TABLE OF CONTENTS

1- OVERVIEW

The crowbar circuit acts as a fuse that shuts down the PPBM. The PPBM may or may not experience damage. This procedure describes the necessary steps to make sure the crowbar circuit is connected properly after the replacement of the Poly Phase Buck Module (PPBM).

The crowbar circuit is a FRU 2 and causes PPBM failures if not properly installed.

2- REQUIRED TOOLS AND EQUIPMENT

ITEM	PART NO.	DESCRIPTION	QTY.
1	2209560	CROWBAR CIRCUIT KIT	1
CROWBAR KIT2209560, consists of the following:			
	2207489	CIRCUIT BOARD/BRACKET ASSEMBLY	1
	2206566	333mm (13.12") BLACK AND YELLOW WIRE	1
	2206566	543mm (21.38") BLACK AND YELLOW WIRE	1
	2206566	359mm (14.13") WHITE AND BLUE WIRE	1
	2206566	606mm (23.68") WHITE AND BLUE WIRE	1
	46-208758P2	CABLE TY-RAP	1
	2209374	NOALAX ANTI-OXIDANT JOINT COMPOUND	1
	46-220184P49	SCREW 1/4-20 X 3/8 LG. SLOTTED ROUND HEAD BRASS	4
	46-208599P19	LOCKWASHER EXT TOOTH PHOS BRNZ PLAIN	4
	46-208935P8	NUT 1/4-20	4
	46-136323P29	HEAT SHINK TUBING %" X 3" LONG	4
	2206566	109mm (4.30") CHOKE REPLACEMENT WIRE	1
	2209379	RING TERMINAL	1

MANPOWER REQUIREMENTS:

One Service Engineer for five (5) hours, no travel.

SPECIAL TOOLS & TEST EQUIPMENT:

- Heat gun 46-194427P229.
- Small ¼ inch ratchet and sockets or ignition wrench set. Socket sizes needed are: 1/4, 5/16, 11/32, 3/8.
- 3/8 ratchet and extension. Socket size needed: 9/16, 7/16 deep well.
- Crimping tool for #10 wire.
- Extension cord.
- Large screwdriver with grounding wire.
- Digital Volt Multimeter (DVM)

3- PROCEDURE

3-1 System Power Down

1. Remove front covers from Gradient Cabinet.
2. Before turning Power Off to the gradient cabinet observe the green LED through the screen on each PPBM. This LED will indicate the successful completion of this procedure after step 29 of the crowbar installation procedure. The green LED is “PPBM Supply Ready”.
3. Turn OFF circuit breakers at the Gradient Cabinet.
4. In the PDU, turn OFF circuit breaker for the Gradient Cabinet.
5. Lock and tag PDU front door.
6. Verify Power is OFF at Gradient Cabinet by observing that the fans in the top of the Cabinet are OFF and the LED’s on each power module are OFF.

3-2 Installation Of 8645 PPBM Catastrophic Failure Crowbar Circuit

1. Extend cabinet stabilizers properly if they are not already.
2. Unlock and open or remove back door.

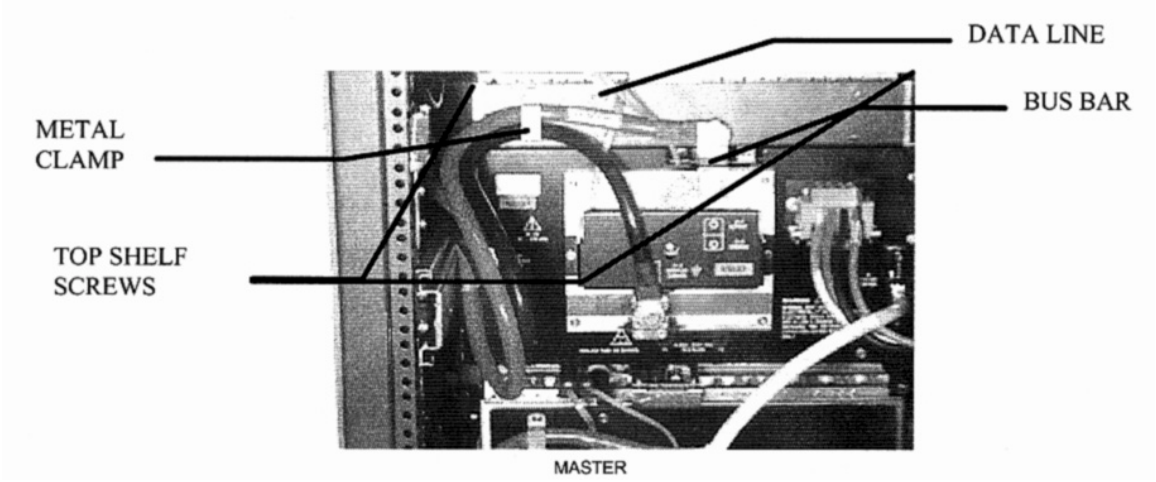
DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! TO PREVENT FATAL ELECTRIC SHOCK, DISCONNECT POWER FROM THE PDU BEFORE YOU PERFORM THE FOLLOWING. SEPERATELY, SHORT THE RED, AND THEN THE BLACK POWER INPUTS FOR ALL POWER MODULES TO CHASSIS USING AN INSULATED HANDLE SCREWDRIVER.

NOTE: Step 3a is for Master Power Module Only

3a. Remove the red output from the terminal on the back bus bars on the master. Remove bolt holding bus bars together. Remove the metal clamp holding the wires to the shelf. Remove the left data line going to power module top shelf. See Illustrations 3-1.

