

PLEASE NOTE:

FOREMAN C2. 0. **AUTOMATIC NUMBER IDENTIFICATION CIRCUIT SD-1E007-01**

FOREMAN C3. 0. **GENERAL MAINTENANCE PROCEDURES**

FOREMAN C4. 0. **STEP-BY-STEP TYPE PBX**

FOREMAN C5. 8. **INTRODUCTION**

FOREMAN C6. 0. **1.01**

FOREMAN C7. 0. **1.02**

FOREMAN C8. 0. **1.03**

This section provides general maintenance information and the procedures to be followed in response to alarms associated with the automatic number identification (ANI) circuit. It is intended to familiarize personnel with ANI maintenance facilities.

1.02 This section is reissued to:

- Add coverage for J59204AJ data link test set (SD-1E506-01)
- Show J58853J ANI test set rated MD.

Since this is a general revision, arrows normally used to indicate changes have been omitted.

1.03 Following is a list of associated sections covering descriptive, trouble locating, verification, and test information.

SECTION	TITLE
981-601-100	Private Branch Exchange Arrangement For Automatic Number Identification (ANI) Circuit SD-1E007-01—General Descriptive Information
540-518-302	Automatic Number Identification Circuit SD-1E007-10—Trouble Locating Procedures—Using Test Sets SD-1E056-01 (J58853J [MD] and J59204AJ) and 716C Test Receiver—Step-by-Step Type PBX
540-518-303	Automatic Number Identification Circuit SD-1E007-01—Manual Verification Procedures—Step-by-Step Type PBX
540-518-304	Automatic Number Identification Circuit SD-1E007-01—Verification

Procedures Using Test Set SD-1E056-01 (J58853J [MD] and J59204AJ)—Step-by-Step Type PBX

540-518-501

Automatic Number Identification Circuit SD-1E007-01—Alarms and Registers—Operation Tests—Step-by-Step Type PBX

2. SELF-CHECK FEATURES

2.01 The ANI circuit checks for the following trouble conditions during the process of identifying a trunk and station:

- (a) System failure
- (b) Station number failure
- (c) Signaling failure
- (d) Word error (2/5 failure).

2.02 *System Failure:* A system failure is indicated by the SYF lamp lighted on the alarm unit and the operation of a PBX alarm. This is an indication that one of the following conditions has occurred:

- (a) The 2-second SYF timer has timed out.
- (b) Operated A fuse.

2.03 The 2-second SYF timer will time out if the time between a strobe pulse and the operation of the BID relay exceeds 2 seconds. A strobe pulse is generated each time a central office (CO) trunk is seized outgoing by the PBX. The strobe pulse starts the 2-second timer and the operation of the BID relay stops the timer from timing out. If, due to a failure, the functions leading to the operation of the BID relay do not occur, the 2-second timer will time out causing a system failure alarm (Fig. 1).

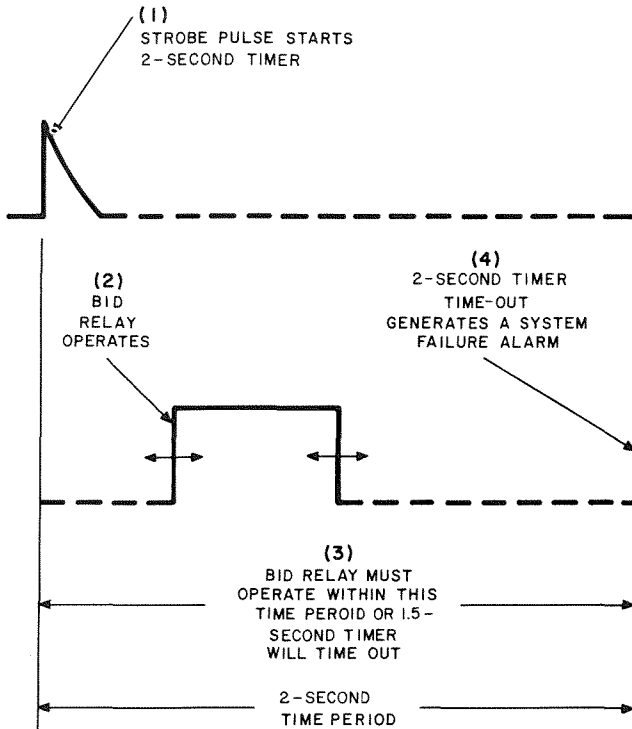


Fig. 1—2-Second Timer—System Failure—Timing Chart

2.04 The A fuse operated will cause the normally operated SYF relay to release, thus causing a system failure alarm.

2.05 After a system failure occurs, the ANI circuit will "reset" and attempt to go into a standby condition to wait for another identification request (strobe pulse).

2.06 Station Number Failure: A station number failure is indicated by the advance of the SNF message register located on the alarm unit. An advance of the message register is an indication that the 1.5-second (SNF/SGF) timer has timed out due to no write pulse or an invalid write pulse. An invalid write pulse is defined as one not having enough pulse power available at the station number matrix to write the station number into the cores of the station number matrix. In the event the first write pulse is not valid, five or six more attempts are made before the 1.5-second timer times out causing a station number failure (Fig. 2).

2.07 After a station number failure occurs, the ANI circuit advances into the transmission

cycle and transmits the trunk identification number and all "ones" for the station identification number.

