Installation Engineering Handbook 62
Western Electric Company, Incorporated
Columbus Works

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TEST OF INCOMING TRUNK TEST FRAME

CONTENTS

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1. GENERAL INFORMATION

1.1 Description of Test: This section outlines the tests to be applied to the Incoming Trunk Test Circuit, SD-25161-01.

1.2 Circuits Tested:

SD-25161-01 - Incoming Trunk Test Circuit
SD-68456-01 - Teletypewriter Control Circuit

1.3 The Test Circuit is Arranged

(a) For automatic tests of incoming trunks in distant offices to which the Office Link Frames connect.

(b) To make a continuity and reversal test of all trunks appearing in the Office Multiple.

(c) To record trouble indications on a teletypewriter so that the test circuit can be used without requiring the services of an attendant.

(d) To cancel frame blockages when the teletypewriter is operating, on all trouble conditions which cause blockage, except when the test circuit recognizes a print and stick (PAS) condition.

1.4 Cross-Connections to be Left Open: The compensating resistance cross-connections should be left open until after the leads between the L-OPR, A-OPR, L-N-OPR-RI, L-N-OPR terminal strips and the G relays have been tested as described in Paragraph 7.1. Trunk cross connections should be left open until after the connector switch crosspoint test in Paragraph 6.

1.5 Temporary Cross-Connections: It will be necessary to obtain a temporary assignment from the telephone company to at least one incoming circuit of each type with which the office will work. These circuits are needed to check all operating features of the test frame as described in Paragraphs 7 to 13. It will also be necessary to provide temporary compensating resistance cross connections together with a TL cross connection if the incoming circuit to be tested has access to a nonsynchronizing test line. A TL cross connection for 24 volt-non repeating incoming and an XB cross connection for crossbar incoming circuit are also required.

1.6 Test Line and Busy Line Cross-Connections: The "IB", "IG", "FB", "FT", and "FU" cross-connections to the counting relays must be installed before test in Paragraph 9 in order to direct the incoming trunk test to a test line or busy line.

2. TEST EQUIPMENT

2.1 Test Sets

Amt	ITE	Description
1	4011	Misc. Trunk Test Set
1	4033B	Link Frame Test Set
1	4137	AC Continuity Test Set
1	4253	MF-KP Test Set
1	4442A	Volt-Ohmmeter
1	4029	Pulse Checking Set
1	2886	Sender Test Set - RCI Unit

Printed in U.S.A.

2.2 Cords

Amt	ITE	Lgth	Cdrs	One End	Other End
1	9404	20"	1	Frankel Clip	59 Cord Tip
1	9598	12'	2	310 Plug	310 Plug
1	9605	12'	3	310 Plug	309 Plug
2	9639	12'	3	310 Plug	3 Banana Plugs
3	9984	12'	10	Jones Plug	10 ITE-2455

2.3 Accessories

Amt	Code	Description
2	322A	Make-Busy Plug
1	349A	Make-Busy Plug
4	ITE-4109	Spade Tips
As Req.	ITE-8507	Alligator Clips

3. FUSING

3.1 Test Procedure - General

CAUTION: TO ELIMINATE A FIRE HAZARD, VERIFY THAT DIRECT GROUND IS NOT PRESENT ON THE ALARM BAR OR STUD ON A FUSE PANEL BEFORE INSTALLING ITS FEEDER FUSE.

NOTE: Use ITE-4442A Volt-ohmmeter. To avoid damaging the meter, first verify that battery is not present on the alarm bar by using the voltmeter portion of the ITE-4442A. If clear, switch to ohmmeter portion for the resistance reading which should be either infinity or approximately 600 ohms.

3.11 Fuse verification is, ordinarily, only required on fuse panels wired by the installer.

3.12 On shop wired and fused fuse panels, inspect the panel for missing or operated fused. If a fuse is missing or operated, test the fuse terminal for the absence of low resistance ground. Clear any grounded condition and install the proper fuse. At the completion of this test all fuse panels should be fully equipped with proper fuses. These may be either the proper specified type or a dummy.

3.13 The operation of relays in circuits when fuses or potentials are applied is normal in some circuits. Oscillations, chatter, and signs of overheating should be analyzed and cleared immediately.

3.14 ITE-4442A Volt-ohmmeter should be used to verify all potentials at fused terminals to insure that polarity and and voltages are correct. Many errors are caused by the use of the R-9572 Test Receiver on potentials other than -48 volts. Handbook 100, TMO-4442, provides full instructions for the use of the volt-ohmmeter.

3.15 When the R-9572 Test Receiver is used, avoid placing it directly on the ear.

3.2 Fusing Tests

3.21 Using fuse of the correct type, as indicated by the circuit drawing and fuse panel designations, install the fuses listed in Table A one at a time. Verify that each fuse is associated with the correct circuit and is free from cross with other unfused posts on the panel.

TABLE A

FUSE DESIG.	POTENTIAL	CAPACITY	TEST LOCATION
A B C D E	-48V	1 1/3	6B, Relay TBL 3B, " CA1 Winding G Sel. 12B Relay C Winding TST Sel.
F G H K L			8B, Relay A 7B, " RO 3B, " TD1 11B, " TCT 5B, " SV
M N R V W	-48V	1 1/3	9B, " VA 8B, " HAD 2L, " ABC- 13B, " CIA- L, " TGA
J*	+130V	1/2 HV	2T, " RF2
AST*	22 VAC	1 1/3	3, Timer AST

* Fused on Misc. Fuse Bay.

4. CAPACITOR TIMED RELAY PGA

4.1 Test Setup

4.11 Connect 48V battery and ground to the A jack of the ITE-4029, pulse checking set, using an ITE-9598 cord.

4.12 Connect T and R of ITE-9639 cord equipped with alligator clips to 4M (RB) and 1B (KP) relays respectively.

4.13 Block operated SG, C3, MF1, and normal KP relays to start pulsing.

4.2 Calibration and Adjustment

4.21 See TMO-4029 for calibration and adjustment procedures.

4.3 Relay Requirements

4.31 Check that the pulse output of the PGA relay meets the requirements specified on page 16 of SD-25161-01, F8.

4.32 If the requirements are not met, change the strapping of resistances in accordance with procedure B of Page 16 in SD-25161-01, F8.

