GE Industrial Systems

Field Exciter Interface Board

IS200EXIAH_A_ _

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.

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, practice, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

Note Indicates an essential or important procedure, practice, condition, or statement.

Contents

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Functional Description

The IS200EXIA Field Exciter Interface Board (EXIA) furnishes control interface functions for a 3-phase non-reversing full wave SCR bridge on the Integrated Gate Commutated Thyristor (IGCT) drives. This bridge provides regulated dc field excitation current to the drive motor. The EXIA board mounts directly on the exciter and there is one EXIA board per drive motor.

The EXIA board provides all the SCR gating signals and the returns of all necessary voltage, current, and diagnostic feedback signals for a non-reversing 6-pulse dc bridge. See Figure 2 for a functional diagram.

Two ISBus™ communication ports, one full duplex and one TX only, and an RS-232 port are provided on the EXIA board for user communications.

IS200DSPX Board

The EXIA board provides a 128-pin DIN connector (P1) for an IS200DSPX Digital Signal Processor Control Board (DSPX). The DSPX board is always present and controls the bridge gating signals, field current regulation, and certain diagnostic functions. Refer to publication **GEI-100267** for complete information on the DSPX board.

Inputs/Outputs

Input signals to EXIA board include ac and dc bridge voltage feedbacks, dc current feedbacks from the bridge, temperature sensor, command logic, and control power.

Output signals from EXIA board include gate power to the six SCRs that comprise the power bridge, three logic signals that indicate the operational state of control, and fault logic.

U1 Field Programmable Gate Array (FPGA)

The U1 FPGA is mounted on the EXIA board and receives control information from the DSPX board and generates the input/output control logic for the exciter, including SCR phase control. Six gate pulse amplifier circuits on the EXIA board convert the gate command logic into gate pulse trains for the six SCRs.

References to bridge voltages and to the six SCRs are according to the conventions shown in Figure 1.

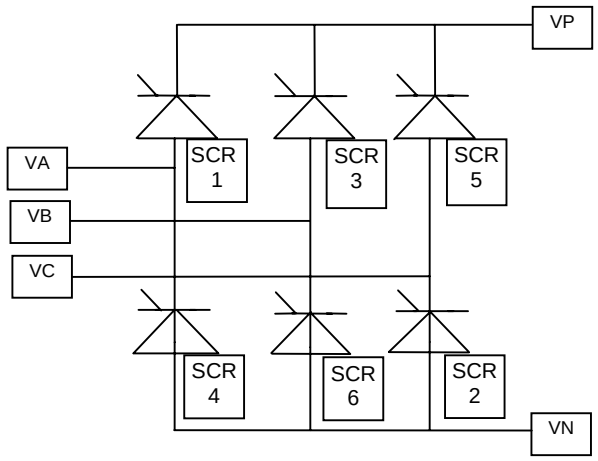

Figure 1. Non-Reversing SCR Bridge

Voltage Feedbacks

Five voltage divider circuits receive the ac phase voltage inputs (VA, VB, VC) and produce attenuated output signals (VA1, VB1, VC1, VP1, VN1 respectively). These are referenced to electrical neutral with an attenuation ratio of 250:1

The five attenuated voltage signals are buffered and measured differentially using instrumentation amplifiers.

The differential voltage outputs are:

VA – VB = **VAB**
VB – VC = **VBC**
VC – VA = **VCA**
VP – VN = **VPN**

Gain may be increased by either inserting jumpers JP1 – JP4 or by changing signal ATTEN_HV from a logic one to a logic zero. HV_ATTEN is the signal from DSPX board that determines the attenuation ratio K. Total attenuation ratios are then LOW, K = 250 and HIGH, K = 100. Testpoints are provided for monitoring these differential voltages.

A dv/dt filter can be added to each line-line voltage feedback at the user level by making signal ODVDTSEL a logic LOW. With or without the dv/dt filter, all three line-to-line voltages are inverted at this stage:

VAB becomes VBA
VBC becomes VCB
VCA becomes VAC

Four identical VCO circuits are used to convert the four bridge voltage feedback signals to a Hz/V signal. Each VCO output is biased at a nominal frequency of 1 MHz. The VCO Transfer Function is FOUT = 1.0 MHz, ±200 kHz/V for VCO input voltage at TP10, TP11, TP12, and TP22 of –5 V to +5 V. Output frequency range is 0 – 2.0 MHz. These voltage VCO outputs are inverted and sent to the DSPX board.

