

DECODER TEST FRAME

DESCRIPTION

PANEL OFFICES

1. GENERAL

- 1.01 This section describes the test frame of the decoder equipment in 3 digit and 3-2 digit panel offices.

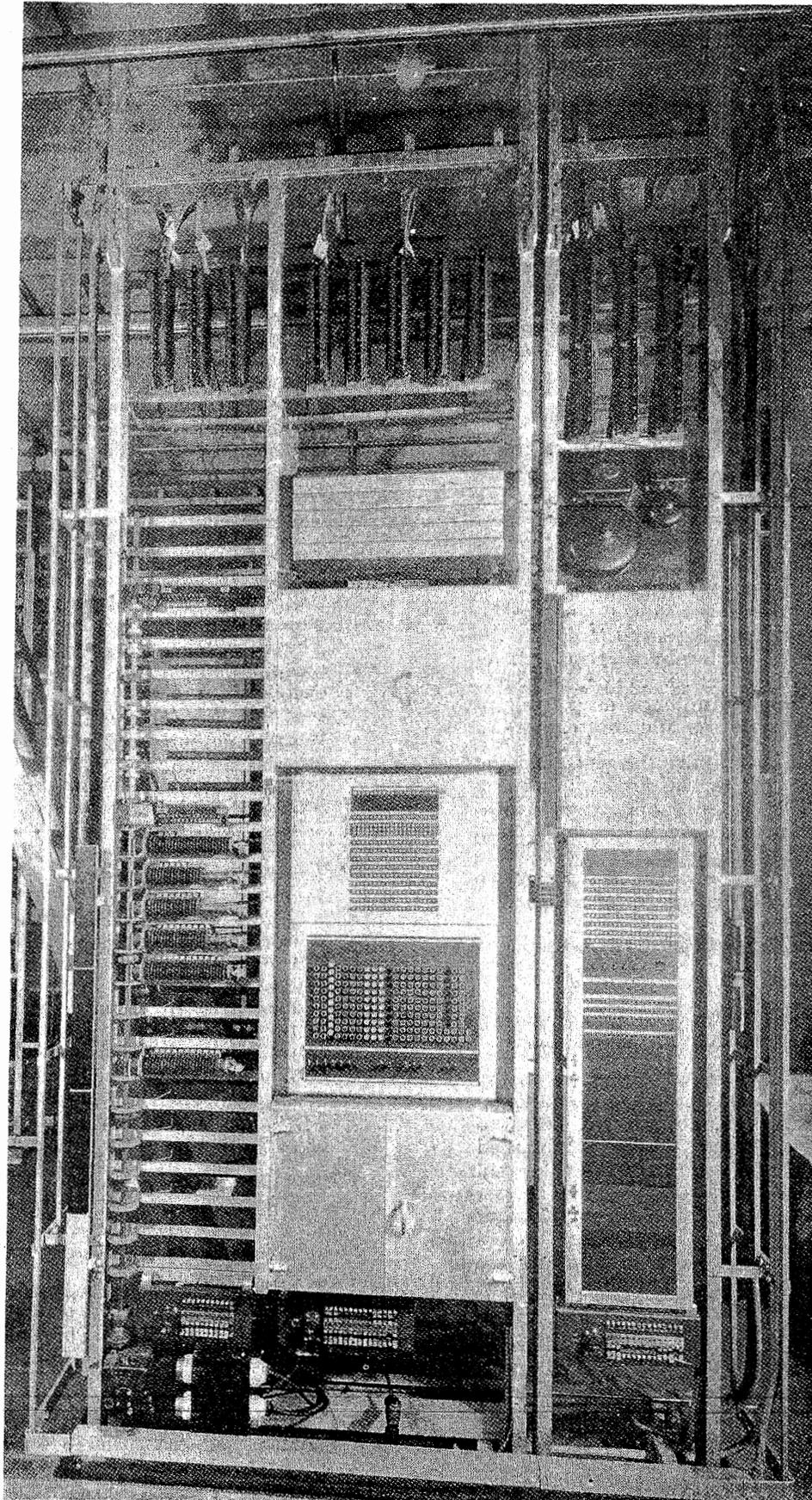
2. EQUIPMENT FEATURES

- 2.01 The decoder test frame is a two-bay structure, 3 feet, 10 inches long. Fig. 1 shows a view of the decoder test frame and the trouble indicator frame, the decoder test frame occupying the two bays at the left of the photograph. The sequence switches and interrupters are mounted in the first bay and the relays, resistances, condensers, peg count registers, keys and lamps in the second bay. The terminal strips extend across both bays near the top of the frame. A standard duplex motor is used to drive the sequence switches and interrupters.
- 2.02 The keys for controlling the tests and the lamps for identifying the circuit under test and for giving progress and trouble indications are mounted in a key and lamp panel. This panel also contains the decoder-connector time alarm lamps and the various time and fuse alarm pilots.

3. DECODER TEST FRAME CIRCUIT

General

- 3.01 Drawing 706-551 shows a simple schematic of the decoder test circuit connections.
- 3.02 Access to the decoders is obtained by means of multi-contact relays located on the decoder frames. Similarly, access to the decoder-connector wiring is obtained by means of multi-contact relays located on the decoder-connector frames. The test circuit multi-contact relays on the decoder frames and also the regular decoder multi-contact relays on the connector frames are employed to complete this connection back to the test circuit.
- 3.03 Since only one decoder or decoder-connector will be under test at one time, the wiring from the test frame is multiplied through the test circuit relays of all decoders except the master decoder. If there are two groups of decoders, the test circuit relays on the master decoder frames are multiplied together. The test circuit connecting relays on the decoder-connector frames are multiplied in a similar fashion. The test relays on the decoder-connector frames are connected at the end of the connector wiring so as to make a test through the entire decoder-connector multiple. When testing decoder-connectors, a path is completed from the test circuit through the connector and back to the test-frame by operating the test circuit multi-contact relay on the decoder-connector frame, the multi-contact relay of a decoder and the test circuit multi-contact relay on the decoder frame.