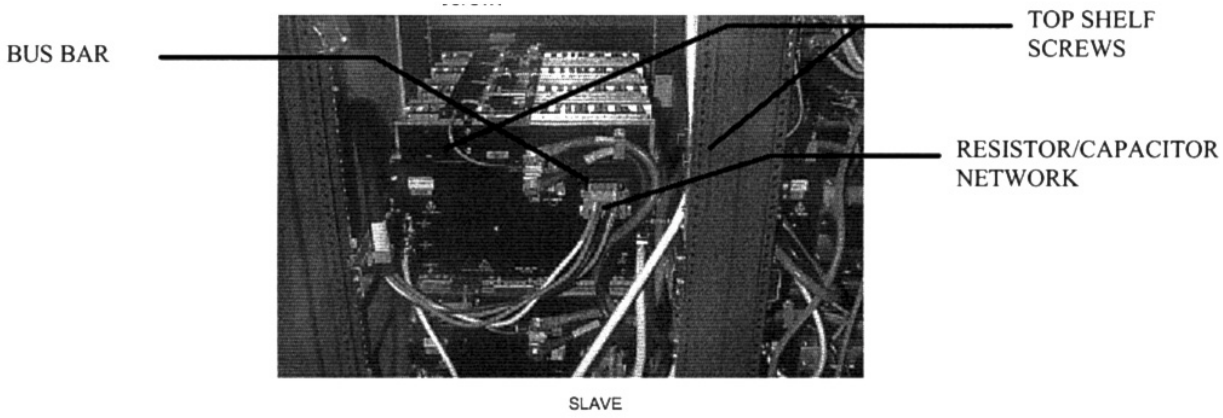
3b. Remove the (two) 2 rear most top shelf screws.



BEFORE REMOVING LEADS AND CLAMP
ILLUSTRATION 3-1

4a. Remove the metal clamp holding the wires to the shelf. Unplug resistor/capacitor network. See Illustration 3-2.

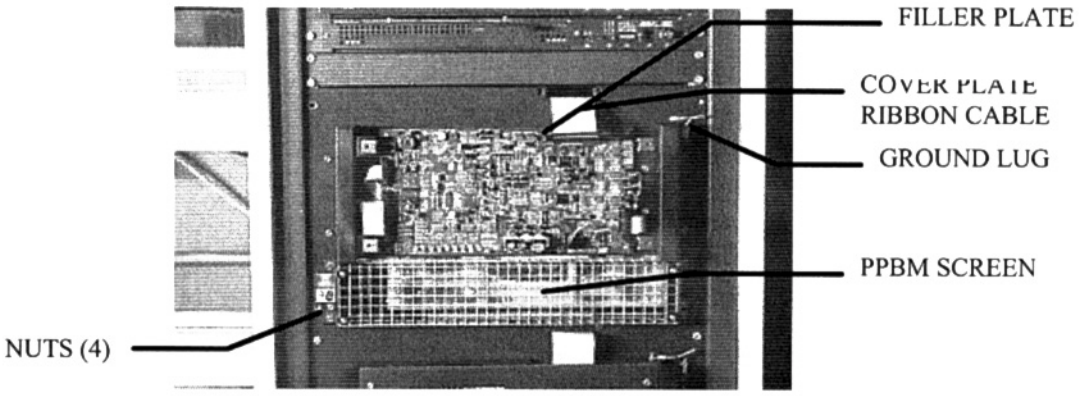
4b. Remove the (two) 2 rear most top shelf screws.



BEFORE REMOVING LEADS
ILLUSTRATION 3-2

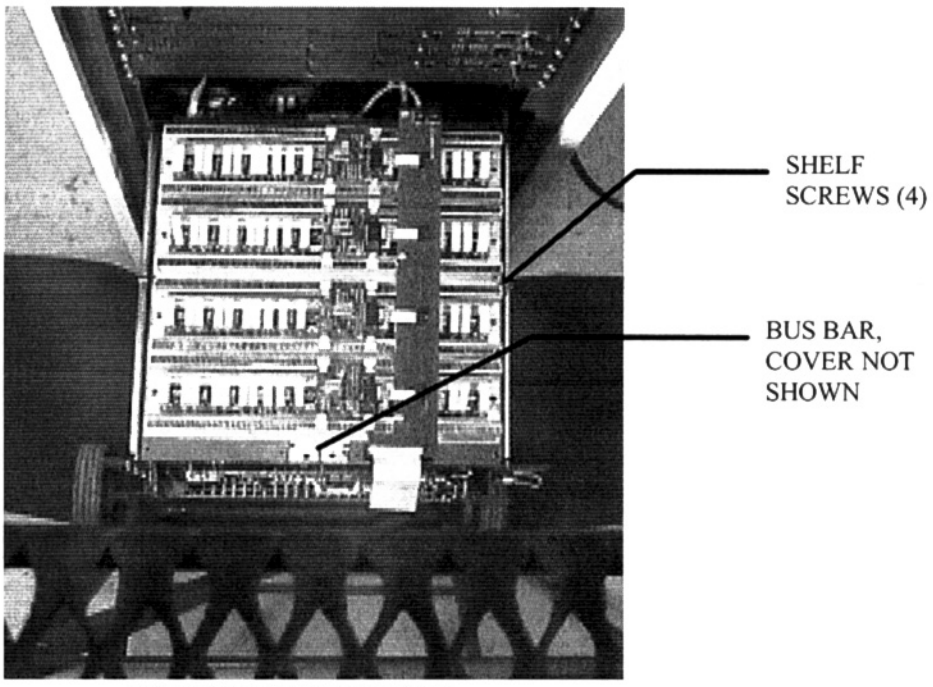
5. Remove the front cover from the Power Module and unplug the ground lug. Remove filler plate above top power module on master only. Remove PPBM screen and brackets on top and middle power modules by removing four (4) nuts. See Illustration 3-3.