2.08 Ordinarily, a station number failure is accompanied by a word error. In this case the word error is caused by no number or an invalid number (missing bits) in the station number matrix as a result of either no write pulse or an invalid write pulse.

2.09 Signaling Failure: A signaling failure is indicated by the SGF lamp lighted on the alarm unit and the operation of a PBX alarm. This is an indication that the 1.5-second SNF/SGF timer has recycled and timed out during the signaling interval or transmission cycle.

Note: In data channel select systems, the SGF lamp does not light. The SGF circuit releases the data channel relays to restore the ANI circuit to normal. This prevents the ANI circuit from getting hung up to a specific nonresponsive CO.

2.10 The recycled 1.5-second SNF/SGF timer will time out if the CON relay does not release within the 1.5-second time period (Fig. 3). The CON relay will not release under the following conditions:

- (a) Signaling over the data trunk does not occur or does not occur within the allotted time period due to a failure in the data channel supervisory circuit at ANI or at the CO automatic identified outward dialing (AIOD) equipment.
- (b) A failure has occurred in the ANI transmission cycle.

2.11 After a signaling failure occurs, the CON relay releases and the ANI equipment goes into a standby condition to wait for another identification request.

2.12 The SIG lamp on the alarm unit will remain lighted until the AR key on the alarm unit is momentarily operated. If the SIG lamp lights on the next identification, the signaling failure is considered to be continuous.

2.13 Word Error (2/5 Failure): A word error is indicated by the advance of the WE message register located on the alarm unit. This is an indication that the word error check circuit

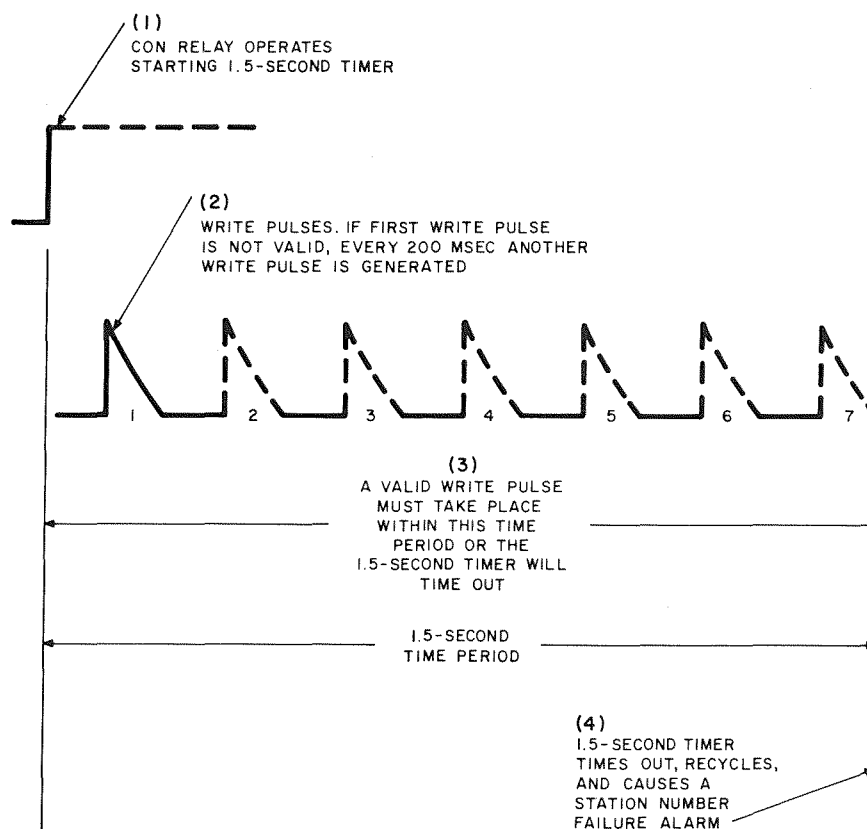


Fig. 2—1.5-Second Timer—Station Number Failure—Timing Chart

detected less than or more than two out of five bits in one or more of the digits that was gated into the parallel-to-serial data translator during the transmission cycle.

2.14 A word error could be the result of a failure to write into a matrix or an incorrect message (2/5 error) being read out of a matrix. However, a failure during write-in also causes a station number failure to occur. An incorrect message being read out of a matrix will cause a word error to occur without a station number failure.

2.15 Following a word error, the ANI circuit will generate all "one" bits for the remainder of the message.

3. TEST FACILITIES

ALARM UNIT

3.01 The alarm unit (Fig. 4 and 5) provides lamps, keys, and jacks for use in determining

the operational condition and performing operational tests of the ANI circuit. Following is a description of the lamps, keys, and jacks on the alarm unit.

3.02 INT TST Key: The internal test (INT TST) key may be operated during testing or maintenance of ANI. When the INT TST key is operated, a continuous simplex battery is applied to the data trunk pairs thus allowing tests to be performed at ANI or at the PBX without causing data trunk signaling or transmission to occur between ANI and the CO.

3.03 To avoid affecting AIOD service, the INT TST key should be operated only during a required maintenance routine. With the INT TST key operated, AIOD service is supplemented by an alternate billing arrangement performed by CO equipment.