Bridge Voltage	VCO Signal to DSPX Board	VCO Input
VAC	VCO1	TP11
VBA	VCO2	TP12
VCB	VCO3	TP10
VPN	VCO4	TP22

The five attenuated voltage feedback signals (VA1, VB1, VC1, VP1, and VN1) are used to detect the presence of a given voltage potential across each of the six SCRs. If the attenuated SCR voltage drop exceeds approximately 0.53 V, the cell state signal for that particular SCR becomes a logic zero. The actual SCR voltage drop will be (0.53 V* 250) or 132.5 volts. See Table 1.

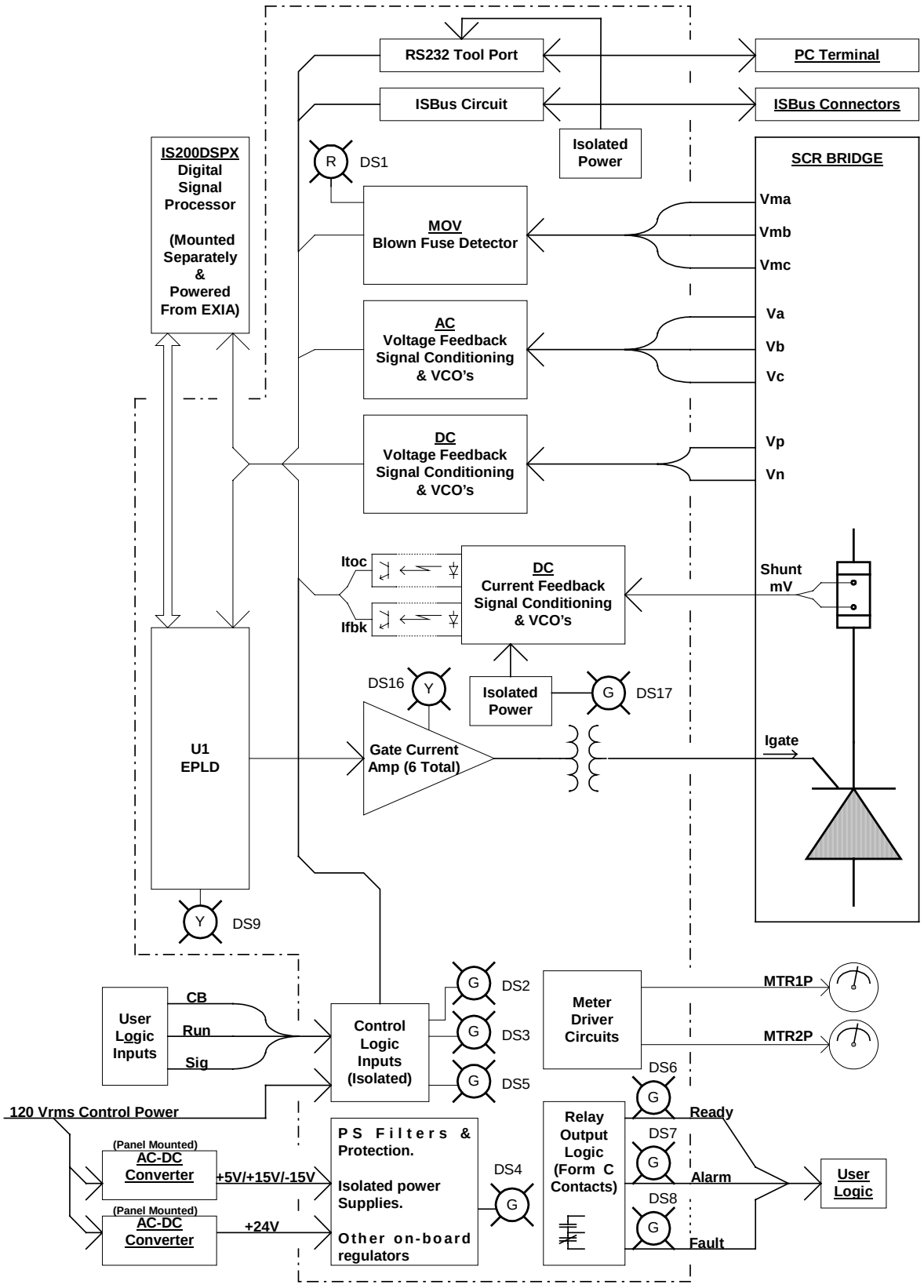

Figure 2. EXIA Board Functional Diagram

Table 1. Cell State Sensing

SCR Position	Input Signals	Output Signal
1	VA1 – VP1	VCSS1
3	VB1 – VP1	VCSS3
5	VC1 – VP1	VCSS5
4	VN1 – VA1	VCSS4
6	VN1 – VB1	VCSS6
2	VN1 – VC1	VCSS2

Indicators and Testpoints

Eleven LED indicators provide diagnostic indication and status for the MOV fuse, logic signals, U1 microprocessor, SCR gate pulses, and power supply control voltage levels.

