

TERMINATING SENDER LINK AND CONTROLLER TEST

CONTENTS

- | | |
|---------------------------------------|--|
| 1. GENERAL INFORMATION | 10. TRUNK SELECTION |
| 2. RECORDS AND REQUIREMENTS | 11. SENDER SUBGROUP SELECTION |
| 3. TEST EQUIPMENT | 12. CROSSPOINT TEST |
| 4. FUSE VERIFICATION | 13. CROSSPOINTS OTHER THAN FS, B, DP OR MFKP |
| 5. CONTACT PROTECTION | 14. ALARMS |
| 6. TMB, BMB, TB, RB, TT, AND RT LEADS | 15. MISCELLANEOUS TESTS |
| 7. SENDER SUBGROUP MULTIPLE | 16. REGISTERS |
| 8. SENDER SELECTION | 17. LOAD CONTROL TIMING CIRCUIT (SD-25471) |
| 9. TRUNK GROUP SELECTION | 18. MISCELLANEOUS CIRCUITS |

1. GENERAL INFORMATION

1.1 Description of Test

1.11 This section describes a method of testing the Terminating Sender Link and Controller Circuit, SD-25459-01, which is arranged to serve from one to four kinds of incoming trunks and from one to four corresponding kinds of terminating senders.

1.12 The terminating sender selector unit multiple between the sender selector units and the associated sender link frames is tested for continuity, crosses, and grounds.

1.13 Control circuit features with regular and mate control circuit operation are checked by means of completed test calls.

1.14 Operating features of the sender selector units are checked in conjunction with each terminating sender link frame.

1.15 Crosspoints and wiring are checked by controlled operation tests.

1.16 Miscellaneous Circuit, SD-25057-01, and Load Control Timing Circuit, SD-25471-01, are also tested in this section.

1.2 Test Procedure

1.21 The parallel cabling for the sender subgroup common wiring (that wiring between the terminating link, sender subgroup terminal strip, and the terminating senders) should not be connected before the multiple tests as described in Paragraph 7 have been completed.

1.3 Cross-Connections

1.31 Sender subgroups and senders are selected preferentially, as determined by the RP- to SG- and the A- to P- or B- to P- cross-connections, respectively. RP- to SG- cross-connection assignment information is provided on the wiring list or in the specification for the terminating sender link frames. A- to P- and B- to P- cross-connection assignments are provided on the wiring list or in the specification for the miscellaneous frames.

1.32 Cross-connect the NS punching as provided in Note 132, shown on Sheet -014 of SD-25028-01.

1.4 The timeout interrupter wiring is tested by means of contact timing checks.

1.5 Parallel wiring for leads OA, OB, OC, OD, GS, TR, RL, SL, EF, F00 or F10, NS0, or NS1, F0 to F9, should not be connected until after tests described in Paragraphs 7.2 through 7.205 have been completed.

2. RECORDS AND REQUIREMENTS

2.1 SD-4-1313 and ID-2230 are required as outlined in Handbook 50, Section 3.

3. TEST EQUIPMENT

3.1 Test Sets

<u>Amt</u>	<u>Code</u>	<u>Description</u>
1	ITE-4082	Terminating Sender Link and Controller Test Set
1	ITE-4010	Terminating Equipment Test Set (See Note)

NOTE: Terminating Equipment Test Set, ITE-4010, is required for use with this instruction only when MF key pulsing incoming trunks are to be tested.

3.2 Cords

Amt	Code or ITE	Lgth	Cdrs	One End	Other End	With ITE
1	ITE-9598	12'	2	310 Plug	310 Plug	4023
10	ITE-9601	12'	3	310 Plug	310 Plug	4023
4	ITE-9639	12'	3	310 Plug	3 2455 Plugs	4023
1	ITE-9627	12'	3	310 Plug	508A Key	4023
2	ITE-9650	6'	4	Operators SET	TEL-	4023
1	ITE-9547	12'	1	2455 Plug	2455 Plug	4023

3.3 Accessories

Amt	Code or ITE	Description	With ITE
R 1	R-3314	Stop Watch	
1	ITE-8253	Contact Protection Test Set	4023
1	ITE-4137A	Continuity Test Set	32A
R 1	.5	M F Condenser	
R 1	3.	M.F Condenser	
1	ITE-4208	Hand Test Tel. Set	4023
20	351C	Plugs, Make Busy	4023
10	322A	" " "	4023
2	349A	" " "	4023
1	R-1824	Pencil Lamp	4023
As Req.	ITE-8507	Alligator Clips	4023
As Req.	ITE-4069	Blocking Tool, Multi- Contact Relay	4023
12	KS-16887-L1	Blocking Tool, U and Y Relay	4023
1	ITE-4442	Volt-Ohmmeter	
1	R-9572	Test Receiver	4023

R - To be requisitioned.

4. FUSE VERIFICATION

4.1 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-4442 Volt-ohmmeter. To avoid damaging the meter, first verify that battery is not present on the alarm bar by using the voltmeter portion of ITE-4442. If clear, switch to the ohmmeter portion for the resistance reading which should be either infinity or approximately 600 ohms.

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

4.12 On shop wired and fused fuse panels, inspect the panel for missing or operated fuses. 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.

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

4.14 ITE-4442 Volt-ohmmeter should be used to verify all potentials at fused terminals to insure that polarity 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.

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

4.2 Fusing Tests

4.21 Using fuses 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.

5. CONTACT PROTECTION

5.1 For those contact protection networks installed on the job, test in accordance with Handbook 61, Section 0.2.

5.2 Where a network is directly across a relay winding, the resistance of the relay used in the standard should be the same as that in the circuit under test.

6. TMB, BMB, TB, RB, TT AND RT LEADS

NOTE 1: Refer to the Terminating Sender Link Frame wiring list for the sender subgroup appearances on the link frames.

NOTE 2: A sender subgroup consists of all the senders associated with one terminating sender selector unit.

6.1 Sender Subgroup Busy

6.11 Setup for Test

6.111 Establish a talking connection by means of the frame line circuit and two ITE-9650 Tel. Sets, between the terminating trouble indicator and the incoming trunk frame associated with the terminating sender link frame selected for test.

6.12 Test Operations

6.121 Operate key BAT at the Terminating Trouble Indicator and insert a 322A make busy plug into jack MB for the terminating sender selector unit, associated with terminating sender subgroup position 0, of the first sender link frame to be tested. Observe that the associated T and B lamps light.

TABLE A

FUSE DESIGNATION	POTENTIAL	AMPERAGE	TEST LOCATION
PS 0-9	-48V ↑	1 1/3 ↑	Primary select magnets 0-9, respectively, of primary switches 0, 1 and 2.
GR 0-9			Relays TGO-9
HD 0			20 hold magnets associated with 10 links. Secondary switch 0.
HD 1			20 hold magnets associated with 10 links. Secondary switch 1.
HD 2			20 hold magnets associated with 10 links. Secondary switch 2.
SS 0			Secondary select magnets 0-9, respectively, on secondary switch 0, relays LRO, AMB0&3 and BMB0&3, as equipped.
SS 1			Secondary select magnets 0-9, respectively, on secondary switch 1, relays LR1, AMB1&4 and BMB1&4, as equipped.
SS 2			Secondary select magnets 0-9, respectively, on secondary switch 2, relays LR2, AMB2&5 and BMB2&5, as equipped.
CONT A,B, C & D			Relays TA, TB, AL and TBL, respectively.
SC			Relay SC1.
D			Contact 10T, relay AGB
E			Contact 10T, relay BGB
F	-48V ↓	1 1/3 ↓	Winding 13B, relay SGE

6.122 At the Sender Link Frame observe that relays AMB-0 and BMB-0 operate and that other equipped AMB- and BMB- relays do not operate.

6.123 At the Sender Link Frame manually operate relay LL-0 and observe that relays AMB-0 and BMB-0 release. Release BAT key and remove 322A MB plug.

6.124 Repeat tests described in Paragraphs 6.121 to 6.123 for sender subgroups 1 to 5, as equipped, on Terminating Sender Link Frame under test.

6.125 Repeat tests described in Paragraphs 6.121 to 6.124 inclusive for all Terminating Sender Link Frames installed.

6.2 A Senders Busy

6.21 With Test Receiver R-9572 connected to 48 volt battery, check for the presence of ground on leads; TB, RB, TT and RT, as required, for sender subgroup positions 0 to 5 as equipped, on the link frame under test.