6. Remove the small cover on the Power Module's front plate that is over the ribbon cable and unplug the ribbon cable from the board. See Illustration 3-3.



FRONT COVER REMOVED, SCREWS REMOVED
ILLUSTRATION 3-3

7. Remove the screws holding in the Power Module and pull it out the full length being careful not to over extend it. See Illustrations 3-3 and 3-4.



POWER MODULE FULLY EXTENDED

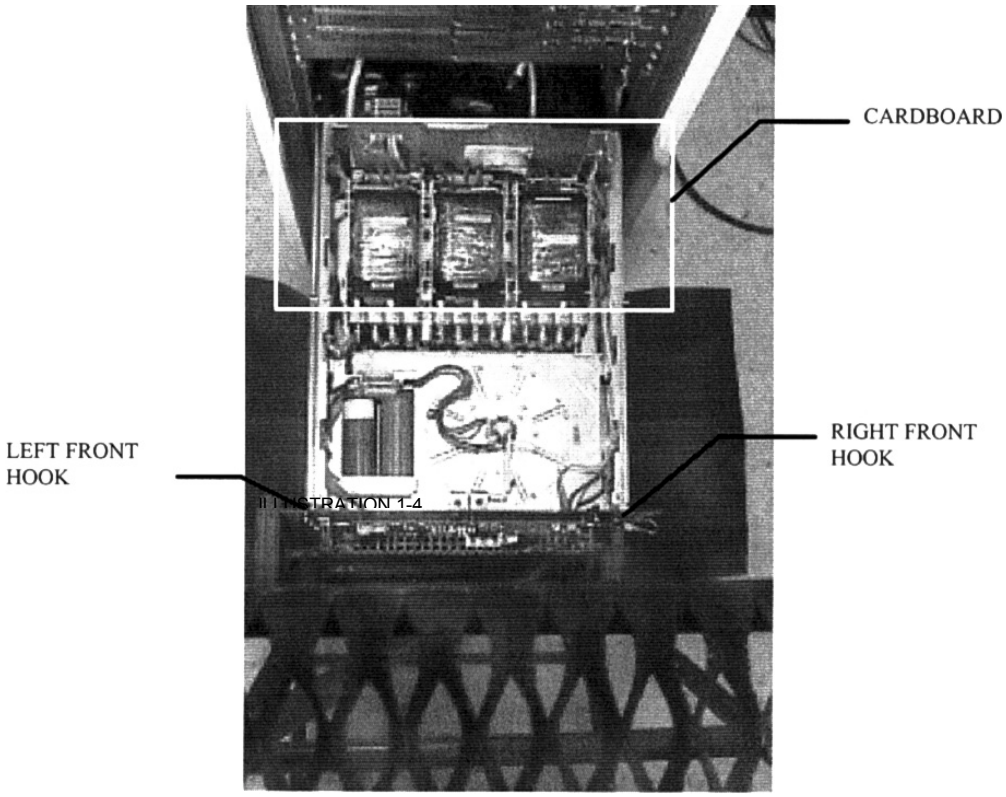
BUS BAR COVER AND BOLTS REMOVED
ILLUSTRATION 3-4

8. Remove the screws from the cover over the front bus bar connections and remove the cover. See Illustration 3-3.

9. Remove the bolts connecting the shelf bus bars with the PPBM bus bars. See Illustration 3-3.

10. Remove the remaining four (4) screws from the top shelf. Lift the top shelf in a backward motion that will detach it from the front hooks. Remove top shelf. See Illustrations 3-4 and 3-5.

11. If a work area is needed, place a piece of cardboard across the rear of power module. See Illustration 3-5. The cardboard will provide a working area for the rest of the procedure. Cardboard can be obtained from the box the FMI was shipped in.

