TABLE OF CONTENTS

Description - The following are procedures for servicing field-replaceable units (FRUs) in the 8645 Gradient Cabinet. Instructions are provided for removing and replacing various modules.

1- INTRODUCTION

The 8645 Gradient Driver subsystem is serviced by isolating faults to a FRU level, and by replacing the defective FRU. This section describes the procedure to replace level 1 FRUs.

2- GRADIENT AMPLIFIER PROCESSOR (GAP)

2-1 GAP Module Replacement

Tools Required

- Medium phillips screwdriver
- Flatblade screwdriver

Module Removal Considerations

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

2-1-1. Lockout / tagout procedure.

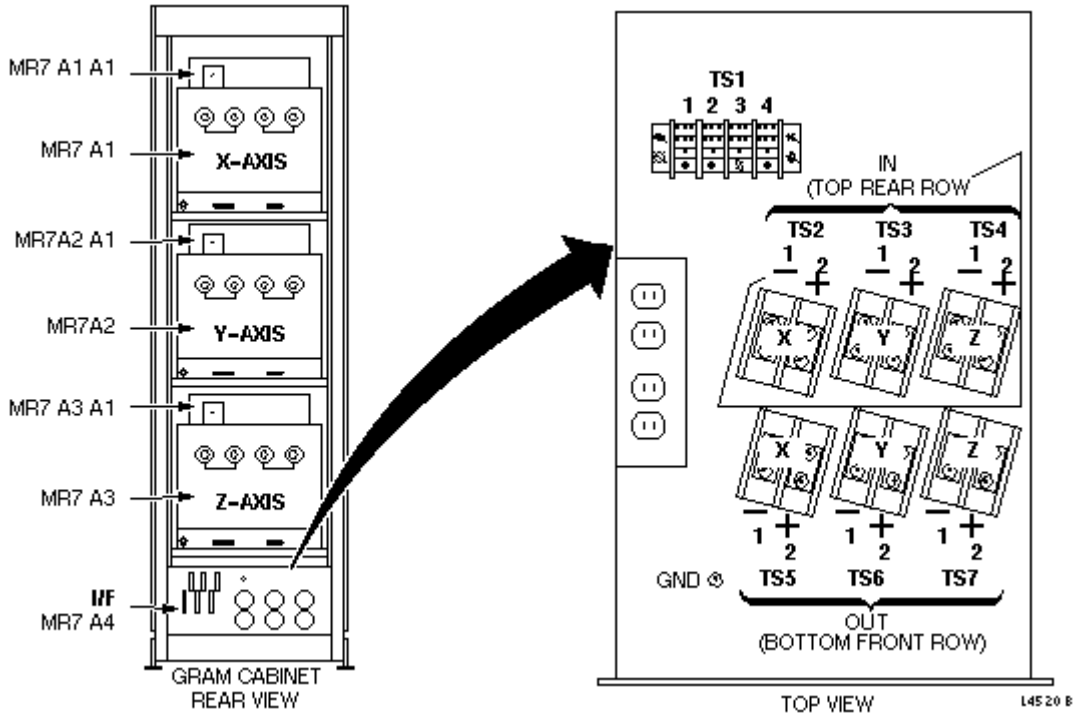
Description - This material is to be applied to all replacement procedures that involve the 8645 Gradient Cabinet modules.

DANGER!!

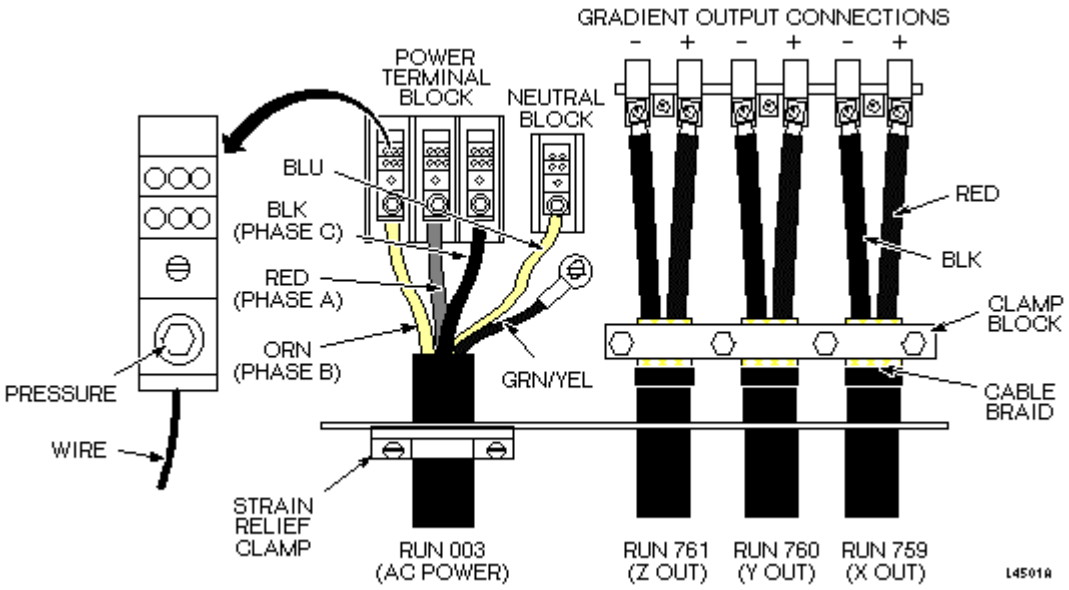
FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO <u>BOTH</u> CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure per GE OSHA Lockout / Tagout Requirements 29 CFR 1910.147. Do this by securing the PDU circuit breaker for the 8645 Gradient Amplifier Cabinet, and for the GRAM Cabinet (if present), with the required devices. (Refer to *Procedure For Safety: Section 6*.)

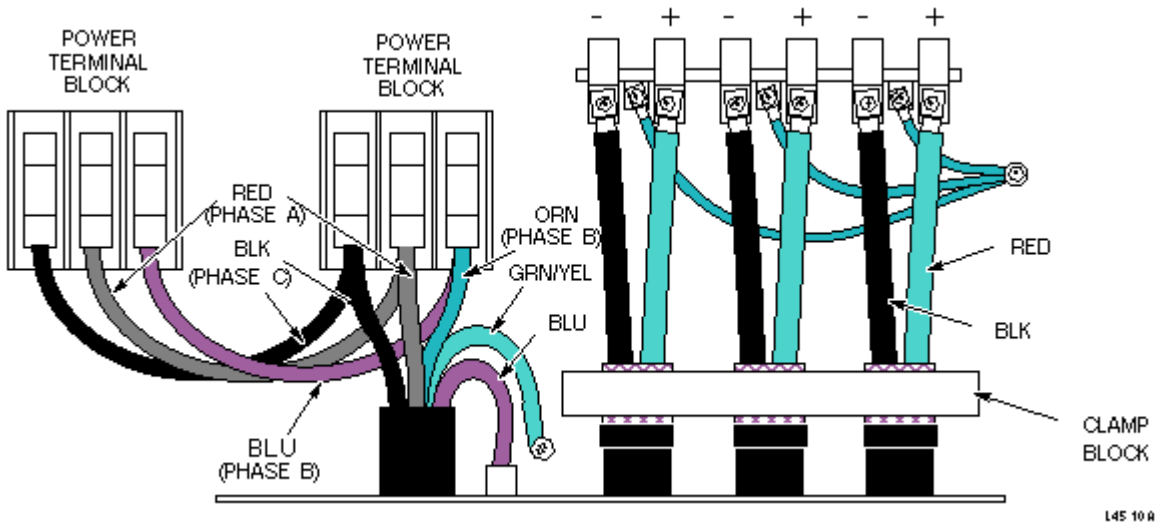
2. Verify that all energy has been dissipated by measuring incoming power to the GRAM Cabinet at TS1 (see Illustration L4520B). Verify that all energy has been dissipated for the 8645 Gradient Amplifier Cabinet by measuring power at TS1. Also see Illustration L4501A for Signa Horizon HiSpeed system, or Illustration L4510A for Signa Horizon or Horizon EchoSpeed systems.



GRAM CABINET, REAR VIEW – BOTTOM PANEL AND TS1
ILLUSTRATION L4520B



8645 CABINET POWER AND OUTPUT CABLE CONNECTIONS
ILLUSTRATION L4501A

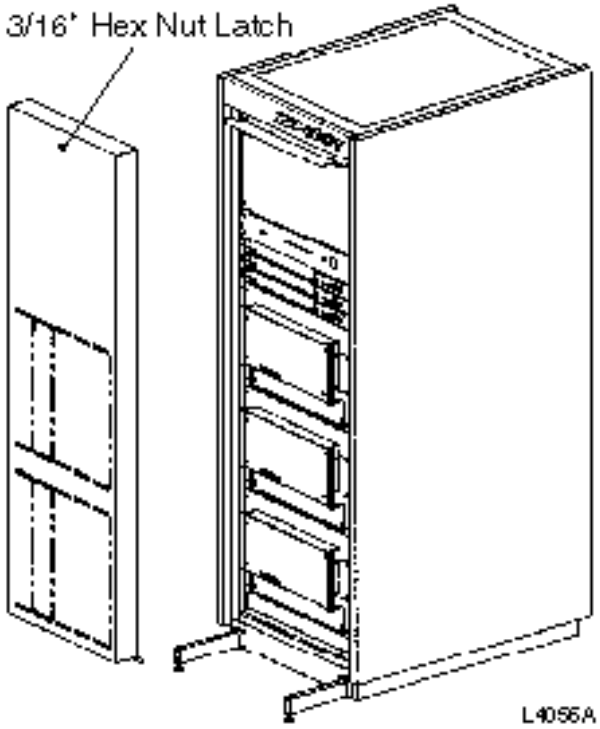


INCOMING POWER TO A DOUBLE-BAY 8645 GRADIENT CABINET
ILLUSTRATION L4510A

2-1-2 Remove the front cover(s) and/or open rear door(s).

Description - This material is to be applied to all replacement procedures that involve the 8645 Gradient Cabinet modules.

1. Remove the front cover. (The double-bay cabinet has two.) The front cover is secured to the cabinet at the top by a hex-nut latch and at the bottom by a 90-degree bend fitting into a slot (see Illustration L4056A). Use a 3/16-inch hex wrench to turn the nut one-quarter-turn counterclockwise to unlock.



CABINET FRONT COVER
ILLUSTRATION L4056A

Note - Main Board indicators - Removing the cover with the power on allows you to observe the status indicators on the front of the power modules.

WARNING!

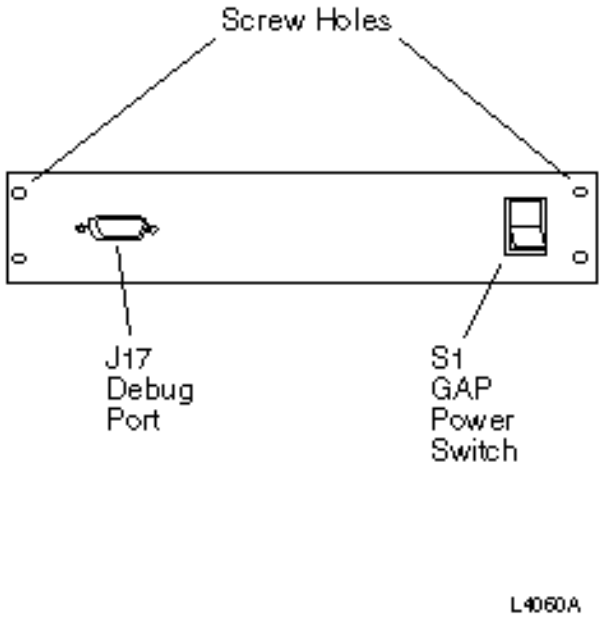
SHOCK HAZARD! POTENTIALLY LETHAL VOLTAGES MAY EXIST IN CAPACITORS EVEN AFTER POWER HAS BEEN SHUT OFF. AFTER POWER IS OFF, WAIT AT LEAST TWO MINUTES UNTIL CAPACITORS HAVE DISCHARGED BEFORE TOUCHING ANY CONDUCTOR.

2. Opening the Rear Door: Turn the key in the lock counterclockwise to open the door, and clockwise to lock it. You may need to push on the door (while turning the key) to lock it.

   On the double-bay cabinet, access to the GAP, MIFs, and fan controller is via the right rear door; opening both doors, however, can improve the lighting of the cabinet interior.

2-1-3 Replace module

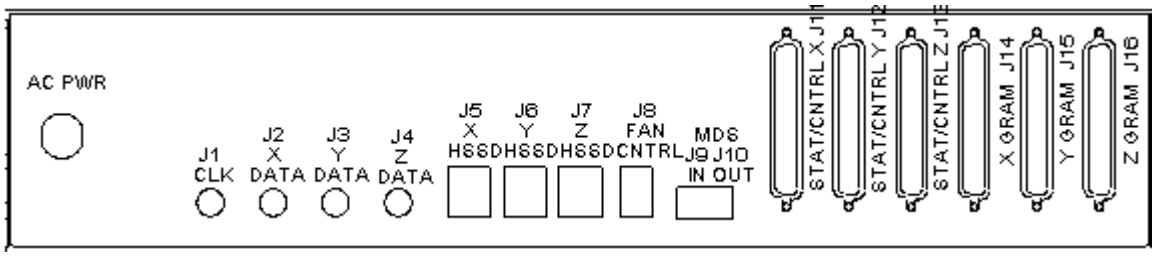
1. At the front of the cabinet, remove the four screws securing the GAP to the cabinet (see Illustration L4060A).



GAP FRONT PANEL
ILLUSTRATION L4060A

4. From the rear, disconnect all cables on the back of the GAP (see Illustration L4016A.). Disconnect the following:

- Fiber optic MDS IN (J9) and OUT (J10)
- Fan control modular connector (J8)
- HSSD modular connectors *x* (J5), *y* (J6), *z* (J7)
- Fiber optic data *x* (J2), *y* (J3), *z* (J4) and clock (J1)
- J11 through J16 I/O 37-pin sub-D connectors

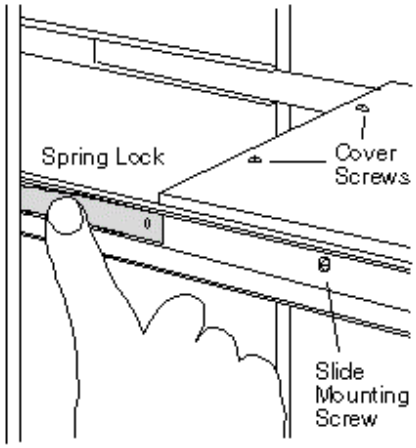


8645: GAP, REAR VIEW
ILLUSTRATION L4016A

5. Unplug the GAP ac power cord from the outlet box, and cut the tie wrap that secures the cord to the slide rail.

6. From the rear, push the module out toward the front.

7. (If desired, the slides can be removed from the cabinet by pressing the spring lock on both slides to release the lock.) Pull the module until the slides clear the rails (see Illustration L4058A).



SLIDE LOCK FOR GAP AND MIF
ILLUSTRATION L4058A

8. To remove the GAP from the slides, remove the two screws on each slide with a standard screwdriver, or a 5/16-inch nut driver.

To install a new GAP module, reverse steps 3–8.

9. No calibrations are required. Run GAP diagnostics to verify full functionality of new GAP.

2-2 GAP Power Supply Replacement

Tools Required

- Medium Phillips screwdriver
- Standard screwdriver

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

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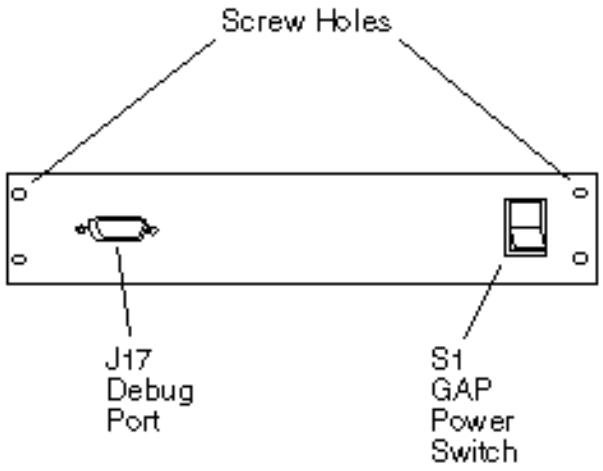
1. Perform lockout / tagout procedure, as described in 2-1-1.

