



GEI-100526A

GE Industrial Systems

Exciter Regulator Options Board IS200EROCH_A

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GE Industrial Systems

Post Sales Service

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)

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Mr. Lucian

Sales manager

Joyoung International Trading Co., Ltd

Whatsapp/Wechat: +86 18106906650

Email: Lily@htechplc.com

Mobile: +86 18106906650

Website: www.xm-dcs.com

Address: Room 1503, Building B, Diamond Coast,
No. 96 Lujiang Road, Siming District, Xiamen Fujian

Wechat



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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.

Functional Description

The EROC can also be used as the simplex ground detector board in EX2100 full static control and Alterrex™ applications. Refer to the section Full Static Control Applications for details.

The IS200EROCH_A Exciter Regulator Options Card (EROC) is used in EX2100™ regulator control systems (simplex and redundant) to provide support for the regulator functions. The EROC mounts in a single slot of the IS200ERBP Exciter Regulator Backplane (ERBP) and IS200ERRB Exciter Regulator Redundant Backplane (ERRB). The EROC includes a board identification (ID) device that interfaces to the M1 or M2 control associated with the specific backplane slot. The ID device includes the barcode serial number, board type, and hardware revision. A green LED on the EROC faceplate illuminates when power is applied. There are two versions or groups of the EROC board, EROCH1 and EROCH2. The differences are described in the following sections.

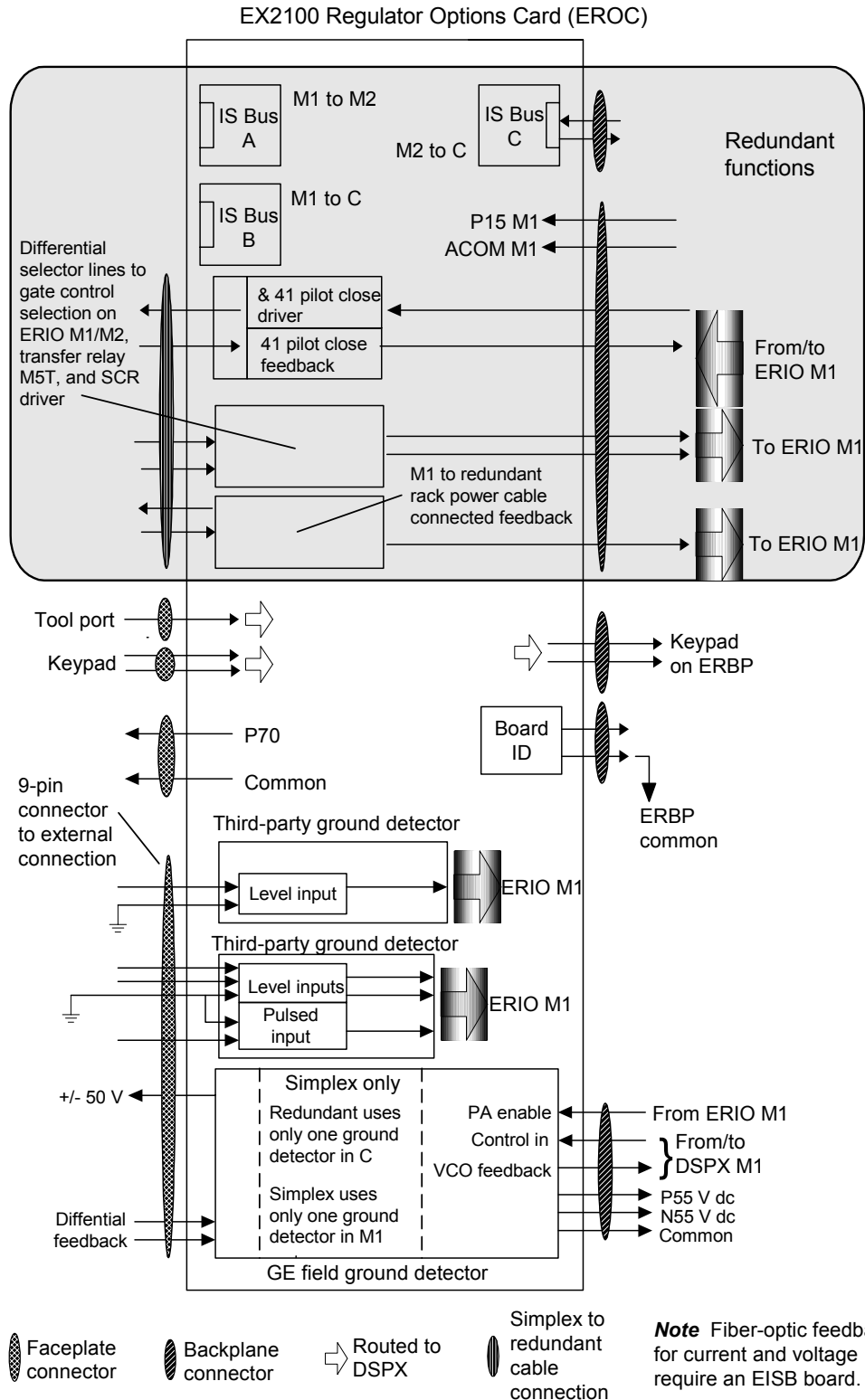
Functions include GE and third-party ground detectors, keypad interface, tool interface, and terminal board power connection. Other functions of the EROC are only used in redundant applications that are described separately in this section. Simplex functions are shown below.

