Installation Engineering Handbook 59
Western Electric Company, Incorporated
Hawthorne Works

Section 902
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OPERATION TEST OF REMOTE TELEGRAPH

TESTBOARD SWITCH FRAME EQUIPMENT

CONTENTS

1. GENERAL

1.1 Circuits Included in Test

SD-98132-01 Incoming Selector Circuit
SD-98133-01 Test Line Control Circuit
SD-98134-01 Test Group Selector Circuit
SD-98135-01 Test Connector Circuit
SD-98136-01 Alarm, Aux. Test Line, Aux. Test Trunk and Interrupter Start Circuit

1.2 Preliminary

1.21 Supplementary tests of selector and connector switches and associated bank multiple (circuits SD-68132-01, SD-68134-01 and SD-68135-01) shall have been completed prior to application of tests described in this section.

1.22 Tests described in this section should be applied before cross connections to associated test board and auxiliary trunk or line circuits are connected.

1.3 Description of Tests:

1.31 Operation tests are made consisting of directing calls through the switch train and terminating them in the miscellaneous trunk test set ITE-4011.

2. RECORDS AND REQUIREMENTS

2.1 Records: Results of tests covered in this section should be recorded on SD-4-1313 and summarized on SD-4-1315.

2.2 Requirements: are contained in the test descriptions and are based on information in BSP 648.033 and BSP AA36.416.

3. TEST EQUIPMENT

3.1 Test Sets

Amt	ITE	Description
1	4442	Volt-Ohmmeter
1	4011	Miscellaneous Trunk Test Set

3.2 Cords

3.21 As supplied with test sets.

4. TEST JACKS

4.1 Using ITE-4442 Volt-Ohmmeter or other means of checking continuity, make a test verifying the continuity and cut-off features of the test jacks in each test Line Control Circuit (SD-98133-01).

4.2 Test jacks are as follows:

L - SW CKT
SEL - SW CKT
AMP IN - SW CKT
AMP OUT - SW CKT

5. FUSING

5.1 Circuits per SD-68132-01, SD-68134-01, SD-68135-01 and the alarm Figures of SD-68136-01 will have been previously fused for performance of the selector and connector supplementary tests.

5.2 V3 (SD-95112-01) amplifier unit should be removed from its socket in each test Line Control Circuit if previously plugged in. Rotate F potentiometer fully counterclockwise. Do not plug unit in until directed later in test section.

5.3 Install fuses in the test control circuits per SD-68133-01 and any remaining fuses in the miscellaneous circuits per SD-68136-01.

5.4 Observe the following procedure when installing fuses:

(a) Before fusing an equipment unit verify that each fuse stud associated with the unit is free of crosses with battery or direct ground.

(b) As each fuse is installed verify that remaining unfused studs in the group are free of battery.

(c) Verify that the designation at the fuse panel agrees with the circuit to which it is wired and that the fuse is of the proper type as specified on the circuit drawing.

(d) As each fuse is installed check with the volt-ohmmeter, set on proper volts scale, that battery of the correct potential is present at at least one point in the circuit just fused.

6. VF AMPLIFIERS AND PAD CIRCUITS

6.1 Installation - VF Amplifiers

6.11 Verify at each test Line Control Circuit V3 Amplifier socket that a +130 volt potential is present at Terminal 10 of the socket and -48 volt potential at Terminal 8. Both measurements are with reference to ground (Terminal 7 of the socket).

6.12 Set the P potentiometer, in each V3 Amplifier unit, at its fully counterclockwise position.

6.13 Install V3 Amplifier units in their sockets using the following procedure:

(a) Set ITE-4442 Volt-Ohmmeter to 60 volt dc scale.

(b) At the test Line Control Circuit in which the Amplifier is to be installed, connect ITE-4442 -(neg.) terminal to the control circuit J1 test jack. Connect ITE-4442 -(pos.) terminal to the J2 jack. If unit is not provided with J1 and J2 jacks, measure filament voltage at V3 repeater socket terminals 8 and 9.

(c) Install the Amplifier in its socket and adjust the test Line Control Circuit F potentiometer until ITE-4442 indicates 20 volts. (Voltage across J1 and J2 jacks will change some as the amplifier tube warms up.)