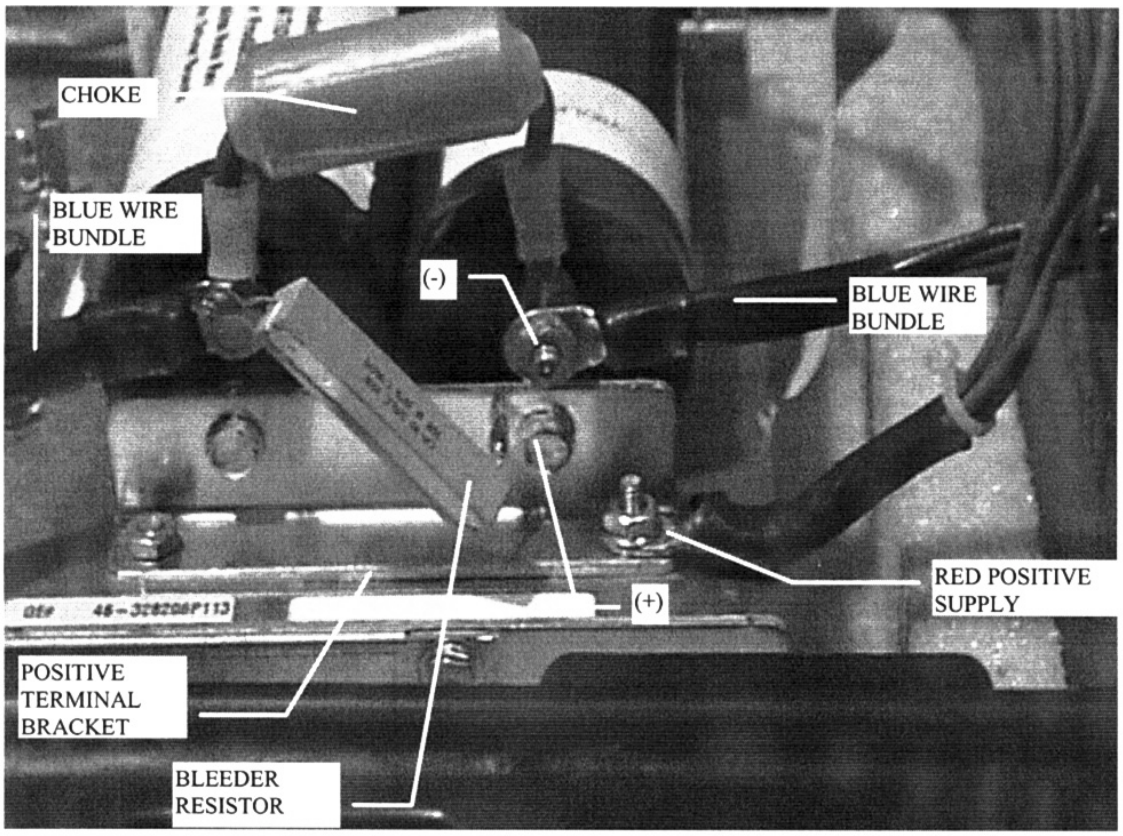


SHELF REMOVED
ILLUSTRATION 3-5

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! TO PREVENT FATAL ELECTRIC SHOCK, THE TWO LARGE ELECTROLYTIC CAPACITORS MUST BE BLED OFF. REFER TO STEP 12.

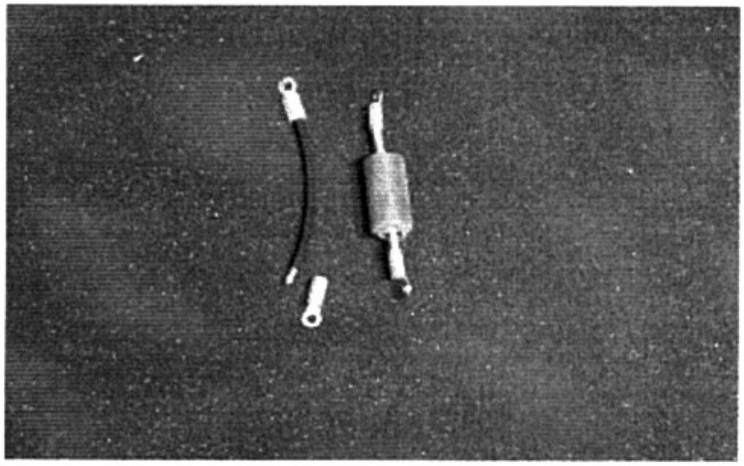
12. Check voltage on the two (2) large blue electrolytic capacitors for any charge and then use a screwdriver with an insulated handle to short capacitors to the chassis. If there is over 10VDC on the capacitors it is a good indication that the bleeder resistor is not functioning and needs to be replaced. See Illustration 3-6.



ELECTROLYTIC CAPACITORS
ILLUSTRATION 3-6

13. Remove the blue PPBM wire bundle from 4000µf (–) Capacitor terminal. Remove the blue negative DC supply bundle from 4000µf (–) Capacitor terminal. Remove red positive DC supply wire bundle. Remove choke and bleeder resistor. Remove positive terminal bracket. See Illustration 3-6.

14. Cut wire going through choke and replace with 4.30 inch (109 mm) wire. Feed new wire choke before crimping ring terminal. See Illustration 3-7.

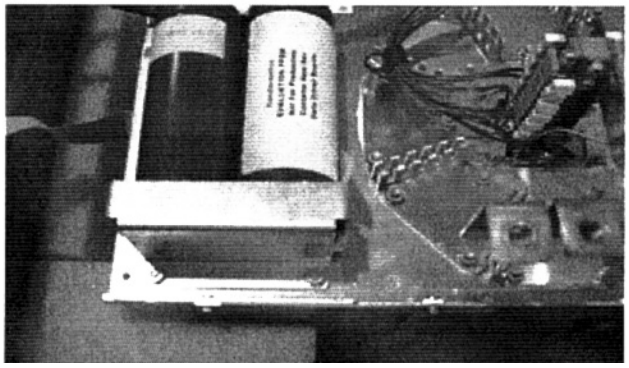


CHOKE WIRE REPLACEMENT
ILLUSTRATION 3-7

15. Remove the support bracket from the other end of the Capacitors. Save nuts. They will be reused. Leave the capacitors undisturbed in heir original position. Confirm that the (+) terminal of each capacitor is on the bottom before mounting the new Crow Bar assembly. See Illustration 3-8.

