

Installation Engineering Handbook 269  
Western Electric  
Northern Illinois Works

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TEMPORARY MEMORANDUM  
1000 VOLT BREAKDOWN TEST OF NO. 3 ESS  
15A, 15B, AND 15C REMREED GRIDS

1. GENERAL

- 1.1 Remreed 15A, 15B, and 15C grids exhibited a failure mode in which the talking path and pulse path became shorted together or the pulse path is shorted to ground, thus causing loss of service to several hundred lines.
- 1.2 A factory test was developed to identify those grids that are likely to develop that failure mode; however, several thousand grids that are presently in in-service offices were shipped before the shop test was introduced. A number of grids were tested in the field prior to going into service which do not have to be retested.
- 1.3 This TM presents a procedure for performing a 1000-volt breakdown test on 15A, 15B, and 15C grids at field locations.
- 1.4 This TM applies to all No. 3 ESS with grids manufactured before September 1, 1978, which have not been field tested. All spare 15A, 15B, and 15C grids manufactured before September 1, 1978, which have not been field tested, and those whose last repair date was before September 1, 1978, which have not been field tested, must also be tested. Those grids which have been field tested are identified by a "1KV" stamp on the front of the grid adjacent to the dating stamp.

2. INSTALLING EQUIPMENT

- 2.1 Refer to Section 2 of ECP 3H120, 3H121, 3H130, which is attached.
- 2.2 All material except 2.6 is available from the Regional Technical Assistance Center (RTAC).

NOTICE - NOT FOR USE OR DISCLOSURE OUTSIDE THE  
BELL SYSTEM EXCEPT UNDER WRITTEN AGREEMENT

3. ADDITIONAL MATERIAL

Refer to Section 3 of ECP 3H120, 3H121, 3H130, which is attached.

4. CORRECTIVE ACTION

4.1 Follow the procedures outlined in ECP 3H120, 3H121, 3H130, which is attached.

5. DISPOSITION OF EXPENSE

5.1 If the amount of time spent in performing the above work operation is sufficient to meet the requirements of CI 47.242, it shall be reported by JIM (Form SD-4-1007), for the issuance of a Type "X" supplementary estimate (Code X-95).

Manager, ESS Installation  
and Field Engineering

9-7-79

Distribution:

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Installation Engineering  
Western Electric  
Northern Illinois Works

ECP 3H120  
3H121  
3H130  
Issue 1  
August 31, 1979

ENGINEERING CHANGE PROCEDURE  
NO. 3 ESS  
IN-SERVICE 1000 VOLT BREAKDOWN TEST  
OF 15A, 15B AND 15C REMREED GRIDS

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1. GENERAL

- 1.1 This ECP is a procedure which should be followed to replace grids in an in-service office for the 1000-volt breakdown test.
- 1.2 This ECP applies to all No. 3 ESS offices. It is a procedure designed specifically for working offices and provides the basis for an MOP. The information within the MOP should be agreed upon by both the responsible telephone company and Western Electric personnel.
- 1.3 Refer correspondence and/or inquiries to:

Department Chief - 7874  
Western Electric  
No. 3 ESS System Test and  
PECC Diagnostic Center Engineering  
Naperville, Illinois 60540

Commercial: 312-462-4152  
CORNET: 367-4152

2. TEST EQUIPMENT

- 2.1 1000-volt breakdown cables for 15A, 15B and 15C grids.
- 2.2 1000-volt breakdown power supply.
- 2.3 Diode retest set for 15A, 15B and 15C grids.
- 2.4 180-volt diode retest power supply.
- 2.5 Continuity test fixture.
- 2.6 VOM capable of measuring 0 to 10k $\Omega$ .

3. PRELIMINARY OFFICE REQUIREMENTS

- 3.1 Spare grids of each type 15A, 15B and 15C as determined by the PECC.
- 3.2 Spare control frame circuit packs and pulser.
- 3.3 TTY printout from unconditional network fabric exercise from both CUs.

3.4 TTY printout from ALIT exercise from both CUs (ground start lines will fail).

3.5 Updated current translation file on tape using TTY message

OP:DATA;CURR!

3.6 Updated-backdated translation file on tape using TTY messages:

OP:DATA;OLD! and  
COPY:LCCTBL CURR:OLD!

3.7 Spare tape with update translation files available.

3.8 List of all critical lines.

NOTE: Recent Change will have to be halted during the testing.