NOTE: This test is made on the contact terminals of relay SC-1 and SC-2 or on the 218D T.S., which is provided in place of relays SC-1

and SC-2. The sender subgroup positions and their associated terminals are arranged as follows:

LEAD	TERM	SENDER SUBGROUP	
		SC-1 REL.	SC-2 REL.
RT	10	0	3 FIRST
TT	13	0	3 KIND
RT	11	1	4 OF
TT	14	1	4 SENDERS
RT	12	2	5 IN THE
TT	15	2	5 SUBGROUP
RB	16	0	3 SECOND
TB	19	0	3 KIND OF
RB	17	1	4 SENDERS
TB	20	1	4 IN THE
RB	18	2	5 SUBGROUP
TB	21	2	5

6.22 At the terminating trouble indicator frame, insert one plug (as required) into sender MB jacks of each sender of the first kind in the terminating sender subgroup associated with sender subgroup position 0 of the Sender Link Frame under test.

6.23 At the Terminating Sender Link Frame, observe that relay AMB-0 operates and that relay BMB-0 does not operate. Check for absence of ground on the corresponding RT and TT leads.

6.24 Remove one of the MB plugs and check for ground on the RT lead and absence of ground on the TT lead. Replace the MB plug.

6.25 Check that ground has not been removed from the RT and TT leads of the remaining subgroups of the frame under test.

6.3 B Sender Busy

6.31 At the Terminating Trouble Indicator Frame, insert one plug (as required) into sender MB jacks of each sender of the second kind associated with sender subgroup position 0 of the sender link frame under test.

6.32 At the Terminating Sender Link Frame observe that relay BMB-0 operates. Check for absence of ground on the corresponding RB and TB leads.

6.33 Remove one of the MB plugs and check for ground on the RB lead and absence of ground on the TB lead. Replace the MB plug.

6.34 Check that ground has not been removed from any of the TB, RB, TT or RT leads associated with the remaining subgroups of the frame under test.

6.4 Repeat the tests described in Paragraphs 6.22 to 6.34 on sender subgroups 1 to 5 (as equipped) on the sender link frame under test.

6.41 Remove the MB plugs for both "kinds" of senders at completion of test.

NOTE: Leads TB, RB, TT and RT associated with sender subgroup positions lower in number than the one under test (sender subgroups already tested) need not be checked for false removal of ground.

6.42 Repeat tests described in Paragraphs 6.21 to 6.41 inclusive for all Terminating Sender Link Frames installed.

6.5 Sender Reserve Indication

NOTE: In cases where only one sender of a kind is equipped in a subgroup, (M wiring) lead TT or TB is not cleared of ground with only one sender available.

6.51 At the Terminating Trouble Indicator, insert MB plugs into sender MB jacks 1 to 9, as associated with senders of the first kind in the sender subgroup under test, so that only one sender of the first kind in the subgroup is available.

6.511 Using any associated sender link frame for test, check for ground and for absence of ground, respectively, on the associated RT and TT leads.

6.512 Move the MB plug from jack 1 to jack 0 and repeat the check on leads RT and TT.

6.513 Continue the test in this way, moving plug 2 to jack 1, plug 3 to jack 2, etc., until all senders of the first kind have been made available, one at a time, and leads RT and TT have been checked with each sender. Remove the make busy plugs.

6.52 Leave one sender of the second kind in the subgroup under test available by making busy the remaining senders of the second kind.

6.521 Using any associated sender link frame for test, check for ground and for absence of ground, respectively, on the associated RB and TB leads.

6.522 Make the senders available, one at a time, as described for the first kind of senders (Paragraphs 6.512 and 6.513) in the subgroup and check that leads RB and TB are grounded and free of ground, respectively, when any one of the senders are available.

6.53 Perform the test described in Paragraphs 6.51 and 6.52 once, for each terminating sender selector unit, using any associated terminating sender link frame for test.

6.6 Senders Available Indication

6.61 Setup for Test

6.611 Establish a talking connection by means of the frame line circuit and two ITE-9650 Tel. Sets between the Terminating Trouble Indicator and the Miscellaneous Frame.

6.62 Test Operations

6.621 Connect one side of Pencil Lamp R-1824 to 48 volt battery and connect the other side to the 2B contact of relay AGB. Observe that the pencil lamp lights.

6.622 Momentarily operate relay AGB and observe that the pencil lamp is momentarily extinguished.

6.623 At the trouble indicator, insert MB plugs into sender MB jacks 1 to 9, as associated with senders of the first kind in the terminating sender subgroup so that only one sender of the first kind in the subgroup is available.

6.624 At the Miscellaneous Frame, observe that the corresponding SB- relays operate and that the pencil lamp is extinguished.

6.625 Momentarily remove the MB plug from MB jack 1 and observe that the pencil lamp lights momentarily.

6.626 Remove and replace plugs 2 to 9, in turn, and observe that the pencil lamp lights momentarily in each case.

6.627 Move the MB plug from jack 1 to jack 0, and again remove and replace plugs 2 to 9. Observe that the pencil lamp lights momentarily after each plug is removed.

6.628 Continue the test in this way until each jack has been paired with all other jacks associated with the same kind of senders in the subgroup.

6.629 Perform the test for the second kind of senders in the subgroup in a manner similar to that described for the first kind in Paragraphs 6.623 to 6.627 inclusive. Connect the pencil lamp to the 2B contact of relay BGB for this test.

6.63 Repeat the tests described in Paragraph 6.621 to 6.629 on each terminating sender selector unit. Remove MB plugs and disconnect pencil lamp.

7. SENDER SUBGROUP MULTIPLE

NOTE 1: The parallel wiring for leads: OA, OB, OC, OD, GS, TR, RL, SL, EF, F00 or F10, NS0, or NS1 and F0 to F9 should be connected after the tests described in Paragraphs 7.201 to 7.205 and before the tests described in Paragraphs 7.206 to 7.213 are performed.

NOTE 2: Select a Terminating Sender Link Frame to be used for the performance of the multiple tests so that the maximum number of sender subgroups may be checked from the same frame. In this way, two Terminating Sender Link Frames will usually provide access to all sender subgroup multiple.

NOTE 3: The tests in the following paragraphs are described in detail for multiple circuits using J and R wiring. The general method of performing the tests is the same for all wiring options.

7.1 Setup for Test

7.11 Make busy the terminating sender subgroups associated with the multiple under test, by inserting 322A MB plugs into the associated sender subgroup MB jacks on the Terminating Trouble Indicator Frame. Insert 349A MB plugs into the MB jacks of the link frames under test.

7.12 Establish a talking connection, as required, by means of the frame line circuit and two ITE-9650 Tel. Sets, between the link frame used for test and a second link frame which has access to one or more of the same sender subgroups.

7.2 Test Operations

7.201 On the link frame used for test block relay C-0 operated and connect ground to terminal 10 of the associated 218C T.S. by means of an ITE-9547 cord equipped with alligator clips. Block operated the C- relay associated with the same sender subgroup and check for ground on the corresponding terminal of the 218C T.S. of the second link frame.

7.202 Move the grounded test cord from terminal 10 to terminal 11 and check for this ground on the corresponding terminal of the second 218C T.S.

7.203 Continue the test in this way until the continuity of leads PO to P9, GS, TR, RL, SL, EF, OA, OB, OC, OD, F00 or F10, NS0, or NS1, and F0 to F9 as specified for terminals 10 to 19, 20 to 24, 30 to 33 and 37 to 49, respectively, has been tested. Release the C- relays.

7.204 Perform the test described in Paragraphs 7.201, 7.202 and 7.203 on the multiple between the other C- relays on the two link frames.

7.205 Perform the test described in Paragraphs 7.201 to 7.204 inclusive on the multiple between the C- relays of the link frame used for test and the C- relays of all other terminating sender link frames associated with one or more of the same sender subgroups.

7.206 On the link used for test, strap to ground terminals 10 to 19, 20 to 24, 30 to 33 and 37 to 49 of the 218C T.S. for the C- relays. (No. 32 strap wire (P-314962) may be used.) Verify that the terminals are grounded by means of a test receiver connected to 48 volt battery.

7.207 Block relays C-0 to C-5 operated as equipped, by means of ITE-4069 relay blocking tools. Check for absence of ground on terminals 10 to 19, 20 to 24, 30 to 33 and 37 to 49 of the 218C T.S. of all sender link frames associated with one or more of the same sender subgroups.

7.208 Release relay C-0 and check for absence of ground on make contact terminals 10 to 19, 20 to 24, 30 to 33 and 37 to 49 of the same relay.

7.209 Release relay C-1 and perform the check for absence of ground on the make contacts of this relay.

7.210 Continue the test in this way until all equipped C- relays on the link frame used for test have been checked as described for relays C-0 and C-1.

7.211 Block relays C-0 to C-5 operated, as equipped on the link frame used for test. Remove the ground strap from terminal 10 and check for absence of ground on the same terminal.

7.212 Remove the ground strap from the remaining terminals, one at a time, and check that each terminal is cleared of ground as the grounded strap wire is removed. Remove the blocks from the C-relays and the 349A MB plugs from the MB jacks.

7.213 Using one or more additional link frames for test, as required, test the multiple for the remaining sender subgroups in a manner similar to that described in Paragraphs 7.201 to 7.212 inclusive. Disconnect all testing equipment.

