

**BELL SYSTEM PRACTICES**  
**Outside Plant Construction**  
**and Maintenance**

**ADDENDUM G72.226**  
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## **CABLE TESTING**

### **ADJUSTABLE BALANCING CONDENSERS FOR REDUCING CROSSTALK IN TOLL ENTRANCE AND TOLL CABLE CIRCUITS**

#### **1. GENERAL**

1.01 This addendum describes the three adjustable condensers which have been made available for reducing crosstalk between those pairs in non-loaded entrance cables of the paper-insulated type over which type J carrier systems are to be routed. The condensers are designed for installation in the D-156618 cable terminal which is described in other information.

1.02 These condensers may also be used for crosstalk reduction at voice frequencies in toll cable circuits and replace the 200 type for this purpose.

#### **2. DESCRIPTION**

2.01 Each of the three condensers consists of a small ceramic spool (approximately 1-3/4" long and 7/16" in diameter) on which is wound a parallel pair of 31-gauge enameled, double silk covered wires. As shown on the right of Fig. 1, two 18-inch twisted flexible leads are provided which are connected to the inner ends of the windings, to facilitate installation of the condensers. The bore of the spool is threaded at that end at which the flexible leads are attached. By means of this threaded section the condensers can be screwed onto the threaded metal pins provided in the D-156618 cable terminal. The condensers are covered with a wrapping of muslin, the loose end of which is tied down with waxed linen thread.

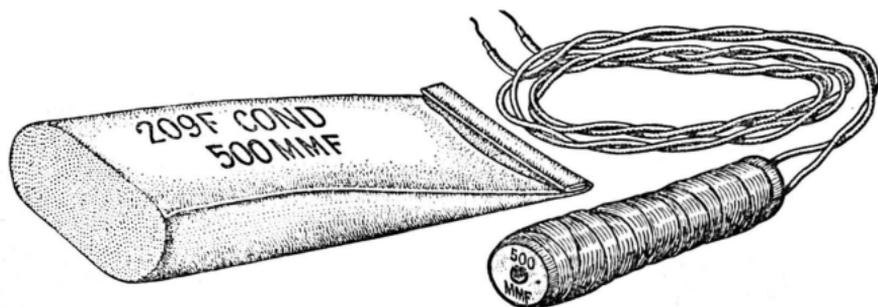


Fig. 1

2.02 A mineral wax having a relatively high temperature melting point is used for factory impregnation of the condensers. After factory impregnation each condenser is sealed in an air-tight lead container, as shown on the left of Fig. 1, about 3" high, 1-7/32" wide and 11/16" thick. The purpose of the container is to protect the condenser against moisture and mechanical damage during shipment and while in storage prior to field use. Before sealing the container a small amount of desiccant is placed in it for absorbing any moisture that the condensers may have absorbed subsequent to impregnation and prior to sealing.

### 3. ELECTRICAL CHARACTERISTICS

3.01 The three condensers differ from each other only in the number of turns of the two wires that are applied to the spools and, therefore, in the total capacitance of the condensers. The capacitance of the 18" twisted leads is about 20 mmf. Allowance must be made for this capacitance when the condensers are to be installed with leads shorter than 18". The capacitance of the leads is negligible when the condensers are installed in the D-156618 cable terminal since the length of lead used is about 1" of untwisted wire. The capacitances of the condensers with 18" leads and with 1" leads are given in the following table. The latter values should be used as a basis for determining the condensers required for a particular D-156618 cable terminal installation. The capacitance values marked on the condenser spool heads and on the metal shipping containers are the minimum capacitances with 18" leads.

**Capacitance (MMF)**

Condenser	18" Leads		1" Leads	
	Min.	Max.	Min.	Max.
209D	70	100	50	80
209E	150	200	130	180
209F	500	650	480	630

3.02 The ceramic spools on which the conductors are wound are divided into four sections longitudinally by means of circumferential separators. The turns of wires are applied to the spools in such manner that approximately one-quarter of the total capacitance is supplied by each section. As a rough approximation the removal of one complete turn of the two wires should reduce the capacitance by about 2 to 3 mmf.

3.03 The coupling introduced between two circuits by the use of the condensers is practically all due to the capacitance of the unit since the conductance has been kept small by design.

3.04 The insulation resistance at 68° F. between the wires of the condensers when dry is at least 500 megohms. The insulation as tested at the factory must withstand a breakdown voltage of at least 1000 volts A-C.

**4. ADJUSTMENT OF CONDENSERS**

4.01 To prevent the penetration of moisture the condensers should not be removed from the lead tube containers until they are to be adjusted. If the progress of the work is such that condensers are adjusted at a faster rate than they are installed, they should be placed in a container with desiccant, such as the tube from which they have been removed. When the lead tubes are no longer required for such purpose they may be discarded.

4.02 These condensers **should not be boiled out** in the field before or after installation because such boiling out might result in changes in capacitance of undesirable magnitude, particularly if the condensers were later exposed to relatively high temperatures. To absorb the moisture which may collect on the condensers during adjustment and installation, desiccant should be placed in the housing that will contain the condensers.

4.03 To adjust the condensers to the required value it is necessary to cut the waxed linen thread which ties down the muslin wrapping, remove the muslin wrapping and unwind the condenser wires until the desired capacitance value is obtained, cutting off the excess length of wire. Before making the adjustment the flexible leads on the condenser should be cut to the length which will be required for installation and the two wires of the leads either kept twisted or separated in accordance with the installation procedure to be used.

4.04 When adjusting the condenser, allowance should be made for the fact that the capacitance may be increased when the ends of the wires are taped down in the following manner. One of the wires should be cut 1/4" shorter than the other so that there will be no danger of short-circuiting. Raise the outer ends of the wires and place one end of a 3" piece of 1/4" friction tape under them, then wrap the tape around the spool so that the ends of the wires will be covered. After the taping operation a check should be made to be certain that the capacitance has not been unduly changed. If it has, the adjustment and taping procedures should be repeated until the desired capacitance is obtained.

4.05 It is expected of course, that the 209D condenser will be used wherever capacitances smaller than about 50 mmf are required, the 209E condenser for capacitances ranging from 50 to 130 mmf and the 209F condenser for capacitances between 130 mmf and about 500 mmf. The minimum capacitance to which these condensers can be adjusted is about 2 mmf due to the capacitance inherent in the method of attaching the flexible leads to the condenser and holding them in position.