There are 43 testpoints also provided for the user. There are two types of testpoints on the EXIA board, ring loops and vertical posts. See Figure 4 for an EXIA board layout diagram that shows the locations of these devices.

WARNING

With the drive operating, some test points will float at bridge potential. Lethal voltages (1000 V) may be present at TP19, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP33, and TP34.

Application Data

WARNING

Portions of the EXIA board are floating at cathode potential (600 V ac) of the SCR and cannot be touched or probed when the bridge is energized.

The EXIA board includes plug connectors, pin connectors, stab-on terminals, receptacles, and terminal boards to interface with other devices in the IGCT drive.

The EXIA board also includes adjustable hardware (a switch and jumpers), testpoints, and LED indicators. There are no fuses as part of the board. See Figure 3 for a board layout diagram that shows the location of major board components.

Connectors

Gate driver connections to the six SCRs that comprise the power bridge are made through six plug connectors included on the board as follows:

- **Table 3.** **J3**, Gate Driver 1 Connector
- **Table 4.** **J4**, Gate Driver 4 Connector
- **Table 5.** **J5**, Gate Driver 3 Connector
- **Table 6.** **J6**, Gate Driver 6 Connector
- **Table 7.** **J7**, Gate Driver 5 Connector
- **Table 8.** **J8**, Gate Driver 2 Connector

Phase A, B, and C voltage sensing signals and dc link positive and negative sensing signals are provided via five stab-on terminal connectors (**E1 – E5**). MOV fuse loss detection signals are also provided via three stab-on terminal connectors (**E6 – E8**). See **Table 9** for all stab-on terminal descriptions.

Shunt inputs for isolated current feedbacks are furnished through connector **J2**. See **Table 10** for pin descriptions.

Dc power (+15 V, –15 V, +5 V, and +24 V) from the panel mounted ac/dc converters is furnished to the EXIA board through connector **J12**. See **Table 11** for pin descriptions and **Table 12** for specifications.

120 V ac, 50/60 Hz is connected at connector **J13** to supply current for external logic inputs. See **Table 14** for pin descriptions.

Analog meter driver output signals are available at connector **J14**. See **Table 13** for pin descriptions. External logic inputs may be made in the form of contact pairs connected at terminal board **TB1**. See **Table 15** for pin/terminal descriptions. Output relay logic signals are available at terminal board **TB2**. See **Table 16** for terminal descriptions.

An RS232C interface port for the DSPX board is available at connector **J9** on the EXIA board. See **Table 17** for pin descriptions. Two ISBus communication ports for the DSPX board are available at connectors **J11A** and **J11B** on the EXIA board. See **Tables 18A** and **18B** respectively for pin descriptions.

The DSPX board is connected to the EXIA board at connector **P1**. See **Table 19** for pin descriptions.

Adjustable Hardware

Eight jumpers (five single position and three dual position) are included on the EXIA board for adjusting gain of the differential amplifiers and current feedback signals. See **Table 2A** (single position) and **Table 2B** (dual position) for jumper descriptions.

One switch, SW1, is provided for reset of the DSPX board. Pressing SW1 initiates a software reset of the board.

Indicators and Testpoints

Eleven LED indicators provide diagnostic indication and status information. See **Table 20** for complete indicator descriptions.

There are 43 testpoints also provided for signal measurement. See **Table 21** for testpoint descriptions.

WARNING

With the drive operating, some test points will float at bridge potential. Lethal voltages (1000 V) may be present at TP19, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP33, and TP34.

Power Specifications

Refer to **Table 12** for complete specifications on incoming dc power to the EXIA board.

Table 2A. Single-Position Jumpers

Jumper	Jumper Position/Description
JP1	**In:** VAB = (VA – VB) ÷ 100 **Out:** VAB = (VA – VB) ÷ 250
JP2	**In:** VBC = (VB – VC) ÷ 100 **Out:** VBC = (VB – VC) ÷ 250
JP3	**In:** VCA = (VC – VA) ÷ 100 **Out:** VCA = (VC – VA) ÷ 250
JP4	**In:** VPN = (VP – VN) ÷ 100 **Out:** VPN = (VP – VN) ÷ 250
JP8	**In:** DCOM for Board ID (Normal Position) **Out:** Factory Test Only (**Do Not Use)**