4.4 K.P. Signal

4.41 Insulate 4B and 8B of the KP relay and block operated relay KP.

4.42 Check that the pulse output of the PGA relay meets the requirements specified on page 16 of SD-25161-01, F8.

4.43 Release all relays and remove the insulation from the KP relays.

5. RELAY OPERATING PATHS

5.1 Test Progress Memory Relays

5.11 Block operated STV, ON1, and ON2 relays and AL1 relay nonoperated.

5.12 Perform the following operations:

OPER.	REL.	OPERATED RELAYS	LAMP
MV		M1,M1A	RF1
	MV	M1,M1A,M2	RF1
MV		M1,M1A,M2,M3	RF2
	MV	M1,M1A,M2,M3,M4,M4A	RF2

5.13 Remove blocks from relays and check that all operated relays release.

5.2 Supervisory Progression Relays

5.21 Block operated ON1 relay.

5.22 Perform the following operations.

OPER.	REL.	OPERATED RELAYS	LAMP
SV1		TAT	
	SV1	TAT,TBT	HIT
SV1		TAT,TBT,TCT	CHT
	SV1	TAT,TBT,TCT,TCT1	
SV1		TAT,TBT,TCT,TCT1,TDT	
	SV1	TAT,TBT,TCT,TCT1,TDT, TDT1	
SV1		TAT,TBT,TCT,TCT1,TDT, TDT1,TET	
	SV1	TAT,TBT,TCT,TCT1,TDT, TDT1,TET,TFT	

5.23 Remove blocks from relays and check that all operated relays release.

6. CONNECTOR SWITCH CROSSPOINT TEST

6.1 This test is made by using the continuity reversal circuit of the test frame to check for continuity of the T, R and S1 or the T, R, S and S1 connections through the connector switch to the office switch multiple. For convenience the office switch multiple connections are made at the jack panel associated with the outgoing trunk test frame. The miscellaneous trunk test set, ITE-4011, is used to place the necessary battery and ground conditions on the multiple.

6.11 Make the following connections on the ITE-4011 test set using ITE-9548 cords:

TM-T	To	MTA-R
TM-R	To	MTA-T
BG-LP-R	To	TJK-S
G1	To	OJK-S

6.12 Connect T jack to the T jack and O jack to the T and MB jack on the OGTT corresponding to the O crosspoint of the group O connector switch, using ITE-9605 cords.

6.13 Connect battery and ground to the test set with ITE-9598 cord patched to frame A jack. Block normal relay MDP.

6.2 Test Operations

6.21 Operate test set, BG and STT keys.

6.22 Block the PT and VT relays normal and the TC relay operated. Insulate 1 and 2T (TR) relay to prevent the TA switch from stepping unnecessarily.

6.23 Operate CP and ST keys. The test circuit connects to the first trunk. The BY lamp light indicating that the S lead is continuous. The test set BG1 lamp lights indicating continuity of the S1 lead.

6.24 Remove the cord from the T and MB jack and insert it into the second T and MB jack. The BY lamp is extinguished and the test circuit tests the tip and ring for continuity and polarity before advancing to the next trunk. Move the cord from the T jack to the T jack of the second trunk.

6.25 Continue to move the cords to succeeding jacks as the test circuit advances until all crosspoints on each group connector switch have been tested.

7. TRUNK CROSS CONNECTION TESTS

7.1 Verification of Leads to G and DM Relays (To Be Made Before Cross-Connecting)

7.11 Leads to G Relays

7.111 Block operated the GO relay. Using an ITE-9984 cord and alligator clips, connect lead 0 to the 00 punching of the L-OPR terminal strip, lead 1 to A-OPR, lead 2 to L-N-OPR-R1, 3 to L-N-OPR, and 4 to the A-N-OPR terminal strip associated with the blocked G relay.

7.112 Connect the other end of the cord to the S receptacle of the Link Frame Test Set, ITE-4033B. Using an ITE-9598 cord connect 48V battery to the test set and operate the SB key.

7.113 Block operated the G1 relay and momentarily apply ground thru a test receiver to the 01 punching of the L-OPR, A-OPR, L-N-OPR-RI, L-N-OPR and A-N-OPR terminal strips and observe that only the proper S lamp lights on the test set. The wrong S lamp lighting indicates a reversal. More than one S lamp lighting would indicate crossed leads. Run a grounded test pick over terminals 02 to 99 as provided, of each terminal strip and check that no click is heard. A click would indicate crossed leads between different G relays.

7.114 Release relay G1 and operate relay G2. Momentarily ground the 02 punchings in the same manner as described in Paragraph 7.113 and observe that the proper S lamps light. Test the terminals other than 02 for crosses.

7.115 Check the leads to succeeding G relays in the same manner as in 7.113. After the last leads have been tested remove the test connections and release any blocked relays.

7.116 Check that punchings 00 to 99 of terminal strip TL and TF are free from ground. A grounded terminal would indicate crossed 1, 2, 3 or 4B contacts on a G relay (App. Fig. 11) or 1 and 2 contacts (App. Fig. 52).

7.117 Block all G relays operated and test that punchings 00 to 99 of terminal strips TL and TFXB are grounded.

7.118 Release one G relay at a time and test that ground is removed from the corresponding punching on terminal strips TL and TFXB.

7.12 Leads to DM Relays

7.121 Block operated CP3 and all DM relays.

7.122 Check that leads 3D4, CP1, TD, TG, 5D, SP, P and TL associated with each DM relay are grounded at the terminal strip.

7.123 Release relay CP3. Check that ground is removed from all CP1 terminals.

7.124 Release one DM relay at a time and check that ground is removed from terminals TD, TG, 3D4, 5D, SP, P and TL associated with each relay as it is released.

7.13 Leads to ADM Relays

7.131 Block operated all ADM- relays.

7.132 Check that leads GY-, OF- and CD- associated with all ADM relays are grounded at the terminal strip.

7.133 Release one ADM- relay at a time and check that ground is removed from its associated terminals GY-, OF- and CD-.

7.2 Check of Compensating Resistance Cross Connections

7.21 Connect one lead of the Ohmmeter. ITE-4442A, to punching 0 of the L-OPR compensating resistance terminal strip. Connect the other lead to contact 9M (L-OPR) lead of any G relay. Manually operate each G relay in turn and observe that the Ohmmeter indicates the resistance specified in the telephone company cross connections and that the circuit is open where no cross connections are specified. Perform the same test with the Ohmmeter lead on contact 8M (A-OPR), 7M (L-N-OPR) and 6M (A-N-OPR) of any G relay.

7.3 Check of G- Relay Cross Connections

7.31 Manually operate and release each G-relay in turn and check relay operation as shown below. Block operated relay TT2.