6.14 After all VF Amplifiers have been installed, readjust the F potentiometer if necessary so that all filaments will be operating with a 20 volt potential across them as measured at the J1 and J2 jacks.

NOTE 1: The office -48 volt supply should be at its mean voltage ± 1 volt at the time this final adjustment is made.

NOTE 2: Cathode activity and gain-frequency tests of the V3 Amplifier are no longer required.

6.2 Line Control Circuit Pads

6.21 Resistance Measurements

6.211 If the SD and RCV pads are equipped with 89 type plug in resistors, remove them. Do not replace them until so directed in this test section.

6.212 In each Line Control Circuit, check the resistance between points shown in the following chart. Use ITE-4442 volt-ohmmeter for measurement.

Measure From		Measure To		Block Operated Relay	Resistance (Nominal
SD	Rel.Cont.4	SD	Rel.Cont.8	-	5960 W
"	Cont.3	"	Cont.7	-	5960 W
"	Cont.4	"	Cont.8	RC	600 W
"	Cont.3	"	Cont.7	RC	600 W
"	Cont.4	"	Cont.1	SD	600 W
"	Cont.3	"	Cont.2	SD	600 W

7. OPERATION TEST BEFORE CROSS CONNECTING

7.1 The following test operations check the following features:

(a) Switch train selecting features.

(b) Transmission through switch train.

(c) Auxiliary test trunk or test line operation.

(d) Test Line Control Circuit operation.

7.2 As these tests are originated and terminated at the switch frame, all wiring between the switch frame and IDF or MDF shall be verified for continuity and absence of crosses.

7.3 Test Setup (Figure 1 of SD-98136-01 Arranged for Z Option) Refer to Figures 4 and 5

7.31 Locate an ITE-4011 Miscellaneous Trunk Test Set near the switch frame. Connect 48 volt battery and ground to the ITE-4011 A jack.

7.32 Interconnect ITE-4011 test jacks as indicated in Figure 5.

7.33 Select an auxiliary test trunk (Figure 1 of SD-98136-01) for test. Connect ITE-4011 to Aux. Test Trunk as follows:

Connect From ITE-4011 Jack	To Aux. Trunk T.S. Term. No:	(Lead)
(REV) T1	36	B1
(REV 1) T1	37	B2
L1	38	B1
L2	35	SP

7.34 Connect ITE-4011 T jack tip and ring to the TT and TR leads associated with the Aux. Test Trunk under test. Make connections at terminal strip G1-G10 on test connector unit. See CAD 2 of SD-98135-01.

7.35 Select an Incoming Selector Circuit for test.

7.351 If E lead pulsing with Figure 3 of SD-98132-01 is provided connect the ring of STO jack to terminal 26 (E lead) of TS on incoming E and F lead signaling unit associated with Incoming Selector used for test. Connect (BG-LP) T to terminal 25 (M1 lead) of signaling unit.

7.352 If loop pulsing with Figure 2 of SD-98132-01 is provided connect the tip and ring of ITE-4011 STO jack to the A jack of the incoming loop signaling circuit associated with the selector used for test. Connect (BG-LP) T and R jacks to incoming selector jack terminals 16 and 20.

7.353 If loop pulsing without Figure 2 of SD-98132-01 is provided connect ITE-4011 STO jack tip and ring leads to terminals 1 and 2 of the incoming selector jack. Connect ITE-4011 (BG-LP) T and R jacks to terminals 16 and 20 of the Incoming Selector jack.

7.4 Test Operations - Auxiliary Test Trunk arranged for Z option.

7.401 Two Way Trunk Busy on Test or Regular

Call:

(a) Operate ITE-4011 BG key.

(b) If E lead pulsing of Incoming Selector is required operate DG key. If loop pulsing is required DG key should be normal.

(c) Operate STO key to seize incoming selector.

(d) At ITE-4011 dial digits that will direct switch train to connect to Aux. Trunk under test.