Table 2B. Dual-Position Jumpers

Jumper	Jumper Position/Description
JP5	**1-2:** VTP31 = 0 – 2.5 PU of Current Fdbk. **2-3:** VTP31 = 0 – 5.0 PU of Current Fdbk.
JP6	**1-2:** P24 to H-Bridge (Normal Position) **2-3:** Factory Test only (**Do Not Use)**
JP7	**1-2:** PCOM to H-Bridge (Normal Position) **2-3:** Factory Test only (**Do Not Use)**

Table 3. J3, Gate Driver 1 Connector

Pin	Nomenclature	Description
1	G1G	SCR#1 Gate Current
2	NC	Not Connected
3	G1K	SCR#1 Gate Current Return

Table 4. J4, Gate Driver 4 Connector

Pin	Nomenclature	Description
1	G4G	SCR#4 Gate Current
2	NC	Not Connected
3	G4K	SCR#4 Gate Current Return

Table 5. J5, Gate Driver 3 Connector

Pin	Nomenclature	Description
1	G3G	SCR#3 Gate Current
2	NC	Not Connected
3	G3K	SCR#3 Gate Current Return

Table 6. J6, Gate Driver 6 Connector

Pin	Nomenclature	Description
1	G6G	SCR#6 Gate Current
2	NC	Not Connected
3	G6K	SCR#6 Gate Current Return

Table 7. J7, Gate Driver 5 Connector

Pin	Nomen-clature	Description
1	G5G	SCR#5 Gate Current
2	NC	Not Connected
3	G5K	SCR#5 Gate Current Return

Table 8. J8, Gate Driver 2 Connector

Pin	Nomen-clature	Description
1	G2G	SCR#2 Gate Current
2	NC	Not Connected
3	G2K	SCR#2 Gate Current Return

