

Testing Ringers and Dials at Subscribers' Stations

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TO maintain the telephone plant so that subscribers will always have the best service practicable, it is necessary from time to time to adjust the equipment installed on their premises. The testing of ringers and dials requires central-office equipment, and circuits have recently been developed for this purpose in dial areas. By their use not only may trouble be located that has actually occurred but any slight defect that might eventually cause failure may be detected.

These new circuits are arranged so that tests may be made from a subscriber's station by an outside repair man without the aid of anyone at the central office. This gives to the subscriber a minimum of both service interruption and annoyance since conversation is eliminated and the duration of the test is shortened. In addition there is a saving of time for the repair man as well as for the central-office employee at a test desk.

The equipment required at the central office consists of three parts: a

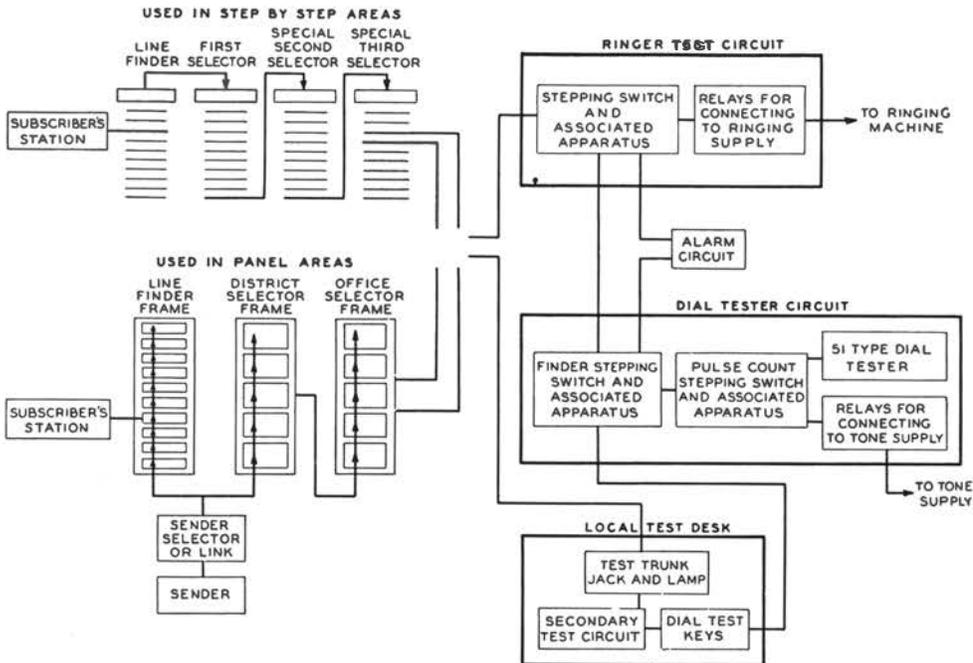


Fig. 1—The dial test circuit may be reached either directly from the subscriber's station or by way of a local test desk in the central office; the ringer test circuit, only from the subscriber's station

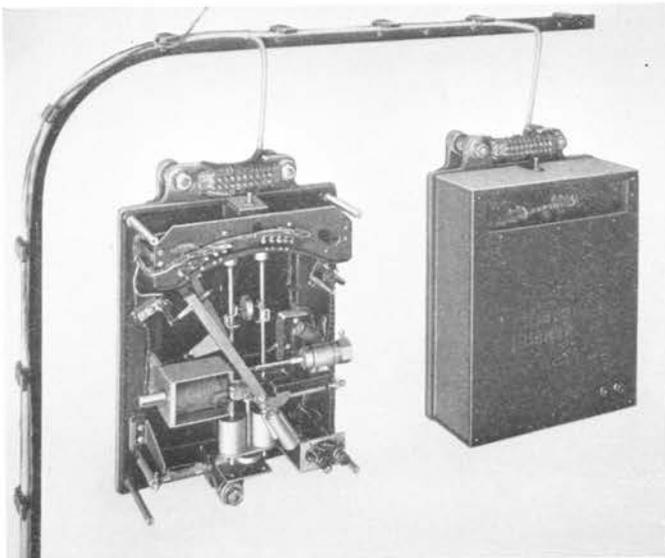
ringer test circuit, a dial test circuit, and an alarm circuit which functions with both of the others. To make a test, the repair man at the subscriber's station dials a code number which connects him to the testing equipment, and dial tone is returned to signify that the equipment is ready to function. The repair man then dials a second code depending on whether he wants to make a dial test or a ringer test. As there are both low and high speed dials in use and several types of ringing—such as single party, four-party semi-selective, and four-party full-selective—a group of codes is provided. After the second code has been dialed, the tests are applied automatically, for the most part, by the central-office equipment, and the repair man subsequently makes the necessary adjustments as described later.

In panel offices the test circuits are connected to either the district or office selector multiple, and in step-by-step offices, to a special third selector.

A schematic diagram of the two arrangements is shown in Figure 1. Hunting features are provided so that the district, office, or special third selector may hunt for an idle test circuit when two or more men are testing from different stations at the same time.

Each ringer test circuit consists of a stepping switch, and associated apparatus which records and translates the code number dialed and makes connection accordingly to either the relays for connecting the ringing supply or to the dial test circuit. There are eight possible codes used to set up the circuit conditions for applying ringing current of the proper potential and polarity to the ringer under test: four single digit codes set up the proper circuit conditions for applying central-office ringing current to individual, two-party, or four-party stations; and four two-digit codes for applying the adjusting ringing current to any station of a four-party full-selective line.

