GE Industrial Systems

Exciter Control Interface Board IS200EXICH_A_ _

Safety Symbol Legend

Warning

Indicates a procedure or condition 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.

These instructions do not purport to cover all details or variations in equipment, nor to provide 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.

Section ***Page***

Functional Description

The IS200EXIC Exciter Control Interface Board (EXIC) is used in Innovation Series™ Medium Voltage - SP Drives. It provides the necessary control interface functions between the IS200DSPX Digital Signal Processor Board (DSPX) and the IS200EXIB Exciter Bridge Interface Board (EXIB). The EXIC board also interfaces to the drive master controller through the ISBus. The DSPX board is connected directly to the EXIC board with a 128-pin DIN connector to control all exciter and signal processing functions and to coordinate those functions with other controllers through the ISBus if necessary. The EXIC board interfaces to the EXIB board through a 44-pin cable, J1.

The EXIC board receives its power from the EXIB board (connector J15) and provides the operating power to the DSPX board (connector P1). A pushbutton-initiated RESET function is also included on the EXIC board.

An RS-232C tool port (J9) and interface circuit is provided on the EXIC board. It consists of a user connector, interface logic and isolation, and signal routing to the appropriate DSPX board I/O pins. This provides communications to the DSPX board by an external terminal.

ISBus communication is provided through two ports (J11A and J11B), coupling transformers, and the necessary drivers and receivers to interconnect them. This provides communication between the DSPX board and other devices of an ISBus communications network.

Voltage Feedback Signal Conditioning

Five voltage feedback signal conditioning circuits are provided for the three ac and two dc voltage feedbacks received from the EXIB board. All five perform identical functions except where noted.

The voltage feedbacks are input to the EXIB board as single-ended signals and then attenuated. The attenuated signals are differentially summed on the EXIC board to reconstruct the V_{L-L} (ac bridge input) and Vp-n (dc bridge output) voltages.

- AC Line-to-Line voltages: (VA1, VB1, VC1 - zero to ±5 V peak, 50/60 Hz)
  VA1 – VB1 = VAB ($V_{L-L,}$ ϕA–ϕB ÷ 250)
  VB1 – VC1 = VBC ($V_{L-L,}$ ϕB–ϕC ÷ 250)
  VC1 – VA1 = VCA ($V_{L-L,}$ ϕC–ϕA ÷ 250)
- DC bridge output voltage: (VP1 [0 to +5 V dc], VN1 [0 to –5 V dc])
  VP1 – VN1 = VPN (Full-Wave Rectified 3ϕ ac volts ÷ 250)

Optional Rescaling and Filtering

Optional rescaling of the attenuated inputs is provided. Amplifier gain is selectable to allow rescaling of the feedbacks to improve resolution when the ac input to the SCR bridge is approximately 300 V rms or less.

Required gain selections are:

301 V – 600 V:	Gain = 1
<300 V:	Gain = 2.5

Optional dv/dt filtering of all three ac line-to-line voltage feedbacks is simultaneously originated by the DSPX board.

Voltage to Frequency Conversion

The EXIC board's voltage controlled oscillator (VCO) provides voltage to frequency conversion of the differential voltages for input to the DSPX board.

The VCO input is center-biased so that the output frequency is 1.0 MHz with an input of zero. Scaling allows an output range of 0 – 2 MHz for a bridge feedback of approximately –1200 to +1200 V peak when the high voltage attenuation range is selected. Each VCO output is routed to a VCO compatible input on the DSPX board.

Current Feedbacks

There are two separate dc current feedback inputs (Hz/volt signals) from the EXIB board through a multi-conductor cable (J1). One input is for current regulator feedback (IFB) and the other for the timed overcurrent model (ITOC). These feedback signals are routed to VCO compatible inputs on the DSPX board.

IFB Range = 0 – 2 MHz corresponding to 0 – 2.5 pu shunt current.

ITOC Range = 0 – 2 MHz corresponding to 0 – 5.0 pu shunt current.

Note A frequency-to-voltage (F-V) converter is provided for diagnostics use during test and startup. The analog output is accessible through a test ring.

