WILCOM MODEL T124
SHIELD CONTINUITY TEST SET
DESCRIPTION AND USE

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1. GENERAL

1.01 This section describes the Model T124 Shield Continuity Test Set and the procedures to follow in locating and analyzing cable shield continuity faults. The set may also be used for making a study of the quality of bond and ground connections at a variety of locations including cable vaults, manholes, cross-connect boxes, pedestals, aerial cable, and supporting strands, or at any point of ready access to splices or ground connections.

1.02 The T124 consists of two probes and a measuring set which has a range of measurement for the signal levels normally existing on the cable shield with respect to ground.

1.03 The terms bonding, grounding, and shield continuity are frequently used interchangeably. For the purpose of this practice the following definitions are applied.

(a) Bonding—Applying this definition to telephone plant, it means the interconnecting of two or more strands, two or more cables or between strand and cable which are not intended to carry transmission.

(b) Grounding—Is the connection by which an electrical circuit or equipment is connected to earth or a conducting structure that serves in place of earth.

(c) Shield Continuity—Is the maintaining of a conductive path across an opening in the cable sheath. Shield continuity across sheath openings is maintained through the use of lead sleeves, splice cases, bonding ribbon, wire, or tie bars.

Objectives

1.04 Cable shield continuity is essential to provide shielding and protection on telephone cables. Any breakdown in shield continuity between sections of cable that are joined together, or from cracks or breaks in a span of the cable shield, can contribute to a significant increase in noise on telephone circuits, or to a breakdown in protection against lightning or power system voltage surges.

2. PRECAUTIONS

2.01 ***Caution must be exercised when making tests so that contact is not made with any high voltage lines. Do not use tree pruner extensions or similar type lay-up sticks with the probes.***

2.02 Before entering manholes, they shall be tested and ventilated as prescribed in Section 620-140-501.

3. PRINCIPLE OF OPERATION

3.01 All cable shields have some ac voltage with respect to ground, usually induced from a power line. This voltage is dependent on a number of factors including the exposure, continuity of shielding, and the location of ground connections on the shield. When shield continuity between two sections of cable which are spliced together is good, the same voltage to ground will be observed on both sides of the splice. However, if the sheath is open or has a high resistance connection, different voltages will appear on both sides of the splice. Different voltages will also be observed between two points on a shield or across a splice if current is flowing in the shield; these differential voltages will vary with the resistance of the path. Consequently, if a high resistance connection has developed, the voltage drop will be higher at this point than across a similar span of a continuous shield.

3.02 Conventional voltmeters cannot be used to detect the differences in potential that will show the degree of continuity or connection under study, as in most cases this difference is small and a differential voltmeter is required to detect the significant voltage differences between two points. In addition, conventional meters require making contact with the shield to make a measurement and this is impracticable and undesirable in cable studies. The T124 measures the differential voltage as well as the voltage to ground, utilizing probes that can be coupled to the cable shield and which do not require physical contact with the shield.

3.03 The technique of determining shield continuity with the T124 requires making a reference measurement across a short span of cable at one side of a splice and comparing this measurement with one made across the splice. If the two measurements are equal, continuity across the splice is good; if higher readings exist across the splice, the continuity is not good. Techniques are described herein for making the measurements required for analyzing a variety of conditions, and examples of the types of faults which exist and can be detected are reviewed.

4. DESCRIPTION

4.01 The T124 (Fig. 1) consists of the following items:

(a) Probes (2) attached to a cable for connection to the measuring set

(b) Measuring set

(c) Extension cable for probes

(d) Ground wire

(e) Cross-bar for supporting probes.

Probes

4.02 The probe assembly consists of a pickup electrode and electronic impedance converting circuit. Noise signals existing on the cable shield are capacitively coupled, through the cable insulation, to the pickup electrode. Each probe is labeled A or B to identify the probe when A to GRD and B to GRD measurements are made.

Measuring Set

4.03 The signals from the two probes are connected through a KEY switch to an input transformer. The difference between the voltages picked up by each probe will be measured when the KEY switch is in the A to B position. When the KEY switch is in the A to GRD or the B to GND position, the voltage picked up by each probe with respect to ground may be measured.