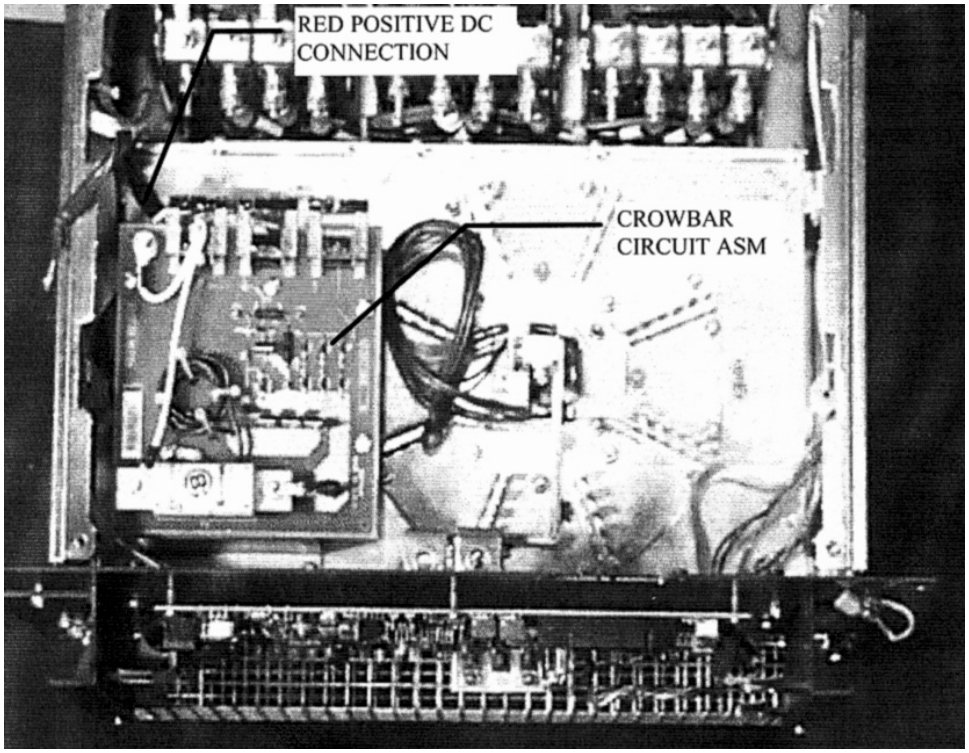
Note

Care should be taken to not damage ribbon cables.



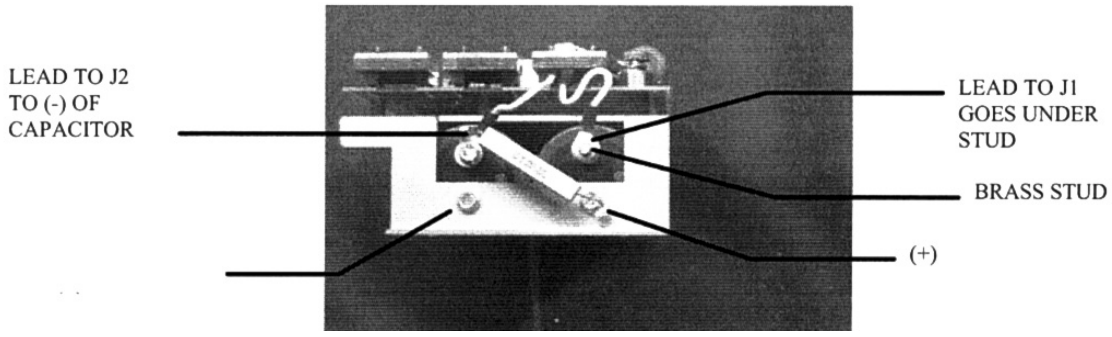
REAR CAPACITOR SUPPORT BRACKET
ILLUSTRATION 3-8

16. Put new assembly in place replacing the nuts previously removed. Reconnect the red positive DC under the nut closest to the chassis wall. Leave red bundle loose until bleeder resistor is in place, then tighten. See Illustration 3-9.

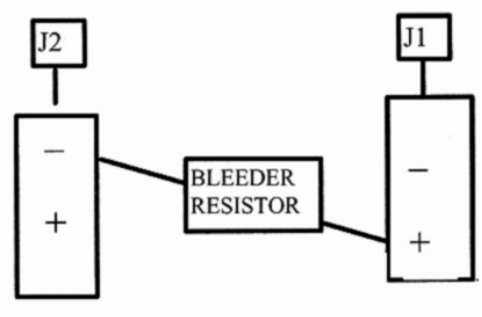


MOUNTING CROWBAR CIRCUIT
ILLUSTRATION 3-9

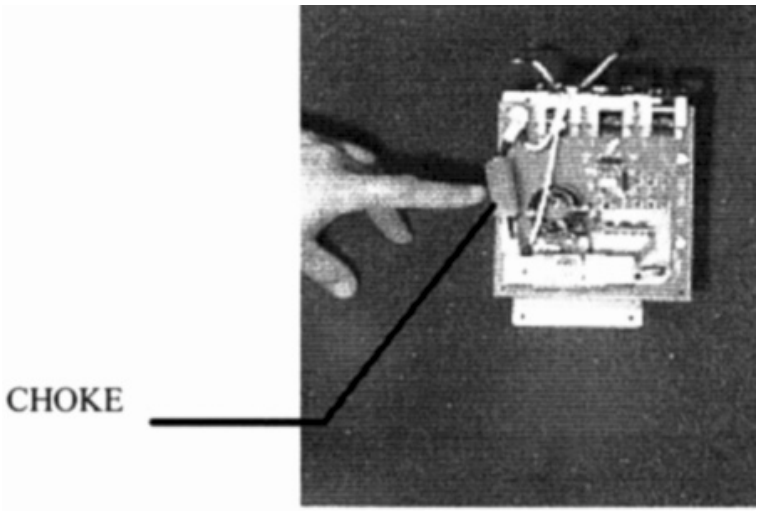
17. Reconnect the capacitors and the bleeder resistor with the original screws. Add the two leads under the terminals on the capacitors with screw and brass stud saved previously. Be careful not to rotate the capacitors and change the polarity, as this will cause the capacitor to explode and burn. See Illustration 3-10.