CROSS CONNECTION		
FROM	TO	RELAY OPERATED
TL	STL	STL, STLA
TL	TL	NTL
TFXB	RI	RI
TFXB	XB	XB
TFXB	TF	TF
TFXB	ESS	ESS, XB
TFXB	ROS	OST
TFXB	ROS	OST, OSTA*
TFXB	OST	OST

CROSS CONNECTION FROM	TO	RELAY OPERATED
TFXB	OST	OST, OSTA Ø
TG	BTY	PT,(TSTGRPA KEY OPER)APP.38
TG	ATY	PT,(TSTGRPB KEY OPER)APP.38
TG	BTY	PT TSTGR1(A) KEY OPERATED (APP. FIG. 60)#
TG	CTY	PT #TSTGR1(B) KEY OPERATED
TG	DTY	PT #TSTGR2(C) KEY OPERATED
TG	ETY	PT #TSTGR2(D) KEY OPERATED
TG	FTY	PT #TSTGR3(E) KEY OPERATED
TG	GTY	PT #TSTGR3(F) KEY OPERATED
TG	HTY	PT #TSTGR4(G) KEY OPERATED
TG	ATY	PT 3TSTGR4(H) KEY OPERATED

* Block Relay BC1 Operated.

Ø Block Relay BC Operated.

Relay PT oeprates when a G- relay associated with sub-group not corresponding to the operated TST-GT-() key is operated. (i.e. if key TST GR1(A) is operated, operation of a G- relay associated with sub-groups B-H will cause the PT relay to operate.)

7.4 Check of DM Relay Cross Connection

7.41 Manually operate and release each assigned DM relay in turn and check that the proper cross-connected relays as listed in the telephone company's assignments, operate.

7.5 Test of CP, RCP, VT, PT, G, RCPT and CPT Cross Connections

7.51 A D punching is provided for each crosspoint of each group connector switch. This punching is cross connected to a RCP, RCPT, CP, VT, PT, G or CPT cross connection to perform the function described in the following table:

D PCHG. CROSS-CONNECTED TO	FUNCTION
CP RCP	CP key normal - pass by, CP key operated - continuity and polarity test.
VT	Pass by vacant terminals.
PT	Normally reversed trunk - always passed by.
G	Causes a G, DM or ADM relay to operate, providing proper conditions for test of Revertive, PCI or MF incoming selectors or trunks.
CPT RCPT	Starts the Tone Detector and closes "T" and "R" leads into the SU and SUR relays on continuity and polarity tone tests.

7.52 Block relay TR normal to prevent the TST and the TA selectors from stepping during this part of the test. Block relay TI operated in order to provide an operating path for the PB relay. The PB relay in turn places ground on the armature of the PT relay for advancing the circuit when the CP key is momentarily restored when checking a CP cross connection.

7.53 Operate the CP and ST key. The group 0 connector switch should close through crosspoint 0. At the test frame verify that only one crosspoint, indicated by the lighted GRP, SEL and HLD lamps, closes. From the telephone company cross connection list determine what terminal the D punching is cross-connected to and follow the procedure specified in the following table to advance the succeeding crosspoints.

D PCHG. CROSS-CONNECTED TO	OBSERVE RELAY	KEY OPERATIONS TO ADVANCE
CP RCP	CP1 Non-Oper.	Quickly release and reoperate CP key.
VT (No Sleeve)	VT Oper.	Release ST, operate and release PCS-H, operate ST.
VT (Trk. Sleeve Grd.)	-	None; circuit should advance automatically.
PT	-	None; circuit should advance automatically.
G	G,DM or ADM and DM Oper.	Release ST, operate and release PCS-H, operate ST.
CPT RCPT	ON Oper. (Tone Detector) ST Oper. (Tone Detector) PT Non-Oper.	Release and reoperate CP key.

7.54 When all D cross connections have been tested, release relays TR and TI and the ST & CP keys. Operate the RN key until the N lamp lights. Release the RN key.

7.6 Check of Cross Connection Terminals

7.61 Ground the terminals on the cross connection terminal strips listed below and check that the associated relays operate and lamps light as each terminal is grounded.

7.62 If no busy line code is assigned with non-standard 4 digit test line codes verify ground on BLD and SKP cross connect punches.

TERMINAL	RELAY	LAMP
3DA	TT3	3D
3DB	TT3	3D
3DR	TR3	RR (Opt RC)3D R(Opt RB)
5D 0-9	OI 0-9,5DG	5D
DC 0-9	DC 0-9	
SG	SGO	
SGNS	SGO,SP7	
MF	MFC,MF,MF1,MDP	
DPL	DPL	
WK	WK	
NS	SP7	
PEM	PEM	App. Fig. 9
4DA	TL4	App. Fig. 23 4D
4DA (Operate Relay BL2)	BL4	App. Fig. 23 4D
4DB	TL4	App. Fig. 23 4D
4DB (Operate Relay BL2)	BL4	App. Fig. 23 4D
4DC	TL4	App. Fig. 23 4D
4DC (Operate Relay BL2)	BL4	App. Fig. 23 4D
CI	PCIC	App. Fig. 70 PCI
CRA	CRA	App. Fig. 63
CRB	CRB	App. Fig. 63
CRC	CRC	App. Fig. 63
NS-	COD-,NSA *	App. Fig. 67 NSC
ABC-	ABC-,7DG #	App. Fig. 65 7D
OI 0-9	OI 0-9 Ø	App. Fig. 24, 67 5D
5D 0,1	OI 0,1 %	App. Fig. 66 ANI
ANI	ANIC	App. Fig. 62, 66 ANI
DCO-9	DCO-9	RE Opt.

* Non-standard 4 digit test line number.
\# 7 digit code.
Ø 5 digit code. Block operated relay F1V.
% ANI digit. Block operated relay ANIC.

8. CONNECTOR CONTROL AND CUT-IN KEYS

8.1 Test that the Group, Select and Hold PCS and PCR keys function properly to cause the test circuit to be connected to any trunk and to automatically advance to a new group and/or selector when the last hold magnet of each switch is released. Check that the associated Group, Select and Hold lamps light to indicate a particular crosspoint.

8.2 Operate the PCS or PCR keys to connect the test circuit to any set of crosspoints. Operate the RN key. The EC lamp lights momentarily, the test circuit restores to normal and the N lamp lights. Release the RN key. The N lamp is extinguished.

8.3 If YN or YP option is furnished, operate REP key. If YM or YQ is furnished, block 2WR relay operated. Check that the CA3 relay operates when a 349A plug is inserted in the C jack of each incoming trunk frame. Release REP key or unblock 2WR relay.

8.4 Using the group, select and hold PCR and PCS keys direct the test connector to an incoming circuit made busy to be used for test.

8.5 Operate the ST key. The BY lamp lights. With the incoming still busy after 4-1/2 to 5 minutes, the TA lamp lights and an audible alarm sounds. Operate and release the TA key. The alarm is silenced the TA lamp is extinguished and the TA selector restores to normal. Release the ST key.