Logic Inputs

MOV fuse status is supplied from a single logic input from the EXIB board that will change state if one of the three MOV fuses opens. EXIB board status is supplied from another single logic input from the EXIB board that annunciates power supply status.

Three isolated circuits accept external logic inputs. The signal potential (from EXIB board) for these is 120 V rms, 50/60 Hz. These three input circuits are identical and provide the following input functions:

- CB - Allows diametric bridge gating if CB opens (CB closed = circuit breaker closed)
- RUN - Permissive to supply field excitation (RUN closed = run permissive)
- SIG - Additional Permissive (SIG closed = additional run permissive, required for LCI)

Power Supply Inputs

Power supply inputs for the EXIC and DSPX boards are supplied from the EXIB board through the J15 connector. Power inputs are as follows:

- +5.0 V dc (± 0.1 V) @ 2.0 amps
- +24.0 V dc (± 0.25 V) @ 0.11 amps
- –24.0 V dc (± 0.25 V) @ 0.11 amps

SCR Gating

Six gate command logic signals (GATE1C – GATE6C) are generated for the six SCRs in the exciter bridge. The gate command signals are routed through a multi-conductor cable (J1) to the EXIB board.

Note If the circuit breaker contacts open during gating, as indicated by the sensing circuit at TB1-12 and TB1-13, gate command pulse trains are transmitted to both SCRs in any one phase of the bridge through normal gate signal paths. Gating continues for as long as field current is sensed.

Relay Contact Outputs

Three relay contact outputs are provided to supply isolated *Form C* contact sets. Each relay logic output consists of one normally open (NO), one normally closed (NC), and a common (COM) connection between the two. These contact sets supply output annunciation of the READY, ALARM, and FAULT signals.

Meter Output Driver Circuits

A connector allows user access to two meter-driver outputs (MTR1 and MRT2). Each output consists of a meter driver circuit with a range of ± 10 V dc.

Application Data

The EXIC board has no fuses or adjustable jumpers and includes one RESET switch. The board has LED indicators, test rings, and testpoints for power supply and signal diagnostic purposes. It also has seven plug connectors, two RJ45 ISBus ports, one stab-on connector (E121, GND), and two terminal boards for signal interfacing. See Figure 1 for the locations of these devices. Refer to the following tables for device descriptions:

Table	Description
1	LED Indicators
2	Testpoints and Test Rings
3	ISBus Connectors
4	TB1 Terminal Board
5	TB2 Terminal Board
6	J1 EXIB Board Interface Connector
7	J9 Remote Terminal Connector
8	J13 Connector
9	J14 Connector
10	J15 Power Connector (EXIB board)

Note Individual testpoints are not shown on Figure 1. Connector P1 is also not defined in this document (these individual pin signals would not normally be checked for troubleshooting).

