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TDRL-901 Cable Fault Locator

User Guide

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Introduction

The TDRL-901 Cable Fault Locator is a portable handhold device used for locating the broken fault, cross fault, insulation fault and so on. It can be used to measure the cable length, wave velocity and distinguish the middle joints and terminals.

It is a simple locating device, adopts to kinds cable and specially, the telecomputer cable.

Design Features

- **TDRL(Time Domain Reflectometry)method make it possible to measure broken fault, cross fault, insulation fault and so on.**
- **Automatic measurement**
- **Auto power-off when sleeping and low battery voltage**
- **Friendly user interface, easy to operate**
- **Supply by dry batter or recharge battery**
- **Handheld device, easy to carry**

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Tech. Specifications

Measurement distance	**0-8km**
Resolution ratio	**0-1km,below 1m;** **2km,below 2m;** **4-8km,below 8m**
Impulse range	**30V**
Impulse width	**80ns-5μ s,auto adjustments**
Blind zone	**1m**
Wave velocity range	**100-300m/μ s**
Adjustable gain range	**0-80db**
Supply power	**AA battery x 6pcs**
Volume	**225mm×155mm×50mm**
Weight	**0.42kgs without battery**
Operating Temperature	**-10℃—40℃**
Humidity	**5-90%RH**
Elevation	**<4500m**

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working principle&Product Structure

● Basic working principle

■ Distance locating:

This device using TDR(Time Domain Reflectometry).When locating,low voltage pulse is injected into and spread along the cable until reach the impedance mismatch point.These points include the short circuit point, fault point,middle connector and so on.When reach these points,the pulse reflection will be send back and record.See Figure.1

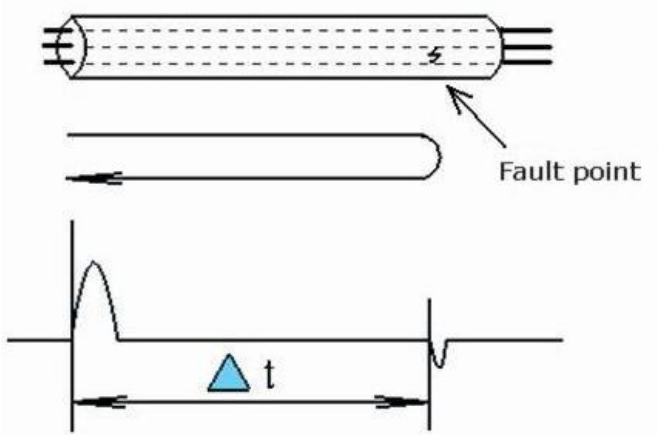

Figure 1. Principle

Figure 1 shows a fault point in a cable, *Δt* is the time during transmitted pulse and pulse reflection is received,so fault point distance *Lx* as below:

$$(1)\ Lx=\frac{V\Delta t}{2}$$

V:pulse Traveling-wave speed

■ Fault diagnose

Mismatching point reflection coefficient ρ :

(2) $$\rho = \frac{(Z_i - Z_c)}{(Z_i + Z_c)}$$

Z_i:input impedance of the fault point

Zc:characteristic impedance

According (2):

Disconnection fault pulse reflection is same polarity as the transmitted pulse when short or cross fault pulse reflection is opposite polarity.So we could judge the fault as below:

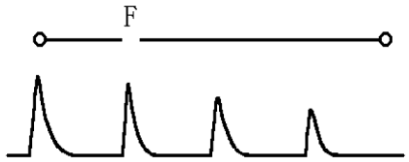

Figure 2A. Reflection waveform of disconnection fault

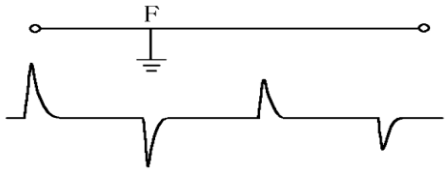

Figure 2B. Reflection waveform of cross fault

• Device configurations

TDRL-901 cable fault locator including main engine, testing lines and documents. Main engine as below Figure 3:

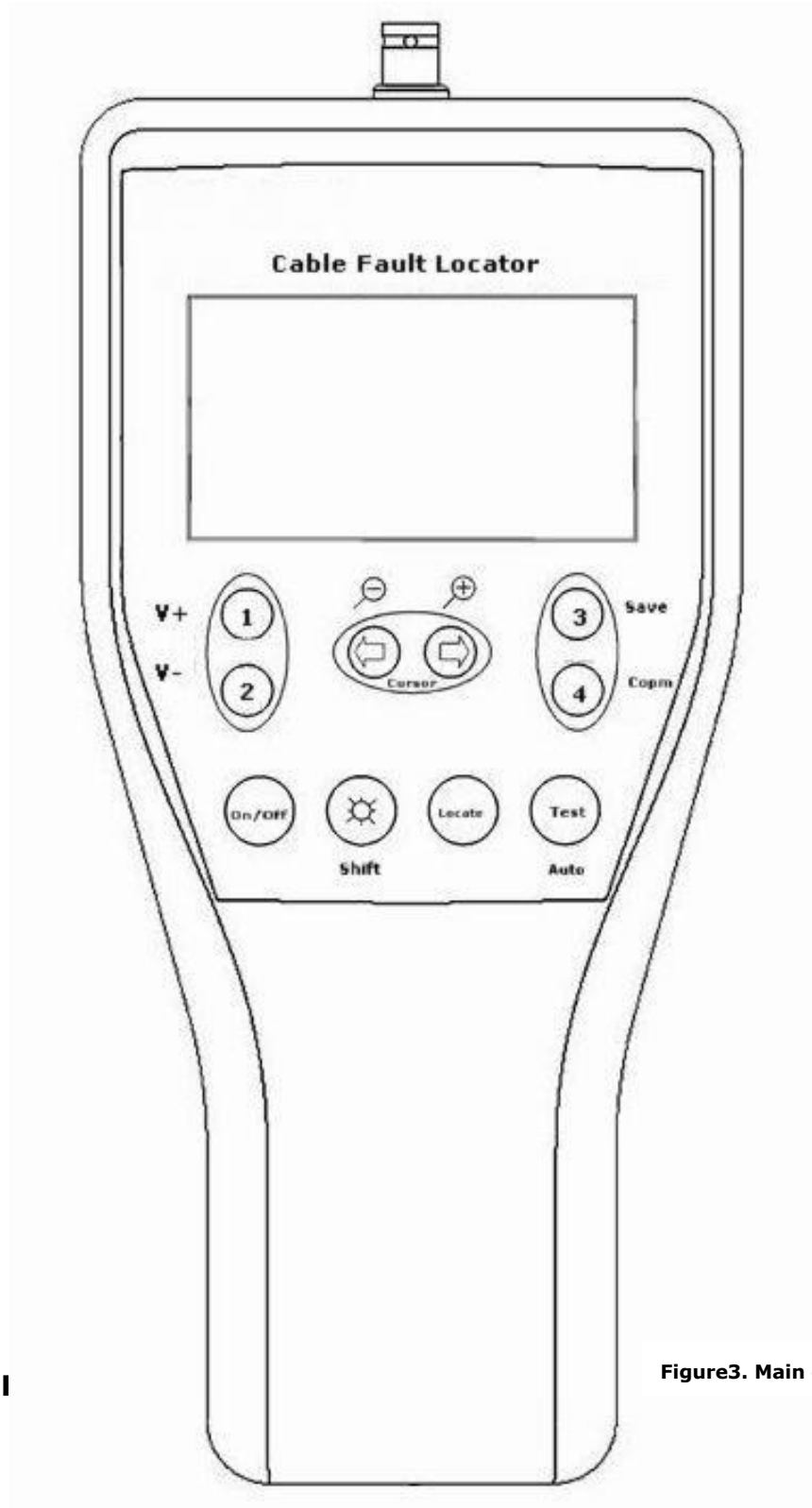

Figure3. Main engine panel

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Display the informations

■ Basic function:

1/2	➢ **Change testing range**
Cursor	➢ ⇦ ⇨ **Move the cursor**
3/4	➢ **Adjust single gain**
On/Off	➢ **Power on/off**
☼	➢ **Open/close screen backlight**
Locate	➢ **Locating the fault point automatically**
Test	➢ **Click for testing once while pressing for more than 3 seconds to begin continuous testing and waveform displaying**

■ Other function:Press shift(☼) and other button together

Shift&V+/V-	➢ **Change the wave velocity**
Shift&⊖/⊕	➢ **Zoom in or out the waveform**
Shift&Save	➢ **Storage the waveform**
Shift&Comp	➢ **Display the saved waveform and current waveform together for comparing**
Shift%Auto	➢ **Find the suitable testing range and the most possible fault point**