8.6 Using the same busy trunk operate the APB and ST keys. The test circuit advances until an idle trunk is found. The PB register operates each time a busy trunk is passed. Restore the keys and remove the busy condition.

9. REVERTIVE PULSE TESTS

9.1 Test Line Test

9.11 Connect the test circuit to an idle incoming. Operate the ST and the REP keys. The test circuit advances and makes the necessary selections to cause the incoming to reach the group of test lines.

9.12 During this test, the tests for the premature operation and the nonoperation of the L relay are omitted on crossbar incomings, and the "A" relay cable charge test is omitted on #1 ESS incomings.

9.13 The PB lamp may flash during the A relay operate test indicating all test line circuits or, in the case of crossbar incomings only, all channels are busy.

9.14 The test line first makes a nonoperate (pre-trip) test and then an operate (trip) test of the ringing trip relay of the incoming circuit. Then soak, release and operate tests are applied in a flashing sequence to the supervisory relay of the incoming circuit. Alternate reversals of battery and ground resulting from the operations of the supervisory relay, serve as an OK signal.

9.15 If the incoming under test meets the test requirements, the test circuit releases the incoming connection and repeats the test until the ST key is restored.

9.16 Operate the CA key in addition to the REP key. Testing stops.

NOTE: The CA key should be allowed to remain operated for several seconds in order to allow time for the incoming or final selector to go to tell-tale, in the case of panel, or for the terminating sender to restore to normal in the case of crossbar.

9.17 In order to start testing again, restore the CA key. Check that if all keys are restored, while a test is in progress, the test circuit will stop after completion of the test call in progress.

9.2 Panel Brush Continuity Test (BC)

9.21 Check to see that the test circuit is normal and then operate the BC key.

9.22 Insert 322A plugs into the IB and IG jacks (Local Panel) or OB and OG jacks (Panel Tandem) corresponding to number of the brush which is to be tested.

9.23 Operate ST key. The test circuit proceeds to make a brush continuity test of the incoming selector, and the final selector is sent to tell-tale in final tens selection without a brush being tripped instead of to the final multiple test line group. When crossbar incomings are encountered, the test circuit is arranged to pass by.

9.24 Repeat test in Paragraph 9.23 with BC and BCR keys operated to check brush continuity recycle feature.

9.3 Busy Line Test (BL)

9.31 Operate the BL key. Under this condition the supervisory and trip relays are operated in the same manner as in service when a busy line is encountered.

9.32 Operate the ST key. The test circuit proceeds as in Paragraph 9.11 with the exception that the incoming is directed to permanently made busy line, instead of to the test line group.

9.33 During this test, a nonoperate test is made of the A relay in crossbar and 24 volt panel incomings, but is omitted on 48 volt panel incomings.

9.4 Release Test of the A Relay (REP-2)

9.41 Operate the REP-2 key. This prepares the circuit for test of the A relay of each incoming to insure the prompt release of these relays. If it is desired to make a rapid test omitting the use of the test line, also operate the BL key as in Paragraph 9.31.

9.42 Operate the ST key. The test circuit then functions as previously described except as follows:

(a) One repeat test is made immediately following the first test on each incoming selector.

(b) The tip and ring conductors are opened between the first test and the repeat test and remain open long enough for an A relay in proper condition to release. The ART lamp lights during the open period. At the end of this interval, if the A relay released, the fundamental circuit is closed for incoming brush selection. If the A relay does not release, the test is stopped in the position for incoming brush selection and the alarm is given.

9.5 Trouble Indications

9.51 Test the trouble indicating features of the test circuit as follows:

FEATURE TO BE TESTED	METHOD OF TEST
(a) TG Lamp Due to Open Tip or Ring	Block relay TG-2 normal. Direct the test circuit to any of 48 volt incoming circuit, either panel or crossbar. Operate the REP and ST keys and note that the test circuit blocks with the TG lamp lighted. Remove block from relay TG-2 and observe that the call goes through OK. Release the ST key.

FEATURE TO BE TESTED	METHOD OF TEST
(b) IB, IG, FB, FT, FU and OF Lamps Due to Tell-Tale Condition of Selector or Term. Sender	With relay contact insulated as specified below, set up a test line call on any 48 volt incoming circuit, operate the REP and ST keys and observe that the test circuit blocks with lamps lighted as indicated. As each test is completed, operate and release the CA key and observe that the call goes through OK.

INSULATE CONTACTS OF RELAY	CIRCUIT BLOCKS WITH LAMPS LIGHTED
7 & 8T(BC1)	IB & OF
4 & 5T(BC1)	IG & OF
1, 2 & 3B(BL1)	FB & OF
5 & 6T(BL1)	FT & OF
7, 8 & 9T(BL1)	FU & OF

(c) LFO Lamp Due to False Operation of L Relay on Non-Oper. Test	Using an ITE-9404 cord connect punchings 9 and 13 together on the Miscellaneous Compensating Resistance T.S. Set up a test line call on any 48 volt incoming circuit from panel office only. Operate the REP and ST keys and observe that the test circuit blocks with the LFO lamp lighted. Remove the ITE-9404 cord, operate and release the CA key and observe that the call goes through OK. Release the ST key.
(d) L-OPR Lamp Due to L Relay Failing to Operate	Block relay IA normal. Set up A test line call on any 48 volt incoming circuit. Operate the REP and ST keys and observe that the test circuit blocks with the L-OPR lamp lighted. Release relay IA, operate and release the CA key and observe that the call goes through OK. Release the ST key.
(e) L Relay Operate Incoming Advance of 24 Volt Incoming Selectors	Insulate contacts 2T-3T of relay ZO. Set up a test line call on a 24 volt incoming selector. Operate the REP and ST keys and observe that the test goes through OK. Operate the CA key and remove the insulation from the ZO relay. Release the CA ey and observe that the call goes through OK. Release the ST key.
(f) A-NO Lamp Due to False Oper. of A Relay	Refer to job incoming trunk test frame cross connection list, A relay nonoperate test. Using an ITE-9404 cord, connect together terminals at the miscellaneous compensating resistance terminal strip to reduce nonoperate resistance of 2000w. For example, if cross connection is connected to terminal 20, it would be necessary to connect 20 and 16 together. Set up a busy line call on a 24 volt incoming selector. Operate the REP and ST keys and observe that the test circuit blocks with the A-NO lamp lighted. Release the ST key and operate and release the CA key. Remove the ITE-9404 cord from punchings 16 and 20 and connect it across the (AN) 10,000w resistance of the test circuit. Repeat the test using a crossbar incoming circuit. Remove the ITE-9404 cord, operate and release the CA key and observe that the call goes through OK. Release the ST key.
(g) A-OPER & PB Lamps Due to a False Busy Condition	Block relay BL1 operated. Set up a test line call on any 48 volt incoming circuit. Operate the REP and ST keys and observe that the test circuit blocks with the A-OPR lamp lighted and the PB lamp flashing. The BL1 relay is blocked operated for this test in order to direct the incoming circuit to a busy line with test circuit set up for a test line call. Release the BL1 relay, operate and release the CA key and observe that the call goes through OK. Release the ST key.
(h) EP Lamp Due to Extra Pulse	Block relays SO and SO1 operated and set up a call to a crossbar incoming circuit. Operate the REP and ST keys and observe that the test circuit blocks with the SR-TST lamp lighted followed by the EP lamp. Release relays SO and SO1, operate and release the CA key and observe that the call goes through OK. Release the ST key.