8. SENDER SELECTION

8.1 Setup for Test

8.11 Establish a talking connection as required, by means of the frame line circuit and two ITE-9650 Tel. Sets between a Sender Link Frame to be used for test and the T.T.I. Frame.

8.2 Test Operations

8.21 At the Sender Link Frame, block unoperated the TA and TB relays and block operated the C-0 relay. Short contacts 11-12T of relay ASG. Momentarily short contacts 4-5B of relays T-0 to 9 in turn. Observe that the associated S lamps light on the trouble indicator frame.

NOTE: Reference should be made to Paragraph 1.4.

8.22 Equip an ITE-9547 cord with alligator clips and connect one end of this cord to ground. Connect the other end of the cord to contact terminal 10 of relay C-0 on the link frame.

8.23 At the T.T.I., observe that lamp S-0 of the associated sender selector unit lights.

8.24 Insert a 322A plug into the corresponding sender make busy Jack MB. Observe that lamp S-0 is extinguished and that lamp S, associated with the last sender of the first kind in the subgroup lights.

8.25 Insert a make busy plug into jack MB for the last sender of the first kind in the subgroup and observe that the next lower numbered S lamp lights.

8.26 Continue the test in this way, making busy the remaining senders of the first kind, one at a time, and observing that the next lower numbered S lamp lights in each case. Remove the MB plug from jack MB-0 to light lamp S-0. Remove the make busy plugs.

8.27 Remove the short from 11-12T of the ASG relay and short contacts 11-12T of the BSG relay. Repeat the test, as required, for the second kind of senders in the sender subgroup, in a manner similar to that described in Paragraphs 8.21 to 8.26 for the first kind.

8.28 Perform the tests described in Paragraphs 8.21 to 8.27, inclusive, once, on one sender link frame, for each terminating sender selector unit. At completion of test remove blocks from C-0, TA and TB relays, straps from ASG and/or BSG relays and the ITE-9650 Tel. Sets.

9. TRUNK GROUP SELECTION

9.1 Block relays TA and MA non-operated, and GTA and GTB operated. Manually operate relays GST-0 to 9. Observe that relays GST-0 to 9 lock and that relays GA-0 to 9 and GB-0 to 9 do not operate.

9.11 Remove the blocks from relays GTA and GTB. Observe that relays TG-0 to 9 as equipped operate in numerical order and that relays GA-0 to 9 and GB-0 to 9 release in numerical order.

9.12 Repeat the test as required. Remove the blocks from relays TA and MA, if the following test is not to be made at this time.

9.2 Traffic Lockout

9.21 Block relays TA, TB and MA non-operated and GTA and GTB operated. Manually operate relays GST-0 to 9. Remove the blocks from relays GTA and GTB. Observe that relays GST-0 to 9 release in numerical order for equipped groups.

9.22 Reoperate the first three GST-relays after relays G-0, G-1 and G-2 have released and before relay GST-9 releases. Observe that relays GST-0, 1 and 2 release after all other GST-relays have released.

9.23 Insert a 349A MB plug into jack EB and repeat the test. Observe the same test results. Remove the MB plug from the EB jack and the blocks from relays TA, TB and MA.

9.3 Trunk Group MB Jack (GB)

9.31 Block relays GTA and GTB operated and manually operate relays GST-0 to GST-9. Insert a 349A MB plug into jacks GB-0 to GB-9, in turn, and observe that relays GST-0 to GST-9, respectively, release. Remove the blocks from relays GTA and GTB and the MB plug from jack GB9.

9.4 Frame Trouble (Emergency Operation and Lockout)

9.41 Home Controller: Insert a 349A MB plug into exercise jack EA, block relay TG-0 non-operated and block relays GTA and GTB operated.

9.411 Manually operate relays GST-0 to GST-9 and remove the blocks from relays GTA and GTB.

9.412 Observe that relays TA, TA1, and TA2 operate, lamp AL lights and relays TG-1 to TG-9 operate in numerical order. Remove the MB plug and momentarily operate key TR to extinguish lamp AL.

9.42 Mate Controller: Insert the 349A MB plug into jack EB and repeat the test. Observe the same test results, except that relays TB, TB1 and TB2 operate instead of relays TA, TA1 and TA2, respectively. Remove the MB plug from jack EB, the block from relay TG-0 and momentarily operate key TR.

9.5 PA Leads

9.51 Insert 351C MB plugs into the three secondary hold magnet verticals associated with incoming trunk group 0.

9.511 Block relays TA and MA non-operated. Block relays GTA and GTB operated and manually operate relays GST-0 to 9, which lock.

9.512 Remove the blocks from relays GTA and GTB, and observe that relays TG-1 to TG-9 operate in numerical order. Remove one MB plug and observe that relay TG-0 operates.

9.52 Reinsert 1st plug and repeat test, removing and reinserting 2nd and 3rd plugs, one at a time.

9.521 Insert the MB plugs into the secondary verticals associated with trunk group 1 and again block relays GTA and GTB operated and manually operate relays GST-0 to 9.

9.522 Remove the blocks from relays GTA and GTB. Observe that relays TG-0 and TG-2 to TG-9 operate in numerical order.

9.53 Remove the 351C MB plugs, one at a time as in group 0, and observe that relay TG-1 operates.

NOTE: In those cases where the PA leads associated with the unequipped trunk groups are connected they should be grounded at the odd numbered springs of the AMB and BMB relays, as required to check that the associated GST relays will release electrically.

9.54 Perform the test for the remaining trunk groups in a manner similar to that described for trunk groups 0 and 1.

9.541 Observe, in each case, that the TG- relay associated with the trunk group under test does not operate until an MB plug has been removed and that all other TG- relays operate in numerical order. Remove the blocks from relays TA and MA.

9.55 Using Test Receiver R-9572 connected to battery, test for ground at 1B or 3B of the GST relay, for the first group of trunks.

9.551 Manually operate all relays AMB and BMB except one. Alternately operate and release this relay. Observe that the ground is removed from 1 & 3B of relay GST each time the last AMB or BMB relay is operated.

9.56 Repeat the test per 9.55 on each of the remaining sender subgroup connectors and all PA leads.

NOTE: In cases where all trunk groups are not equipped, the GST- relays associated with the unequipped groups will remain locked operated indefinitely when operated manually as outlined in Paragraph 9. For this reason the fuses (IT GR-0 to 9) for the unequipped trunk group are to be removed following tests outlined in Paragraph 9.

10. TRUNK SELECTION

10.1 Home Controller

10.11 Block relays TA, MA and G-0 non-operated and relay GST-0 operated. Observe that relays T-0 to T-9 operate.

10.12 Block relay TE operated. Observe that relays T-1 to T-9 release and that relay T-0 does not release.

10.13 Release relay T-0, operate T-9 and check that relay T-9 locks. Manually operate relay T-8, observe that it locks and that relay T-9 releases.

10.14 Manually operate relays T-7 to T-0 in turn. Observe that each manually operated relay locks and that the next higher numbered relay releases in each case. Remove the blocks from relays TA GST-0 and TE.

10.2 Mate Controller

10.21 Insert a 349A MB plug into jack EB, block relay TB non-operated and relay GST-0 operated. At the associated mate controller circuit observe that relays T-0 to T-9 operate.

10.22 Block relay TE of the mate controller operated. Observe that relays T-1 to T-9 release and that relay T-0 does not release.

10.23 Release relay T-0, operate T-9 and check that relay T-9 locks. Manually operate relay T-8, observe that it locks and that relay T-9 releases.

10.24 Manually operate relays T-7 to T-0 in turn. Observe that each manually operated relay locks and that each higher numbered relay releases in each case.

10.241 Remove the blocks from relay TE of the mate controller and from relays TB, MA, G-0 and GST-0 of the home controller. Remove the make busy plug from jack EB.

11. SENDER SUBGROUP SELECTION

NOTE 1: For purposes of this test, the connection of the trunk used for test to a sender, may be considered to be satisfactory when any one of the following conditions, as determined by the type of trunk, has been met:

a) FS Trunk - The generation of reverberative pulses (TELLTALE) by the terminating sender, heard in the ITE-4208 Tel. Set Receiver, followed by the operation of the TEL-SET C key, restores the circuits to normal.

b) B Trunk - Note that order tone from the B switchboard position circuit is received and request the B operator to operate the position PD key, once or twice as required for reorder. Verify the return of the reorder signal, (120 IPM Tone) indicating the completion of the test call. Operate the TEL-SET-C key to restore the circuit to normal.

c) Dial Pulse Trunk - Note that low or high dial tone is received from the DP sender circuit. Dial the office overflow test line number and verify the return of the overflow signal, (120 IPM Tone) which indicates the completion of the test call. Operate the TEL-SET-C key to restore the circuit to normal.

