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1- INTRODUCTION

The following boards are available as FRU's for the GRAM:

- Power Supply Board, 46-288948G1 (#T3503TG)
- Control Board, 46-288952G1 (#T3503CH)
- Gate Driver Board, 46-288946G1 (#T3503CE)

Verify the GRAM Module is Revision F or later; this is labeled on GRAM back panel (lower right corner). If the GRAM does not meet this revision requirement, the entire GRAM (#T3503AS) must be replaced upon failure as there is much rework required inside the GRAM.

This procedure provides information about how to isolate failures to these new FRU boards and replacement procedures. The information is organized by failure symptoms; there are 3 different cases that lead to different FRU replacement, so match your problem symptoms to one of the 3 cases to begin isolation of failure.

DON'T BLOW UP ADDITIONAL HARDWARE! Please be aware that the troubleshooting information provided may include "precheck items" to verify if a problem is isolated to one of the new circuit board FRU's or if additional (more extensive) problems require the entire GRAM to be replaced. Follow instructions in the precheck items to order the correct replacement part.

2- SYMPTOMS (CASE 1): POWER SUPPLY BOARD

The following conditions are indicated on the GRAM or in the error log: Undervoltage, Overvoltage, GRAM Not Ready, Diagnostic Failure, No Power - "GRAM not responding", or Overload. Perform the following prechecks to verify damage is isolated to the Power Supply Board on the failed GRAM.