A keypad connector is provided on the EROC faceplate and another on the backplane (ERBP simplex and ERRB redundant). The EROC provides keypad data transmission to both connectors. Only one keypad can be connected at a time. The keypad connectors support the bezel-mounted keypad(s). The two locations are to support mounting variations of the EX2100 regulator control. The EROC communicates with the keypad connectors using RS-232C (1200 to 38.4 K baud).

Ground loop isolation for the tool connector is provided by the dc/dc converter.

The tool connector on the EROC faceplate interfaces an external computer to the IS200DSPX Digital Signal Processor Control board (DSPX) through a 9-pin plug connector. The tool connector supports M1/M2 and uses RS-232C (1200 to 38.4 K baud).

The ECTB connector supplies positive 70 V dc power to the contact output section of the IS200ECTB Exciter Contact Terminal board (ECTB).



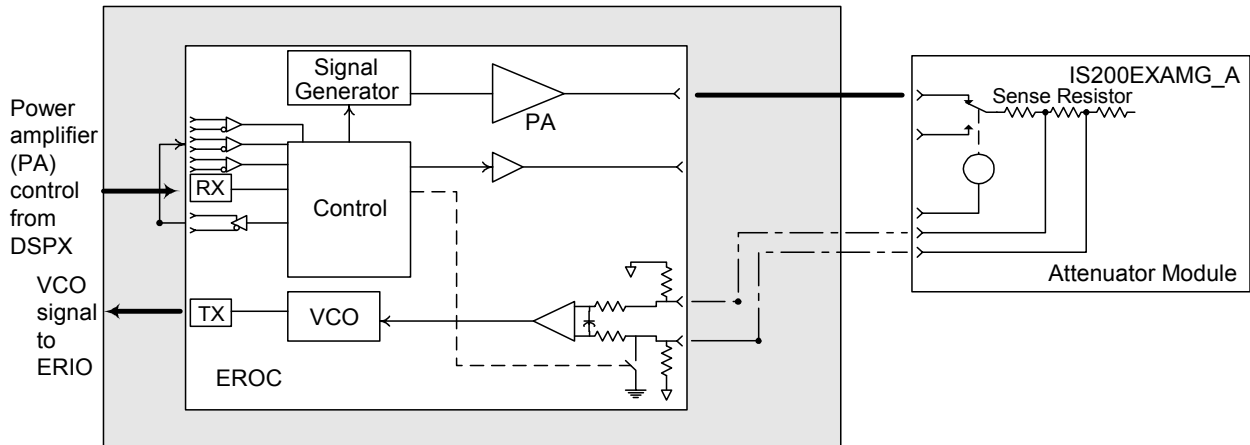
EROC Simplex Application Functional Block Diagram

Ground Detector

The GE ground detector may be used as a simplex ground detector in other exciter applications.