After the repair man has dialed the preliminary test code—called the “ringer test” code—and heard the tone telling him he is connected to a test circuit, he dials one of these eight codes—if he is to make a ringer test—and then places his receiver back on the hook. This causes the ringing current to be applied, and the bell should ring. If it does not ring satisfactorily—and the line is not a four-party full-selective one—the repair



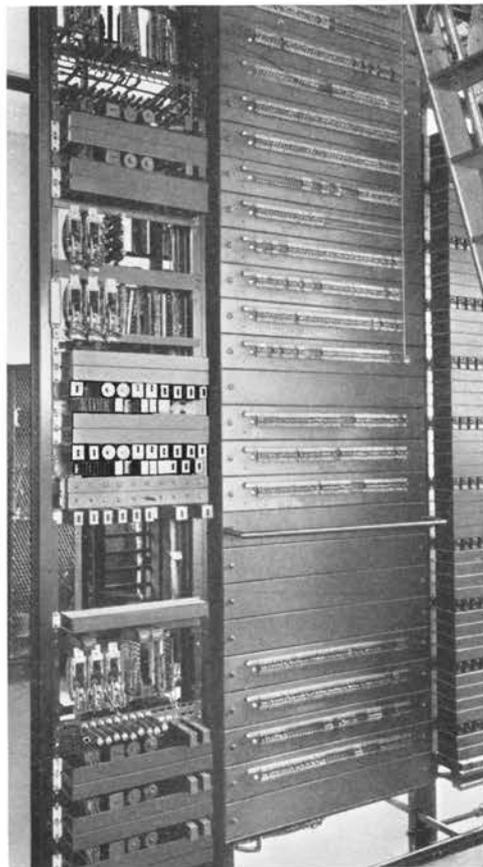
Two dial testers, one with cover removed, mounted on the wall of a central test bureau in New York City

man must adjust the bell until it does.

If the line is four-party full-selective, the repair man—instead of making the adjustment on the normal ringing current—hangs up his receiver and after again removing it receives dial tone, then dials one of the two digit codes, and again hangs up the receiver. This procedure connects to the line a special bell-adjusting ringing test which has a lower value of current than that used for regular central-office ringing. The A-C component of this circuit is obtained from the regular continuous-ringing supply of the central office by a step-down transformer, and the D-C component, from an independent dry battery of lower voltage than the central-office ringing battery. The bell-adjusting ringing current thus gives a closer adjustment, which is necessary on lines using superimposed ringing.

Repeated tests may be made, or the two kinds of ringing current may be applied alternately, by removing the receiver, dialing the proper code, and again placing the receiver on the hook. Gauges are used in making the adjustments to obtain the proper clearance between the armature and core. The gongs are then adjusted so that the striking of the clapper will produce the best results. After the bell has been adjusted it is frequently retested by dialing for the regular central-office ringing current. While dialing for the different kinds of ringing, the bell is observed to determine whether there is any tapping due to the dial pulses. To disconnect from the testing circuit the receiver is removed from the switchhook and replaced without dialing.

After the preliminary code for the dial test, four secondary codes are possible—corresponding to the eight



Relays and stepping switches for a group of dial and ringer test circuits are mounted on a single frame

codes for the ringer test. For the ordinary subscriber's dial only two of them are used, however; one gives an adjusting speed of from $9\frac{1}{2}$ to $10\frac{1}{2}$ pulses per second, and the other gives a test speed of from 8 to 11 pulses per second. The other two codes are the equivalent of these but are used to check the higher speed dials used by operators. A dial can be tested without first testing the ringer or after completing the ringer test, but a ringer cannot be tested after the dial without disconnecting and reestablishing the connection.

When one of the dial test codes has been dialed, the circuit associates a

dial tester* with the line and returns a dial tone to indicate that the repair man should dial the number zero, which is used in order to obtain the greatest number of pulses possible by a single turn of the dial. At the break of the first dial pulse the testing mechanism functions, and at the beginning of the last pulse it causes a distinctive tone to be connected to the line—indicating whether the dial is normal, too slow, or too fast. The bells are observed for tapping while dialing for this test.

Adjustment of the dial is made by the use of tools provided for the purpose; a governor holder for securing the governor in place and a screw driver for adjusting its speed. After adjustment the dial is retested by the dialing code used for obtaining a test on the adjusting speed. Tests may be repeated any number of times by using the proper code and then dialing zero. The line may be disconnected from the test circuit at any time by replacing the receiver on the switchhook.

If the repair man happens to be making other tests through the local test desk, or if for other reasons he wishes to do so, he may obtain the

dial test circuit (but not the ringer test) by way of this desk. It is equipped with keys which allow the desk man to apply the proper dial tests, and in this case both the repair man at the subscriber's station and the local desk man hear the tones indicating whether the dial is normal, too fast, or too slow. At the completion of the test, the desk man can talk to the repair man by operating the proper keys.

An alarm feature is provided which disconnects the test circuit from the line if it is held for an abnormal length of time, and brings in an alarm at the local test desk if the disconnect feature fails to restore the test circuit to normal. This feature prevents the subscriber's line from being kept out of service in case trouble should develop in any of the circuits used for these tests, and also prevents one of the relatively small number of test circuits from being held by a single test connection for an undue length of time.

The number of tests made is recorded on registers: one for the ringer and one for the dial test circuit. A register is also provided for recording the number of times these circuits are disconnected for being held too long.

* BELL LABORATORIES RECORD, *August, 1927, p. 427.*