NO. 73A TEST SET
DESCRIPTION

1. GENERAL

1.01 This section describes the portable No. 73A test set consisting of a variable ratio transformer to be used in conjunction with standard transmission measuring apparatus for making tests of electrolytic condensers or measuring low resistances.

1.02 Section 032-110-501 gives detailed methods of conducting the tests and making connections to electrolytic condensers.

1.03 Electrolytic condensers deteriorate slowly with age which results in an increase of internal a-c impedance and therefore checks to determine if this impedance is within specified limits are required.

1.04 Electrolytic condensers being generally of large capacitance (low a-c impedance) cause transmission losses which are beyond the range of standard transmission measuring sets. The No. 73A test set provides a means by which the low impedance of these condensers can be measured by the bridging method using a standard transmission measuring set such as the No. 12A.

1.05 Low resistance apparatus such as fuses can also be measured with the aid of the No. 73A set. It should be noted, however, that in the use of this set for measuring loss due to contact resistance, the value of the resistance being measured may be affected by the a-c testing current used in these tests. For example, the 1000-cycle current through a 1-ohm resistance will be about 20 ma and through 0.1 ohm, which represents a value in the range of contact resistance, it will be about 40 ma, which may be sufficient to clear out a bad contact.

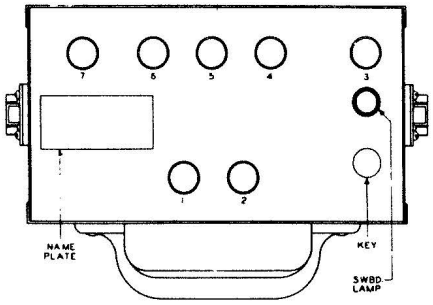

Fig. 1 - Face View of Set

1.06 The test set, illustrated in Fig. 1, is equipped with binding posts for making the test connections. The test cords which are provided for connecting the set to the condenser or other apparatus to be tested should always be used since these cords are designed with the necessary low resistance for this purpose. It is important to observe the precautions in 3.03 when using the set to avoid damage to it or to the fuses in the circuit under test. Usually a condenser must be disconnected from the circuit before testing. It is particularly important to discharge condensers which are used in battery supply circuits before connection is made to the test set. This should be done in accordance with Section 032-110-501.

2. TESTING PRINCIPLES

2.01 As illustrated in Fig. 2, the No. 73A test set consists of a transformer which steps up the impedance of the condenser under test to values within which bridged transmission loss tests can be made with the No. 12A transmission measuring set. For example, when employing an impedance ratio of 500:1, the loss due to a condenser of about 1 ohm impedance will be about 4 db instead of 50 db which would result if the condenser were connected directly to the transmission measuring circuit without the coil of the No. 73A test set.

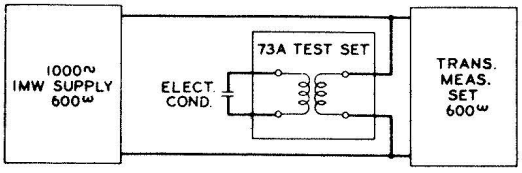

Fig. 2 - Schematic of Testing Circuit

2.02 The transmission loss of an electrolytic condenser decreases as the condenser deteriorates. The rejection limits for a condenser are determined by circuit conditions and different limits may be found for different applications of the same condenser.

3. DESCRIPTION

Assembly

3.01 The No. 73A test set consists of a variable ratio transformer, a non-locking key, a switchboard signal lamp and 7 binding posts assembled on a steel panel. This assembly is housed in an aluminum finished metal

box provided with a cover and carrying handle. Two test cords are provided for connecting the set to the apparatus under test. These can be stored under the cover. The set is 7-1/2" long, 5-1/4" wide and 5-3/8" high, including the cover, the hardware and the handle. Its total weight is about 7 pounds. A face view of the set without cover or test cords is shown in Fig. 1.

Circuit

3.02 A schematic of the circuit of the test set is shown in Fig. 3. It will be noted that a lamp is connected in series between the transformer and terminal 3 of the set and that a key is provided to short-circuit the lamp. Their functions are explained below.

Lamp

3.03 The lamp is provided to give a steady light as a warning when the low impedance of the set is bridged between a battery supply voltage and ground. When lighted, the lamp should not be short-circuited by operating the key since this might burn out the set or operate a fuse. The lamp must be short-circuited during measurements but this should be done by operating the key only when the lamp is not lighted. The lamp also provides a safe discharge path for voltages up to about 60 volts on condensers used in battery supply circuits. A burned out lamp should be replaced since with an open circuit the set would not provide either a discharge path or a warning when battery voltage is present.

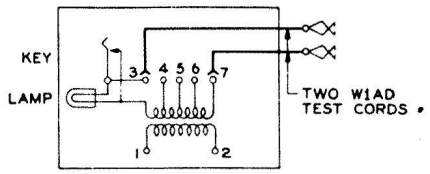

Fig. 3 - Schematic Circuit of No. 73A Test Set

Key

3.04 The key is provided for the purpose of short-circuiting the lamp while a measurement is being made. It is a non-locking key to minimize the chance of short-circuiting the lamp while test connections are being established. Multipled contacts (not illustrated) are provided on the key to obtain low contact resistance.