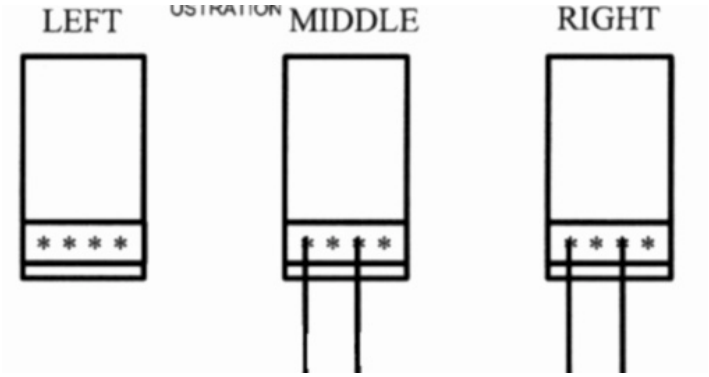
CONNECTING RESISTOR AND LEADS
ILLUSTRATION 3-10



18. Connect the choke to J1 and J2 using the nuts already on the studs on the new module. See Illustration 3-11.

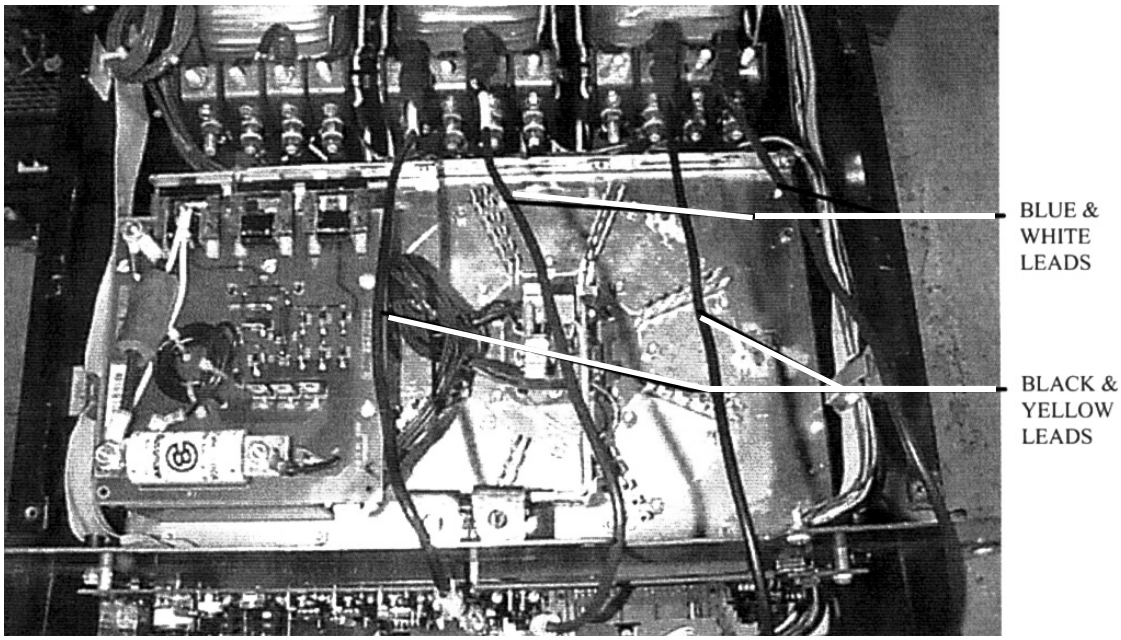


INSTALLING THE CHOKE
ILLUSTRATION 3-11



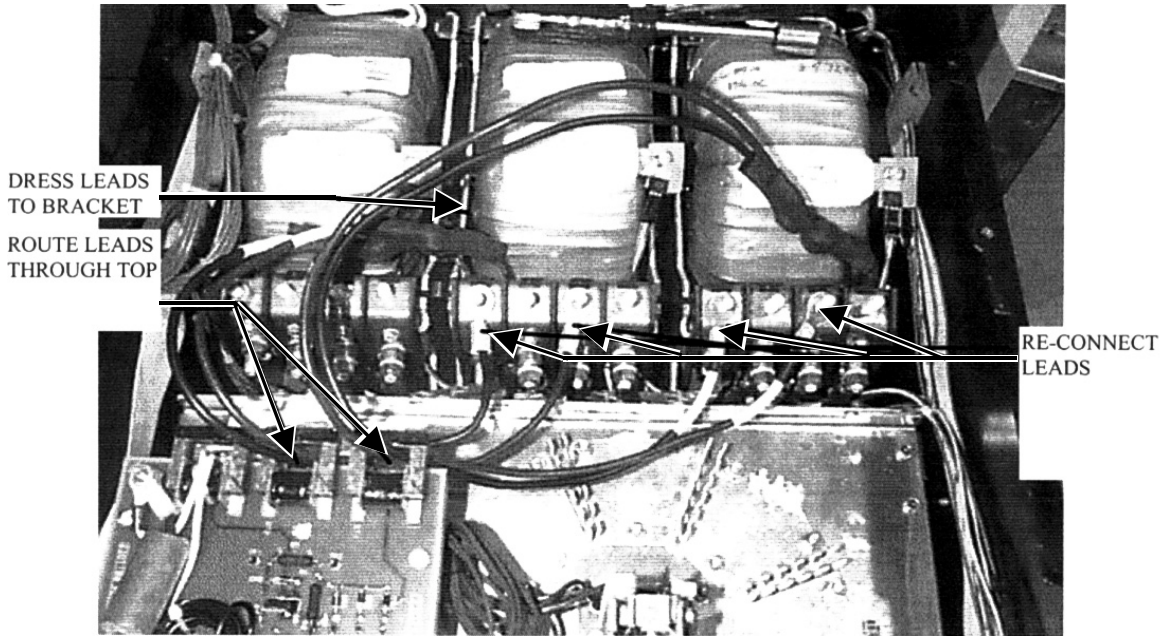
Extend these leads.

19. Remove the four (4), 2 wire assemblies from the right two transformers and attach new extensions using brass screws, washers, and nuts. The washer is used on the nut side. The two longer extension leads are used on the transformer farthest to the right side of the Power Module. Tighten all connections. Do not connect to the transformers yet. Slide shrink tubing onto lead extension. Shrink the insulating tubing around each connection with a hot air gun. The long extensions go on the right two leads and the shorter extensions go on the left two leads. See Illustration 3-12.



