

# TRIPLETT



# TDR

**Cable Fault Finder**

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## **Instruction Manual**

**TRIPLETT**  
Test Equipment & Tools

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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.

### **WARNING**

**ONLY use the unit with non-energized or deenergized and suitably isolated circuits. Connection to AC power mains will damage the instrument and may cause user injury.**

### **Symbols used on Instrument**

! Caution: Refer to accompanying notes.

**CE** Equipment complies with current EU directives

## Standards

UL 1311-1 and CUL 1311-1

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	IEC 1000-4-6	A

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Part # 84-891

## **1. First Operation**

The TDR Cable Fault Finder comes complete with

- Alligator Clip adaptor
- Alkaline 9v PP3 cell
- Toolbelt Holster Carry Case

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

Remove all packaging, remove battery compartment cover and check that the battery is connected (see section 14).

## **2. The TDR Cable Fault Finder**

The Triplett TDR is a hand held battery powered unit designed to measure the length of copper power and communication cables, or indicate the distance to a fault on the cable, given access to one end only.

Advanced signal processing techniques enable the TDR to identify opens and short circuits, and directly indicate the fault distance on an alpha-numeric display.

An internal library of standard cable types enables accurate measurement without the necessity of entering Velocity of Propagation or Characteristic Impedance information.

The TDR also incorporates an oscillating tone generator, that is detectable with a Triplett Hound, Hound 2, or Hound 3, for use in the tracing and identification of cable pairs.

The TDR can be used to:

Measure the length of cable on a drum, without the need to unwind, and given access to one end only.

Measure segment lengths in a Local Area Network, and distance to a fault.

Locate the distance to a fault on an installed cable run.

### 3. Specifications

Approximate Range	Coaxial Cable: 6400ft max (1999m) Structured Wiring: 2500ft max (750m) Telephone Cable: 2500ft max (750m)
Resolution	0.1ft < 100ft & 1ft > 100ft
Accuracy	+/- 3% or 1.5ft
Vp Range	0 to 99%
Cable Library	39 Standard Cable Types
Tone Generator	Oscillating between 810Hz and 1110Hz
Display	Alpha-numeric LCD
Connector	BNC
Battery	9v PP3 Alkaline cell
Battery Life	Better than 2000 tests
Temperature	32 to 112 deg F (0 to 40 deg C)
Storage Temp.	0 to 150 deg F
Dimensions	7.9" x 3.1" x 1.4"
Weight	less than 0.55lb
Safety	IEC1010-1
EMC	To EU directives
UL, CUL and CE	Approved

### 4. Principles of Operation

The TDR works by measuring the time taken for a signal to travel to the far end of the cable (or to an intermediate fault) and to return.

The velocity at which the signal is transmitted (Velocity of Propagation ie. Vp) will depend on the characteristics of the cable under test.

## 5. Attaching a cable to the TDR

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

The cable attachment to the TDR is via a BNC Jack located at the top of the unit. For un-terminated cables use the alligator clip adaptor.

Coaxial Cable      Connect the red clip to the center wire and the black clip to the shield.

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

Unshielded  
Twisted Pair      Separate out one pair and connect the two clips to the two wires of a pair.

Unshielded  
Multi-Conductor  
Cable      Connect the clips to any two wires.



## 6. Setting the cable type

Before the TDR can be used to take measurements, it needs to be set for the cable type to be measured.

If the cable is listed in the library (see Section 16) then setting up is simply a matter of selecting the appropriate cable type.

## 7. Selecting a library cable type

1. Switch on the TDR with the ON/Off switch at the side of the unit
2. The display will show the previously selected cable setting with its  $V_p$ .

For example

E/net 9907 $V_p=78\%$
--------------------------

3. Scroll through the library using the ▲ and ▼ keys to find the required cable type. The types are displayed in alphabetical order and listed in Section 16 of this user guide.

When the TDR is switched off it automatically stores the last setting and will display this setting when powered up.

