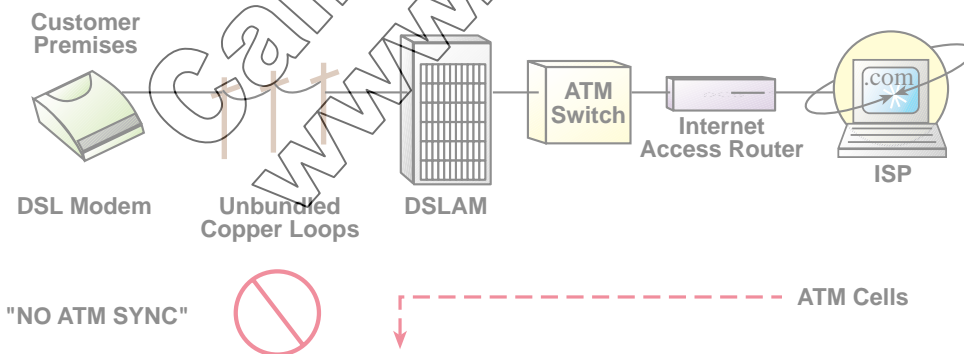
Function Highlights

- Validates DSL physical layer performance and troubleshoots slow DSL.
- Provides point-to-point protocol support for PPPoA, PPPoE, DHCP/IPCP, CHAP, PAP, and LCP.
- Analyzes Bridged Ethernet, PPPoA, PPPoE, and IP over ATM data layers with PING and Through mode.
- Supports TE mode and ATM Loopback mode.
- Isolates the ATM layer as a source of problems, validates log-in functions and authentication protocols, and verifies the provisioning of the customer's ISP account and Internet connection.
- Tests customer applications and isolates customer premises equipment (CPE) problems using built-in Through mode and Ethernet terminal equipment functionality via the Ethernet port.
- Troubleshoots local loop faults impacting DSL service by segmenting faults at any point along the loop.
- Generates numerous link control error messages and statistics for actual and maximum upstream and downstream connect rates, percentage of line capacity used, noise margins, and transmission power.
- Allows PING changes to be made without rebooting.

Applications

Technicians need to test all the connections of a DSL network—from the CPE, through the network, to the ISP—before the provider can commission DSL service. Since failure of any transport, network, or service layer function (protocol) may cause the service to fail, technicians need to check more than synchronization between the network interface device (NID) and DSLAM. With the DSL Services Tester, technicians can test the customer's entire service, not just DSL sync, which eliminates repeat trucks rolls to troubleshoot the network connection and CPE.

Check ATM Layer Synchronization at the CPE



The "NO ATM SYNC" warning indicates an incorrectly provisioned circuit, a DSLAM mapping error, or a misconfigured ATM switch.

Before a provider commissions and provisions DSL service in an ATM network, and to maintain the service at the highest level of performance, technicians perform tests to validate and confirm several protocol layers.

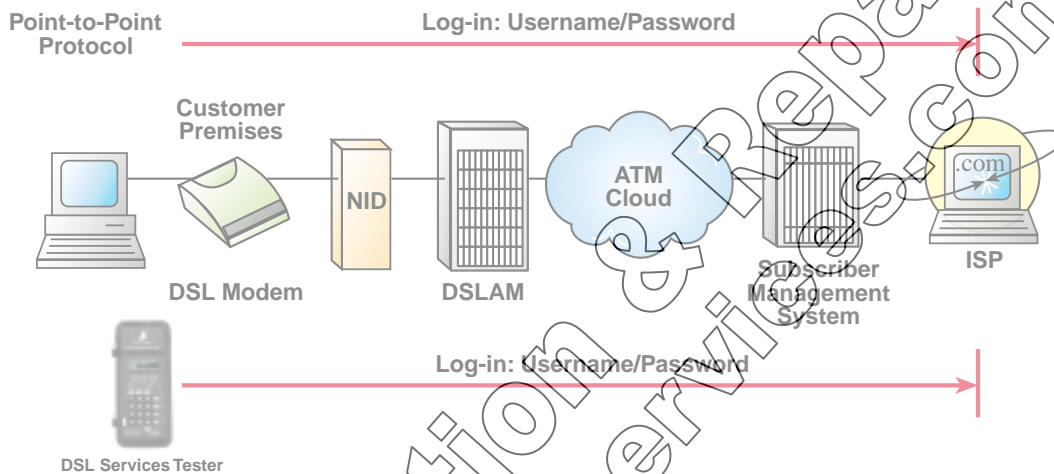
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ATM cells must be synchronized from end-to-end for the network to reliably transport data and voice signal payloads. However, when ATM synchronization is absent at the premises users cannot establish a connection.

