



GEI-100467

GE Industrial Systems

Exciter Ground Detector Module IS200EGDMG_

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met during installation, operation, and maintenance. If further information is desired or if particular problems arise that are not covered sufficiently for the purchaser's purpose, the matter should be referred to GE Industrial Systems.

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Safety Symbol Legend



Warning

Indicates a procedure, practice, condition, or statement that, if not strictly observed, could result in personal injury or death.



Caution

Indicates a procedure or condition that, if not strictly observed, could result in damage to or destruction of equipment.

Note Indicates an essential or important procedure or statement.

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Functional Description

The IS200EGDMH1 Ground Detection Module is used in the EX2100™ Excitation Control. It is a double slot, double height (6U) form factor board that mounts in the Exciter Power Backplane rack (EPBP). The field ground detector detects field leakage resistance between any point in the generator field circuit to ground, either on the ac or dc side. A simplex system will have one EGDM, and a redundant system will have three. The location of the EGDM(s) is shown in Figure 1. EXAM, the attenuator module, senses the voltage across the ground sense resistor and sends the signal to the EGDM(s) over a nine-conductor cable. The EXAM module is mounted in the High Voltage Module located in the Auxiliary Panel.

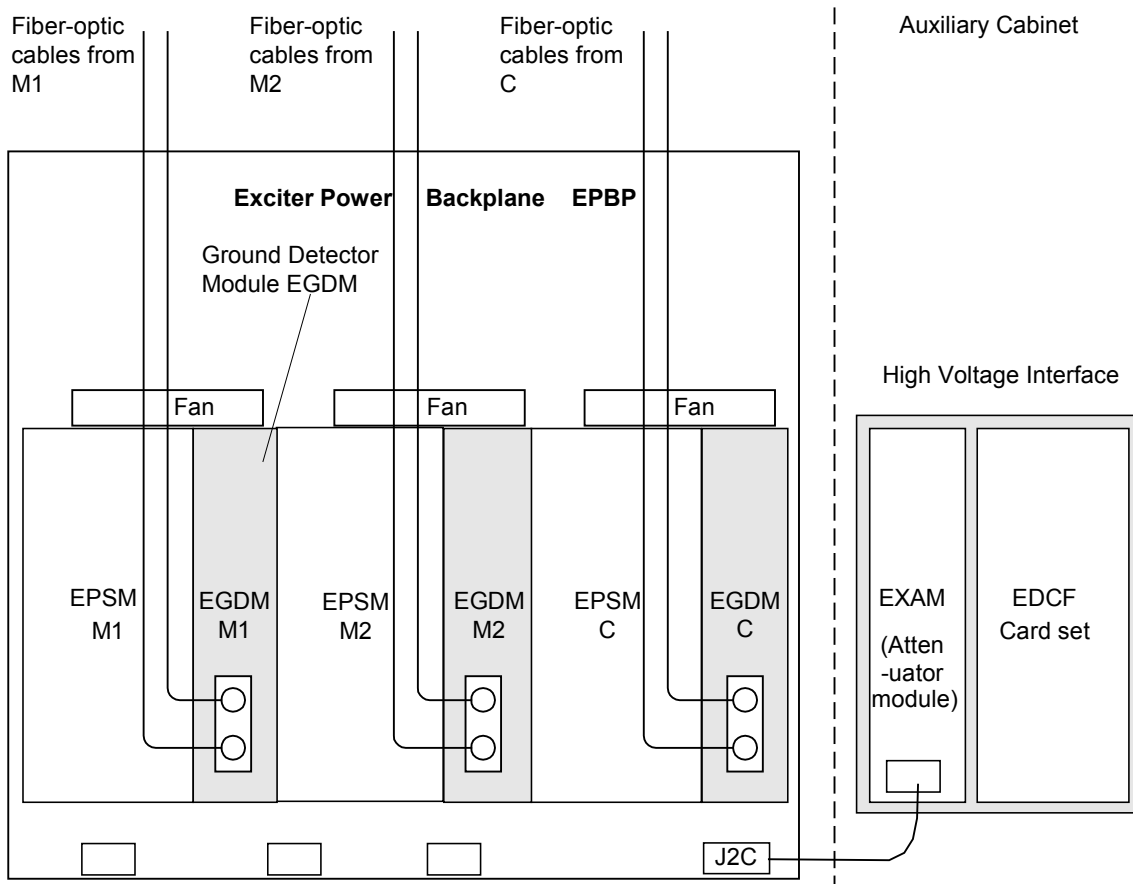


Figure 1. EGDM and Attenuator Module Mounting