4.04 When the probes are applied to the cable with the LEVEL switch in the 0 position, and the KEY switch in either the A to GND or the B to GND position, a signal level of 1 volt on the shield with respect to ground will give a reading of 0 on the meter. If the signal exceeds 20 dBv, which can be measured by setting the LEVEL switch at +20, the probe amplifier will overload and the measuring capabilities of the set will be exceeded. Levels of this magnitude are rarely observed and are usually an indication of trouble on the cable.

5. ASSEMBLY OF EQUIPMENT AND USE OF PROBES

5.01 The probes may be used in various ways depending upon the access to the splice or connection to be checked. Each probe is mounted on two brackets which in turn are mounted on a short fiberglass rod, which is equipped with clamps for mounting on a 4-foot section of fiberglass rod

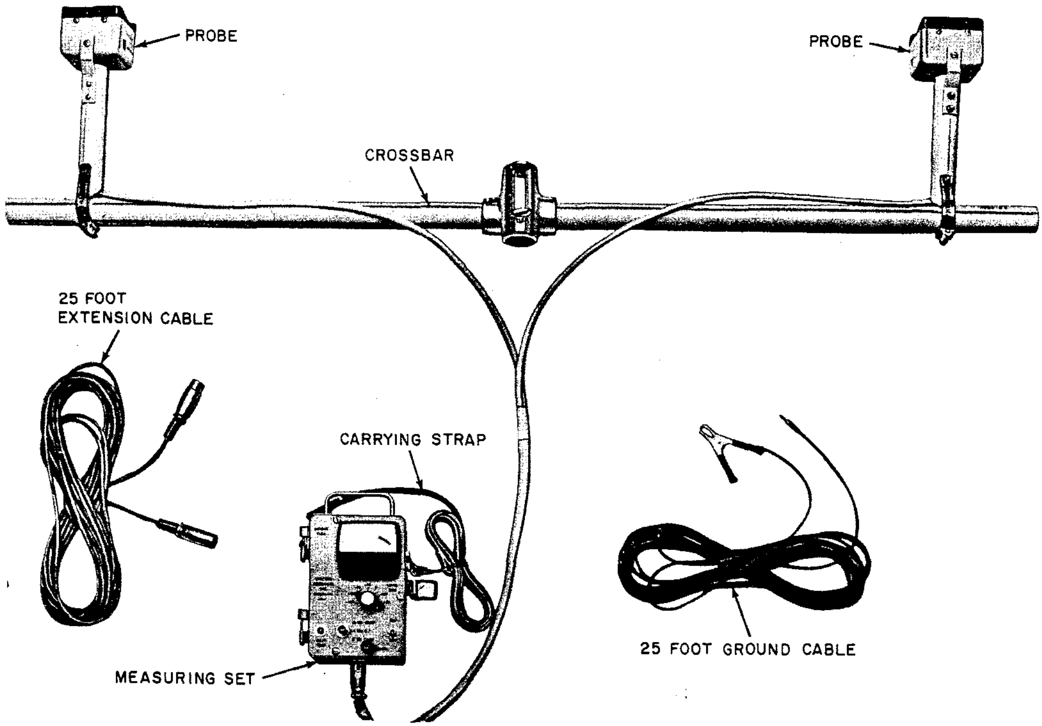

Fig. 1—T124 Test Set

called a cross-bar. Quick disconnect fasteners hold the probes to the mounting brackets; these provide means for pivoting the probes to align them with the axis of the cable under test, and for removing the probes from the brackets for use in restricted spaces.

Hand Held Applications

5.02 Insert the connector at the end of the cable from the probes in the measuring set.

5.03 When the probes are hand-held by their supporting sticks, care should be exercised to apply them over a span which permits applying uniform pressure to the probes. If the arms are stretched too far or if awkward positions are used, the probes cannot be held steadily and erratic readings can result. Excessive pressure may also cause unsteady handling of the probes and result in unstable readings. When the probes are applied with uniform light steady pressure, fairly stable readings should be noted. If instability occurs when the probes are properly applied, faulty conditions may exist.