Technicians use the DSL Services Tester to determine if a complete path or circuit exists from end-to-end at the ATM layer and if the ATM cells are aligned with the upper layer protocols (i.e. IP). With the DSL Services Tester, the source of the problem can be found and corrected immediately so that users are back online without delay.

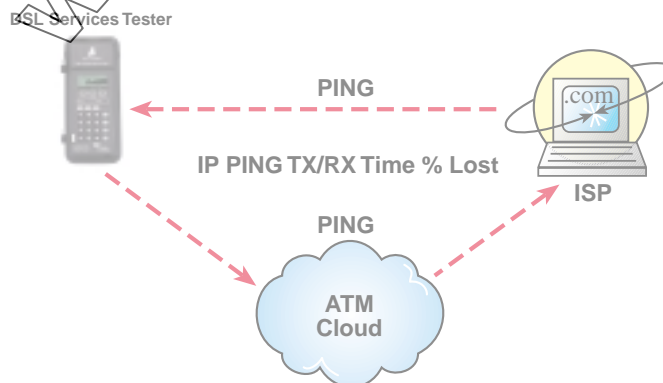
The DSL Services Tester employs real-signal technology on the loop. This capability is important because network customers often connect to the ISP using point-to-point protocol, which is usually a client on the customer's PC or modem. This protocol establishes and maintains the customer's connection through the network by establishing a permanent circuit or route at network layers 2 and 3. With the DSL Services Tester, technicians can test the network server's performance from the customer site.

Verify IP Layer Routing and Connections



The DSL Services Tester ensures a successful point-to-point protocol connection from the customer to the ISP.

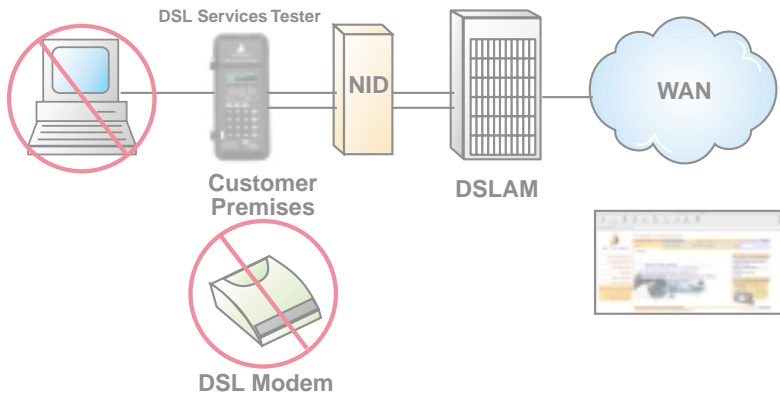
With the universal deployment of IP, especially for the Internet, it is critical that the network transports data correctly to ensure that common Internet applications such as Web browsers, e-mail, and streaming video function properly. The DSL Services Tester, using the common PING utility associated with most IP stacks or suites, verifies routing connectivity across the network to an IP host or server, and it also assesses packet loss rates and packet delay to and from the PING destination. To test the IP layer, the DSL Services Tester checks if another host device is alive and able to echo back; uses Flood mode to gauge network congestion and determines the minimum, maximum, and average delay time of IP packets. By tracking packet delay and loss on various network segments, the DSL Services Tester's PING utility helps providers prove to their customers that delays and slow service are not due to provider error.



The DSL Services Tester verifies IP layer routing.

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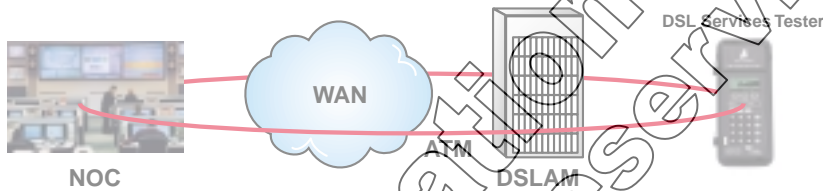
Verify Applications and Isolate CPE Problems



Results can be easily viewed from a laptop or the DSL Services Tester.