• Display interface when working

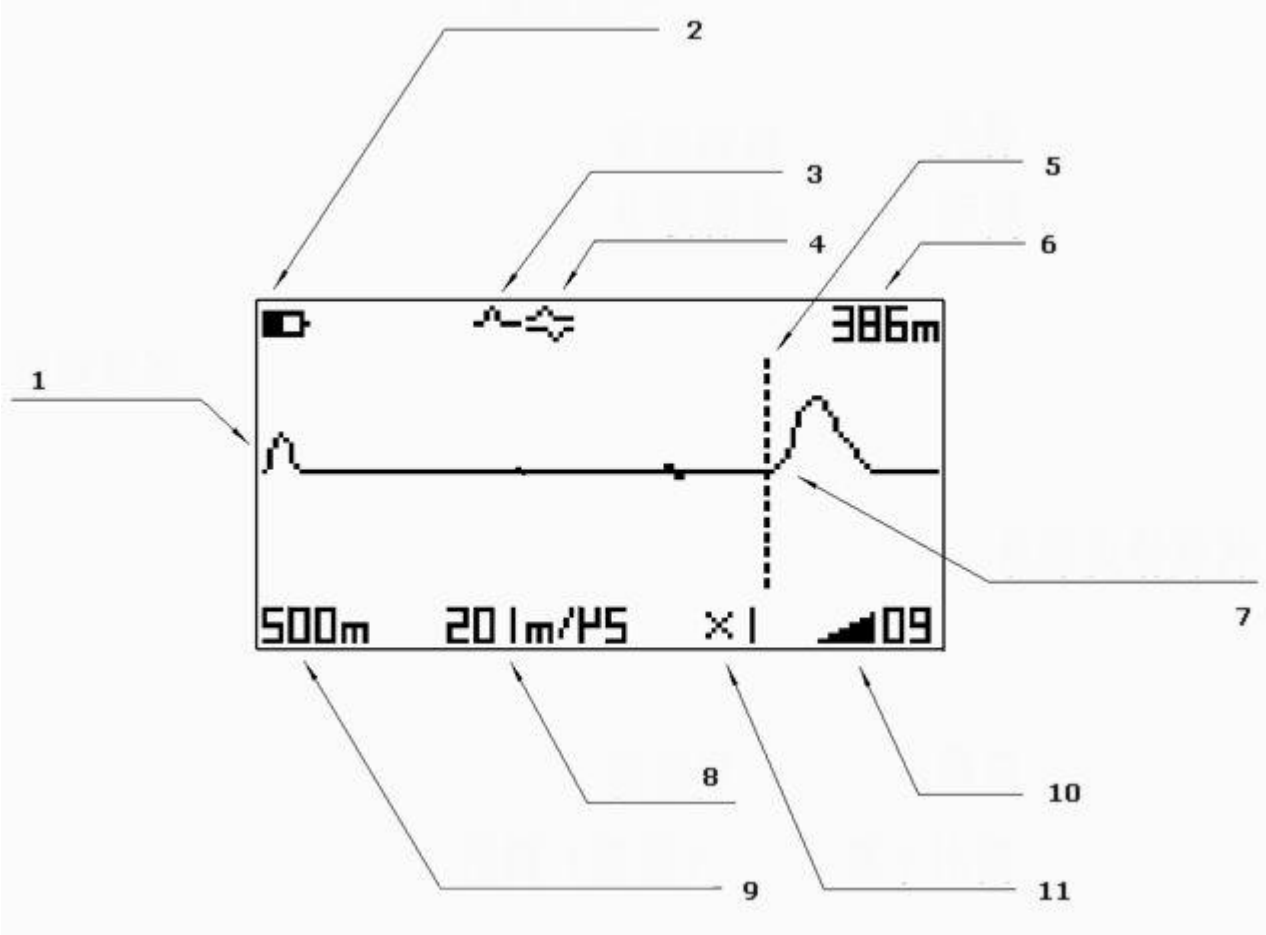

Figure 4. Interface details

Specification

1	➢ **Transmitted impulse**
2	➢ **Battery lever**
3	➢ **Temporarily store mark**
4	➢ **Comparing mark**
5	➢ **Cursor**
6	➢ **Distance**
7	➢ **Reflection impulse of cable fault point**
8	➢ **Wave velocity**
9	➢ **Measuring range**
10	➢ **Gain**
11	➢ **Display scale**