The ground detector connector supports connecting a GE ground detector or a third-party ground detector. Either ground detector can be used in simplex or redundant applications. Third-party ground detectors require the use of an IS200ERGT Exciter Regulator Ground Detector Terminal Board (ERGT) to interface to the EROC.

A GE ground detector interfaces with the IS200EXAM Exciter Attenuation Module (EXAM) through the 9-pin ground detector connector. The function block diagram is shown below:



EROC Ground Detector to EXAM Interface Block Diagram

A GE simplex ground detector is controlled by the M1 DSPX. This configuration uses the ERBP backplane, the M1 EROC, and the M1 IS200EPSM Exciter Power Supply Module (EPSM).

A GE redundant ground detector is controlled by the M2 DSPX. This configuration uses the ERRB backplane, the M2 EROC, and the M2 EPSM. The 9-pin ground detector cable is connected to the EROC in the redundant rack. No cable is connected to the M1 EROC ground detector connector.

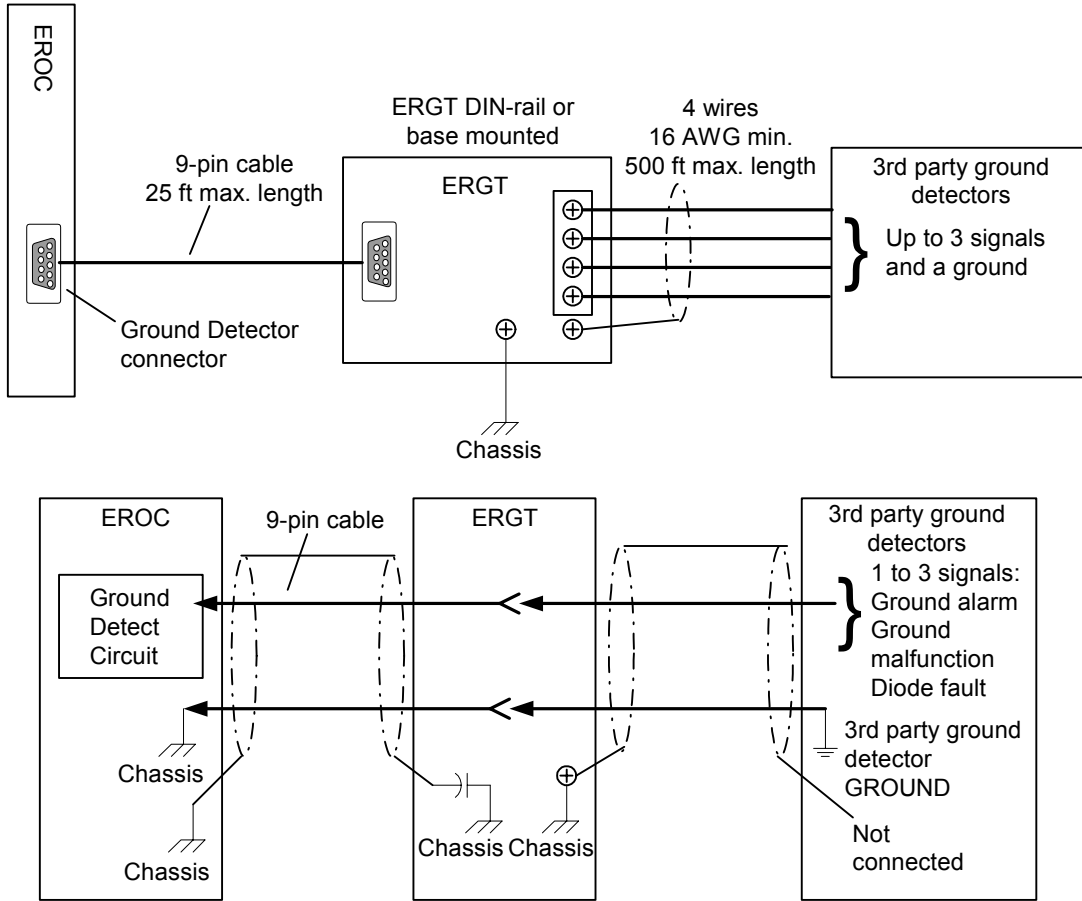
Third-party Ground Detector

Because an external power supply feeds the third-party ground detector, a ground voltage difference between its output and the EROC may exist. A signal conditioning circuit is used to compensate for the potential differences.

The EROC supports a single third-party ground detector with up to three outputs:

- Ground alarm
- Ground detector malfunction
- Diode fault monitor.

Third-party ground detectors are powered from an external source not associated with EX2100 regulator control power. Third-party ground detectors interface to the EROC through the ERGT as shown below.