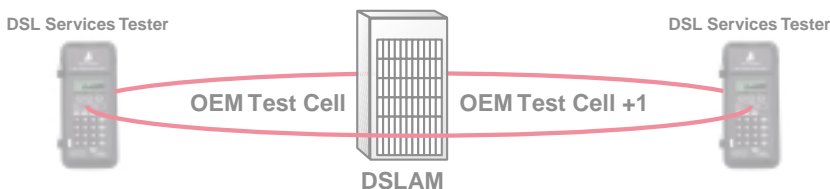
While network customers may transport basic user data over IP, they typically use specific applications to interact with Internet Web sites, news services, and e-commerce databases as well as to collaborate via video and office applications. To demonstrate and validate that a customer's applications are functioning properly, technicians connect the DSL Services Tester to the customer's PC or laptop, activate the DSL Services Tester's built-in Through mode, and run the applications. Technicians can also completely isolate CPE components by replacing the customer's modem with the DSL Services Tester.

Validate DSLAM Mappings



The DSL Services Tester can help validate and troubleshoot port mappings.

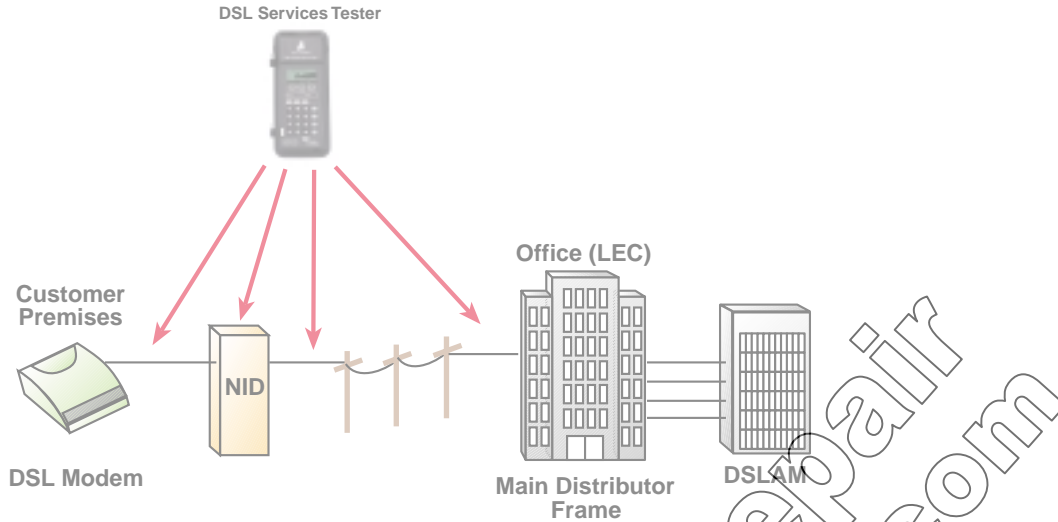
Technicians ensure a customer's high-speed DSL connection by conducting tests to confirm that the DSLAM is correctly provisioned for each connection and port at the DSL/ATM layer interface (mapping). Although the network operations center (NOC) can often configure and monitor ATM traffic down to the DSLAM, incorrect mappings in the DSLAM will prevent the customer from connecting to the network. Placing the DSL Services Tester in ATM Loopback mode allows technicians to validate or troubleshoot these port mappings. To confirm the mappings, technicians can either activate the DSL Services Tester's Loopback All mode while the DSLAM is in service or operate it in conjunction with other Acterna test equipment, such as the SONET Field Services Module or the ATM Tester 750A, while the DSLAM is out-of-service. Also, when the DSL Services Tester is used along with other Acterna test products, such as the SONET Field Services Module or the ATM Tester 750A, it can identify and increment Acterna-type test cells. By placing the DSL Services Tester in Loopback mode, technicians can provide absolute confirmation that an ATM cell traveled the correct path and reached the correct destination.



With Acterna TestPad 2000 application modules, the DSL Services Tester can confirm passage of ATM cells.

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Verify Service Rates



The DSL Services Tester 350+ emulates DSL transceiver-unit modems to confirm DSL physical layer performance.

Although DSL provides a high-speed link between the provider's high-speed network and the CPE and can support high-speed digital services such as DSL, dial-up modem service is the typical bottleneck on the local loop. The DSL Services Tester lets technicians quickly and easily confirm DSL physical layer performance by emulating DSL transceiver unit modems. In this mode, the DSL Services Tester verifies the actual DSL rate for the current connection and the connection's maximum possible rate. It checks the signal-to-noise margin to evaluate the DSL signal strength over the loop, pointing to future performance capabilities or limitations. Technicians can synchronize the DSL Services Tester at different points on the loop to segment faults on the copper loop.

The DSL Services Tester's data rate and line rate results verify slow service. By looking at the "bits per tone" measurement and graphics, technicians can determine if the disturbers are from sources transmitting T1, E1, or HDSL and take corrective action. In addition, the DSL Services Tester indicates excessive noise margins, which identify the presence of crosstalk.