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Application

- **Fault determined**

When cable fault appeared, pls first judge fault feather and broken lever. The TDR fault are divided into three kinds as below:

- **Disconnection fault: cable broken and communication disconnect.**
- **Crossing fault which is generally classified into three kinds: grounding fault, self-crossing fault, and common crossing. During these conditions, the insulating layer was broken even touched to affect the communication quality.**
- **Defective insulation fault:**

The cable corn is entranced by moisture or water to reduce the insolation resistance.The difference between this and above crossing fault is this has a big resistance, common over thousand Ohms.

In generally, for above first and second fault, it's easy to detect by pulse test, but for the third, user should consider the cable path, time of fault, range of the fault, environment and so on.

- **Lines connection**

Before testing,pls disconnection inside devices with problem cable first.

Then inside testing to make sure the rough location of the fault point. After then,go to the filed to pinpoint the fault.

When testing,connect the lines plug with testing interface, and clamp the fault cable.

● Choose testing range

■ **To get complete testing waveform,the testing range should be several hundred meters longer than the length of the cable.For example,if the cable is 900m,the testing range should be 2km.when found the fault point closer,reduce the range accordingly.**

■ **This device offer below six testing ranges to choose, 125m, 250m,500m,1km,2km and 4km.**

■ **Press 1 or 2 button to change the testing range.Check 'basic function' for reference.**

■ **Pls notice that,the device test once automatically after once range changing.**

● Setting the wave velocity

According different cable material,user should choose different wave velocity.

Shift&V+/—	➢ **Change the wave velocity**
Adjustable range	➢ **100-300m/μ s**

***Some common cable pls take below for reference:**

Plastic power cable	➢ **201m/μ s**
Polyethylene power cable	➢ **192m/μ s**
Oil filled cable	➢ **160m/μ s**
paper pulp insulated cable	➢ **216m/μ s**

Accurate measurement,use the method in page ,to calibrate the wave speed

● Gain adjustment

3/4 button	➢ **Adjust single gain,increase or reduce**
➢ **Auto testing for every time the gain changing**	

● Gain adjustment

Gain is the magnification times of the signal. This could change the wave amplitude. Common in every range, there re default gain, but if it' s not suitable, you also could choose manual adjustable.

Gain adjustment: press Gain +/-to change the signal gain. Every time change the gain, the device will test automatically.

● Cursor positioning

The beginning of the reflection impulse waveform is the fault position. When move the cursor into this position, for example, the virtual cursor in pic.5,there will be a distance appear in the right corner of the screen which is the fault distance.

Pls notice, if the cursor on other position, the distance is not useful.