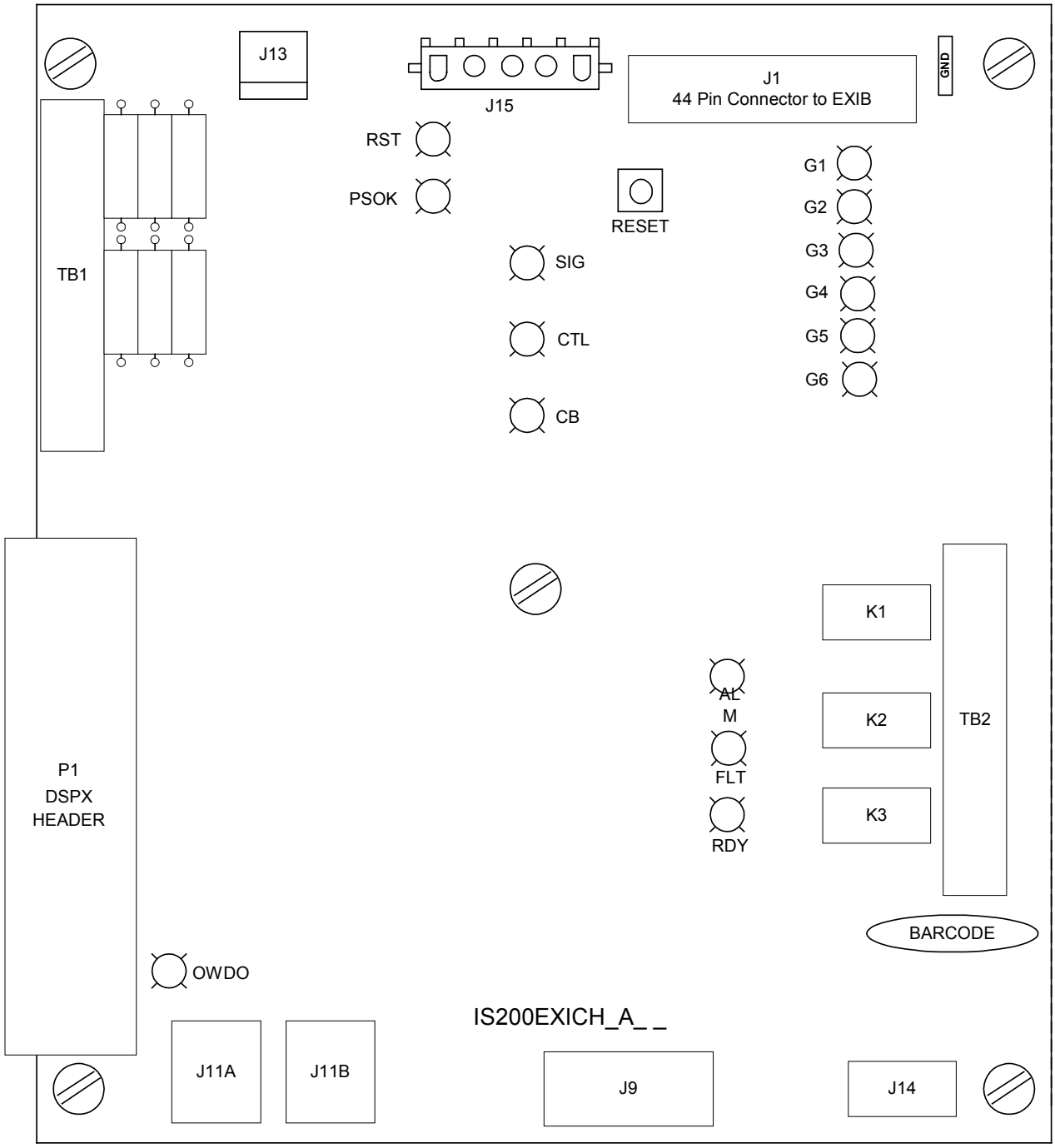


Figure 1. EXIC Board Layout Diagram

Table 1. EXIC Board LED Indicator Descriptions

LED	Color	Mnemonic	Description
DS2	Green	PSOK	Power supply from EXIB board indicator - ON when OK
DS4	Green	RST	Reset function indicator - ON when not reset
DS41	Green	CB	External discrete logic input CB indicator - ON when circuit breaker is closed (logic zero)
DS42	Green	CTL	External discrete logic input CTL indicator - ON when CTL (run permissive) is closed (logic zero)
DS43	Green	SIG	External discrete logic input SIG indicator - ON when SIG (additional run permissive) is closed (logic zero) (used in LCI applications only)
DS51	Green	ALM	ALARM relay contact set output signal indicator - ON = no Alarm
DS52	Green	FLT	FAULT relay contact set output signal indicator - ON = no Fault
DS53	Green	RDY	READY relay contact set output signal indicator - ON = Ready
DS81	Yellow	OWDO	Watchdog timer indicator - ON when active
DS141	Yellow	G1	Gate pulse indicator for SCR1 - ON when gating
DS142	Yellow	G2	Gate pulse indicator for SCR2 - ON when gating
DS143	Yellow	G3	Gate pulse indicator for SCR3 - ON when gating
DS144	Yellow	G4	Gate pulse indicator for SCR4 - ON when gating
DS145	Yellow	G5	Gate pulse indicator for SCR5 - ON when gating
DS146	Yellow	G6	Gate pulse indicator for SCR6 - ON when gating