NOTE: In a typical arrangement the first appearance of the line control circuit appear on level 1 of the incoming selector circuits. Connector group 1 appears on level 1 of the group selector circuit, connector group 2 appears on level 2 etc.

EXAMPLE 1: Dial digits 11111. Connection will be made from incoming selector through line control circuit No. 1, group selector No. 1, the first idle connector of group 1 to aux. trunk 11 of group 1.

EXAMPLE 2: Dial digits 12231. Connection will be made from incoming selector through line control circuit No. 2, group selector No. 2, the first idle connector in group 2 to aux. trunk 31 of group 2.

EXAMPLE 3: (For later use in testing HOLD feature of line control circuit). Dial digits 62231 to regain connection to aux. trunk No. 31 of group 2 through line control circuit No. 2 after this line circuit had been released with a HOLD order stored in it. (2nd appearance of line control circuits appears on level 6 of incoming selectors.

(e) Aux. test trunk indicates that associated 2 way trunk is busy. BG and BG1 lamps in ITE-4011 flash at 60 IPM rate if loop pulsing is used. BG lamp only, flashes if E lead pulsing is used.

(f) Release STO key, switch train releases. Leave BG key operated, also DG key if E lead pulsing is used.

7.402 Two Way Trunk Made Busy for Maintenance

(a) Operate ITE-4011 REV and REV-1 keys. L1 lamp in ITE-4011 lights.

(b) Operate STO key and dial number of Aux. trunk under test. BG and BG1 (or BG only) lamps light steadily.

(c) Release STO, REV and REV-1 keys. L1 and BG- lamps extinguish. Switch train releases.

7.403 Two Way Trunk Made Busy to Outgoing Traffic By Telegraph Test Board Operator

(a) Operate ITE-4011 REV key. L1 lamp lights. (This is equivalent to signal from the associated 2 way trunk that it is idle.)

(b) Operate STO key and dial number of auxiliary trunk under test.

(c) Dial digit 2 (make busy signal). BG or BG and BG1 lamps flash at 30 IPM rate. B- lamp lights in aux. trunk unit.

(d) Verify that ground is present at terminal 37 of T.S. on aux. trunk unit.

7.404 Line Control Circuit Receives a SEND Order

(a) Dial digit 6. ITE-4011 L2 lamp lights. Observe that the SD relay in the Line Control Circuit, in use for test, has operated.

7.405 Line Control Circuit Receives a RECEIVE Order

(a) Dial digit 8. L2 lamp remains lighted. SD relay in control circuit releases, RCV relay operates.

7.406 Release of RECEIVE Order Prior to Release of Make Busy Condition

(a) Dial digit 0. RCV relay releases. L2 lamp is extinguished.

7.407 Release of Make Busy

a) Dial digit 2. B- lamp at aux. trunk unit extinguished.

7.408 HOLD Order:

(a) Dial digit 4. H relay in test Line Control operates.

(b) Release ITE-4011 STO key. Incoming selector releases.

(c) Operate STO key and dial the first 2 digits of the number required to reach the Line Control Unit used for test. The BG or BG and BG1 lamps flash at 120 IPM rate.

(d) Release STO key. Incoming selector releases.

(e) Operate STO key. Dial the 2 digits that will step the incoming selector to the second appearance of the Line Control Circuit used for test. (Digits 61 to 60).

7.409 Release After a HOLD Order:

(a) At ITE-4011 dial digit 0. The H relay in the Line Control unit releases.

(b) Release STO key. The switch train releases.

7.410 Transmission Through Switch Train-Monitor-Receive-Send

(a) Connect a test receiver to terminals 47 and 48 of the Line Control unit T.S. (T and R leads).

(b) Operate STO key and dial up the aux. trunk used for test.

(c) Operate ITE-4011 TN key. In the line control circuit used for test turn up the VF amplifier gain until tone is heard in the test receiver connected to the line control circuit T and R leads. Rotate amplifier gain control fully counterclockwise.

(d) Dial digit 8. Again turn up amplifier gain until tone is heard. This checks transmission through RCV pad. Amplifier gain setting should be much lower than when checking the monitoring path in "C" above. Retain gain setting for following test.