2. Remove the front cover(s) and/or open rear door(s), as described in 2-1-2.

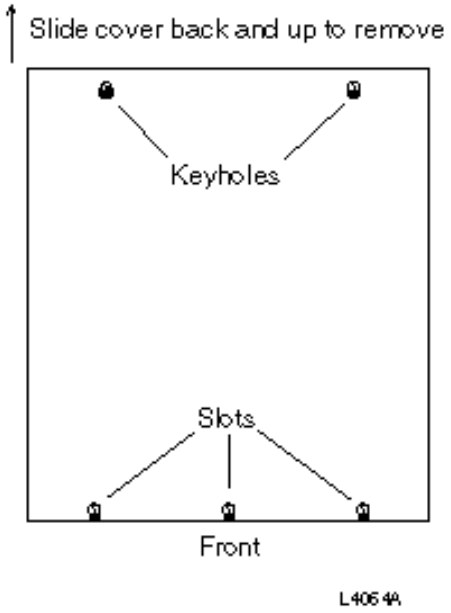
3. From the front, remove the four screws securing the GAP to the cabinet (see Illustration L4060A).



GAP FRONT PANEL
ILLUSTRATION L4060A

4. From the rear push the module out toward the front.

5. Loosen (but do not remove) the five screws securing the top cover of the GAP (see Illustration L4064A).

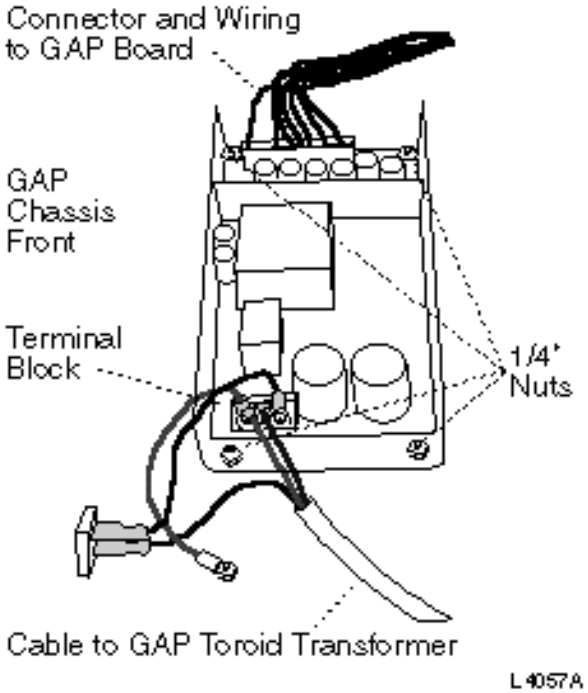


GAP OR MIF TOP PANEL
ILLUSTRATION L4064A

6. Slide the cover back so the slotted holes clear the screws.

7. Lift up and remove the cover.

8. With a short standard screwdriver, loosen (but do not remove) three screws on terminal block of the power supply (see Illustration L4057A).



GAP POWER SUPPLY
ILLUSTRATION L4057A

9. Pull up and remove the spade terminals attached to the screws.

10. On the left side of the power supply, remove the large connector leading to the GAP board.

11. Remove four 1/4-inch nuts holding the power supply to the GAP chassis.

12. Remove the power supply.

To install the new power supply, reverse steps 3–12.

13. No calibrations are required. Run GAP diagnostics to verify GAP is fully functional.

3- MASTER INTERFACE (MIF) MODULE REPLACEMENT

Note - MIF cover removal - To remove the MIF cover only, e.g., to check the fuse, the steps are the same as the first seven steps listed in section 2-2, GAP Power Supply replacement

Tools Required

- Medium Phillips screwdriver
- Standard screwdriver or 5/16-inch nut driver
- Cable ties

Module Removal Considerations

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Note - test - Components on the power module interconnect and predriver boards (located on the top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

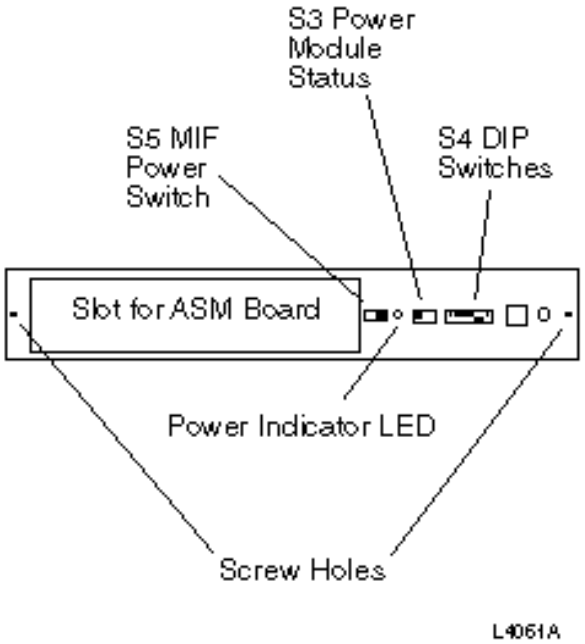
DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO <u>BOTH</u> CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in step 2-1-1

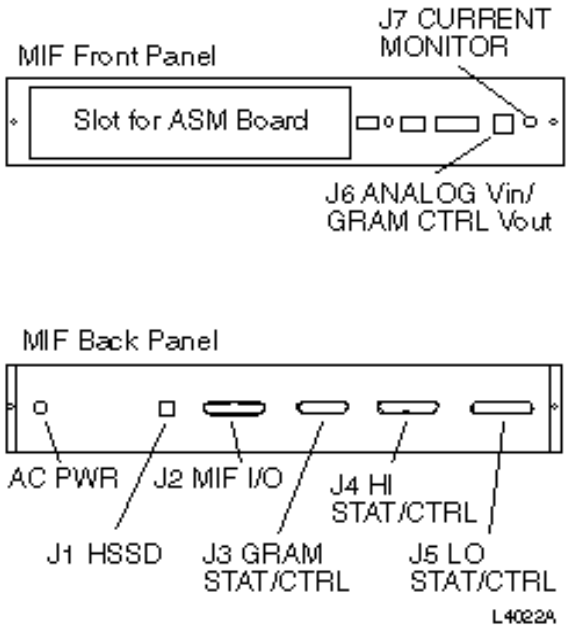
2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. From the front, remove the two screws securing the MIF to the cabinet (see Illustration L4061A).



MIF FRONT PANEL
ILLUSTRATION L4061A

4. From the rear, detach the four sub-D connectors and one modular plug (see Illustration L4022A).



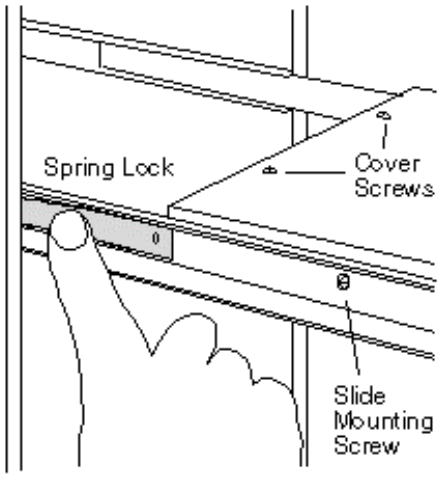
MIF CONNECTIONS
ILLUSTRATION L4022A

5. Unplug the power cable from the outlet box.

6. Cut the cable tie holding the power cable to the slide.

7. Push the MIF module forward until it stops.

8. If desired, the slides can be removed from the cabinet by pressing the spring lock on both slides to release the lock and pulling the module until the slides clear the rails (see Illustration L4058A). You would also need to cut cable ties holding remaining cables to the slide.

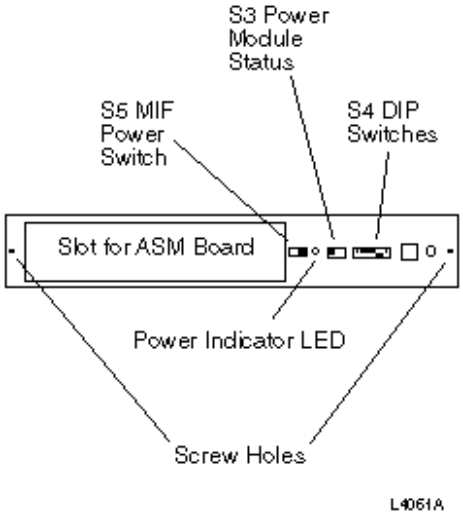


SLIDE LOCK FOR GAP AND MIF
ILLUSTRATION L4058A

9. To remove the MIF from the slides, remove the two screws on each slide with a flat-blade screwdriver, or a 5/16-inch nut driver.

10. Remove the Analog Service Module from the defective MIF and install it in the new MIF module.

11. Be sure that the power switch (S5) of the new MIF is on, and that the DIP switches (S4) are set as follows (also see Illustration L4061A):



MIF Front Panel
ILLUSTRATION L4061A

Horizon:
switches 1–5, 8 off
switches 6 and 7 on

HighSpeed:
switches 1–6 off
switches 7 and 8 on

EchoSpeed:
switches 1–5 off
switches 6–8 on

To install a new MIF module, reverse steps 3–11.

12. Perform functional checks as follows only if this is a Base SR20 System (EchoSpeed & HiSpeed require no functional checks; suggest running a scan to verify operation):

    a. Check gradient calibration using procedure for Gradient Calibration (DQA Version) or alternate proprietary procedure for SPT Quick Head Check; calibrate if necessary.

    b. Check shim using procedure for LVShim Check; shim if necessary.

4- ANALOG SERVICE MODULE (ASM) REPLACEMENT

Tools Required

- None

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

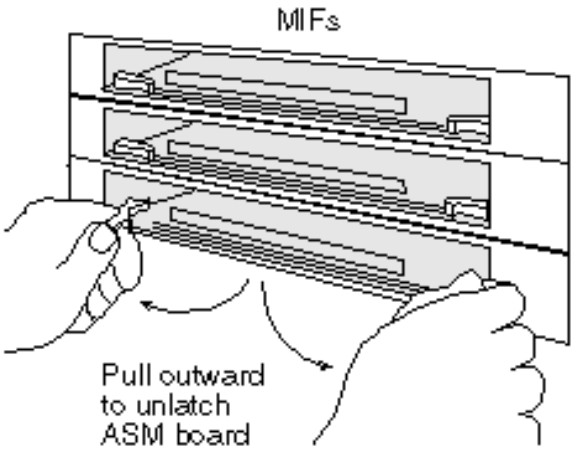
DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in step 2-1-1

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. Pull white tabs (inner sections move out) holding the ASM in the MIF slot (see Illustration L4059A).



ASM BOARD LATCHES
ILLUSTRATION L4059A

4. Slide the failed ASM board out.

5. Push the new board in.

6. Push white tabs toward center to close.

7. No Functional Checks Required for new ASM, perform any scan to verify operation.

5- POWER MODULE FRU REPLACEMENTS

5-1 Power Module Replacement

Removing a power module from the 8645 cabinet for servicing or replacement requires that all connections from the back be removed.

Tools Required

- Medium Phillips screwdriver
- Small standard screwdriver
- 9/16-inch nut driver or wrench
- Oxide-inhibiting compound (supplied with FRU; required for replacement)

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

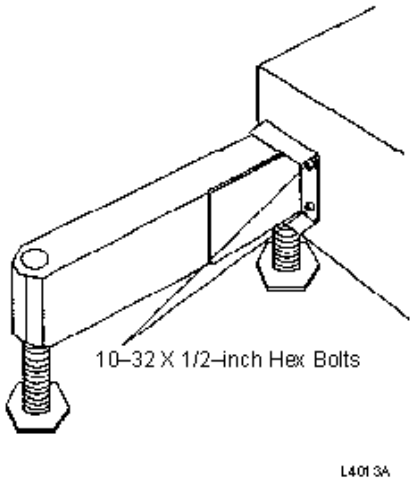
1. Perform lockout / tagout procedure, as described in step 2-1-1

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. If the cabinet stabilizers, located on the front of the cabinet, are not already extended, pull them out until they are fully extended (90°).

4. Lower and tighten the leveling feet on the stabilizers.

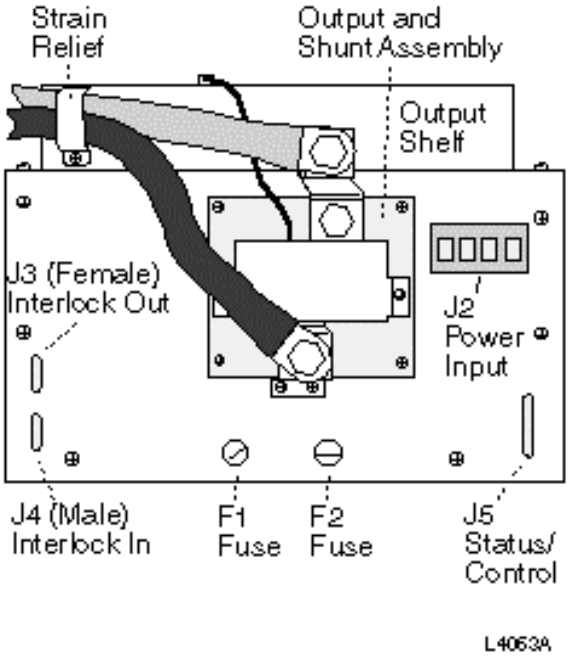
5. Attach the anti-tip brackets to the inside of the stabilizers using two 10–32 hex bolts on each (see Illustration L4013A).



ATTACHING THE ANTI-TIP BRACKETS
ILLUSTRATION L4013A

6. From the front, remove the four Phillips screws securing the power module to the cabinet.

7. From the rear, remove ac power input cables at J2 by unscrewing screw terminals with a small standard screwdriver (see Illustration L4063A).



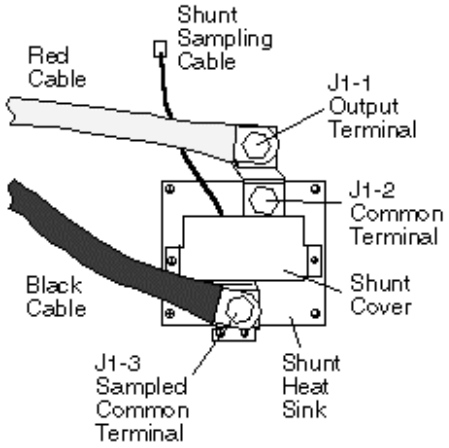
POWER MODULE, REAR VIEW
ILLUSTRATION L4063A

8. Remove the screw holding the output cable strain relief. Remove the strain relief.

9. Remove the output cables with a 9/16-inch nut driver, or wrench, as follows (see Illustration L4098A):

Note

Low Power Modules - Low Power modules (on the double-bay cabinet) do not have an external current shunt as illustration L4098A depicts.



