

TX 4000

TDR Cable Fault Locator Operating Instructions

CONTENTS

Section 1	Notices	
1.1	Receiving the TX4000.....	3
1.2	Safety notices.....	3
1.3	Standards.....	4
Section 2	Introducing the TX4000	
2.1	TX2004 features.....	5
2.2	Specifications.....	6
2.3	Accuracy.....	7
Section 3	First operations	
3.1	Preparing the TX4000.....	7
3.2	Menu & screen displays.....	8
3.3	Set auto shutdown.....	8
3.4	Set unit of measure.....	9
3.5	Set Velocity of propagation.....	9
3.6	How to determine unknown Vp values.....	9
Section 4	Using the TX4000	
4.1	Setting Cable parameters.....	10
4.2	Auto fault location.....	11
4.3	Manual fault location.....	11
4.4	Connecting to a cable to be tested.....	11
4.5	Cursor controls.....	12
4.6	Selecting range scales.....	13
4.7	Scan hold facility.....	13
4.8	Gain setting.....	13
4.9	Backlight.....	14
4.10	Contrast.....	14
4.11	Tone generator.....	14
4.12	Typical fault displays.....	15
4.13	Typical cable Vp and Impedance values.....	15
Section 5	Maintenance	
5.1	Battery replacement.....	16
5.2	Cleaning.....	16
5.3	Storage.....	16

Section 1 - Notices

1.1 Receiving the TX4000

Upon delivery of the TX2003, ensure the contents are consistent with the packing list, notify your supplier of any missing items.

If the equipment appears damaged, notify your carrier and supplier immediately, giving a detailed description of any damage, save the damaged packaging to substantiate your claim.

The TX4000 includes a 0.5 mtr test lead, soft case and user manual.

1.2 Safety notices



- This instrument meets the safety requirements of IEC61010-1: 1995
- The TX2003 is designed for use on de-energized circuits only.
- Connection to line voltages will damage the instrument and could be hazardous to the operator
- This instrument is protected against connection to telecom network voltages according to EN61326-1.
- Safety is the responsibility of the operator

International Electrical Symbols



This symbol signifies that the instrument is protected by double or reinforced insulation. Use only specified replacement parts when servicing the instrument.



This symbol on the instrument indicates a WARNING, and that the operator must refer to the user manual for instructions before operating the instrument. In this manual, the symbol preceding instructions indicates that if the instructions are not followed, bodily injury, installation/sample and product damage may result.



Risk of electric shock. The voltage of the parts marked with this symbol may be dangerous.

1.3 Standards

The TX4000 has been manufactured in accordance with and meets the requirements of the following international standards:

SAFETY	IEC 61010-1 EN 60950
EMC	BS/EN 61326-1
Water/Dust Proof to IP54	

Section 2 - Introducing the TX4000

The TX4000 is a hand held Time Domain Reflectometer with 11 range scales covering the range 0-4000 meters, with a 7 meter first range scale and a 0.5 meter dead zone near and far end faults are clearly displayed on its 128x64 pixel back light Liquid Crystal Display.

The Auto Fault Location key will move the cursor directly to the first event or fault, thus eliminating the need to visually interpret the wave form. When set in manual mode, the wave form may be visually scanned as on conventional TDRs. In both modes the user variable gain covering the range of default to 64 db's may be used to magnify small events identified on the waveform. The scan lock feature will allow the user to hold the trace for closer examination.

Designed for identifying and locating faults on all metallic cables with two or more insulated conductors. The TX4000 has impedance matched circuits for 25, 50, 75 and 100 ohms and with velocity of propagation settings from 1-99% (or the equivalent in feet or meters/micro second) will cover the range of power, data, communication and CCTV cables.

Housed in a rugged IP54 rated ABS enclosure and weighing only 350 grams (12 ounces), the TX4000 is suitable for outside use.

2.1 TX2004 Features



- 1 Output via 2 x 4 mm safety sockets
- 2 LCD displaying start up screen
- 3 Cursor left key / increase selected value
- 4 Cursor right key / decrease selected value
- 5 Auto fault location / scan hold
- 6 Navigation button
- 7 Escape / Return
- 8 Back light on/off
- 9 Power on / off

