

# 4500

## TELECOM/DATACOM ANALYZER

### Puma 4500A Series

NETWORK TESTING

A Complete Solution  
for T3, Dual T1  
and Datacom Testing



Consultronics Products Group

[www.EXFO.com](http://www.EXFO.com)

Telecommunications Test and Measurement

# EXFO

EXPERTISE REACHING OUT

# Puma A Series

## The Perfect Test Set for Installers

Turning up T3, T1, and Fractional T1 (FT1) circuits is mission critical for today's service providers. The Consultronics Puma 4500A is unbeatable when it comes to getting the job done fast. Users are able to configure the unit in an instant to match the service being installed. Technicians love the Puma's large full-color graphic display, its ease of use, its powerful feature set and the brilliant way it displays 100% of the needed measurement results.

## Are Your Field Technicians Keeping Up?

ILECs, CLECs, IXC's, ISPs and Wireless Service Providers can all benefit by putting Puma 4500's in the hands of their technicians. The hand-held rechargeable battery-powered unit has been designed to make installing circuits easy and fast.

## Make Quick Connections

The Puma has a full suite of built-in interfaces for testing the following services:

- T3 (DS3) Services (voice and data)
- T1 Services (voice and data)
- Fractional T1 (FT1) Services
- Asynchronous Data services on RS232C
- T1 and FT1 services delivered by HDSL, HDSL2, and G.shdsl
- Frame Relay Services on T1 and FT1 V.35, RS449, EIA530, RS232C, and X.21 (V.11)
- Primary Rate ISDN services

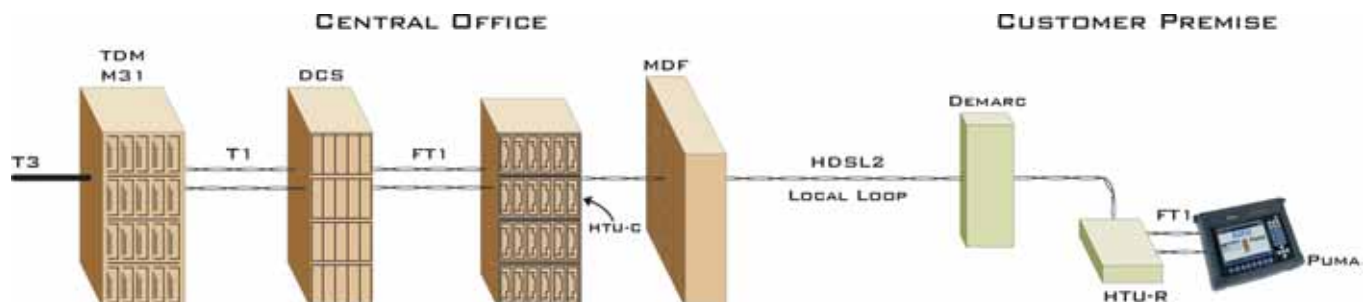
Unlike other T3/T1 test sets, the Puma 4500A has the interfaces you need built into the unit. This means that no special external adapters or plug-in modules are required. No longer will your test sets be out of action because special cables are misplaced or a plug-in module is lost.

## Very Portable T3 (DS3) Testing

The Puma 4500A is ideal for installing T3 circuits. It can terminate the line for a bit error rate test (BERT), or can plug into monitor jacks to view the line status. The Puma 4500A auto-configures itself for line coding (B3ZS, AMI) and frame format (M13 and C-bit parity). The Puma 4500A also has integrated FEAC control for performing loopback tests, etc. A full suite of BERT patterns are provided.

## Full T1 Drop and Insert

All of the Puma 4500A's extensive list of DS1, FT1, DDS, Voice, and Frame Relay tests can be done through the T3 interface. The Puma 4500A can simultaneously drop and insert DS1's into the T3 data stream. For example a  $n \times 64$  kbps Frame Relay test can be performed at a T3 connection point.



*Loop Back Testing of  $n \times 64$  kbps FT1*

## Efficient T1 Installation Testing

It only takes a few seconds to connect the Puma 4500A to a T1 circuit. Setting up a BERT test on any type of T1 is easy. The Puma supports B8ZS and AMI coded SF (D4), ESF and SLC96 formats. Loop back tests and end-to-end performance tests are fully supported. The Puma 4500A comes with all of the industry standard bit error rate (BER) patterns included.

