Green is life tmg

ABN 43 064 478 842

231 osborne avenue clayton south, vic 3169
PO box 1548, clayton south, vic 3169
t 03 9265 7400 f 03 9558 0875
freecall 1800 680 680
www.tmgtestequipment.com.au

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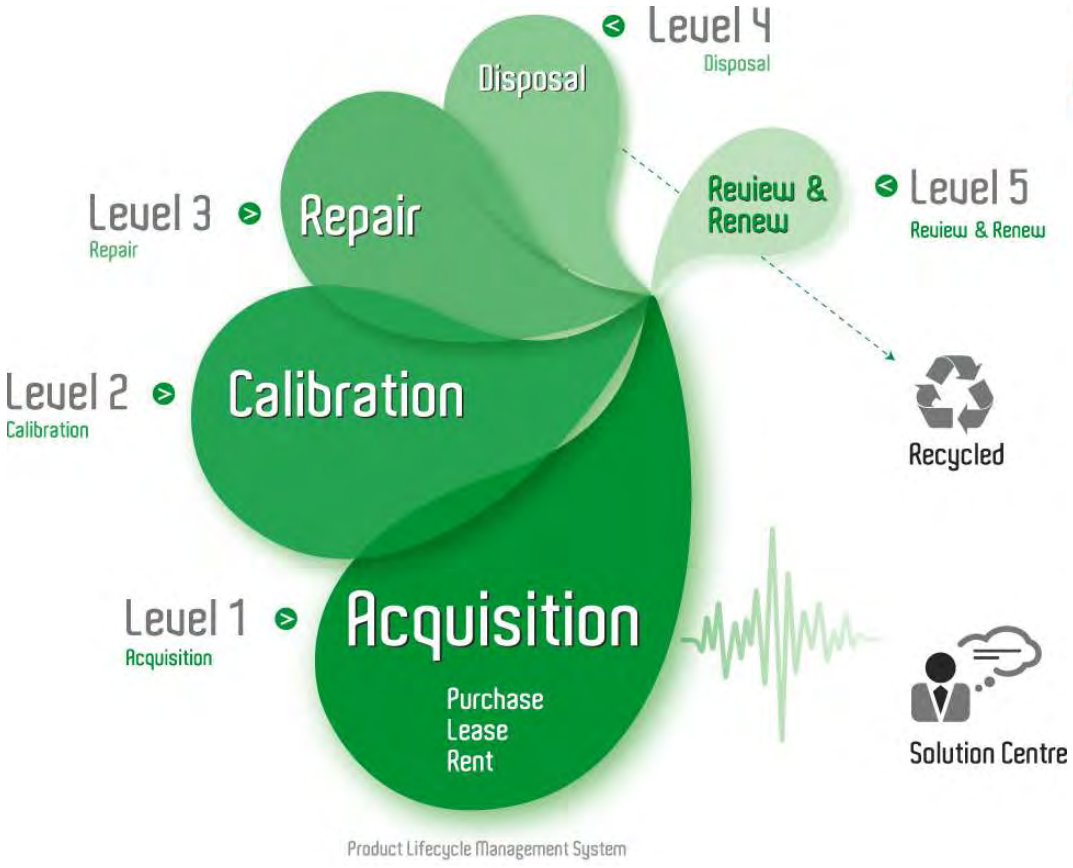
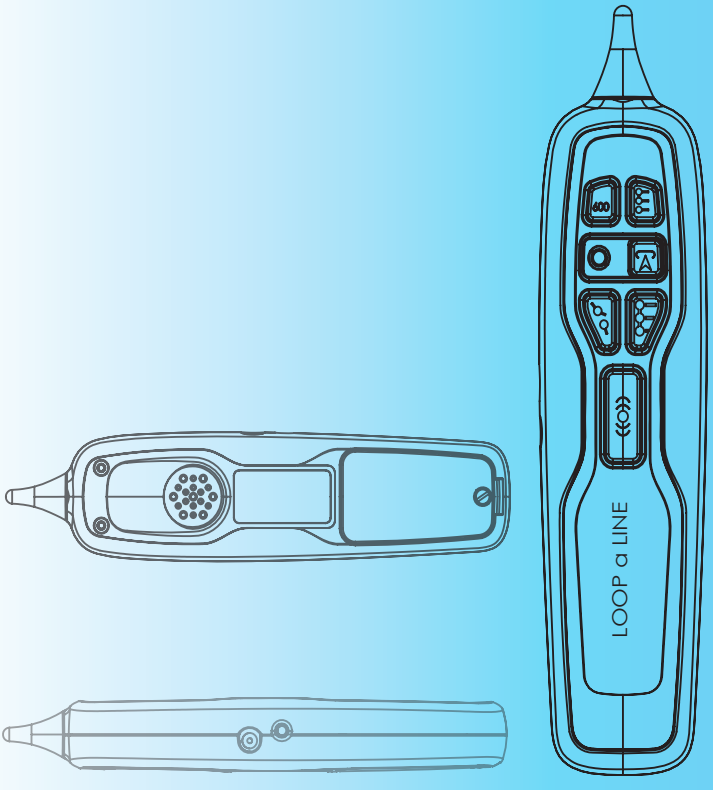