In a redundant control, the set of three EGDM boards are configured as Controller (C), Master 1 (M1), and Master 2 (M2). The configuration for each EGDM is controlled by a set of program pins on the P2 connector. Information on which master provides the drive signal to the sense resistor in the Attenuator Module is sent from the DSPX, through the EISB in the controller rack, to EGDM C. Upon receiving this information over the fiber-optic link, C either powers the relay in the Attenuator Module if M2 is the driver, or leaves it unpowered if M1 is the chosen master. At the same time a differential signal is sent to M1 and M2 that indicates the chosen master. This signal enables the signal generator on the active master and selects the test command source on each module (M1, M2 and C). Now the active master receives an *Oscillator Signal* over the fiber optic link from the DSPX through the EISB that it converts to a positive or negative 50-volt signal. This square wave voltage is sent by cable to the EXAM module and applied to one end of the Sense Resistor.

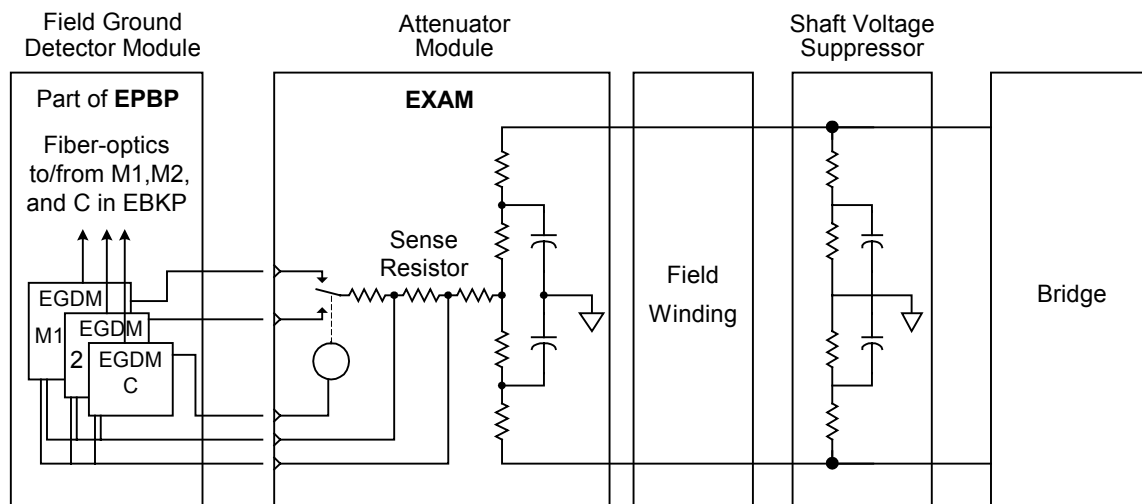


Figure 2. Ground Detector Functional Block Diagram

The signal conditioner receives an attenuated (10:1) differential signal from the Sense Resistor in the EXAM module. The signal conditioner is a simple unity gain differential amplifier with a high common-mode rejection ratio followed by an A-to-D converter (Voltage Controlled Oscillator VCO). The VCO feeds a fiber optic transmitter. The signal conditioner circuitry is powered by an isolated power supply to maintain personnel and equipment safety due to the high common-mode voltage at the Sense Resistor. The signal conditioner can measure the power amplifier output level by grounding the bridge side of the attenuated Sense Resistor on command from the control section.