EROC Third-party Ground Detector Interface Block Diagram

A simplex third-party ground detector is controlled by the M1 DSPX. This configuration uses the ERBP backplane, the M1 EROC, the ERGT, and the M1 EPSM.

A redundant third-party ground detector is controlled by the M2 DSPX. This configuration uses the ERBP backplane, the M2 EROC, the ERGT, and the M2 EPSM. The 9-pin ground detector cable is connected to the EROC in the redundant rack. No cable is connected to the M1 EROC ground detector connector.

Redundant Only Applications

The EROC redundant connector interfaces signals between the M1 EROC and the M2/C EROC. A diagnostic detects the presence or absence of the cable between the EROCs.

ISBus Simplex to Redundant Rack Interface

The EROC ISBus connectors interface functionality (M1 to C and M1 to M2) between M1 (ERBP) and M2/C (ERRB) of transmit and receive signals for system and local channels. The transceivers use the RS-422 standard, and the EROC uses RS-485, which has RS-422 as a subset.

The EROC in M2/C (ERRB) provides full functionality of the ISBus signals between sections M2 and C. Both M2 and C transmit and receive for system and local channels. The M2 to C and C to M2 signals are routed through the backplane connectors from the transmitting DSPX to the EROC, buffered and sent to the receiving DSPX. The M2 to C and C to M2 channels within ERBB are not transformer coupled.

In redundant applications, the EROC provides support for the regulator redundant system connections and ISBus as shown below.