3.04 TST A Jack: The test A (TST A) jack accepts a 258-type make-busy plug. When a make-busy plug is inserted in the TST A jack,

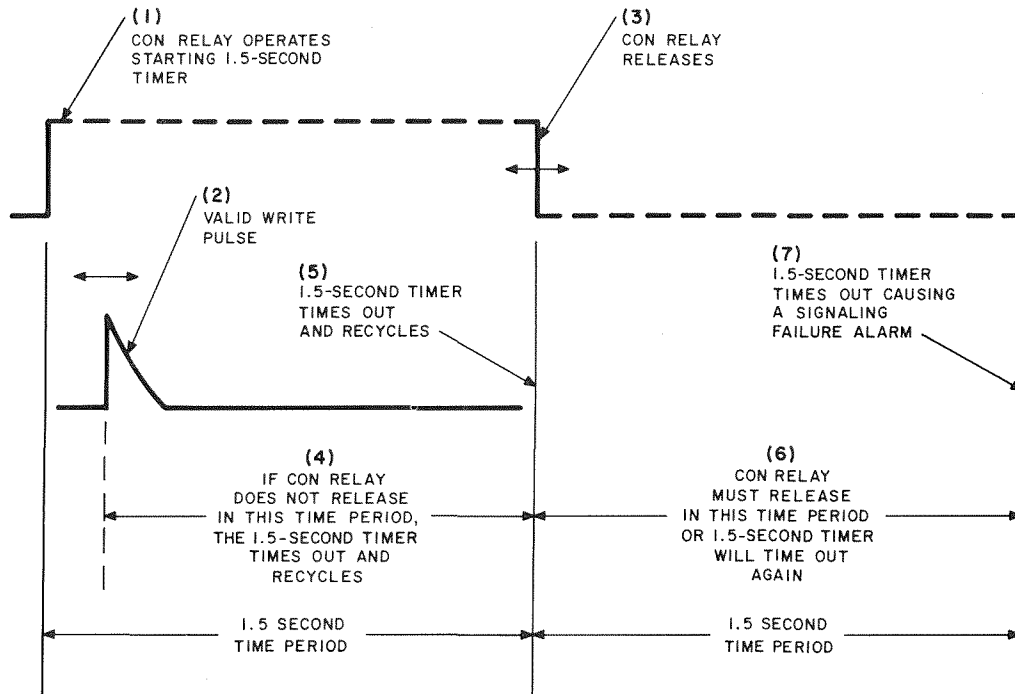


Fig. 3—1.5-Second Timer—Signaling Failure—Timing Chart

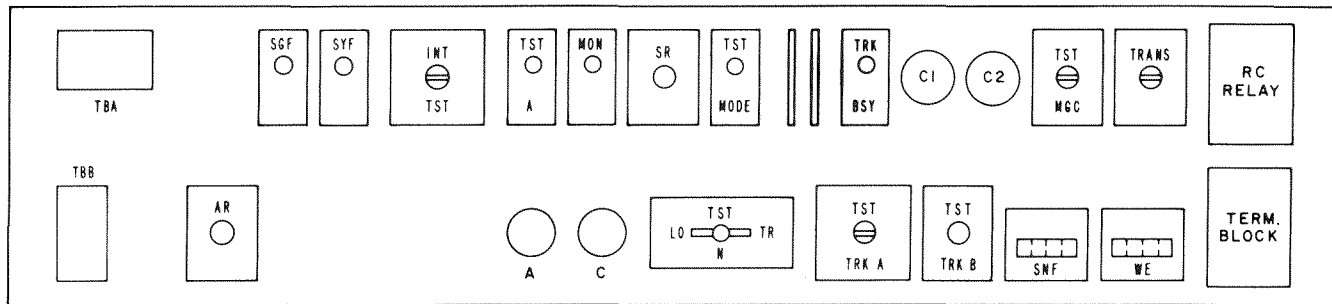


Fig. 4—ANI Alarm Unit—SD-1E007-01, Issues 1 through 4

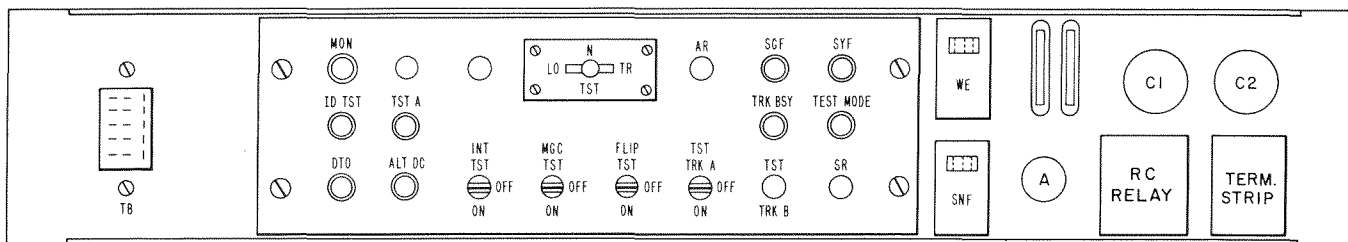


Fig. 5—ANI Alarm Unit—SD-1E007-01, Issue 5 and Subsequent Issues

the ANI circuit is prevented from advancing into a transmission cycle and a signaling failure alarm will occur. This feature can be used to locate troubles occurring during the identification cycle. This jack also is used for operational testing of the RC relay using a 35F test set.

3.05 MON Jack: The monitor (MON) jack accepts the plug of a 1011G handset. The output of the data transmitter can be monitored at this jack. The two output frequencies are 1150 Hz and 1850 Hz. The 1150 Hz represents a logic "0" and the 1850 Hz represents a logic "1". When the ANI circuit is in a standby condition, the data transmitter is transmitting a continuous 1150 Hz.