CSU, DSU, NIU, T1 office and line repeater loop back codes make it simple for technicians to perform single person loop back testing and T1 line fault finding. Westell, Westell/Teltrend, Charles Industries, Adtran, Larus, HyperEdge and other industry codes are included.

**Out-of-band loopback codes can also be sent in the Facilities Data Link (FDL) on ESF and SLC-96 circuits.**

## LEDs Give Instant Feedback

Just above the Puma 4500A's back-lit LCD graphic display is a row of bi-colored LEDs that indicate the status of the selected test interface(s). During T3 and T1 tests, the LEDs are used to indicate the signal and alarm status of the T3 interface and the two T1 interfaces. When all the LEDs are green, the test is up and running without any alarms.



*LEDs Indicate Status and/or Alarms*

## DS0 Testing Included

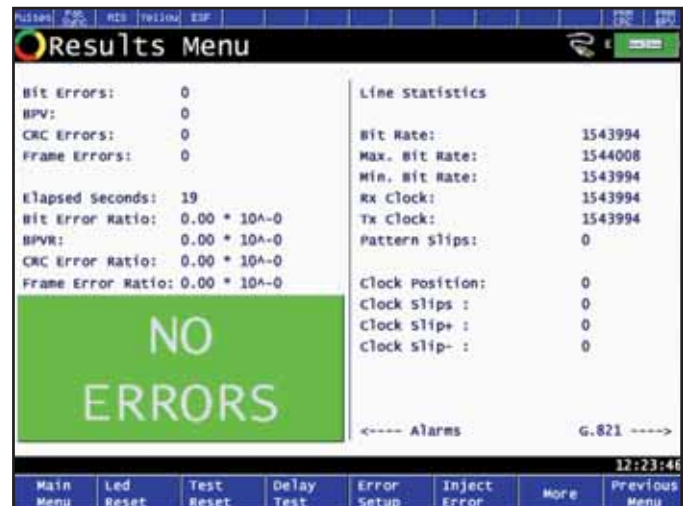
The Puma 4500A can simultaneously generate and receive BERT patterns to and from any channel in a DS1. This in turn can be multiplexed up to a DS3. Robbed Bit Signaling can be turned on or off in order to perform 56 and 64 kbits/s testing.

## A Full Page of BER Test Results

Circuit installers love the Puma's large color LCD display. A single screen simultaneously shows a full complement of results. The Puma 4500A does performance testing to G.821, G.826 and M.2100.

## Fractional T1 (FT1)

The Puma does performance testing at any FT1 rate. Both contiguous and non-contiguous  $n \times 56$  and  $n \times 64$  kbits/s are supported. The Puma 4500A even allows a different channel map to be selected on the transmit side as compared to receive. This allows the Puma 4500A to test DS-1 circuits as they pass through various Digital Cross Connect Systems (DCS) and add/drop multiplexers (ADM).