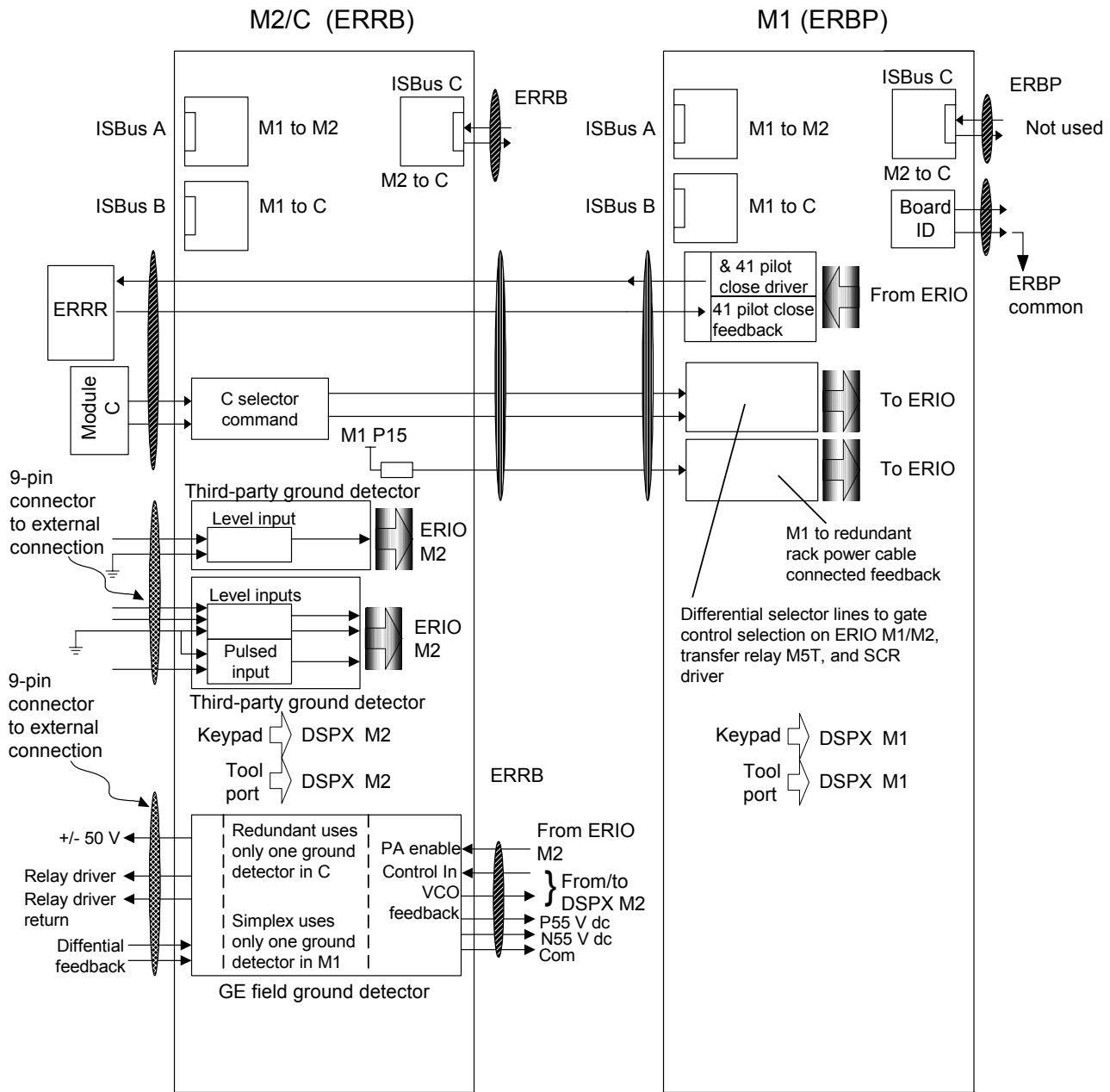
Full Static Control Applications

In addition to the applications of EROC in EX2100 regulator control systems, EROC is used in EX2100 full static systems.

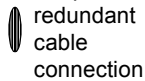
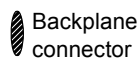
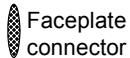
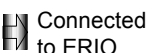
In Simplex control, EX2100 static control using the IS200ESBP Exciter Simplex Backplane (ESBP), a single EROCH1 mounts in a slot of ESPB. This applies for all simplex static control, regardless of bridge rating and application, including potential source, compound source, and Alterrex systems. In these applications, EROC also provides the interface to the RS-232 C tool connector and the keypad, both mounted on the door of the control cabinet. EROC also provides the interface to the EXAM board used with the GE simplex ground detector described in a previous section. These interface are provide via faceplate connectors.

EROCH2 is used in redundant EX2100 full static controls for Alterrex applications. Two EROC boards are installed in slots in the IS200EPBP Exciter Power Backplane (EPBP). This backplane has three redundant sections called M1, M2, and C. One board installs in the M1 IS200EGDM Exciter Ground Detector Module (EGDM) slot, and one installs in the M2 EGDM slot. The corresponding C EGDM slot is not used in Alterrex applications. In non-Alterrex applications, these three slots contain EGDMs to provide a single redundant GE ground detector.

In these Alterrex applications, two EROC boards are used to provide two simplex GE ground detector interfaces. The M1 EROC connects via the faceplate connector to an EXAM board that is connected to the exciter field circuit to detect exciter grounds. The M2 EROC connects to an EXAM board that is connected to the generator field circuit to detect generator grounds. Both EROC boards connect via fiber optic cables to IS200EISB Exciter ISBus Board (EISB) in the control rack, in the corresponding M1 and M2 sections.