3.06 SR Key: The system reset (SR) key is provided to reset the ANI circuit. This key is momentarily operated after replacing a circuit pack or during a trouble locating routine.

3.07 TRK BSY Lamp: The trunk busy (TRK BSY) lamp is indirectly connected to the sleeve lead of the CO trunk circuit which is connected to the sixth input of the first TSE1 (AG12) trunk sensing circuit. To determine if the CO trunk circuit is busy, momentarily operate the TST TRK B key. The TRK BSY lamp lighted indicates a busy trunk.

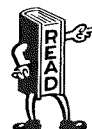
3.08 TST TRK A Key: The test trunk A (TST TRK A) key is the first of two keys to be operated when initiating a simulated trunk seizure test. When the TST TRK A key is operated, a ground is extended on the A lead to the sixth input of the first trunk sensing circuit. This simulates the operation of the supervisory relay in the associated CO trunk circuit and makes the trunk circuit busy.

3.09 TST TRK B Key: The test trunk B (TST TRK B) key is the second of two keys to be operated when initiating a simulated trunk seizure test. When operated following the operation of the TST TRK A key, a ground is extended on the B lead to the sixth input of the first TSE1 (AG12) trunk sensing circuit. This simulates the operation of the cut-through relay in the associated CO trunk circuit.

3.10 MGC TST Key: The matrix enable gate control test (MGC TST) key is provided to disable the matrix enable gate. When the MGC TST key is operated, the write (WRP1) pulse

should be prevented from writing a station number into a station number matrix causing a word error and station number failure to occur.

3.11 TST Key: The test (TST) key is provided to aid in locating a PBX station line circuit, attendant circuit, or tie trunk selector which is unable to be identified due to a station number failure occurring each time that circuit is used for an outgoing call. The key has three positions: lockout (LO), normal (N), and trap (TR). When in the LO position, the occurrence of a station number failure will cause the relay tree in the trunk connector circuit to be held operated, keeping the calling circuit from disconnecting from the CO trunk circuit. A connecting circuit trace then can be performed to determine if the trouble causing the station number failure is in the PBX circuits or the ANI circuit. When the TST key is in the TR position, the occurrence of a station number failure will cause the holding ground on the sleeve of the CO trunk circuit to be removed and the trunk will drop from the connection. Maintenance routines performed with this key will assist in localizing troubles to PBX circuits, switchtrain sleeve connections, or the ANI circuit.



To avoid affecting AIOD service, the TST key should be operated only during a required maintenance routine. When the TST key is operated to LO and a station-trunk connection is held up, the ANI circuit is prevented from making any further identifications.

3.12 TST MODE Lamp: The test mode (TST MODE) lamp is a guard lamp that indicates when one or more of the following conditions is in effect:

- (a) INT TST key operated
- (b) Plug inserted in TST A jack
- (c) TST TRK A key operated
- (d) MGC TST key operated
- (e) TST key operated to LO or TR position.

3.13 TRANS Key: Operation of the transfer (TRANS) key transfers the output of the data transmitter from the normal data channel to an alternate data channel.

3.14 AR Key: The alarm reset (AR) key is momentarily operated to reset the signaling failure alarm and to extinguish the SGF lamp.

3.15 SGF Lamp: The signaling failure (SGF) lamp is an alarm lamp that indicates a signaling failure has occurred. Operation of the AR key will extinguish the lamp.

3.16 SYF Lamp: The system failure (SYF) lamp is an alarm lamp that indicates a system failure condition. When the lamp remains lighted it indicates a continuous failure causing the system failure alarm. An intermittent flash of the lamp indicates an intermittent failure.

3.17 SNF Message Register: The station number failure (SNF) message register is a 14-type nonresettable message register. The register will advance one count following each station number failure.

3.18 WE Message Register: The word error (WE) message register is a 14-type nonresettable message register. The register will advance one count following each 2/5 word error.

3.19 ID TST Jack: The identification test (ID TST) jack serves the following two functions:

(a) To provide a write pulse path (sleeve) from the test set to a station number matrix, a test cord is connected between ID TST jack and any P or P1 terminal on the 251H terminal strips. The terminal selected will determine the station number identified during a CO trunk test.

(b) When a specific trunk or station number is to be displayed by the J58853J (MD) test set, a test cord is connected between the ID TST jack and the S2, P, or P1 terminal (on the

251-type terminal strips) for the trunk or station number to be displayed. This connection provides a trigger pulse for the test set.

3.20 DT0 and ALT DC Jack: When the normal data channel to the CO fails and an alternate data channel is provided, a patching cord (2P4A cord or equivalent) is connected between the data trunk 0 (DT0) jack and the alternate data channel (ALT DC) jack.

TEST AND PATCH JACK UNIT

3.21 The test and patch jack unit (Fig. 6) provides a means for patching a data bus to a spare data channel when data channel selection is provided. Following is a description of the jacks and lamps on the test and patch jack unit.

3.22 DB Jacks: The data bus (DB) jacks provide a jack appearance for the T and R leads of each of the five outputs from the data channel selector circuit.

3.23 DC Jacks: The data channel (DC) jacks provide a jack appearance for T and R leads of each normal data channel.

3.24 SP Jacks: The spare (SP) jacks provide a jack appearance for T and R leads of each spare data channel. Each normal data channel has a spare data channel.