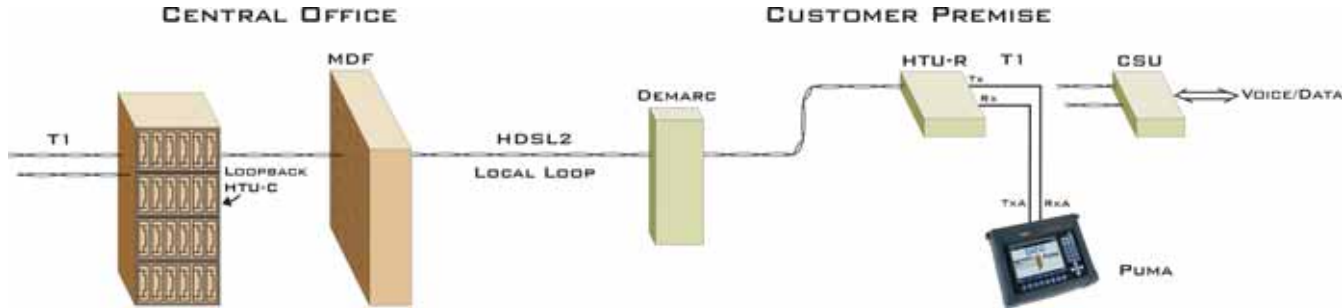


*The results of a T1 BER Performance Test*

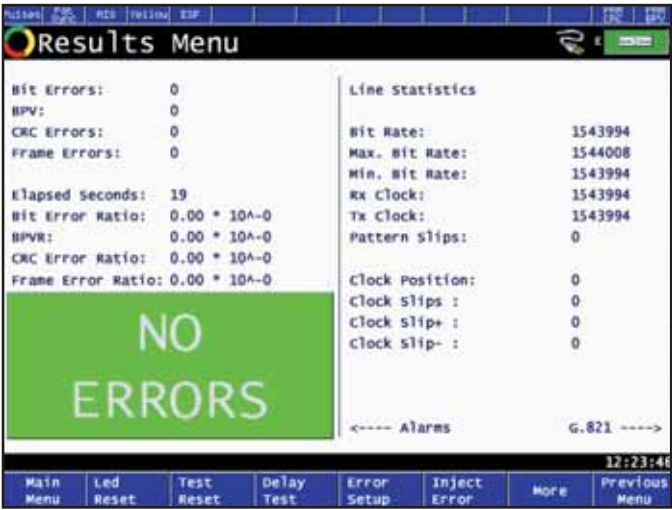
## Monitor Live T1 Circuits at the Customer Premise, Central Office and other Points across the Network

The Puma 4500A has two full T1 ports. Its two receivers are used to monitor live T1 circuits for status and alarms throughout your network. The Puma 4500A connects directly to the MONITOR jacks on Integrated Access Devices (IADs), HDSL modems, Digital Access Cross Connect Systems (DACs), CSUs, PBXs and many other monitoring points on the network.

The Puma 4000 offers the ultimate display for monitoring live T1 circuits. It simultaneously shows the status of all 24 channels in both directions. (east-west, west-east). Channels that are active turn green. Those that contain BER test patterns display the pattern detected. The user can scroll from channel to channel and easily jump to either a BER test or decode the speech in the channel. The ABCD bit signaling for each channel is also shown.



Performing a Loop Back BERT Test on an HDSL2 Circuit at the Customer Premise



The results of a T1 BER Performance Test

Propagation Delay

Measurements determine the delay caused by channel routings and multiple path differential delays. The Puma 4500 series can measure propagation delay at various points across a network. Tests can be conducted over the T1 interface to a resolution of 1mS.

Pulse Mask Conformance Testing

Local cabling can cause degradation of transmitted pulses in T1 signals. The Puma 4500A displays the shape of incoming pulses against ANSI and other industry standard pulse masks. Technicians find this optional feature extremely useful for setting proper Line Build Out (LBO) values on network elements and for hunting down bad interconnection cables.

If you deploy pre-equalization in building risers, you'll find this feature extremely valuable. Many T1 test sets don't support this feature. Those that do, can't match the resolution of the Puma 4500A.

Jitter & Slips Analysis

Timing and synchronization problems are the trickiest problems to track down in today's networks. The Puma 4500A's T1 Jitter and Slips measurement capabilities make this task a whole lot easier.

Slips Analysis

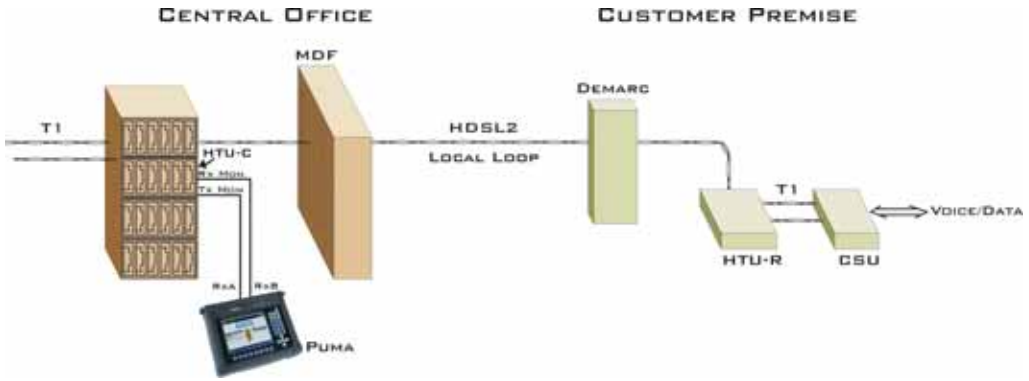
Pattern Slips measurements are a count of the number of times where a group of bits were erroneously added or deleted from the bit stream. Analyzing slip measurements in conjunction with Frame loss measurements allows technicians to identify whether the slips are controlled or uncontrolled, which in turn helps pin-point the source of timing problems.