(e) Interchange test receiver and ITE-4011 T jack connections. Dial digit 6. Tone should be heard in the test receiver. This is a check of SD pad transmission and reversal of the amplifier input and output connections.

(f) Turn amplifier gain control fully counterclockwise. Dial digit 0 to release SEND order. Release STO key to return switch train to normal.

7.411 Repeat tests 7.403 to 7.410 using same aux. trunk circuit as above but using each remaining Line Control Circuit in turn.

7.412 Repeat tests 7.401, 7.402, 7.403 and 7.410 (tests a, b and c) using one Line Control Circuit and each remaining auxiliary trunk circuit. (Test connections between aux. trunk circuit and ITE-4011 will have to be changed to test each aux. trunk.)

NOTE: At completion of 7.403 dial a 2 to release MB condition.

7.413 Repeat test per 7.410 a, b and c using one line control unit, one aux. test trunk and each test connector. Steer calls to test connector by busying out all test connectors except the one used for test.

7.414 Take down test connections. Replace 89 type resistors.

7.5 Test Setup for Auxiliary Test Line Figure 1 of SD-98136-01 Using Y Option. Refer to Figures 4 and 5 of this section.

7.51 Use same test setup as described in Paragraph 7.3 for auxiliary test trunk with following exceptions.

(a) Connections to ITE-4011 (REV) T1, (REV-1) T1 and LT jacks are not used.

(b) Connect L2 jack to terminal 31 (SR lead) of an auxiliary test line T.S. to be used for test.

(c) Connection between ITE-4011 T jack and TT and TR leads is not used.

7.6 Test Operations - Auxiliary Test Line With Y Option

7.61 Make Busy of No. 5 Crossbar Terminating Line Circuit

(a) At ITE-4011 operate BG key. If E lead dialing is used operate BG key.

(b) Operate STO key and dial the number that will cause connection to the auxiliary line under test. (First 2 digits of number should direct call through first appearance of line control circuit.)

(c) Dial digit 2. ITE-4011 L2 lamp lights. Lamps BT or BG and BG1 flash at 30 IPM rate. Frame B- lamp lights.

(d) Dial digit 2 again. L2 lamp and BG or BG and BG1 lamps extinguish. Frame B- lamp extinguishes.

(e) Release STO key. Switch train releases.

7.62 Perform above test using each auxiliary test line.

7.63 Take down all test connection.

8. OPERATION TEST AFTER CROSS CONNECTING TO AUXILIARY TRUNK CIRCUIT

8.1 The following tests are made at the auxiliary test trunk units after cross connecting to the No. 5 cross bar 2 way trunk and associated auxiliary trunk.

8.2 The 2 way trunk circuits should be idle in which case the B relay of the associated auxiliary test trunk will be operated.

8.3 At the auxiliary test trunk block the B1 and B2 relays operated. The B- lamp lights. At the associated 2 way trunk the MB relay operates.

8.4 Apply ground to terminal 35 of the auxiliary test trunk T.S. The Sp relay in the associated auxiliary trunk operated.

8.5 Release the B1 and B2 relays.

8.6 Perform this test at each cross connection auxiliary test trunk circuit.

Manager, Panel and Step-by-Step
Switching Systems Engineering

ATTACHED:
FIGURES 1, 2, 3, 4 and 5.