3.25 SP Lamps: The spare (SP) lamps indicate when a data bus is patched to a spare data channel.

3.26 Should a normal data channel fail, a patching cord (2P4A cord or equivalent) is connected between the associated DB jack and the SP jack. A similar patch is made at the CO.

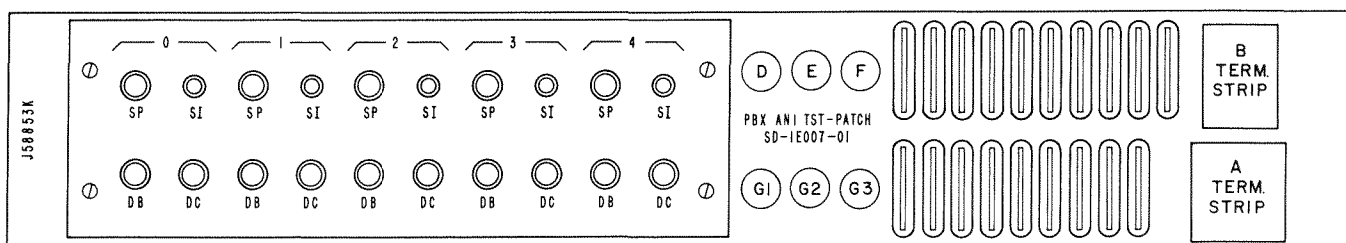


Fig. 6—ANI Test and Patch Jack Unit

4. ANI NUMBER VERIFICATION TEST SETS

4.01 Two ANI number verification test sets (J58853J [MD] and J59204AJ) (Fig. 7 and 8) can be used as aids in the maintenance of the ANI circuit.

J58853J (MD) TEST SET (SD-1E056-01)

4.02 The number verification test set provides for the verification of the 4-digit trunk and station number assignments for a PBX equipped with ANI.

4.03 The test set can be used in three different modes of operation for displaying the trunk and station numbers identified by the ANI circuit.

4.04 When the test set is in the NORMAL mode it will monitor the ANI circuit and display the trunk number or station number of each identification, depending on the position of the READOUT switch.

4.05 When the test set is in the ERROR LOCK mode it will monitor the ANI circuit and display the trunk number or station number of each identification. When a 2/5 word error occurs, the displayed data will be held on the readout lamps. The digit or digits causing the 2/5 word error will not be displayed on the test set readout lamps, but the remaining digits of the message will be displayed.