- 3.04 The "A," "B," and "C" office code sequence switches are used to transmit to the decoders the digits of the office codes which a subscriber dials into the sender. These switches set up the same circuit combinations on the receiving leads to the decoder as are set up by the senders except that resistance is inserted in the leads to make the test more severe. When making the "all codes" test, the same conditions are set up simultaneously on the receiving leads of the master decoder and of the decoder under test.
- 3.05 Two sets of matching relays are provided in the test circuit. One set of relays is arranged to record the translated information sent by the master decoder over its transmitting leads and the other set records the information sent by the decoder under test over its transmitting leads. When testing with a particular code on a single test basis, the set of relays first mentioned is operated from the matching keys instead of from the master decoder. An "OK" test is indicated by the operation of corresponding relays in each set.
- 3.06 The decoder sequence switches on the test frame control the connection of the test circuit to the decoders. One switch is required for each group of decoders.
- 3.07 The connector sequence switches control the connection of the test circuit to the decoder-connectors. Three switches are required for each group of decoder-connectors.
- 3.08 The connector test control sequence switch controls the tests made on the decoder-connector circuits.
- 3.09 The multi-contact relays in the test circuit are used to connect the various testing combinations to the master decoder, other decoders, and to the decoder-connectors.



DECODER TEST AND TROUBLE
INDICATOR FRAMES
FRONT VIEW

Fig. 1.

PANEL SYSTEM DECODER TEST CIRCUIT

Schematic of Test Circuit Connections

706-551
Information
Log No. P-21576 (1-5-28)
ISSUE 1

C.V.T.