Table 2. EXIC Board Testpoint and Test Ring Descriptions

Testpoint	Nomenclature	Description
TP1	VAB	ϕA – ϕB volts (attenuation = 1/100 or 1/250)
TP2	VPN	Dc bridge volts (attenuation = 1/100 or 1/250)
TP3	VBC	ϕB – ϕC volts (attenuation = 1/100 or 1/250)
TP4	VCB	–VBC
TP5	VBA	–VAB
TP7	P18	Positive 18 V dc power supply from EXIB board
TP8	GVLT	Ground fault volts (VP + VN/250)
TP9	GFLT	Logic zero = ground fault
TP10	IFBA	Dc current feedback (shunt mV x 20) + 0.2 V
TP11	VA1	Attenuated ∅A volts (VA/250)
TP12	VB1	Attenuated ∅B volts (VA/250)
TP13	VC1	Attenuated ∅A volts (VA/250)
TP14	VP1	Attenuated +dc volts (VP/250)
TP15	VN1	Attenuated –dc volts (VN/250)

Table 2. EXIC Board Testpoint and Test Ring Descriptions — continued

Testpoint	Nomenclature	Description
TP16	DFM1	1/2 of differential gate command signal for SCR#1
TP17	DFM1C	1/2 of differential gate command signal for SCR#1
TP18	DFM2	1/2 of differential gate command signal for SCR#2
TP19	MOV	MOV fuse status (low = fuse OK)
TP20	DFM2C	1/2 of differential gate command signal for SCR#2
TP21	IFB	Current regulator feedback (freq. = shunt mV x 8 kHz/mV)
TP22	DFM3	1/2 of differential gate command signal for SCR#3
TP23	ITOC	Timed overcurrent feedback (freq. = shunt mV x 8 kHz/mV)
TP24	DFM3C	1/2 of differential gate command signal for SCR#3
TP25	PSOK	Power supply status (logic high = OK)
TP26	DFM4	1/2 of differential gate command signal for SCR#4
TP27	DFM4C	1/2 of differential gate command signal for SCR#4
TP28	DFM5	1/2 of differential gate command signal for SCR#5
TP29	DFM5C	1/2 of differential gate command signal for SCR#5
TP30	DFM6	1/2 of differential gate command signal for SCR#6
TP31	DFM6C	1/2 of differential gate command signal for SCR#6
TP32	P5	Positive 5 V dc power from EXIB board (+5.0 V dc)
TP33, 34	DCOM	Digital common (test ring)
TP35	P24	Positive 24 V dc power from EXIB board
TP36	PCOM	Power input common (test ring)
TP37	N24	Negative 24 V dc power from EXIB board (–24.0 V dc)
TP38	PCOM	Power input common (test ring)
TP39	P15	Positive 15 V dc power from EXIB board (+15.0 V dc)
TP40	ACOM	Analog common (test ring)
TP42	N15	Negative 15 V dc power from EXIB board (–15.0 V dc)
TP43	OUV	Power supply status (logic low = power supply fault)
TP44	OXRST	DSPX board reset (logic low = reset)
TP46	N18	Negative 18 V dc power from EXIB board (–18.0 V dc)
TP47	VCO2	VBA voltage feedback from VCO2*
TP48	4MHZ	VCO clock input
TP49	VCO4	VPN voltage feedback from VCO4*
TP50	VCO3	VCB voltage feedback from VCO3*
TP51	TMP1	Bridge ambient temperature sensor 1

*Feedback frequency = 1MHz (±800 Hz/V) or 1 MHz (±2000 Hz/V)