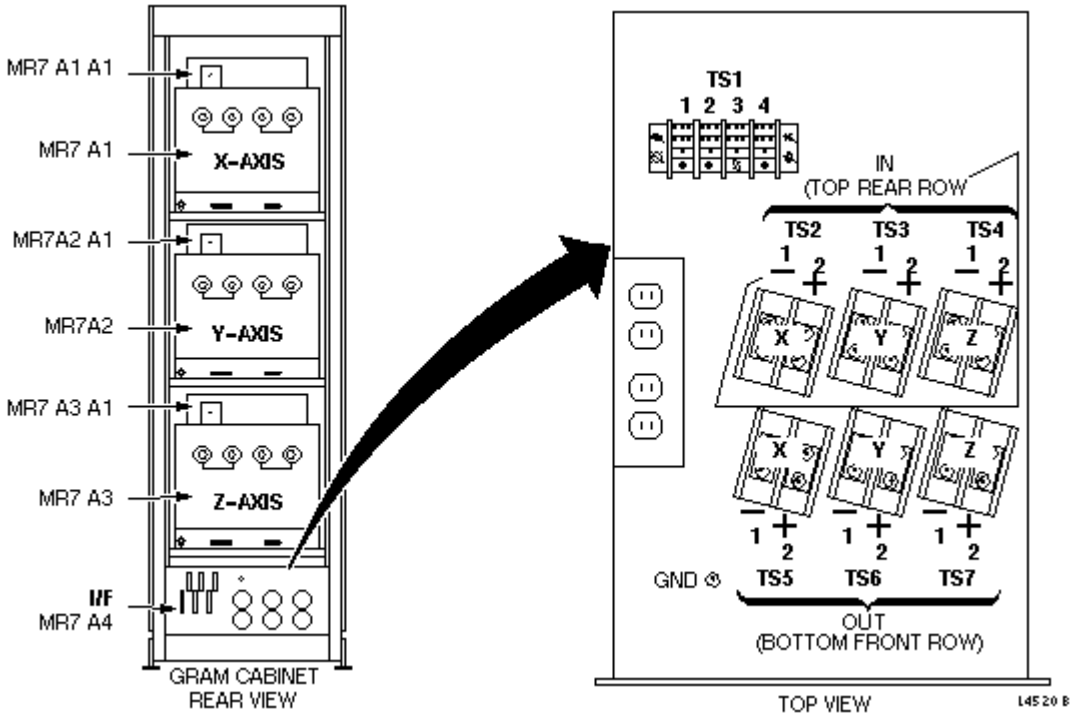
2-1 Lockout Gradient Power

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

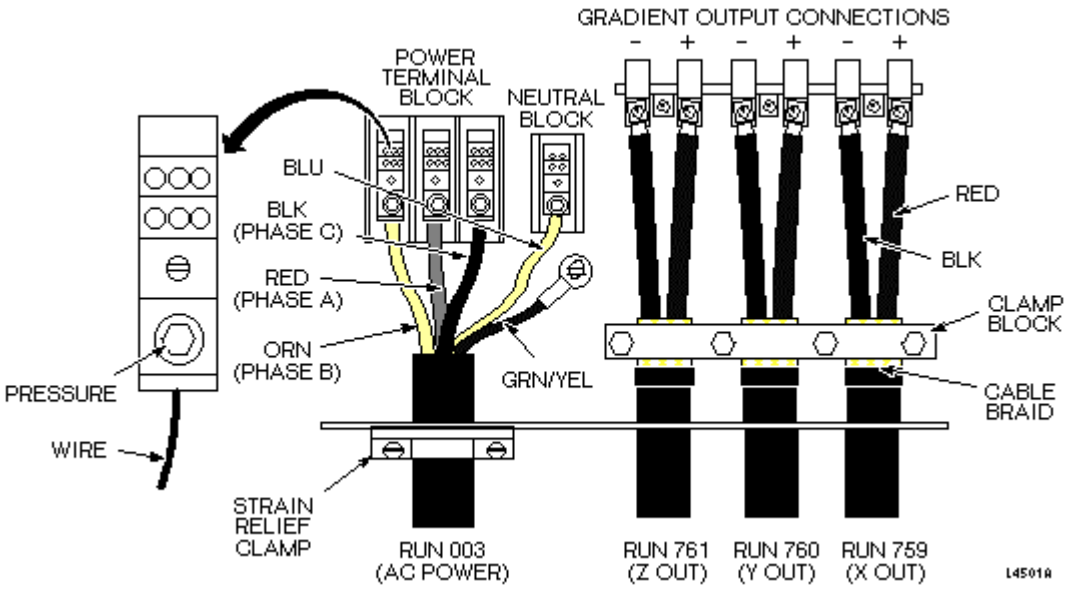
FATAL ELECTRIC SHOCK HAZARD!! THE GRADIENT AMPLIFIERS (AND GRAM, IF PRESENT) ACT AS CONSTANT LOAD SOURCES, AND WILL SEND MAXIMUM CURRENT TO ANY LOAD (INCLUDING YOU!). TO PREVENT FATAL ELECTRIC SHOCK, ENSURE THAT POWER IS OFF TO BOTH CABINETS BEFORE STARTING THIS PROCEDURE.