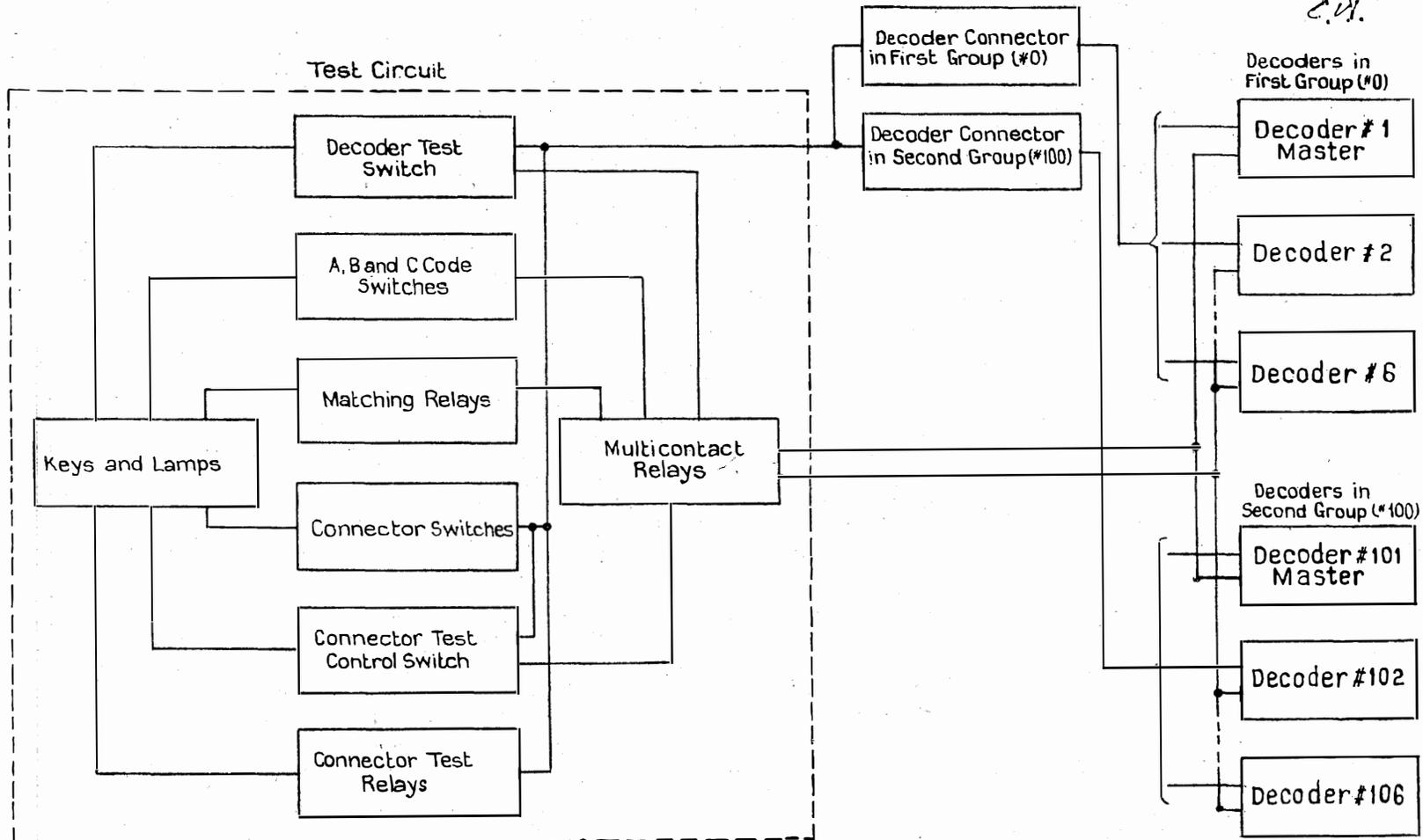


Fig. 2.

3.10 The operation of the test frame circuit is controlled by means of keys located in the key and lamp panel. For controlling the tests and for the indication of irregularities, the following keys and lamps are provided:

Keys

ST	Start
RN	Restore to Normal
REP	Repeat
CA	Control Advance
TA	Time Alarm
DR	Decoder
CONN	Connector
PPH	Particular Path
PCD	Particular Code
SCD	Special Code
ALT	Alarm Test
PC	Particular Circuit
EC	End of Cycle
LP }	Lamp Keys
LP-1 }	
TRBG	Trouble Release Busy Ground

Recording Keys for Aiding in Selecting Particular Decoders and Decoder Connectors for Test.

Recording Keys for Setting the "A," "B" and "C" Switches, the Class of Service to be Used and for Operating the Matching Relays for Particular Code Tests.