HIGH POWER MODULE, REAR VIEW
ILLUSTRATION L4098A

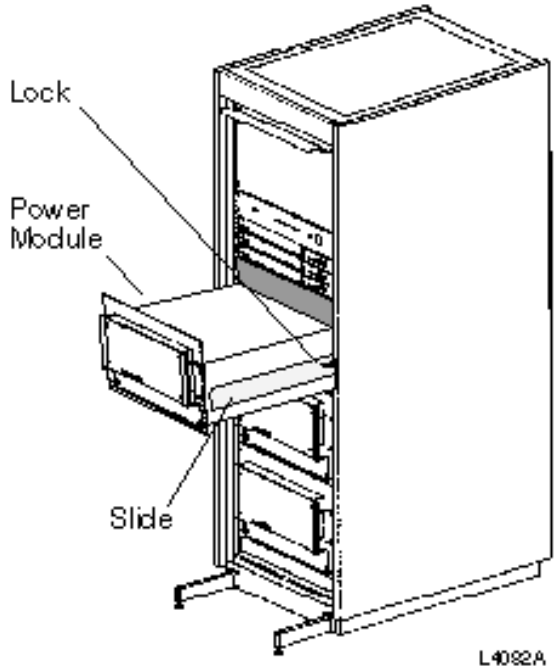
Horizon and EchoSpeed – J1-1 (output) and J1-3 (sample common)

HighSpeed – J1-1 (output) and J1-2 (common)

10. From the rear, detach the cable from J5 (Status/Control) (see Illustration L4063A).

11. In the double-bay cabinet, detach the cables to J3 (Interlock Out) and J4 (Interlock In).

12. From the rear, push the power module straight out until the slides lock (see Illustration L4082A).



POWER MODULE, EXTENDED FROM CABINET
ILLUSTRATION L4082A

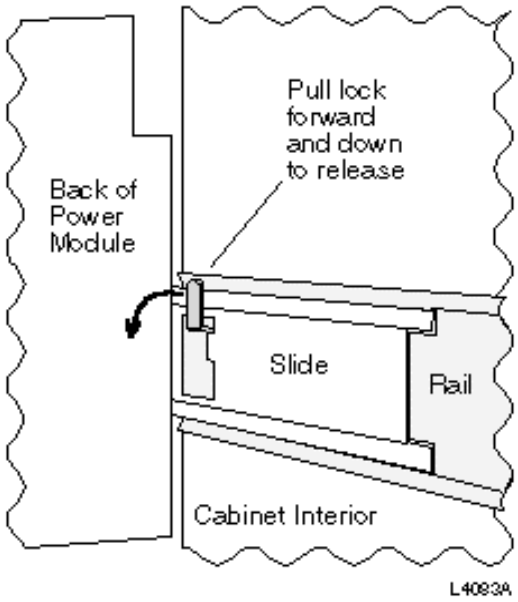
CAUTION

Equipment damage possibility. Power modules generate large amounts of heat and (unlike the GAP and MIFs) have open tops for adequate cooling. When sliding the power modules in or out, be sure that cables hanging down do not get caught on the predriver or interconnect boards. If caught by a cable, components on the board may be damaged.

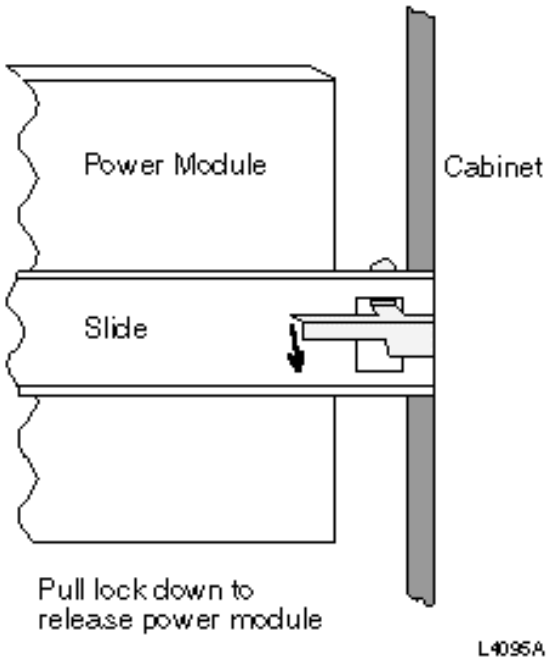
WARNING!

POSSIBLE PERSONAL INJURY! A POWER MODULE WEIGHS APPROXIMATELY 176 POUNDS (≈79.2 KG), TOO HEAVY FOR ONE PERSON. GET HELP TO LIFT AND CARRY THE MODULES.

From the front, pull the tops of the two slide locks forward, or press the sides of the locks down. See Illustration L4083A and Illustration L4095A.



POWER MODULE LATCH, INTERIOR
ILLUSTRATION L4083A



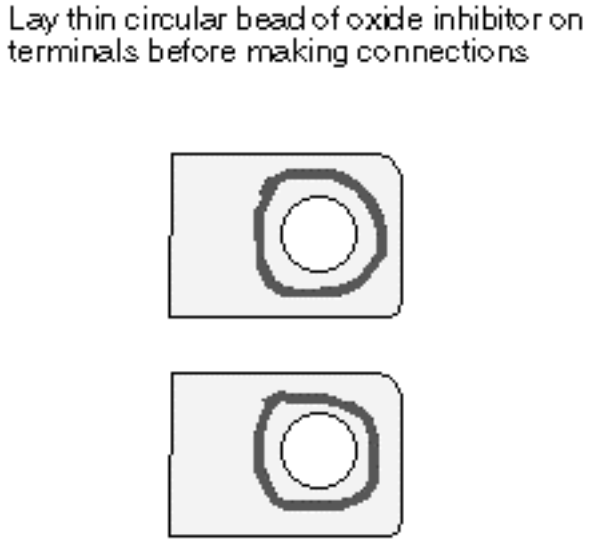
POWER MODULE LATCH, EXTERIOR
ILLUSTRATION L4095A

14. Pull the module forward, past the locks, until the slides are free of the rails.

15. Lower the power module to the floor, or to a table.

To reinstall the power module, reverse the above steps.

16. Apply more antioxidant to output terminals as necessary (see Illustration L4079A).



APPLYING ANTIOXIDANT TO OUTPUT TERMINALS
ILLUSTRATION L4079A

17. Perform functional checks, as described below if the power module replaced is a Hi Side Power Module on a Base SR20 System. There are no calibrations to check for Lo Side Power Module replacements; run a 3-plane DQA scan to verify operation. Likewise, EchoSpeed & HiSpeed require no functional checks; run a 3-plane DQA scan to verify operation on these systems.

    a. Check gradient calibration using procedure for Gradient Calibration (DQA Version) or alternate proprietary procedure for SPT Quick Head Check; calibrate if necessary.

    b. Check shim using procedure for LV Gradient Shim Check; shim if necessary.

5-2 Power Module Front Cover Replacement

Following the front cover procedure is the main board removal process.

Tools Required

- 1/4-inch nut driver

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

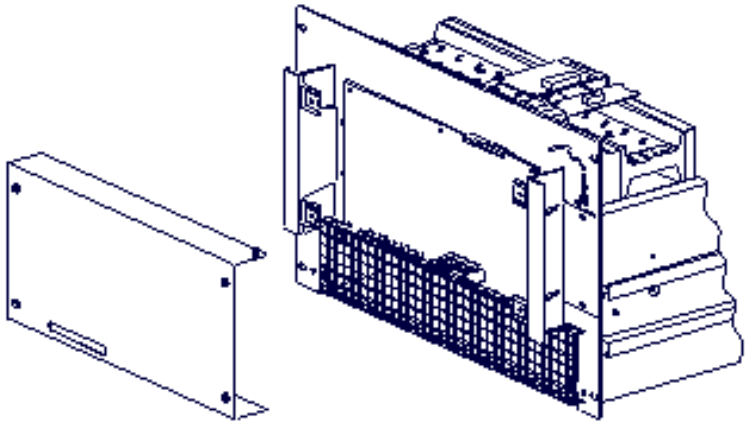
DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

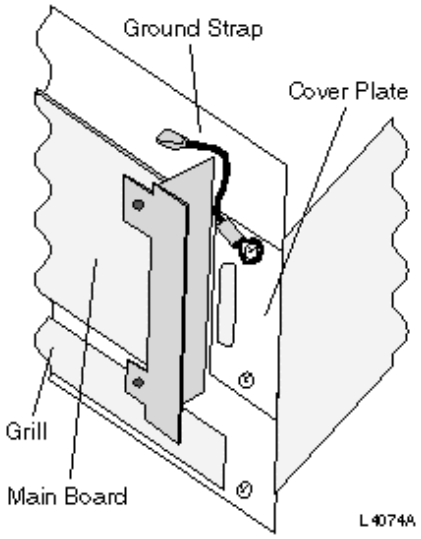
1. Perform lockout / tagout procedure, as described in step 2-1-1

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. Disconnect the grounding connector (spaded lug) on the upper-right of the front cover. See Illustration L4034A and Illustration L4074A.



POWER MODULE: FRONT PANEL ASSEMBLY
ILLUSTRATION L4034A



POWER MODULE GROUND CONNECTION
ILLUSTRATION L4074A

4. Use a 1/4-inch nut driver to loosen the four hex screws holding the front cover. (They will remain attached to the panel by plastic locking washers.)

5. Remove the cover.

6. To reassemble, reverse the preceding steps. If you need to remove the main board, go on to the section below.

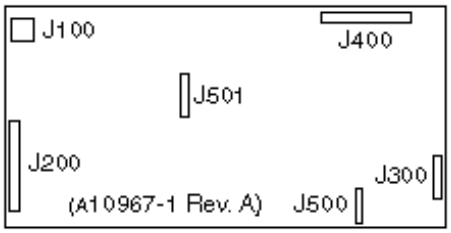
Main Board Removal

Tools Required

- Medium Phillips screwdriver

Procedure

1. Unplug the five connectors (J200–J501) (see Illustration L4025A).



J100 Modular Analog Input (for testing only-normally unconnected)
J200 Master Interface--via J5 on back of power module
J400 Interconnect Board
J300 Interlock--to J3/INTERLOCK IN and J4/INTERLOCK OUT on back of power module
J500 Power Toroid Transformer (small)
J501 Polyphase Buck Module

L4025A

MAIN BOARD CONNECTIONS
ILLUSTRATION L4025A

2. Remove the six screws and tension washers.

3. Using proper ESD precautions, remove the board and place in an anti-static bag.

4. Verify that the jumpers and switches on the new board are set properly (see Table 13).

TABLE 13
MAIN BOARD JUMPERS AND SWITCHES

Jumper #	Description	Options	Normal Settings
B100	X1 Input Polarity	Horizontal (both): Inverted Vertical (both): Non-inverted	Horizontal (both jumpers)
B101	Active Ballast	Left: On Right: Off	Right
B102	J5 –Input	Installed: Connected to MIF signal Removed: Disconnected from MIF	Installed
B103	J5 +Input	Installed: Connected to MIF signal Removed: Disconnected from MIF	Installed
B200	Transistor Junction Overtemp Latch	Installed: Enable Removed: Disabled	Removed
B300	Transistor Junction Overtemp Latch	Installed: Enable Removed: Disabled	Removed
B301	Standby	Up: External standby command Down: Manual standby	Up
B302	Long Overload	Installed: Standby on long overload Removed: No standby on long overload	Installed
S100	Input Source Selector	Up: X10 Input Down: X1 Input	Up

To reinstall board, reverse the preceding four steps.

5. Perform functional checks as follows only if this is a Base SR20 System (EchoSpeed & HiSpeed require no functional checks; suggest running a 3-plane DQA scan to verify operation):

a. Check gradient calibration using procedure for Gradient Calibration (DQA Version) or alternate proprietary procedure for SPT Quick Head Check; calibrate if necessary.

b. Check shim using procedure for LV Gradient Shim Check; shim if necessary.

5-3 Main Board Replacement

See Step 5-2.

5-4 Output Shelf Assembly Replacement

Output Shelf Assembly Removal

Tools Required

- Medium Phillips screwdriver
- 9/16-inch nut driver
- Oxide-inhibiting compound (supplied with FRU; required for replacement)

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

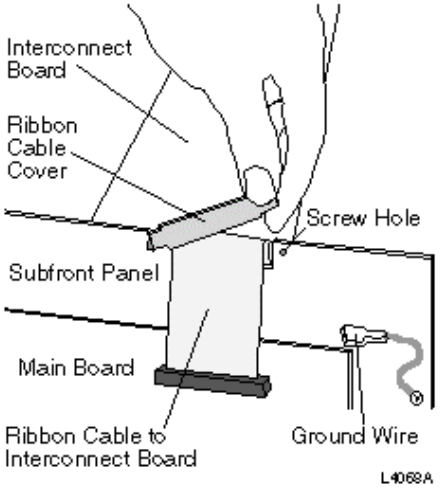
1. Perform lockout / tagout procedure, as described in Step 2-1-1.

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. Remove Power Module and its Front Cover, as described in Section 5-2.

   Note - Servicing without removal - If you are servicing the module while it is still installed in the cabinet, you will need to do only steps 1-6,8,9, and 12 of Power Removal in Section 5-1

4. Remove one screw holding the ribbon cable cover (see Illustration L4068A).

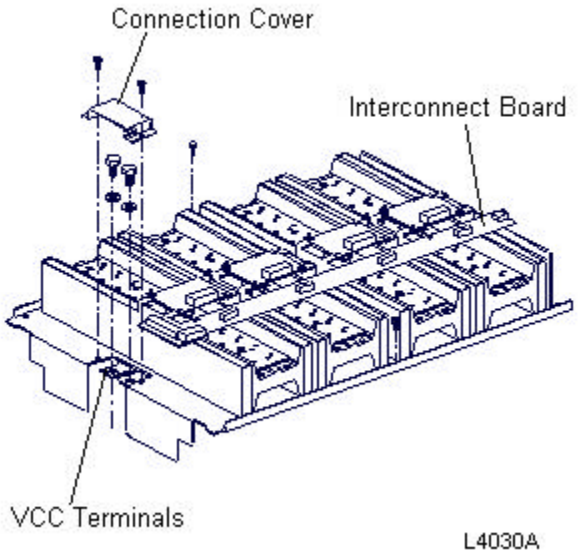


RIBBON CABLE COVER
ILLUSTRATION L4068A

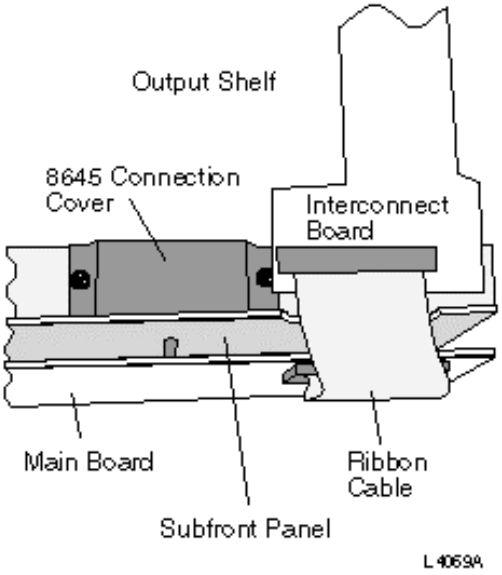
5. Remove the ribbon cable cover.

6. Disconnect the interconnect board from the main board.

7. Remove the two screws that hold the 8645 connection cover (beside the ribbon connector and behind the main board). See Illustration L4030A and Illustration L4069A.



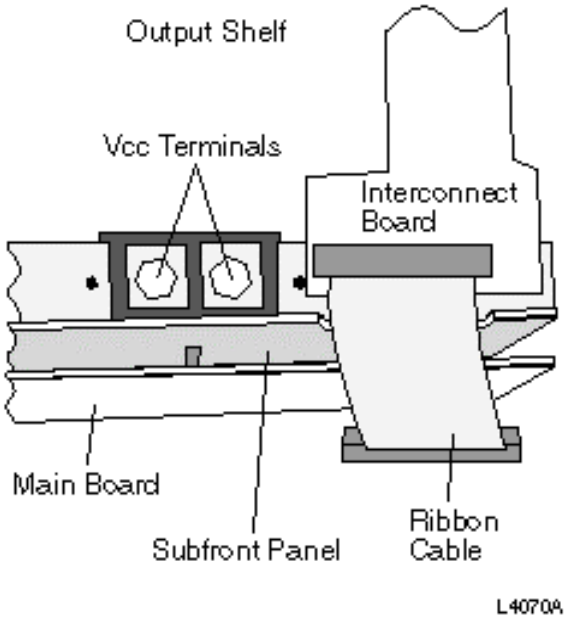
OUTPUT SHELF ASSEMBLY
ILLUSTRATION L4030A



CONNECTION COVER
ILLUSTRATION L4069A

8. Remove the 8645 connection cover.

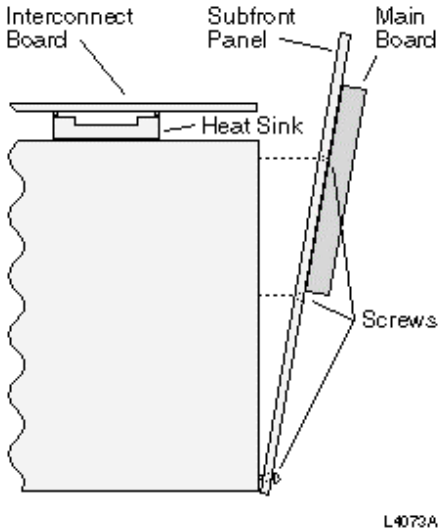
9. Use a 9/16-inch nut driver to remove the two Vcc bolts and washers (see Illustration L4070A).