INSTALLING LEAD EXTENSIONS
ILLUSTRATION 3-12

20. Feed the new wire assembly's pairs (one black/yellow and one blue/white) from the transformers down through the current transformers on the board and re-attach to their respective power transformers. See Illustration 3-13.



ROUTING LEAD EXTENSIONS
ILLUSTRATION 3-13

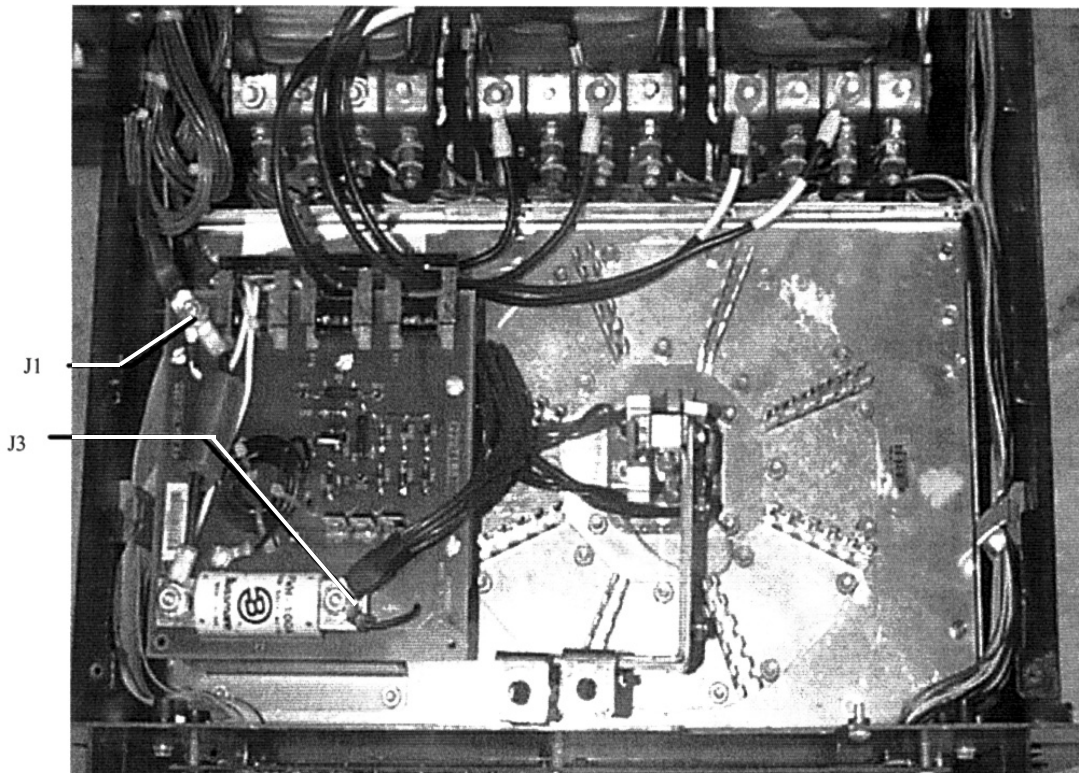
21. Wire dress the lead extensions to middle transformer bracket using the cable tie provided.

22. Connect PPBM wire bundle to studJ3. Tighten nut. See Illustration 3-14.

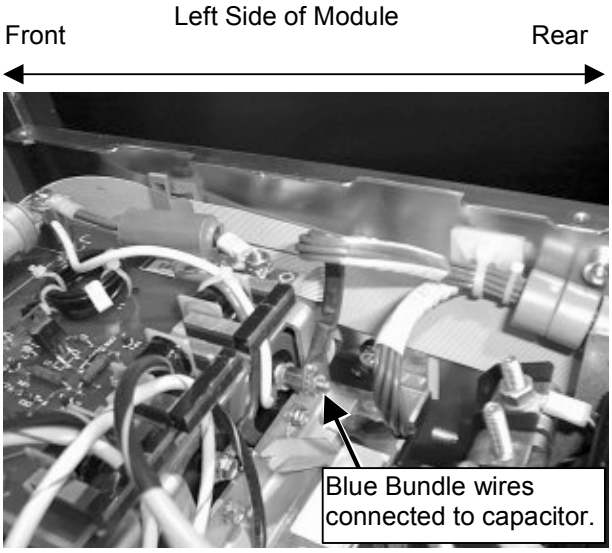
Note

It is very important that the DC supply wire bundle (Blue) is connected to Stud J1. Incorrect wiring may cause PPBM fault conditions. See Illustration 3-15 for correct wiring.

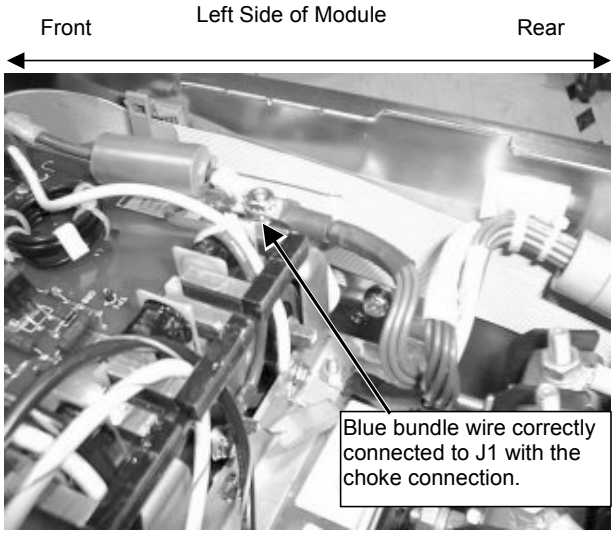
23. Connect negative DC supply wire bundle (Blue) to stud J1. Tighten nut. See Illustration 3-14 and 3-15.