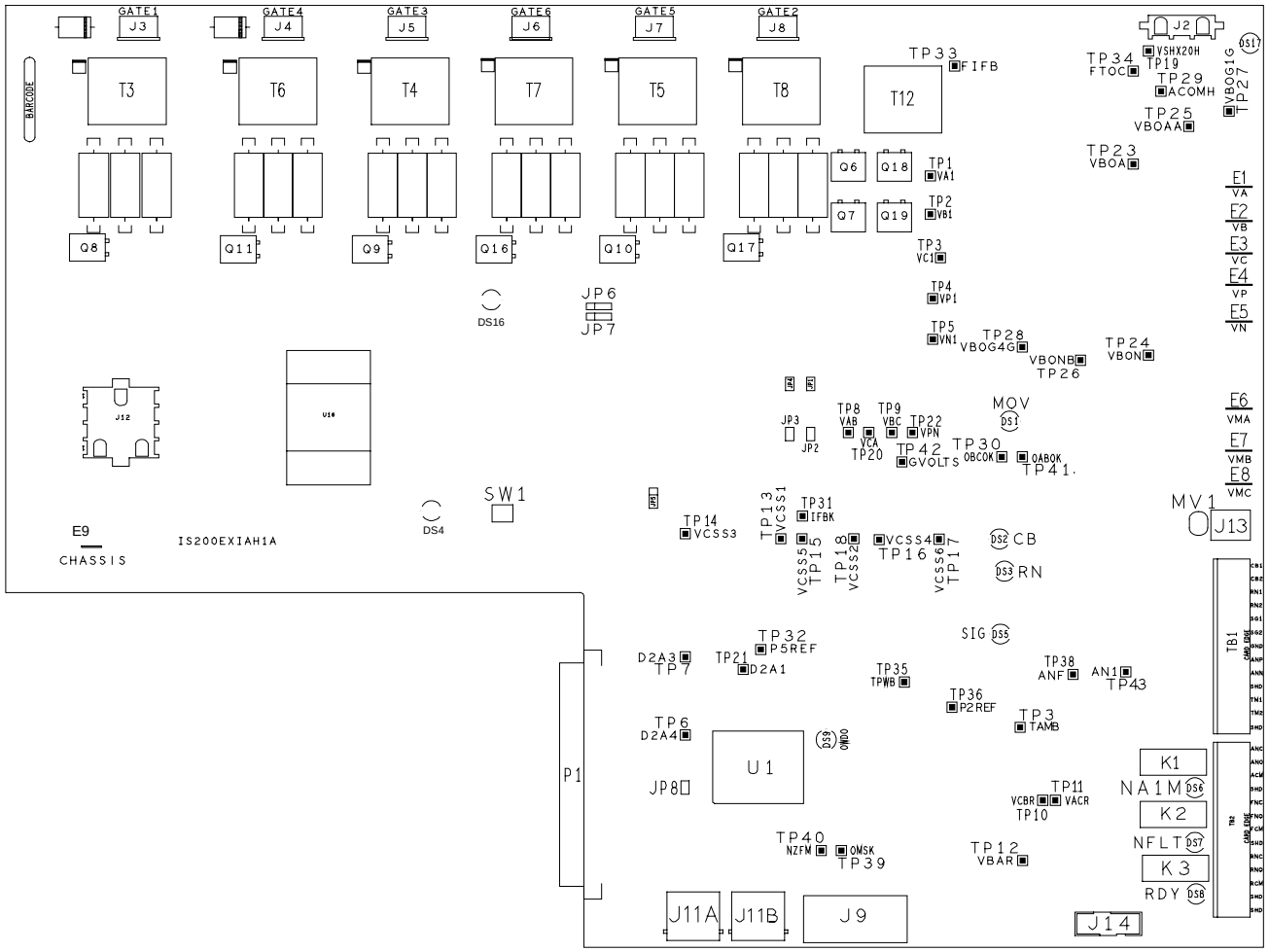

Figure 3. EXIA Board Layout Diagram

Table 9. Stab-On Terminals

Terminal	Nomenclature	Description
E1	VA	SCR Bridge Input Voltage, Phase A
E2	VB	SCR Bridge Input Voltage, Phase B
E3	VC	SCR Bridge Input Voltage, Phase C
E4	VP	SCR Bridge Output Voltage, Positive Bus
E5	VN	SCR Bridge Output Voltage, Negative Bus
E6	VMA	Load Side of MOV Fuse, Phase A
E7	VMB	Load Side of MOV Fuse, Phase B
E8	VMC	Load Side of MOV Fuse, Phase C
E9	CHASSIS	Chassis Ground

Table 10. J2, Shunt Input Connector

Pin	Nomenclature	Description
J2-1	SHN	Isolated current shunt feedback negative input
J2-2	SHP	Isolated current shunt feedback positive input
J2-3	ACOMH*	Optional shield connection

***Voltage may exceed 1000 V; do not ground any point on this connector.**

Table 11. J12 Connector, Dc Power Supply Inputs

Pin	Nomenclature	Description
J12-1	P15	+15 V dc Analog Power
J12-2	ACOM	Analog Return
J12-3	N15	–15 V dc Analog Power
J12-4	P5	+5 V dc Digital Power
J12-5	DCOM	Digital Power Return
J12-6	P5	+5 V dc Digital Power
J12-7	PCOM	Gate Power Return
J12-8	ACOM	Analog Return
J12-9	EXTPCOM	Auxiliary Gate Power Return (Not Used)
J12-10	P24	+24 V dc Gate Power
J12-11	DCOM	Digital Power Return
J12-12	EXTP24	Auxiliary +24 V dc Gate Power (Not Used)

Table 12. Input Power Specifications

Requirement	Specification
Input Power* (To Panel Mounted Ac–Dc Power Converters)	120 V rms ± 20%, 47 – 63 HZ Sinusoidal Waveform
Power Dissipation: (Estimated)	P5: 25 Watts P15: 15 Watts N15: 15 Watts P24: 98 Watts (Includes SCR gate power.)
Input Voltages: (From Panel Mounted Ac/Dc Power Converters)	P5: +5 V dc, ± 2%, 5 Amps P15: +15 V dc, ± 5%, 1 Amp N15: –15 V dc, ± 5%, 1 Amp P24: +24 V dc, ± 5%, 4 Amps
Load Regulation: (With a 50% load step)	P5: ± 3% All Others: ± 5%
Transient Response: (Following a 25% load Step)	All: ± 3% maximum droop with recovery to within 1% in 500 microseconds or less
Output Overshoot:	All: Not to exceed 5% over operating range.
Output Voltage Ripple	P5: <1% peak-to-peak All others: ≤ 2% peak-to-peak
Line Regulation:	± 0.5% maximum output change with ± 20% line excursion at maximum load

* The ac/dc power converters are protected for possible transients up to 200 V/microsecond and 1600 A/microsecond that may be present on the incoming ac line. Such transients must not cause the dc supplies to exceed the specifications shown in Table 7.

The input ac waveform may contain line notches created by SCR commutation. These notches may decrease the amplitude of the ac voltage waveform by 50% for up to 200 microseconds on each positive and negative ½ cycle. See Figure 4 for line notch illustration.

