



5. FUSE VERIFICATION5.1 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.

- 5.11 Fuse verification is, ordinarily, only required on fuse panels wired by the installer.
- 5.12 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 and 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.
- 5.13 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.
- 5.14 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.
- 5.15 When the R-9572 Test Receiver is used, avoid placing it directly on the ear.
6. CONTACT PROTECTION
- 6.1 For those contact protection networks installed on the job, test in accordance with Handbook 61, Section 0.2.

7. MISCELLANEOUS CIRCUIT FOR DP TERMINATING SENDER CIRCUIT, SD-25053-01

7.1 Verify the below listed features of the Miscellaneous Circuit, not checked on other tests, as follows:

7.11 Test Battery Jack and Supply

7.111 Verify presence of 48 Volts on 48V test battery terminal and tip of jack A.

7.112 Verify presence of direct ground on test terminal G.

7.113 Verify presence of high resistance ground (12,000 ohms) on test terminal HRG.

7.114 Verify presence of direct ground on sleeve of jack A.

7.12 Spare Jack

7.121 Verify presence of continuity and absence of cross for leads T, R, and S of jack B to all associated jack B appearances and to the M.D.F.

7.13 Frame Line Jack.

7.131 Jack TEL (A and B) - Verify presence of continuity and absence of cross for the leads on the tip and sleeve of jack TEL (A and B) to all associated jack TEL appearances and to the M.D.F.

7.132 Jack D - Verify presence of continuity and absence of cross for leads T and R of jack D to all associated jack D appearances.

7.14 Remote Control Jacks

7.141 Jack C - Verify presence of continuity and absence of cross for leads T, R, and S of jack C to all associated jack C appearances.

7.142 Jacks (MX and MN) and (MX-D and MN-D) - Verify presence of continuity and absence of cross for the leads on the tip and ring of jacks (MX and MN) and (MX-D and MN-D) to all associated appearances of these jacks.

7.143 Jack E - Verify presence of continuity and absence of cross for leads RC, RC1, RC2, and RC3 to all associated appearances of these leads.

- 7.144 Jack TEL 1 (A and B) - Verify presence of cross for the leads on the tip and sleeve of jack TEL 1 (A and B) to all associated jack TEL 1 appearances.
- 7.15 Fuse Alarm
- 7.151 Connect 48V battery through test receiver R-9572 to the alarm bar of the 20 ampere frame fuse. Observe that the major alarm sounds, lamps 20A and the associated red aisle pilot light, relay A operates in the Floor Alarm Fuse and Time Alarm Circuit, and lamp FA does not light.
- 7.152 Disconnect the battery from the alarm bar. Observe that the alarm is silenced, the lighted lamps are extinguished, and relay A is released.
- 7.153 Verify the 20A resistance shunt by removing lamp 20A and repeating the tests of Paragraphs 7.151 and 7.152. Replace lamp 20A at the completion of this test.
- 7.154 To verify the presence of the 350 ohm resistance between the 20 ampere alarm bar and lamp 20A:
- (1) Connect 48V battery through test receiver R-9572 to the alarm bar for the 20A fuse,
  - (2) Using another test receiver R-9572, connect to the same point on the alarm bar and to the fuse mounting side of lamp 20A,
  - (3) Verify an appreciable click in both receivers, and
  - (4) Disconnect both test receivers.
- 7.155 Connect 48V battery through test receiver R-9572 to the frame fuse panel alarm bar. Observe that the major alarm sound, Lamps FA and the associated red aisle pilot light, relay A operates in the Floor Alarm Fuse and Time Alarm Circuit, and lamp 20A does not light.
- 7.156 Disconnect the battery from the alarm bar. Observe that the alarm is silenced, the lighted lamps are extinguished, and relay A is released.

