

# Register and sender testing in No. 5 crossbar

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A number of features are included in a No. 5 crossbar office to insure that the occasional faults arising from the continual operation of electromechanical apparatus over long periods of time will not cause repeated failures in establishing connections. These include self-checking features in the marker that test for open and crossed circuits on each call it handles, the automatic monitor<sup>1</sup>, and a trouble recorder<sup>2</sup> that makes a punched card record of the nature and location of troubles reported to it. They are located at a maintenance center<sup>3</sup>, with a number of other test circuits and facilities

that are used as required. In addition to these various facilities, provisions have been made for testing registers and senders. The test facilities are combined with the monitor circuit and much of the equipment is used in common. The control of the test circuit is at the maintenance center.

Since the marker's checking features and the automatic monitor keep a continual watch on the behavior of registers and senders, the register and sender test circuit is not made automatic in its initiation of tests, but is under control of the maintenance force at the maintenance center. They use it as varying conditions require. A trouble record on a register or sender, for example,

<sup>1</sup> See page 108; <sup>2</sup> page 112; <sup>3</sup> page 105.

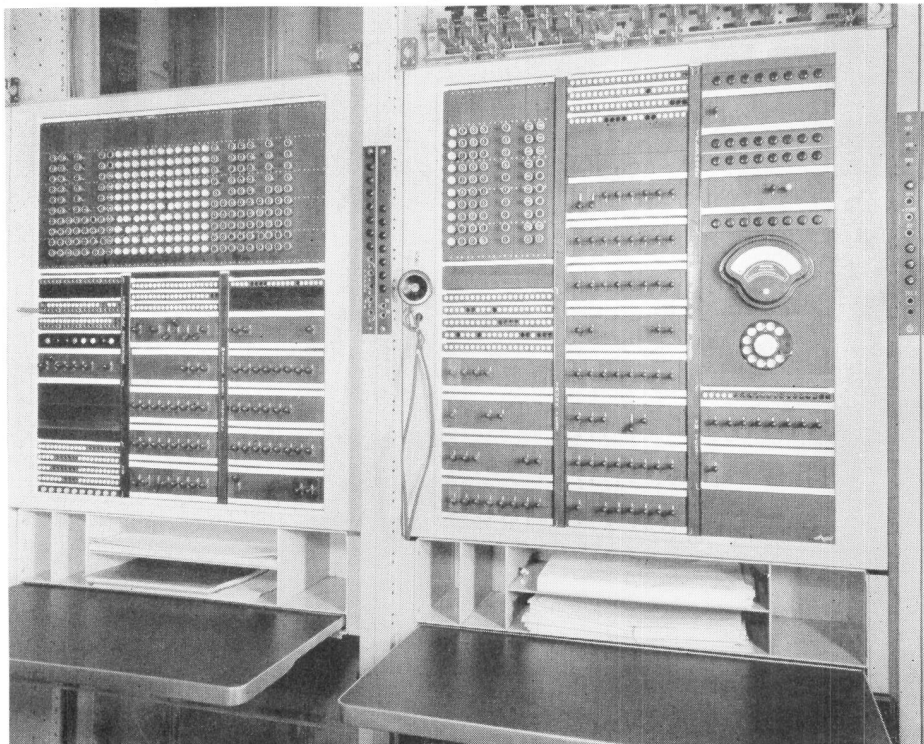


Fig. 1 — Positions at the maintenance center used for controlling the register and sender test circuit.

might indicate that certain registers or senders should be tested.

When a test is to be made, the test conditions are set up on keys on the panels shown in Figure 1. This would indicate to the circuit the number to be called, the particular register or sender to be tested, the method of pulsing, and the type of line or trunk calling. Once these conditions have been set up, the operation of a start key sets the circuit in operation. The tests are run through automatically by the test circuit, and the progress of the test is indicated by lamps. If the call goes through successfully, an OK lamp is lighted, while if trouble is encountered, lighted progress lamps will indicate the stage of operation at which it occurred. Under certain conditions, the trouble recorder is called in to make a record of the conditions found.

In running through its tests, the test circuit calls in a marker to establish connections through the line link and trunk link frames, and to select registers, senders, or trunks in the same general manner as for service calls. The major difference is that the marker may be required to select a particular register or sender rather than any idle one, and that the marker is informed it is handling a test call and will act accordingly. In addition to its other tests, the register and sender test circuit checks the recording of pulses by the register and the outputting by senders, and where the work is similar, it uses corresponding elements of the automatic monitor. To provide a margin of safety, all pulsing tests are more severe than encountered on service calls.

The various circuits called into action in testing an originating register are indicated in Figure 2. In each office there is a line link vertical to which the register and sender test circuit has access, and after the test conditions have been set up and the start key operated, a marker is seized and this line location and the particular originating register desired is transmitted to it. The marker then establishes a connection through the line link and trunk link frames to the desired register, operates relay *M* in the register, and then disconnects. Relay *M* connects the register to a set of test leads from the test circuit that is multiplied to all the registers in the office. In this way there is established

a circuit through a line link and trunk link frame to the register and back to the test circuit as indicated by the solid lines in the diagram. Over this circuit the various test conditions are applied. Following this, the register seizes a marker to transmit to it the number pulsed into the register from the test circuit. The marker, recognizing that this is a test call, establishes a connection to the test circuit, over the master test frame connector, so that the digits and other in-