Reason for Reissue:
To change Paragraph 2.1

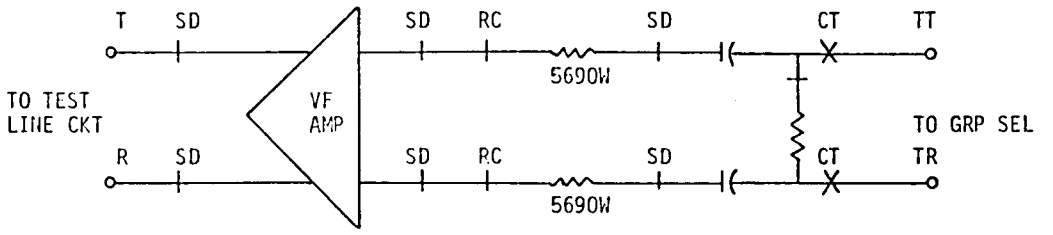


FIG. 1 LINE CONTROL CKT TRANSMISSION
MONITORING - CT RELAY OPERATED

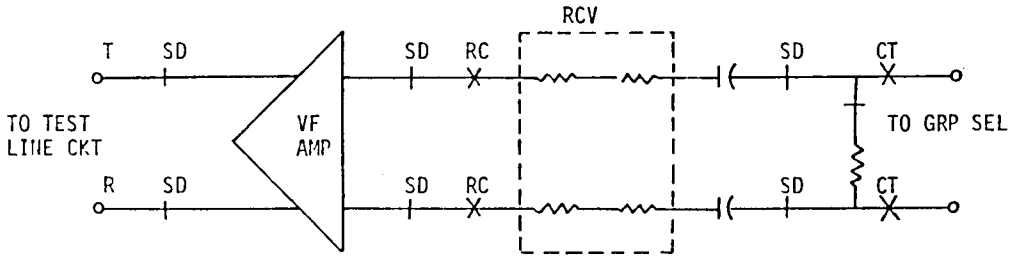


FIG. 2 LINE CONTROL CKT TRANSMISSION