Table 2. EXIC Board Testpoint and Test Ring Descriptions — continued

Testpoint	Nomenclature	Description
TP52	TMP2	Bridge ambient temperature sensor 2
TP53	AN1	External analog input 1 = (ANP – ANN)/2
TP54	TPWB	Voltage-converted PWB temperature
TP55	TAMB	Voltage-converted ambient temperature
TP56	P2REF	Positive 2 V reference (+2.0 V dc)
TP57	HIFI1A	Frequency-converted analog input**
TP58	HIFI1B	Frequency-converted analog input**
TP59	AC2	Grounded side ac input
TP60	1N	CB input circuit reference
TP61	2N	CTL input circuit reference
TP62	3N	SIG input circuit reference
TP63	OCTL	External logic CTL (run permissive) input
TP64	OSIG	External logic SIG (additional run permissive) input
TP65	OCB	External logic CB (circuit breaker) input
TP66	ALM	ALARM relay contact set output signal
TP67	FLT	FAULT relay contact set output signal
TP68	RDY	READY relay contact set output signal
TP69	GRRX	ISBus signal
TP70	GRTX	ISBus signal
TP71	T_TX	RS-232C
TP72	T_TXN	RS-232C
TP73	P5I	Isolated +5 V dc power for remote terminal
TP74	ICOM5	Isolated common for remote terminal
TP75	RX	RS-232C
TP76	TXN	RS-232C
TP77	TX	RS-232C
TP78	T_RX	RS-232C
TP79	NZFM	Not zero firing mask
TP80	OMSK	Zero firing mask
TP81	KILL	XILINX input from controller
TP82	GENOK	SCR gate enable OK
TP83	P5REF	Positive 5 V reference (+5.0 V dc)
TP84	D2A4	Digital-to-analog circuit 4 output
TP85	RP10	Positive 10 V reference (+10.0 V dc)
TP86	D2A3	Digital-to-analog circuit 3 output

**Frequency = 1 MHz ± VAN1 x 200 kHz/V

Table 2. EXIC Board Testpoint and Test Ring Descriptions — continued

Testpoint	Nomenclature	Description
TP87	RN10	Negative 10 V reference (−10.0 V dc)
TP88	D2A2	Digital-to-analog circuit 2 output (ground fault ref.)
TP89	M1	Meter driver output 1
TP90	M2	Meter driver output 2
TP91	D2A1	Digital-to-analog circuit 1 output (diagnostics)
TP92	DCOM	Digital common (test ring)

Table 3. EXIC Board ISBus Connector Descriptions

Connector	Description
J11A	Duplex port - send/receive GRATX and GRARX signals to/from the DSPX board*
J11B	Transmit only port - send GRBTX signal from the DSPX board*

*See Figure 2

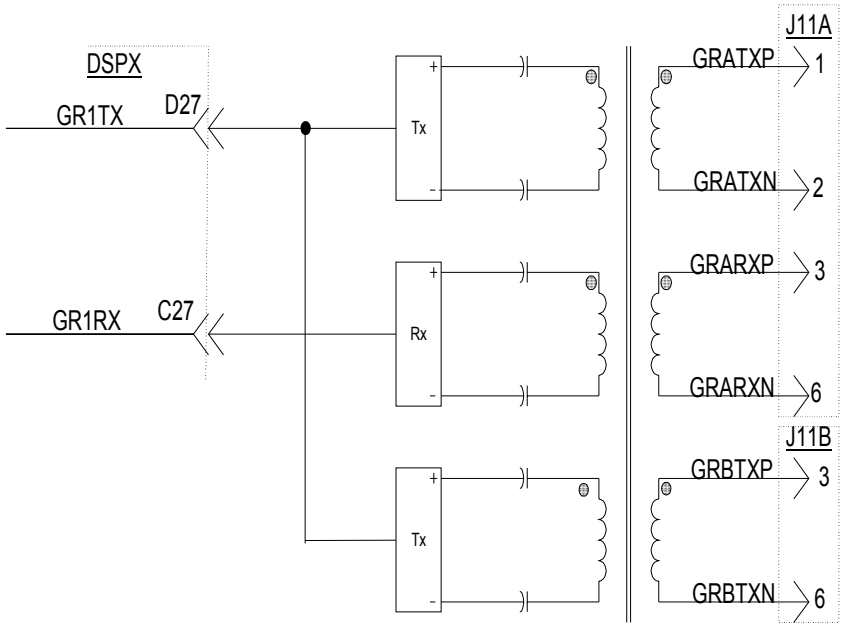


Figure 2. ISBus Connections on EXIC Board

Table 4. EXIC Board TB1 Terminal Descriptions (External Logic Inputs)