Clock Slips occur when the received frequency deviates from the reference clock by one or more cycles. Measurements can be taken in or out-of-service, thereby identifying timing discrepancies between two DS1s before loss of frame synchronization occurs. This type of analysis forms an important part of TDM network maintenance. The Puma 4500's dual T1 interfaces are used for this measurement.



Pulse Mask Conformance Testing

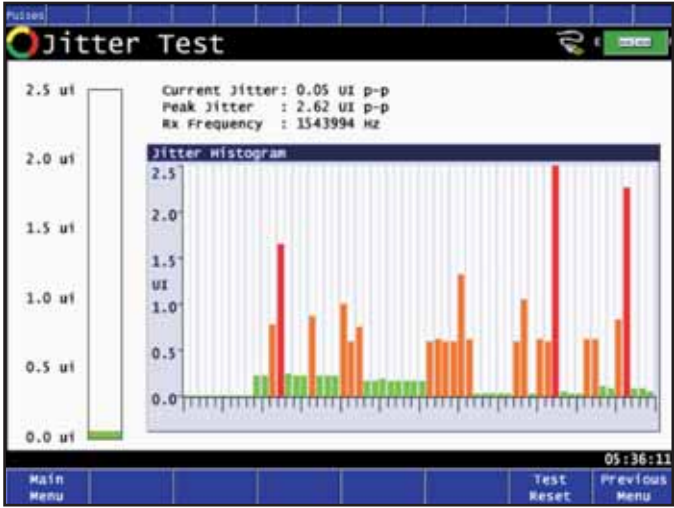




Monitoring a Live T1 Circuit at the Central Office

**Jitter Measurement**

The Consultronics Puma 4500 is the first hand-held all in one T3/T1 test set to offer T1 jitter measurements. Noisy clock sources and synchronization problems can be found with this measurement. When equipped with the Jitter Measurement Option, the Puma is capable of displaying both the instantaneous readings of jitter and the trend (history) over the preceding 60 seconds. Instantaneous jitter measurement results are shown both numerically as peak-to-peak UI values and as a bar graph. The trend is displayed both as a histogram and numerically. The peak value of jitter experienced during the current test session is also shown. The Puma can be connected in bridged or terminated mode or to a DSX



Jitter Test and Histogram

monitoring point.

**Signal Level Measurement**

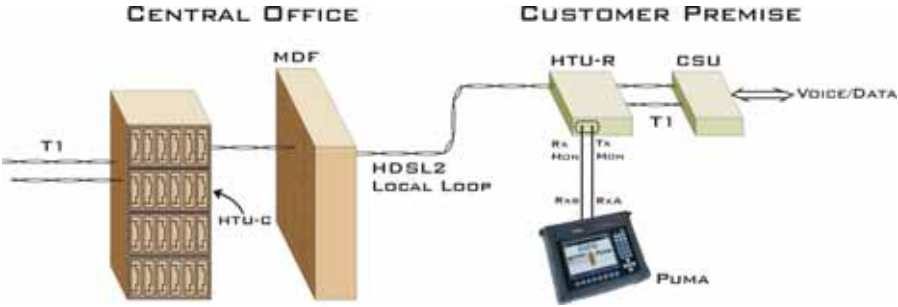
The Signal level measurement can be performed “in” or “out” of service in order to know if low pulse levels have caused slips to occur.

**Frame Relay Testing**

Many T1 and FT1 circuits are used to deliver frame relay for Virtual Private Networks (VPN) and ISP connections. The Puma 4000A's Frame Relay Testing Option allows technicians to confirm that frame relay connections are correctly provisioned. Frame relay testing can be performed on the