2.2 Specifications

Ranges Meters	7, 15, 30, 60, 120, 250, 500, 1km, 2km, 3km, 4km
Feet	20, 45, 90, 180, 360, 750, 1500, 3000, 6000, 10,000, 14,000.
Range Selection	Manual range control / Auto range
Accuracy	1% of selected range*
Resolution	Approx 1% of range
Sensitivity	Min 3 pixel return at 4km on 0.6mm Ø, PE, TP
Velocity Factor	Adjustable from 1% to 99%
Output Pulse	5 volts peak to peak. Into open circuit
Output Impedance	Selectable 25, 50, 75 & 100 ohms
Output Pulse Width	3 ns to 3 ms, Automatic with range
Scan Rate	2 scans / second or scan held, pre set for each range scale
Tone Generator	810 – 1100Hz
Battery Life	30 hours continuous scanning
Power Supply	6 volts 4 x 1.5 AA Alkaline cells
Power Down	Selectable 1, 2, 3, 5 minutes or disabled
Back Lit Display	128 x 64 pixel
Voltage Protection	250 volts AC
Operating Temp	-10° / 50°C
Storage Temp	-20° 70°C
Dimensions	165 x 90 x 37 (6.5 x 3.5 x 1.5 ins)
Weight	350 gms (12oz)
Safety	IEC 61010-1 EN 60950
EMC	BS/EN 61326-1
Water/Dust Proof	IP54

* Measurement accuracy of $\pm 1\%$ assumes the instrument setting for velocity of propagation (Vp) of the cable under test to be accurately set, homogeneity of the Vp along the cable length, and accurate cursor positioning.

2.3 Accuracy

The TX4000 is able to measure distances to faults and cable lengths to an accuracy of +/- 1%.

This measurement accuracy is based on the correct value of Vp being used for the cable under test, and homogeneity of the Vp along the cable length.

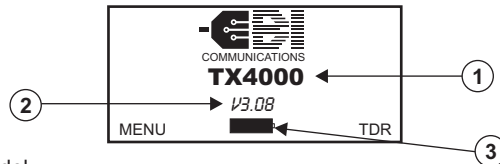
If the Vp is set incorrectly by the operator, or the Vp varies along the length of the cable, then additional errors will be incurred and the measurement accuracy will be affected.

Note:- The Vp is less well defined with unshielded multicore cable, including power cable, and is lower when a cable is tightly wound on a drum than when installed.

Section 3 - First Operation

3.1 Preparing the TX4000 for use

Press button ① to power the tester, the following screen will be displayed:



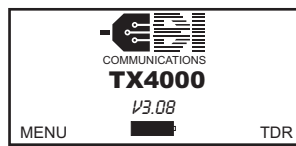
- 1 Model
- 2 Software version programmed into tester
- 3 Battery condition indicator (all black battery, fully charged, as charge decreases symbol changes to white) Battery condition indicator is permanently displayed.

Prior to use the following parameters will need to be set

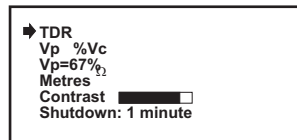
- | | | |
|---|-------------------------------------|-------------|
| 1 | Auto shutdown | section 3.3 |
| 2 | Select unit of measure | section 3.4 |
| 3 | Select velocity of propagation unit | section 3.7 |

3.2 Menu and Screen Displays

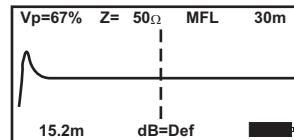
Start up display



Menu display

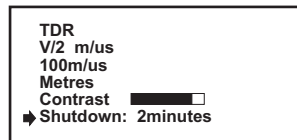


Trace display



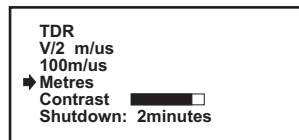
To select menu or TDR, press ◀ or ▶ as indicated on the TX4000 front panel

3.3 Set Auto Shutdown



To preserve battery life, the TX4000 is fitted with an auto shutdown feature. Shutdown time is selectable between disabled, 1, 2, 3 and 5 minutes. To change settings press ▼ to move ▶ to shutdown, use ◀ or ▶ to select setting, press ⏏ to store setting to memory.

3.4 Set Unit of Measure from menu display

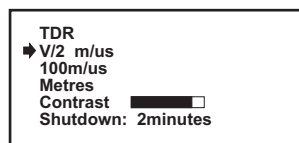


Press ▼ to move ► to unit of measure (feet or meters). Press ◀ or ▶ to scroll between feet and meters. Press ⏏ to store selected setting in memory.

Note:- When unit of measure has been selected, this will automatically change the V/2 figure, which will also be displayed in the selected unit of measure.

3.5 Set Velocity of Propagation from menu display

Velocity of propagation (Vp) may be set as % or speed in micro seconds (ms). The unit of measure, the speed is displayed in (feet or meters), will be determined by the setting selected in section 3.4



Press ▼ to move ► to displayed unit, press ◀ to scroll between v/2 M/Ms or Vp %. Press ⏏ to store selected setting in memory. TDR, selected values will be automatically set.