NOTE 2: With a plug in exercise jack EB, the sender subgroup preference is determined by the RP- to SG- cross-connection of the mate controller circuit.

11.1 Selection on a Regular Basis

11.11 Complete test calls from each trunk group, one test call with the home controller and one test call with the mate controller, to each of the associated subgroups, in accordance with the following.

11.12 Block relay RS normal and insert the plug of the ITE-4208 Tel. Set into the T jack of any trunk circuit, (FS, B, DP or MFKP) which recognizes selection by the tel. set and which is served by the first kind of senders in sender subgroups 0 - 5 as equipped.

11.121 Observe that the C- relay associated with the first choice sender subgroup operates and serves to connect the trunk to a sender for completion of the test call.

11.13 Block operated relay AMB- associated with the first choice sender subgroup and repeat the test call. Observe that the C- relay associated with the second choice sender subgroup operates and serves to complete the connection of the trunk to a sender.

11.131 Block operated relay AMB- associated with the second choice sender subgroup and repeat the test call. Observe that the C- relay associated with the third choice sender subgroup operates and serves to complete the connection of the trunk to a sender.

11.14 Repeat the tests described in Paragraphs 11.12 and 11.13 from a trunk in each trunk group served by the same senders. Remove the blocks from the AMB- relays.

11.15 In a manner similar to that described for the first kind of senders in sender subgroups 0, 1 and 2 perform the tests, as required, for the second kind of senders in the same sender subgroups. For this test block the BMB- instead of the AMB- relays.

11.16 Repeat the tests described in Paragraphs 11.12 to 11.15 for sender subgroups 3, 4 and 5 as equipped. Remove the blocks from the RS and the AMB- or BMB- relays.

11.17 Insert a 349A MB plug into jack EB, block relay RS of the mate controller circuit non-operated and repeat the tests described in Paragraphs 11.12 to 11.16. Observe the same test results. Remove the 349A plug from jack EB.

11.2 Selection on Reserve Basis (See Note 2)

11.21 Block operated the RS relays in the home and the mate controller circuits, also, insulate the 4B-5B contacts of these relays. Repeat the tests described in Paragraphs 11.12 to 11.17 and observe the same test results. Remove the blocks and the insulators from the RS relays.

11.3 Last Path to Idle Sender Made Busy

11.31 Block relays AMB-0 and 1 operated and insulate contacts 1B, 2B and 3B of relay RS. Start a test call from a trunk group associated with sender subgroups 0, 1 and 2.

11.311 Observe that relay RS operates, block operated relay AMB-2 and observe that relay RA operates and releases.

11.312 Remove the block from relay AMB-2, the insulators from relay RS and observe that the test call is completed. Remove the blocks from relays AMB-0 and 1.

11.4 Second Trial

11.41 Insulate the GS lead (contact 20) of the C- relay associated with the first choice sender subgroup. Start a test call from a trunk associated with the first kind of senders in sender subgroup 0, 1 and 2 and observe that the C- relay operates.

11.411 After an interval of 1 to 1-1/2 seconds, lamp AL lights and the minor intermittent alarm sounds. The C- relay releases and another C- relay operates and serves to connect the trunk used for test to a sender for completion of the test call. Momentarily operate key TR to extinguish lamp AL and to silence the alarm.

11.42 Repeat the test call, as required, from a trunk associated with the second kind of senders in the sender subgroups and observe the same test results. Remove the insulator and momentarily operate key TR.

11.43 Insulate lead GS associated with the second choice C- relay and block operated relays AMB- and BMB- associated with the first choice C- relay.

11.431 Repeat the test calls described in Paragraphs 11.41 and 11.42 and observe the same test results. Remove the insulator and momentarily operate key TR.

11.44 Insulate lead GS associated with the third choice C- relay and block operated relays AMB- and BMB- associated with the second choice.

11.441 Repeat the test calls as previously described, but when the AL lamp lights, remove the block and release the first choice AMB- or BMB- relay, so that senders of the first or the second kind, respectively, as required, are made available for completion of the test calls on second trial. Remove the blocks and the insulator and operate key TR.

11.45 Repeat the test on the C- relays associated with sender subgroups 3, 4, and 5, as required.

11.5 Failure of Second Trial

11.51 Block relay TST non-operated and start a test call. Observe that the C- relay associated with the first choice sender subgroup operates, lamp AL lights, the operated C- relay releases, a second C- relay operates, relays TA, TAl, TA2, M and MC operate, the operated C- relay releases and the test call is completed through the operation of a C- relay by the mate controller circuit. Remove the block from relay TST and momentarily operate key TR.

12. CROSSPOINT TEST

12.1 FS Trunks and Senders

12.11 Setup for Test

12.111 Connect 48 volt battery and ground to the Terminating Sender Link and Controller Test Set, ITE-4082, by connecting test set jack PWR to jack A of the associated incoming trunk frame by means of an ITE-9598 cord.

12.1111 Operate key RL, as required, to restore the test circuit to normal. Using ITE-9601 cords, connect test set jacks (FS)0-9 to incoming trunk jacks (T) 0 of FS trunk groups 0-9, respectively, as equipped on the incoming trunk frame associated with the terminating sender link frame under test.

12.1112 Insert 351C MB plugs into all sender link secondary hold magnets associated with the FS- trunk

groups under test excepting 0, 3, 6 and 9 on SW(0), 1, 4, and 7 on SW(1) and 2, 5 and 8 on SW(2).

12.12 Test Operations

NOTE: Repeat the test operations described in Paragraphs 12.121 to 12.15, as required, when all equipped FS trunk groups on the link under test cannot be tested together.

12.121 Operate key ST. Note that the HOME controller connects senders to the trunks under test by observing that a corresponding number of link secondary hold magnets serving like numbered trunk groups and relay HC operate and that no T relays operate in the mate controller.

12.1211 Also observe that the trunk under test in the lowest numbered trunk group operates a secondary select magnet in accordance with the position (0-9) of the trunk in the trunk group and the associated A to P cross-connection as specified.

12.1212 Count pulses as indicated by the dial RVP calibration and dial IB, IG, FB, FT and FU digits as required for the associated office overflow signal test line number, (NF-OFT).

12.1213 Observe that lamps (FS) 0-9 light and that lamps (FT)0-9 flash the overflow signal, (120 IPM). Operate key RL to restore the circuits to normal.

NOTE 1: The following chart indicates the number of IB, IG and FB reverting pulses required for the thousands and hundreds digits of any line number. Tens and units digits are dialed unchanged. For trunk groups common to two 10,000 number series; add 5 to IG for calls to lines in number series B.

Incoming Brush	Incoming Group	Final Brush				
		0	1	2	3	4
0	0	00	01	02	03	04
	1	05	06	07	08	09
	2	10	11	12	13	14
	3	15	16	17	18	19
1	0	20	21	22	23	24
	1	25	26	27	28	29
	2	30	31	32	33	34
2	3	35	36	37	38	39
	0	40	41	42	43	44
	1	45	46	47	48	49
3	2	50	51	52	53	54
	3	55	56	57	58	59
	0	60	61	62	63	64
4	1	65	66	67	68	69
	2	70	71	72	73	74
	3	75	76	77	78	79
5	0	80	81	82	83	84
	1	85	86	87	88	89
	2	90	91	92	93	94
	3	95	96	97	98	99
		Line Thousands and Hundreds Digits				

NOTE 2: Trunk groups common to number series A and B, individual to A and individual to B may be tested together as follows: Select any line, to be used for test, which is unassigned in number series A and B. In number series A, cross-connect terminal NF to OFT. In number series B, at the LDF, connect ground to the (S) terminal. Dial the test line number for one or two of the three series of test calls described in Paragraphs 12.121 to 12.13. Observe the OVERFLOW signal for the common trunks and trunks individual to number series A. Observe the BUSY signal (60 IPM flashing) for the trunks individual to number series B. Add 5 to IG on the remaining series of test calls. Observe the BUSY signal for all trunk groups, if leads OA and OB are wired (J- Figure 7 sheet 012) for number series A and B indications. Observe the OVERFLOW signal for A office trunk groups and the BUSY signal for common and B office trunk groups when leads F00 and F10 are wired (S Figure 7 sheet 012) for number series A and B indications.

12.122 Move the ITE-9601 cords from the (T) 0 to the (T) 1 trunk jacks and repeat the test calls. Observe the same test results.

12.1221 Continue the test in this way, moving the test cords and completing test calls until all trunks in FS trunk groups 0-9 have been tested in a manner similar to that described for trunks 0 and 1.

12.123 Insert the 351C MB plugs into all secondary hold magnets associated with the FS trunk groups excepting 0, 3, 6 and 9 on SW(1), 1, 4 and 7 on SW(2) and, 2, 5 and 8 on SW(0). Insert a 349A MB plug into jack EA and repeat the tests described in Paragraphs 12.121 and 12.122. Observe the same test results.