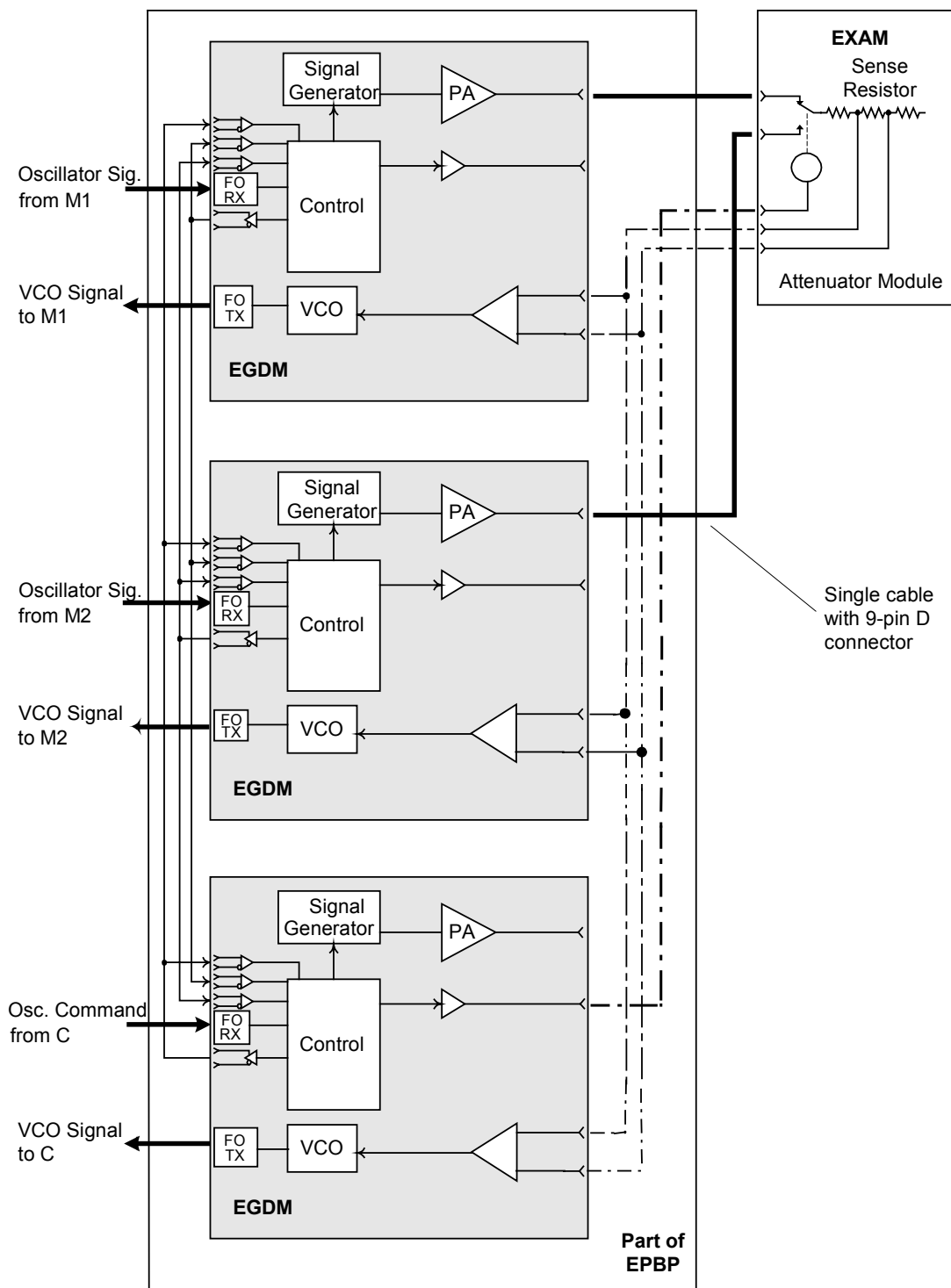


Figure 3. EGDM Interconnect Diagram

The C section of the controller receives all the programming and control signals from the various sources to determine which module will be the master. It also receives the oscillator signal from the DSPX so that it can generate a test command at each transition of the oscillator signal. The test command is a 250 ms long signal that can be retrIGGERED on every transition of the oscillator signal (even if the period of the signal is less than 250 ms).

This test command is then sent to the control section of each module (M1, M2 and C) to generate a 250 ms long test signal at each positive transition of the test command. This signal is not retriggerable and therefore the transitions must be separated by more than 250 ms before another test signal can be generated.

The power supply section receives 24 V dc from the appropriate EPSM through the EPBP (backplane). Using a dc to dc converter, it converts this into ± 65 V dc (non-isolated) for the power amplifier in the signal generator section, and +5 V dc (isolated) and ± 15 V dc (isolated) for the signal conditioning.

The power amplifier output is a voltage source with an output impedance less than 1.0 Ohm. The output voltage is a ± 50 Volt squarewave with a current limited to about 80 mA, and with a normal operating period of 5 seconds. During test operation the period reduces to 400 ms.

