STEP-BY-STEP SYSTEMS
NO. 1 OR 350A
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12C OR NO. 14

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 Prior to this issue the test clip data for the primary and secondary windings of the (SR) relay was shown as connect battery to 2(SR) and ground to 5(SR).

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3310-MKS-RLL-PH

STEP-BY-STEP SYSTEMS
NO. 1 OR 350A
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12-C OR NO. 14

CHANGES

B. CHANGES IN APPARATUS

B.1

Superseded	Superseded By
206BH rel. "V" option	280F rel. "U" option
239FC rel. "Z" option	280A rel. "W" option

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 The soak for the (SR) relay was formerly: Pri. - .050 amp.
Sec. - .0072 amp.

C.11 There was formerly a non-operate req. for the (SR) relay sec. wdg. of test .0001 amp.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The use of the 206BH relay, "V" option, and the 239FC relay, "Z" option, is rated "Mfr.Disc." and they are superseded by the 280F relay, "U" option, and the 280A relay, "W" option, respectively, to provide polarized relays with improved adjustment stability. Reference to "V", "U", "Z" & "W" options is made in circuit note 104 and the "options used" table.

D.2 A duplicate set of leads to the perm. sig. release cct. is added instead of including this circuit in the bracket with test desks.

D.3 Fig. L is revised to show mult. leads to Perm. Sig. Rls. Ckt. and Note 202 is added. Note 201 is rated "Mfr.Disc."

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3330-RTD-AJB-YT

STEP-BY-STEP SYSTEMS
NO. 1 OR 350A
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12-C OR NO. 14

CHANGES

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 Page 1 - (MB) relay - After soak column changed from .500 amp. to .400 amp. for both operate and non-operate tests.

Page 1 - (MG) relay - After soak column changed from .515 amp. to .400 amp. for both operate and non-operate tests.

All other headings, no change.

E TELEPHONE LABORATORIES, INC.

D . 3330-VJA-FJS-KM

(7308(C)

STEP-BY-STEP SYSTEMS
NO. 1 OR 350A
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12-C OR NO. 14

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The permanent signal release circuit for connectors was added to the connecting information for leads "EC" to "BC" shown at the bottom of this circuit.

D.2 The first line of the title was formerly step-by-step system and the second line Nos. 1 or 350A.

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3350

OCH)
RSW) BF

STEP BY STEP SYSTEMS
NO. 1 OR 350A
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12-C OR NO. 14

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Figure K was rated "Mfr. Disc." and Fig. L was added.

D.2 The second line of the title was added.

All other headings, No change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 332

OCH)
RSW) MT

STEP-BY-STEP
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12C OR NO. 14

CHANGES

B. CHANGES IN APPARATUS

B.1 Removed

62D Protector
1-1/3 Ampere non-alarm type fuse

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The 62D Protector and 1-1/3 ampere non-alarm type fuse at R.R. is replaced by "Y wiring" so that it will not nullify the fuse alarm.

D.2 Note 104 added.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 332

REP)HX
FJS)

CIRCUIT DESCRIPTION
AMERICAN TELEPHONE & TELEGRAPH CO.,
DEPT. OF DEVELOPMENT & RESEARCH.
BELL TELEPHONE LABORATORIES, INC.
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STEP-BY-STEP SYSTEM
PERMANENT SIGNAL TEST CIRCUIT
FOR USE IN TESTING SUBSCRIBER LINES
FROM LOCAL TEST DESK NO. 12C OR NO. 14

DEVELOPMENT

1. PURPOSE OF CIRCUIT

1.1 This circuit is designed to provide means for releasing a first selector from a permanent signal line in order to facilitate testing the line from the local test desk.

2. WORKING LIMITS

2.1 There are limiting conditions in the use of this circuit which may prevent the release of the first selector from a "permanent" line. A signal is provided at the test desk which will indicate the failure to release a first selector. Lines less than about 70 ohms loop resistance may not permit the release of the first selector. When the resistance of the tip and ring leads from the shunting battery in this circuit through the test train to the connection to the line at the I.D.F. exceeds 4 ohms per lead the release of the first selector cannot be assured. In addition, the exact limits of release will vary for different first selectors due to variation in the adjustment of the (A) relays. As a result of these limitations there will usually be a small percentage of lines in each office on which it will be impossible to release the selector but these can be identified only by test.