FEATURE TO BE TESTED	METHOD OF TEST
(j) MO Lamp Due to Momentary Open of Trunk	Insulate 5T-6T contacts of the A4 relay of the test circuit. Set up a test line call on any type of incoming circuit. Operate the REP and ST keys. Note that the test frame blocks with the SR-TST and MO lamps lighted. Remove the insulation from the A4 relay, operate and release the CA key and observe that the call goes through OK. Release the ST and REP keys.

10. MF TESTS

10.1 Digit Steering Test

10.11 Perform operations in columns A and B. Check indications in columns C to F.

10.12 If App. Fig. 66 is equipped perform steps 1 to 19g. If not equipped do steps 1 to 19 and 20 to 22.

STEP	A	B	C	D	E	F
	RELAY		RELAY		LAMP	
	OPERATE	RELEASE	OPER.	RLS.	ON	OFF
1	C3		KP		KP	
2	7DG,PGA, RB		ADG		A	
3		PGA		KP		KP
4	PGA		BDG		B	
5		PGA		ADG		A
6	PGA		CDG		C	
7		PGA		BDG		B
8	5DG,PGA		TU			
9		PGA,5DG		CDG		
10	PGA		TH		TH	
11		PGA		TU		C
12	PGA		HU		H	
13		PGA		TH		TH
14	PGA		T		T	
15		PGA		HU		H
16	PGA		U		U	
17		PGA		T		T
18	PGA		SST			
19		PGA		U		U
19a	ANIC,PGA		NI1,KP ADG	SST	AID KP A	
19b		PGA				KP
19c	NI2,PGA		BDG		B	
19d		PGA		ADG		A
19e	PGA		CDG		C	
19f		PGA	PS	BDG,CDG NI1		BC, AID
19g		ANIC,7DG C3		ALL		
20	PGA		PS			
21		PGA		SST		
22		C3,7DG		PS		

10.2 Digit Check

10.21 Setup for Test

10.211 Using power cord ITE-9649 (and if necessary ground adaptor R-2674), connect ITE-4253 test set to a source of 110V, 60 cycle AC. Connect 24V, 48V and ground, to binding posts 24V, 48V and GND, respectively.

10.212 Operate power switch to ON position and allow set to warm up for 5 minutes.

10.213 Check that meter needle rests at the left end boundary of the scale (with MEAS switch in OFF position).

NOTE 1: Test set must always be operated with front panel horizontal, otherwise meter will not read correctly.

NOTE 2: If meter needle does not rest at left-hand edge of scale carefully reset it by means of the "Zero corrector" screw using a thin bladed screwdriver inserted thru the hole in the main panel directly below the center of the meter scale.

NOTE 3: Always operate MEAS switch to OFF position when not in use as this short circuits the meter and serves as a protective feature.

10.214 Set MEAS switch at A position and with a screwdriver adjust the A potentiometer until the meter indicates 0 db. Set switch on B and adjust B potentiometer until meter indicates 0 db. Set switch alternately on first one C position then the other and adjust C potentiometer until the average of the two meter readings is 0 db.

10.215 Set MEAS switch on MEAS position and set SEL switch on OSC ADJ position. Set FREQUENCY dial on 700, set DEVIATION dial on 0 and adjust OUTPUT control until meter indicates 0 db.

10.216 Set MEAS switch on OFF position and SEL switch on BIAS ADJ position. With a screwdriver adjust BIAS ADJ potentiometer until the 0-700 indicating lamp just lights. Operate the FREQUENCY dial to the 900, 1100, 1300, 1500 and 1700 cycle steps in turn and note that the corresponding indicating lamps light. The fact that all lamps do not light to the same brilliance has no significance with relation to this check of the test set.

10.217 Operate SEL switch to KP position. Set SA switch on 4 and SR switch on 3.

10.218 Connect T and R of J2 jack to bottom terminals of MT and MR capacitors respectively, using an ITE-9639 cord equipped with alligator clips.

10.22 Test Operation

10.221 Operate MF relay. Operate and release in turn KP1, DC0 to DC9 and STC relays. While each relay is operated, the test set lamps should light as follows:

RELAY	BLOCK OPER.	LAMPS
KP1	MF	2-1100 ~, 10-1700
DC0	"	4-1300 ", 7-1500 "
DC1	"	0- 700 ", 1- 900 "
DC2	"	0- 700 ", 2-1100 "
DC3	"	1- 900 ", 2-1100 "
DC4	"	0- 700 ", 4-1300 "
DC5	"	1- 900 ", 4-1300 "
DC6	"	2-1100 ", 4-1300 "
DC7	"	0- 700 ", 7-1500 "
DC8	"	1- 900 ", 7-1500 "
DC9	"	2-1100 ", 7-1500 "
STC	"	7-1500 ", 10-1700 "

10.3 Trunk Tests

10.31 Test Preparation

10.311 Patch ITE-4011 as follows:

TM-T	To	REV1-R
TM-R	To	POL-
REV1-T	To	POL+
REV1-T1	To	BG LP-T
REV1-R1	To	BG LP-R

10.312 Connect 48V battery and ground to A jack using ITE-9598 cord.

10.313 Operate PTR key on test frame if XT option is furnished.

10.32 Delay Dial Trunks

10.321 Patch test set T jack to TST jack of a delay dial MF trunk location on OGTT jack panel using ITE-9605 cord.

10.322 Set test circuit on trunk using G, S and H PCR and PCS keys.

10.323 Operate test REV1 and BG keys.

10.324 Operate REP and ST keys. MF and KP lamps light and test circuit awaits trunk test.

10.325 Operate test set STT key. BG, BG1, and POL lamps light.

10.326 Release REV1 key. POL lamp is extinguished, test circuit pulses digits, progress being shown by KP lamp going out and lamps TU to U lighting in turn as each digit is pulsed. SR TEST lamp lights.