Test Connections

3.05 The W1AD test cords which include clips are provided with the set for making connections to condenser or circuit terminals. The clips provide a means for making good contacts with terminals normally encountered in the plant. The resistance of the cords (about .02 ohm each) is held to close tolerances in order to permit setting satisfactory test limits. The resistance of the test connections between the No. 73A set and the transmission measuring circuit is relatively unimportant, 1

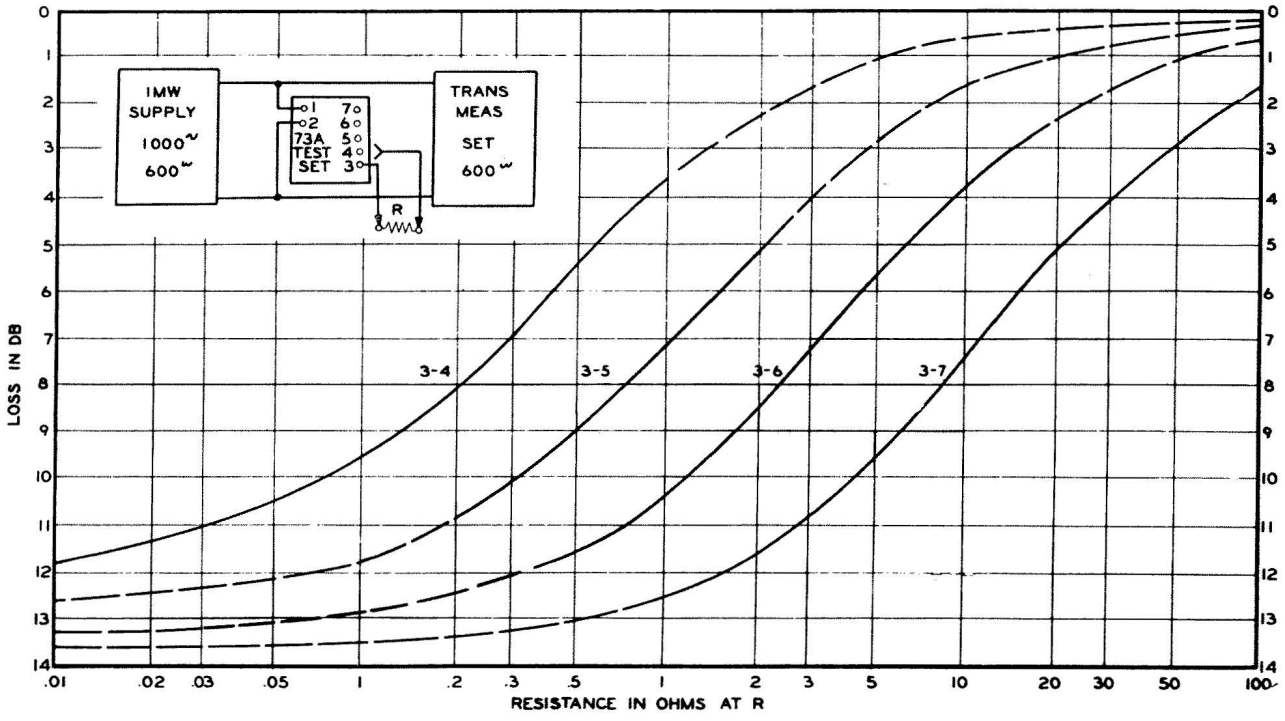

Fig. 4 - Typical Resistance Loss Curves

ohm causing less than .1 db error for an extreme case.

Transformer

3.06 The transformer used in the set is a No. 94R repeating coil which provides impedance ratios of 15, 50, 150 and 500 to 1. The primary or high impedance winding of the transformer causes a bridged loss across a 600-ohm measuring circuit of less than .2 db when the low side is open-circuited. With the four available transformer ratios any low impedance can be connected to give a loss which is less than 15 db. As an extreme case, a short circuit by means of the test clips with the leads connected to terminals 3 and 4 results in an impedance in the primary circuit of about 100 ohms. This is due to the resistance of the transformer winding, the test leads, and the wiring of the set and results in a loss of 12 ± .5 db. A measurement of this is a satisfactory check of the test connections. Other values of impedance between a short circuit and about 100 ohms when connected to the secondary or low impedance winding cause losses which vary in a non-uniform manner as illustrated in Fig. 4. Precise curves for a particular set can be obtained for resistance by measurements in the manner indicated by the sketch. Electrolytic condensers, however, have impedances which vary in phase angle due to structural conditions, thus making a similar set of curves in terms of capacitance or impedance of questionable value.

Use of Set on Ladders

3.07 Where it is desired to strap the No. 73A to a ladder step, any leather strap about 1/2 inch wide and at least 2 feet long with a buckle on one end may be used. A book or skate strap obtained locally would be suitable. The strap may be buckled around the set and ladder step in such a way that it passes through the handle opening and over the top of the set between the 1 and 2 and 5 and 6 binding posts. The strap may be drawn up moderately tight so that the buckle then falls at the back side of the set opposite the handle.