2.2 This circuit is not intended for use in releasing first selectors from "permanent" on coin lines or on P.B.X. trunks.

OPERATION

3. FUNCTIONS

3.01 Provides means by the operation of the (ST) relay for starting a permanent signal test.

3.02 Provides timing means under control of an interrupter and the (FL) relay to apply various tests, for proper intervals and in definite sequence.

3.03 Provides means for restoring circuit to normal from various test conditions.

3.04 Makes a polarity test of the line.

3.05 Makes a marginal bridge test for low resistance condition on the line.

3.06 Makes a test for low resistance to ground on the battery side of the selected polarity.

3.07 Makes a test for low resistance to battery on the ground side of the selected polarity.

3.08 Makes a marginal battery bridge test for low resistance condition on the line

3.09 Applies shunting battery and ground of the proper polarity to shunt and release the (A) relay of the first selector.

3.10 Provides means for immediately cutting off the shunting battery after the selector releases.

3.11 Supplies 60 I.P.M. interrupter ground to the associated test distributor control circuit or to the test line to test distributor while relay (ST) is operated.

3.12 Provides an end of cycle signal to the associated test distributor control circuit or to the test line to test distributor.

3.13 Provides a ground signal to the connecting circuits when the test circuit has completely restored to normal and is awaiting reselection.

4. CONNECTING CIRCUITS

4.1 Test Distributor Control Circuit for No. 14 Local Test Desk.

4.2 Test Line to Test Distributor for No. 12C Local Test Desk.

4.3 60 and 120 IPM Interrupter and Interrupter Alarm Circuit.

DETAILED DESCRIPTION

5. CIRCUIT OPERATION

5.1 Selection of Test Circuit

When the tester at a local test desk determines that a "permanent" condition exists on a line he will attempt to release the first selector connected to the line in order to make more definite tests to determine the cause of the permanent signal. The tester will make use of the test train including a test connector and connect to the line through the connector multiple. The permanent signal test circuit is common to a number of test distributor trunk circuits and a chain circuit through (CH) relays in the trunk circuit is provided so that only one trunk can be connected to the test circuit at one time. The operation of a permanent signal release key, (P.S.-RLSE), at the test desk will cause the test distributor control circuit to become connected to the test circuit resulting in the operation of the (ST) relay.

5.2 Polarity and Marginal Bridge Test

Relay (ST) operates from ground in the test distributor control circuit. Relay (FL) operates and releases on 60 I.P.M. pulses approximately 1/2 second make and 1/2 second break. The first operation of relay (FL) will close ground to operate relay (W) in series with 500 ohm resistance. Relay (Z) remains shunted as long as this operating ground is connected. The operation of relay (W) will close the tip and ring of the line through relays (PT) and (PM) to make a marginal and polarity test. If the polarity is that of a selector on a direct line, namely, ground on the tip and battery on the ring, relay (PT) will operate. If the bridge causing the permanent signal is more than about 50 ohms in resistance relay (PM) will operate. If reversed polarity is indicated relay (PM) will operate but relay (PT) will not operate and relay (SO) will operate after a time interval. Relay (SO) will close a circuit to operate and lock relay (R) which reverses the tip and ring with respect to the test relays and relay (PT) should then operate and relay (PM) reoperate. With either polarity, therefore, both relays (PM) and (PT) should operate which closes a circuit to operate relay (IR). The release of relay (FL) will remove the shunt from relay (Z) which will operate. Relay (W) remains locked up. The operation of relay (FL) on the next closure of the interrupter will close ground to shunt and release relay (W) and maintain relay (Z) operated as long as ground is closed. Relay (W) is closed, therefore, for a period of 1/2 second minimum to 1 second maximum and the polarity-marginal test is made during this period.

5.3 Low Resistance Battery and Ground Test

The release of relay (W) with relay (Z) operated will close a circuit through a contact of relay (D) to operate relay (W1). The operation of relay (W1) will transfer the tip and ring leads from the (PT) and (PM) relays to relays (MG) and (MB) respectively, in order to make a test for low resistance battery or ground. This test is applied only if the polarity and marginal test has functioned properly and operated relay (LR). The release of relay (FL) will now cause relay (Z) to release since relay (W) is already released. Relay (W1), however, locks operated to the control ground on relay (ST) through a contact of relay (D) and if relay (LR) has not operated the release of both relays (W) and (Z) will close ground from relay (ST), through the locking contact of relay (W1), back contact relay (W), back contact relay (Z), back contact relay (LR) to operate disconnect relay (D) which will cancel further test. However, relay (LR) should be operated, assuming a normal test condition, and the release of relays (W) and (Z) will simply count another 1/2 second time interval. The low battery and ground test is applied, therefore, for approximately one second. If a low battery or low ground is encountered during this interval relay (MB) or (MG) will operate and close a ground to shunt relay (LR) which will release and operate relay (D) which in turn cancels the application of shunting battery.

