Radiodetection
Bicotest

T272

High Resistance Fault Locator

Operating Manual

Issue 4

Refer to Preface & Safety Instructions before operating

Applicable from serial no. 37888 onwards

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Contents

1. Health and Safety at Work 1
3. Technical Specification 2
4. Connections 2
Connections both ends available - 3
Operation 6

1. Health and Safety at Work

1.1 Health And Safety At Work Act 1974 Section 6.1 (c)

This product is tested and supplied in accordance with our published specifications and, when used in normal or prescribed applications within the parameters specified for mechanical and electrical performance, will not cause danger or hazard to health or safety, provided that normal engineering and safety practices are observed and such products are used only by trained and qualified persons.

All usage of this product must be in accordance with this Operating Manual and any work on the electrical components housed within the machine must be undertaken by qualified personnel.

If there is any doubt about any aspect relating to the correct use of this equipment contact Bicotest Technical Services Department at Delamare Road, Cheshunt, Hertfordshire EN8 9TG, England, or contact your local Bicotest agent.

Please also study the Product Safety Data Section 9 before using the equipment.

2. Introduction

This manual is a guide to the operation and maintenance of the High Resistance Fault Locator, Model T272. The instrument has been designed to meet the requirements of the cable testing and fault locating Engineer, to locate cable faults where the resistance ranges from zero to 200 MΩ. Faults can be between two conductors or between a conductor and its metallic sheath, concentric neutral, or earth.

Easy to operate, the T272 features solid state circuitry and utilises a conventional Wheatstone bridge circuit in which the two sections of the faulty conductor, one on each side of the fault, together with a good conductor if necessary, comprise the two external arms of the bridge. The other two arms of the bridge are contained within the instrument.

By employing a detection circuit of extremely high input resistance it is possible to locate high resistance faults without the loss of sensitivity associated with other types of low and high voltage bridges. A ten-turn Vernier balancing control is provided which indicates the fault position as a percentage of the total loop length. If both ends of the faulty conductor are not accessible at the test end then a good conductor of the same cross-sectional area is required. If the good conductor is of a different size then a conversion factor may be used to calculate an equivalent loop length, or a pair of healthy conductors may be used in which case the resistance is not critical.

3. Technical Specification

Power Supply for Instrument (Internal)	9 V battery, PP3 or equivalent
Power Supply for Bridge Network (External)	A DC source with output voltage to suit the cable under test must be provided, e.g. 6 or 12V car battery for power cables, or a zinc chloride battery for smaller cable sizes and telephone cables.
Size	155 x 245 x 102 mm
Weight	1.4 kg

The following leads are included to enable the fault locations detailed in section 4.1 and 4.2.1 to be carried out.

The Green lead is used to make the connection from the sheath terminal on the bridge. The two core Red lead is used to connect the faulty conductor to the 'Red' conductor terminal on the bridge and to one side of the "external" battery. The two core Black lead is used to connect the sound conductor to the 'Black' conductor terminal and the other side of the "external" battery.

With this bridge arrangement, faults having resistances up to 200 MΩ in dielectrics such as rubber and polyethylene can be located with an accuracy well within +0.5% of the loop length and typically 0.1% although this may be limited by the non-uniformity of the conductor. The instrument is contained within a plastic housing fitted with a carrying strap. terminals, controls, and the null detector (micro ammeter) are mounted on the top panel.

4. Connections

WARNING Do not connect this instrument to a live or charged cable. Ensure that the cable to be tested has been completely discharged and earthed and that all normal safety procedures have been followed. To prevent "post - charging", such as may take place after a DC voltage or insulation resistance test, ensure that the cable has been earthed for an adequate length of time before connecting the instrument.

4.1 Connections to a faulty cable on a drum or ring circuit

In this scenario both ends of the faulty conductor are accessible at the test end. This is the case during cable manufacture or when the cable is on a cable drum, or forms a "ring" circuit.

The following connection arrangements should be made (see figures 1 and 2).

4.1.1 Prepare the cable ends by stripping back the sheath at least 150 mm from each end. Expose at least 100 mm of conductor and clean to remove oil and other impurities. In the case of smaller cable sizes and telephone cable these dimensions may be scaled down.

4.1.2 The leads provided (Red and Black) are terminated at one end with crocodile clips on both conductors, and at the other end with a 4 mm "Banana" plug on one conductor and a crimp connector on the other.

Connect both crocodile clips from the Red lead to the cable conductor at one end, connect both crocodile clips from the Black lead to the other end of the cable conductor. Connect the 4 mm connectors to the Red and Black CONDUCTOR terminals on the T272.

For use of the guard terminal see section 6.1.

4.1.3 Connect the crocodile clip of the Green/Yellow lead to the cable sheath, and the 4 mm connector on this lead to the SHEATH terminal on the bridge. If the fault is not to the metallic sheath but to another conductor, then connect the crocodile clip to this conductor, and earth it if necessary.

4.1.4 Connect one of the crimp connectors to a suitable battery (see section 5.4). If the cable resistance is very low it may be advisable to limit the bridge network current by connecting a suitable resistance in series with this lead, e.g. a 1 Ω 100 W resistor will limit the current from a 12 V battery to 12 A which should give adequate sensitivity. Connect the second battery lead as indicated in section 5.