Application Data

Layout of the EGDM board is shown in Figure 4.

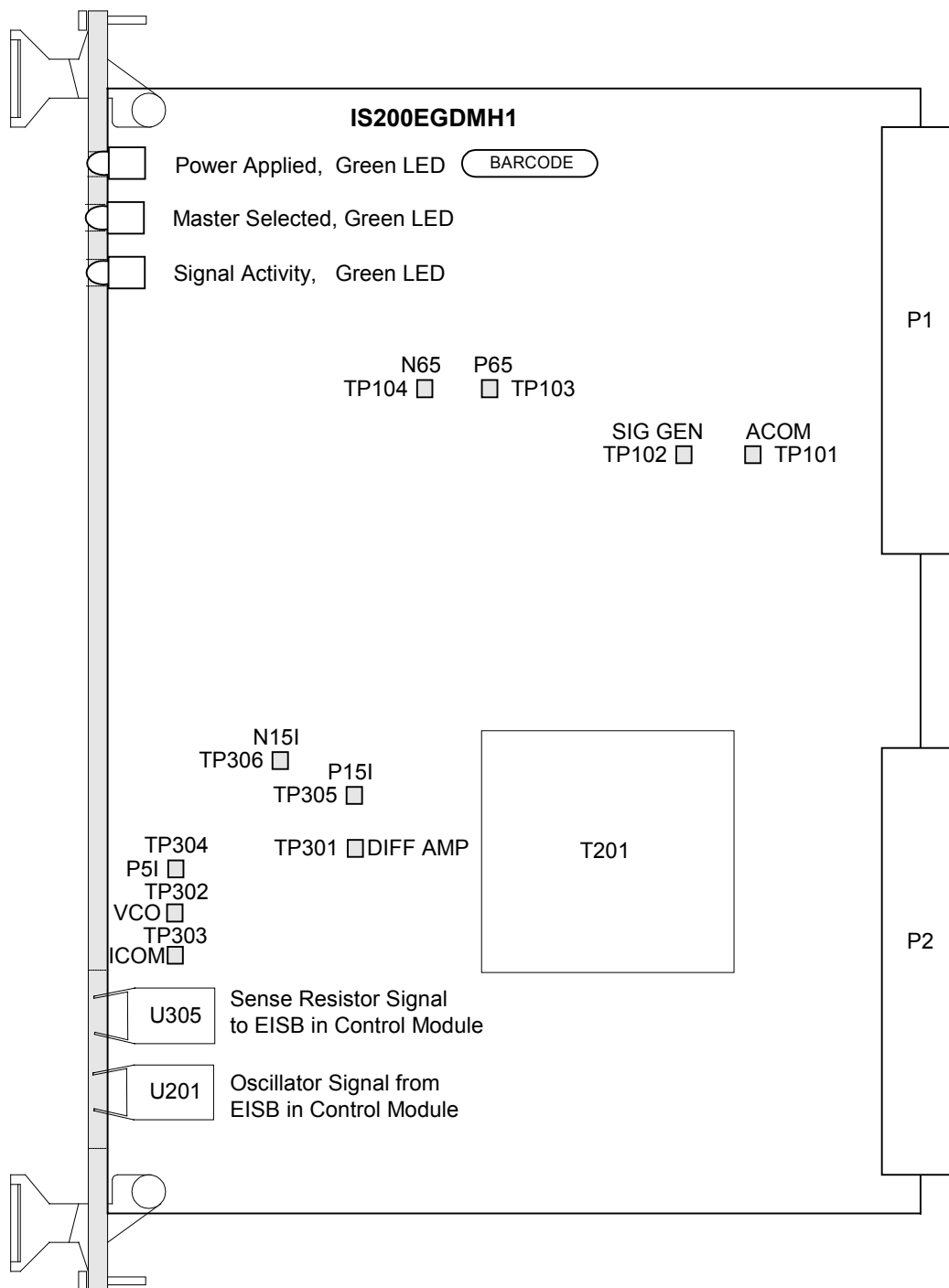


Figure 4. EGDM Board Layout

EXAM Cable Connector

The J2C cable connector on the power backplane carries the low frequency oscillator voltage to the EXAM module, and brings the voltage signal from the Sense Resistor back to the EGDMs. The J2C 9-pin sub-D connector pin descriptions are shown in Table 1.

