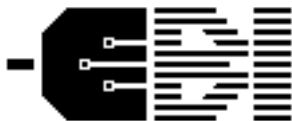


# TX2001 - Time Domain Reflectometer & Toner

## User Guide

*Technology through Innovation*



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## Safety Warnings

This Instrument meets the safety requirements of IEC 61010-1:1993. It is for use on de-energised circuits only, however the Instrument is protected against telephone network voltages (EN60950: 1999 Scn2.3). Connection to mains supply voltages will result in damage to the Instrument and/or a hazard to the operator. Hence the user must assume responsibility for ensuring his or her own safety.

## Symbols used on Instrument

! Caution: Refer to accompanying notes.

**CE** Equipment complies with current EU directives

## Standards

Safety:IEC610101-1:1993

EMC BS/EN 61326-1:1997

	EMC Standard	Category of Pass
ESD	IEC 1000-4-2	A
EM	IEC 1000-4-3	A
Burst	IEC 1000-4-4	A
Surge	IEC 1000-4-5	A
Conducted RF	1EC 1000-4-6	A

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## WARNING

**The Time Domain Reflectometer should not be connected to energised circuits. Connection to mains supply voltages will damage the instrument and could be hazardous to the user.**

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# 1. First Operation

The Time Domain Reflectometer comes complete with

- Crocodile Clip adaptor
- 4off Alkaline 1.5v AA cells
- Carry Case

**IT IS IMPORTANT THAT YOU READ THIS HANDBOOK  
BEFORE OPERATING THE INSTRUMENT**

Remove all packaging, remove battery compartment cover and connect the battery (see section 7)

## 2. The Time Domain Reflectometer

This Instrument is a palmtop sized Time Domain Reflectometer for testing copper cables for faults: open circuits, short circuits and impedance mismatches.

It can be calibrated for coaxial, telephone or data cables having Velocities of Propagation between 20% and 99%.

It has the facility to select cable Impedances of 50, 75 or 100 Ohms to match the TDR to the cable under test. This automatically eliminates the transmission pulse from the display, enabling easier identification of short range faults.

The reflection profile of the cable under test is displayed as an oscilloscope-like trace on a liquid crystal display. A movable cursor can be aligned with features of interest and the distance read off.

Copper cables up to 3km in length can be interrogated by this instrument for fault diagnosis. This handbook has been written assuming Metric measurement, should Feet be selected then simply substitute Feet for Metres.

This Time Domain Reflectometer also contains a built in tone generator producing a warbling output oscillating between 810Hz and 1110Hz.

When injected into a cable this tone can be detected using a standard tone probe for the locating, tracing and identification of cables or wires within a cable.

### 3. Specification

Cable types-	All unpowered coaxial, telephone & data cables (balanced & unbalanced)
Velocity of Prop.	From 20 to 99% in 1% steps
Cable Impedance	Selectable 50, 75 or 100 Ohms
Protection	Overvoltage protection against telephone network voltages. (EN60950:1999 Sect 2.3)
Nominal Range (Vp=67%)	Up to 3000m (10,000ft) in 5 auto selected ranges (180m, 360m, 780m, 1440m & 2880m) (600ft, 1200ft, 2400ft, 4800ft & 9600ft)
Range resolution	1% of full scale range
Accuracy *	<2.5% of full scale range (inc. resolution)
Sensitivity of Instrument	Minimum of 3 pixels (1.7mm) vertical deflection on display for short or open circuit at 2Km.
Tone Generator	Oscillating between 810Hz and 1110Hz
Display -	100 x 32 pixel LCD
Connector -	BNC
Tx Pulse Height -	+1.5v into 50 Ohm load.
Tx Pulse Width -	25ns min to 2.15µs selected by Auto Range.
Battery Life -	Standby mode >4000hrs Single scan >80hrs (see note) Continuous scanning (5/sec) >7.5hrs
EMC	CE Approved
Temperature	0-40degC (32-112degF)
Dimensions	165x90x37mm
Weight	350gms (12oz)

\* Assuming Accuracy of Velocity of Propagation <1.5%

**Note:** The meter has an automatic powerw down facility after 2 minutes of non use whilst switched on

## 4. Set-Up Mode

To enter Set-Up mode turn the Instrument on, then while holding down the TDR key press the ▼ key. The display should be similar to:

>Vp=67%  
Z=50Ω  
Metres

The > sign marks that the Vp figure is ready to be adjusted. Use the ► key to increase the Vp value, and the ◀ key to decrease it. When the desired Vp is showing press the ▼ key. The > sign will now move down to the Z figure.