1. Perform lockout / tagout procedure 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

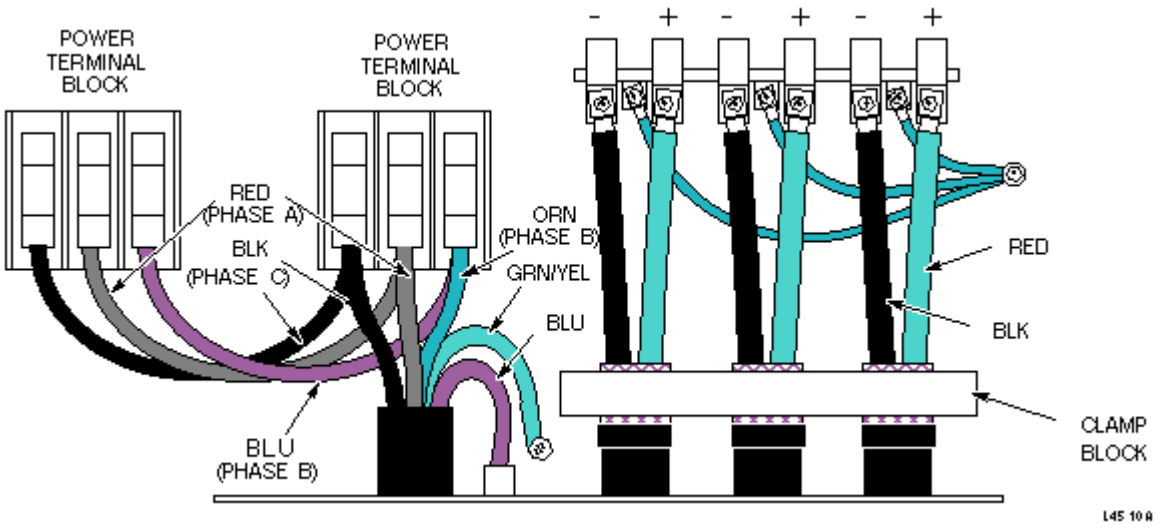


ILLUSTRATION L4510A
INCOMING POWER TO A DOUBLE-BAY 8645 GRADIENT CABINET

2-2 PreChecks before replacing Power Supply Board (Case 1):

1. Power down GRAM and Gradient Cabinets.

2. Measure the internal resistor banks (power resistors) for “shorts” or “open circuits”. See illustration 1. If any “shorts” or “opens”, there is additional internal damage to the GRAM and you must replace the whole GRAM (#T3503AS).

3. If all 4 measurements are close to the nominal 40 ohms, order a replacement Power Supply Board (#T3503TG).

4. Order a replacement Power Supply Board (#T3503TG) if any of the following are true:

- F2 fuse on Power Supply Board is open
- If resistance across CR33 diode is not 100 ohms
- Either R527 or R540 are open