FINAL WIRING
ILLUSTRATION 3-14



INCORRECT WIRING



CORRECT WIRING

ILLUSTRATION 3-15

24. Use a permanent marker and remark PPBM 46-328206P114, and remark 8645 Power Module 46-328206P115.

25. Reinstall the shelf in reverse order of removal. Apply Joint Compound to bus bar before replacing bus bar lugs.

26. Replace the front cover from the Power Module and plug in it's the ground lug.

27. Push Power Module to its in position and screw back in place.

28. Re-connect power and data line at rear of power module. Apply Joint Compound to power connectors before re-connecting.

29. Repeat the above steps 3 through 28 on all remaining Power Modules in the Gradient Cabinet.

30. Replace filler plate above top Power Module and PPBM screens on top and middle Power Modules.

31. Close or reinstall the back door and lock.

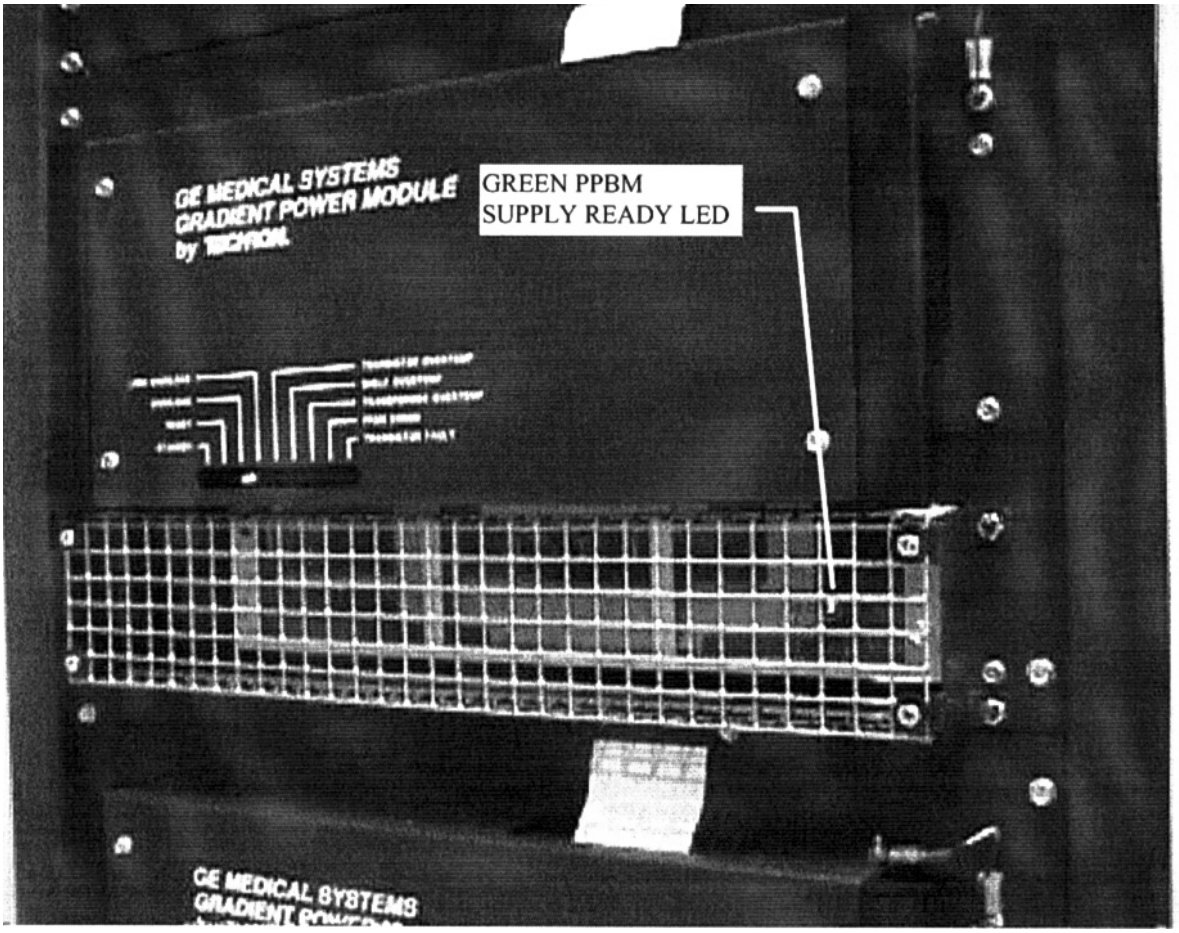
32. Replace the cover on the front of the Gradient Amp.

33. Return the Cabinet stabilizers to their original position.

3-3 Restore System Operation

1. Return power to the Gradient and GRAM Cabinets by turning on the Circuit Breakers at the PDU.

2. Momentarily turn ON the circuit breaker for power module and observe green LED in PPBM. Quickly turn OFF the circuit breaker and observe the green LED fading out. The LED will fade out within 30 seconds, which indicates the power module is working properly. Any other result indicates a problem that will need attention. See Illustration 3-16.



PPBM POWER SUPPLY READY LED
ILLUSTRATION 3-16

3. If no problem was observed in step 2, turn circuit breaker on.

3-4 Functional Check

1. Reset TPS.

2. Perform a goodbye scan and verify image quality is OK.

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	Aug. 24, 2001	K. Keshena	Converted FMI 60474 to a replacement procedure.