teletech

TX 916
Operator's Manual



Contents

TX916 LOOP-a-LINE

1. INTRODUCTION

Teletech's TX916 Loop-a-Line consists of two battery operated devices known as the PROBE and the OSCILLATOR. Together these devices are used by the communication technician to aid in telephone installation and cable fault location and repair.

A communication technician can work unassisted by remotely controlling an OSCILLATOR (located at the exchange MDF or street cabinet) from a PROBE located on the same line up to 20km away. This eliminates multiple journeys along the cable path and dramatically cuts repair and intallation costs.

Operating modes:

- Pair identification
- Disconnect/connect service to the exchange
- Open circuit pair
- Short circuit pair(with or without ground)
- Insert 600 ohm line termination

When a Loop-a-Line is used in conjuction with a Multimeter, Resistance Bridge or TDR instrument, loop and insulation resistance and resistance balance measurements as well as fault locating can be performed.

2. PHYSICAL DESCRIPTION

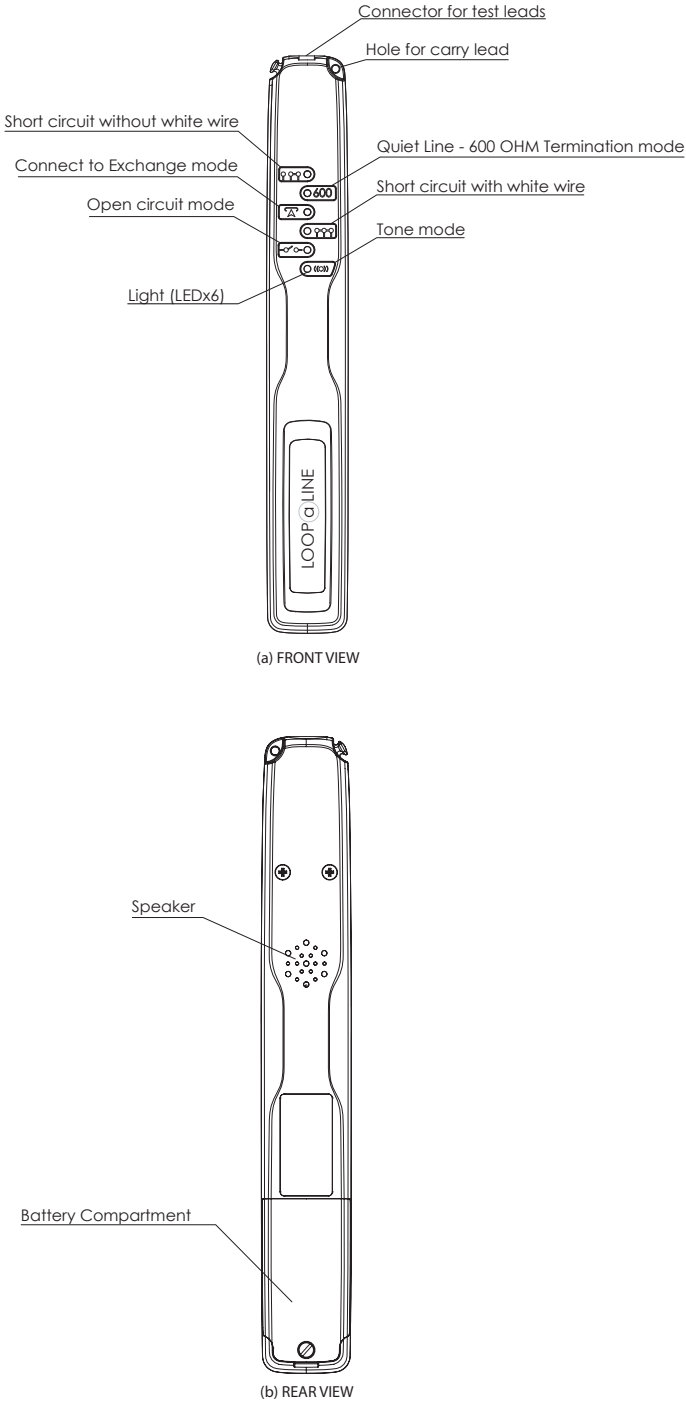


Figure 2-1 OSCILLATOR

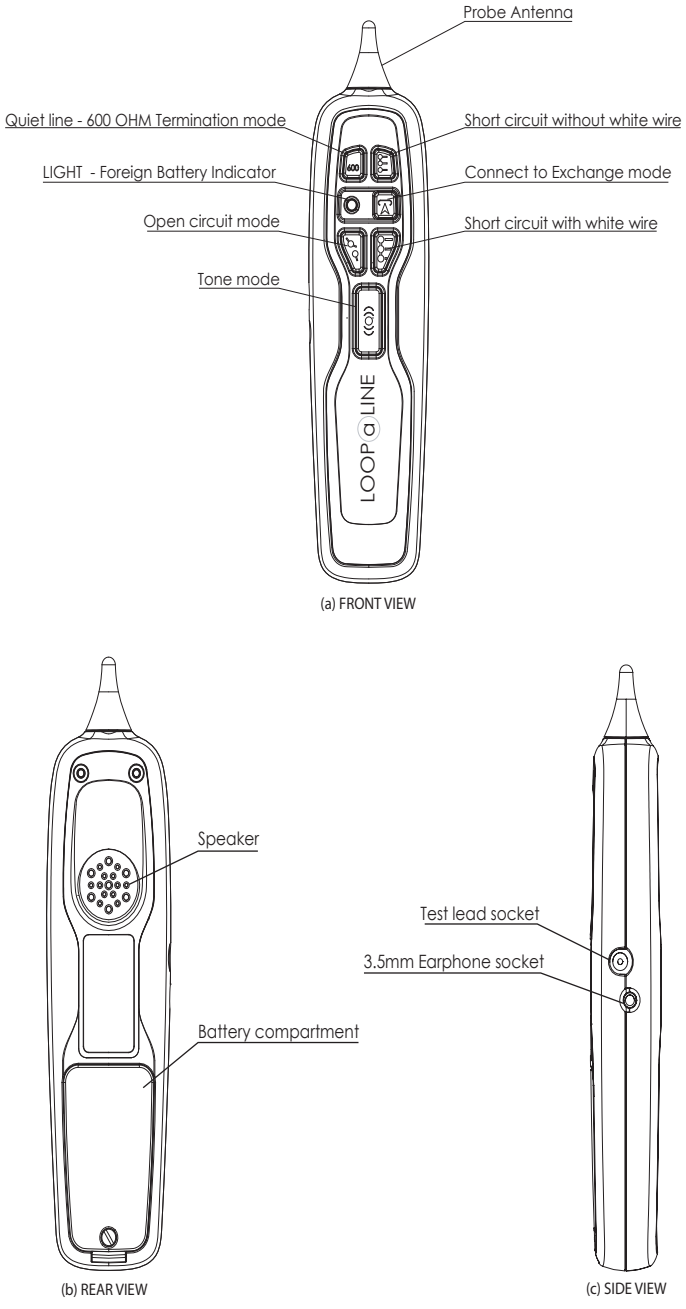


Figure 2-2 PROBE

2.1 BATTERY REPLACEMENT

Both devices are powered by a 9V alkaline battery (IEC6LR61) which can be inserted or removed by opening the battery lid on the rear of the device using a flat head screw driver. Orient the battery according to the polarity diagram within the battery compartment.
Note: Use only an alkaline battery

Warning: Disconect all test leads before removing the battery lid to avoid possible connection to high voltages sometimes present on telephone lines.

2.2 TEST LEADS

The OSCILLATOR and PROBE each have their own set of test leads which can be inserted into their sockets as shown below in Figure 2-3.