10.327 Release ST key and momentarily operate RN and CA keys until N lamp lights. Release test set STT and BG keys.

10.33 Wink Start Trunks

10.331 Patch test set T jack to TST jack of a wink start MF trunk location on OGTT jack panel using ITE-9605 cord.

10.332 Set test set on trunk using G, S and H PCR and PCS keys.

10.333 Operate test set BG key.

10.334 Operate REP and ST keys. MF and KP lamps light and test circuit awaits trunk test.

10.335 Operate test set STT key. BG and BG1 lamps light. POL lamp lights. Operate REV1 key.

10.336 Release test set REV1 key. POL lamp is extinguished. Test circuit pulses digits and SR TEST lamp lights.

10.337 Release ST key and momentarily operate CA and RN keys until N lamp lights. Release test set STT and BG keys.

10.4 Recorder Tests

10.41 Delayed Dial Trunk

10.411 Connect to trunk as outlined in Paragraphs 10.321 and 10.322.

10.412 Operate test set BG and REV1 keys.

10.413 Operate REP and ST keys. MF and KP lamps light and test circuit awaits trunk test.

10.414 Operate test set STT key. Release and reoperate REV-1 key. Lamp OF flashes if XU option is furnished. If XT option is provided an XPX is printed at the teletypewriter.

10.415 Release ST key and momentarily operate CA and RN keys until N lamp lights. Release STT key.

10.42 Wink Start Trunk

10.421 Connect to trunk as outlined in Paragraphs 10.331 and 10.332.

10.422 Operate test set BG and REV1 keys.

10.423 Operate REP and ST keys. MF and KP lamps light and test circuit awaits trunk test.

10.424 Operate test set STT key. Release and reoperate REV-1 key. Lamp OF flashes if XU option is furnished. If XT option is provided an XPX is printed at the teletypewriter.

10.425 Release STT and REV1 keys. Operate and release CA key. Test circuit recycles, MF and KP lamps light and test circuit awaits trunk test.

10.426 Operate test set STT key. Operate and release test set REV-1 key. After KP lamp is extinguished and before U lamp lights, operate test set REV-1 key, OF lamp flashes (XU option). If XT option is provided a print-out will be made at the teletypewriter.

10.427 Release ST key and momentarily operate CA and RN keys until N lamp lights. Release test set STT key. Release PTR key on test frame.

11. PCI TESTS

11.1 Digit Steering

11.11 Perform operations in Column A and B. Check indications in Columns C to F.

11.12 If App. Fig. 66 is equipped perform steps 1-19h. If not equipped perform steps 1-19 and 20-22.

STEP	A	B	C	D	E	F
	RELAY		RELAY		LAMP	
	OPERATE	RELEASE	OPER.	RLS.	ON	OFF
1	5DG,7DG C3		KP		KP	
2	RB,TGA, KP1		ADG	KP	A	KP
3		TGA,KP1				
4	CO		BDG		B	
5		CO		ADG		A
6	CO		CDG		C	
7		CO		BDG		B
8	CO		TU			
9		CO		CDG		
10	CO		TH		TH	
11		CO		TU		C
12	CO		H		H	
13		CO		TH		TH
14	CO		T		T	
15		CO		H		H
16	CO		U		U	
17		CO		T		T
18	CO		SST			
19		CO		U		U
19a	ANIC,CO		KP,ADG NI1	SST	KP,A AID	
19b		CO		KP		KP
19c	NI2					
19d	PGA		BDG		B	
19e		PGA		ADG		A
19f	PGA		CDG		C	
19g		PGA	PS	BDG, CDG NI1		B,C
19h		ANIC,7DG		ALL		
20	CO	5DG,C3	PS			
21		CO		SST		
22		5DG,7DG C3		ALL		

11.2 Pulsing

11.21 Setup for Test

11.211 At the ITT select a crosspoint D terminal which is cross-connected to a vacant terminal (VT). Install a temprary cross-connection from the selected D terminal to a G- terminal cross-connected for a PCI route.

11.212 Locate the ITE-2886, Sender Test Set, RCI Unit, at the OGTT jack bay. Connect the test set 24V, 48V and Ground terminal to the test battery supply. (A 3 AMP fuse should be installed in the 24V TBS at the Relay Rack Fuse Panel and tagged to identify it as a temporary arrangement so as to insure its removal at completion of test.)

11.213 Using an ITE-9605 cord, patch the test set A jack to the test jack (T) of the Office Link Appearance associated with the selected D terminal.

11.214 At the ITT, set the test circuit to the selected terminal using the G, S and H-PCR and PCS keys.

11.22 Seizure and Pulsing

11.221 At the ITT, operate keys REP and ST. Lamp A on test set is lighted.

11.222 Operate test set key AS. Lamp A is extinguished and the eight digit number is displayed. The station digit is always a zero. If a final positive pulse is required lamp FP is also lighted.

11.223 Restore key AS. Number display is wiped out and lamp A is relighted.

11.224 Repeat Paragraphs 11.222 and 11.223.

11.225 Move temporary cross-connection to another G- terminal requiring a different PCI route. Repeat Paragraphs 11.22 - 11.224.

11.226 Repeat Paragraphs 11.222 - 1.225 for each cross connected PCI route.

11.227 Restore test frame to normal. Remove temporary cross connections and block from relay VT. Disconnect test set connections and replace temporary 24V fuse.

12. MISCELLANEOUS TESTS

12.1 Simplex Ring Forward

12.11 Block operated TR3, SP4 and C3 relays. Block relay AL1 nonoperated.

12.12 Operate relay PS until it locks and then momentarily operate SUR relay. Operate PS relay until it locks. When RFT relay operates, check that a +130V pulse is received on an ITE-4442 volt-ohmmeter connected between terminal 1 of TST repeat coil and ground while RFT relay is operated. Check that RF1 lamp is lighted.

12.13 Momentarily release SP4 relay. Check that a +130V pulse is received on the volt-ohmmeter connected between terminal 6 of TST repeat coil and ground. Check that RF2 lamp lights and RF1 lamp is extinguished.

12.14 Remove blocks from TR3, SP4, AL1 and C3 relays. Release frame by operating RN key.

12.2 Check of Nonsynchronizing Test Line

12.21 Block operated SP4 and SP7 relays. Check that PC relay operates.

12.22 Operate and release PH relay with results as follows.

OPERATE	RELEASE	OPERATE	RELEASE
PH	PH	PC1	PC
PH	PH	PC2	PC1
PH	PH	PC3	PC2
PH	PH	PC4	PC3
		SP6,AV	

12.23 Release SP4 and SP7 relays.

12.3 Busy Timing Interval

12.31 If TH option is provided verify the presence of interrupted ground on 5B of relays BY and TBL. This ground will occur every 30 seconds.