#### 4. TEST PROCEDURE FOR 15A GRIDS

4.1 Verify that all of the preliminary office requirements were performed.

NOTE: This procedure should be done only during minimum traffic periods.

4.2 Run peripheral control unit diagnostics on both control frames from both CUs. All units should ATP before proceeding.

4.3 Relocate all critical lines, on the grid to be replaced, to another grid.

4.4 Strap ground start lines for the grid you are replacing.

4.5 Remove and replace the 15A grid with a tested grid using the following procedure:

##### 15A Grid Replacement

- A. Remove the fuses associated with the grid. Refer to SD-3H901 sheet D2 for fuse locations or Appendix A.
- B. Remove the Berg connectors on the rear of the grid. The connector at location 710 will be removed first, the others can be removed in any sequence.

4.

- C. Remove the 951A connectors on the front of the grid.
- D. Replace the grid (with a 1KV tested grid).
- E. Replace the 951A connectors on the front of the grid.
- F. Replace the Berg connectors on the rear of the grid. The connector at location 710 will be replaced last. ALSO, EXTREME CARE SHOULD BE USED WHEN REPLACING THE CONNECTOR AT LOCATION 100 SINCE IT SUPPLIES THE -48 VOLTS TO THE GRID.
- G. Replace the fuses for the grid.

NOTE: When the 710 Berg connector is pulled on a 15A Grid the following TTY messages will be printed out on your TTY:

EXAMPLE:

```
A 12 REPT SC 01 TRBL 017440 060017 060017
    12 REPT SYC 0 ACT
* 12 REPT SM 4 ROW 0 TRBL
A 12 REPT SC 00 TRBL 017440 060037 060037
* 12 REPT SM 4 ROW 1 TRBL
A 12 REPT SC 01 TRBL 017440 060057 060057
* 12 REPT SM 4 ROW 2 TRBL
* 12 REPT SM 4 ROW 3 TRBL
```

4.6 Remove the off-line scanner.  
The TTY Input message will be:

RMV:SC XX!

The TTY response will be:

M XX RMV SC XX 000000

- 4.7 Restore the off-line scanner.  
The TTY Input message will be:

RST:SC XX!

The TTY Output message will be:

EXAMPLE:

10 DGN FIOC 00 ATP

A 11 REPT SM 4 ROW 0 TRBL CLR

A 11 REPT SM 4 ROW 1 TRBL CLR

A 11 REPT SM 4 ROW 2 TRBL CLR

A 11 REPT SM 4 ROW 3 TRBL CLR

11 DGN SC 00 ATP

M 11 RST SC 00 COMPL

or

17 DGN FIOC 00 ATP

18 DGN SC 00 ATP

M 18 RST SC 00 COMPL

M 18 REPT SM 4 ROW 0 TRBL CLR

M 18 REPT SM 4 ROW 1 TRBL CLR

M 18 REPT SM 4 ROW 2 TRBL CLR

M 19 REPT SM 4 ROW 3 TRBL CLR

- 4.8 Run network fabric on only the replaced 15A grid. See Input Manual for TTY message.

- 4.9 Switch CUs.  
Input message will be:

SW:SYC!

- 4.10 Run network fabric on only the replaced 15A grid. See Input Manual for TTY message.
- 4.11 Relocate all critical lines back to the proper place.
- 4.12 Repeat Steps 4.3 through 4.11 for the remaining 15A grids in the office.

5. TEST PROCEDURE FOR 15B GRIDS

- 5.1 Lock the processor on-line.
- 5.2 Remove and replace the 15B grid with a tested grid using the following procedure:

15B Grid Replacement

- A. Remove the grid from service using the RMV:GRID a OSW d! message, where
  - a = concentrator group (1-15)
  - d = output switch 0 or 4Wait for reply: tt RMV GRID a OSW d COMPL. Any other message should be checked in OM-3H300.
- B. Remove the Berg connectors on the rear of the grid.
- C. Remove the 951A connectors on the front of the grid.
- D. Replace the grid.
- E. Replace the 951A connectors on the front of the grid.
- F. Replace the Berg connectors on the rear of the grid.
- G. Restore the grid to service using the RST:GRID a OSW d! message.

- 5.3 Run network fabric on only the replaced 15B grid. See Input Manual for TTY message. See Note below.
- 5.4 Unlock and switch CUs.

