

SUBSCRIBER'S LINE INSULATION TESTS

1. GENERAL

1.01 This section describes general methods of making Subscriber's Line Insulation Tests. This data is applicable to all types of L.I.T. sets. Specific instructions covering the several types of Test Sets is covered in the Appendices to this section. Instructions covering the (ST-627579) H-297-421 Test Set and Test Set per 105-10-1054 are covered in A204.426. The standard No. 1 and No. 5 Crossbar Test Sets are covered in A272.561 and A275.561 section.

2. OBJECTIVES

2.01 In general, the objectives of Subscriber's Line Insulation Testing and its follow-through are to improve service and maintain the telephone plant in serviceable condition at minimum cost. These objectives are attained through subscriber line insulation testing by:

- (a) Detecting and clearing faults before they interfere with service.
- (b) Obtaining maximum service life from plant by replacing deteriorated plant on the basis of electrical test indications.
- (c) Spreading the maintenance load and thereby reducing the number of reported troubles which have to be located and cleared during peak load periods and frequently on an overtime basis.

3. TYPES AND RANGES OF LINE INSULATION TESTS

3.01 Rapid subscriber's line insulation tests consist of the following three general types as determined by the class of plant to which each test is primarily directed. (Each type of test may indicate some troubles in all classes of plant.)

- W (a) Short Circuit - Drop Wire and Open Wire
- H (b) Short Circuit and Ring Ground (SC-RG) Inside Wire and Station Equipment.
- W (c) Tip Ground (TG-RG) Terminal Face Plate Leakage
- D (d) FEMF (Crossed Battery) Cable Trouble

3.02 Each type of test is further associated as follows, with an atmospheric or weather condition under which maximum opportunity exists for detecting trouble in the class of plant to which the test is primarily directed.

- (a) Wet Weather - Drop Wire and Open Wire
Wet Weather - Face Plate Leakage

(b) Humid Weather - Inside Wire and Station Equipment

(c) Dry Weather - Cable

3.03 The flexibility required to adapt these tests to the varying conditions such as may be imposed by the weather, available force, etc., is provided by various ranges of insulation test values available in test sets. These test ranges, together with instructions for setting them up are covered in the appendix covering the particular type of test set in use.

3.04 Short circuit tests used primarily to detect trouble in drop wire and open wire are made during, or immediately following, rain of one hour minimum duration. Generally, test values in the A Range are employed. During periods of little rainfall, short circuit tests to detect trouble in these types of plant may also be successfully made at test values in the B Range.

3.05 Short circuit and ground tests used primarily to detect trouble in inside wire and station equipment are generally made in the A or B Ranges during periods when the relative humidity is high and houses are either not heated or are heated occasionally with open flame devices.

3.06 Foreign EMF tests used primarily to detect trouble in cable are generally made in either the C or D Range during dry weather when indications of cable trouble are least likely to be masked by indications of trouble in associated plant.

3.07 Short circuit and ground tests used to detect trouble in cable are generally made during dry weather in the B or C Ranges.

3.08 Positive indications of cable trouble may also be picked up on short circuit and short circuit and ground tests during wet or humid weather. Similarly, positive indications of trouble in the wire plant and in station equipment can be picked up as a by-product on tests which are not primarily directed to these types of plant and equipment.

3.09 On short circuit tests directed primarily at drop wire, both open wire and drop wire trouble will be detected. Similarly, open wire and cable trouble will be detected on foreign EMF tests and on short circuit and ground tests in dry weather, both of which are directed primarily at cable trouble. In order to avoid the confusing presence of open wire indications in these tests, the C.O. terminations of circuits which include open wire should be insulated until troubles in drop wire and cable are brought under control. Short circuit tests can then be made which are directed primarily at open wire.

3.10 Tip Ground tests are made during wet weather primarily to detect Terminal Face Plate leakage. This leakage will mask all types of trouble. By comparing the Tip Ground indications with the FEMF indications it will be possible to determine which of the FEMF indications point to incipient cable troubles.

4. FREQUENCY AND EXTENT OF TESTS

4.01 The frequency and extent of subscriber line insulation tests should be determined jointly by the central office, test center, line and station repair and cable repair force supervisors.

4.02 No single plan will apply under all conditions and the schedule adopted for each locality should be based largely on current trouble experience, atmospheric conditions and available manpower. However, the following factors should be considered:

- (a) Frequent cycles of short circuit tests will make available for current dispatching the most advanced cases of wire deterioration, thus reducing the possibility of subscriber reports from this source.

On short circuit tests during wet and humid weather, it would appear that the greatest advantage will be obtained by making a complete cycle of the office at each test.

- (b) Frequent cycles of foreign EMF tests should disclose many of the defects currently developing in cable sheath before the insulation on associated pairs deteriorates into a condition of service failure.

The C.O. terminals at which tests are made are connected to pairs scattered at random throughout the cables. Because of this, frequent, partial cycles of tests have been found more effective than infrequent, complete cycles in detecting imminent cable failures during average conditions of temperature change and relative humidity. These frequent, partial cycles also tend to level out the test and verification loads on the central office and test center forces.

- (c) Frequent cycles will reduce the omissions due to busy lines and also the requirements of special tests and associated records for rechecking lines on which trouble is indicated but which is not located and cleared on the first attempt.

4.03 The several operating ranges available in the test set provide a positive means of controlling the number of test indications recorded, processed and investigated by the central office, test center and outside plant forces. For a specific test, the operating range used should be determined by the ratio of test indications picked up on the first several hundred or so terminals covered. This ratio should be established jointly by the central office, test center and outside repair force supervisors and should be predicated largely on available manpower. Other factors influencing the number of items picked up on test and the test range finally selected are as follows:

- (a) Severity of moisture condition at time of test.
- (b) Time interval between moisture conditions.
- (c) Frequency of testing.
- (d) Condition of outside plant (trouble rate).
- (e) Available testing equipment.

4.04 On short circuit and short circuit and ground tests for drop wire, inside wire and station set trouble, limits imposed by the line and station repair force may in some instances make it advisable for the test bureau to request the central office force to record only red, or red and yellow test indications to keep the number of lines to be processed to a workable minimum.

4.05 There is very little value in detecting, recording and processing low insulation test indications which can not be investigated and the trouble cleared before these indications are again picked up on subsequent test cycles.

4.06 On foreign EMF tests and also on short circuit and ground tests during dry weather, a minimum coverage of one cycle weekly might be considered, with an average of 1/5 of the lines covered on five consecutive days. Good results are obtained by testing during and following drops in temperature which are accompanied by high relative humidity. During such periods, the air inside the cables is contracting and outside air is being drawn in through any sheath openings that exist. These combinations of temperature and humidity exist most frequently during the early morning hours.

5. RECORDING LINE INSULATION TEST DATASubscriber Line Insulation Test Record
(Form E-3826)

5.01 A facsimile of this form is attached.

It is 8-3/8" x 10-7/8" in size and printed on durable paper. It is designed for filing in a suitable binder along with associated copies of the Subscriber Line Insulation Analysis Sheet (Form E-3828). It is expected that these record forms will be considered active until all of the verified test indications are cleared, have disappeared, are found OK or are abandoned. These forms will then be used in preparing the "Subscriber Line Insulation Test Results Summary" (GP-71).

5.02 Record in the spaces at the top of this form general information relating to the test and in Column B to E, inclusive, the details of the test.

5.03 The Form E-3826 covering each cycle of test should be promptly forwarded to the Plant Service Center for processing.