VCC CONNECTOR
ILLUSTRATION L3070A

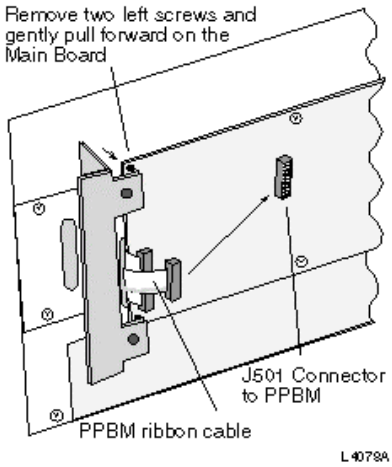
10. Remove the six screws securing the output shelf to the chassis. (If you are servicing the module while it is installed in the cabinet, you may need to push the module back in to remove the rear two screws.)

11a. If you are servicing the module while it is installed in the cabinet, you can ease removal of the shelf by loosening the subfront panel. Remove the top four Phillips screws and loosen the bottom two (see Illustration L4073A).

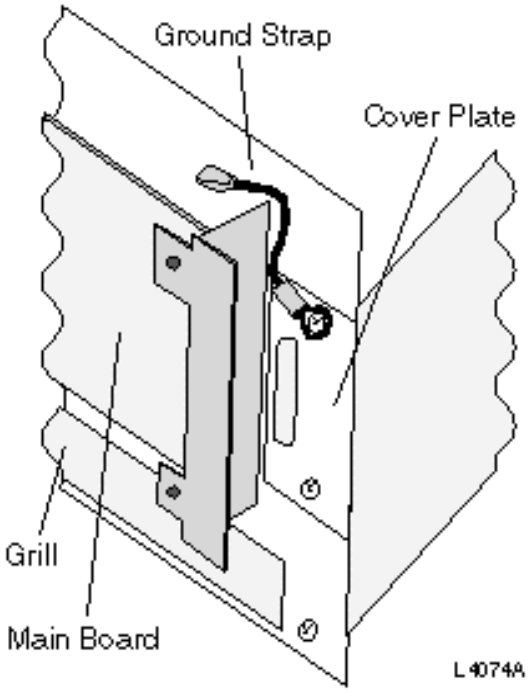


POWER MODULE SUBFRONT PANEL
ILLUSTRATION L4073A

11b. If you remove the subfront panel entirely, remove the two left screws holding the main board to facilitate removing the ribbon connectors (see Illustration L4078A). When reinstalling the subfront panel, be sure to reinstall the two side 8645 cover plates and the ground strap (see Illustration L4074A).



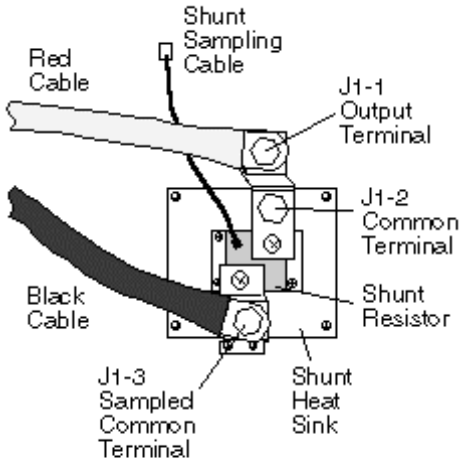
ATTACHING POLYPHASE BUCK MODULE (PPBM) CABLE
ILLUSTRATION L4078A



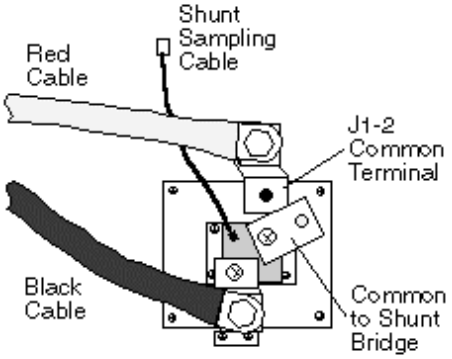
POWER MODULE GROUND CONNECTION
ILLUSTRATION L4074A

12. Remove the bolt connecting the red cable to J1-1.

13. Remove the bolt holding the J1-2 common terminal to the shunt bridge. You may need to loosen the screw on the Common to Shunt Bridge. See Illustration L4096A and Illustration L4097A. During reassembly, retighten all bolts and screws securely.



POWER MODULE SHUNT, CONNECTED
ILLUSTRATION L4096A



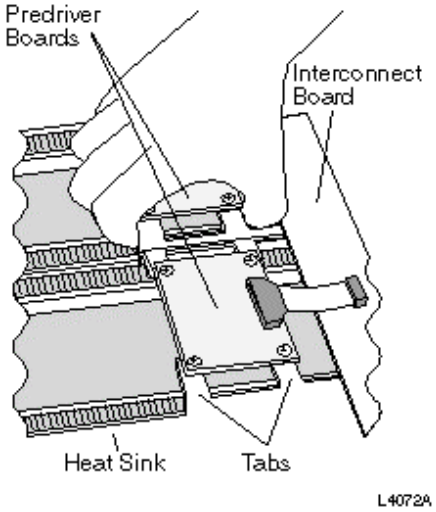
POWER MODULE SHUNT, DISCONNECTED
ILLUSTRATION L4097A

14. Disconnect the phone jacks from J401 and J402 on the interconnect board.

CAUTION

Equipment damage possibility. Do not handle the shelf by holding the resistors. Doing so could damage connections or components.

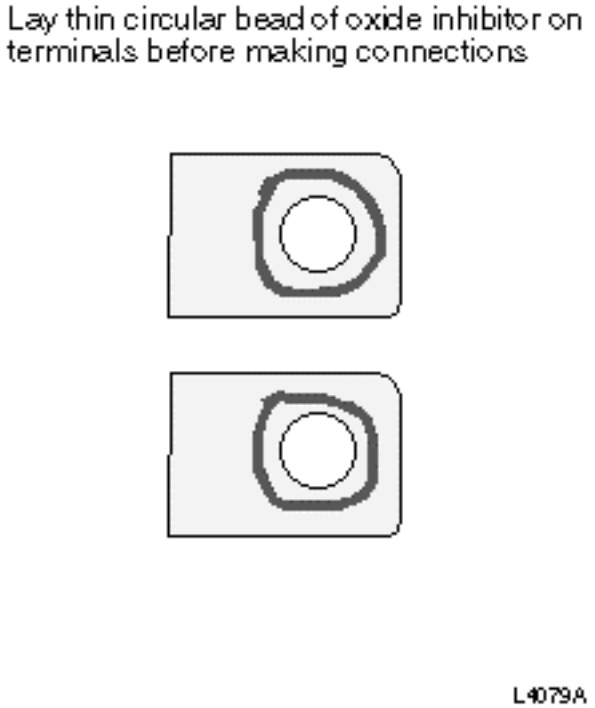
15. Pick up the shelf and place on flat surface. Be careful, the shelf is heavy! You can lift up on the heat sink tabs that hold the predriver boards, but do not lift up on the predriver boards themselves (see Illustration L4072A).



HEAT SINK TABS
ILLUSTRATION L4072A

To reinstall, reverse the above steps.

16. Apply more anti-oxidant to Vcc and output terminals as needed (see Illustration L4079A).



APPLYING ANTIOXIDANT TO OUTPUT TERMINALS
ILLUSTRATION L4079A

CAUTION

Equipment damage possibility. Be sure that no cables are pinched when you place the shelf back on the chassis.

17. To facilitate realignment, reinstall the bolts in the Vcc connections before reinstalling the six chassis screws. Start all six screws into the chassis before tightening any of them.

18. There are no calibrations required; perform a 3-plane DQA scan to verify system operation.

5-5 Polyphase Buck Module Replacement

Two different PPBM's exist. There is a PPBM without a crowbar circuit and a PPBM with a crowbar circuit. All replacement PPBM's will have the crowbar circuit. An example of a PPBM with crowbar circuit is shown in Illustration 5-1.

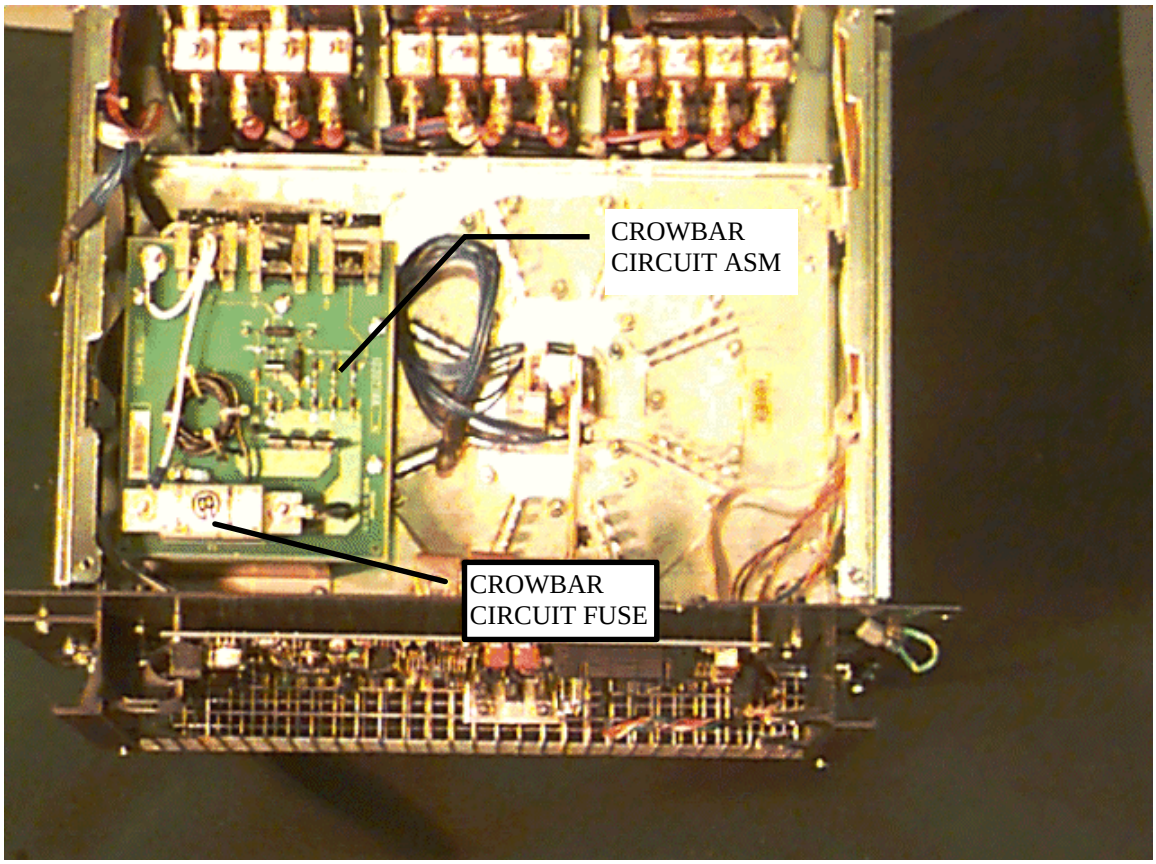


ILLUSTRATION 5-1
RECONNECTING RED DC WIRE

5-5-1 Preparation for PPBM Removal

Tools Required

- 11/32-inch nut driver
- 3/8-inch nut driver
- Medium Phillips screwdriver

- Oxide-inhibiting compound (supplied with FRU; required for replacement)
- Heat gun 46-194427P229
- Small ¼ inch ratchet and sockets or ignition wrench set. Socket sizes needed are: ¼, 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.

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in 2-1-1.

2. Remove the front cover(s) and/or open rear door(s), as described in 2-1-2.

3. Remove Power Module and its Front Cover, as described in Section 5-2.

4. Remove Output Shelf Assembly, as described in Section 5-4.

Note

You can perform many service procedures on the power module while it is still installed in the cabinet; to do so, however, you may need to push the module all the way back in the cabinet and work from behind the opened rear door for some steps and push the module toward the front and work from the front of the cabinet for other steps.

5-5-2 Fuse Replacement procedure/functional check for PPBM's with crowbar circuit

It is possible that only the fuse is bad and not the PPBM. The fuse can be checked using an ohmmeter and determining whether it is good or bad.

Note

Make sure that there is not any voltage on the fuse before using the ohmmeter. Voltage in the fuse will severely damage ohmmeter.

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. The part number for the fuse is 2208412.

2. Remove bolts holding fuse to crowbar circuit. See Illustration 5-1.

3. Remove fuse and replace with new fuse.

5-5-3 Removing PPBM without crowbar circuit

1. Locate the blue cable running from the toroid power supply to the left-most capacitor. See Illustration L4039A and Illustration L4075A.

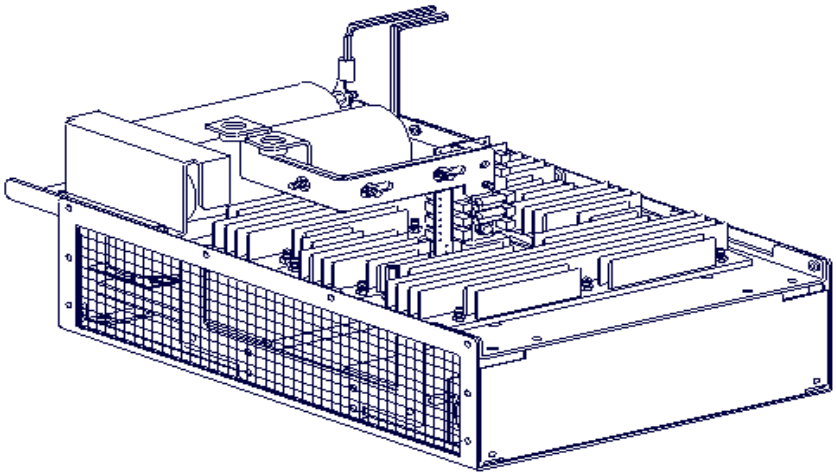
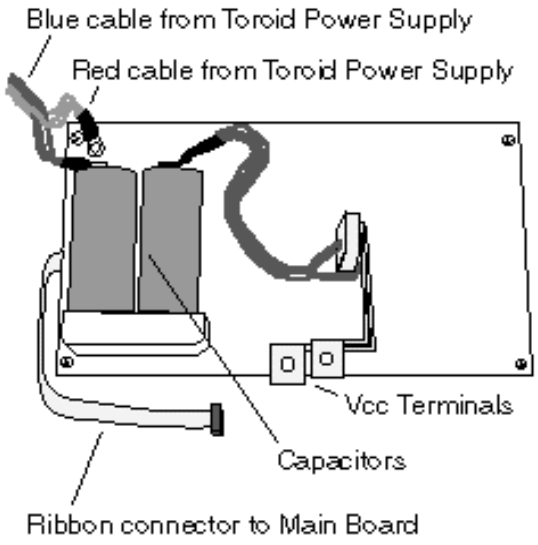


ILLUSTRATION L4039A
POLYPHASE BUCK MODULE (PPBM)



POLYPHASE BUCK MODULE, TOP VIEW
ILLUSTRATION L4075A

2. Use a 3/8-inch nut driver to remove the nut and lock washer holding the cable to the capacitor post.

3. Locate the red cable running from the toroid power supply to the PPBM chassis (see Illustration L405A).

4. Use an 11/32-inch nut driver to remove the nut and lockwasher from the PPBM chassis.

5. Disconnect the PPBM ribbon cable from the power module main board (see Illustration L4076A).

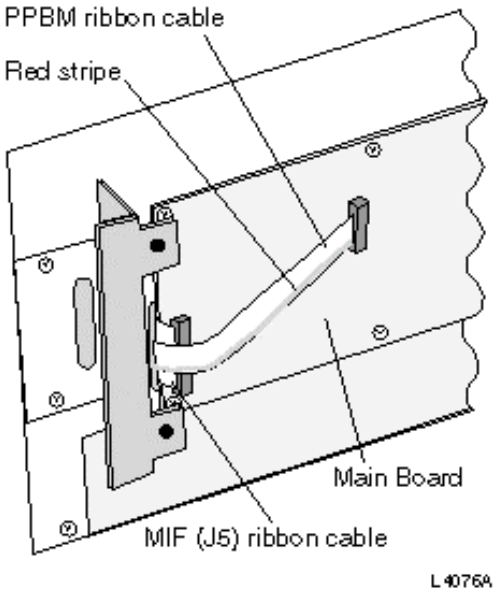


ILLUSTRATION L4076A
PPBM CABLE TO MAIN BOARD

6. Feed the PPBM ribbon cable back through the power module subfront panel.

7. Remove the four screws (and internal star washers) securing the PPBM to the power module chassis (see Illustration L4075A).