7.

- 5.5 Run network fabric on only the replaced 15B grid. See Input Manual for TTY message. See Note below.
- 5.6 Repeat Steps 5.1 through 5.5 for the other 15B grid in the office.

NOTE: Due to the physical layout of the output switches (i.e., switch group A contains switches 0 through 3 for both concentrator 0 and 1) it will be necessary to use eight input messages to completely exercise the 15B grid of switch group A.

Example to exercise switch group A, the following message will be used:

EX:NW x OSW 00!  
EX:NW x OSW 01!  
EX:NW x OSW 02!  
EX:NW x OSW 03!  
EX:NW x OSW 10!  
EX:NW x OSW 11!  
EX:NW x OSW 12!  
EX:NW x OSW 13!

6. TEST PROCEDURE FOR 15C GRIDS

NOTE: The following is a layout of the 15C grids for a 2 Control Frame office and the removal and restoral messages for these grids.

CONTROL FRAME 0 OR 1

15C SG 0L 0-7	15C SG 1L 16-23	15C SG 0H 8-15	15C SG 1H 24-31
15C SG 2L 0-7	15C SG 3L 16-23	15C SG 2H 8-15	15C SG 3H 24-31

FRONT VIEW

RMV:GRID a JSW e!

a = concentrator group (1-15) or  
Network Frame (1-15)

e = junctor switch (0, 8, 16 or 24)

RST:GRID a JSW e!

a = concentrator group (1-15) or  
Network Frame (1-15)

e = junctor switch (0, 8, 16 or 24)

EXAMPLE:

The message RMV:GRID 1 JSW 0! will remove grids  
SF 0L and SF 2L. To remove the same two grids  
in control frame 1 the message would be RMV:GRID  
8 JSW 0!

- 6.1 Lock the processor on-line.
- 6.2 Remove and replace the 15C grid with a tested grid using the following procedure:

15C Grid Replacement

- A. Remove the grid from service using the RMV:GRID a JSW e! message, where

a = concentrator grou (1-15)

e = junctor switch (0-31)

Wait for reply: tt RMV GRID a JSW e COMPL. Any other message should be checked in OM-3H300.

- B. Remove the Berg connectors on the rear of ther grid.
- C. Remove the 951A connectors on the front of the grid.
- D. Replace the grid.

- E. Replace the 951A connectors on the front of the grid.
- F. Replace the Berg connectors on the rear of the grid.
- G. Restore the grid to service using the RST:GRID a JSW e! message.

- 6.3 Run network fabric on only the replaced 15C grid. See Input Manual for TTY message. See Notes below.
- 6.4 Unlock and switch CUs.
- 6.5 Run network fabric on only the replaced 15C grid. See Input Manual for TTY message. See Notes below.
- 6.6 Repeat Steps 6.1 through 6.5 for the remaining 15C grids in the office.

NOTE: Due to the nature of the fabric program and third stage network each junctor switch within a 15C grid will have to be exercised individually.

EXAMPLE 1: To exercise the (15C grid) SGOL the following input messages would be used:

```
EX:NW x JSW 0!  
EX:NW x JSW 1!  
EX:NW x JSW 2!  
EX:NW x JSW 3!  
EX:NW x JSW 4!  
EX:NW x JSW 5!  
EX:NW x JSW 6!  
EX:NW x JSW 7!
```

NOTE: When testing SGOL, SG1L, or SG1H the highest net frame in the lineup should be specified.

When testing SG2L, SF2H, SG3L, or SG3H, the highest numbered network frame in the office should be specified.

## 7. FINAL TESTING

- 7.1 Run peripheral control unit diagnostics on both control frames from both CUs. All units should ATP before proceeding.