A Frame Relay Ping Test



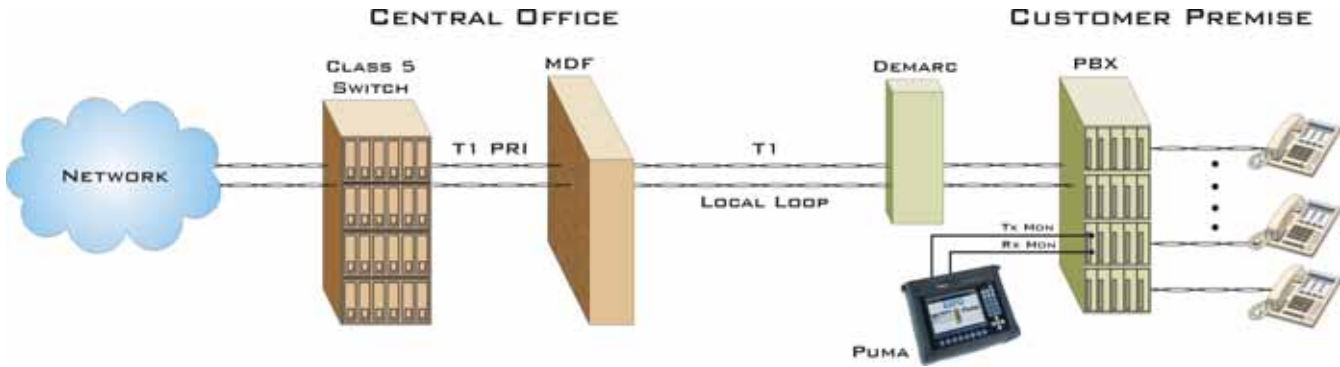
Monitoring a Live HDLSL2 Circuit at the Customer Premise

### DDS Testing

From a central office, DSU loop up/down codes can be sent towards the customer premise. Once a loop back is established, a Bit Error Rate test can be performed.

### Frequency Offset

Marginal network components can be isolated with the Puma 4500's frequency offset feature. The Puma can transmit frequency offsets thus simulating the stress placed on network equipment when timing problems exist.



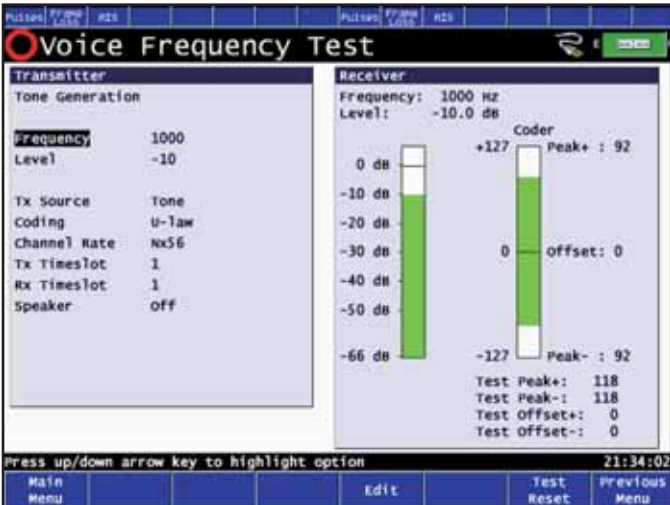
Monitoring Live PRI Circuits with the Puma 4500

### VF Tone Insertion & Measurement

Measuring the levels of analog tones as they are carried through a network is easy with the Puma 4500A. Tones of all possible PCM levels and frequencies can be inserted into any channel. The Puma 4500A measures the level and frequency of received tones. The Puma 4500A also has external 600-ohm analog ports. This allows it to be connected to the Consultronics Auto-TIMS III or other TIMS sets for a full analysis of analog channels.

### On-Screen Histograms

Intermittent customer problems can be expensive and frustrating, sometimes requiring several truck rolls to discover. The Puma 4500A helps find intermittent problems with just two visits. It has the ability to do long term testing (hours, days or weeks) with results presented in a histogram format. Your troubleshooters can start a test on one day and find results the next.