Terminal	Nomenclature	Description
1	SHD	Chassis ground
2	TM1	Bridge temperature sensor 1
3	TM2	Bridge temperature sensor 2
4	SHD	Chassis ground
5	ANN	Analog input negative
6	ANP	Analog input positive
7	GND	Chassis ground
8	SG2	Additional permissive external logic input 2
9	SG1	Additional permissive external logic input 1
10	CTL2	Control permissive external logic input 2
11	CTL1	Control permissive external logic input 1
12	CB2	Circuit breaker external logic input 2
13	CB1	Circuit breaker external logic input 1

Table 5. EXIC Board TB2 Terminal Descriptions (Output Relay Logic)

Terminal	Nomenclature	Description
1	SHLD	Chassis ground
2	SHLD	Chassis ground
3	RDYCOM	Ready relay contact common output
4	RDYNO	Ready relay contact normally open output
5	RDYNC	Ready relay contact normally closed output
6	SHLD	Chassis ground
7	FLTCOM	Fault relay contact common output
8	FLTNO	Fault relay contact normally open output
9	FLTNC	Fault relay contact normally closed output
10	SHLD	Chassis ground
11	ALMCOM	Alarm relay contact common output
12	ALMNO	Alarm relay contact normally open output
13	ALMNC	Alarm relay contact normally closed output

Table 6. EXIC Board J1 Connector Pin Descriptions (EXIB Board Interface)

Pin No.	Nomenclature	Description
1	VA1	Phase A voltage feedback (= VA/250)
2	VA1RTN	VA1 return
3	VB1	Phase B voltage feedback (= VB/250)
4	VB1RTN	VB1 return
5	VC1	Phase C voltage feedback (= VC/250)
6	VC1RTN	VC1 return
7	VP1	Positive bus voltage feedback (= VP/250)
8	VP1RTN	VP1 return
9	VN1	Negative bus voltage feedback (= VN/250)
10	VN1RTN	VN1 return
11	OMOVFOK	MOV fuse status (low = MOV fuses OK)
12	NC	Not connected
13	VCO_5	Current regulator feedback
14	NC	Not connected
15	VCO_6	Timed overcurrent feedback
16	NC	Not connected
17	PSOK	Power supply status (high = power supply OK)
18	NC	Not connected
19	DFM1	1/2 differential signal for SCR#1 control
20	DFM1C	1/2 differential signal for SCR#1 control
21	DFM2	1/2 differential signal for SCR#2 control
22	DFM2C	1/2 differential signal for SCR#2 control
23	DFM3	1/2 differential signal for SCR#3 control
24	DFM3C	1/2 differential signal for SCR#3 control
25	DFM4	1/2 differential signal for SCR#4 control
26	DFM4C	1/2 differential signal for SCR#4 control
27	DFM5	1/2 differential signal for SCR#5 control
28	DFM5C	1/2 differential signal for SCR#5 control
29	DFM6	1/2 differential signal for SCR#6 control
30	DFM6C	1/2 differential signal for SCR#6 control
31 – 40	SP_ _ _	Spare - not used
41	ENGT	Gating enable
42	OGATE	J1 connection status (low = J1 connection OK)
43	BRD_IDB	EXIB board identification
44	DCOM	Digital common
45, 46	CHASSIS	Screw terminal chassis ground

Table 7. EXIC Board J9 Connector Pin Descriptions (Remote Terminal Connector)

Pin No.	Nomenclature	Description
1	NC	Not connected
2	RX232	RS-232C signal input
3	TX232	RS-232C signal output
4	NC	Not connected
5	ICOM232	RS-232C signal return
6, 7	NC	Not connected
8	TXEN232	RS-232C transmit enable
9	NC	Not connected
10, 11	CHASSIS	Chassis ground

Table 8. EXIC Board J13 Connector Pin Descriptions (Ac Input Connector)