- 7.2 Run unconditional network fabric exercise from both CUs. Check printout with Step 3.3.
- 7.3 Run ALIT exercise (TST:LINE!) from both CUs (ground start lines will fail). Check printout with Step 3.4.
8. TEST PROCEDURE 1KV TEST
- 8.1 Calibrate the 1000-V test set in accordance with Appendix A.
- 8.2 Connect the appropriate 1000-V 951A test connectors to the front of the grid to be tested. Make sure the 951A connector with the long wires on it is on the leftmost connector position on the grid and the 951A connector with the alligator clip is on the rightmost position on the grid. Attach the alligator clip to the case of the grid being tested, not the frame.
- 8.3 Connect the appropriate 1000-V Berg connector test assembly to the rear of the grid to be tested. Verify that the Berg connectors are connected to the correct pins.
- 8.4 Connect the black wire (with the banana plug) from the Berg connectors to the black wire (with the banana jack) on the 951A connectors.
- 8.5 Connect the red wire from the Berg connectors to the red jack on the 1000-V test set. Connect the black wire from the 951A connectors to the black jack on the 1000-V test set.
- 8.6 **READ COMPLETELY BEFORE TESTING:** Operate the test switch on the 1000-V test set, hold it for 3 to 10 seconds and observe the test set meter. Check that the meter indication does not exceed 20 microamperes at any time while the test switch is operated. (A pulse on operating and releasing of the test button is normal.) If the meter indicates more than 20 microamperes, release the button and then repeat the test for 10 seconds. If the meter indication exceeds 20 microamperes on the retry, the switch is defective. If the current stays below 20 microamperes initially or on the retry, the switch is OK.
- 8.7 Remove all test connectors from the front and rear of the tested grid. If the grid passed, proceed to the paragraph 9 diode retest.

## 9. TEST PROCEDURE DIODE RETEST

- 9.1 Select the proper diode retest set for the type of grid being tested. Verify its operation in accordance with Appendix B as often as indicated. Connect the diode retest set to the 180-V supply and calibrate it in accordance with Appendix A.
- 9.2 Connect the diode test connectors to the rear of the grid being tested. Verify that the connectors are in the correct positions.
- 9.3 Set the switches on the diode test set to the sequence of positions listed in Table A for 15A grids, Table B for 15B grids, and Table C for 15C grids. At each position, depress the "test" button for at least 1 second and observe the meter indication. The indication shall be 20 microamperes or less. An indication of more than 20 microamperes indicates a defective diode and the grid must be replaced. If the indication on the meter is between 5 microamperes and 20 microamperes, depress the test button for 10 seconds to determine if the indication will go over 20 microamperes. Remove the diode test set connectors after completing the sequence of tests.
- 9.4 Those grids that have passed the 1KV and diode test shall be stamped 1KV. This stamping shall be positioned on the front of the grid adjacent to the dating stamp.

## 10. DEFECTIVE GRID AND FAILURE REPORT

- 10.1 Self adhesive labels, furnished by Oklahoma City through the RTAC shall be attached to the top of each failed grid. The label will indicate: Return to Oklahoma City Works, Merchandise Department, 1000-Volt Breakdown, Work Order No. 734064. The filling out of the trouble report tag is not required.
- 10.2 Fill out the attached failure report forms and send to:
- G. C. Hinkelman  
Department 7874, Room 6D-221  
Bell Laboratories  
Naperville and Warrenville Roads  
Naperville, Illinois 60540
- 10.3 All grids will be returned to Oklahoma City on an RGM basis. Failed grids shall be identified as "1000-Volt Breakdown" as the "Why Returned" reason. Unused grids will be identified as "Surplus grids not required for 1000-Volt Breakdown test."

10.4 Grids shall be returned per CI 61.240-23 to:

Western Electric  
Department 291 (West Dock)  
c/o 1000-Volt Test  
7725 West Reno Avenue  
Oklahoma City, Oklahoma 73125

10.5 An RMN shall be filled out in accordance with BSP 790-110-540 and sent to Oklahoma City. Attention is called to Section 2.01, 2.02 (1), and 3.01 (3).

Manager, ESS Installation  
and Field Engineering

NO. 3 ESS GRID TESTING FAILURE REPORT FORM

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NOTE: IF THE GRID FAILED 1000V BREAKDOWN MARK APPROPRIATE BOX WITH "1KV FAIL".  
IF THE GRID FAILED THE DIODE RETEST MARK APPROPRIATE BOX WITH "DIODE FAIL"  
AND INDICATE THE SWITCH POSITIONS. IF THE GRID HAS ALREADY BEEN FACTORY  
TESTED TO 1000V MARK THE APPROPRIATE BOX WITH "FACTORY."

NO. 3 ESS GRID TESTING FAILURE REPORT FORM

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NOTE: IF THE GRID FAILED 1000V BREAKDOWN MARK APPROPRIATE BOX WITH "1KV FAIL".  
IF THE GRID FAILED THE DIODE RETEST MARK APPROPRIATE BOX WITH "DIODE FAIL"  
AND INDICATE THE SWITCH POSITIONS. IF THE GRID HAS ALREADY BEEN FACTORY  
TESTED TO 1000V MARK THE APPROPRIATE BOX WITH "FACTORY."