4.06 When the test set is in the MANUAL LOCK mode it will monitor the ANI circuit and

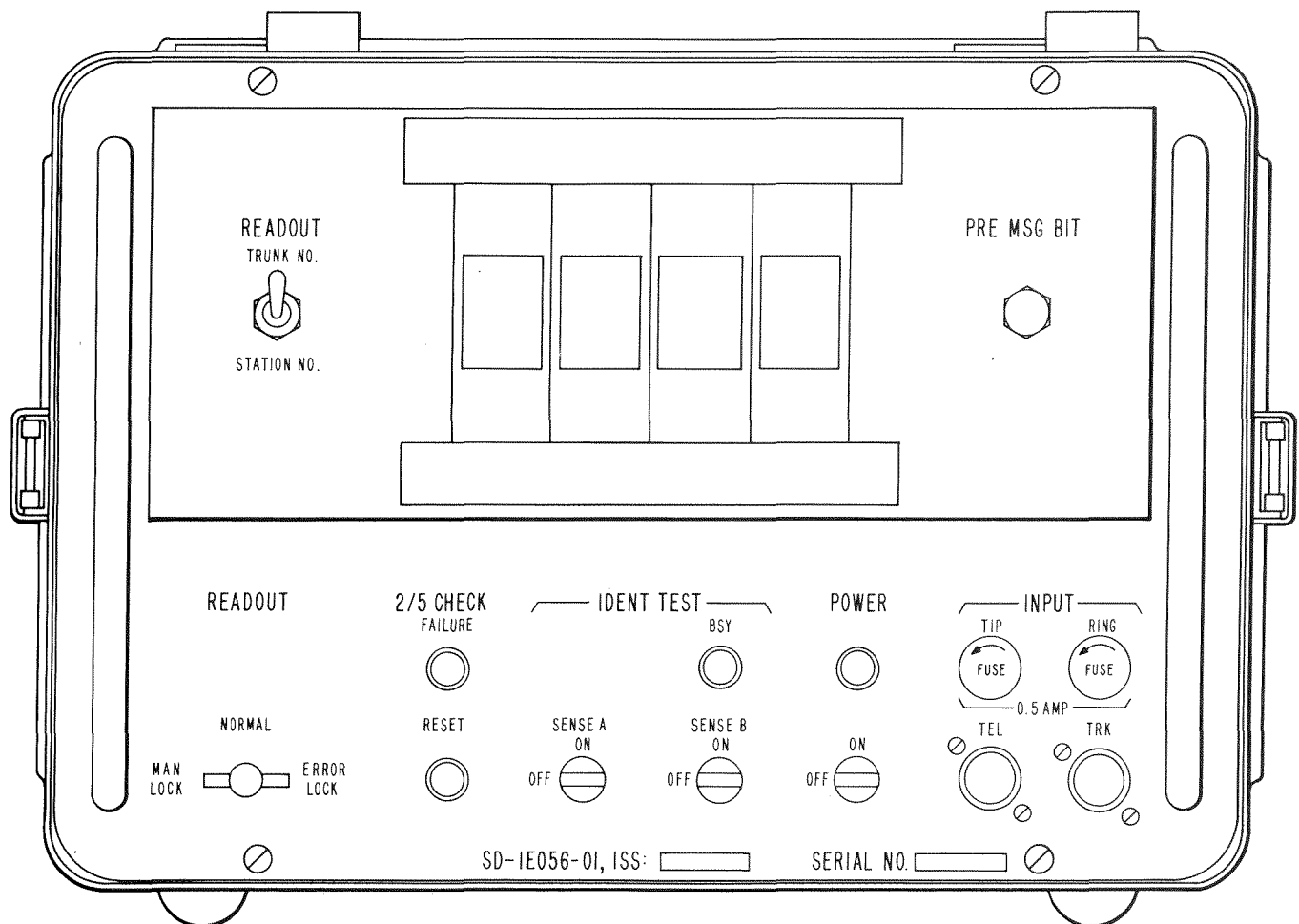


Fig. 7—J58853J (MD) ANI Number Verification Test Set

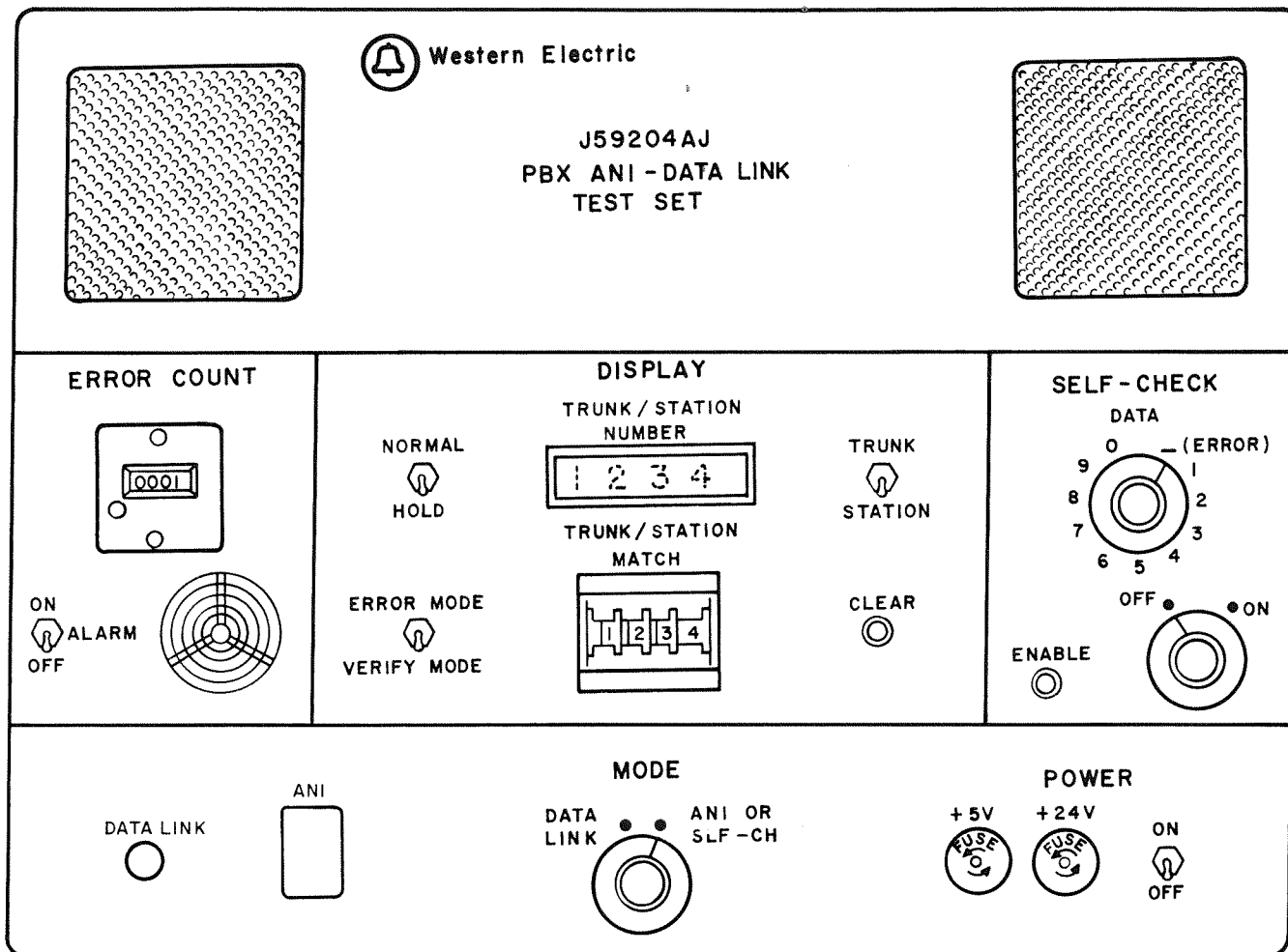


Fig. 8—J59204AJ Data Link Test Set

display the trunk number or station number only when a trigger (ANI write pulse) is applied to the test set.

4.07 The test set can be used as a means for initiating a CO trunk seizure and displaying the trunk identification number or as a means for simulating a CO trunk seizure at any trunk sensing circuit and displaying the associated assigned trunk identification number.

4.08 By utilizing the test set, identification failures can be localized to a PBX failure or an ANI failure. Further use of the test set may help in localizing the trouble in the specific area.