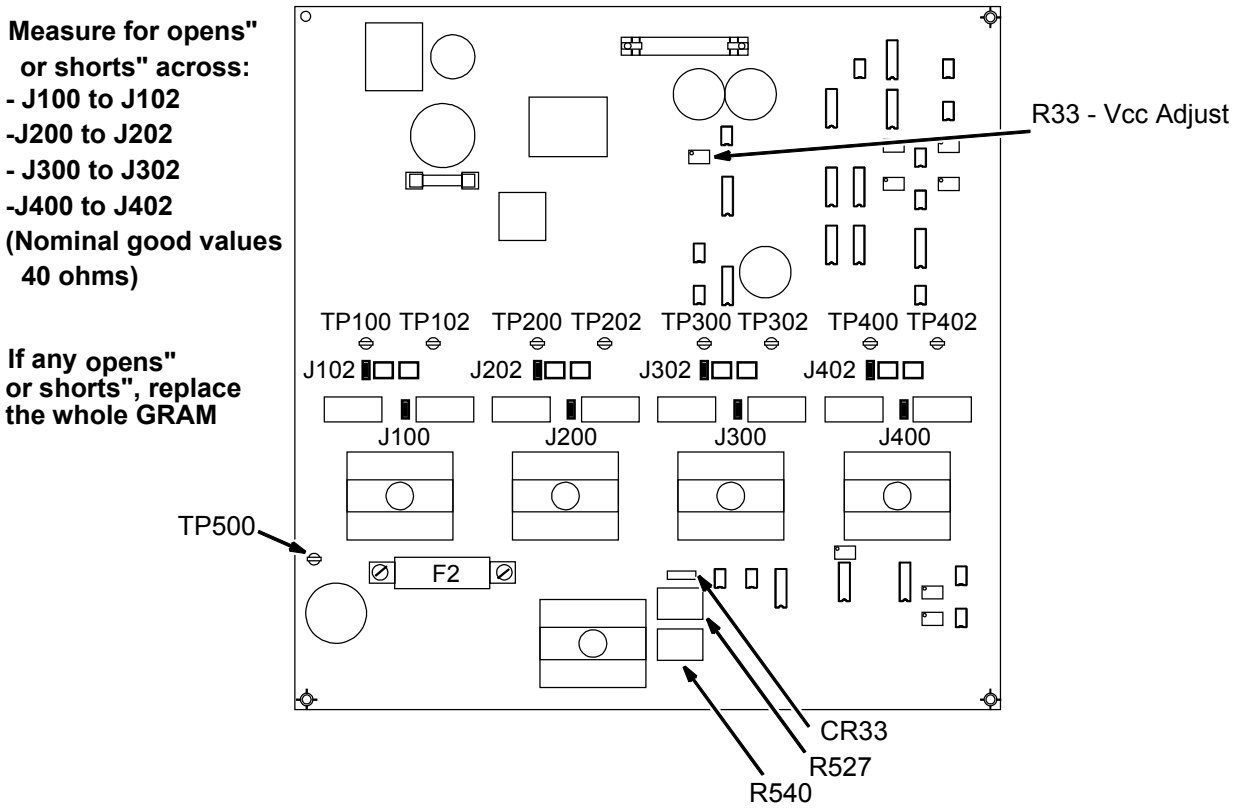


ILLUSTRATION 1
GRAM POWER SUPPLY BOARD

2-3 Power Supply Board Replacement Procedure (Case 1):

1. Power down GRAM and Gradient Cabinets by following Section 2-1, Lockout Gradient Power.

CAUTION

Shock Hazard! Capacitors inside GRAM must discharge for 5 minutes after power is turned OFF to GRAM cabinet. Verify _ 0 VDC across the following: TP400 - 402; TP300-302; TP200-202; TP100-102 before servicing the GRAM. See illustration 1.

CAUTION

Shock Hazard! There is a 300 VDC input to the Power Supply Board that must discharge for 5 minutes after power is turned OFF at GRAM cabinet. Verify _ 0 VDC from TP500 to F2 (right hand side of F2) before servicing the GRAM. See illustration 1.

2. Verify the following cables are labeled (mark if not). Remove all red and black leads, white power cables, and ribbon cable from the Power Supply Board. Remove all retaining screws to remove the bad Power Supply Board.

3. Install replacement Power Supply Board.

4. Affix 2 relay Warning labels that came with the replacement board if not present on GRAM. One to front cover (lower left corner) and one on the back cover (middle of cover).

5. Power ON the GRAM and Gradient Cabinets.

6. Measure V_{CC} (TP18 on front of Control Board to ground; see illustration 2) and verify 5 $\pm$ 0.05 VDC. Adjust using R33 on Power Supply Board if necessary. See Illustration 1.

7. Verify 400 $\pm$ 7.0 VDC is present in GRAM and on Power Supply Board by measuring at the following locations:

TP100-102; TP200-202; TP300-302; TP400-402; see illustration 1 for test point locations.