8. Lift the left (capacitor) end of the PPBM and pull the assembly to the left to detach the right end from the bracket (see Illustration L4077A).

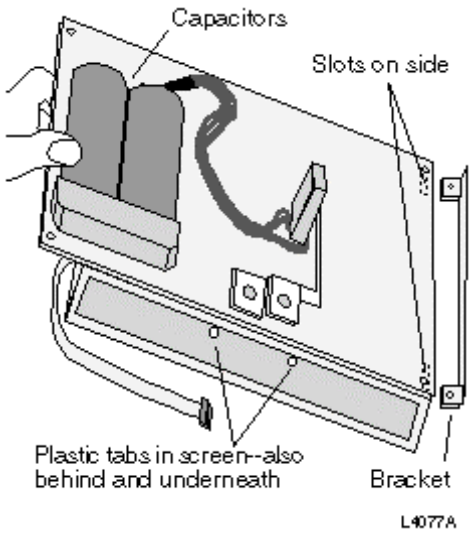


ILLUSTRATION L4077A
LIFTING OUT THE POLYPHASE BUCK MODULE

Note

Carrying the PPBM - You can conveniently carry the PPBM by using the large blue capacitor as a handle

CAUTION

Plastic tabs hold isolating paper in place on the inside of the PPBM shield screen. Handle the screen with care to avoid breaking off the tabs or knocking them out of place.

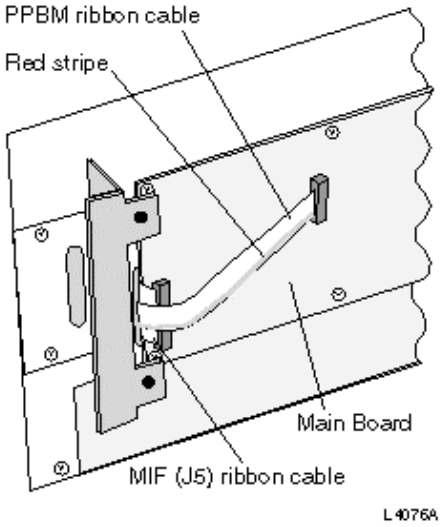
9. Replace PPBM by sliding right end into brackets and then lay left (crowbar circuit) end. Make sure PPBM is in brackets. See Illustration L4077A.

Note

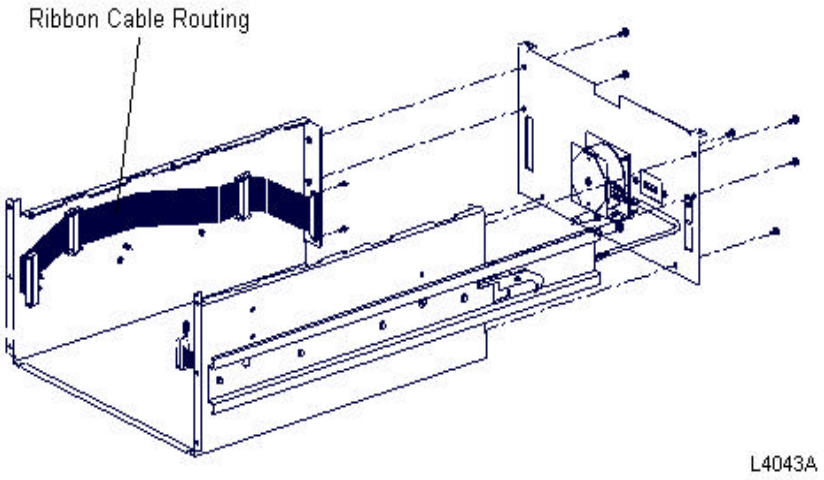
Wiring harnesses - Make sure the wiring harness of toroid power supply are tucked out of the way as much as possible,

CAUTION

Be careful not to damage the large ribbon cable on the left side of the chassis. The cable runs from J5 on the power module back panel to the main board. See Illustration L4076A and Illustration L4043A.



PPBM CABLE TO MAIN BOARD
ILLUSTRATION 4076A



POWER MODULE: EXPLODED VIEW
ILLUSTRATION L4043A

10. Screw in four screws (and internal star washers) securing PPBM to the power module chassis. See Illustration L4075A.

11. Feed PPBM Ribbon cable back through.

12. Connect the red positive DC under the nut closest to the chassis wall. Leave red bundle loose until bleeder resistor is in place, then tighten. Refer to Illustration 5-2

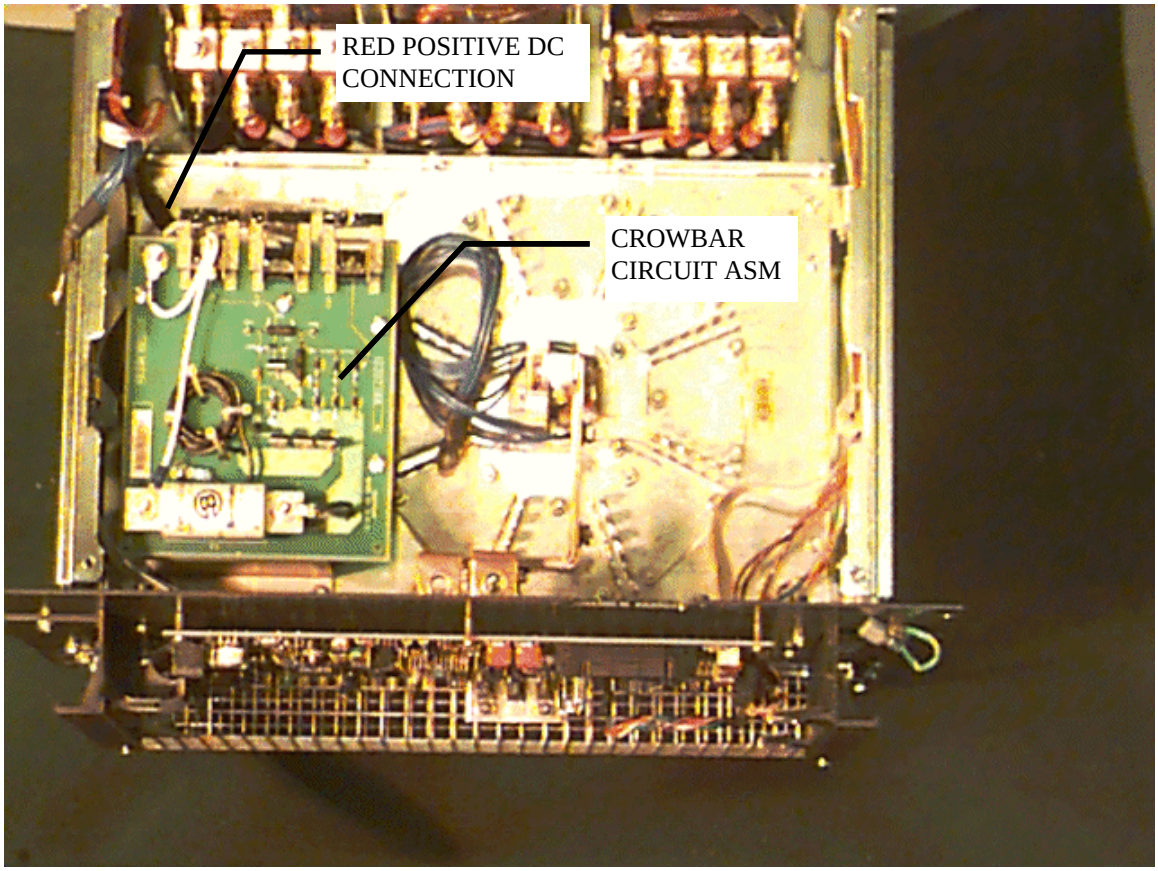


ILLUSTRATION 5-2
CONNECTING RED DC WIRE

13. 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 extensions. 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 5-3.

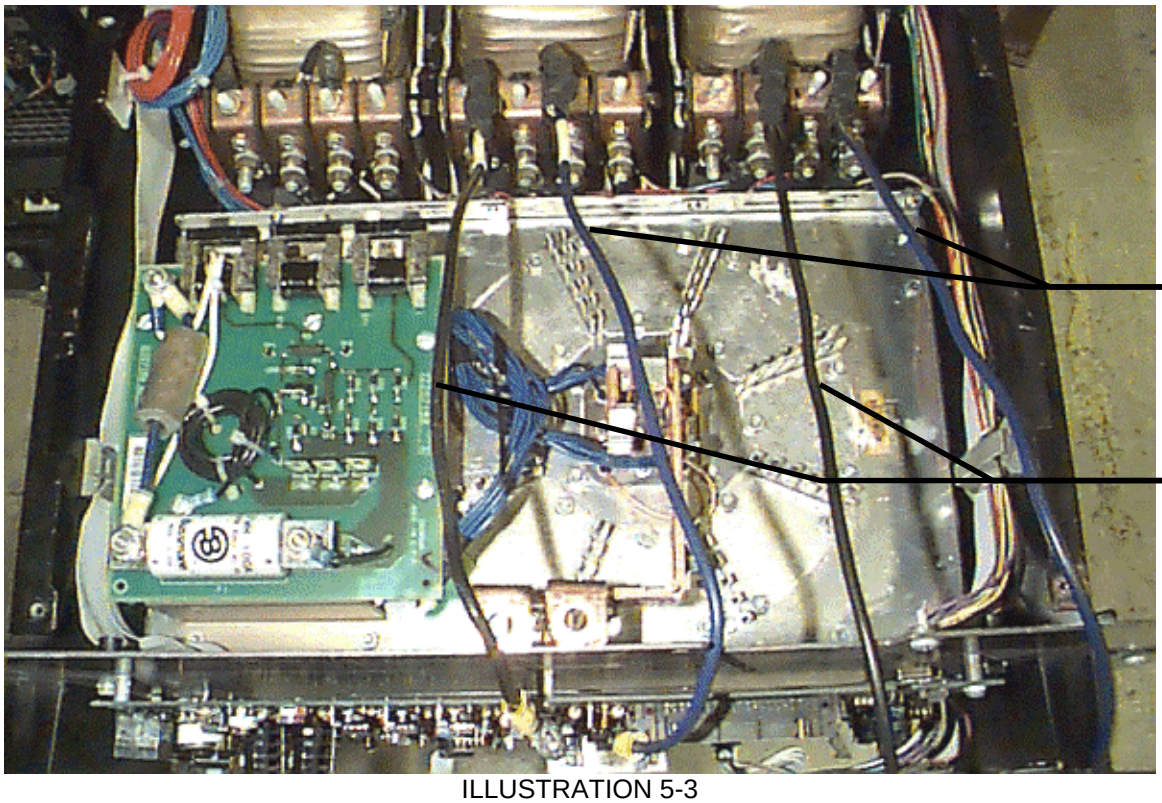


ILLUSTRATION 5-3
INSTALLING LEAD EXTENSIONS

14. 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 5-4.

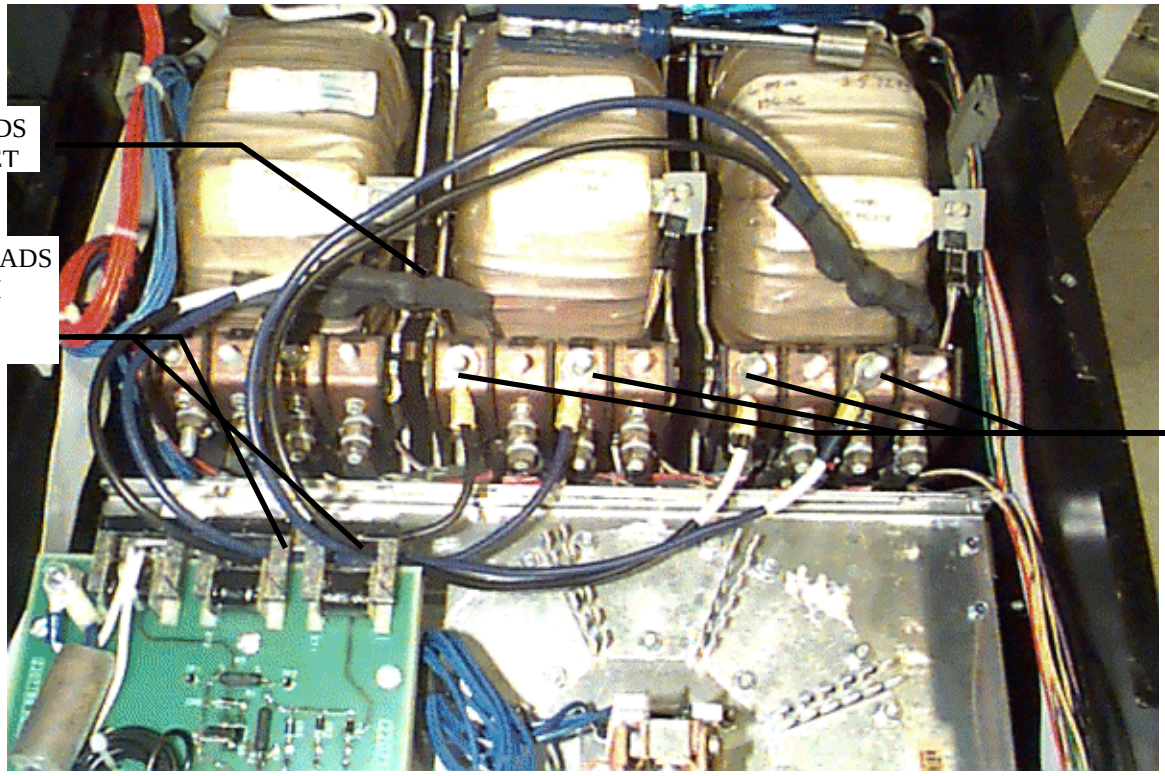


ILLUSTRATION 5-4
ROUTING LEAD EXTENSIONS

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

16. Connect negative DC supply wire bundle (Blue) to stud J1. Tighten nut. See Illustration 5-5.

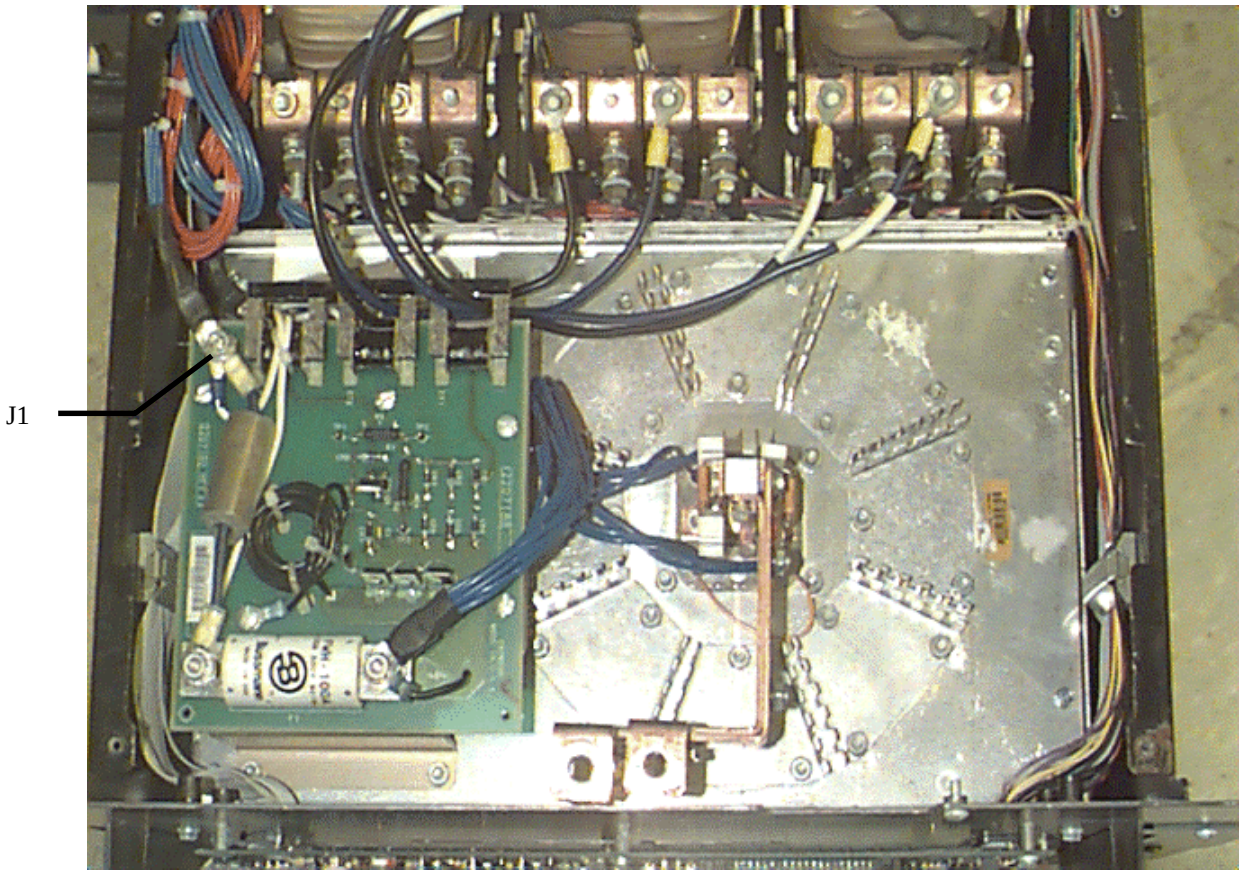
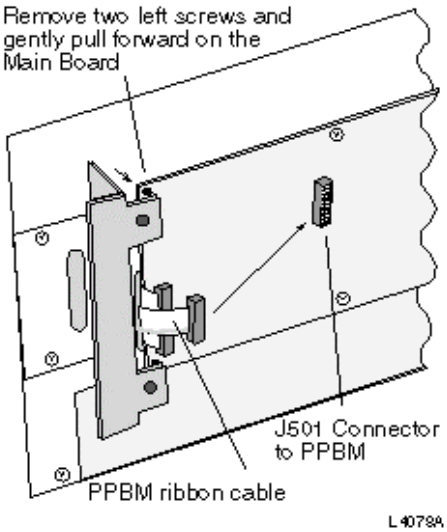


