# EXPANSION OF EXISTING DIAL CENTRAL OFFICE SWITCHBOARDS

**Purpose:** The purpose of this addendum is to show that service may be extended beyond a nominal 1500-ohm (including the telephone set) loop from the central office without long line adapters provided the outside plant is predominately buried. A further extension may be obtained if standby auxiliary power equipment with automatic controls is provided to hold the central office voltage at the float value of 51 to 52 volts in case of commercial power failure.

**Additions:** 9.6 The capability of most 1500-ohm switchboards will be increased to 1700 ohms, a gain of 200 ohms, if the outside plant is predominately buried. The buried plant is not subjected to the extreme variations in temperature as is aerial cable and will be maintained more nearly at the nominal resistance shown in the 68°F. tables. A result can be the use of finer gauge cables at less cost. If the outside plant is part buried and part aerial, for example, 50 percent of each, the gain is proportionately less. (See Figure 1 for mixed aerial and buried plant). If the mixed aerial and buried plant has 10 percent or less of its total resistance above ground, the plant can be considered 100 percent buried.

9.7 A further gain of 200 ohms to a 1900 ohms capability with buried plant can be realized if a standby power source with automatic controls is installed to carry the office load at the float voltage of 51 to 52 volts in case of failure of the commercial power. The standby power source may be a motor generator, or counter cells, or end cells in the central office battery. Two chargers, either of which has the capacity to carry the full load, or as an alternative, two smaller chargers with a combined capacity to carry the full load, are recommended for use with the standby power to maintain a charge on the battery. Refer to TE & CM-325, "Application Guide for the Preparation of Detail Dial Central Office Equipment Requirements," and TE & CM-320, "Emergency Generating and Charging Equipment," for detailed information.

9.8 Caution must be exercised in coordinating various types of interoffice trunks with the intraoffice switching equipment to make sure the extended range is available. The use of certain interoffice trunks such as some types of loop dial carrier, or special DDD trunks, may limit the subscriber loops to lower values than those described in this addendum.

9.9 Before designing the cable plant it will be necessary to test the capability of the individual central office equipment. This test is to be performed at float voltage. Two artificial lines with telephones including ringers are to be made with five-watt or greater resistors. A combination of resistors, which will make each line 1900 ohms with no shunt resistance or capacitance other than the phone and its ringer, are connected to spare line terminals in two separate line groups. Connector terminals from one-half the connector groups are then connected to each line terminal. Make a call through at least 50 percent of the selectors in each group, and 100 percent of the connectors in each group. Answer all calls, check for trip during the silent period, and observe that the answer bridge relay operates properly. Move one artificial line and telephone to a line terminal in a new group and once again call the stationary line and telephone. This time it will not be necessary to call through all connectors. Continue to move this line and telephone until all selector groups have been tested. Make calls on all interoffice trunks, toll and EAS. It is also necessary to call operator trunks. Successful completion of these tests mean the loop limits of this central office can be extended in accordance with Paragraphs 9.6 and 9.7. If these tests cannot be successfully completed, current flow to manufacturer's specification, the battery feed or ring trip relays, which are failing to respond, and then repeat tests. If tests still fail, lower artificial loop resistance in 100-ohm steps until tests can be successfully completed. The difference between this new value and 1900 ohms must be subtracted from all loop limits shown in Paragraphs 9.6 and 9.7.

9.10 Illustration. Figure 1. Limiting Resistance of Outside Plant Portion of Subscriber Loop When Plant is Partly Aerial and Partly Underground.