Running a VF Tone Insertion and Measurement Test

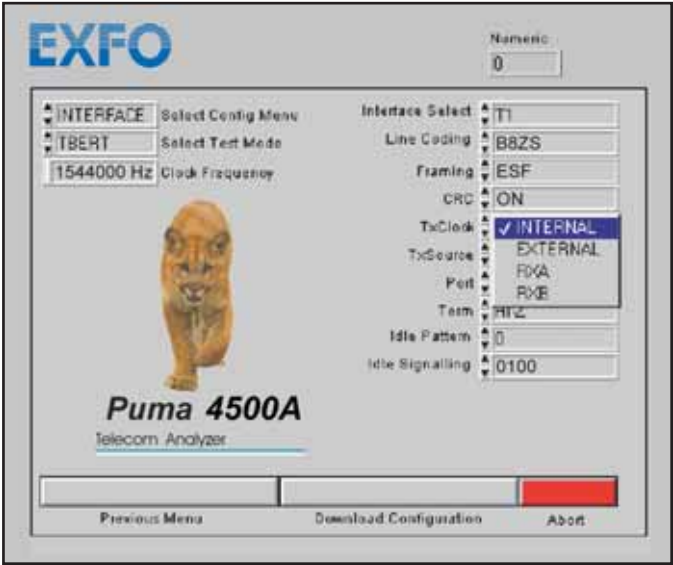


### Remote Control with Puma-View Software

Technicians can use their notebook computers to run tests and store results with the Microsoft Windows based Puma-View software supplied by Consultronics. The optional program is a true MS Windows application that takes advantage of the Graphical Users Interface, printer drivers, and the storage abilities provided by Microsoft.



The Puma 4500A Rear Panel



Puma-View Remote Control Software

### Technical Support & Service

All Consultronics products are backed by free-of-charge technical support. Call and talk to Consultronics support personnel toll free at 1-800-267-7235 or 1-905-738-3741 between 7:30 am and 5:30 pm, Monday through Friday EST.

### Lifetime Software Upgrades

Specifications in the telecommunications industry are constantly changing. While other suppliers charge for software upgrades, Consultronics offers free lifetime downloading of the latest version of software for the CableSHARK P3 from the Consultronics Web site.\*

*\*Note: Software upgrades that enhance the existing set of features and measurements are free of charge. Consultronics reserves the right to charge for additional measurement functions, or for enhancements that require additional hardware.*

### Warranty & Repair Service

Each Consultronics test set is rigorously tested and calibrated to internationally traceable standards before they are shipped. All Consultronics products carry a 1-year parts and labor warranty (excludes soft pack carrying case, test cables, and/or manuals). Extended warranty coverage packages are also available.



**ORDERING INFORMATION**

The Puma is a series of products. The following chart lists available models and optional features. Consultronics often adds new functions and offers new models in the Puma series.

	T3	Dual T1	V.35	RS232C	RS449	EIA530*
<b>Portable Models</b>						
Puma 4500A	●	●				
Puma 4300A		●	●	●	●	●
Puma 4200A		●				
Puma 4100A			●	●	●	●
Puma 4050A			●			
<b>Rackmount Models</b>						
Puma 4500A-RM	●	●				
Puma 4300A-RM		●	●	●	●	●
Puma 4200A-RM		●				
Puma 4100A-RM			●	●	●	●
Puma 4050A-RM			●			

**ACCESSORIES**

Each Puma comes with an internal rechargeable NiMH battery pack, universal A.C. power adapter/battery charger and User's Guide. The following is a list of accessories that is available for the Puma.

Softpack carrying case (Notebook Computer Style)	PCMCIA Memory Card (4 MEG)
Softpack carrying case (Telco Hangable Design)	Operator's Head Set
Hardpack carrying case	Detachable, fold-out Stand
Small, battery-powered printer	A Variety of Test Cables

Find out more about EXFO's extensive line of high-performance portable instruments by visiting our website at [www.EXFO.com](http://www.EXFO.com).

Rugged Handheld Solutions		Platform-Based Solutions		
OPTICAL	COPPER ACCESS	OPTICAL FIBER	DWDM Test Systems	Transport/Datacom
<ul style="list-style-type: none"> <li>• OLTs</li> <li>• Power meters</li> <li>• Light sources</li> <li>• Talk sets</li> </ul>	<ul style="list-style-type: none"> <li>• ADSL/ADSL2+, SHDSL, VDSL test sets</li> <li>• VoIP and IPTV test sets</li> <li>• Ethernet test sets</li> <li>• POTS test sets</li> </ul>	<ul style="list-style-type: none"> <li>• OTDRs</li> <li>• OLTs</li> <li>• ORL meters</li> <li>• Variable attenuators</li> </ul>	<ul style="list-style-type: none"> <li>• OSAs</li> <li>• PMD analyzers</li> <li>• Chromatic dispersion analyzer</li> </ul>	<ul style="list-style-type: none"> <li>• SONET/DSn (DS0 to OC-192) testers</li> <li>• SDH/PDH (64 kb/s to STM-64) testers</li> <li>• T1/T3 testers</li> <li>• E1 testers</li> <li>• 10/100 and Gigabit Ethernet testers</li> <li>• Fibre Channel testers</li> <li>• 10 Gigabit Ethernet testers</li> </ul>

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