J59204AJ TEST SET (SD-1E506-01)

4.09 The J59204AJ data link test set provides a means of testing the operation of the PBX-ANI and associated data channels for valid 2/5 coded frequency shift keyed (FSK) data. The test set also provides for the verification of the 4-digit trunk and station number assignments for a PBX equipped with ANI.

4.10 The test set can be used in three different modes of operation for displaying the trunk and station numbers identified by the ANI circuit.

4.11 In the SLF-CH mode with the SELF-CHECK switch operated to ON, the self-check circuit verifies the operation of the test prior to its use

in testing or troubleshooting the ANI circuit. The self-check circuit generates a data message determined by the position of the DATA switch each time the ENABLE switch is operated. The data message consists of a 4-digit group display of the decimal digits 0 through 9 (0000, 3333, 7777) or an error code (---). This data message progresses through the test set as a normal identification checking all operating functions of the test set.

4.12 In the ANI mode with the SELF-CHECK switch operated to OFF, the data link test set (Fig. 8) will monitor and display the 4-digit trunk or station numbers identified by the ANI circuits, depending upon the position of the TRUNK/STATION switch. The identification is taken just prior to the last stage of the data transmitter in the ANI circuit.

4.13 In the DATA LINK mode, the data link test set monitors and displays the 4-digit trunk or station numbers identified by the ANI circuit depending upon the position of the TRUNK/STATION switch. The identification data is taken directly from the T and R leads of the data channel.

4.14 In either the ANI or DATA LINK modes of operation, the test set checks for valid 2/5 coded frequency shift keyed (FSK) data. An error or errors in the data message are indicated by the registration of a count on the ERROR COUNTER. With the ALARM switch in the ON position and the ERROR MODE/VERIFY MODE switch in the ERROR MODE position, an audible alarm sounds to indicate that a 2/5 digit error has occurred. With the ALARM switch in the ON position and the ERROR MODE/VERIFY MODE switch in the VERIFY MODE position, an audible alarm sounds to indicate a match or verification has occurred. The alarm will continue until the next data message if the NORMAL/HOLD switch is in the NORMAL position unless disabled by operating the ALARM switch to OFF.

4.15 When the test set detects one or more 2/5 digit errors in a data message, a dash is displayed on the TRUNK/STATION display in lieu of the incorrect digit. If the SD-1E007-01 ANI circuit detects a 2/5 digit or digits error, the incorrect digit and all subsequent identification data will be displayed as dashes.

4.16 By utilizing the data link test set, identification failures can be localized to a faulty PBX/ANI

combination or faulty data channel. Errors detected while operating the test set in the ANI mode indicate a faulty ANI circuit. Numerous errors detected in the data link mode after monitoring no errors or a low error rate in the ANI mode will indicate a faulty data channel.

5. TEST SET CONNECTIONS TO ANI

J58853J (MD) Test Set

5.01 Connection information for the number verification test set is provided in Sections 540-518-302 and 540-518-304.

J59204AJ Test Set

5.02 Fig. 9 and 10 show interconnections for power, internal data, and control signals for the data link test set from the ANI circuit. Fig. 9 also shows the use of an adapter cable (J59204AJ, List 2) necessary when the test set is used with ANI circuit SD-1E007-01, Issues 1 through 4.

5.03 Fig. 11 shows test cord connection from the test set to the MON jack in ANI to access the frequency shift keyed (FSK) data on the data channel when the test set is operating in the DATA LINK mode.

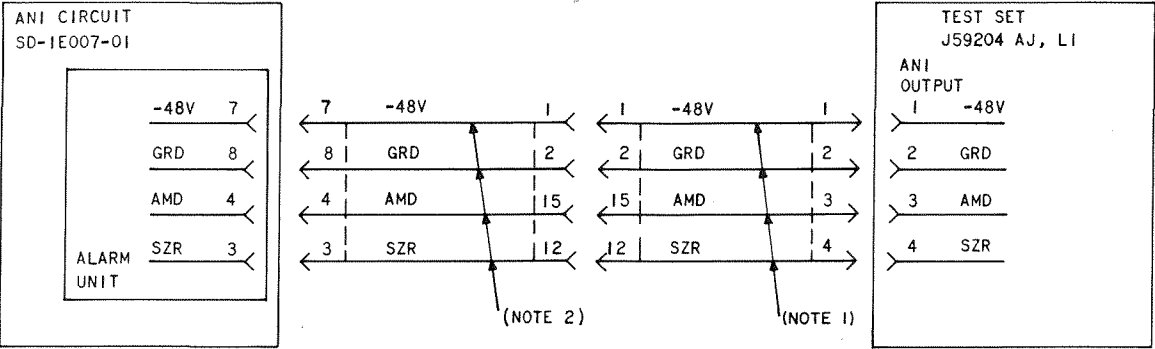
5.04 A 110-volt ac line cord is provided to power the low voltage power supplies in the test set.