## 8. SUPPLEMENTARY TESTS

NOTE 1: For General Description, Test Call Progress, and Test Set-Up information, refer to Paragraphs 9.1, 9.2, and 9.3 respectively, and

NOTE 2: Keys PCR and PCS may be used to advance the test frame to the particular sender to be tested.

### 8.1 Sender Lamp S

- 8.11 At the TTI, operate key BAT. On one of the tests calls to each MF sender, verify that the associated lamp S, on the TTI, lights momentarily when the sender is seized.

### 8.2 Jacks MB

- 8.21 At the TTI, insert a make-busy plug into jack MB of each MF sender. Operate keys APB and MFS.
- 8.22 Originate a Class 0 test call. Observe that the sender locating lamp lights for the first MF sender to be tested and that all MF senders are passed.

- 8.23 Remove all make-busy plugs from jacks MB.

### 8.3 Jack HLD

- 8.31 *At the TTI, insert a make-busy plug into jack HLD associated with the sender under test.*
- 8.32 *At the test frame, set up any Class 0 test call. Operate keys REP and SS.*
- 8.33 *Operate key ST. The sender is seized, test frame lamps RC and KP are lighted while sender times out in 14-30 seconds. Lamp RC is extinguished and lamp TL at the TTI is lighted and the alarm sounds in 5-12 seconds.*
- 8.34 *Momentarily operate key CA. The test frame restores to normal then attempts to re seize the sender and blocks with lamp BY lighted.*
- 8.35 *Restore test frame to normal. Remove make-busy plug from jack HLD at the TTI. The sender restores to normal.*
- 8.36 *Repeat test of Paragraph 8.31 to 8.35 on each MF Sender.*

### 8.4 Reorder

- 8.41 At the Sender Test Frame, operate keys CL-8, TH-9, H-9, T-9, U-9, MFS, REP-2, TA, and R0. Originate a test call. Observe that lamp RC lights and remains lighted for 14-30 seconds, lamp D lights, the test frame completes two test calls to each MF sender before lamp EC lights, and the minor alarm sounds.

8.42 Restore the test frame to normal.

8.5 Time Out

NOTE 1: This test holds the sender group busy continually. Notify other testers attempting to use these senders, and

NOTE 2: Do not use the TTI when making time out tests.

8.51 At the TTI, insert a make-busy plug into jack HLD of the first sender to be tested. At the Sender Test Frame, operate keys CL-6, TH-4, H-4, T-4, U-4, MFS, and TA. Originate a test call.

8.52 Using stop watch R-3314, verify that lamps RC and KP are lighted for 14-30 seconds.

8.53 After lamp RC is extinguished, verify lamp S at the test frame and the associated lamp TL at the TTI light and the minor alarm sounds 5-12 seconds later.

8.54 Operate key MGB and remove the make-busy plug from jack HLD. Verify the alarm is silenced and lamp TL is extinguished.

8.55 Operate and release key AV. The test frame advances to the next sender to be tested. Release key MGB.

8.56 Repeat tests of Paragraph 8.5 on each MF sender.

8.57 Restore the test frame to normal.

8.6 Interrupter TM

8.61 Block operated relay ON1. Observe that relay TM1 locks operated within 14 seconds, relay TM2 operates 15 seconds later, lamp TL lights at the TTI, and the alarm sounds.

NOTE: When leads B and F to the interrupter are reversed, relay TM2 will operate about 1 second after relay TM1.

8.62 Restore to normal relay ON1. Verify relays TM1 and TM2 release, lamp TL is extinguished, and the alarm is silenced.

8.7 Crossed Office Indication Leads

NOTE: This test and the operation of an office indication key in other tests are required only when the senders are arranged to serve a multi-office terminating unit and associated office indication keys (LOA, LOB, LOC and OI) are specified for the test circuit.

8.71 Operate an F- key associated with the sender under test. Operate keys LOA, LOB, CL-0, MFS and ST. Observe that lamps MGB, BY, GB and SEL light momentarily and that the test circuit blocks with lamp RL lighted.