RECEIVING - CT AND RC RELAYS
OPERATED

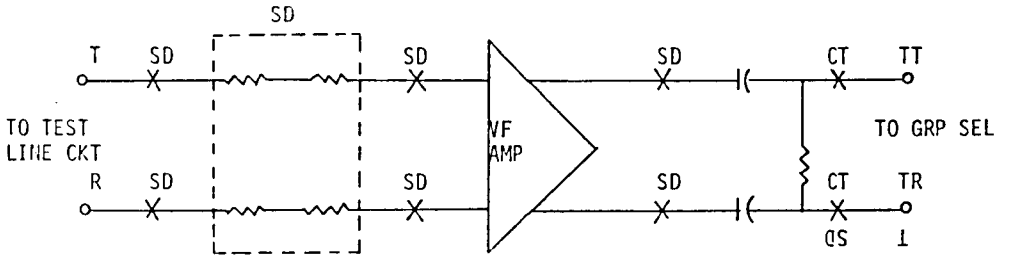


FIG. 3 LINE CONTROL CKT TRANSMISSION
SENDING - CT AND SD RELAYS
OPERATED

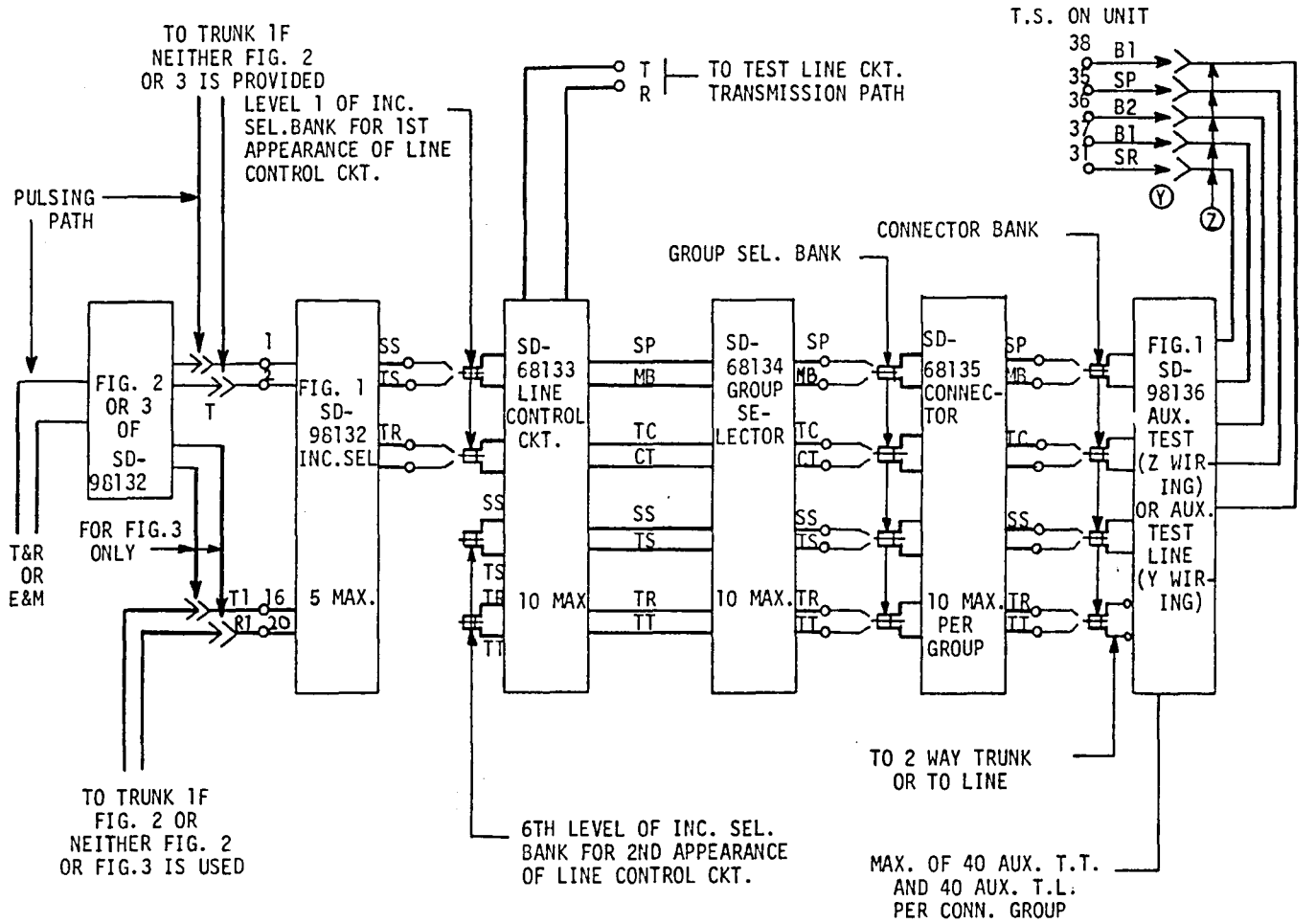
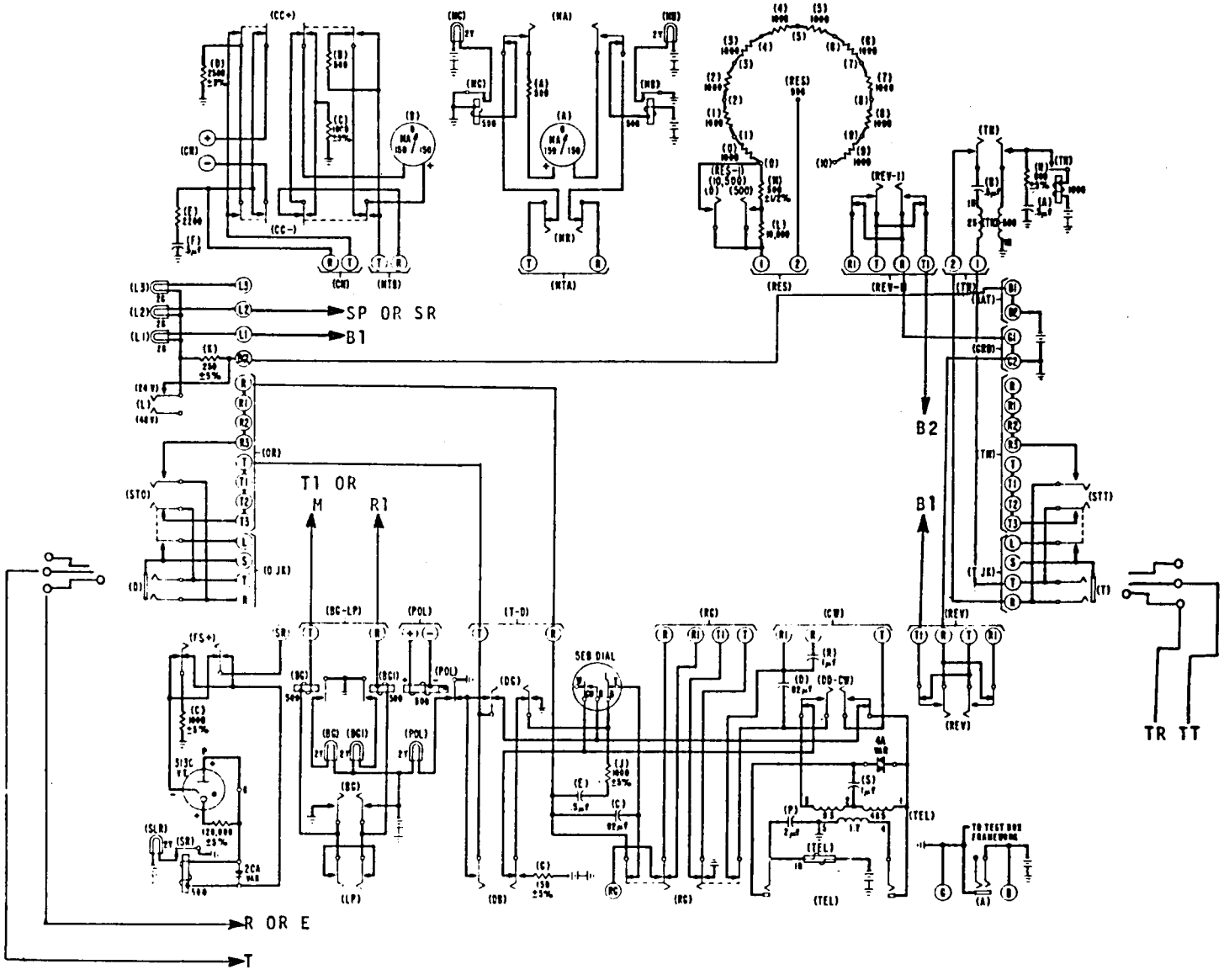