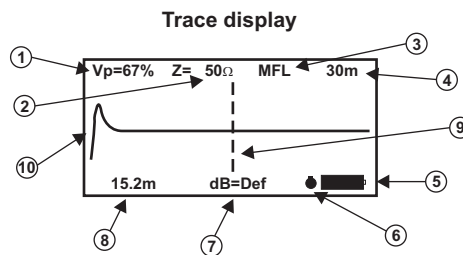
3.6 How to determine Vp Settings

If the TX4000 is to be used with a cable type for which the Vp is unknown, this must first be determined. determined by the setting selected in section 3.4

1. Take a sample of the cable at least 100m or 300 ft long
2. Measure the actual length of cable using a rule or tape measure or some other reliable method.
3. Connect the TDR TX4000 and adjust the Vp setting such that the tester gives a correct reading of the sample length, (refer to section 4.1 Setting cable parameters)

Section 4 - Using the TX4000

Upon completion of the set up procedures in section 3, press \odot to return to start up display and select TDR. The following screen will be displayed.



1. Vp Setting
2. Impedance setting (Z)
3. Manual / Auto Fault Location
4. Range scale
5. Battery condition indicator
6. Scan hold icon
7. User variable gain
8. Cursor distance reading
9. Cursor
10. Output pulse

4.1 Setting Cable Parameters

Velocity of Propagation (Vp)
Impedance Value (Z)


Use navigation key to scroll to selected parameter, when parameter is highlighted, use \leftarrow or \rightarrow to change values, press navigation key to move to next parameter, when set up is completed press \odot to store settings. If cable Vp is unknown, refer to section 3.6 upon start up. The TX4000 will display the values last used.

4.2 Auto Fault Location

The TX4000 may be used in auto or manual fault location modes. When set in auto fault location (AFL) the TX4000 will scan the cable run and the cursor will automatically stop at the first event. To start the scan press key AFL, if the scan stops within the first meter (3 feet) it will identify the connection between the TX4000 and the cable under test as an event, press the key AFL to continue the scan. The end of the cable run would normally be identified as an open or short (refer to section 4.12 for typical fault displays). Small events identified in the cable run may be enlarged by increasing the gain thereby making the fault more obvious (refer to section 4.8 Gain Settings).

4.3 Manual Fault Location

When set in manual fault location (MFL) the operator will need to visually scan the displayed trace and manually align the cursor to the event identified (refer to section 4, testing a cable).

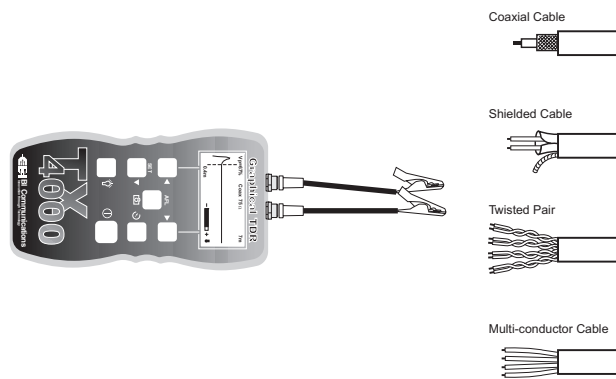
To select manual or auto fault location, use navigation key to scroll to displayed setting (AFL or MFL) use key ◀ or ▶ to change setting. Press  to exit.

4.4 Connecting TX4000 to a cable to be tested



Attach the test lead set to the TX4000 via the 2 safety sockets located at the top of the unit,

1. Ensure that no power supply or equipment is attached to the cable to be tested
2. Ensure that the far end of the cable under test is open or shorted (not fitted with a resistive termination)
3. Attach the TX4000 to one end of the cable to be tested



Coaxial Cable: Connect the red clip to the centre wire and the black clip to the shield/screen.

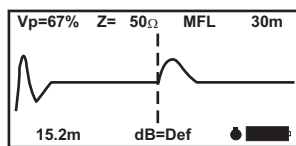
Shielded Cable: Connect the red clip to a wire adjacent to the shield and the black clip to the shield.

Twisted Pair: Separate out one pair and connect the red and black clips to the two wires of the pair.

Multicore Cable: Connect the clips to any two wires.

4.5 Cursor controls

Having followed the set up procedures in the preceding sections, a typical display showing impedance anomalies is shown below. Further examples are shown in section 4.12.



The vertical cursor line is moved left or right along the line of the trace by pressing ◀ and ▶ buttons to determine the distance to the event. Position the cursor at the beginning of the event and read off the distance at the bottom left corner.

On the fault display shown above a low impedance fault occurs at 64 meters shown by a negative spike, and a high impedance at 129 meters. The open end of the cable is shown as a large positive spike, this is used to determine the end of the cable run and the overall length of the cable being 180 meters.

4.6 Selecting Range Scales

The TX4000 has 11 range scales covering the range of 0 to 4,000 meters.