Lamps

X }	62 Matching Lamps for Decoder Tests
Y }	
Z	54 Checking Lamps for Decoder-Connector Tests
DB	Decoder Busy
MDB	Master Decoder Busy
CNB	Connector Busy
TBL	Trouble
EC	End of Cycle
TRBG	Trouble Release Busy Ground

Four Groups of Locating Lamps for Identifying the Group and Decoder or Decoder Connector to which the Test Circuit is Connected.

4. TESTS OF DECODERS

"All Codes" Tests

- 4.01 The "all codes" test of decoders includes tests of the trouble release, second trial, permanent signal and special service operator features as well as tests of all codes from 211 to 999 except those containing one or two zeros.
- 4.02 Tests of all codes are started by the operation of the DR key and the ST key. If the decoders serve subscribers who have different classes of service, one of the class of service recording keys is also operated.

4.03 The test circuit connects to the master decoder and to the first decoder to be tested if these circuits are idle, or, if busy on calls, as soon as they become idle. If the master or service decoder is busy it is indicated by the lighting of the MDB and DB lamps, respectively. When the test circuit has connected to the decoders, it causes the time alarm circuit in the decoders to be opened to prevent the decoder time alarm functioning in the event of trouble while testing.

4.04 The special features in the decoders are tested before the tests of the regular codes, the first test being of the trouble release feature. On this test all receiving leads of both decoders are grounded. This condition is recognized by the decoders as a trouble condition and they proceed to time out and place a ground on the trouble release leads. Ground on the trouble release and "CK-1" leads from both decoders indicates an "OK" test.

4.05 The second test checks the ability of the decoder, when seized on a second trial, to send through a translation without making a preliminary check of the receiving leads. On this test the "A-1" and all the "B," "C" and "D" leads are grounded but battery through resistance is connected to the "CK2" leads. The decoders are arranged to handle this combination as a call to the special service operator. Both the master and the decoder under test should, therefore, connect ground on certain of the transmitting leads, thereby operating the corresponding matching relays in the test circuit. The matching relays connected to the master decoder transmitting leads are all designated with the prefix "X," those connected to the transmitting leads of the decoder under test being prefixed "Y." When the decoders have translated the received information, they send a ground over their release leads which gives the test circuit a signal to advance, provided both decoders have translated the received information in exactly the same manner. If the translations do not match, the test circuit will not advance, the alarm will be sounded, the TBL lamp will light and the master decoder will be restored to service by the test circuit. The LP key is then operated to light the lamps showing the decoder under test, and to light the X and Y lamps corresponding to the matching relays which have operated. These lamps indicate wherein the translations made by the two decoders differ.

4.06 The third test checks the ability of the decoder to send a call through to the special service operator in the usual man-

ner. On this test both decoders are caused to make the preliminary test of the receiving leads for grounds, crosses and opens after which the receiving leads are left open. This is the condition which obtains when a subscriber dials "zero." The translation and check is made in the same manner as described in the preceding paragraph.

- 4.07 The fourth test checks the ability of the decoder to set up the routing to the permanent signal trunks in care of a permanent signal. This test is similar to the test for the special service operator routing except that in this case the "PS" leads are grounded and the translations from both decoders should match.
- 4.08 The fifth test checks the ability of the decoder to properly translate the code 200. The decoders are so arranged that if a subscriber dials a zero in the second or third digit instead of the letter O which corresponds to the digit 6, the decoder will treat it as a 6. This feature is checked during this test.
- 4.09 Following the test of the code 200, all other codes from 211 to 999 except those containing one or two zeros are tested in succession. After the test on one decoder is finished, the test circuit proceeds to test each of the remaining decoders in the group in a similar manner. Where there are two groups of decoders the test circuit also proceeds to test the decoders of the second group matching them against the master decoder in that group.

Single Tests of Particular Codes or Special Features

- 4.10 Tests of a particular code are made by operating the PCD key in addition to the DR key and also the proper recording keys to set the "A," "B" and "C" office code switches and to set up the class of service condition to be used. The proper matching keys are also operated to correspond to the translation of the code since on tests of particular codes, the master decoder is not employed. These matching keys operate the X matching relays which under the test of all codes are operated by the master decoder. The ST key is then operated. The decoder under test should operate the proper Y matching relays over its transmitting leads. If the translation is made properly, the test circuit proceeds to the next decoder. The master decoder can be tested in this manner as well as the other decoders in the group.
- 4.11 Where there are two groups of decoders the test circuit also tests the decoders of

the second group unless the EC key is operated. If this key is operated the test will stop at the end of the first group of decoders. The purpose of this key is primarily to stop the test in case the translation made by the second group of decoders differs from that made by the first group. In that case it is necessary to reset the matching keys for the translation expected from the second group.