12.13 Insert the 351C MB plugs into all secondary hold magnets associated with the FS trunk groups excepting 0, 3, 6 and 9 on SW(2), 1, 4 and 7 on SW(0) and 2, 5 and 8 on SW(1). Move the 349A MB plug from jack EA to jack EB and repeat the tests described in Paragraphs 12.121 and 12.122.

12.131 Observe the same test results except that the MATE controller is used instead of the HOME controller. Remove the MB plugs. Remove the test line test connections at the completion of cross-point tests.

12.2 T, R and CO Crosspoint Test (B) Trunks Only

NOTE 1: This test is required only when an open T or R conductor in a connection established between a trunk circuit and the B

switchboard position circuit is not readily detected by the performance of the test described in Paragraph 12.3.

NOTE 2: This test is not required for trunks associated with B senders which are arranged for operation with a centralized B switchboard.

12.21 Setup for Test

12.211 Block operated a position circuit T- relay. Block normal its TA relay and short the lower 1 and 2 contacts. Plug a tel. set into the TEL jacks. Connect a 3 mfd condenser across the secondary winding of the T coil of the B position telephone circuit. This setup is made to provide continuous tone over the tip and ring.

12.2111 Make two B sender subgroups busy at the TTI Frame. Strap the CO leads of all B senders to ground at the sender unit terminal strip. Insulate the battery normally supplied to the sender CO leads by the senders.

12.212 Using an ITE-9639 cord connect the T and R plugs to the B and R jacks, respectively, of an ITE-4137A. Connect a .5 mfd condenser in series with a test receiver across the ITE-4137A B and R jacks.

12.22 Test Operations

12.221 Plug the ITE-9639 cord plug into the T jack of the B incoming trunk. The meter needle deflects to the left to about .35. This deflection is maintained until the trunk T- relay operates. The meter then deflects to the right to about 25. Tone is heard in the test receiver. Remove the cord from the test jack to restore the equipment to normal.

NOTE 1: The meter readings are approximate and apply to trunks per SD-25022 and SD-25292. It is intended that comparative readings be obtained. Tests over other types of B trunks may result in different readings, but for any one type of trunk, the readings should be comparable. Any other meter readings should be investigated as trouble conditions.

NOTE 2: Variations in tone should be investigated as trouble conditions.

12.222 Repeat the test from each B trunk to its preferred sender in the subgroup. Continue the test until comparable tests have been made to each sender subgroup.

12.223 Make a comparable test over all B trunks not equipped with test jacks. In this case use the equipment specified for the test of these trunks or any other convenient means for originating the test calls.

12.224 Remove the blocking tools, MB plugs, and the short circuit from the TA relay.

12.3 B Switchboard Trunks and Senders

12.31 Setup for Test

12.311 Insert the plugs of an ITE-9598 cord into jack PWR on ITE-4082 and jack A or the associated incoming trunk frame. Operate key RL as required to restore the test circuit to normal.

12.3111 Connect test set jacks (DP-B)0-9 to incoming trunk jacks (T)0 of (B) trunk groups 0-9, respectively, as equipped, by means of ITE-9601 cords. Insert the plug of the Tel. Set into the test set TEL jacks. Insert 351C MB plugs into all sender link secondary hold magnets associated with the B trunk groups excepting 0, 3, 6 and 9 on SW(0), 1, 4 and 7 on SW(1) and 2, 5 and 8 on SW(2).

12.3112 For the purpose of this test the number of senders available shall be the same as the number of links, and in no case shall there be more than 10. Make excess senders busy.

NOTE: Repeat the test operations described in Paragraphs 11.321 to 12.324, as required, when all equipped DP trunk groups on the link under test cannot be tested together. Use ITE-9639 cords equipped with alligator clips for connecting to trunks not equipped with T jacks.

12.32 Test Operations

12.321 Operate key ST:

(1) Note that the HOME controller connects senders to the trunks under test by observing that a corresponding number of link secondary hold magnets serving like numbered trunk groups and relay HC operate.

(2) Observe that the trunk connected for test in the lowest numbered trunk group operates a secondary select magnet in accordance with the position, (0-9), of the trunk in the trunk group and the A or B to P cross-connection as specified,

(3) Verify the receipt of double or single order tone for individual and common trunk groups respectively.

(4) Check the talking connection between the test set and the B position.

(5) Request the B operator to operate the position PD key as required for reorder and

(6) Observe that the associated DP-B lamps on the test set flash the reorder signal (120 IPM).

NOTE: Test trunk groups common to number series A and B, individual to A and individual to B as follows: Use the test lines previously described in Note 2 under Paragraph 12.121. At the B switchboard, key the test line number for individual (OA or OB), trunk groups and key the A office and the test line number for common (OC) trunk groups. Observe the overflow signal for OA and OC trunk groups. Observe the busy signal for OB trunk groups. Key the B office for the common trunk groups on the remaining series of test calls. Observe the overflow signal for OA trunk groups. Observe the busy signal for OB and OC trunk groups.

12.322 Move the ITE-9601 cords from the (T)0 to the (T)1 jacks and repeat the test calls. Observe the same test results. Continue the test in this way, moving the test cords and completing test calls until all trunks in B trunk groups 0-9 have been tested in a manner similar to that described for trunks 0 and 1.

12.323 Insert the 351C MB plugs into all secondary hold magnets associated with the B trunk groups excepting 0, 3, 6 and 9 on SW(1), 1, 4 and 7 on SW(2) and 2, 5 and 8 on SW(0). Insert a 349A MB plug into jack EA and repeat the tests described in Paragraphs 12.321 and 12.322. Observe the same test results.

12.324 Insert the 351C MB plugs into all secondary hold magnets associated with the B trunk groups excepting 0, 3, 6 and 9 on SW(2) 1, 4 and 7 on SW(0) and 2, 5 and 8 on SW(1). Move the 349A MB plug from jack EA to jack EB and repeat the tests described in Paragraphs 12.321 and 12.322.

12.3241 Observe the same test results except that the MATE controller is used instead of the HOME controller circuit. Remove the MB plugs.

12.4 Dial Pulse Trunks and Senders

12.41 Setup for Test

12.411 Insert the plugs of an ITE-9598 cord into jack PWR on ITE-4082 and jack A of the associated incoming trunk frame. Operate key RL as required to restore the test circuit to normal.

12.4111 Connect test set jacks (DP-B) 0-9 to incoming trunk jacks (T)0 of DP trunk groups 0-9, respectively as equipped, by means of ITE-9601 cords. Insert the plug of the Tel. Set into the test set TEL jacks. Insert the

351C MB plugs into all sender link secondary hold magnets associated with the DP trunk groups excepting 0, 3, 6 and 9 on SW(0), 1, 4 and 7 on SW(1) and 2, 5 and 8 on SW(2).

NOTE 1: Repeat the test operations described in Paragraphs 12.411 to 12.425, as required, when all equipped DP trunk groups associated with the link under test cannot be tested together.

NOTE 2: Use ITE-9639 cords equipped with alligator clips for connecting to trunks not equipped with T jacks.

12.42 Test Operations

12.421 Operate keys NCD and ST.

Note that the HOME controller circuit connects senders to the trunks under test by observing that a corresponding number of link secondary hold magnets serving like numbered trunk groups and relay HC operate. Dial any single digit.

12.4211 Operate and restore keys (B)0-9, in turn, one key

for each DP trunk group and verify the receipt of low or high dial tone as required for the trunk groups under test. Operate key RL to restore the circuits to normal.

NOTE: The sender circuits time out in 30 to 60 seconds. The corresponding circuits will then signal reorder (120 IPM), instead of dial tone.

12.422 Operate key ST. Observe that

the trunk under test in the lowest numbered trunk group operates a secondary select magnet in accordance with the position (0-9) of the trunk in the trunk group and the A or B to P cross-connection as specified.

12.4221 Count pulses as indicated by the dial DP calibration

and dial CD, TH, H, T and U digits as required for the office overflow signal test line number.

12.4222 Observe that a BS lamp lights and a DP-B lamp

flashes the overflow signal for each trunk group connected for test.

NOTE 1: Dial pulse trunk groups require four or five digit dialing as indicated by a low or high dial tone signal, respectively. Dial 5 digits for all test calls. Operate test set key NCD and dial any first digit when the trunk groups connected for test require 4 digits only. Test trunk groups which require 4 digits with trunk groups which require 5 digits, as follows: With key NCD normal, operate keys (B) 0-9 as required for trunk groups which require 4 digits. Restore the operated (B) keys after the CD digit has been dialed.