## **8. Testing cables not included in library**

If the cable type to be tested is not in the library, then it can still be tested if the Vp is known. If the Vp is unknown refer to Section 9.

Using the ▼ Key scroll to the bottom of the library and beyond, until you find the the Vp settings from 99% downwards.

## **9. How to determine unknown Vp settings**

If the TDR is to be used with a cable type for which the Vp is unknown, this first must be determined.

1. Take a sample of the cable at least 60 feet in length
2. Measure its length by direct measurement
3. Connect to the TDR and adjust the Vp setting to give a reading of the correct length .

This Vp setting can now be noted and used on unknown lengths of the same cable type.

## 10. Measuring cable length

Set the cable type or the Vp for the cable to be measured and attach to the cable as described in section 5.

Press the ● Key

Assuming there are no shorts in the cable then the length of the cable will be displayed, in feet. For lengths less than 100ft this will be given to one decimal place.

Length  
63.9ft

For lengths over 100ft the decimal place is suppressed.

Length  
345ft

If there is a short in the cable then the distance to the short will be displayed.

Short  
40.2ft

If the cable is outside the measurement range then the display will read:

Length  
Out of Range

or

Short  
Out of Range

## 11. Checking networks (thin wire ethernet)

While carrying out the following tests, equipment should NOT be connected to the network.

Set TDR with network cable type ie. E/net 9907, remove 50 $\Omega$  terminators from both ends of network.

Connect TDR in place of one of the terminators.

Press ●

Length of network will be displayed as:

Length XX.Xft
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Repeat measurement from other end of network

The length shown should be the same from either end and indicate the total length of the network. If the lengths differ and are less than the expected, this is probably due to an open circuit in the network at the distance shown

If displays of:

Short XX.Xft
-----------------

are shown this indicates a short circuit in the network at the distance shown

Disconnect TDR and refit terminators.

## 12. Accuracy

For coaxial twisted pair and shielded types an accuracy of  $\pm 5\%$  can be expected, or  $\pm 1.5\text{ft}$  at less than 30ft.

The velocity of propagation is less well defined with unshielded multiconductor cable, including AC mains cable, and is lower when the cable is tightly wound on a drum than when it is installed.

This is due to capacitance and inductance effects between the turns, therefore limiting accuracy to  $\pm 10\%$  or  $\pm 3\text{ft}$  at less than 30ft.

The BNC to alligator clip adaptor has an effective length of 4 inches.

## 13. Theoretical and actual Vp

Vp can, in theory be calculated from the dielectric constant, but actual values often differ slightly from the theoretical. In a real cable the dielectric may not fill the space between the conductors completely, and this has the effect of increasing Vp.

In twisted pair cables the Vp depends to an extent on the pitch of the twist. The tighter the pitch the more dielectric and less air space and so the Vp is higher.

This has an implication for Cat 5, where the different pairs are deliberately given staggered pitches to reduce crosstalk. Variation of Vp between pairs with Cat 5 is typically  $\pm 2\%$ .

## 14. Battery

The TDR requires a standard 9 volt alkaline battery.

When the battery has become discharged, and needs replacing, the display shows:

Low  
Battery

To replace battery, switch off the TDR, remove battery cover and replace battery. Replace the cover.

## 15. Trouble Shooting

If display shows:

Length  
Out of Range

Check length of cable under test is within specified range of TDR

Check connections from TDR to cable under test. Check for open circuit in cable at less than 5 feet. Check alligator clip to BNC adaptor lead. Connect alligator clips together, press ●

If display reads:

Short  
Out of Range

Then the adaptor lead is OK.

If display reads:

Length  
Out of Range

Then the adaptor lead needs replacing or repairing.

If display shows:

Short  
Out of Range

Check cable under test for short circuit at less than 7.5ft. Check that terminators have been removed from network. Length to short circuit is outside of range, check by reconnecting to opposite end of cable if possible.