- 4.12 When testing particular special features, the procedure is the same as that outlined for other codes except that the SCD key is operated instead of the PCD key and one of the special code recording keys is operated in place of the A, B and C keys. The matching keys used to set up the expected translation are not required for the "trouble release" test.
- 4.13 When making the "trouble release" test the ability of the decoder to keep itself busy for a short interval can be tested by operating the TRBG key. If the trouble release busy ground is present for a sufficiently long interval the TRBG lamp will light.

Repeat Tests

- 4.14 Repeat tests can be made by operating the REP key. If tests are being made using all codes, the test of "all codes" will be repeated on the same decoder as long as desired. When testing on a particular code basis, the operation of the repeat key causes the code being used to be tested repeatedly on the same decoder.

Selection of a Particular Decoder

- 4.15 A particular decoder can be selected for test by operating the PC key, the DR key, the proper "decoder group" and "decoder" recording keys and the ST key.

5. TESTS OF DECODER-CONNECTORS

Tests of All Connectors to All Decoders

- 5.01 Tests of all decoder-connectors with all decoders is made by operating the CONN and ST keys. The test circuit then proceeds to connect to the first decoder circuit to which all connectors are to be tested if, or as soon as, this circuit is idle. The test circuit causes the decoder time alarm circuit to be opened, preventing the alarm from operating. The connection to the decoder is accomplished by operating the test circuit multi-contact relay on the decoder frame. As soon as the decoder has been connected, the test circuit connects to the first connector circuit, if this circuit is idle or as soon as it becomes idle, by operating the test circuit multi-contact relay located on the connector frame. The decoder is

then connected to the connector wiring by operating the decoder multi-contact relay associated with the connector. Having connected to the decoder and decoder-connector, the test circuit operates relays in the decoder circuit, disconnecting the "CK-1," "CK-2," "CK-3," "TRL," and all transmitting leads from other apparatus in the decoder. Ground is connected to all leads toward the decoder, battery being connected through an individual relay per lead to all leads toward the connector. These relays are all designated with the prefix "Z" and each lights a lamp provided the LP key is operated. There are 54 of these leads under test and if there are no opens either in the contacts or wiring, all 54 Z relays operate, thus checking for continuity. If there is an open in any lead, the test circuit stops and the lead in trouble is indicated by all Z lamps being lighted except the one corresponding to the lead in trouble. The operating ground is then removed, leaving the relays locked up over a chain locking ground. The locking circuit of the first Z relay is then opened and if the lead associated with the relay is not grounded or crossed with some other lead, the relay will release and open the locking circuit of the second Z relay. In a similar manner the remaining relays are released in succession until all have released. If any leads are grounded or crossed with some other lead, the relay connected to the first lead involved will not release and will consequently hold up all the remaining relays. The relays which have not released will be indicated by the Z lamps which are lighted. The operation of the LP-1 key will then allow all relays, except those associated with the leads falsely grounded or crossed, to release; then the only lamps left lighted will be those indicating the leads in trouble.

- 5.02 After the continuity and ground-cross test, the test circuit multi-contact relay on the decoder frame is checked to see if all contacts open when the relay is released. In making this test all the Z relays are first operated as outlined for the continuity test, after which the multi-contact relay on the decoder frame is released. Any contact which does not open will cause the corresponding Z relay to remain operated and indicate a failure.
- 5.03 A test is then made for false battery crosses on all connector leads except the RL and receiving leads which are normally connected to battery. The Z relays associated with the leads under test are first operated in the same manner as for the continuity test except that ground is connected to the relay windings, battery being connected to

the wiring toward the decoder. When these relays have operated, the test circuit multi-contact relay located on the decoder frame is again released. Any leads crossed with battery will cause the corresponding Z relays to remain operated.