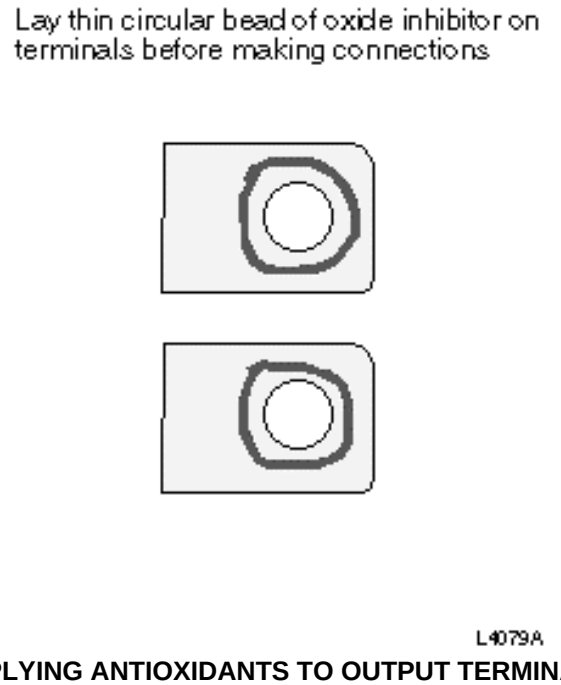
ILLUSTRATION 5-5
BLUE CABLE CONNECTION

17. Removing the left two screws holding the main board facilitates reinstalling the ribbon connectors (see Illustration L4078A). When you are in front of the main board, the PPBM ribbon cable is on the outside of the larger ribbon cable. For your reference, the red line on the PPBM cable should be down (see Illustration L4076A).



ATTACHING POLYPHASE BUCK MODULE (PPBM) CABLE
ILLUSTRATION L4078A

18. Apply oxide-inhibiting compound to the +/–Vcc connectors (see Illustration L4079A).



APPLYING ANTIOXIDANTS TO OUTPUT TERMINALS
Illustration L4079A

19. There are no calibrations required; perform a 3-plane DQA scan to verify system operation.

5-5-4 Removing PPBM with crowbar circuit

1. Locate the blue cable running from the torid power supply to the crowbar circuit at stud J1 See Illustration 5-6.

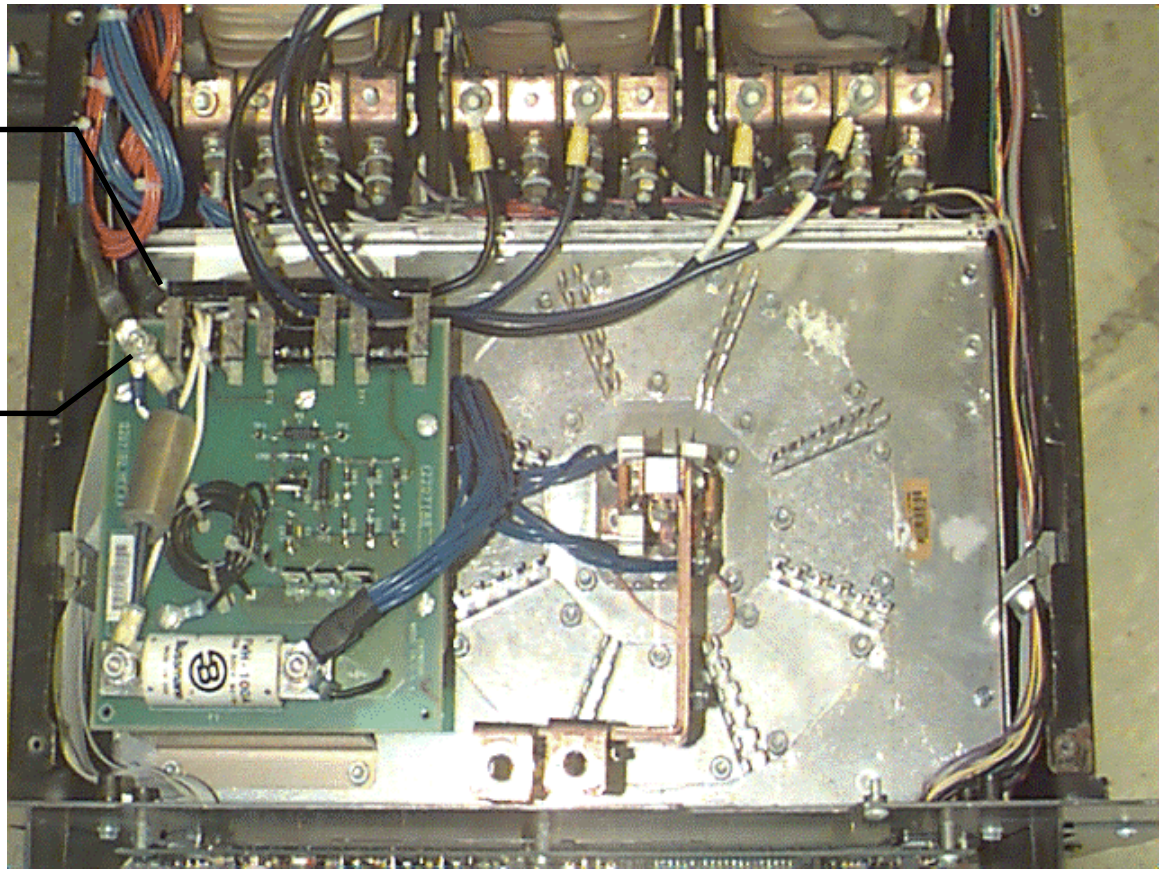


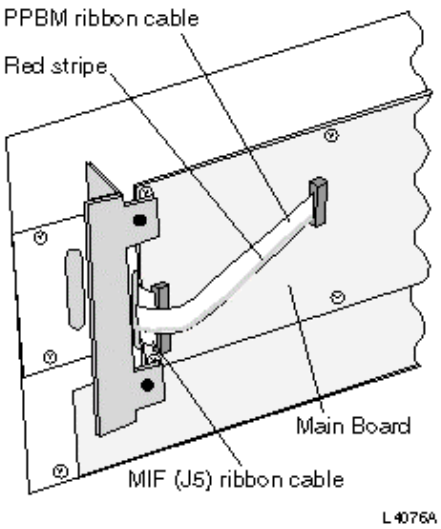
ILLUSTRATION 5-6
BLUE AND RED CABLE LOCATIONS

2. Use a 3/8-inch nut driver to remove the nut and lock washer holding the cable to the crowbar circuit.

3. Locate the red cable running from the toroid power supply to the PPBM chassis. See Illustration 5-6.

4. Use an 11/32-inch nut driver to remove the nut and lockwasher from the PPBM chassis.

5. Disconnect the PPBM ribbon cable from the power module main board. See Illustration L4076A.



PPBM CABLE TO MAIN BOARD
ILLUSTRATION 4076A

6. Detach the wire assembly (one black/yellow and one blue/white) from their respective power transformers. Feed wires back through the current transformers. Push wires out of the way of PPBM. See Illustration 5-7.

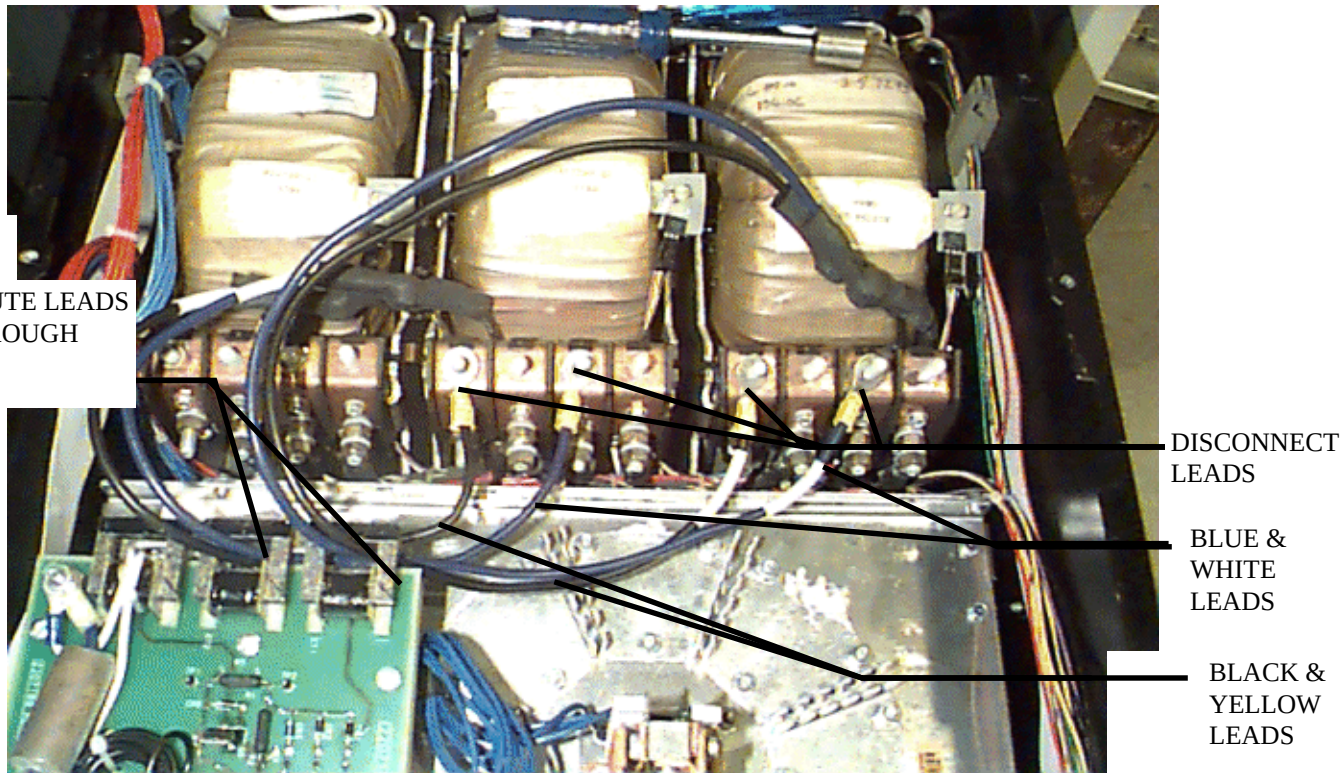
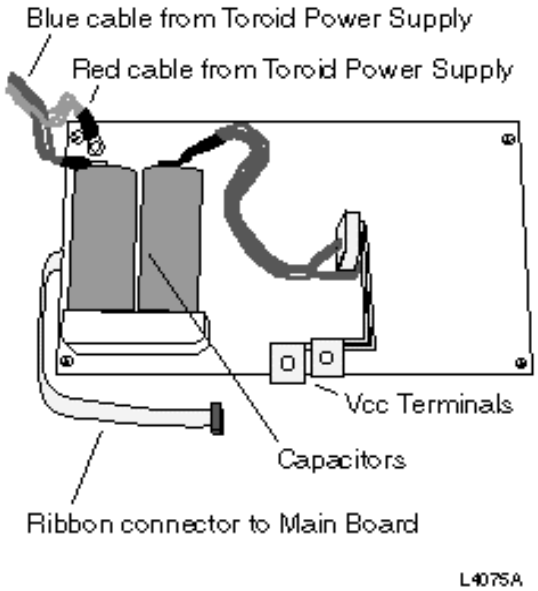


ILLUSTRATION 5-7
DISCONNECTING WIRE ASSEMBLY

7. Disconnect the PPBM ribbon cable from the power module main board. See Illustration L4076A.

8. Feed the PPBM ribbon cable back through the power module subfront panel.

9. Remove the four screws (and internal star washers) securing the PPBM to the power module chassis. See Illustration L4075A.



POLYPHASE BUCK MODULE, TOP VIEW
ILLUSTRATION L4075A

10. Lift the end of the PPBM and pull the assembly to the left to detach the right end from the bracket. See Illustration L4077A. You can grab it by the crowbar circuit.

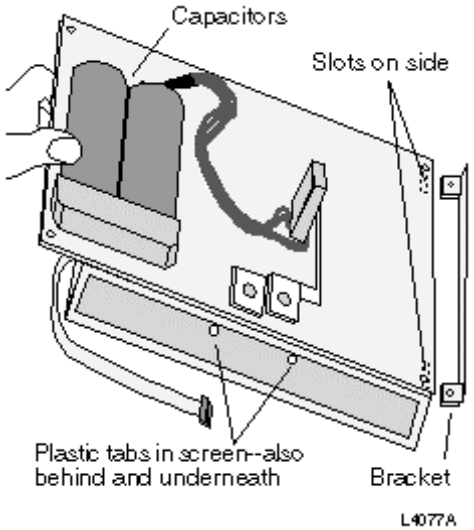


ILLUSTRATION L4077A
LIFTING OUT THE POLYPHASE BUCK MODULE

Note

You can conveniently carry the PPBM by using the crowbar circuit as a handle.

CAUTION

Plastic tabs hold isolating paper in place on the inside of the PPBM shield screen. Handle the screen with care to avoid breaking off the tabs or knocking them out of place.

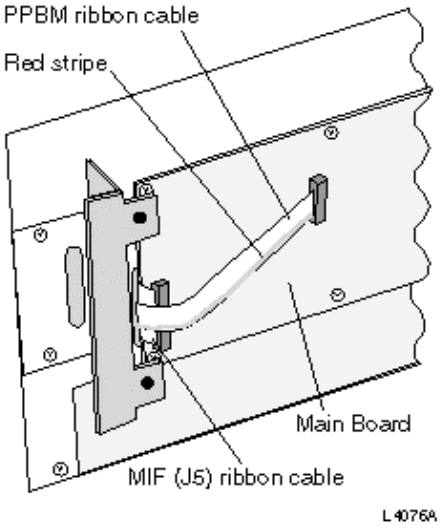
11. Replace the new PPBM with crowbar circuit by reversing the steps taken above.