6. PROCEDURES TO FOLLOW IN RESPONSE TO TROUBLE REPORTS

6.01 Trouble reports can be separated into two major types: PBX trouble reports and CO trouble reports.

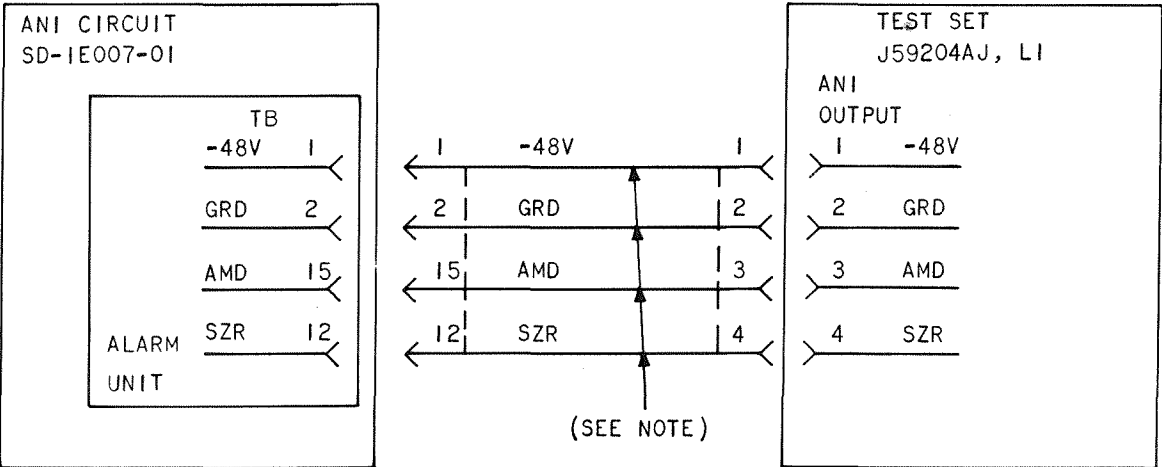
6.02 Trouble reports from the PBX will usually be in response to an alarm in the event of a system failure, signaling failure, or excessive 2/5 word error (WE) or station number failure (SNF) message registrations.

6.03 Trouble reports from the CO will be in response to system failures, signaling failures, and 2/5 word errors. Both system and signaling failures will cause a message register time-out at the AIOD equipment. The 2/5 word errors will cause a 2/5 alarm at the AIOD equipment.



- NOTES:
1. CONNECTING CABLES AVAILABLE AS FOLLOWS:
 - (a) 10-FOOT CABLE, PART OF J59204AJ, L1
 - (b) 25-FOOT CABLE, PART OF J59204AJ, L3
 2. ADAPTER CABLE, J59204AJ, L2

Fig. 9—Test Set Connections for ANI Circuit SD-1E007-01, Issues 1 through 4



- NOTE:
- CONNECTING CABLES AVAILABLE AS FOLLOWS:
- (a) 10-FOOT CABLE, PART OF J59204AJ, L1
 - (b) 25-FOOT CABLE, PART OF J59204AJ, L3

Fig. 10—Test Set Connections for ANI Circuit SD-1E007-01, Issue 5 and Subsequent Issues

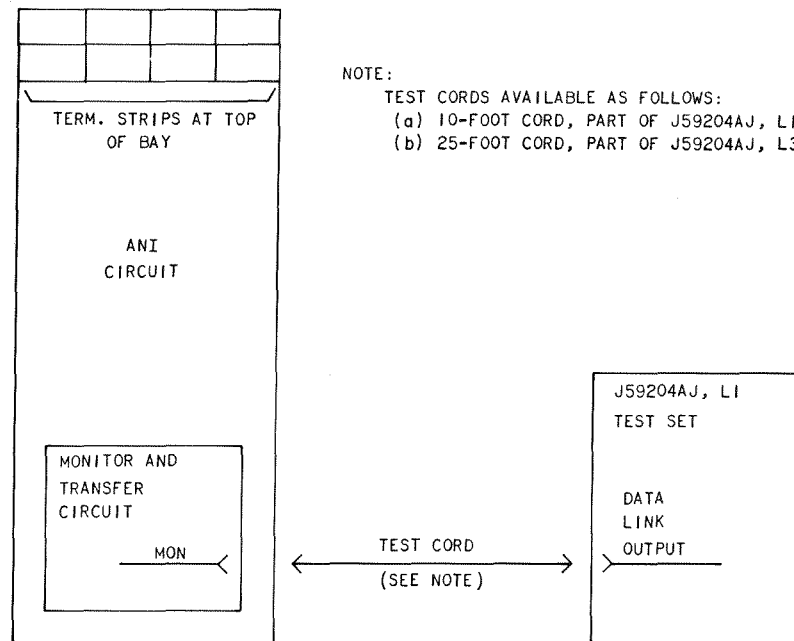


Fig. 11—Test Set Connection for Data Link Mode for ANI Circuit SD-1E007-01

6.04 The system failure alarm is self-resetting, thus an intermittent or single failure will not cause a continuous system failure alarm. Only a continuous failure condition will cause a continuous system failure alarm.

6.05 When a failure alarm occurs in the ANI circuit, the trouble condition must be located and corrected in the minimum amount of time.

6.06 The recommended procedure is to analyze the alarm condition and determine whether the trouble occurred during the identification or transmission cycle, or during signaling.

6.07 Table A shows the failure alarm that will operate when a failure occurs in a particular ANI cycle.

TABLE A

FAILURE ALARM	ANI CYCLE
SYF, SNF	Failure occurred during identification cycle.
SGF	Failure occurred during data trunk signaling interval or transmission cycle.
WE	Failure occurred during identification cycle or transmission cycle.

6.08 When the failure alarm has been analyzed, refer to trouble locating procedures covered in Section 540-518-302.