Connections both ends available -

e.g. cable drum or ring circuit

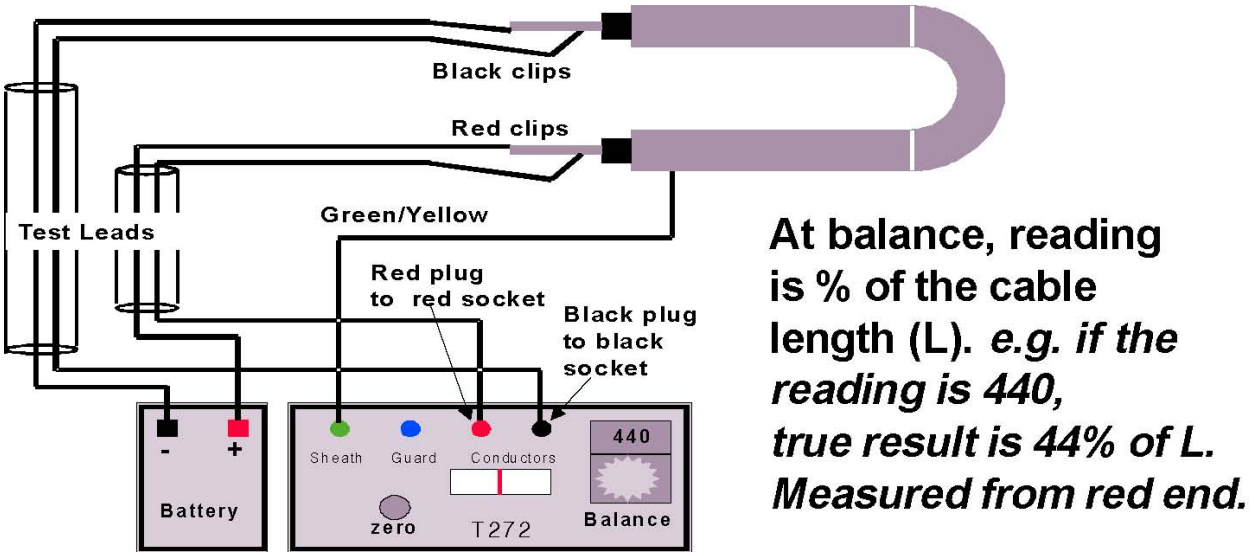

Figure 1 – Fault to sheath, both cable ends accessible at test end

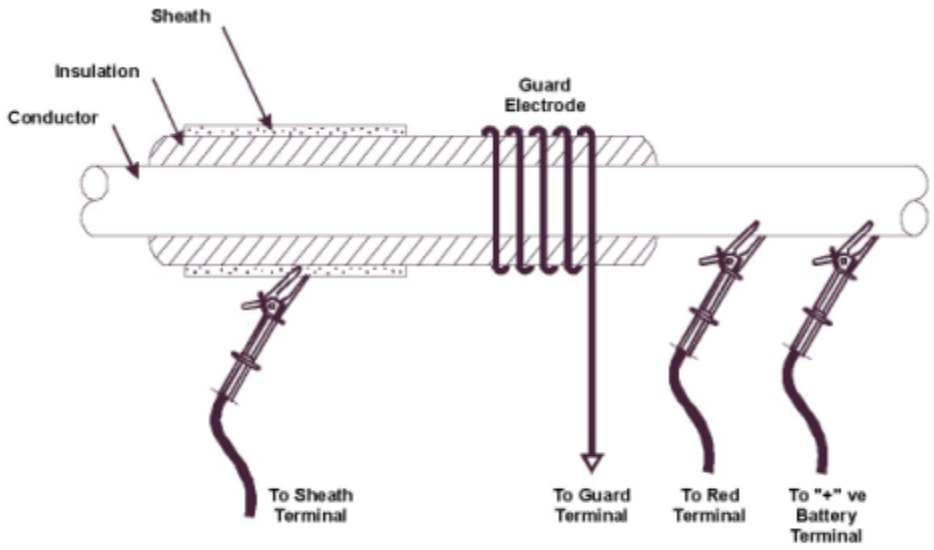

Figure 2 – Connections when using guard terminal (see section 6.1)

4.2 Connections to a faulty installed cable

In this scenario the ends of the faulty conductor are not accessible at the same point. This would be the case of a cable in service. One of the following methods may be used.

4.2.1 The more common method is to use a good conductor in the cable (**Murray loop**). The insulation resistance of the good conductor should be at least one hundred times that of the faulty conductor. Connect the good conductor and the faulty conductor solidly together at the far end. Note that the resistance of this connection is included in the cable loop resistance and may thus introduce errors. It should therefore be as low a resistance as possible and of the same order of size as the conductor itself. It should also be adequately insulated from earth. Make connection at the near end as shown in figure 3 (faulty conductor to Red conductor terminal), but initially only connect one side of the battery. This method effectively doubles the length of the faulty conductor.

4.2.2 In the situation where there is no sound return conductor (i.e. all phases damaged), there are 3 options: **i)** If another cable of the same cross-sectional area, which follows the same route is available then it may be used to carry out the test detailed in 4.2.1 above. **ii)** If an auxiliary pilot or telephone cable links the two substations in which the faulty cable is terminated, two conductors from this cable can be used to carry out a **Hilborn loop** test, or the feeder conductors may be used to locate a fault on the pilot or telephone cable. **iii)** If the cable length is not too great then a two core cable can be run between the two ends of the faulty cable to enable a **Hilborn loop** test to be carried out.