- 5.04 Following the false battery test of the leads not normally connected to battery, the multi-contact relay on the decoder frame is reoperated, the Z relays are reoperated as in the false battery test and a test of the multi-contact relay which connected the decoder to the decoder-connector is made. With all Z relays operated, the multi-contact relay connecting the decoder to the connector is released and all Z relays should release. If any contacts do not open or if there is false battery on any of the 54 leads, the corresponding Z relay will not release.
- 5.05 A similar test is made of the contacts of the test circuit multi-contact relay located on the connector frame. In this case, the Z relays have battery connected to their windings, ground being connected to the wiring toward the decoder.
- 5.06 Following the completion of the test of the first connector to the first decoder, the test circuit makes a similar test of each of the remaining connectors in turn to this same decoder. The procedure is then repeated, using each of the remaining decoders in turn until all connectors have been tested through to all decoders. When all tests have been completed, the EC lamp lights.
- 5.07 Where there are two groups of decoders, the test circuit completes all tests of the first group of connectors to all decoders in that group and then makes similar tests of the second group of connectors to all decoders in that group.

Tests of All Decoder Connectors to a Particular Decoder

- 5.08 Tests can be made through all connectors to a particular decoder by making use of the PPH key, the CONN key and the proper recording keys to select the desired decoder. When all connectors have been tested to the particular decoder, the EC lamp lights.

Selection of a Particular Decoder-Connector

- 5.09 A particular connector can be selected for test by employing the PC key, the CONN key and the proper recording keys corresponding to the group, frame and connector. After the ST key is operated, the test circuit proceeds to select the particular connector after which the PC key is released to allow tests to start.

Repeat Tests

- 5.10 In order to make repeat tests through the connector to which the test frame is connected to all decoders the REP key is operated and the PPH key is normal. In this case tests are made through the connector to each decoder in succession after which the test circuit stops and lights the EC lamp.
- 5.11 In order to make the repeat tests through a connector to a particular decoder the PPH key is operated in addition to the REP key. With the test frame connected to a connector and to the decoder to which tests are to be made tests will be repeated until stopped by the maintenance man.

Tests of Decoder and Decoder-Connector Time Alarms

- 5.12 A test of the decoder time alarm can be made by setting the test circuit for making the trouble release test as described previously and operating the ALT key. In this test the decoder time alarm circuit is not opened and the time alarm should function and operate the bell.
- 5.13 In order to test the connector time alarm, the test circuit is set to make a test on all connectors to a particular decoder and the ALT key is operated. The test circuit is prevented from completing a test on the connector but will hold the connector busy, thus causing the time alarm to function and the bell to operate.

Control Advance and Remote Control Features

- 5.14 The "control advance" feature is essentially the same as that provided in other test frame circuits and is operated to advance the test circuit, if for any reason it becomes blocked.

Stopping and Restoring the Test Circuit to Normal

- 5.15 In order to stop the test circuit it is only

necessary to restore the ST key to normal. If the start key is reoperated, the test circuit will proceed without going back to the first circuit. The operation of the RN key will restore the test circuit completely to normal.

Time Alarm Feature

- 5.16 The time alarm feature is substantially the same as that provided for other automatic test circuits. A time alarm key (TA) is provided which, when operated, retires the alarm and prevents the advance of the test to the next circuit.

Peg-Count Registers

- 5.17 The number of decoders which are tested is recorded on a "decoders tested" register (DRT). This register scores once for each decoder tested whether on a "single code" or on an "all codes" basis. The number of connector circuits which are tested is recorded on the "connectors tested" register (CNT). This register scores once for each connector tested, whether over a single path or over all paths. The number of repeat tests is recorded on the repeat register (REP). The trouble register (TBL) records the number of times the test circuit alarm operates.

6. CIRCUITS AND CIRCUIT DESCRIPTIONS

- 6.1 Table 1 is a list of circuit and equipment drawings pertaining to the decoder test frame. Detailed circuit descriptions will be found in the CD sheets corresponding to the SD drawings.

TABLE 1.

Title	Drawing
Automatic Test Circuits	SD-21188-011
Miscellaneous Circuits for Decoder	
Test Frame	SD-21250-01

(This section consists of excerpts from D. and R. Bulletin No. 465)