***Auto position: Press "Auto" key, device will automatically position. If deviation, please position manual.**

***Maunal position: Press ⇦& ⇨ to move the curve left and right.**

Refer fig. 5

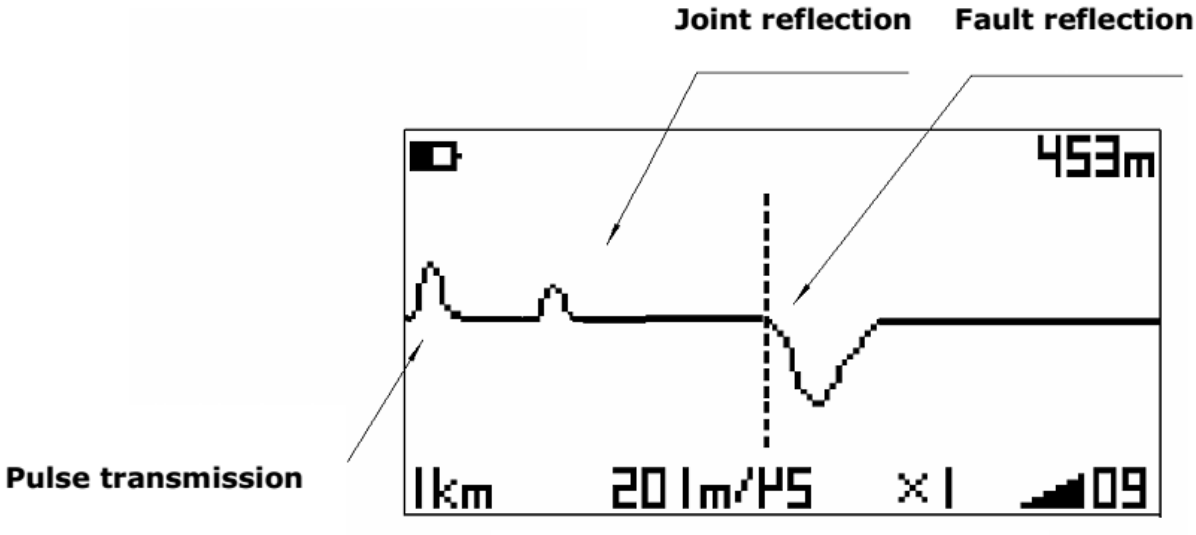

Figure 5. Typical example

***This waveform is a typical example of crossing fault.The dot cursor position is the fault position,453m.**

If the waveform is downward, the fault is broken fault.

- **Waveform zoom in and zoom out**

To get a higher resolution, please use zoom in/out function.

Press button to zoom in and to zoom out.

***When 'Zoom out', auto positioning function is not workable.**

- **Waveform temporary storage and compare**

It's easier to distinguish the fault type through comparing the good cable and fault cable.

First, testto get the fault waveform and press TS to keep it. There's a TS mark on the left corner of the screen.

Then test a good cable under the same condition.

Press Comp. to show the two waveforms together and there'll be a compare mark on the screen.

Find the fault point from check the difference of the two waves. Fig. 6 show this condition.

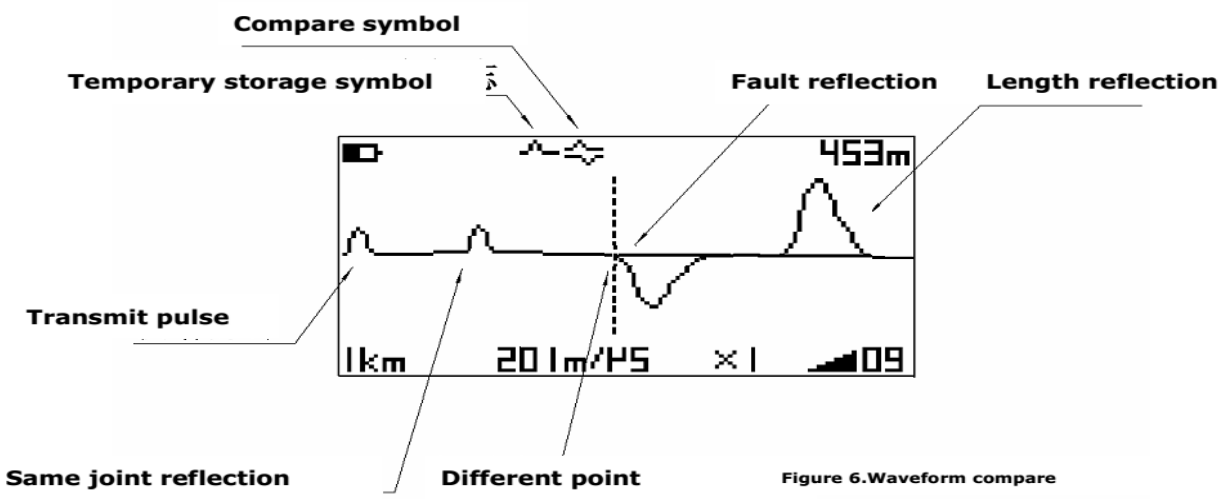

Figure 6.Waveform compare

- **Auto testing**

Press Auto key, the device will automatically test, choose range and position cursor. The result is only for reference.

- **Continuous testing**

Longtime press Test up to 3 sec. and the device will come in the continuous testing mode. And will stop after 1 minute. Or you could press Test button again to stop.

This function is common used to routing inspect multi-pair core wire.

- **Wave velocity correct**

According now the cable length, we could correct the wave velocity. Use same known length cable and test the opposite terminal open circuit and short circuit waveform and compare. Move the virtual cursor to the obvious difference and change the wave velocity to make the tested distance same as the known length. Then the velocity is the real one of this cable.

Instrument Maintenance

Charge

Standard configuration is 6AA NI-MH battery ,capacity above 1300mAH is better. Dry battery is also ok if no NI-MH battery if necessary but need high capacity ones.

***Please notice don't put the battery backwards.**