NO. 3 ESS GRID TESTING FAILURE REPORT FORM

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NOTE: IF THE GRID FAILED 1000V BREAKDOWN MARK APPROPRIATE BOX WITH "1KV FAIL".  
 IF THE GRID FAILED THE DIODE RETEST MARK APPROPRIATE BOX WITH "DIODE FAIL"  
 AND INDICATE THE SWITCH POSITIONS. IF THE GRID HAS ALREADY BEEN FACTORY  
 TESTED TO 1000V MARK THE APPROPRIATE BOX WITH "FACTORY."

NO. 3 ESS GRID TESTING FAILURE REPORT FORM

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NETWORK FRAME NO. \_\_\_\_\_

15A	15A
15A	15A
15A	15A
15B	15B

NOTE: IF THE GRID FAILED 1000V BREAKDOWN MARK APPROPRIATE BOX WITH "1KV FAIL".  
 IF THE GRID FAILED THE DIODE RETEST MARK APPROPRIATE BOX WITH "DIODE FAIL"  
 AND INDICATE THE SWITCH POSITIONS. IF THE GRID HAS ALREADY BEEN FACTORY  
 TESTED TO 1000V MARK THE APPROPRIATE BOX WITH "FACTORY."

NO. 3 ESS GRID TESTING FAILURE REPORT FORM

CONTROL FRAME 0

15C	15C
15C	15C

15C	15C
15C	15C

CONTROL FRAME 1

15C	15C
15C	15C

15C	15C
15C	15C

NOTE: IF THE GRID FAILED 1000V BREAKDOWN MARK APPROPRIATE BOX WITH "1KV FAIL".  
IF THE GRID FAILED THE DIODE RETEST MARK APPROPRIATE BOX WITH "DIODE FAIL"  
AND INDICATE THE SWITCH POSITION. IF THE GRID HAS ALREADY BEEN FACTORY  
TESTED TO 1000V MARK THE APPROPRIATE BOX WITH "FACTORY."

SPARES

15 _	15 _	15 _	15 _	15 _
------	------	------	------	------

NOTE: MARK THE APPROPRIATE BOXES WITH THE RESULTS OF TESTING MAINTENANCE  
SPARES. IF ADDITIONAL SPARES ARE TESTED MARK RESULTS ON REVERSE SIDE

## APPENDIX A

### Calibration of the 1000-Volt Supply

1. Put on-off switch up.
2. Put the cal-meas switch up.
3. Depress the test switch and adjust the pot., above the cal-meas switch, until the meter reads 100 microamperes. Then release the test switch.
4. Place a short between the red and black terminals.
5. Put the cal-meas switch down.
6. Depress the test switch and make sure the meter indicates 100 microamperes.
7. Remove the short between the terminals. The 1000-volt supply is now ready.

### Calibration of the 180-Volt Supply

1. Connect the black lead from the supply to the black terminal on the diode test set, connect the red lead from the supply to the red terminal on the diode test set, and connect a wire from the diode test set neutral terminal to frame ground.
2. Put the on-off switch of the 180-volt supply on.
3. Depress the test button on the 180-volt supply and the test button on the diode test set. The meter should indicate 18 microamperes.
4. The test button on the diode test set is used only to check the connection of the 180-volt supply to the diode test set and should not be used for testing. Only the test button on the 180-volt supply is used for actual testing.

APPENDIX A - CONT'D

15A Grid Fuse Assignments

	TO REMOVE 15A GRID UNIT	AT FRAME EQUIP LOC	REMOVE FUSES
1.	A0	058-10	0A0.0A1. 0A2.0A3
2.	B0	065-10	0B0.0B1. 0B2.0B3
3.	C0	072-10	0C0.0C1. 0C2.0C3
4.	A1	058-33	1A0.1A1. 1A2.1A3
5.	B1	065-33	1B0.1B1. 1B2.1B3
6.	C1	072-33	1C0.1C1. 1C2.1C3