If the display shows:

Low  
Battery

Replace battery.

If the display is blank:

Check if good battery is installed in TDR. Install or replace battery

If cable length measurement appears to be inaccurate:

Check that cable type or Vp value have been correctly selected Conductors within cable may be broken, select alternative conductors if available.

## 16. Cable Library

Appletalk

BT2002

Coax Air 50Ω

Coax A/S 75Ω

Coax Solid PE 50Ω

Ethernet 9880

Ethernet 9907

IBM Type 9

RG6/U

RG59 B/U

T/Pair PE

T/Pair Paper 72nF

Twinax 100Ω

Belden 8102

CAT5 STP

Coax Air 75Ω

Coax Foam PE 50Ω

Coax Solid PE 75Ω

Ethernet 9901

IBM 1/2A/6

Mains BS6500

RG58 (8219)

RG62 A/U

T/Pair PTFE

T/Pair Paper 83nF

URM70 Coax

Belden 9933

CAT 5 UTP

Coax A/S 50Ω

Coax Foam PE 75Ω

CW1308

Ethernet 9903

IBM Type 3

Multicore PVC

RG58 C/U

Jelly PE

T/Pair PVC

Twinax 78Ω

URM76 Coax



## 17. Additional Features

### Units of measurement

Choice of Units. The Cable Fault Finder will display cable lengths either in meters or feet.

To change the units to be used, switch the TDR off, then switch on while holding down the ● key. The unit in use, either “Meters” or “Feet” will be displayed.

Toggle from one to the other using the ▼ key. To resume normal operation switch off, then on again.

### Tone Generator

In Warble Mode the TDR generates a warbling tone, which is transmitted down the cable under test and can be picked up with a standard tone probe like the Triplett Hound 2 or Hound 3 (optional). This facilitates cable tracing. To select Warble Mode, switch the TDR off, then switch on again while holding down the ▼ key. The message “Warble” will appear on the display. To resume normal operation switch off, then on.

## **18. Maintenance and Warranty**

No regular maintenance of the Triplett TDR is required. In the event the product is defective or is damaged, please contact Triplett for repair information.

### **Triplett Product Return Instructions**

In the unlikely event that you must return your Triplett equipment for repair, the following steps must be taken.

- 1: Call 1-800-TRIPLETT to obtain a Return Material Authorization (RMA) number from Customer Service.
- 2: Enclose a copy of the original sales receipt showing date of purchase.
- 3: Clearly print the RMA number on the outside of the shipping container.
- 4: Return to: Triplett / Jewell Instruments  
850 Perimeter Road  
Manchester, NH 03103  
ATTN: Repair Dept.

## **Triplett Three Year Limited Warranty**

Triplett warrants instruments and test equipment manufactured by it to be free from defective material or workmanship and agrees to repair or replace such products which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge within three years of the date of original purchase for parts and labor.

If we are unable to repair or replace the product, we will make a refund of the purchase price. Consult the Instruction Manual for instructions regarding the proper use and servicing of instruments and test equipment. Our obligation under this warranty is limited to repairing, replacing, or making refund on any instrument or test equipment which proves to be defective within three years from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence, accident or which have had the serial numbers altered, defaced, or removed.

Accessories, including batteries and fuses, not of our manufacture used with this product are not covered by this warranty.

To register a claim under the provisions of this warranty, contact Triplett's Customer Service Department for a Return Authorization Number (RMA) and return instructions. No returned product will be accepted without an RMA number. Upon our inspection of the product, we will advise you as to the disposition of your claim.

## **Triplett Three Year Limited Warranty**

ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF THREE YEARS FROM DATE OF PURCHASE, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.

The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplett may have, including incidental or consequential damages.

Some states (USA ONLY) do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. No representative of Triplett / Jewell Instruments or any other person is authorized to extend the liability of Triplett in connection with the sale of its products beyond the terms hereof.

Triplett reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.



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