NOTE 2: Test trunk groups common to number series A and B, individual to A and individual to B as follows: Use the test lines previously described in Note 2 under Paragraph 12.121. On one or two of the three series of test calls described in Paragraphs 11.422 to 11.424, dial the A office or any ODD CD digit, restore (B) keys as required and dial the test line TH, H, T and U digits. Observe the OVERFLOW signal for common trunks and trunks individual to number series A. Observe the busy signal for trunks individual to numbers series B. Dial the B office or any EVEN CD digit on the remaining series of test calls. Observe the OVERFLOW signal for A office trunk groups. Observe the BUSY signal for common and B office trunk groups.

12.423 Move the ITE-9601 cords from the (T) 0 to the (T) 1 trunk

jacks and repeat the test calls. Observe the same test results. Continue the test in this way, moving the test cords and completing test calls until all trunks in the DP trunk groups have been tested in a manner similar to that described for trunks 0 and 1.

12.424 Insert the 351C MB plugs into

all secondary hold magnets associated with the DP trunk groups excepting 0, 3, 6 and 9 on SW(1), 1, 4 and 7 on SW(2) and, 2, 5 and 8 on SW(0). Insert a 349A MB plug into jack EA and repeat the tests described in Paragraphs 12.422 and 12.423. Observe the same test results.

12.425 Insert the 351C MB plugs

into all secondary hold magnets associated with the DP trunk groups excepting 0, 3, 6 and 9 on SW(2), 1, 4 and 7 on SW(0) and 2, 5 and 8 on SW(1). Move the 349A MB plug from jack EA to jack EB and repeat the tests described in Paragraphs 12.422 and 12.423.

12.4251 Observe the same test

results except that the MATE controller circuit is used instead of the HOME controller. Remove the MB plugs.

12.5 MF Key Pulsing Trks. and Senders

12.51 Setup for Test

12.511 Connect 48 volt battery and

ground to the Terminating Equipment Test Set ITE-4010 by connecting test set jack A(PWR) to jack A of the associated incoming trunk frame by means of an ITE-9598 cord.

12.5111 Insert plug of Tel. Set into the test set Tel.

Jacks. Patch an ITE-9957 cord to the test set 15 point (HB Jones) socket and to the signaling current supply control circuit 15 point (HB Jones) socket on the incoming trunk frame.

12.5112 Using ITE-9601 cords, connect test set jacks 0-9 to incoming trunk jacks (T)0 of MF key pulsing trunk groups 0-9 respectively, as equipped on the incoming trunk frame associated with the terminating sender link frame under test.

NOTE: Refer to Note 2, Paragraph 12.121 concerning trunk groups common to number series A and B, individual to A and individual to B.

12.512 Operate test set key RS as required to restore test set to normal (N and O lamps light). Operate keys REV, AA, and as required COMP resistance.

12.513 Insert 351C MB plugs into all sender link secondary hold magnets associated with the MF key pulsing trunk groups under test excepting 0, 3, 6 and 9 on SW(0) 1, 4 and 7 on SW(1) and 2, 5 and 8 on SW(2).

12.52 Test Operations

NOTE: Repeat the test operations described in Paragraphs 12.521 to 12.526 as required when all equipped MF key pulsing trunk groups on the link frame under test cannot be tested together.

12.521 Operate key ST. Observe that relay HC operates, that the proper crosspoints close on the primary switch associated with TGO, that the crosspoints closed on the secondary switch are in accordance with the A to P cross-connections specified and that lamp KA on the test set lights indicating that the number can be keyed.

12.522 Operate the KP key (for about 1/4 second) and following its release the required number is to be keyed on the MFKP numerical keys to reach the office overflow test line (usually in the 9900 series). Thousands, hundreds, tens and units digits are keyed in the order named.

12.5221 Keys are to be held down long enough to insure sending a 60 mil. second pulse to the MF receiver. When the unit digit has been sent the AV key is operated. Lamp SU flashes as test line is reached. Overflow pulses (120 IPM) and tone should be checked through Tel. Set. Operate RS key to restore test set to normal.

NOTE: Operation of HB key at start of call will allow tone to be heard in telephone set. Listen for tone on one trunk of each group. HB key must be released before test will progress to next trunk.

12.523 Repeat operations and observe results described in Paragraphs 12.521 and 12.522 for each of the 0 trunks in trunk groups 0 to 9 as equipped.

12.524 Move the ITE-9601 cords from the (T) 0 to the (T) 1 trunk jacks and repeat the test calls. Observe the same test results.

12.5241 Continue the test in this way, moving the test cords and completing test calls until all trunks in MF key pulsing trunk groups 0-9 have been tested in a manner similar to that described for trunks 0 and 1.

12.525 Insert the 351C MB plugs into all secondary hold magnets associated with the MF key pulsing trunk groups excepting 0, 3, 6 and 9 on SW(1), 1, 4 and 7 on SW(2) and 2, 5 and 8 on SW(0). Insert a 349A MB plug into jack EA and repeat the tests described in Paragraphs 12.521 to 12.523. Observe the same test results.

12.526 Insert the 351C MB plugs into all secondary hold magnets associated with the MF key pulsing trunk groups excepting 0, 3, 6 and 9 on SW(2), 1, 4 and 7 on SW(0) and 2, 5 and 8 on SW(1). Move the 349A MB plug from jack EA to jack EB and repeat the tests described in Paragraphs 12.521 to 12.523.

12.5261 Observe the same test results except that the MATE controller is used instead of the HOME controller. Remove the MB plugs. Remove test line test connections (Note 2, Paragraph 12.121) at the completion of crosspoint tests and ITE-4082, Terminating Sender Link and Controller Test Set.

13. CROSSPOINTS OTHER THAN FS, B, DP, OR MFKP

13.1 Test crosspoints associated with other than FS, B, DP or MF key pulse circuits by means of the equipment normally associated with the incoming trunk. In this case, one call shall be completed through each sender subgroup by inserting 351C MB plugs into two associated link secondary hold magnets as on the regular crosspoint test.

14. ALARMS

14.1 Interrupter Check

14.11 IA Interrupter: Cross contacts 6T-7T on relay CA. Relay TA operates. Observe that relay TA1 operates after an interval of 5 to 6 seconds and that the TA2 relay operates approximately 1 second after TA1. Remove the cross and momentarily operate key TR.

14.12 IB Interrupter: Cross contacts 5T-6T of relay CB. Relay TB operates. Observe that relay TB1 operates after an interval of 5 to 6 seconds and that the TB2 relay operates approximately 1 second after TB1. Remove the cross and momentarily operate key TR.

14.13 HD Jack: Insert a 349A plug into jack HD and repeat the tests described in Paragraphs 14.11 and 14.12. Observe that relays TA1, TA2, TB1 and TB2 do not operate and that relay MA operates 5 to 6 seconds after TA or TB for the respective tests. Remove the MB plug.

14.14 ST Interrupter: Connect one side of the R-1824 pencil lamp to 48 volt battery and connect the other side to the 6B contact of relay SS. Observe that the lamp is successively lighted and extinguished for periods of approximately 1/2 second. Remove the pencil lamp.

14.2 Grounded GS, TR, RL, SL or SM Lead

14.21 Connect one end of an ITE-9547 cord to ground and connect the other end of this cord to terminal #14 (GS lead) of the subgroup T.S. associated with a first choice sender subgroup on the link frame under test.

14.211 Insert the plug of the ITE-4208 Tel. Set into the T jack of any associated trunk circuit which recognizes selection by the Tel. Set and note that the C- relay associated with the first choice sender subgroup operates.

14.212 After an interval of 1 to 1-1/2 seconds, lamps: AL, the white aisle pilot and the associated LA on the terminating trouble indicator light. The minor audible alarm operates intermittently, the operated C- relay releases and a C- relay associated with another sender subgroup operates and serves to complete the connection of the trunk used for test to a sender.

14.213 Remove the ground from lead GS and momentarily operate key TR to extinguish the lighted lamps and to silence the alarm.

14.22 In a manner similar to that described for lead GS, ground terminals 15, 16 and 17, in turn, (leads TR, RL and SL respectively) and originate a test call in each case. Observe the same test results for each of the test calls.

14.23 Insert a 349A MB plug into jack EB and repeat the tests described in Paragraphs 14.21 and 14.22. Observe the same test results. Disconnect the ITE-9547 cord and remove the MB plug at the completion of the tests.

NOTE: Refer to Note 2, Paragraph 11.

14.24 Block operated an SS magnet. Start a test call as in Paragraph 14.21. Note that the C- relay does not operate, but that the alarm circuit operates and the call transfer to the mate frame, and will again fail. Remove the block. Repeat the test for each secondary switch.

14.3 Double Connections

14.31 Connect one end of an ITE-9547 cord to the top winding terminal of a first choice sender subgroup C- relay and connect the other end of this cord to terminal 0 (S) of the associated trunk multiple on the primary switch trunk level of a trunk to be used for test.

14.311 Start a test call and observe that the C-, LR-, AMB- and BMB- relays associated with the first choice sender subgroup operate, lamp AL lights, the operated C- relay releases and a second C- relay operates and serves to connect the trunk to a sender for completion of the test call.