Note

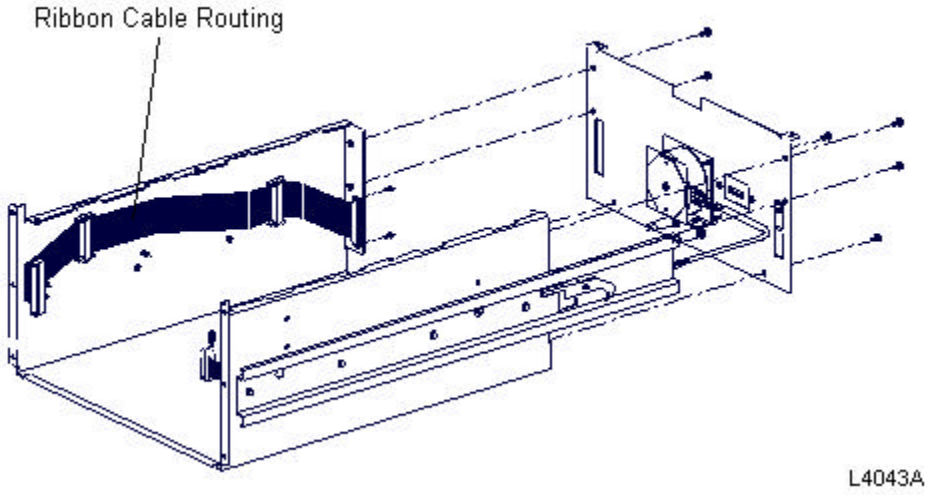
Wiring harnesses - Make sure the wiring harness of toroid power supply are tucked out of the way as much as possible.

CAUTION

Be careful not to damage the large ribbon cable on the left side of the chassis. The cable runs from J5 on the power module back panel to the main board. See Illustration L4076A and Illustration L4043A.

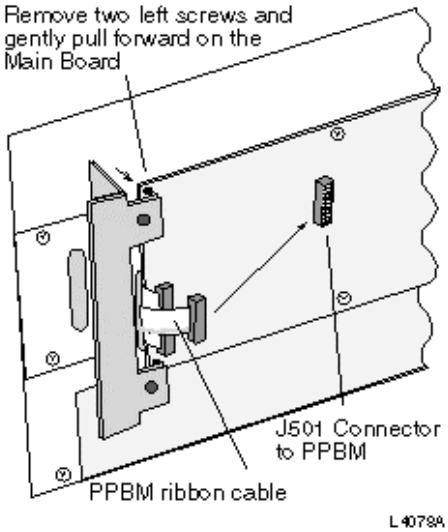


PPBM CABLE TO MAIN BOARD
ILLUSTRATION 4076A



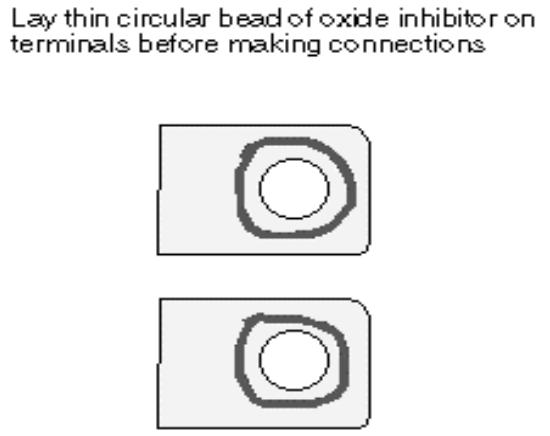
POWER MODULE: EXPLODED VIEW
ILLUSTRATION L4043A

12. Removing the left two screws holding the main board facilitates reinstalling the ribbon connectors (see Illustration L4078A). When you are in front of the main board, the PPBM ribbon cable is on the outside of the larger ribbon cable. For your reference, the red line on the PPBM cable should be down. See Illustration L4076A.



ATTACHING POLYPHASE BUCK MODULE (PPBM) CABLE
ILLUSTRATION L4078A

13. Apply oxide-inhibiting compound to the +/–Vcc connectors. See Illustration L4079A.



APPLYING ANTIOXIDANTS TO OUTPUT TERMINALS
Illustration L4079A

14. There are no calibrations required; perform a 3-plane DQA scan to verify system operation.

5-6 Toroid (One Phase) Replacement

Tools Required

- Medium Phillips screwdriver
- 7/16-inch nut driver

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in Step 2-1-1.

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. Remove Power Module and its Front Cover, as described in Section 5-2.

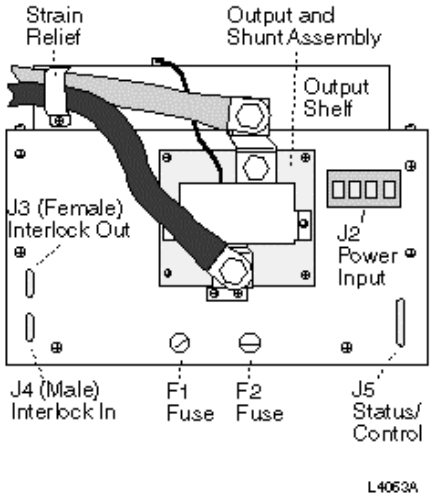
4. Remove Output Shelf Assembly, as described in Section 5-4.

5. Remove Polyphase Buck Module, as described in Section 5-4.

Note

Servicing Power Module without removal - You can perform many service procedures on the power module while it is still installed in the cabinet; to do so, however, you may need to push the module all the way back in the cabinet and work from behind the opened rear door for some steps and push the module toward the front and work from the front of the cabinet for other steps.

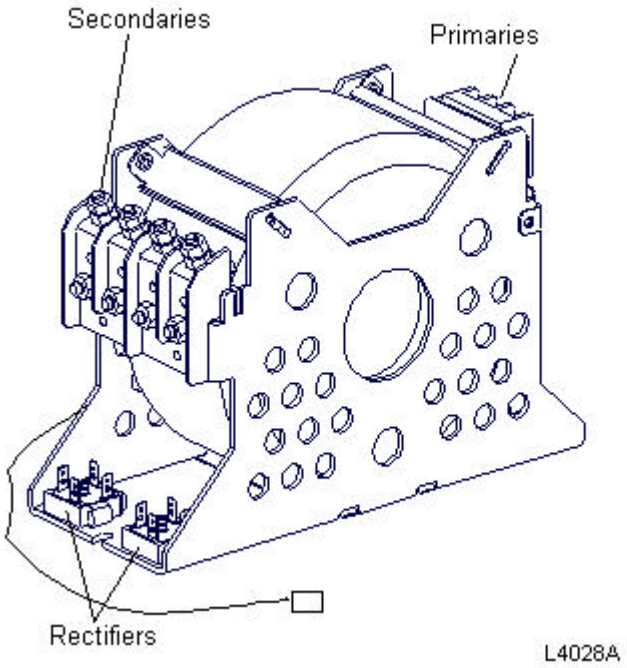
6. Remove the six screws from the back panel (see Illustration L4063A).



POWER MODULE, REAR VIEW
ILLUSTRATION L4063A

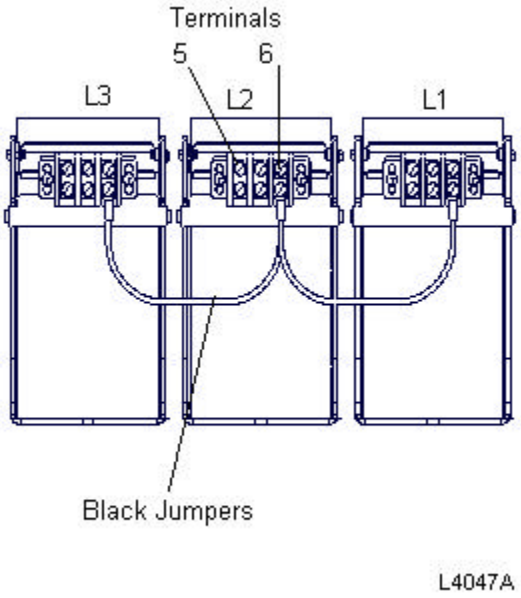
7. Pull out the back panel, and leave it suspended by the wiring.

8. The three main toroids (L1, L2, and L3) are replaced separately. The main sequence of operations is the same for all three, but some wiring is different for each one (see Illustration L4028A).

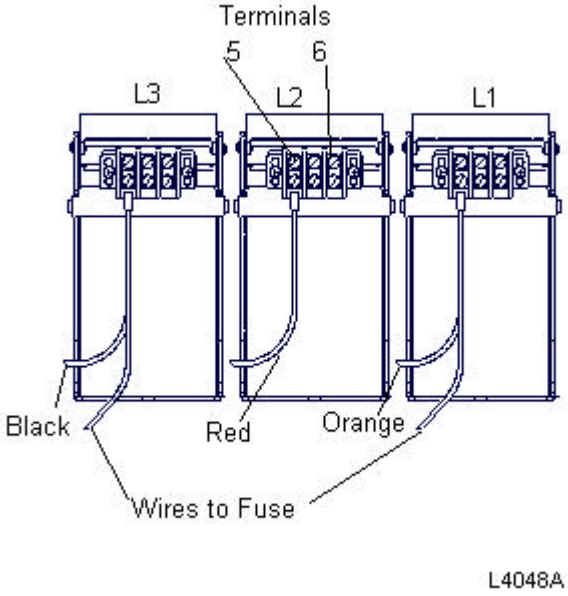


TOROID ASSEMBLY (SINGLE PHASE)
ILLUSTRATION L4028A

9. From the back of module, remove the two lower outer screws (#5 and #6) on the toroid terminal block. (Do not remove the upper row screws that connect the toroid primary winding.) See Illustration L4047A and Illustration L4048A. Be careful not to pull the terminals out of the plastic mount.



TOROID WIRING, STEP 4
ILLUSTRATION L4047A



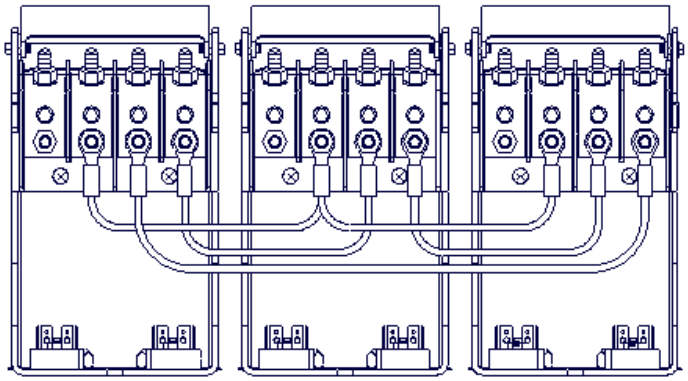
TOROID WIRING, STEP 5
ILLUSTRATION L4048A

10. Remove the wires. The black wire on terminal #6 is a jumper to the other toroid primaries (see Illustration L4047A above). The black, red, or orange wire on terminal #5 goes to the input connectors (see Illustration L4048A above). The left and right toroids also have a wire leading to fuse holders (F1 and F2) from terminal #5.

11. Remove the 7/16-inch nut from the captive stud holding the toroid base to the chassis.

12. Go to the front of the module (secondary side) and remove the other 7/16-inch nut from the captive stud.

13. Remove the three lower-right 7/16-inch nuts (connected to external wiring) from the side of the terminal block (see Illustration L4045A).



TOROID WIRING, STEP 2
ILLUSTRATION L4045A

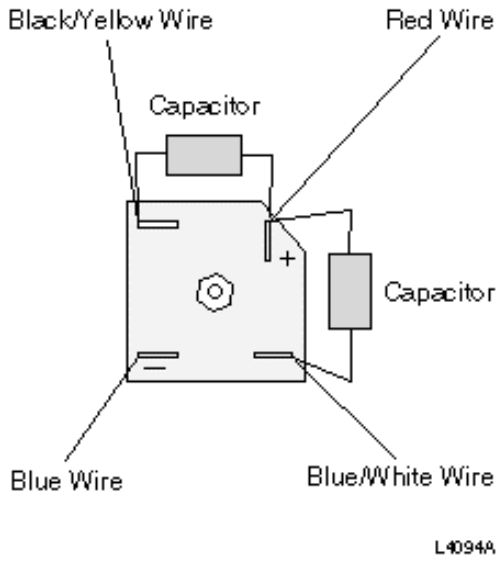
14. Remove the attached wires and fold back. (The blue/white wires go from terminal #1 of one toroid to terminal #2 of the next toroid. The black/yellow wires attach to terminal #3 on each toroid.)

15. Remove the two rectifier connectors leading from the rectifiers to the capacitor.

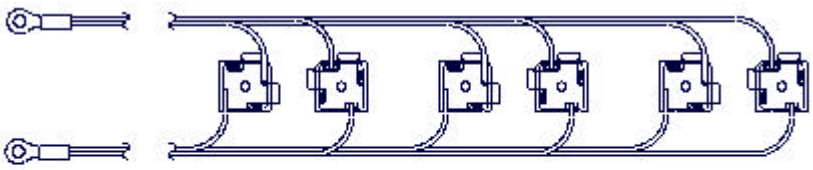
For reassembly,

Note

Reassemble tips - For reassembly look at one of the other rectifiers, since all are identical, or see Illustration L4094A and Illustration L4046A. The positive terminal is next to the key corner of the rectifier assembly. When attaching connectors to rectifiers, work from the back to the front.



TOROID RECTIFIER CONNECTIONS
ILLUSTRATION L4094A



L4046A

TOROID WIRING, RECTIFIERS
ILLUSTRATION L4046A

16. Disconnect thermal sense wires leading to the main board.

17. Lift the toroid assembly out of the power module chassis.

For reassembly, follow instructions above in reverse order.

18. There are no calibrations required; perform a 3-plane DQA scan to verify system operation.

5-7 Shunt Replacement

Tools Required

- Medium Phillips screwdriver
- 9/16-inch nut driver or wrench

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in Step 2-1-1.

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. With a 9/16-inch nut driver or wrench, remove the bolts attached to J1-2 common and J1-3 sample common. Remove the cable to J1-3 sampled common (see Illustration L4098A in Section 5-1).

4. Disconnect the shunt sampling cable from the modular jack on the interconnect board.

5. With a medium Phillips screwdriver, remove the four screws holding the shunt heat sink to the back of the power module (see Illustration L4063A in Section 5-1).

6. Remove the shunt and heat sink assembly.

To install a new shunt assembly, reverse the above steps.

7. Apply more antioxidant to output terminals as necessary before reconnecting (see Illustration L4079A in Section 5-5).

8. Perform functional checks as follows only if this is a Base SR20 System (EchoSpeed & HiSpeed require no functional checks; suggest running a scan to verify operation):

   a. Check gradient calibration using procedure for Gradient Calibration (DQA Version) or alternate proprietary procedure for SPT Quick Head Check; calibrate if necessary.

   b. Check shim using procedure for LVShim Check; shim if necessary.

6- COOLING SYSTEM

6-1 Fan Controller Board Replacement

Fan Control Board Removal

Tools Required

- Medium Phillips screwdriver

Module Removal Considerations

CAUTION

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

DANGER!!

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in Step 2-1-1.

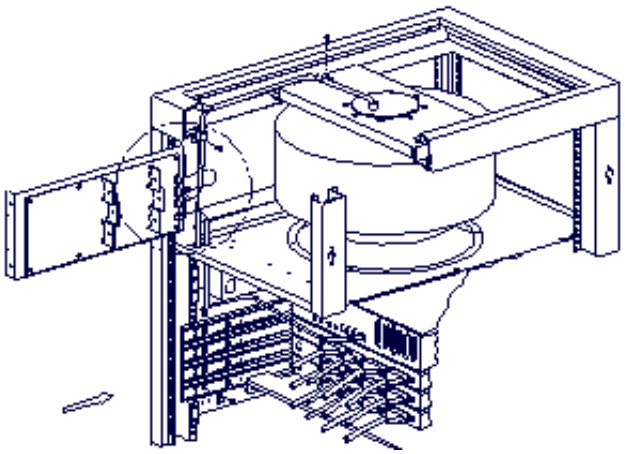
2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2.

3. From rear, remove the four screws on the upper rear cabinet cover panel (upper-right rear panel of the double-bay cabinet).

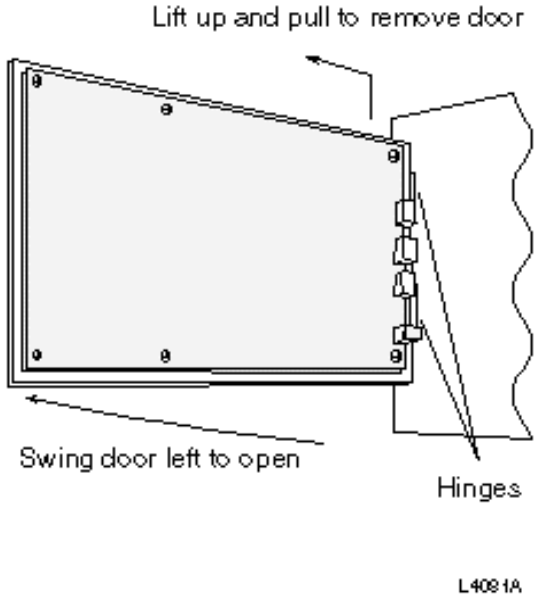
4. Remove the fan cover panel.