Legend:



Note Fiber-optic feedbacks for current and voltage require an EISB board.

EROC Redundant Applications Functional Block Diagram

Application Data

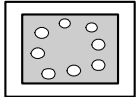
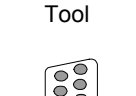
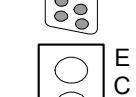
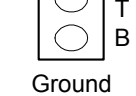
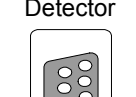
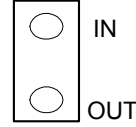
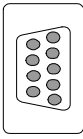
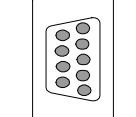
The EROC is a double-slot height (6U) board with 96-pin P1 and P2 backplane connectors. It has no fuses or testpoints. One green LED (Power) illuminates when power is applied.

The EROC operates from the following power supply inputs:

Digital +5.0 V dc $\pm 5\%$ @ 5 Watts Maximum

Analog ± 15 V dc $\pm 10\%$ @ 15 Watts Maximum

Connectors on the EROC faceplate are as shown below and outlined in the following sections.

EROCH 1	Application	Regulator	Simplex Full Static Control	Redundant Regulator Control Alterrex Static Control	EROCH 2
 Power					 Power
 ISBus M1 - M2	EROCH Groups:	H1	H1	H2	
 ISBus M1 - C	Connector				
 Keypad	ISBus	Used for redundant regulator controls. Not simplex	Not used	Not present	
 Tool	Keypad	Connects to keypad	Connects to key pad on control cabinet door	Not present	
 Tool	Tool	Connects to toolbox (PC COM port)	Connects to toolbox port on control cabinet	Not present	
 ECT P70	Ground Detector Fiber Optics	Not present	Not present	Connects to EISB board in control rack	
 Ground Detector	ECTB P70	Connects to ECTB	Not used	Not present	 Ground Detector IN OUT
 Redundant	Ground Detector (EXAM)	Connects to EXAM	Connects to EXAM	Connects to EXAM	 EXAM
 Redundant	Redundant	Used for redundant regulator controls	Not used	Not present	

EROCH Faceplates and Connector Applicability Chart

Keypad Connector

The keypad connector is located on the EROC faceplate. It is an 8-pin circular DIN connector and signals are as follows:

Keypad Connector Pin Signals

Pin #	Signal
1	KPP24
2	KPTX232
3	KPRX232
4	KPCOM
5	KPCOM
6	KPCOM
7	KPP24
8	KPRTS232

Tool Connector

The tool connector is located on the EROC faceplate. It is a 9-pin plug connector and signals are as follows:

Tool Connector Pin Signals

Pin #	Signal
1	Not connected
2	TLRX232
3	TLTX232
4	Not connected
5	TLICOM
6	Not connected
7	TLRTS232
8	Not connected
9	Not connected

ECTB Connector

The J13 ECTB connector is located on the EROC faceplate. It is a 3-pin mini connector and signals are as follows:

J13 ECTB Connector Pin Signals

Pin #	Name
1	P70
2	Not connected
3	ICOM

Ground Detector Connector

The ground detector connector is a 9-pin receptacle connector on the EROC faceplate and pin signals are as follows.

Ground Detector Connector Pin Signals

Pin #	Signal	Description
1	M1_PA	GE ground detector power amplifier output
2	GDET_MAL	Third-party ground detector malfunction
3	-----	Not connected
4	SEN_ATT	GE ground detector input
5	COM_GD	Third-party ground detector common
6	GDET_ALM_II	Third-party ground detector alarm fault
7	DIO_MON	Third-party ground detector diode fault monitor
8	GDET_ALM_I	Third-party ground detector alarm fault
9	SEN_AMP	GE ground detector input

Redundant Connector

The redundant cable connector connects the M1 EROC to the M2/C EROC. It is a 9-pin plug connector located on the EROC faceplate and pin signals are as follows:

Redundant Connector Pin Signals

Pin #	Signal	Description
1	SEL_P	Master Select Line Positive
2	-----	Not connected
3	-----	Not connected
4	CABLE_RR	Redundant Rack Cable Diag. Output (M2) and Input (M1)
5	K41_FDBKR	M1 K41 Coil Feedback
6	SEL_N	Master Select Line Negative
7	CABLE_RTN	Return line for Cable_RR
8	-----	Not connected
9	K41_DRVVR	M1 K41 Driver

ISBus Connectors

The ISBus cable connectors (M1-M2 and M1-C) connect the M1 rack to the M2/C rack through two jack connectors on the EROC faceplate. Pin signals are as follows:

ISBus Connector Pin Signals

Pin #	Signal	Description
1	ISBTX_AP	Transmit signal positive
2	ISBTX_AN	Transmit signal negative
3	ISBRX_AN	Receive signal negative
4	-----	Short to pin 5
5	-----	Short to pin 4
6	ISBRX_AP	Receive signal positive
7	-----	Not connected
8	-----	Not connected

The EROC to EROC ISBus cable connection requires a cable with a wire crossover. The crossover routes the transmit lines to the receive lines. The positive transmit to negative receive prevents asymmetrical waveshape due to the RS-485 driver. Wire crossover must be as follows:

- Pin 1 - Pin 3
- Pin 2 - Pin 6
- Pin 3 - Pin 1
- Pin 6 - Pin 2

Renewal/Warranty Replacement

Board 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 anti-static bags.

Use the following guidelines when handling boards:

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

Replacement Procedures

The EROC is mounted in the ERBP and ERRB (regulator), or ESBP and EPBP (full static control), and is replaced as a single board. It is recommended that the customer stock a spare EROC. It is not online replaceable in any applications, including redundant regulator control.



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.

Refer to the Installation and Startup Guide GEH-6674 or GEH-6631, for complete de-energizing procedures and follow all local practices of lock-out/tag-out.

➤ **To replace the EROC**

1. Make sure that the board rack in which the EROC resides has been de-energized.
2. Open the exciter control cabinet door, and test any electrical circuits **before touching them** to ensure that power is off.
3. Verify all cables are labeled with the correct connector name, as marked on the EROC faceplate, to simplify reconnection.
4. Disconnect all cables from the EROC (including redundant and ISBus if present).

**Warning**

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

5. Carefully remove the EROC 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 EROC by raising the ejector tabs.
 - c. Using both hands, gently pull it from the rack.
-

**Caution**

Because EROC is designed for specific backplane slots, inserting the EROC into the wrong slot can damage the electronics.

6. Slide the replacement EROC 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 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 module is seated squarely.
9. Reconnect all cables that were disconnected in step 4.
10. Close the exciter control cabinet door.

How to Order a Board

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

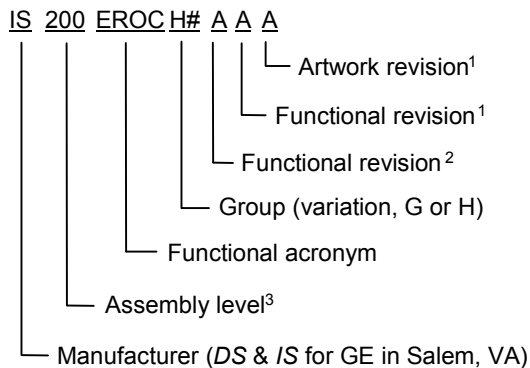
- How to accurately identify the part
- If the part is under warranty
- How to place the order

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. The following figure explains the structure of the part number.

The board's functional acronym, shown below, is normally based on the **board description**, or name. For example, EROC is described as the *Exciter Regulator Options Card*.



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

This number identifies the EROC. If the control rack is required, it must be ordered using a different number.

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.

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

Placing the Order

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

GE Industrial Systems
Post Sales Service
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.



GE Industrial Systems