Next to the PROBE's test connector (see Figure 2-2c) is a 3.5mm audio jack that allows earphones to be inserted and is useful when performing Pair Identification in noisy environments.

Warning: Due to large voltage spikes sometimes present on telephone lines, don't insert the earphones when the PROBE's test leads are connected to the line.

Figure 2-3 Loop-a-Line

3.OSCILLATOR OPERATION

3.1 OSCILLATOR POWER UP

Inserting the test lead into the OSCILLATOR's socket initiates the OSCILLATOR power up cycle:

The OSCILLATOR flashes on all six of its lights (LEDs) once simultaneously (<0.5 sec) to indicate that the leads have been correctly inserted and battery power is present. The OSCILLATOR then performs a battery level check and displays the battery strength in the form of a light array bar graph. Maximum battery capacity displays all six lights but if the battery is nearly flat and needs replacing, only one light is displayed (see Figures 3-1a, 3-1b, 3-1c). If no lights are displayed then the battery voltage is insufficient for any operation and should be replaced.

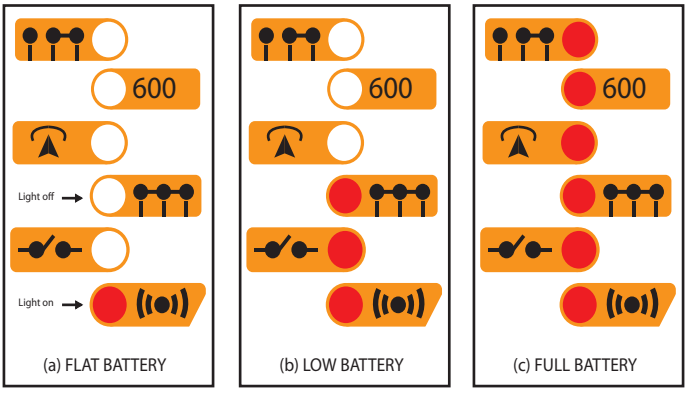


Figure 3-1 Light array indicating: (a) FLAT, (b) LOW, (c) FULL battery level

After indicating the battery level the OSCILLATOR enters TONE mode. The light next to the (•) symbol will flash every 3 seconds indicating that the OSCILLATOR is on and generating a tone signal.

The factory default tone is referred to as the *Warble*. This is the tone that will be heard by the PROBE when using the OSCILLATOR in TONE mode for the first time. Three other tones are available and can be selected using the PROBE (Refer to section 4.3 *Tones*).

3.2 OSCILLATOR POWER OFF

Removing the OSCILLATOR's test lead from the socket immediatly turns off the OSCILLATOR.

3.3 CABLE SHORT CIRCUIT DETECTION

This feature of the OSCILLATOR is always disabled on power up. When this feature is enabled, the OSCILLATOR can be used for confirming traces over short distances without using a PROBE.

To enable this feature, connect the PROBE leads to the OSCILLATOR Blue test leads, either directly or via an unbroken cable pair. Press the PROBE's and **600** keys *simultaneously* and hold them down for about 1 second until a beep is heard. This places the OSCILLATOR into TONE mode (the tone last used will be produced) and causes the OSCILLATOR to sound its buzzer if either a short circuit or a reverse polarity battery is present between its Blue test leads.

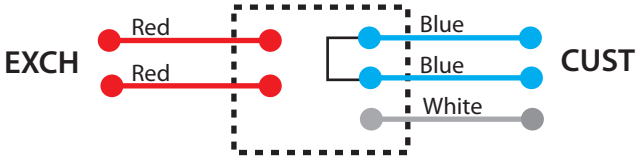
To disable this feature, either power down the OSCILLATOR (see section 3.2) or connect the PROBE leads to the OSCILLATOR Blue test leads, and hold down one of the six PROBE keys for 1 second. *Note: When in TONE mode, the OSCILLATOR applies a nominal 4.5V DC to the cable pair to which it is connected . This voltage is necessary for the OSCILLATOR to be able to detect a short circuit.*

3.4 OSCILLATOR MODES

The OSCILLATOR has six operating modes. The selected operating mode is indicated by a flashing light on the OSCILLATOR next to the mode symbol. A description of each mode follows:

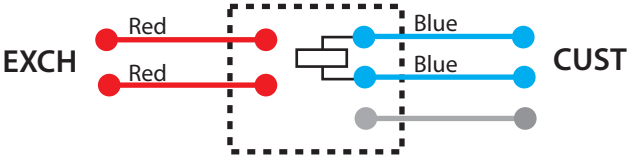
Short circuit (Without White wire)

The OSCILLATOR tone generation is stopped and the cable line is looped. The White lead and the Red leads are open circuit. After disconnecting the PROBE leads from the line, the loop resistance and ground leakage can be measured. A RFL Bridge can be used to locate any resistance faults on the line (See section 5.3.1, *Two Wire RFL test*). By using a TDR the distance to the OSCILLATOR can be measured.