8.711 Operate key CL-3 and observe that the test call is completed.

8.712 Repeat the test as required for pairs of keys (LOA-LOC) and (LOB-LOC). Observe the same test results. Restore the test circuit to normal.

8.8 Crossed Frame Indication Leads

8.81 Operate an office indication key and key FA (0) or FA (1) if equipped. Operate two F- keys which correspond in number with the sender under test.

8.811 Operate keys REP, CL-0, MFS and ST. Observe that lamps MGB, BY, GB and SEL light momentarily and that the test circuit blocks with lamp RL lighted.

8.812 Operate key CL-3 and restore ST. Observe that the test call is completed.

8.813 Operate F- keys for the first and third F- relays equipped in the sender under test and reoperate keys CL-0 and ST. Observe that the test circuit blocks as before.

8.814 Operate key CL-3, restore key ST and, observe that the test call for the second pair of F- keys is completed.

8.815 Continue the test in this way, operating two F- keys and completing a test call until all possible combinations of the sender F- relays have been tested.

8.816 Restore and reoperate key REP as required to permit advance of the test circuit to the remaining, MF senders.

9. OPERATIONAL TESTS
- 9.1 General Description
- 9.11 The Terminating Sender Test Frame is used for applying operational tests by simulating various types of calls in the senders and checking the resulting operations.
- 9.12 On a test call, a connector connects the test circuit to the sender. The sender is first tested for busy and, if idle, the test circuit transmits frame indication.
- 9.121 For senders arranged to serve a multi-office terminating unit, it transmits a terminating link office indication signal, (OA or OB), or a signal, (OC).
- (1) OC indicates to the sender that the terminating office code will be transmitted by means of an MF signal before the line number is transmitted and in the same manner.
- (2) An odd or an even office code digit is transmitted to the sender for the A or B office signal, respectively.
- 9.13 The sender test circuit is then connected through the sender to the associated MF key pulse receiving circuit.
- 9.131 Office code, if required, and line number, MF signals, each digit consisting of two frequencies corresponding to the operated OI, TH, H, T and U keys of the test circuit, are transmitted from the sender test circuit to the receiver.
- (1) The signaling frequencies used for MF key pulsing are 700, 900, 1100, 1300, 1500, and 1700 cycles, which are designated 0, 1, 2, 4, 7 and 10 respectively.
- (2) Frequencies 0, 1, 2, 4, 7 are used for the office indication and the numerical digit codes.
- (3) Frequency 10 is used in combination with other frequencies for the KP and ST signals.
- (4) In areas where office codes consist of two letters and a numerical digit, the numeral will be keyed for the terminating office indication.
- 9.132 The MF signals are translated into DC signals which are transmitted to and registered in the sender under test.
- 9.133 When registration is completed, the sender connects to a terminating marker through a terminating marker connector.
- 9.14 The test circuit records the information passed from the sender to the marker and checks that this information corresponds to the selections imposed on the sender by the test circuit. As each digit is being checked, a corresponding lamp is lighted. If any digit does not check with that set up on the keys, the test circuit will block with the corresponding lamp lighted. Frame registration is checked in a similar manner.
- 9.15 If the sender fails to perform any of its functions, the test circuit blocks and, except in making time out tests, causes an alarm to be sounded. Lamps are provided to indicate which sender is being tested and progress lamps are provided to indicate what function of the sender is being tested at any time.
- 9.16 The test circuit makes use of regular service circuits in addition to the sender under test. These include the Terminating Marker Connector, Terminating Marker, and the sender selector equipment which is common to the Terminating Sender Links.
- 9.17 Registers are provided to record the number of circuits tested, the number of repeated single tests, and the number of busy senders passed without testing.
- 9.2 Test Call Progress
- 9.21 With the proper keys operated for a particular test call, operate key ST. A connector connects the test circuit to the first idle MF sender and to the associated sender subgroup circuit of the Terminating Sender Link.
- 9.22 When the first sender has been tested, register CT will operate and the test circuit will advance to the next sender. This process will continue until a busy sender is encountered or a test failure occurs or all senders in the group have been tested.
- 9.23 If a test failure occurs, lamp TA will light and the associated alarm will sound.