Generic Operational Parameter	Definition	Unit Range	Resolution
SNR margin	Amount of increased noise relative to noise power that system can tolerate, still meeting BER of 10^{-7}	0 to +63 db	1 db
Maximum line rate downstream		8,160 kbps	32 kbps
Actual line rate downstream		8,160 kbps	32 kbps
Maximum line rate upstream		8,160 kbps	32 kbps
Actual line rate upstream		8,160 kbps	32 kbps
Line capacity		0 to 100 %	1
Attenuation	Signal loss with distance	0 to 64 db	1 db
Upstream interleaved depth		128 bytes	1 byte
Downstream interleaved depth		128 bytes	1 byte
Bits per tone	Number of bits per tone	0 to 15	1
SNR per tone	Signal-to-noise ratio per tone	0 to 255 db	1 db

The DSL Services Tester's "bits per tone" graphics and measurements identify sources of disturbance.

Technical Specifications

PHYSICAL CHARACTERISTICS

Overall Dimensions4.25 x 2.75 x 9.25 in
 (10.80 x 6.99 x 23.50 cm)
 Overall Weight.....3 lb (1.36 kg), with battery

APPLICATIONS ENVIRONMENT

Temperature Range
 Operating.....+32 to 122° F (0 to 50° C)
 Storage.....-40 to 150° F (-40 to 65.56° C)
 Humidity10 to 90% relative humidity,
 non-condensing

POWER REQUIREMENTS

Charging Time20 to 30 minutes fast charge
 Battery Type9.6 V NiMH rechargeable
 Operating Time.....Typically 2 hours on a full charge

DISPLAY

DMT.....Bits per tone
 Signal-to-noise ratios per tone
 Gain per tone (350+A only)

LEDS

.....Modern synch
Low battery
Charging
Ac Error

INPUT AND OUTPUT CONNECTORS

.....xDSL Telco Line Interface
Serial Port
Ethernet Interface

STATISTICS

.....Actual and maximum downstream
 connect rates (0 kbs to 8.3 Mbps)
Actual and maximum upstream
 connect rates (0 kbs to 1000 kbs)
Up and downstream percent used
 DSL line capacity (0 to 100%)
Up and downstream noise
 margin (0 to 64 dBm)

.....Local and remote TX power (0 to 21 dBm)
Training time/sync counter (0 to 999)
Downstream coding gain
IP PING: TX/RX/% lost packets, packet
 delay (min., max., average in ms)
ATM statistics
Ethernet statistics
Network status and protocol error messages

PPP/IP CONNECTIVITY

.....PPPoA
PPPoE
IPoATM
Bridged Ethernet (RFC 1483)
Routed IP
IP PING
Through mode
NAME SERVER Look-up

AUTOMATION

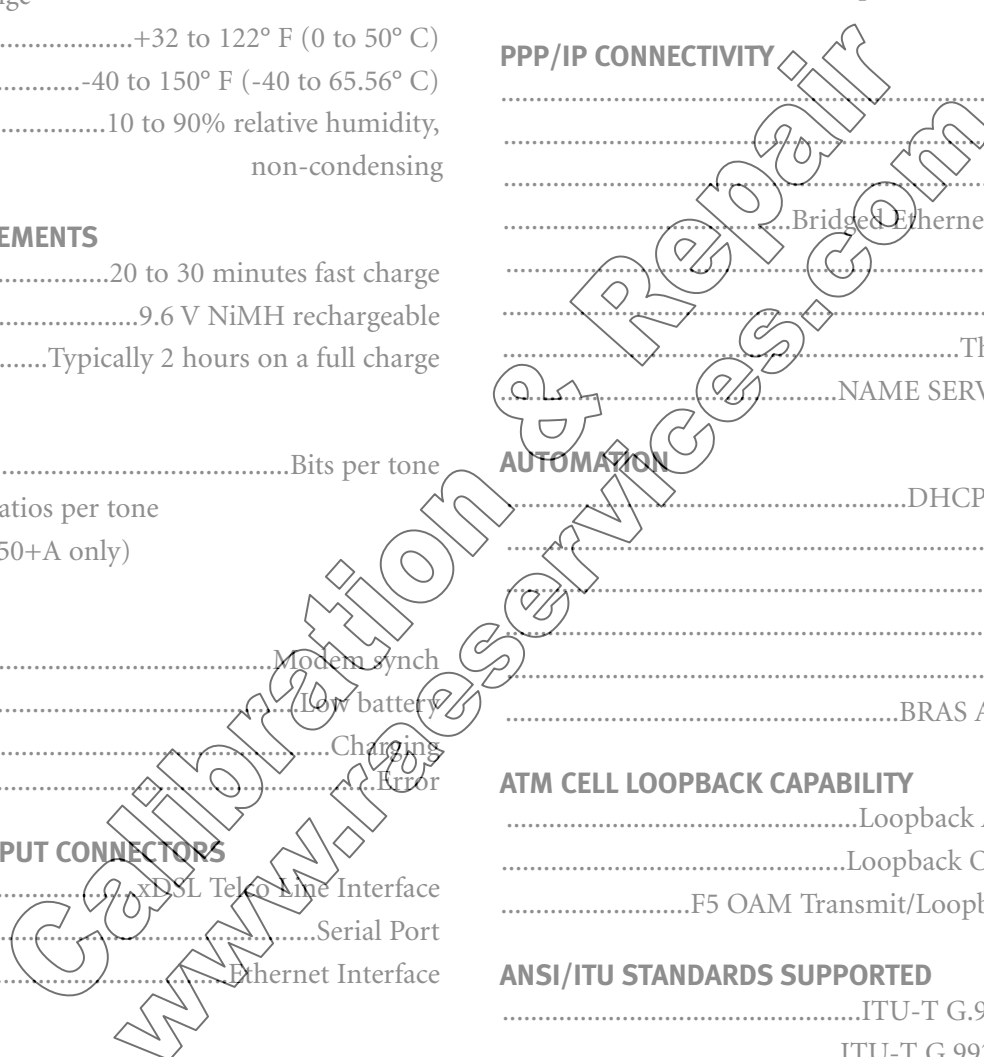
.....DHCP server/client
IPCP
CHAP
PAP
NAT
BRAS Authentication