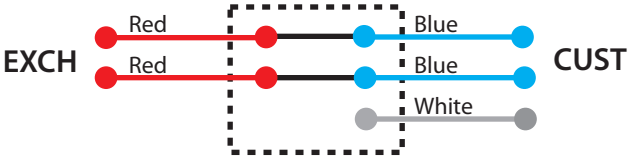
600 Quiet Line - 600 Ω (ohm) termination

The OSCILLATOR tone generation is disconnected and the line is terminated with an AC coupled 600 Ω (ohm). This termination is suitable for measuring line noise or Return loss. The white lead and the red leads are open circiut.



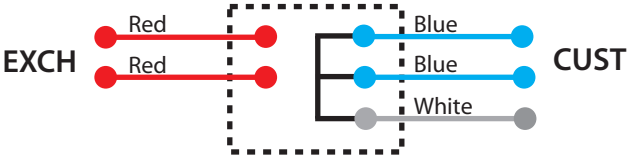
Exchange Connect

The OSCILLATOR tone generation is disconnected and the line is connected through to Exchange using the Red leads. The White lead is open circuit.



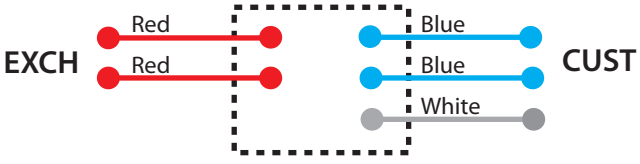
Short Circuit (With White wire)

The OSCILLATOR tone generation is disconnected and the line is looped. The White lead is shorted to the Blue leads and the Red leads are open circuit. After disconnecting the PROBE leads from the line, the loop resistance and ground continuity may be measured. This termination is also used for a Three wire RFL test (see section 5.3.2).



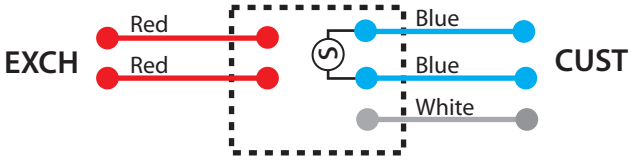
Open Circuit

The OSCILLATOR tone generation is disconnected and the line is isolated from the Exchange. After disconnecting the PROBE leads from the line, insulation resistance, foreign battery voltage or TDR open circuit tests can be performed.



TONE MODE (Pair Identify)

The OSCILLATOR's Red leads are disconnected (open circuit) and a tone signal is output on the Blue test leads. The White lead is open circuit. The PROBE tip is used to detect the tone signal at the Far End (see section 5.1 *Pair Identification*).



4. PROBE OPERATION

4.1 SIGNAL TRACING

To trace the tone signal generated by the OSCILLATOR, press the TONE key and slowly move the PROBE's antenna within close proximity to the cables under test. A tone signal picked up by the PROBE antenna will be reproduced as an audible tone. The audible tone volume increases as the PROBE antenna tip is brought closer to the cable carrying the tone signal. This tracing technique is used in Pair identification (see section 5.1 *Pair Indentification*)

4.2 MODE SELECTION

Each key on the PROBE selects one of the six OSCILLATOR modes. The symbols on the PROBE keys are identical to the symbols displayed on the OSCILLATOR (see section 3.4 *Oscillator Modes*).

The PROBE must be connected to the same unbroken line as the OSCILLATOR to control the OSCILLATOR. Holding a single key down for about 1 second will cause the PROBE to transmit a command to the OSCILLATOR to change operating mode. The PROBE will then beep once and power down, except in the case of TONE mode, where it will remain powered for 2 minutes and then power down automatically.

4.3 TONES

There are four selectable OSCILLATOR tones available for use in pair identification: *Warble , continuous , two high beeps repeating and three high beeps repeating.* The factory default tone generated by the OSCILLATOR is the *Warble ,* and this is the tone heard when using the OSCILLATOR for the first time in TONE mode.