- 9.24 After all MF senders in the first subgroup have been tested, the test circuit advances to the next link subgroup and sequentially tests the MF senders.
- 9.25 When all MF senders have been tested, lamp EC lights.
- 9.26 Release key ST. Operate and release key RN.
- 9.3 Test Set-Up
- 9.31 Restore all keys to normal. Operate and release key RN.
- 9.32 When all senders are to be tested without changing the key setting, be sure that a frame indication (F and FA keys) is set up which all senders are equipped to accept. When testing with a frame indication which all senders will not accept, tests should be limited to the group of senders which will accept the frame indication used. Change the frame indication keys for each cycle or part of cycle, to insure a simulated check from each incoming trunk frame.
- 9.33 Operate key MFS to test only MF senders.
- 9.34 If the MF senders serve a multi-office terminating unit, operate a different office indication key for each test call.
- 9.341 Complete test calls on a supplementary test basis for any MF sender office indication relays not included in the routine tests.

NOTE: Sender test key operations and MF sender apparatus options, for office indication to MF senders arranged for multi-office service, are associated as follows:

(A) OFF KEYS	SDR.APP. SPECIFIED	(B) OFF KEYS
01 (ODD)	W	01 (EVEN) & OAB
LOA	Y	LOB & OAB
01 (ODD) & LOA	W&Y	01 (EVEN). LOB & OAB
01 (ODD) & LOC or LOA	W&X	01 (EVEN). LOC & OAB
FA-0	¢	FA-1 & OAB

¢ When the senders receive office indication signal over leads F00 and F10 from the terminating sender link.

- 9.35 Refer to Paragraph 9.4 for test set-up of test calls to be made.

9.4 Test Calls

9.41 Trouble Release

- 9.411 Sender Link - Operate keys CL-3, MFS, and ST. Test progress lamps MGB, BY, GB, SEL and RL light momentarily, the test circuit advances and automatically repeats the test on each MF sender in turn. Restore the test circuit.

- 9.412 Terminating Marker - Operate office and frame indication keys as required and any TH, H, T and U keys in addition to keys CL-4, MFS and ST. Test progress lamps; MGB, BY, GB, SEL, RL, S, CT, RC, KP, TH, H, T, U, ST and TC are lighted momentarily and extinguished, after which lamp TRL lights momentarily before the test circuit advances and completes the test on the remaining MF senders. Restore the test circuit.

9.42 Trunk Disconnect

9.421 During Registration

- (1) At the Terminating Trouble Indicator, insert 322A-MB plugs into jacks HLD of the MF senders under test. Operate office and F- keys and any TH, H, T and U keys, as required.
- (2) Operate keys CL-5, REP-2, MFS, DPR and ST. Progress lamps MGB, BY, GB, SEL, RL, S, CT, RC, KP, TH, H, T and TD light momentarily and the test circuit completes two test calls to each MF sender before advancing to the remaining MF sender circuits. Restore the test circuit.

- 9.422 After Registration - Operate key CL-9 and repeat the test described in Paragraph 9.421. Progress lamps MGB, BY, GB, SEL, RL, S, CT, RC, KP, TH, H, T, U, ST and D light momentarily for each of the test calls. Restore the test circuit.

- 9.423 FT Relay - Operate keys TFT and CL-0 and repeat the test described in Paragraph 9.421. Progress lamps MGB, BY, GB, SEL, RL, S, CR, RC, KP, TH, H, T, U, ST and TC light momentarily for each of the test calls. Remove the MB plugs from jacks HLD and restore the test circuit to normal.