8. Proceed to Calibration Requirements section at end of this procedure.

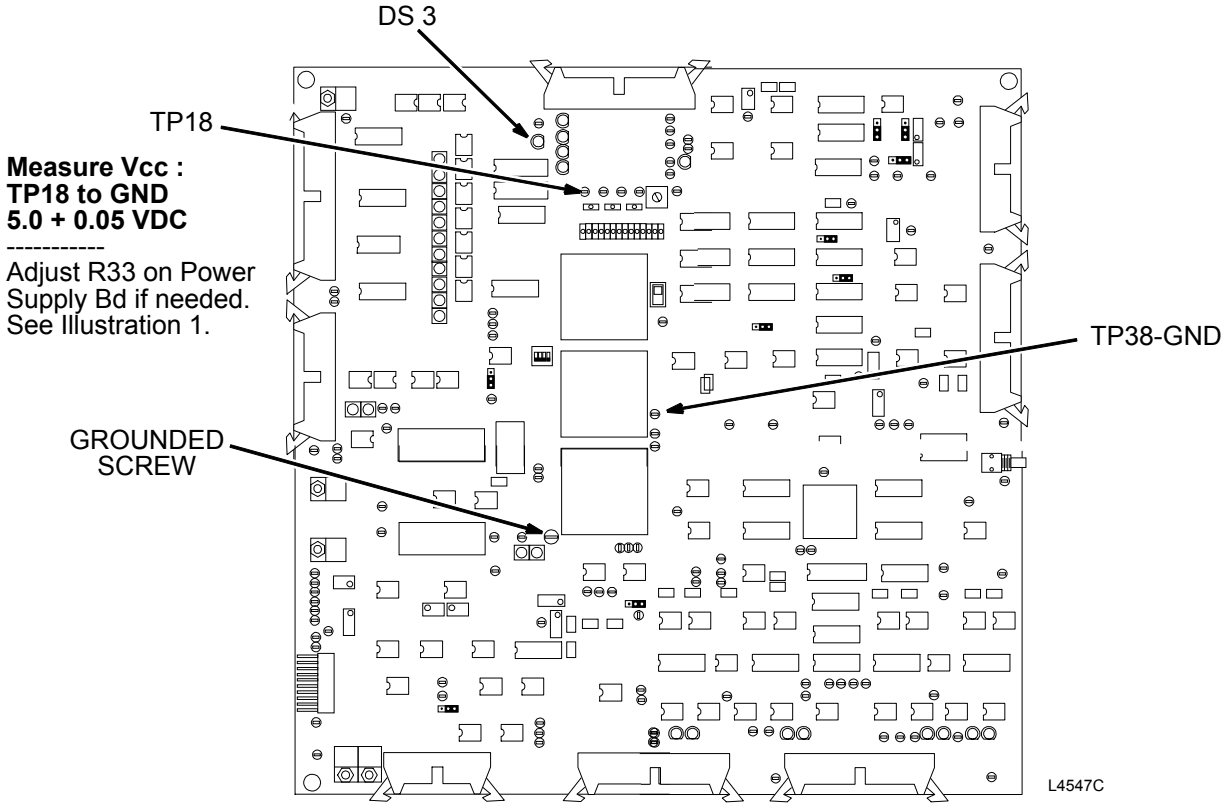


ILLUSTRATION 2
GRAM - CONTROL BOARD

3- SYMPTOMS (CASE 2): CONTROL BOARD

The following conditions are indicated on the GRAM or in the error log: "GRAM not responding", Round Robin Monitoring error, SPT Stability Failure, Overload, or GRAM won't tune.

3-1 Control Board Replacement Procedure (Case 2):

1. Power OFF the GRAM and Gradient Cabinets by following Section 2-1, Lockout Gradient Power.

CAUTION

Shock Hazard! Capacitors inside GRAM must discharge for 5 minutes after power is turned OFF to GRAM cabinet. Verify _ 0 VDC across the following: TP400 - 402; TP300-302; TP200-202; TP100-102 before servicing the GRAM. See illustration 1.

CAUTION

Shock Hazard! There is a 300 VDC input to the Power Supply Board that must discharge for 5 minutes after power is turned OFF at GRAM cabinet. Verify _ 0 VDC from TP500 to F2 (right hand side of F2) before servicing the GRAM. See illustration 1.

2. Remove Digital Tuning Board and Gradient Analog Service Module (GASM) Boards from front of Control Board.

Note

There is one screw that provides a ground connection to the Control Board. This is the one screw without a fiber washer and is shown in illustration 2. Keep track of this one and make sure you put it back in the same location or the board will not function properly.

3. Carefully remove all screws securing Control Board. Taking special care to keep track of grounding screw as noted above.

4. Replace the failed Control Board.

5. Install securing screws and then grounding screw into it's proper location as shown in Illustration 2.

6. Install Digital Tuning and GASM Boards. Take special care to ensure connectors are fully seated.

7. Power On GRAM and Gradient Cabinets.

8. Measure V_{CC} referring to illustration 2.

9. Proceed to Calibration Requirements section at the end of this procedure.

4- SYMPTOMS (CASE 3): GATE DRIVER BOARD

The following conditions are indicated on the GRAM or in the system error log: Overvoltage or Undervoltage, and GRAM Power Supply fault LED DS 3 on top left of Control Board is red. See illustration 2 for location of DS 3.

4-1 PreChecks before replacing Gate Driver Board (Case 3):

1. Open the hinged front cover of the GRAM to gain access to the Power Supply Board.

2. With power On to the GRAM, inspect the right front corner of the Power Supply Board for LED DS 1. If DS 1 is not lit, follow instructions in illustration 3.