5.4 Battery Test for Low Resistance

The next operation of relay (FL) will reoperate relay (W) which will close a circuit to operate relay (Z1). This circuit may be traced from ground through make contact of relay (ST), make contact of relay (LR), back contact relay (Z), make contact of relay (W), make contact of relay (W1), make contact of relay (BC) to the winding of relay (Z1). The operation of relay (Z1) will operate relay (Z2) which will close the series resistance shunting battery for a low bridge test for approximately 0.2 second during which time if marginal relay (M) operates in series with the shunting current it will close a circuit to operate relay (D) and prevent the application of direct shunting battery. Relay (M) is marginal so that it will operate only if the resistance of the bridge on the line is so low that more than one ampere will flow if direct shunting battery is applied. The operation of relay (LR) closes a circuit through a back contact of relay (Z1) to operate relay (SR). The operation of relay (Z1) opens the circuit for relay (SR) which uses a condenser timing scheme to time an interval of approximately 0.2 second for the application of the shunting battery through resistance before applying the direct shunting battery. The release of relay (SR) will close a circuit to operate relay (W2) provided relay (D) has not operated.

5.5 Application of Shunting Battery and Ground

Relay (W2) will remain operated while relay (Z1) is operated and will close the direct shunting battery and ground to the tip and ring to shunt the (A) relay of the selector and release the switch. In order to insure the release of the switch this shunting current must be applied for about 1.3 seconds. This time is counted by the operation and release of relay (FL). Relay (FL) will remain operated for about 0.3 second after the operation of relay (W2), then its release will operate relay (Z). Relay (FL) will remain non-operated for 1/2 second then will operate again releasing relay (W) which now will release relay (IR) since relay (Z1) is operated. Relay (FL) will be operated for another 1/2 second making three intervals of a total of 1.3 seconds after relay (W2) operates. If the selector releases at any stage during the application of the shunting battery, ground will be removed from lead "BC" releasing relay (BC). The release of relay (BC) will open the circuit for relays (Z1) and (W2). Relay (W2) in releasing will cut in the 14 ohm resistances in each side of the shunting battery. Relay (Z1) will release in turn releasing (Z2) which will open the shunting battery circuit. Ground will remain on the "ST" lead, however, and the timing will continue as above described. A condenser and resistance are connected across the tip and ring at the No. 2 springs of relay (Z2) in order to reduce the click on the line when shunting battery is applied and removed.

5.6 Release of Test Circuit

The release of relay (FL) will release relay (Z) which will close a circuit to operate relay (D). This circuit may be traced from ground on a make contact of relay (ST), locking make contact of relay (W1), back contact relay (W), back contact relay (Z), back contact relay (IR), through relay (D) to battery. Relay (D) will operate and lock. The operation of relay (D) indicates the end of test and subsequent operation is merely to release relays in a certain order to restore the circuit to normal. The operation of relay (D) opens the circuit for relay (W1) which releases and opens the locking circuit for relay (Z1) if relay (BC) is still operated. Relay (D) in operating also opens the circuit for relay (W2) which will release and cut in the 14 ohm resistances in each side of the shunting battery. Relay (Z1) releases and opens the holding circuit for relay (Z2) which will release opening the circuit of the shunting battery. Relay (W2) in releasing will close ground through its back contact through a make contact of relay (D) to the "EC" lead. This signals the control circuit that the test is completed and will cause ground to be opened from the "ST" lead releasing relay (ST). Ground will also be removed from the (BC) lead if not previously opened by the release of

the selector. The release of relay (ST) opens the locking ground for relay (D) also for relay (R) if it has been operated. These relays, releasing, completely restores the test circuit to normal and connects ground to lead "G" to permit reselection by another control circuit.

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Dept. 332-A

WPA)VS
WHM)