9.43 Low Input

NOTE: This test checks the ability of the receiver and the sender to operate on weak pulses of minimum duration (.027 sec.) and maximum time between digits, (.036 sec.), insuring that the indicated channels have adequate sensitivity.

9.431 700 and 1300 Cycles

- (1) Operate office and frame indication keys, as required, and numerical keys 4444.
- (2) Operate keys CL-0, MFS and ST. Progress lamps MGB, BY, GB, SEL, RL, S, CT, RC, TC, TH, H, T and U light momentarily for each completed test call.

9.432 900 and 1100 Cycles - Operate numerical keys 3333 instead of 4444 and repeat the test described in Paragraph 9.431. Observe the same test results.

9.433 1300 and 1500 Cycles - Operate numerical keys 0000 instead of 4444 and repeat the test described in Paragraph 9.431. Observe the same test results.

9.434 On one cycle of test, set up and complete test calls for the remaining numerical keys and the associated channels in a manner similar to that described for digits 4, 3 and 0, namely, 1111, 2222, 5555, 6666, 7777, 8888 and 9999 respectively, for pairs of channels (700-900), (700-1100), (900-1300), (1100-1300), (700-1500), (900-1500), and (1100-1500). Observe the same test results. Restore the test circuit.

9.435 Slow Key Pulse - On one cycle of test, perform the tests described in Paragraph 9.431 with key SKP operated.

9.436 Special Call

- (1) On one cycle, operate key CL-1, make busy Terminating Marker 1 and repeat any one of the low input test calls to each MF sender. Observe that relay SPL of Terminating Marker 0 operates for each of the test calls.
- (2) Move the marker MB plug from jack DB-1 to jack DB-0 and repeat the test. Observe that relay SPL of marker 1 operates for each of the test calls. Remove the MB plug.

9.437 Three Frequencies Present

NOTE 1: This and the following test, respectively, check the ability of the receiver circuit to produce a reorder signal when three frequencies are received in place of a two frequency numerical digit or when three numerical digits and the ST signal are received in place of four numerical digits.

NOTE 2: Hundreds digit keys 1, 3, 5 or 8 should not be used for the three frequencies test.

- (1) Operate office and frame keys, as required, and numerical keys 6666. Operate keys TFD, LL, RO, CL-0, MFS and ST. Progress lamps MGB, BY, CB, SEL, RL, S, CT, RC, TC, KP, TH, H and T light momentarily for each completed test call.
- (2) Operate numerical keys 0000 and repeat the test call. Observe the same test results.
- (3) Continue the test in this way, operating in turn, numerical digit keys 2222, 7777 and 9999. Observe the same test results in each case.
- (4) On the first cycle of test, check that the CK3 relay in the associated receiver circuit operates for each of the test calls.

9.438 Three Digits Keyed - Operate office and frame keys as required, and numerical keys 666 (U6 non-operated). Operate keys DPR, LL, RO, CL-0, MFS and ST. Progress lamps MGB, BY, GB, SEL, RL, S, CT, RC, TC, KP, TH, H and T light momentarily for each completed test call.

9.439 False Key Pulse Signal

NOTE: This test checks the ability of the receiver to recognize a false KP signal after the circuit has unlocked and is prepared to receive numerical digit pulses. It also checks that the unlocking circuit has adequate speed and sensitivity.

- (1) Operate office and frame indication keys, as required, and any TH, H, T and U keys. Operate keys FKP, RO, CL-0, MFS and ST. Lamp FP lights momentarily for each of the completed test calls. Restore the test circuit to normal.

9.44 High Input

NOTE: This test checks the ability of the receiver to recognize a third frequency in a KP signal, checks that the volume limiting amplifier is operating properly and that the indicated channels are not too sensitive.

9.441 700 and 1500 Cycles - Operate office and frame indication keys as required and numerical keys 7777, Operate keys TF, LL, IL, CL-0, MFS and ST. Progress lamps FP, KP, TH, H, T, U and ST light momentarily for each completed test call.