To select a range scale, or scan the cable run, press navigation key to scroll to range scale, press ◀ to decrease range, press ▶ to increase range. To exit press ↻.

4.7 Scan hold and Continuous Scanning Modes

This function only operates in manual fault location mode. When the TX4000 is first switched on, it is set to "Continuous scan" mode.

In this mode the TX4000 fires pulses into the cable under test thus enabling intermittent faults to be identified. Scan hold allows the user to hold a trace for closer examination and to disconnect from test cable whilst leaving the trace displayed.


To select scan hold, press key AFL for approximately 4 seconds then release, scan hold icon ⏸ is displayed at the bottom right hand corner, to exit press key AFL and release.

4.8 Gain Settings

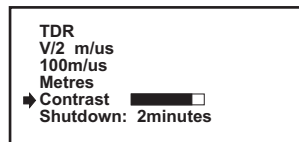
The TX4000 has pre set gain for each of its 11 range scales, there is in addition to this a user controllable gain to a maximum of 64db in 1db steps.






To use this function, use navigation key to scroll to db setting, press ◀ to decrease gain, ▶ to increase gain, press ↻ to store setting.

4.9 Backlight

The LCD display is fitted with an electro-luminescent backlight to enable easy viewing under a variety of different lighting conditions. The backlight is switched on and off with the  key.

4.10 Set Contrast from menu display

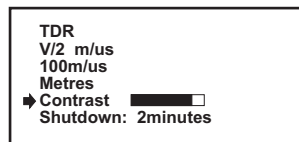






Press  to move  to contrast. Press  to decrease contrast, press  to increase contrast. The backlight is switched on and off with the  key.

4.11 Tone Generator

The TX4000 may also be used as a tone generator to trace and identify cables and wires. The user will need a conventional inductive tone probe within the range 810 Hz to 1110Hz.

To select tone generator from menu display



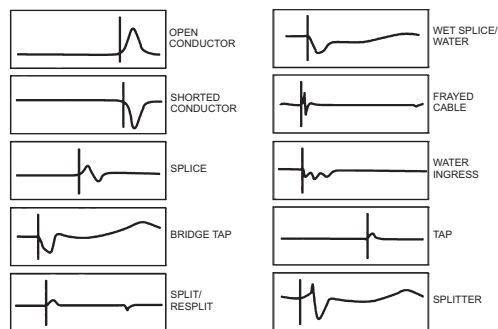
Press  to move  to TDR. Press  to cross between TDR and warble. Press the  button to exit.

When tone has been selected, connect test lead to cable pair to be traced and using tone probe which will emit a tone, the volume will increase the nearer the probe is to the cable / being traced.

Note:- The auto off function is disabled in tone generator mode so that the tone can be injected into a cable for extended periods while tracing takes place.

4.12 Typical Fault Displays

The following diagrams show typical fault traces to assist you in the identification of faults using the TX4000:



4.13 Typical Cable V.P and Impedance Values

Type	Vp	Z	Type	Vp	Z
Cat5 STP	72	100	T/Pair Jelly PE	64	100
Cat5 UTP	70	100	T/Pair PE	67	100
Coax Air	98	50/75	T/Pair PTFE	71	100
Coax Air Space	94	50/75	T/Pair PVC	58	100
Coax Foam PE	82	50/75	T/Pair Paper 72nF	88	100
Coax Solid PE	67	50/75	T/Pair Paper 83nF	72	100

Section 5 - Maintenance

5.1 Battery Replacement



Disconnect the instrument from any cable or network link

- Turn the instrument off
- Loosen the two black screws and remove the battery compartment cover
- Replace the batteries with 4 x 1.5 volt Alkaline batteries, observing the polarities
- Refit the battery compartment cover and refit the two screws

5.2 Cleaning



Disconnect the instrument from any source of electricity

- Turn the instrument off
- Use a soft cloth lightly dampened with soapy water, wipe over the instrument, rinse the cloth in clean water squeezing out any excess water, wipe over the instrument removing any soap residue, dry instrument with a dry cloth
- Do not splash water directly on the instrument
- Do not use alcohol, solvents or hydrocarbons

5.3 Storage



If the instrument is not to be used for a period of more than 60 days, it is recommended that the batteries are removed and stored separately (see 5.1)

Section 6 - 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 but sent back for repair by suitably trained and qualified personnel.

New instruments are guaranteed against breakdown due to manufacturing or component defects for 36 months after the purchase date by the user.

Note:- Any unauthorized prior repair or adjustment to the instrument will automatically invalidate the warranty

The quality management system of BI Communications fulfils the stringent requirements of the international quality standard BS EN ISO 9001. Quality System Certificate No 12500.

6.1 Contacting Us

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