14.312 Momentarily operate key TR to extinguish lamp AL and to silence the alarm.

14.32 Block operated relays AMB- and BMB- associated with the first choice sender subgroup. Move the test cord from the first choice C- relay to the second choice C- relay and repeat the test call.

14.321 Observe the same test results except that the second and third choice sender subgroups are used for the first and second trials respectively. Momentarily operate key TR.

14.33 Block operated relays AMB- and BMB- associated with the second choice sender subgroup and move the test cord to the third choice C- relay.

14.331 Repeat the test call as previously described, but when the AL lamp lights, remove the blocks and release the first choice AMB- or BMB- relays, as required, so that senders are made available for completion of the test call on second trial.

14.332 Momentarily operate key TR, remove the blocks from relays AMB- and BMB- and disconnect the test cord.

14.34 Insert a 349A MB plug into jack EB and repeat the test. Observe the same test results. Disconnect the ITE-9547 cord and remove the MB plug.

14.341 Refer to Note 2, under Paragraph 12:1212.

14.4 Open SL Lead

14.41 Insulate the SL lead (contact #23) of the C- relay associated with the first choice sender subgroup. Start a test call from an associated trunk circuit and observe that the C- relay operates. After an interval of 1 to 1-1/2 seconds, lamp AL lights and the minor intermittent alarm sounds. The C- relay releases and another C- relay operates and serves to connect the trunk used for test to a sender for completion of the test call. Remove the insulator.

14.42 Insert a 349A MB plug into jack EB and repeat the test. Observe the same test results. Remove the insulator and the MB plug at the completion of the test.

NOTE: Refer to Note 2 under Paragraph 11.

14.5 Failure of Sender to Return a Release Signal

14.51 Insulate contact #22 (RL lead) of the C- relay associated with a first choice sender subgroup. Start a test call and observe that the C- relay operates.

14.511 After an interval of 1 to 1-1/2 seconds, lamp AL lights and the minor intermittent alarm sounds. Relay R operates and the test call is completed. Operate key TR to extinguish lamp AL and to silence the alarm. Remove the insulator.

14.52 Insert a 349A MB plug into jack EB and repeat the test. Observe the same test results. Remove the insulator and the MB plug at the completion of the test.

NOTE: Refer to Note 2 under Paragraph 11.

14.6 Emergency Operation

14.61 Transfer to the Mate Controller: Block relay TT non-operated and start a test call. Observe, after an interval of 6 to 13 seconds, that lamps AL and the white aisle pilot light, the minor intermittent alarm operates, relays H and HC release, relays M and MC operate and that the test call is completed.

14.611 Remove the blocking tool from relay TT and momentarily operate key TR to restore the alarm and to restore the alarm and to restore the home controller circuit to service.

14.62 Transfer to the Home Controller: Manually operate relay TA2, observe that it locks and that the minor alarm circuit operates as previously described. Block relay FB normal and start a test call.

14.621 Observe, after an interval of 6 to 13 seconds, that relays TB2, H and HC operate, relay TA2 releases and that the test call is completed. Remove the blocking tool from relay FB and momentarily operate key TR to retire the alarm.

14.63 Locking Paths for TA2 Relay

NOTE: This test should also be made on the emergency controller circuit.

14.631 TA1 Relay Contacts: Insert a 349A plug into jack MB of the mate controller circuit. Block relay TA1 operated. Within 6 seconds relay TA2 operates and locks. The major alarm sounds. Remove the TA1 block and observe that TA2 releases. Remove the plug from the MB jack.

14.632 TB1 Relay Contacts: Operate relay TA2, note that it locks. Operate relay TB1 and note that TA2 releases.

14.633 TB2 Relay Contacts: Operate relay TA2 and note that it locks. Operate relay TB2. Observe that TA2 releases. Momentarily operate key TR and observe that TB2 releases.

14.64 Locking Paths for TB2 Relay

NOTE: This test should also be made on the emergency controller circuit.

14.641 TB1 Relay Contacts: Insert a 349A plug into the home MB jack. Block relay TB1 operated. Within 6 seconds relay TB2 operates and locks. Remove the block from relay TB1. TB2 releases. Remove the plug from the MB jack.

14.642 TA1 Relay Contacts: Operate relay TB2 and observe that it locks. Operate relay TA1. Observe that TB2 releases.

14.643 TA2 Relay Contacts: Operate relay TB2 and observe that it locks. Operate relay TA2. Observe that TB2 releases. Momentarily operate key TR, Observe that TA2 releases.

14.7 Major Alarms

14.71 Home Controller Made Busy: Insert a 349A MB plug into the MB jack of the home controller circuit and observe that the TSL guard lamp in the floor alarm cabinet lights.

14.711 Block relay FB non-operated and start a test call. Observe after an interval of 6 to 13 seconds that lamp M and the white aisle pilot light and that the major audible alarm operates.

14.7111 Remove the block from relay FB and observe that the test call is completed. Remove the MB plug and momentarily operate key TR to retire the alarm.

14.72 Mate Controller Made Busy: Insert a 349A MB plug into the MB jack of the mate controller circuit, block relay FA non-operated and start a test call.

14.721 Observe after an interval of 6 to 13 seconds that lamp M, and the white aisle pilot light and that the major audible alarm operates.

14.722 Remove the block from relay FA and observe that the test call is completed. Momentarily operate the TR key. Remove the MB plug if the following test is not to be made at this time.

14.73 Home and Mate Controller Circuits Made Busy: Insert 349A MB plugs into the MB jacks of the home and the mate controller circuits.

14.731 Observe that the M lamps of the home and the mate controller circuits, and the associated white aisle pilot light immediately, and that the major audible alarm operates. Remove the MB plugs and momentarily operate key TR.

14.74 Transfer Failure: Block relays TA1 and TB1 operated. Observe that lamp M and the white aisle pilot light and that the major audible alarm operates immediately. Remove the relay blocking tools and momentarily operate key TR.

14.75 Hold Jack, Time Out

14.751 Insert a 349A MB plug into jack HD, block relay TT nonoperated and start a test call.

14.7511 Observe, after an interval of 6 to 13 seconds, that lamp M and the associated white aisle pilot light and that the major audible alarm operates. Remove the block from relay TT and momentarily operate key TR.

14.752 Insert a 349A MB plug into jack EB, block relay FB non-operated and start a test call.

14.7521 Observe after 6 to 13 seconds, that lamp M and the associated white aisle pilot light and that the major audible alarm operates. Remove the block from relay FB and observe that the mate controller serves to complete the test call. Remove the MB plugs from jacks HD and EB.

14.8 Alarm Reset

14.81 Block relay DA operated. Relay TA operates. Manually operate relay FA before relay TA1 operates. Observe that relay TA releases. Remove the block from the DA relay.

14.82 Block relay DB operated. Relay TB operates. Manually operate relay FB before relay TB1 operates. Observe that relay TB releases. Remove the block from relay DB.

14.83 Block relays, TA1 non-operated and TA operated. Start a test call and observe that the FA relay remains operated until the block is removed from relay TA. Remove the blocking tool from relay TA1.

14.84 Insert a 349A MB plug into jack EB, block relay TB1 non-operated and relay TB operated. Start a test call and observe that the FB relay remains operated until the block is removed from relay TB. Remove the block from relay TB1 and the MB plug from jack EB.

14.9 EA and EB Open Contact Check

14.91 Insert 349A MB plugs into jacks EA and EB and start a test call. Observe that the home controller serves to complete the test call.

14.911 Block relay TA2 operated and repeat the test call. Observe that the mate controller serves to complete the test call.

14.912 Remove the block from relay TA2, the plugs from jacks EA and EB and momentarily operate the TR key.

15. MISCELLANEOUS TESTS

15.1 M Resistance Check

15.11 Check for the presence of 226 ohm resistance battery on the 4B contact of relay RA.

15.111 Manually operate relays ASG and BSG and note that the battery is removed. Note that the battery is not removed when the relays are operated separately. If relay BSG is not equipped, note that the operation of relay ASG does not remove the battery.

15.12 Repeat the test as required for the emergency controller circuit

15.2 LR Relay Break Contact Test

15.21 Insert 351C MB plugs into the verticals of the first secondary switch. The 0 to 9 hold magnets operate. The associated hold magnets on the primary switch operate.

15.22 Operate the 0-LR relay. The hold magnets previously operated will release. Release the 0-LR relay; the hold magnets reoperate.

15.23 Repeat the above test on the second and third secondary switch using 1-LR and 2-LR relays respectively.

15.3 Test of A Leads to Calls Waiting Signal Circuit and the Associated J Resistances

NOTE: This test is required only when F wiring is provided on drawing SD-25459 or AD wiring on SD-25028. When testing an addition where SD-25028 is specified M resistance shall be substituted for the J resistance, punching 222 shall be substituted for punching 198, and AD for F wiring in Paragraphs 15.31 to 15.33.