ATM CELL LOOPBACK CAPABILITY

.....Loopback All ATM cells
Loopback OEM test cells
F5 OAM Transmit/Loopback (Future)

ANSI/ITU STANDARDS SUPPORTED

.....ITU-T G.992.2 (G.Lite)
ITU-T G.992.1 (G.DMT)
ANSI T1.413 Full-rate
CAP w/DOH (Globespan, Cisco)
ITU-T G.992.1 Annex B (G.DMT over ISDN)



Ordering Information

Call technical support or your sales person to receive a compatibility chart to configure your DSL Services Tester TPI 350+

Mainframes

DSL Services Tester TPI 350+ (A)	ADI-R DSL Services Tester ATU-R Emulation G.Lite, D.DMT, and T1.413 (includes standard accessories)
DSL Services Tester TPI 350+ (B)	ADI-C DSL Services Tester ATU-C Emulation G.Lite, D.DMT, and T1.413 (includes standard accessories)
DSL Services Tester TPI 350+ (C)	Globespan DSL Services Tester ATU-R Emulation G.Lite, G.DMT, T1.413, and CAP (includes standard accessories)
DSL Services Tester TPI 350+ (J)	Annex B DSL Services Tester ITU-T G.992.1 Annex B (includes standard accessories)

Standard Accessories

DSL Services Tester 350+ (1)	Battery Charger/A/C Adapter (40W, 18 VDC)
DSL Services Tester 350+ (3)	Softpack Carrying Case
DSL Services Tester 350+ (6)	6-Pos/4-Pin Mod. to 2 Clips Cable (Bed-of-Nails)
DSL Services Tester 350+ (9)	English 350+ User's Guide
DSL Services Tester 350+ (13)	U.S. Power Cord

Optional Accessories

DSL Services Tester 350+ (1)	Replacement Battery Charger/A/C Adapter (40W, 18 VDC)
DSL Services Tester 350+ (2)	DSL Service; 6-Pos/4-Pin Mod. to 6-Pos/4-Pin Mod. (RJ-11 to RJ-11) TTC 350 to NID
DSL Services Tester 350+ (3)	Replacement Softpack Carrying Case
DSL Services Tester 350+ (4)	DSL Service; 6-Pos/4-Pin Mod. to Clip Lead (RJ-11 to two (2) Alligator clips, red/ring & green/tip cable)
DSL Services Tester 350+ (5)	Battery Pack (NiMH)
DSL Services Tester 350+ (6)	6-Pos/4-Pin Mod. to 2 Clips Cable (Bed-of-Nails)
DSL Services Tester 350+ (9)	English 350+ Operating Manual
DSL Services Tester 350+ (12)	Ethernet: RJ-45 to RJ-45 Crossover, 350+ to PC
DSL Services Tester 350+ (14)	DB-9 to DB-9 Serial Data Cable, for F/W downloads

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Calibration & Repair
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Note: Specifications, terms, and conditions are subject to change without notice.

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