FIG. 4 SWITCHING TRAIN ASSOCIATED WITH
REMOTE TELEGRAPH TEST BOARD.



NOTE ARROWS ON KEY CHART INDICATE KEYS OPERATED BEFORE START OF TEST

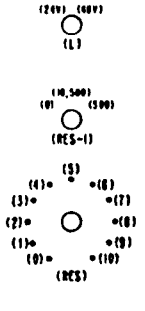
CIRCUIT REQUIREMENTS						
DESIG	CODE	RES %	TEST	SOAK MA	TEST MA	READJ MA
POL	2501M	5%	0	-15	9.0	3
			0	15		1
			80	15		1.8
POL	2001	10%	0	-12	-	R 3
			80	-12	-	R 2
			0	-12	3.2	3
			80	12	1.7	1.8
			0	12	9	1
TD	2006	5%	0		13	12
			80		10.5	11
RR,RC1	1	5%	0		12	11
			80		9	10
RR,RR	D-475	5%	0		9.5	8.3
			80			9.9
SR		5%	0		7	

*APPLIED WITH TENSION OF BIASING SPRING RELEASED

REQ	CORDS AND ACCESSORIES						WITH ITE
	ART	ITE	LENGTH	CORS	END	END	
	0	0547	12"	1	2455	2455	
	1	0801	12"	3	310	310	
	1	0805	12"	5	310	500	
	2	0839	12"	5	310	5-2455	
	14	0540	9"	1	2455	2455	
	1	0590	12"	2	310	310	
	2	0314	12"	3	310	5-0805	
	0	0507	ALLIGATOR CLIPS				
	0	2455	PLUGS				
	0	0100	SPADE TIPS				
	2	4412	CONNECTOR 2-POINT				
	2	4413	CONNECTOR 4-POINT				

NOTE ALL RESISTOR VALUES ARE ±1% UNLESS OTHERWISE SPECIFIED

	CC-	LP	DD-CW	
STO	CC+	DG	REV	REV-I
	TD	RA	RR	
STT	RC	RR	DG	FS+



MISCELLANEOUS TROUBLE TEST SET, ITE-4011

FIG. 5 TEST SETUP FOR E LEAD OR LOOP PULSING