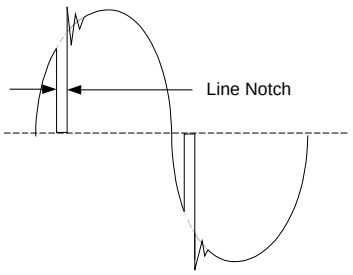

Figure 4. Line Notches

Table 13. J14, Analog Meter Driver Output Connector

Pin	Nomenclature	Description
J14-1	NC	Not Connected
J14-2	NC	Not Connected
J14-3	DCOM	Common, Meter #2 Return
J14-4	NC	Not Connected
J14-5	NC	Not Connected
J14-6	MTR2P	Meter driver #2 positive output
J14-7	MTR1P	Meter driver #1 positive output
J14-8	DCOM	Common, Meter #1 Return
J14-9	NC	Not Connected
J14-10	NC	Not Connected

Table 14. J13, External Logic Power Connector

Pin	Nomenclature	Description
J13-1	AC1	120 V ac, 50/60 Hz Sine Wave
J13-2	AC2	120 V ac Return (Must Be Grounded)

Table 15. TB1, External Logic Input Terminal Board

Terminal	Nomenclature	Description
TB1-1	SHLD	Temperature Shield Connection (Optional)
TB1-2	TMP2	Bridge Temperature Feedback
TB1-3	TMP1	Bridge Temperature Feedback Return
TB1-4	SHLD	Analog Signal Shield (Optional)
TB1-5	ANN	Analog Input Signal, Negative
TB1-6	ANP	Analog Input Signal, Positive
TB1-7	GND	Logic Signal Shield Connection (Optional)
TB1-8	SIG2	"Logic" Signal Input
TB1-9	SIG1	"Logic" Signal Return
TB1-10	RN2	"Run" Signal Input
TB1-11	RN1	"Run" Signal Return
TB1-12	CB2	"CB" Interlock Input
TB1-13	CB1	"CB" Interlock Return

Table 16. TB2, Output Relay Logic Signal Terminal Board*

Terminal	Nomenclature	Description
TB2-1	SHLD	Shield Connection (Optional)
TB2-2	SHLD	Shield Connection (Optional)
TB2-3	RDYCOM	"Ready" Signal Output, Return
TB2-4	RDYNO	"Ready" Signal Output Normally Open Contacts
TB2-5	RDYNC	"Ready" Signal Output Normally Closed Contacts
TB2-6	SHLD	Shield Connection (Optional)
TB2-7	FLTCOM	"Fault" Signal Output, Return
TB2-8	FLTNO	"Fault" Signal Output Normally Open Contacts
TB2-9	FLTNC	"Fault" Signal Output Normally Closed Contacts
TB2-10	SHLD	Shield Connection (Optional)
TB2-11	ALMCOM	"Alarm" Signal Output, Return
TB2-12	ALMNO	"Alarm" Signal Output Normally Open Contacts
TB2-13	ALMNC	"Alarm" Signal Output Normally Closed Contacts

*Signals connected to TB2 must not exceed 120 V rms with transients known and controlled by an external means.

Table 17. J9, RS232C Interface Connector (For DSPX Board)

Pin	Nomenclature	Description
J9-1	NC	Not Connected
J9-2	RX232	Signal Output To External Receiver
J9-3	TX232	Signal Input From External Transmitter
J9-4	NC	Not Connected
J9-5	ICOM232	Signal Return
J9-6	NC	Not Connected
J9-7	NC	Not Connected
J9-8	TXEN232	Transmit Enable Output Signal
J9-9	NC	Not Connected
J9-10	CHASSIS	Chassis ground screw connection
J9-11	CHASSIS	Chassis ground screw connection

Table 18A. J11A, ISBus Duplex Connector (For DSPX Board)

Pin	Nomenclature	Description
J11A-1	GRATXP	Channel A Transmitter Output (Positive)
J11A-2	GRATXN	Channel A Transmitter Output (Negative)
J11A-3	GRARXP	Channel A Input To Receiver (Positive)
J11A-4	NC	Not Otherwise Connected (jumpered to pin J11A-5)
J11A-5	NC	Not Otherwise Connected (jumpered to pin J11A-4)
J11A-6	GRARXN	Channel A Input To Receiver (Negative)
J11A-7	NC	Not Connected
J11A-8	NC	Not Connected
J11A-9	CHASSIS	Chassis Ground Connection
J11A-10	CHASSIS	Chassis Ground Connection

Table 18B. J11B, ISBus "Transmit Only" Connector (For DSPX Board)