15.31 Using a Test Receiver R-9572 check for resistance battery on the D.P.T.S. (A) terminal associated with terminal 198 on the miscellaneous terminal strip at the top of the frame.

15.311 Insert an MB plug into the calls waiting signal circuit TST jack located on the miscellaneous relay rack and check for the absence of battery and ground at the above mentioned terminal. Check for continuity between the two above mentioned terminals.

15.32 Block operated a GST- relay associated with a group having F wiring specified and check for resistance ground (4800 ohms) at terminal 198 of the miscellaneous terminal strip.

15.321 Release the GST- relay and check that ground is removed from terminal 198. Repeat this test on all GST- relays for which F wiring is specified.

15.33 Using Volt-Ohmmeter ITE-4442 connect the X-1 and X-2 terminals of the Volt-Ohmmeter to the terminals of the J resistance.

15.331 Check that the resistance is within the following limits. Max. 4848 ohms, Min. 4752 ohms. Repeat this test on all J resistances on the frame. Remove MB plug and testing equipment.

15.4 LL Relay Chains

15.41 Using KSI6887L1 tools block the TS relay operated and the SS relay normal on all link frames. Using ITE-4069 tools block operated the HC relays and also the SC-1 relays, as equipped, on all link frames.

15.411 Manually operate the SG-0 relay in the last link circuit. The associated LL- relay operates and the SG- relay locks.

15.42 Operate in sequence the SG- relays of the preceding link circuits. Note that the associated LL- relays operate. These SG- relays do not lock. The LL- relays release when the SG- relays are released. Block in sequence the SG- relays operated, except the one that is locked operated.

15.43 Release the LL-0 relay of the last circuit. The associated SG-0 releases. Remove the block from the SG-0 relay in the next lower numbered link and note that it remains operated.

15.44 Continue the operations described in Paragraph 15.43, releasing the LL-0 relay in the higher numbered link and noting the release of the SG- relay on the same link and the SG relay locking circuit on the preceding link.

15.45 Manually operate the SG-0 relay in the first link. The associated LL-0 relay operates and the SG-0 locks. Operate and release the SG-0 relay in the next higher numbered link. The associated LL-0 does not operate. Release the first and operate the second SG-0. It locks and the associated LL-0 operates.

15.46 Continue the test with the SG-0 in the next higher numbered link until all SG-0 and LL-0 relays have been checked.

15.47 Repeat the preceding tests on the LL-1 and LL-2 chains.

15.48 Remove the blocks from the SC-1 relays and block the SC-2 relays operated. Repeat the test on the LL-3, LL-4 and LL-5 chains, as equipped. Remove the blocks from the TS, SS, HC and the SC-2 relays at the completion of the tests.

16. REGISTERS

16.1 Sender Subgroup Busy Register

16.11 Setup for Test

16.111 Establish a talking connection, by means of the frame line circuit and two ITE-9650 Tel. Sets, between the traffic register rack and the miscellaneous frame associated with the first sender selector unit to be tested.

16.12 Test Operations

16.121 Manually operate and release relay AGB of the sender selector unit under test. Observe that the associated sender subgroup register (SGT) scores and releases. Repeat the operation as required. Manually operate and release relay GMB several times and note that the associated register does not score.

16.122 Repeat the test described in Paragraph 16.121 on each terminating sender selector unit.

16.2 Sender Group Busy Registers

16.21 Block relay AGB- normal and insert 322A MB plugs into the sender MB jacks associated with all the senders of the first kind in one sender subgroup. Observe that the associated T lamp lights. Remove one of the MB plugs and observe that lamp T remains lighted momentarily.

16.211 Replace the MB plug and repeat the operation with each of the other MB plugs in turn. Observe the same test results. Remove the MB plugs and remove the block from the AGB- relay.

16.22 Repeat the test for the second kind of senders in the same sender subgroup. The test is the same except that relay BGB- is blocked instead of AGB- and lamp B is observed instead of lamp T. Remove the MB plugs and remove the block from the BGB- relay.

16.23 Repeat the tests described in Paragraphs 16.21 and 16.22 on each terminating sender subgroup.

16.24 Insert 322A MB plugs into all the sender subgroup MB jacks associated with a common group.

16.241 Observe that the associated group busy lamps. (two of: FSB, BB, DPB and KPB). for the first and the second kinds of senders in the common group light, the minor intermittent alarm operates, and when provided, the A switch-board auxiliary signal lamp LR lights.

16.242 The associated sender GB register, (except for B switchboard senders) AGB- or BGB- or both score and continue to score under control of the GB interrupter as long as all of the AGB2 or BGB2 (as provided) relays, respectively, in the group remain operated.

NOTE: For FS terminating senders, check that ground is connected, through contacts of all the operated AGB2 or BGB2 relays as required, to the terminating sender load control timing circuit, operating the TSB relay.

16.25 Remove and immediately replace each of the subgroup MB plugs. Observe that the associated subgroup T and B lamps remain lighted. Remove the MB plugs and momentarily operate the ASB key on the Terminating Trouble Indicator to extinguish the lighted lamps and to silence the minor alarm.

16.26 Repeat the tests described in Paragraphs 16.24 and 16.25 on each common group of terminating senders. Remove testing equipment.

17. LOAD CONTROL TIMING CIRCUIT (SD-25471)

NOTE 1: Perform tests per Paragraphs 17.2 and 17.22 to 17.31 if Z wiring is installed or Paragraphs 17.21 to 17.31 with Y wiring.

NOTE 2: Caution should be used to be sure that the (IT-), (OF-) and (RT-) relays do not operate during the following tests.

17.1 Make a continuity test of the G-leads from the contacts of (IT-) and (OF-) relays, as furnished to associated sender, and from the (IT-) relay to the sender test frame.

17.2 Block normal (IT-), (OF-) and (RT) relays. Ground pchg. 56 on MISC TS of last sender selector circuit of first (and second if S wiring is used) subgroup.

17.21 Check that TSB relay operates in 0 to 6 seconds (depending on the position of the T1 interrupter when TSB relay is operated), that the T3 and OFA relays operate and the RT, IT- and OF- relays are energized approximately 6 seconds later. The DC lamp of the switchboard auxiliary signal circuit lights.

17.22 Block TSB relay operated. Observe that the T1 relay operates within 6 seconds (depending upon the position of the T1 interrupter at the time the TSB is operated) and that about 6 seconds later the T5 relay operates and locks; T6 relay operates and locks approximately one second after T5; and T3 relay operates and the (RT) Tel. is energized approximately 6 seconds after T5. The DL lamp of the switchboard auxiliary signal circuit lights.

17.23 Release the TSB relay. RT relay is de-energized but T3 remains operated. After a period of not more than 29 seconds (depending upon the position of the T2 interrupter when the TSB relay is released) relay T2 operates and locks. Relay T4 operates about 29 seconds after T2 is operated. T3 relay releases and the DL lamp is extinguished. All operated relays T1, T2, etc. release.

17.24 Manually operate T3 relay. (T2 may operate, but disregard its operation.) It locks. Hold TSB relay operated for 7 or 8 seconds and observe that T1 relay does not operate.

17.25 Release TSB relay. Hold T3 operated and manually operate T4 relay. It locks. (T2 may operate but disregard its operation.) Release T3 relay. T4 (and T2 if operated) relay releases.

17.26 Block T6 relay operated if provided (Y apparatus). Insulate 3T and 4T of T1 relay. Connect ground to the B lead to the T1 interrupter. T1 relay operates. Observe that after a period of 6 to 7 seconds T3 relay does not operate.

17.261 This checks reverses in the wiring of the A and B leads to the T1 interrupter. Other reverses are checked in Paragraph 17.11 or 17.12. Release T6 relay and remove insulator.

17.27 Insulate 3T and 4T of T2 relay. Connect ground at the F contact of the T2 interrupter. T2 relay operates. Observe that after 30 seconds the T4 relay does not operate. Remove insulator.

17.3 Traffic Register Check

17.31 When the traffic register operates under control of a GB interrupter per Figure 21 of SD-25317,

hold TSB relay operated and observe that the GB register scores at 1.3 second intervals.

17.32 When Figure 7 of SD-25317 is used, flash the TSB relay and observe that the GB register flashes.

No arrows are shown due to extensive changes.

18. MISCELLANEOUS CIRCUITS

18.1 Check miscellaneous circuits not checked on other tests as follows:

- (a) Test battery supply
- (b) Frame Line Circuit
- (c) FA and 20A fuse alarm check that the fuse alarm is not stopped when the FA or 20A lamp is burned out or removed.

Manager, Crossbar Product Engineering
Control Center

Reason for Reissue:

- (1) Include changes required for DID-LLP.
- (2) Make a general revision to update to current engineering standards.