To select a different tone, first connect the PROBE to the same line as the OSCILLATOR. The user must then hold the PROBE's TONE key down for about 1 second until a single BEEP is heard. If the key continues to be held down for a further second after the first beep is heard, the PROBE will generate a double beep indicating that the PROBE has changed from low to high sensitivity (soft to loud). The PROBE will continue to cycle between high and low sensitivity until the TONE key is released. At each beep the tone type will change.

The selected tone is saved when the OSCILLATOR is powered off. For example, if the tone is on ' *Warble '* and the technician changes the tone to ' *two high beeps repeating '* the OSCILLATOR will then start up next time with the ' *two high beeps repeating '* tone.
The factory default tone can be restored by simultaneously pressing and holding down and keys on the PROBE for about 1 second until a beep is heard.
(see Figure 4 -1)

Figure 4 - 1 Reset Tone to warble (Factory Default)

4.4 CONNECTED TO EXCHANGE

The PROBE has a red /green light located to the left of the key. This will light up when the PROBE is connected to a cable pair that has a battery connected to it that is >15 DC. The light colour displayed indicates the polarity of the line: Green light indicates a negative Exchange battery on the test lead's Black clip. Red light indicates a negative Exchange voltage on the test lead's Red clip.

4.5 AUDIO BATTERY LEVEL INDICATOR

If the PROBE battery is almost flat, the PROBE will emit a long and descending pitch screech whenever a key is pressed. This is easily distinguishable from the normal higher pitch beep emitted when a key is pressed when operating from a sufficiently charged battery. The battery should be replaced to ensure correct operation.

5. LINE TESTS

5.1 PAIR IDENTIFICATION

1. Power on the OSCILLATOR by inserting the test lead into the 6 pin socket.

2. For Pair Identification it is sufficient to connect the OSCILLATOR's blue leads to the line as follows:

- Blue test lead with Red clip to pair 'a' wire
- Blue test lead with Black clip to pair 'b' wire

Note: Reverse the clips if the OSCILLATOR beebs, indicating incorrect polarity

However, should the technician wish to perform additional tests following the Pair Identification process, it is recomended that the following connections be made prior to commencing Pair Identification

- Red lead with Red clip to Exchange 'a' wire (+ 've)
- Red lead with Black clip to Exchange 'b' wire (-' ve)
- Blue test lead with Red clip to customer 'a' wire (+ ' ve)
- Blue test lead with Black clip to customer 'b' wire (- ' ve)
- Connect White lead to the cable sheath (' e ')
- Remove jumper.

If the leads are not connected this way then it is possible to short a customer's working service if the cross-connection (links, jumper, etc.) has not been opened and the OSCILLATOR is switched to EXCHANGE CONNECT mode. Similarly, a short circuit can occur when the cross-connection is being restored and the OSCILLATOR has been left in EXCHANGE CONNECT mode.

3. Move to the Far End of the Line and use the PROBE tip to identify the cable pair carrying the OSCILLATOR tone signal. Confirm the pair by selecting a different mode and checking that the OSCILLATOR's tone stops. The PROBE's sensitivity (volume) can be adjusted by using the (●) TONE button (see section 4.3 *Tones)*

5.2 CHECK FOR BALANCED PAIR

This is accomplished by moving the PROBE tip between the 'a' and 'b' wires of the cable pair carrying the signal and identifying a null point (place of negligible signal volume). If no null point is found then the cable pair is unbalanced and a cable fault is likely present (see section 5.3 *Fault Location*).

5.3 FAULT LOCATION

5.3.1 Two Wire Test

This test is performed on a pair containing one good wire and one faulty wire with leakage to ground. The test requires the use of a Resistance Bridge or TDR in addition to the Loop-a-Line. The test is as follows:

1. At the Exchange, connect the Blue, Red and white OSCILLATOR leads (as described in section 5.1)

2. At the customer end, identify the line pair and then connect the PROBE test leads (see section 5.1)

4. Disconnect PROBE leads. To identify the faulty line, measure the resistance and voltage of wires 'a' - 'b' 'a - 'e' and 'b' - 'e'.