Pin	Nomenclature	Description
J11B-1	NC	Not Connected
J11B-2	NC	Not Connected
J11B-3	GRBTXP	Channel B Transmitter Output (Positive)
J11B-4	NC	Not Otherwise Connected (jumpered to pin J11B-5)
J11B-5	NC	Not Otherwise Connected (jumpered to pin J11B-4)
J11B-6	GRBTXN	Channel B Transmitter Output (Negative)
J11B-7	NC	Not Connected
J11B-8	NC	Not Connected
J11B-9	CHASSIS	Chassis Ground Connection
J11B-10	CHASSIS	Chassis Ground Connection

Table 19. P1 Connector, Row A (To DSPX Board)

Pin	Nomenclature	Signal
A1	P5	Positive 5 V Power Supply
A2	XD0	Data Bus Bit
A3	XD4	Data Bus Bit
A4	DCOM	Digital Common
A5	XD8	Data Bus Bit
A6	XD12	Data Bus Bit
A7	XD16	Data Bus Bit
A8	XD20	Data Bus Bit
A9	XD24	Data Bus Bit
A10	NC	No Connection
A11	XA0	Address Bus Bit
A12	DCOM	Digital Common
A13	XA4	Address Bus Bit
A14	XA8	Address Bus Bit
A15	XA12	Address Bus Bit
A16	OCS_BIC	Chip Select
A17	OCS_IO	I/O Chip Select
A18	NC	No Connection
A19	NC	No Connection
A20	DCOM	Digital Common
A21	OXRST	Reset
A22	P15	Positive 15 V Power Supply
A23	HIFI2A	Logic Input = DONE
A24	HIFI4A	Logic Input = SIGIN
A25	NC	No Connection
A26	VCO_1	VCO Signal = VAC
A27	VCO_5	VCO Signal = IFB
A28	DCOM	Digital Common
A29	GR2TX	Channel B, ISBus Transmit
A30	NC	No Connection
A31	PWM1	PWM 1 Signal
A32	P5	Positive 5 V Power Supply

Table 19. P1 Connector, Row B (To DSPX Board)

Pin	Nomenclature	Signal
B1	P5	Positive 5 V Power Supply
B2	XD1	Data Bus Bit
B3	XD5	Data Bus Bit
B4	XD9	Data Bus Bit
B5	XD13	Data Bus Bit
B6	XD17	Data Bus Bit
B7	XD21	Data Bus Bit
B8	DCOM	Digital Common
B9	XD25	Data Bus Bit
B10	NC	No Connection
B11	XA1	Address Bus Bit
B12	XA5	Address Bus Bit
B13	XA9	Address Bus Bit
B14	DCOM	Digital Common
B15	NC	No Connection
B16	NC	No Connection
B17	NC	No Connection
B18	DCOM	Digital Common
B19	NC	No Connection
B20	CLKT1	1 MHz Clock Signal
B21	ACOM	Analog Common
B22	HIFI1A	VCO Signal = Analog In
B23	HIFI2B	Logic Input = WD Timer
B24	DCOM	Digital Common
B25	NC	No Connection
B26	VCO_2	VCO Signal = VBA
B27	VCO_6	VCO Signal = ITOC
B28	NC	No Connection
B29	NC	No Connection
B30	NC	No Connection
B31	PWM2	PWM 2 Signal
B32	P5	Positive 5 V Power Supply

Table 19. P1 Connector, Row C (To DSPX Board)

Pin	Nomenclature	Signal
C1	P5	Positive 5 V Power Supply
C2	XD2	Data Bus Bit
C3	XD6	Data Bus Bit
C4	XD10	Data Bus Bit
C5	XD14	Data Bus Bit
C6	XD18	Data Bus Bit
C7	XD22	Data Bus Bit
C8	DCOM	Digital Common
C9	XD26	Data Bus Bit
C10	NC	No Connection
C11	XA2	Address Bus Bit
C12	XA6	Address Bus Bit
C13	XA10	Address Bus Bit
C14	DCOM	Digital Common
C15	OXRD	Bus Read Command
C16	NC	No Connection
C17	CPU_CLK_1	32 MHz Clock
C18	NC	DCOM
C19	NC	No Connection
C20	NC	No Connection
C21	ACOM	Analog Common
C22	HIFI1B	External Analog Common
C23	HIFI3A	CB Logic Input
C24	DCOM	Digital Common
C25	CLK20MHZ	To Pull-Up Resistors Only
C26	VCO_3	VCO Signal = VCB
C27	GR1RX	INBUS Receive
C28	GRACL_TX	To Pull-Up Resistors Only
C29	T_TX_TTL	RS232C Tool Port Transmit
C30	NC	No Connection
C31	NC	No Connection
C32	P5	Positive 5 V Power Supply

Table 19. P1 Connector, Row D (To DSPX Board)