Pin No.	Nomenclature	Description
1	AC1	Ac input
2	AC2	Grounded side of ac input

Table 9. EXIC Board J14 Connector Pin Descriptions (Analog Meter Driver Connector)

Pin No.	Nomenclature	Description
1, 2	NC	Not connected
3	DCOM	Digital common (meter 2)
4, 5	NC	Not connected
6	MTR2P	Meter 2 output
7	MTR1P	Meter 1 output
8	DCOM	Digital common (meter 1)
9, 10	NC	Not connected

Table 10. EXIC Board J15 Connector Pin Descriptions (Power Input Connector from EXIB Board)

Pin No.	Nomenclature	Description
1	P24	Positive 24 V dc power input (+24 V dc)
2	PCOM	Power common
3	N24	Negative 24 V dc power input (–24 V dc)
4	P5	Positive 5 V dc power input (+5 V dc)
5	DCOM	Digital common

Renewal/Warranty Replacement

How to Order a Board

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

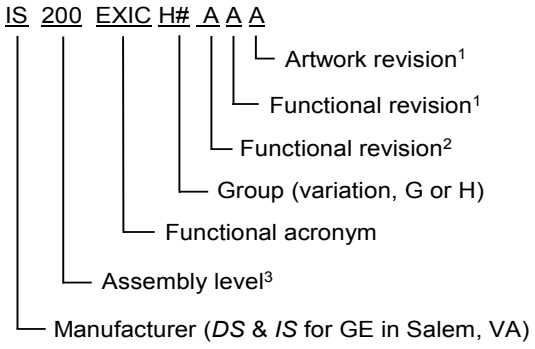
- How to accurately identify the part
- If the part is under warranty
- How to place the order

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. Figure 3 explains the structure of the part number.

The board's functional acronym, shown in Figure 3, is normally based on the **board description**, or name. For example, the EXIC board is described as the Exciter Control Interface board.



[1]Backward compatible
[2]Not backward compatible
[3]*200* indicates a base-level board; *215* indicates a higher-level assembly or added components (such as PROM)

Figure 3. 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

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

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

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

Phone: + 1 800 533 5885 (United States, Canada, Mexico)
+ 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 the following** when ordering any warranty or renewal parts:

- Complete part number and description
- Drive serial number
- Drive 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.

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).

Replacement Procedures

Warning

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

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

➢ To replace the EXIC board

1. Make sure that the drive in which the board resides has been de-energized. (Refer to the appropriate *User's Guide, GEH-6419,* for complete de-energizing procedures and follow all local practices of lock-out/tag-out.)
2. Open the bridge control cabinet door, and using equipment designed for high voltages, test any electrical circuits **before touching them** to ensure that power is off.
3. Locate the EXIC board (with DSPX board mounted to it) and remove the DSPX board from it as follows:
4. 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.)
5. Unseat the board by raising the ejector tabs and remove the board from the connector, then put the board in an antistatic bag and set aside until reassembly.
6. Carefully disconnect all cables from the EXIC board as follows:
   - Verify all cables are labeled with the correct connector name (as marked on the board) to simplify reconnection.
   - Grasp each side of the stab-on connector that joins with the board's stab terminal and gently pull the stab-on connector loose.
   - For cables with pull-tabs, carefully pull the tab.
   - Grasp each side of the TB_ connector that joins with the board's TB_ and gently pull the TB_ connector loose (individual wires do not have to be removed from the TB_ connector).

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

7. Remove the five screws that hold the EXIC board to the insulating standoffs, and remove the board.
8. Orient the new EXIC board in the same position as the one removed and install it onto the standoffs with the five screws removed in step 5.
9. Align the DSPX board with the EXIC board's P1 connector and reinstall it as follows:
   a. Begin seating the board by firmly pressing on the top and bottom of the faceplate at the same time.
   b. Finish seating the board 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.

10. Reconnect all cables to EXIC board as labeled and ensure that cables are properly seated at both ends.
11. Remount the TB connectors to EXIC board TBs as labeled and ensure that these connectors are properly seated.
12. Close the bridge control cabinet door.

GE Industrial Systems

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