> *Note:* To free the craftsmen of holding the probes against the cable while operating the measuring set, it is recommended that at least one and possibly both probes be temporarily attached to the cable under test.

5.04 The probes may be mounted on the cross-bar and the cross-bar assembly may then be used to apply the probes to the cable. The probes should be spaced sufficiently to span the splice to be evaluated. Be sure the cable to the probe fits into the slot on the bottom of the rod holding the probe when mounting on the cross-bar.

5.05 When continuity in pedestals is checked, it may not be possible to apply the probes to the cables with the supporting rods due to restricted space, particularly in smaller pedestals. The probes are mounted to short rods with quick disconnect type fasteners which can be released to free the probes from the short rods. Turn each large screw head 90 degrees and pull the brackets away from the case; the probes are then free and can readily be applied to the cables in the pedestal by hand. After tests are completed remount the probes to the short rods by inserting the studs in the two large holes and turning them 90 degrees until they lock in place and the probes can once again be pivoted.

Aerial Applications

5.06 ***It is recommended that aerial cables be checked by the hand-held method from a ladder or bucket truck. The use of tree pruner extension sections (layup sticks) is not recommended because the instrumentation has made electrical fusing or protection to the craftsmen impossible. Hazardous conditions resulting from proximity to power circuits presents too great a risk.***

5.07 When a ladder or bucket truck is used the probes may be hand-held or used on the cross-bar as described in 5.04. If the cross-bar is used, a short section of 1 1/4 inch lay-up stick may be inserted in the vertical portion of the cross shaped fixture mounted on the cross-bar. The vertical section may be extended beyond the cross-bar so this extension can be used to rest the assembly on the cable and serve as a support to facilitate guiding the probes to the cable. The measuring set may also be mounted on vertical section with the clamps supplied with the T124 to facilitate reading the meter while holding the probes in place. If the measuring set is to be used by somebody on the ground, the 25-foot extension cable should be connected between the probe cable and the measuring set.

5.08 When the probes are applied to the cable it is important to have the cable fit into the V of the probe in such a way that the probes are steady and the cable makes uniform contact with both sides of the V.

5.09 The probes are pivoted to facilitate lining them up with the slope of the axis of a suspended cable when it leaves a closure. However, in some instances this angle may be greater than the maximum angular movement of the probe; in such cases it may be necessary to apply the probes by hand to maintain uniform contact over the length of the probe. Unless each probe is firmly pressed against the cable over the length of the probe there will be differences in the voltage picked up by each probe; this will result in incorrect readings on the meter.

> ***Note:*** If a defect is indicated by a measurement, make several additional checks to be sure that the probes have been properly seated and their position does not affect results. Be sure that the probes are applied directly to the cable so that they ***do not*** come in contact with the strand, wire wrapped supports, or clamps. Supporting wires and the strand can carry currents which will affect measurements.

6. TEST PROCEDURE

6.01 A systematic procedure is recommended for analyzing and correcting sheath continuity faults rather than haphazardly selecting seemingly potential trouble spots and making random repairs to a cable. Major continuity problems may be found in splices and on bonding and grounding connections in cable vaults in central offices. These may have a bearing on both noise and protection problems. Grounding of aerial cables and cable supporting strands varies considerably from location to location. With the cumulative effects of a variety of conditions, there is no certainty as to how much effect each fault will have on noise. In some cases a cumulative effect may be observed as each continuity fault is repaired, but in a good many cases little effect is observed until the last fault is corrected and then a reduction in noise may be noted.

6.02 It is recommended that tests on a cable be started in the cable vault of the central office to be sure that all the cable shield is carried across splices, all ground connections are in good condition, and all cable shields are bonded as required for protection purposes.

6.03 After all defects in shield continuity bonding and grounding have been corrected in the cable vault, tests may start at the first manhole or aerial splice and then all succeeding splices should be checked in sequence until the end of the cable is reached. All defects should be corrected when they are located. If faults are not corrected, misleading data can result when tests are made through a series of defects. If a number of lateral cables are connected to the main cable, they should also be tested as they can introduce noise in the