TABLE A

15A Grid Diode Test Set Switch Settings

<u>Switch 3</u>	<u>Switch 2</u>	<u>Switch 1</u>
1	1	1 through 11
2	1 through 4	0
3	4 through 1	0
4	1 through 4	0
5	4 through 1	0
6 through 9	1	0
10	2 through 4	0
11	5 through 8	0

TABLE B

15B Grid Diode Test Set Switch Settings

<u>Switch 2</u>	<u>Switch 1</u>
1	0
2	0
3	1 through 8
4	8 through 1
5	1 through 8
6	8 through 1

TABLE C

15C Grid Diode Test Set Switch Settings

<u>Switch 2</u>	<u>Switch 1</u>
1	1 through 8
2	8 through 1
3	0
4	1 through 8

## 15A, 15B, 15C DIODE BOX CONTINUITY TEST PROCEDURE

15A DIODE BOX (NOTE: THIS TEST SHOULD BE PERFORMED PRIOR TO GRID TESTING AND AGAIN AFTER EACH NETWORK FRAME IS COMPLETED)

1. Remove +180V and GND leads from the test points on the diode test box (D.T.B.).
2. Connect the paddleboard labeled 300 to location 720 (red pin retainer location) on the continuity test fixture (C.T.F.).
3. Connect the remaining paddleboards to any of the connector pin fields 000-019 through 700-719 on the C.T.F.
4. Using Table D, perform steps 1 through 14 by connecting an ohmmeter between the designated test points, setting switches and reading the ohmmeter for the correct resistance.
5. If no continuity is observed at a particular step, refer to Table E to determine which lead is being tested.

15B AND 15C DIODE BOXES (NOTE: THIS TEST SHOULD BE PERFORMED PRIOR TO GRID TESTING AND AFTER TESTING CONTROLLER 0 15C GRIDS, IN OFFICES WITH GREATER THAN SEVEN NETWORK FRAMES.)

1. Remove +180V and GND leads from the test points on the diode test box (D.T.B.).
2. Connect the paddleboards to any of the connector pin fields 000-019 through 700-719 on the continuity test fixture (C.T.F.).
3. Connect an ohmmeter between the +180 and GND test points on the diode test box.
4. Perform the normal switching sequence that is used when running the diode test on a 15B or 15C grid (Table B for 15B and Table C for 15C grid). The ohmmeter should indicate  $10K\Omega$  in each switch position.
5. If no continuity is observed at a particular switch position, refer to Table F (for the 15B diode box) or Table G, (for the 15C diode box) to determine which lead is being tested.

STEP	CONNECT OHMMETER		SWITCH POSITIONS			ON DIODE TEST BOX, DEPRESS AND HOLD SWITCHES:	OHMMETER INDICATION
	+ LEAD TO:	- LEAD TO:	SW3	SW2	SW1		
1	+180 ON D.T.B.	TPA ON D.T.B.	11	1	1→11		10KΩ IN EACH POSITION
2	+180 ON D.T.B.	TPB ON D.T.B.	11	1	11→1		10KΩ IN EACH POSITION
3	+180 ON D.T.B.	TPC ON D.T.B.	11	1	1→11		10KΩ IN EACH POSITION
4	+180 ON D.T.B.	TPD ON D.T.B.	11	1	11→1		10KΩ IN EACH POSITION
5	+180 ON D.T.B.	TPA ON D.T.B.	11	1→8	1	5,6,&7	10KΩ IN EACH POSITION
6	+180 ON D.T.B.	TPA ON D.T.B.	11	8→1	1	4,6,&7	10KΩ IN EACH POSITION
7	+180 ON D.T.B.	TPA ON D.T.B.	11	1→4	1	4,5,&7	10KΩ IN EACH POSITION
8	+180 ON D.T.B.	TPA ON D.T.B.	11	4→1	1	4,5,&6	10KΩ IN EACH POSITION
9.	TP1 ON C.T.F.	GND ON D.T.B.	11	5→8	X		<1Ω IN EACH POSITION
10	TP2 ON C.T.F.	GND ON D.T.B.	11	8→5	X		<1Ω IN EACH POSITION
11	TP3 ON C.T.F.	GND ON D.T.B.	11	5→8	X		<1Ω IN EACH POSITION
12	TP4 ON C.T.F.	GND ON D.T.B.	11	8→5	X		<1Ω IN EACH POSITION
13	TPA ON D.T.B.	GND ON D.T.B.	1→10	X	1		<1Ω IN EACH POSITION
14	TPA ON D.T.B.	GND ON D.T.B.	11	1	1		<1Ω IN EACH POSITION