Table 1. J2C Connector Pin Description

Pin Number	Nomenclature	Description
1	M1 AMP	Amplifier input from EGDM-M1
2	M2 AMP	Amplifier input from EGDM-M2
3	RLY 24V	24 V power to switching relay
4	SENSE ATT	Attenuator end of sense resistor
5	NC	Not connected
6	NC	Not connected
7	NC	Not connected
8	RLY DRV	Switching signal to relay from EGDM-C
9	SENSE AMP	Amplifier end of sense resistor

Fiber-Optic Connectors

On EGDM, the lower fiber-optic connector (U201) carries the oscillator signal from the EISB board. This is a Hewlett Packard HFBR2528 receive connector. The upper fiber-optic connector (U305) sends the sense resistor signal to the EISB board. This is a Hewlett Packard HFBR1528 transmit connector.

Indicators

Three green LEDs are located at the top of the front panel. These indicate board status as follows:

LED Indicators	Description
Upper LED	Power is applied to the board from the backplane
Middle LED	This board is selected as the master
Lower LED	This board is master and is sending a 50 volt signal

Test Points

Ten test points are located on the board as follows:

Test Points	Nomenclature	Description
TP101	ACOM	Analog Common
TP102	SIG GEN	Output from the signal generator
TP103	P65	+65 V dc
TP104	N65	-65 V dc
TP301	DIFF AMP	Sense signal output from the differential amplifier
TP302	VCO	Voltage controlled oscillator output
TP303	ICOM	Isolated Common
TP304	P5I	+5 V dc (isolated)
TP305	P15I	+15 V dc (isolated)
TP306	N15I	-15 V dc (isolated)

Board Replacement

Handling Precautions



Caution

To prevent component damage caused by static electricity, treat all boards with static sensitive handling techniques. Wear a wrist-grounding strap when handling boards or components, but only after boards or components have been removed from potentially energized equipment and are at a normally grounded workstation.

Printed wiring boards may contain static-sensitive components. Therefore, GE ships all replacement boards in antistatic bags.

Use the following guidelines when handling boards:

- Store boards in antistatic bags or boxes.
- Use a grounding strap when handling boards or board components (per previous *Caution* criteria).

For Exciters (Offline)

➤ To replace the board in a system offline



Warning

To prevent electric shock, turn off power to the exciter, then test to verify that no power exists in the board before touching it or any connected circuits.



Caution

To prevent equipment damage, do not remove, insert, or adjust board connections while power is applied to the equipment.

1. Make sure that the control panel has been de-energized. (Refer to the EX2100 Installation and Startup Guide, *GEH-6631*, for complete de-energizing procedures and follow all local practices of lock-out/tag-out).
2. Inside the control cabinet, test any electrical circuits **before touching them** to ensure that power is off.
3. Carefully disconnect all cables from the EGDM board as follows:
 - a. Verify all cables are labeled with the correct connector name (as marked on the board) to simplify reconnection.
 - b. Remove the two fiber-optic snap-in connectors and cables on the front of the board.



Caution

Avoid dropping any mounting hardware into the equipment as this could cause damage when power is reapplied.

4. Carefully remove the board from the rack, as follows:
 - a. Loosen the screws at the top and bottom of the faceplate, near the ejector tabs. (The screws are captive in the faceplate and should not be removed).
 - b. Unseat the board by raising both the ejector tabs.
 - c. Using both hands, gently pull it from the rack.
5. Slide the replacement board into the **correct slot** in the rack.
6. Begin seating the board by firmly pressing the top and bottom of the faceplate at the same time with your thumbs.
7. Finish seating the board in the slot by starting and then tightening the screws at the top and bottom of the faceplate. **Tighten the screws evenly** to ensure that the board is seated squarely.
8. Reconnect the two communication cables that were disconnected when the old board was removed.
9. Close the control cabinet door.

For Redundant Exciters (Online)

For a **redundant** control system, it is possible to replace a failed EGDM while the exciter is running. You have the option to leave the failed EGDM in place, and let the exciter run on the remaining EGDMs. However, in the unlikely event of a second failure in another control section, the exciter will shut down. If you decide to change the EGDM, follow the procedure below.

➤ To replace a board in a redundant system online

1. Open the control cabinet door and locate the failed EGDM from the indicators on the front of the three boards. Confirm the failed EGDM using the toolbox diagnostics.



