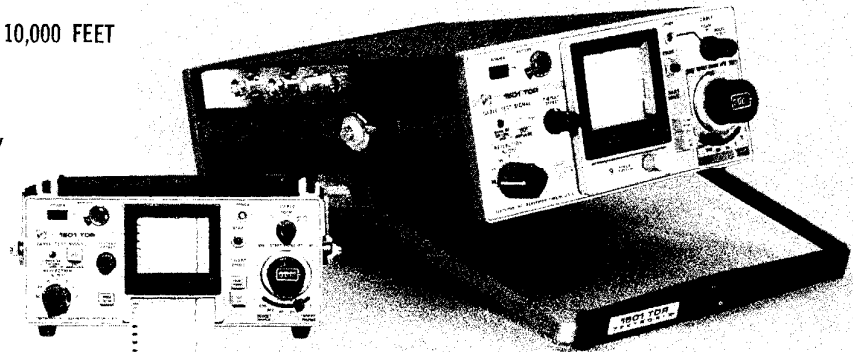


## TDR Portable

- DETECTS and LOCATES CABLE FAULTS to 10,000 FEET or 3000 METERS
- ACCURATE to INCHES for SHORT RANGES
- SELF-CONTAINED RECHARGEABLE BATTERY
- AC OPERATED WHILE BATTERY CHARGES
- LESS THAN EIGHT POUNDS
- 50-OHM or 75-OHM SOURCE IMPEDANCE
- PLUG-IN STRIP CHART RECORDER
- USE with OSCILLOSCOPE OPTIONAL



1501 TIME DOMAIN REFLECTOMETER

The 1501 is a portable, battery-operated Time Domain Reflectometer (TDR) used to detect and locate faults and to measure impedance variations in transmission cables through the use of test pulses. Resultant reflections from any discontinuities indicate the seriousness and character of the faults. The 1501 TDR is designed for use wherever communication or power transmission cable systems are used.

Two types of test signals and operating modes are provided . . . narrow pulses (IMPULSE mode) or fast rise long duration step signals (STEP mode). The step mode is usually preferred for analytical work; the impulse mode is especially for operating in the presence of noise signals or power voltage on the line. Test pulses are generated within the 1501 and drive the cable under test through a type "F" connector on the side panel. Adapters are available to mate with other connector types. Reflected signals return to the same connector and are terminated by the source impedance, either 50 ohms or 75 ohms—selectable with an internal switch. The input circuits are automatically protected from voltage on the line up to  $\pm 100$  volts for frequencies up to 440 Hz. Voltages over 5 volts automatically AC couple the input, blocking DC and low frequency voltages, and causing a front panel light to indicate the presence of voltage on the line.

The 1501 is designed to be a complete measurement package when the Chart Recorder (016-0506-00) is plugged in. A strip chart 4 CM wide by 32.5 CM long can be made in about 20 seconds for about 10 cents per chart. For convenience in previewing each chart or as a substitute for graphic records a separate oscilloscope may be easily connected to the Vertical and Horizontal outputs of the 1501. The 323 or 324 SONY/TEKTRONIX Oscilloscopes are recommended for a size and style match with the 1501. The TEKTRONIX 211 Oscilloscope is also recommended. Most any oscilloscope with DC coupled vertical and horizontal amplifiers having a vertical sensitivity of 0.2 volts per division and a horizontal sensitivity of 0.5 volts per division is suitable.

The recorded portion of each chart has ten major horizontal divisions spaced 2.5 CM apart (about 1 inch) and eight major vertical divisions spaced 0.5 CM apart. The long (25 CM) horizontal scale provides distance resolution down to an inch or two for the 500 foot range at 2 feet per division. A direct reading, ten turn, start point delay dial provides the means for precise distance measurements using an oscilloscope display. Each chart is 7.5 centimeters longer than the recorded portion to provide space for handwritten data.

The chart recorder when installed in the 1501 can be driven by the 1401A or 1401A-1 Spectrum Analyzer, works especially well when coupled with a 323. The 1401A has a 50- $\Omega$  input and the 1401A-1 has a 75- $\Omega$  input especially suited for CATV.

### CHARACTERISTICS

**Test Signal Amplitudes**—Step 1 V, Impulse 10 V.

**Displayed Rise time**—1.3 ns (from reflection).

**Displayed Impulse Width**—1.3 ns (at 50% amplitude).

**Displayed Aberrations**— $\pm 5\%$ ,  $-5\%$ , total not to exceed 8% of test signal amplitude within first ten feet, much less thereafter.

**Vertical Deflection Factors**—0.5, 1, 2, 5, 10, 20 and 50% (of test signal amplitude) per division. One division on scope is equal to one 0.5 centimeter division on chart. Accuracy is 3%.

**Displayed Noise (Tangentially measured)**—Less than 0.2% using noise filter mode, or recorded on chart.

**Source Impedance**—75 ohms within 2% or 50 ohms within 2%. Selectable with internal slide switch.

**Maximum Safe Input Voltage**— $\pm 100$  volts (DC + peak AC) for AC frequencies to 440 Hz.

**Horizontal Scale Factors**—2, 5, 20, 50, 200, 500 feet per division. Accuracy within 3%.

**Start Point (Delay) Ranges**—500 feet and 5000 feet, continuously variable. Direct distance readout on dial. Accuracy within 2% of dial setting.