X=DON'T CARE

TABLE D

TABLE E

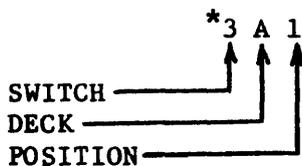
STEP FROM TABLE D	SWITCH POSITION			LEAD TESTED
	SW3	SW2	SW1	
1	↑ 11	↑ 1	1	011
			2	212
			3	017
			4	314
			5	111
			6	412
			7	313
			8	114
			9	018
			10	118
			11	014
2			11	311
			10	217
			9	216
			8	215
			7	414
			6	512
			5	117
			4	317
			3	112
			2	312
			1	015
3	↓ 11	↓ 1	1	113
			2	411
			3	115
			4	418
			5	214
			6	012

STEP FROM TABLE D	SWITCH POSITION			LEAD TESTED
	SW3	SW2	SW1	
3	↑ 11	↑ 1	7	613
			8	315
			9	415
			10	316
			11	318
			11	417
4		↓ 1	10	413
			9	511
			8	514
			7	013
			6	211
			5	218
			4	016
			3	213
			2	416
			1	116
5			1	501
			2	503
			3	505
			4	507
			5	008
			6	006
			7	703
			8	705
6	↓ 11	↓ 1	8	706
			7	704
			6	005
			5	007
			1	007

TABLE E (Cont'd)

STEP FROM TABLE D	SWITCH POSITION			LEAD TESTED
	SW3	SW2	SW1	
6	↑ 11	4	↑ 1	407
		3		405
		2		403
		1		401
7		1		502
		2		504
		3		506
		4		508
8		4	↓ 1	408
		3		406
		2		404
		1		402
9		5	↑ X	301
		6		303
		7		305
		8		307
10		8		207
		7		205
		6		203
		5		201
11		5		302
		6		304
		7		306
		8		308
12	↓ 11	8	↓ X	208
		7		206
		6		204
		5		202

STEP FROM TABLE D	SWITCH POSITION			LEAD TESTED
	SW3	SW2	SW1	
13	1	↑ X	↑ 1	*3A1/3B1 to 1A12/1B12
	2	↑	↑	3A2/3B2 to 2A5/2B5
	3	↑	↑	3A3/3B3 to 2A6/2B6
	4	↑	↑	3A4/3B4 to 2A7/2B7
	5	↑	↑	3A5/3B5 to 2A8/2B8
	6	↑	↑	3A6/3B6 to 3A2/3B2
	7	↑	↑	3A7/3B7 to 3A3/3B3
	8	↑	↑	3A8/3B8 to 3A4/3B4
	9	↑	↑	3A9/3B9 to 3A5/3B5
	10	↑	↓ X	3A10/3B10 to 3E1
14	11	1	↓ 1	500



NOTE: THESE ARE INTERNAL SWITCH WIRING CHECKS.

TABLE F

15B GRID

SWITCH SW2	POSITION SW1	LEAD(S) TESTED	SWITCH SW2	POSITION SW1	LEAD(S) TESTED
1	12	600,006	5	8	208
2	12	006,600	6	1	301
3	1	601	↑	2	302
↓	2	602	↓	3	303
↓	3	603	↓	4	304
↓	4	604	↓	5	305
↓	5	605	↓	6	306
↓	6	606	↓	7	307
↓	7	607	↓	8	308
3	8	608			
4	1	701			
↑	2	702			
↑	3	703			
↑	4	704			
↑	5	705			
↑	6	706			
↑	7	707			
4	8	708			
5	1	008,201			
↑	2	202			
↑	3	203			
↑	4	204			
↑	5	205			
↑	6	206			
5	7	207			

TABLE G

15C GRID

SWITCH SW2	POSITION SW1	LEAD(S) TESTED
1 ↑ ↓ 1	1	219, 311
	2	312
	3	313
	4	314
	5	315
	6	316
	7	317
	8	318
2 ↑ ↓ 2	1	310, 211
	2	212
	3	213
	4	214
	5	215
	6	216
	7	217
	8	218
3 4 ↑ ↓ 4	12	311, 219
	1	611, 711
	2	612, 712
	3	613, 713
	4	614, 714
	5	615, 715
	6	616, 716
	7	617, 717
8	618, 718	