9.442 1100 and 1300 Cycles - Operate numerical keys 6666 and repeat and test described in Paragraph 9.441. Observe the same test results.

9.443 700 and 900 Cycles - Operate numerical keys 1111 and repeat the test described in Paragraph 9.441. Observe the same test results.

9.444 On one cycle of test, set up and complete test calls for the remaining numerical keys and associated channels in a manner similar to that described for digits 1, 6 and 7, namely, 0000, 2222, 3333, 4444, 5555, 8888 and 9999 for pairs of channels (1300-1500), (700-1100), (900-1100), (700-1300), (900-1300), (900-1500) and (1100-1500). Observe that the same test results in each case. Restore test circuit to normal.

9.445 Single Frequency Signal

NOTE: This test checks the ability of the receiver to disregard a single frequency signal.

(1) Operate office and frame keys as required and numerical keys 7777. Operate keys SF, LL, CL-0, MFS and ST. Observe that the test circuit completes the test call to each MF sender in turn. Restore the test circuit to normal.

9.446 Twist Test

NOTE: This test checks that the receiver will function properly when the 1500 cycle power supply is attenuated, (815 db), more than the 700 supply cycle power supply.

(1) Operate key TWT and repeat the single frequency test call described in Paragraph 9.445. Observe the same test results. Leave key TWT in the operated position for the following test call.

9.447 Digit Pulse Reversed

NOTE: This test checks the MF senders for their ability to transfer properly from one digit to the next during a minimum interval, (.027 sec.) between digits and pulses of maximum duration, (.036 sec.).

(1) Operate key DPR and with key TWT operated, repeat the single frequency test call described in Paragraph 9.445. Observe the same test results. Restore the test circuit to normal.

9.45 DID Test

9.451 Description - This test checks that the MF Key Pulse Terminating Sender functions properly on a DID call to a PBX station. On this test, the sender records an office indication and then translates it into a DID Number Series Indication.

9.452 Procedure

(1) Refer to TABLE A, operate keys as shown to set up test call.

(2) Operate key ST. Verify that the test circuit proceeds to test all MF Key Pulsing Senders to which it has access. After the last sender has been tested, verify lamp EC is lighted and the minor alarm sounds.

(3) Restore key ST to normal and momentarily operate key RN. Verify that all lamps are extinguished and that the minor alarm is silenced.

(4) Repeat Paragraphs 9.452 (2) and (3) using an Unassigned Office Indication.

TABLE A

CALL NBR	TEST CALL DESCRIPTION	CL	KEYS OPERATED				MISC	SEE NOTE
			TH	H	T	U		
1	Non-DID							1
2	Assigned DID Indication	0	X	X	X	X		2, 3 and 4
3	Unassigned DID Indication	0	X	X	X	X	RO	2 and 5

NOTE 1: After the MF sender has been modified and before returning the sender to service, the satisfactory completion of test calls per Paragraphs 9.41 through 9.436 is required. When the Terminating Sender Link, Terminating Marker Connector, and Terminating Marker have been modified, the satisfactory completion of test calls 2 and 3 of Table A is required,

NOTE 2: X shows keys, switches, and/or dials to be operated in accordance with information obtained from the Office Records for the test call being made,

NOTE 3: When the Assigned DID Indication required in an Office Code, operate keys OI- and LDA/LOC or keys LOB and OAB,

NOTE 4: When a Number Series Indication is required, operate key NS- in combination with the keys required to give an Assigned DID Indication. This information is obtained from the cross-connection information of the Office Records, and

NOTE 5: When an Unassigned DID Indication is required, operate the appropriate OI- key. This information is obtained from the Office Records for the test call being made.

*Lines Presented in Script Indicate  
New or Changed Information*

Manager, Crossbar Product Engineering  
Control Center

Reason for Reissue:  
To correct Paragraph 8.3 and delete Paragraph 9.448.