5. Remove the two screws securing the fan control panel to the cabinet.

6. Swing open the fan control panel (The hinge is on the left.). See Illustration L4031A and Illustration L4081A.

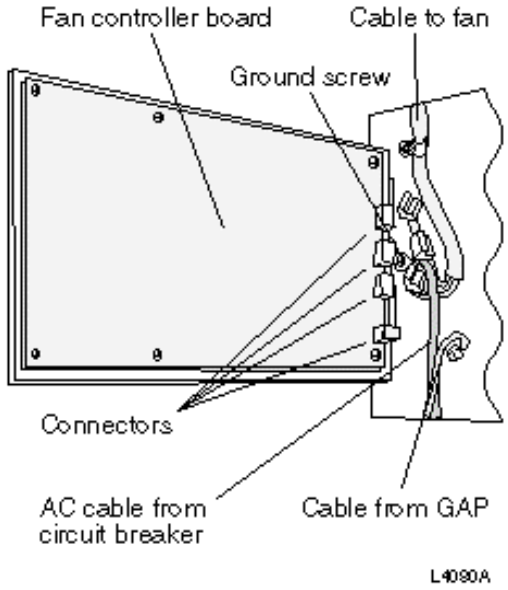


BLOWER ASSEMBLY
ILLUSTRATION L4031A



FAN CONTROL DOOR
ILLUSTRATION L4081A

7. Unplug cables from the four board connectors (see Illustration L4080A).



FAN CONTROLLER BOARD
ILLUSTRATION L4080A

CAUTION

When reconnecting the board, be sure you that do not switch the cables leading to J2 and J3. The brown wire cable attaches to J2; the blue, to J3.

8. Remove fan control panel by pulling up on the hinge and out (see Illustration L4081A above).

9. Remove the six screws holding the board to the panel.

10. Remove the board and place in antistatic bag.

Note

Don't lose the flat washers - Be careful of the flat washers between the board and standoffs. Put them back on if they fall off.

To reassemble, reverse the above steps.

11. Verify fan operation after powering up cabinet.

6-2 Fan Replacement

Tools Required

- Medium Phillips screwdriver
- 5/16-inch nut driver

- 1/4-inch nut driver
- Cable ties
- Torque wrench capable of 175 ft-lbs

Module Removal Considerations

Equipment damage possibility. The various modules may have static-sensitive components, such as boards, that can be damaged if not handled in a static-free environment. Take appropriate care (e.g., wear wrist grounding strap) when handling these modules.

When removing a module for servicing, do not pull it out from the front; instead, push it out from the rear. As you are pushing the module forward, be careful that attached and nearby cables do not get caught on obstructions.

Components on the power module interconnect and predriver boards (located on top of the power modules) are also vulnerable to being damaged by a cable that catches on something.

Procedure

FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure, as described in Step 2-1-1.

2. Remove the front cover(s) and/or open rear door(s), as described in Step 2-1-2

3. Remove the GAP Module, as described in Section 2-1.

4. Remove all three MIFs, as described in Section 3.

5. From rear, remove the four screws on the upper-rear cabinet cover panel (upper-right rear panel of the double-bay cabinet).

6. Remove the fan cover panel.

7. Remove the two screws securing the fan control panel to the cabinet.

8. Swing open the fan control panel (The hinge is on the left.). See Illustration L4031A in Section 6-1 and Illustration L4081A in Section 6-1.

9. Unplug cables from the four board connectors (see Illustration L4080A in Section 6-1).

CAUTION

Equipment damage possibility. When reconnecting the board, be sure that you do not switch the cables leading to J2 and J3. The brown wire cable attaches to J2; the blue, to J3 (see Illustration L4040A).

F1 0.5 A fuse

J1 AC power from CB4 (4-wire)
J2 To fan motor leads (brown)
J3 To fan motor leads (blue)
J4 Control signal from GAP (modular)

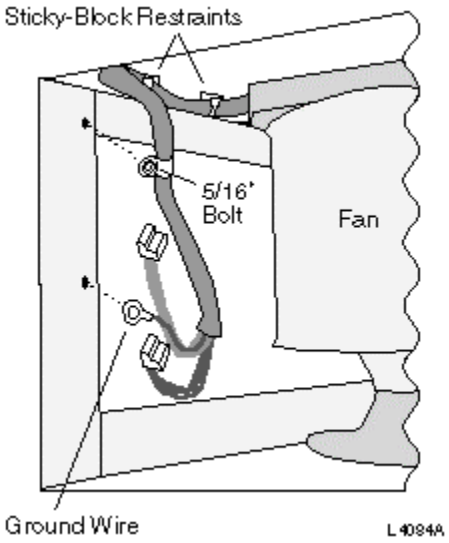
L4040A

FAN CONTROLLER FUSE AND CABLE CONNECTIONS
ILLUSTRATION L4040A

10. Remove fan control panel by pulling up and out on the hinge (see Illustration L4081A in Section 6-1).

11. Cut the ties holding the cables leading from the board to the fan.

12. Remove the ground screw (1/4-inch hex) on the fan cable (see Illustration L4084A).



FAN CABLE
ILLUSTRATION L4084A

13. Remove 5/16-inch bolt securing fan cable to cabinet.

14. Pull loose the two sticky blocks holding the fan cables.

15. From the front, remove the screws securing the GAP and MIFs to the cabinet.

16. From the rear, remove all cables to the GAP and MIFs.

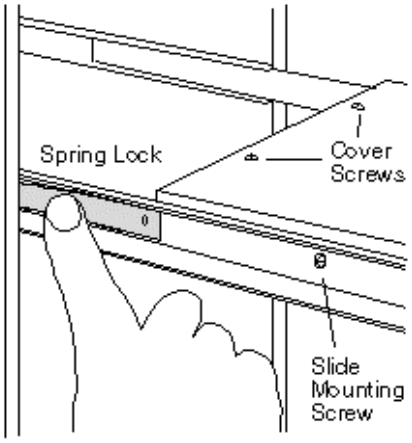
Note

MIF reinstallation tip - When reinstalling, start reconnecting the cables from the bottom MIF and work up.

17. Cut cable ties on the slides of the GAP and MIFs.

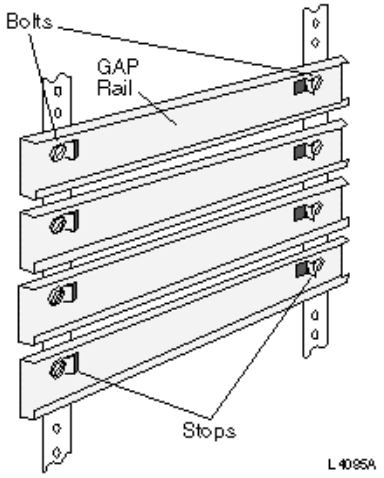
18. Push the GAP and MIFs forward until they stop.

19. From the front, press inward on the slide locks and remove the GAP and the MIFs from the rails (see Illustration L4058A).

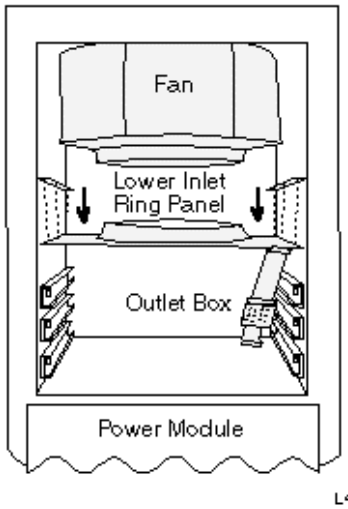


SLIDE LOCK FOR GAP AND MIF
ILLUSTRATION L4058A

20. From the front and rear remove the four (total) 5/16-inch bolts in the uppermost pair of (GAP) rails and remove the two rails (see Illustration L4085A). Three sets of rails will remain (see Illustration L4088A).



CABINET RAILS (ONE SIDE)
ILLUSTRATION L4085A

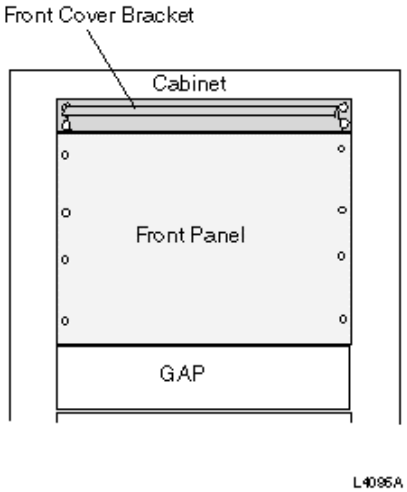


FAN MODULE: LOWER INLET RING PANEL
ILLUSTRATION L4088A

Note

Reinstalling the rails - When reinstalling, the lip of the rail is on the bottom. While tightening the bolts, push the rail up to adjust for proper clearance for the GAP

21. Remove the eight Phillips screws and star washers on the front panel (see Illustration L4086A). Remove panel.



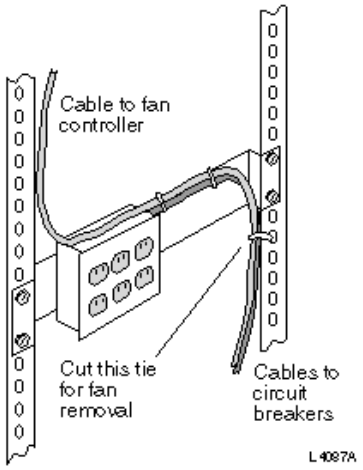
FAN: FRONT COVER BRACKET
ILLUSTRATION L4086A

22. Remove the four 5/16-inch bolts holding the front cover bracket. Remove bracket.

Note

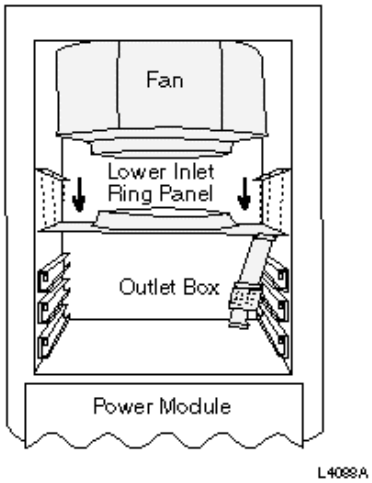
Reinstalling the bracket - When reinstalling, install the bracket before the panel but keep the brackets loose until the panel is secure. With the bracket loosely installed on the cabinet, slide the panel up and into the bracket. Then tighten the bolts and screws on both.

23. From the front and rear, remove four 5/16-inch bolts on the bracket holding the outlet box to the cabinet (see Illustration L4087A).



FAN: OUTLET BOX AND BRACKET
ILLUSTRATION L4087A

24. Cut the cable tie that secures the outlet cord and the fan controller cable to the cabinet. Let the box hang down (see Illustration L4088A).

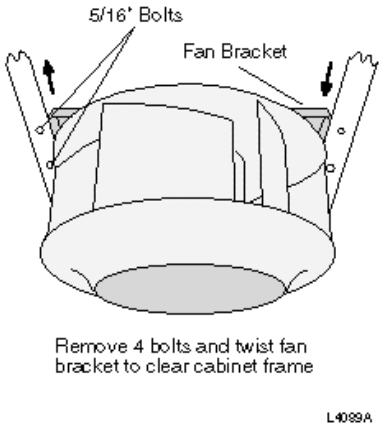


FAN MODULE: LOWER INLET RING PANEL
ILLUSTRATION L4088A

25. From the front and rear, remove the six 5/16-inch screws holding the lower inlet ring panel to the frame of the cabinet.

26. Pull the inlet ring panel down about eight inches.

27. From the front and rear, remove the four 5/16-inch bolts that secure the fan bracket to the cabinet frame (see Illustration L4089A).



FAN BRACKET
ILLUSTRATION L4089A

28. Twist the fan bracket to clear the cabinet frame and lower the fan assembly.

CAUTION

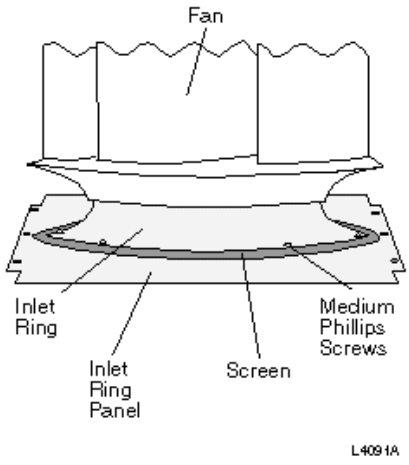
Possible personal injury and/or equipment damage. The fan assembly weighs approximately 40 pounds (≈18 kg). Get someone to help remove the fan from its awkward location.

29. From the front, remove the fan assembly by tilting it to one side and pulling it out.

Note

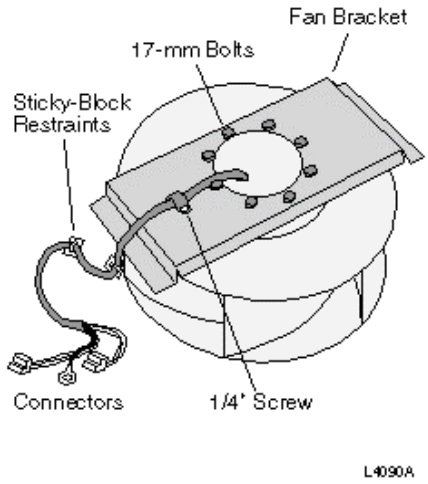
Reinstalling the cable - When reinstalling, the cable must come out of the right side of the bracket. Spin the fan blade cage to make sure that it does not rub on the inlet ring. If it does, be sure that the fan is installed properly.

The inlet ring and the bracket that holds the inlet cover can be adjusted slightly by loosening their respective screws (see Illustration L4091A).



FAN INLET RING
ILLUSTRATION L4091A

30. Remove the 1/4-inch screw holding the fan cable to the bracket (see Illustration L4090A).



FAN ASSEMBLY
ILLUSTRATION L4090A

31. Remove the eight 17-mm bolts holding the fan motor to the bracket.

> Note - Reinstalling the bolts - When reinstalling, tighten these bolts to 175 foot-pounds with a torque wrench.

32. Remove the fan from the bracket.

To reinstall, reverse the preceding steps.

33. Verify fan operation after powering up cabinet.

7- GRADIENT FILTER REPLACEMENT

The gradient air filters are located inside the cabinet front cover. The filters should be cleaned or replaced on a periodic basis to ensure proper cabinet cooling.

Note

> Filter Cleaning - the gradient filters may be leaned rather than replaced. Depending on the environment, the filters should be cleaned approximately once each year. Shake or vacuum the filters to remove major particles. Wash the filters using any detergent and water. When the filters are dry, apply a filter spray coat.

Unless you are replacing a filter due to physical damage, replace all the filters at the same time. To replace a filter, lift up and pull out from the bottom edge.

8 - QUICK REFERENCE OF FUNCTIONAL CHECKS

TABLE 1
FUNCTIONAL CHECKS REQUIRED

FRU	**8X Functional Checks**
Power Module (Hi Side on SR20) **T3503CA**	-Check Gradcal (non-prop) or SPT Quickcheck (prop) - LV Gradient Shim
Power Module (Lo Side on SR20) **T3503CA**	3-plane DQA scan
Power Module (SR77 & SR120) **T3503CA**	3-plane DQA scan
Output Shelf **T3503AH**	3-plane DQA scan
Main Board (SR20) **T3503AJ**	- Check Gradcal (non-prop) or SPT Quickcheck (prop) - LV Gradient Shim
Main Board (SR77 & SR120) **T3503AJ**	3-plane DQA scan
PPBM **T3503GG & T3503GH**	3-plane DQA scan
Toroid Asm **T3503AK**	3-plane DQA scan

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	May 26, 1998	J. Saperstein	Initial conversion from Toolbook to Word format.
1	July 30, 1998	M. Whitlow	Replacement of PPBM with Crowbar Circuit
2	May 21, 1999	SM Atladottir	Updated Procedure References for New GUI