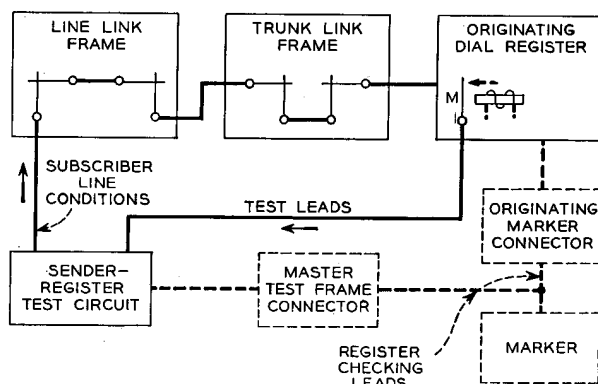


Fig. 2—Block schematic of circuits brought into action in testing originating registers.

formation transmitted to the marker can be recorded in the test circuit and checked against the information transmitted to the register. If the information were not properly recorded by the register and transmitted to the marker, the trouble recorder would be called in to make a record. Other troubles will be indicated by lamps. If all tests are satisfactorily completed, the OK lamp will light and the connection will be broken down.

For testing senders, the circuits employed are those indicated in Figure 3. Following an initial procedure similar to that described above, a marker is seized and establishes a connection to the desired trunk and selects the desired sender, and the trunk connects to the sender through the sender link. Relay *TT* is operated in the trunk to transfer the *T* and *R* leads of the trunk from the circuit to the distant office to the test circuit. Relay *M* in the sender is also operated to connect the sender to the test circuit over a special set of leads as was done for the originating

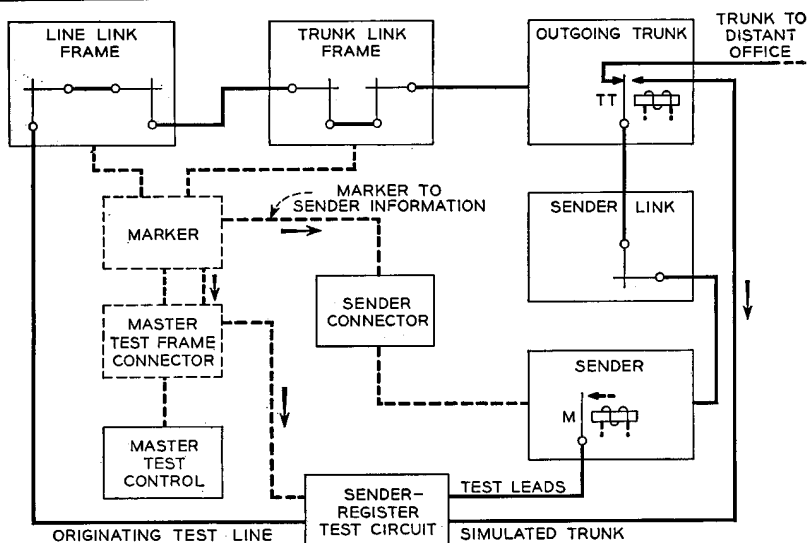


Fig. 3 — Block schematic of circuits used in testing senders.

register. Outgoing pulsing information is then transmitted to the sender by the marker and is received by the test circuit through the master test frame connector. After this, the control circuit shown by the dotted lines is released. The sender test circuit then applies various tests to the sender, records the pulses sent out by the sender, and checks the results against the known information. Pulsing troubles result in a trouble record card. Other types of troubles will be indicated on lamps.

Figure 4 illustrates in a similar way the connections established for checking incoming registers. The marker is not used for establishing the connection, but a preference

circuit within the test circuit secures access to the desired register through the incoming register link circuit. The test circuit applies the desired test, and the register then calls for a marker. Recognizing this as a test call, the marker stops progress, calls in the master test frame connector, and permits the test circuit to record all the information the register is transmitting to it. This connection, shown by the dotted lines, is established only momentarily. The test circuit then matches the register results against the known information, and gives an OK lamp if everything is satisfactory, a trouble card on pulsing failure, or a trouble lamp on other types of trouble.

The relays, amplifiers, resistances, and other circuit elements are mounted on standard frames. One frame is used for the monitoring apparatus, and a double frame for the test equipment used for all registers and senders employing dial or multifrequency pulsing. An additional frame is required when revertive pulsing or call indicator pulsing is required. The keys for controlling the tests and lamps for indicating the progress and results of the tests are mounted adjacent to the master test control circuit keys and lamps as shown in Figure 1. The monitor register and sender test apparatus is shown on the middle panel of the right-hand frame. The progress lamps are located at the top of the panel.

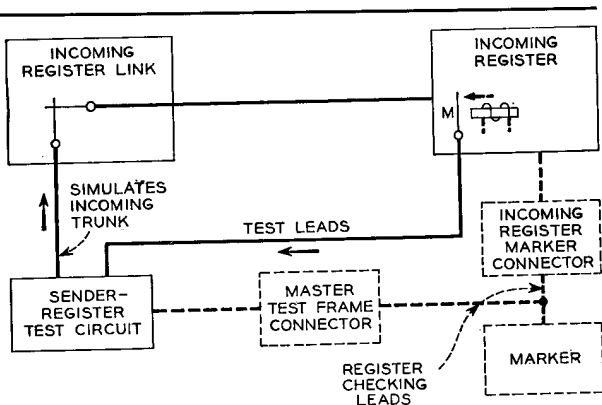


Fig. 4—Block schematic of circuits used in testing.