Vp=71%  
>Z=50Ω  
Metres

The impedance can be set to one of three values: 50, 75 or 100Ω. The 50Ω and 75Ω settings are for use with coaxial cables and the 100Ω setting for use with twisted pair. Use the ► key to select the next higher value, and the ◀ key to select the next lower value.

Press the ▼ key again. The > sign will now move down to the units selected.

V<sub>p</sub>=71%  
Z=100Ω  
>Metres

Use the ► key to toggle between feet and metres.

V<sub>p</sub>=71%  
Z=100Ω  
>Feet

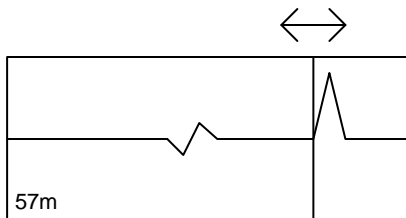
To exit calibration mode simply press the TDR key.

Calibration data is stored in non-volatile memory so that the last settings used are restored when the Instrument is switched on.

## 5. Analysing a cable

Connect the Instrument to the end of the cable to be tested either direct via the BNC connector or via the croc-clip adaptor provided for use with bare cable ends. Press ▼. The Instrument will make a single scan of the cable which will be displayed on the LCD. To continuously update the display hold the ▼ key down. The display will update at approx. 5 scans per second.

Notice that the trace is crossed by a cursor, and the distance corresponding to the cursor is displayed in the lower left hand corner of the display.



The above diagram shows a typical trace. Positive excursions of the trace show points where the impedance of the cable increases; negative excursions where the impedance decreases. The large positive pulse on the right hand side would indicate the open end of the cable. A large negative pulse shows a short circuit.

The distance to any feature in the trace can be determined by moving the cursor to left or right. This is controlled using the ◀ and ▶ keys.

When the cursor is over the feature the distance can be read off directly from the figure in the corner.

### **Injecting a tone for Cable Tracing**

Pressing the key marked TDR will toggle the instrument between TDR mode and Tone Generator mode.

## 6. Range Scales

The Instrument has five range scales, giving full scale ranges (at  $V_p=67\%$ ) of approx. 180m, 360m, 720m, 1440m and 2880m (600ft, 1200ft, 2400ft, 4800ft and 9600ft). Thus each scale covers twice the range of the previous one. Range change is automatic. When the cursor is moved right above 90% of full scale the Instrument automatically switches to the next range scale up and when the cursor is moved left below 30% of full scale it automatically switches to the next range scale down.

The pulse width used changes with the range scale setting. On the shortest 180m (600ft) range scale a pulse width of 25ns allows maximum resolution. With increasing range a longer pulse is used to maximise sensitivity. On the longest 2880m (9600ft) range scale pulse width is 2.15 $\mu$ s.

## 7. Battery replacement

When the battery needs replacing the Instrument will display "Low Battery" when a scan is attempted. Access to the compartment holding the battery is obtained by removing the small screw and sliding the cover downwards.

Use 4 AA size batteries of the alkaline type.

## **Repair and Warranty**

The Instrument contains static sensitive devices and is not user serviceable. If an Instrument fails, or its protection has been impaired, it should not be used and sent for repair by suitably trained and qualified personnel.

New Instruments are Guaranteed for 1 Year from the date of purchase by the user.

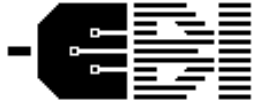
NOTE: Any unauthorised prior repair or adjustment will automatically invalidate the Warranty

### **INSTRUMENT REPAIR AND SPARE PARTS**

For service requirements for BI Communications Test equipment contact either:

The Distributor from whom the Instrument was originally purchased

or  
Customer Service Dept  
**BI Communications plc**  
Unit 7, Buckwins Square  
Burnt Mills Industrial Est.  
Basildon, Essex  
SS13 1BJ  
Tel: +44(0)1268 729393  
Fax: +44(0)1268 727987



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This Instrument is manufactured in the United Kingdom.  
The Company reserves the right to change the specification or design  
without prior notice.

**BI Communications plc.** Unit 7, Buckwins Square,  
Burnt Mills Industrial Estate, Basildon, Essex

Tel No: +44(0)1268 729393  
Fax No: +44(0)1268 727987  
E Mail: [bicomms@dircon.co.uk](mailto:bicomms@dircon.co.uk)  
**[www.bicomcommunications.com](http://www.bicomcommunications.com)**