5. Reconnect the PROBE's Blue leads and press key.

6. Disconnect the PROBE and connect the Resistance Bridge or TDR and locate the fault (as per the instrument's manual).

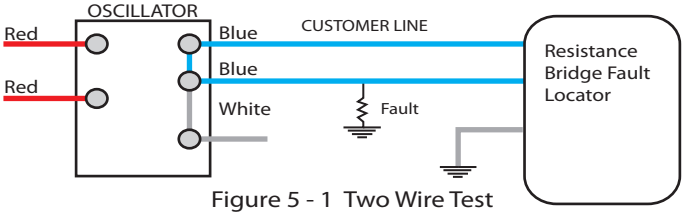


Figure 5 - 1 Two Wire Test

5.3.2 Three Wire Test

The Three Wire Method for resistance fault location is used when there is a "good" pair available in the cable and the other two wires of the "faulty" pair have fault resistance between them, or both have fault resistance to ground. If only one wire of the pair is faulty, the Two Wire Method can be used. The Three Wire test is performed as follows:

1. Connect the blue OSCILLATOR leads to a good pair and the White OSCILLATOR lead to one wire of the faulty pair.

2. Connect the PROBE's blue leads to the good pair at the Far End.

3. Press SHORT (WITH GROUND) to connect the Blue leads and White leads together.

4. Disconnect the PROBE and carry out fault location using a Resistance Bridge or TDR.

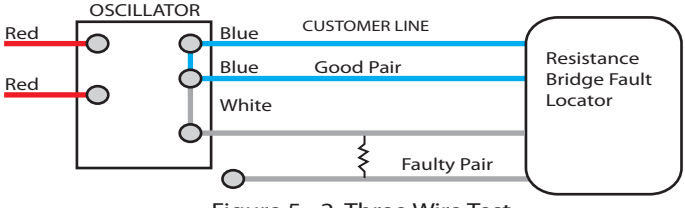


Figure 5 - 2 Three Wire Test

5.3.3 Pulse Echo Test (PET/TDR)

The SHORT / OPEN mode can be used to calibrate a PET (TDR) for length of line to the OSCILLATOR.

6. TECHNICAL SPECIFICATIONS

6.1 OSCILLATOR

- Battery 9V alkaline IEC6LR61.
- LED low battery indication.
- Short circuit detection, foreign battery reverse polarity on Blue test leads.
- Weight and dimensions: 110g, 240mm x 35mm x 25mm

Mode 1: Tone (Pair I/D)

- Tone output 1kHz-2kHz
- Selectable *warble (default), continous, two tone beeps repeating* and *three tone beeps repeating.*
- Enable/disable buzzer for short circuit and foreign battery reverse polarity detect
- Max consumption, line pair short circuited and buzzer enabled=8.80mA (70.5 hours, 580mAh battery)
- Tone output level into Line +9.1dBm into 600Ω (Ohm)
- Output impedance 600Ω (Ohm)

Mode 2: Open Circuit

- Current consumption approx. 0.75mA
- Resistance between terminals > 1GΩ (Ohm)
- Max open circuit voltage 500V dc
- Line Balance: 54pF (black clip-red clip), 58pF (black clip-ground plane), 72pF (red clip-ground plane)

Mode 3, Mode 4: Short Circuit (with or without ground)

- Current consumption approx. 0.75 mA
- Max short circuit current 2A
- Resistance between terminals, <0.30Ω (Ohm)

Mode 5: Connect Exchange

- Current consumption approx. 0.75mA

Mode 6: 600 ohm termination

- 600ohm cable pair termination, configuration for noise measurement.
- Current consumption approx. 0.75mA

6.2 PROBE

- Battery 9V alkaline IEC6LR61
- Low battery indication using low frequency beep
- Tone receiver, loudspeaker or earphone output (<2000Ω)
- High and low tone sensitivity settings
- Tone receiver mode automatically powers off after 2 minutes
- Max current consumption in tone receiving mode approx. 98mA
- Current consumption in other modes <1uA
- Green/Red LED shows exchange connected
- Weight and Dimensions: 130g, 200mm x 50mm x 28mm

7. SAFETY PRECAUTIONS

Disconnect earphones before connecting probe test leads to the line. Disconnect test leads before opening battery compartment.

Teletech Pty Ltd
61 Betula Ave,
P O Box 85, Vermont, VIC 3133, Australia

Tel: +61 3 9873 2777
Fax: +61 3 9873 5902
www.teletech.com.au