12.32 Block relay CP3 operated. Verify the presence of interrupted ground on 5B of relays BY and TBL. This ground will occur every 6 seconds.

12.33 Release relay CP3.

12.34 If TI and TJ options are provided verify the FBT key is normal.

12.35 Verify the presence of interrupted ground on 5B of relays BY and TBL. This ground will occur every 30 seconds.

12.36 Operate FBT key. Verify the presence of ground every 6 seconds on 5B of relay BY and the presence of ground every 30 seconds on 5B of relay TBL.

12.37 Operate relay CP3. Verify the presence of ground every 6 seconds on 5B relay BY and TBL.

12.38 Restore the FBT key to normal and release relay CP3.

13. OPERATION TESTS

NOTE: During tests check that the circuits tested (CT), repeat tests (RST) and pass busy (PB) registers function properly.

13.1 Continuity Polarity Test (CP)

13.11 Under this test all trunks on the office secondary multiple are tested for continuity and reversals.

13.12 Observe that the test circuit is normal and then operate the CP key.

13.13 Operate the ST key. The test circuit proceeds to test each trunk until all trunks have been tested.

NOTE: Subgroups may be individually tested by operation of the appropriate TST GR- keys.

13.2 Test Line Test

13.21 With the test circuit normal, operate ST key. Make a test line test on all cross-connected trunks. If option TP is provided, the ITT frame will test to a synchronous test line in a distant XB tandem or 4A office. The flash signals will be recognized through relay TTA normal.

13.22 The SYT relay will operate when testing the home office synchronous test line.

13.3 Automatic Start of ITT Frame - TM Option

13.31 Set the test frame for the Continuity Polarity test. Operate keys CP and AST.

13.32 Actuate the AST Timer. Verify the test frame and the teletypewriter motor starts and the test circuit proceeds until all circuits have been either tested or passed.

13.33 The test frame will then stop with the PRS relay operated and the teletypewriter shut off.

13.34 Momentarily operate the RN key to restore the frame to normal.

13.35 Insulate 6 and 6B of relay AST.

13.36 Actuate the AST timer. Verify relays AST and ASTA do not operate, relays BY1 and ASTF operate, lamp TIP lights and the audible alarm sounds.

13.37 Release keys CP and AST, reset the AST timer and operate the ACO key. Remove the insulation from 6 and 6B of relay AST.

13.38 The AST timer that was reset in Paragraph 13.37 should be done so according to telephone company instructions.

13.4 Home Office Busy Line, Reorder and Announcement Trunk Test - CPT

13.41 Operate CP key.

13.42 Operate ST key.

13.43 The CPT relay in operating starts the tone detector. The tone detector will recognize the signal from the trunk and operate either the TBY, TRO or AMB relay. The operation of one of these relays and the SU relay cause the CP1 relay to advance to the next trunk by operating the CT register.

13.44 Restore the test frame to normal.

13.5 Testing into a Centrex Office Test Trunk Circuit

13.51 Operate the ST key.

13.52 The circuit will function as on a synchronous test line test until with the SP selector in position 6 or 17 a 5 second off-hook signal is received from the centrex test trunk. The PH relay operates the CNX and CNX1 relays. (CNX Lamp Lighted) The CNX2 relay then operates. After 6 seconds the TBY relay operates. The EP1 relay operates and the test circuit advances.

13.53 Restore the test frame to normal.

13.6 ANI Trunk Test (App. Fig. 62)

13.61 Apparatus Fig. 62 provides a wink test of MF-ANI trunks only.

13.62 Operate keys CP and ST. When the distant end is attached, as indicated by operation of relay RB, register CT is operated to advance the test circuit to the next trunk.

13.63 Restore the test frame to normal.

13.7 ANI Trunk Test (App. Fig. 66)

13.71 Apparatus Fig. 66 provides a more thorough test of MF or PCI-ANI trunks including a pulsing and a transmission test.

13.72 Operate key ST. The test proceeds as a normal MF or PCI call to the point where relay PS (Pulses Sent) should operate. Lamp AID is lighted to indicate that the ANI identification is to be made. When the ANI identification is completed lamp AID is extinguished and the tone detector is started. When the distant office closes the trunk to a milliwatt test line, the tone detector recognizes the 1000 Hz tone and supplies a ground signal to operate the CT register and advance the test circuit to the next trunk.

13.73 Restore the test frame to normal.

14. TELETYPEWRITER CONTROL (SD-68456-01)

NOTE: When the print-out requires an identity digit (Option N) to be printed preceding the trunk identification digits, cross-connect terminal ID (T.S. C on Code Relay Unit, Punching 58) in Figure 2 to terminal 0-9 (T.S. C on Code Relay Unit Punchings 56,17,27,37, 47,57,18,28,38 and 48) in Figure 3 as specified by the telephone company.

14.1 Walking Relay Sequence

14.11 Preparation: Disconnect the Hubbell Connector and the "D" plug so that the teletypewriter distributor is inoperative. All test frame keys should be normal. The following test checks the ability of the walking relays W0 to W13 to progress in sequence according to the type of record being transmitted.

14.12 Block operated relay WA and BY and non-operated relay PX in the TTY Control Circuit. Observe walking relay W0 and code relay CR operate as indicated in Table 1, Step 1.

14.13 Momentarily operate relay WR. Observe relays W0 and CR release and the relays indicated in Step 2 operate. Continue the momentary operation of relay WR observing that the walking relays and code or cut-on relays operate in sequence through Step 15.

14.14 Remove block from relay BY. Verify all walking and code relays are released.

14.15 Block operated relay TB. Observe relays W0 and CR operate. Repeat Steps 1 through 15 of Table 1 with WR relay operation.

14.16 Remove block from relays TB, PX and WA. Verify all walking and code relays are released. Reconnect the Hubbell Connector and "D" plug to the teletypewriter distributor circuit.

TABLE 1

STEP	WALKING RELAY OPERATED	CODE OR CUT-ON RELAY OPERATED
1	W0	CR
2	W1	LF
3	W2	FS
4	W2A	* 0-9
5	W2B	%
6	W3	TTH
7	W4	TH
8	W5	HU

TABLE 1 (Cont'd.)

STEP	WALKING RELAY OPERATED	CODE OR CUT-ON RELAY OPERATED
9	W6	0 or 1
10	W7	U or TN
11	W8	SP
12	W9	LS
13	W10	XC1
14	W11	XC2
15	W13	#

* Identification digit as cross-connected per Note under Paragraph 14.

With relay (BY) blocked operated, code relay B operates. With relay (TB) blocked operated, code relay XC3 operates.