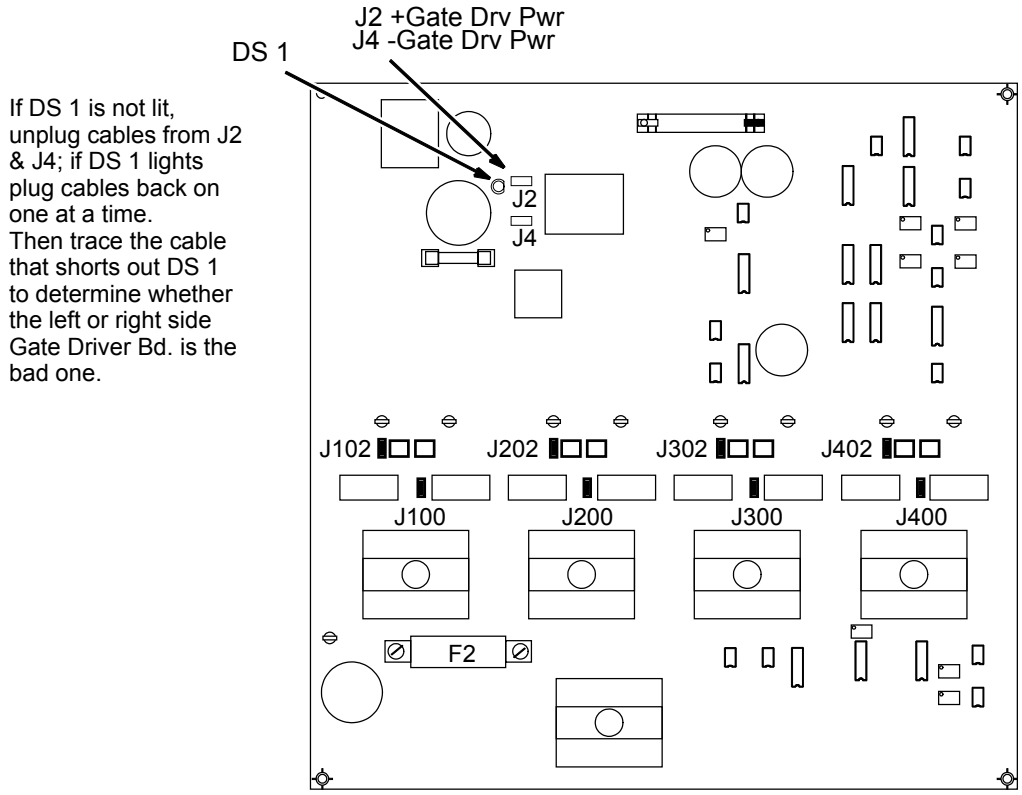


ILLUSTRATION 3
GRAM - POWER SUPPLY BOARD

3. Power OFF the GRAM and Gradient Cabinets by following Section 2-1, Lockout Gradient Power.

4. Remove the side cover (right or left as determined in step 2.) to gain access to the bad Gate Driver Board.

5. Inspect the Gate Driver Board for burned resistors and transistors. See illustration 4.

6. If components shown in illustration 4 are intact, order a replacement Gate Driver Board (#T3503CE).

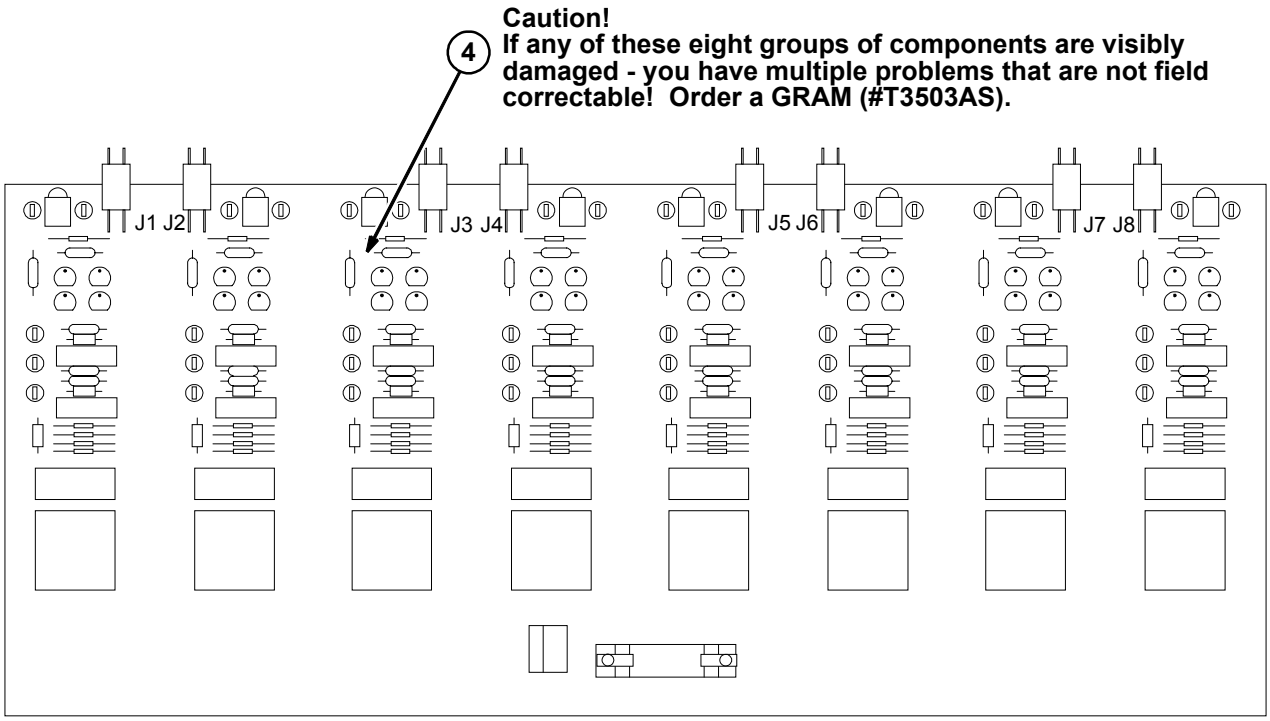


ILLUSTRATION 4
GRAM - GATE DRIVER BOARD

4-2 Gate Driver Board Replacement Procedure (Case 3):

1. Power OFF the GRAM and Gradient Cabinets by following Section 2-1, Lockout Gradient Power.

CAUTION

Shock Hazard! Capacitors inside GRAM must discharge for 5 minutes after power is turned OFF to GRAM cabinet. Verify _ 0 VDC across the following: TP400 - 402; TP300-302; TP200-202; TP100-102 before servicing the GRAM. See illustration 1.

CAUTION

Shock Hazard! There is a 300 VDC input to the Power Supply Board that must discharge for 5 minutes after power is turned OFF at GRAM cabinet. Verify _ 0 VDC from TP500 to F2 (right hand side of F2) before servicing the GRAM. See illustration 1.

2. Remove the cables from the failed board.

3. Remove the two screws that secure the board to the chassis.

4. There is no calibration required after replacing the Gate Driver Board.

5- CALIBRATION REQUIREMENTS:

The following calibrations must be performed following replacement of a GRAM Control Board or Power Supply Board.

For Release 8.x systems:
- GRAM Tuning For 8645/GRAM
- Gradient (Gradcal) Calibration
- LVShim Release 8.x
- EPI B0 Dither Non-Proprietary

For Release 5.x systems:
- GRAM Tuning - For 8645/GRAM Hardware
- Gradient Calibration (DQA Version)
- LVShim Release 5.6 (Sections 1-7)
- EPI B0Dither & Group Delay (Manual)

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	July 28, 1998	M. Whitlow	Initial Release
1	MAY 21, 1999	SM Atladottir	Updated Procedure References for New GUI
2	October 13, 1999	K. Keshena	Changed to document to proprietary header.