Warning

Great care should be taken in replacing the module since the other controllers, power supplies, and terminal boards are still energized and active.

2. De-energize the section of the power supply rack (EPBP) containing the EGDM to be replaced. This section is de-energized by switching off the appropriate output of the exciter power distribution module (EPDM).
3. Check the EGDM LEDs to confirm that control is transferred to the other master. Check that the LED indicator on the appropriate section of the EPDM is off, and the indicators on the EPSM are off.
4. Carefully disconnect all cables from the failed EGDM board as follows:
 - a. Verify all cables are labeled with the correct connector name (as marked on the board) to simplify reconnection.
 - b. Remove the two fiber-optic snap-in connectors and cables on the front of the board.
5. Carefully remove the EGDM from the power supply rack as follows:
 - a. Loosen the screws at the top and bottom of the faceplate, near the ejector tabs. (The screws are captive in the faceplate and should not be removed.)
 - b. Unseat the module by raising the ejector tabs.
 - c. Using both hands, gently pull it from the rack.

**Caution**

Because EGDM are designed for specific rack slots, inserting the EPSM into the wrong slot can damage the electronics. Refer to the power supply rack diagram in the *EX2100 User Guide GEH-6632* for correct location.

6. Slide the replacement EGDM into the **correct slot** in the rack.
7. Begin seating the board by firmly pressing the top and bottom of the faceplate at the same time with your thumbs.
8. Finish seating the module in the slot by starting and then alternately tightening the screws at the top and bottom of the faceplate. **Tighten the screws evenly** to ensure that the module is seated squarely.
9. Reconnect the two fiber-optic communication cables disconnected in step 3.
10. Apply power to the appropriate section of the power supply rack from the EPDM, and check that the EGDM power indicator comes on. Check that the green power LEDs on the corresponding controller boards come on.
11. Close the cabinet door.

Renewal/Warranty Replacement

How to Order a Board

When ordering a replacement board for a GE exciter, you need to know:

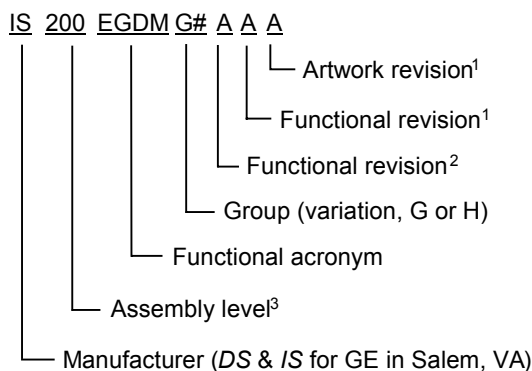
- How to accurately identify the part
- If the part is under warranty
- How to place the order

This information helps ensure that GE can process the order accurately and as soon as possible.

Board Identification

A printed wiring board is identified by an alphanumeric **part (catalog) number** located near its edge. *Board Part Number Conventions* explains the structure of the part number.

The board's functional acronym, shown in Figure 4, is normally based on the **board description**, or name. For example, the EGDM board is described as the *Exciter Ground Detector Board*.



¹Backward compatible

²Not backward compatible

³200 indicates a base-level board; 215 indicates a higher-level assembly or added components (such as PROM)

Board Part Number Conventions

Warranty Terms

The GE *Terms and Conditions* brochure details product warranty information, including **warranty period** and **parts and service coverage**. The brochure is included with customer documentation. It may be obtained separately from the nearest GE Sales Office or authorized GE Sales Representative.

Placing the Order

“+” indicates the international access code required when calling from outside of the USA.

Parts still under **warranty** may be obtained directly from the factory:

GE Industrial Systems
Product Service Engineering
1501 Roanoke Blvd.
Salem, VA 24153-6492 USA

Phone: + 1 888 GE4 SERV (888 434 7378, United States)
+ 1 540 378 3280 (International)

Fax: + 1 540 387 8606 (All)

Renewals (spares or those not under warranty) should be ordered by contacting the nearest GE Sales or Service Office. Be sure to include:

- Complete part number and description
- Exciter serial number
- Exciter Material List (ML) number

Note All digits are important when ordering or replacing any board. The factory may substitute later versions of replacement boards based on availability and design enhancements. However, GE Industrial Systems ensures backward compatibility of replacement boards.



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