% Option ZC Code relay SP operates.
Option ZD with all ITT keys normal code relay V operates.
with ITT key BL operated code relay D operates.
with ITT key BC operated code relay H operates.
with ITT relay CP3 operated code relay F operates.

14.2 Teletypewriter Operation

14.21 Trunk Identity Number

14.211 Operate PTR key. If UG option is provided check that the teletypewriter starts. If UH option is provided, the teletypewriter will not start until the ST key is operated and will stop at the end of a cycle. Block operated relay CP3. The APB key must be normal for this test.

14.212 Set the test circuit on a busy trunk and operate ST key. Check that in 60 to 70 seconds, a record of the trunk identity is printed on the teletypewriter.

14.213 Release ST key and momentarily operate RN key. Remove block from CP3 relay.

14.22 Test Failure

14.221 Set test circuit on an idle trunk.

14.222 Manually operate one at a time, the BK (WH opt), HAD, PAS and PRP relay, holding each relay operated for complete record of the trunk identity on the teletypewriter.

14.223 Perform tests of Table 2 and check trouble lamps on ITT frame with printed record on TTY. Trunk identity will be printed before trouble character in each case. If WH option is specified, operate relay BK as shown. If WH option is not specified, operate relay PRP or PAS in place of relay BK in the tests shown in Table 2.

TABLE 2

RELAY OPERATION BLOCK OPERATED UNLESS SPECIFIED	TTY PRINT 1st	2nd	3rd	TROUBLE LAMP
KP,BK	A	X	X	KP-TG
ADG,RB,BK	N	X	X	A-OB
BDG,RB,BK	T	X	X	B-OG
CDG,RB,BK	D	X	X	C-IB
TU,RB,BK	D	X	X	C-IB
TH,RB,BK	E	X	X	TH-IG
HU,RB,BK	G	X	X	H-FB
T,BK	I	X	X	T-FT
U,BK	L	X	X	U-FU
ALM,TDT,M1A,BK	O	X	X	SFL
EP1,SW,BK	P	X	X	EP
TCT,TBT,BK (NEG Nonoperated)	R	X	X	CHT
TBT,BK(NEG Nonoperated)	X	I	X	HIT
TFT,TDT,ALM,FS2,M1A,BK (NEG Nonoperated)	X	L	X	FS1
TFT,TDT,ALM,FS1,M1A,BK (NEG Nonoperated)	X	O	X	FS2
OF1,BK	X	P	X	OF
M1A,BK(NEG Nonoperated)	X	Q	X	RF1
M3,M1A,BK (NEG Nonoperated)	X	R	X	RF2
SP2,MO3,C2,BC,BK	X	X	P	MO
HAD,BK(NEG Nonoperated)	X	X	A	HAD
WN,BK	X	X	F	WN
AR,BK	H	X	X	RTF
PTF1,BK	V	X	X	PTF
NS,BK	X	F	X	NS
TIM,TBY,TNC,BK	X	H	X	TBY
SP4,TMC,BK	X	X	T	NA
(Insulate 2 & 3T(C)) set TST selector to pos. 19 C2,BK	Q	X	X	DF

15. TONE DETECTOR

15.01 Using a R-9572 Test Receiver apply ground to the A Terminal Strip at the Tone Detector Circuit SD-94800-01 and verify the proper relays operate at the ITT frame as listed in Table 3.

TABLE 3

TONE DETECTOR			ITT
LEAD DESIGNATION	PCH	T.S.	RELAYS OPERATED
PTF	23	A	PTF (APP FIG 42)
RO	42	A	TRO* (APP FIG 42)
BY	32	A	TBY (APP FIG 42)
MB (RA Opt.)	22	A	AMB (APP FIG 42)
ANN	41	A	AMB (APP FIG 42)

* Block operated relay PTF after completing this test. Repeat test. Verify relay PTF1 operates. Release relay PTF.

15.02 Apply ground to punching 34 of Terminal Strip A. Verify ground is present at 5T of relay TR in ITT frame.

15.03 Apply ground to punching 24 of Terminal Strip A. Verify ground is present at 8T of relay TR in ITT frame.

15.04 If the ITT's arranged for Option RJ, apply ground to punching 21 of Terminal Strip A. Verify ground is present at 12F of relay TMC in ITT frame.

15.05 Momentarily operate the following relays one at a time, if provided: Relay C2A (VP option), relay C5 (VF option) or relay CPT (UM option). Verify relay ON operates in the Tone Detector Circuit with every relay operation.

15.06 Apply ground to punching 13 of Terminal Strip A. Verify relay TN operates. Insulate contact 1M, relay NS. Block operated relay TTM and verify relay NS also operates. Momentarily operate relay TNA and verify relays TN and NS remain operated.

15.07 Momentarily operate relay AMB and verify relay TNC operates. Momentarily operate relays TRO and TBY in turn and verify relay TNC operates.

15.08 Remove insulator from relay NS and verify relay TNA operates. Manually release relay TN and verify relay TNA remains operated and relay TNB operates.

15.09 Apply ground to punching 43 of terminal strip B. Relay AR operates.

15.10 Remove ground from punchings A13 and B43 and remove blocking tool from relay TTM. Verify all operated relays release.

15.11 Apply ground to punching 12 of terminal strip A. Momentarily operate relay ANIC on ITT frame. Register CT operates.

15.12 Remove ground from punching A12.

15.13 Set up a test call. Block relay TN nonoperated.

15.14 Operate ST key. Verify the period of time between operation of ST relay in tone detector and TTM relay in the test frame is 12 seconds.

15.15 Restore test frame to normal and remove block from relay TN.

15.16 Operate ST key. The test will proceed with the following results.

(1) If neither TNA(TONE) or FLR(OFF-HOOK) relays operate, relay HAD is operated and lamp HAD is lighted to indicate a High and Dry condition.

(2) The Tone Detector will indicate the type of signal received by operating one of the following relays:

(a) NS - Noise
(b) PTF - Pre-trip Failure
(c) AR - Ring-trip Failure
(d) TBY - Tone Busy
(e) TRO - Tone Reorder
(f) AMB - Announcement or Master Busy

(3) If the test frame is arranged to test ANI trunks using App. Fig. 66, the Tone Detector must be arranged to detect 1000 Hz tone. If the 1000 Hz tone is recognized the Tone Detector will function to operate the test frame CT register to advance the circuit to the next test.

(4) If connection is made to a subscribers line (wrong number) during a Busy Line test, relay WN will operate to light lamp WN and operate relay PAS to terminate all tests.

15.17 Restore the test frame to normal.

No changes are indicated due to extensive revision.

Manager, Product Engineering
Control Center

Reason for Reissue:
Complete revision to update to current Engineering Standards.