**Distance Ranges**—0-520 feet at 2 feet/div  
0-550 feet at 5 feet/div  
0-5200 feet at 20 feet/div  
0-5500 feet at 50 feet/div  
0-7000 feet at 200 feet/div  
0-10,000 feet at 500 feet/div

**Metric Calibration (Option 2)**—The metric 1501 Options 2 and 3 have scale factors of 0.5, 2, 5, 20, 50 and 200 meters with delay ranges of 100 and 1000 meters. This allows measurements to be made out to 3000 meters.

**Cable Dielectric**—Three choices. Either solid polyethylene, foam polyethylene with propagation velocity of 0.81, or one other, adjustable to your choice.

**Sweep Rate**—Changes from about 40 per second (flicker free) to 4 per second when noise filter mode is selected. Approximately 20 seconds when a chart recording is made. Front panel push button starts the recording. Paper automatically stops when record is complete.

**Sweep Output**—0 to +5 volt ramp within 2%.

**Vertical Output**—0.2 V per chart division. Range limited to +2 V to -2 V.

**External Pen Drive Input**—0.2 V per chart division, 1.6 V P-P.

### ENVIRONMENTAL CAPABILITIES

**Ambient Temperature**—Operating: -15°C to +55°C; Non-operating: -55° to +75°C (without batteries), -40°C to +60°C (with batteries); Charging: 0°C to +40°C.

**Altitude**—Operating: 30,000 feet; maximum ambient temperature rating must be decreased by 1°C/1000 feet from 15,000 feet to 30,000 feet; nonoperating: 50,000 feet.

**Vibration**—Operating: 15 minutes along each of the 3 major axes, 0.025 inch peak-to-peak displacement (4 g's at 55 Hz) 10 to 55 to 10 Hz in 1-minute cycles.

**Shock (operating and nonoperating)**—30 g's 1/2 sine, 11 ms duration. Two guillotine-type shocks per axis in each direction for a total of 12 shocks.

**Electromagnetic Interference**—Meets radiated interference requirements of MIL-1-6181D and MIL-1-16910C over the range 150 kHz to 1 GHz. Instrument must be battery operated.

**Humidity**—Operating and Storage: 5 cycles (120 hours) to 95% relative humidity referenced to MIL-E-16400F (Paragraph 4.5.9 through 4.5.9.5.1, Class 4).

### POWER SOURCES

**External DC Source**—Operates from an external DC source of 6 V to 16 V, requires 5 W.

**External AC Source**—Operates from an external AC source of 90 to 136 V, or 180 to 272 V; 48 to 440 Hz, 15 W maximum at 115 VAC.

**Battery Operation**—Removable power pack contains a battery of 6 size C NiCd cells providing at least 8 hours of operation with 30 recordings at 20° to 25°C. Power packs may be removed and plugged into AC to recharge the cells or may be left in the 1501 for recharge. The cells completely recharge in 16 hours. The 1501 may be operated from AC while the cells recharge or turned off except for recharge.

### DIMENSIONS AND WEIGHTS

	1501	
	in	cm
Height	≈4	8.9
Width w/handle	≈9	21.6
Depth w/panel cover	≈11	27.0
Depth w/handle	13	33.0
Weight w/Recorder and Accessories	≈8	≈3.6
Net weight w/o Recorder and Accessories	≈7	≈3
Domestic shipping weight w/Recorder	≈13	≈5.9
Export-packed weight w/Recorder	≈21	≈9.5

### TIME DOMAIN REFLECTOMETER MODULE

**1501 Included Accessories**—Cover front (200-0812-00); chart recorder (016-0506-00); two rolls chart paper (006-1658-00); "F" male to male adapter (103-0157-00); "F" female to female adapter (103-0159-00); "F" male to BNC female adapter (103-0158-00); 8-ft power cable assembly (161-0043-02); cover plate, chart recorder blank (016-0509-00); TDR slide rule (003-0700-00); TDR Application Note #1 (062-1538-00); cable interconnector (012 0211-00).

### ORDERING INFORMATION

1501 (with recorder)	\$1900
Option 1 (without recorder)	Subtract \$475
Option 2 (Metric version)	No Charge
Option 3 (Metric version without recorder)	Subtract \$475

### OPTIONAL ACCESSORIES

Chart Recorder, Order 016-0506-00	\$525
323 Oscilloscope with P7 Phosphor—The 323 with high persistence P7 phosphor is highly recommended. Order 323 Option 76	\$995
1501 Convenience Accessory Group—Panel cover (200-0812-00); neck strap carrying assembly (346-0051-00); accessory pouch (016-0113-03); protective cover (016-0112-00); Order 020-0053-00	\$27.50
Protective Cover—Waterproof blue vinyl, Order 016-0112-00	\$11.00
Handle Conversion Kit (for two instruments)—For combining an existing 323 or 324 Oscilloscope with 1501 TDR. Order 040-0563-00	\$33.00
Handle Conversion Kit (for three instruments)—For combining the 1501 with a 323 or 324/1401A or 1401A-1. Order 040-0596-00	\$55.00
Chart Paper—One roll, Order 006-1658-00	\$7.55
Power Pack—Extra power pack, identical to the one supplied with the 1501, allows one power pack to charge while the other is powering the 1501. Order 016-0119-02	\$110.00
Battery Set—Set of 6 NiCd cells, Order 146-0012-01	\$25.30
Adapters	
"F" male to BNC female, Order 103-0158-00	\$6.90
"F" female to BNC male, Order 013-0126-00	\$6.90
"F" female to GR 874*, Order 017-0089-00	\$11.00

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