Pin	Nomenclature	Signal
D1	P5	Positive 5 V Power Supply
D2	XD3	Data Bus Bit
D3	XD7	Data Bus Bit
D4	DCOM	Digital Common
D5	XD11	Data Bus Bit
D6	XD15	Data Bus Bit
D7	XD19	Data Bus Bit
D8	XD23	Data Bus Bit
D9	XD27	Data Bus Bit
D10	NC	No Connection
D11	XA3	Address Bus Bit
D12	DCOM	Digital Common
D13	XA7	Address Bus Bit
D14	XA11	Address Bus Bit
D15	OXWR	O = Write to Data Bus
D16	OXBUSY	O = Data Bus Busy
D17	NC	No Connection
D18	NC	No Connection
D19	BRD_ID	Board Identification
D20	DCOM	Digital Common
D21	NC	No Connection
D22	N15	Negative 15 V Power Supply
D23	HIFI3B	Logic Zero = RUN
D24	NC	No Connection
D25	NC	No Connection
D26	VCO_4	VCO Signal = VPN
D27	GR1TX	Channel A, ISBus Transmit
D28	DCOM	Digital Common
D29	T_RX_TTL	Tool Port Receive
D30	T_TXEN_TTL	Tool Port Enable
D31	NC	No Connection
D32	P5	Positive 5 V Power Supply

Table 20. LED Indicators

LED	Nomenclature	Color	Description
DS1	MOV	Red	LED turns ON within 12 seconds upon rupture of any MOV fuse.
DS2	CB	Green	LED turns ON when external circuit breaker auxiliary contacts are closed or a jumper is installed from TB1-12 to TB1-13.
DS3	RN	Green	LED turns ON when external RUN contacts are closed or a jumper is installed from TB1-10 to TB1-11.
DS4	NOT RESET	Green	LED turns ON when P5 dc voltage is >4.5 V dc.
DS5	SIG	Green	LED turns ON when external signal contacts are closed or a jumper is installed from TB1-8 to TB1-9.
DS6	READY	Green	LED turns ON when normally open contacts are closed on output relay K1.
DS7	ALARM	Green	LED turns ON when normally open contacts are closed on output relay K2.
DS8	FAULT	Green	LED turns ON when normally open contacts are closed on output relay K3.
DS9	OWDO	Amber	LED turned ON by the watchdog timer in the U1 EPLD software.
DS16	GATE	Amber	LED turns ON when a gate command signal to any of the six SCR gate circuits is generated by the U1 EPLD.
DS17	SHUNT PSOK	Green	LED turns ON when P12H minus N12H >18 volts, providing an indication of control power at the shunt isolator circuit.

Table 21. Testpoints

Testpoint	Nomenclature	Description	Type*
TP1	VA1	Voltage Feedback Phase A = VA – Neutral/250	R
TP2	VB1	Voltage Feedback Phase B = VB – Neutral/250	R
TP3	VC1	Voltage Feedback Phase C = VC – Neutral/250	R
TP4	VP1	Voltage Feedback Positive = VP – Neutral/250	R
TP5	VN1	Voltage Feedback Negative = VN – Neutral/250	R
TP6	D2A4	Digital/Analog Converter Channel 4	P
TP7	D2A3	Digital/Analog Converter Channel 3	P
TP8	VAB	Voltage Feedback = VA – VB/K	R
TP9	VBC	Voltage Feedback = VB – VC/K	R
TP10	VCBR	–VBC Input to VCO	P
TP11	VACR	–VCA Input to VCO	P
TP12	VBAR	–VAB Input to VCO	P
TP13	VCSS1	SCR # 1 Status (1 = ON)	P

*Type = Shape of testpoint, R = Ring (Loop) and P = Vertical Post

Table 21. Testpoints (Continued)

Testpoint	Nomenclature	Description	Type*
TP14	VCSS3	SCR # 3 Status (1 = ON)	P
TP15	VCSS5	SCR # 5 Status (1 = ON)	P
TP16	VCSS4	SCR # 4 Status (1 = ON)	P
TP17	VCSS6	SCR # 6 Status (1 = ON)	P
TP18	VCSS2	SCR # 2 Status (1 = ON)	P
TP19	VSHX20XH	Ifbk = Shunt mV*20	P
TP20	VCA	Vfbk = V∅C – ∅A/K	R
TP21	D2A1	D/A Channel 1, Diagnostics	R
TP22	VPN	Vfbk = Vp – Vn/K	R
TP23	VBOA	SCR #1 Overvoltage - ∅A	R
TP24	VBOAA	SCR#1 Overvoltage - Mid	R
TP25	VBOG1G	SCR#1 Overvoltage -Gate	R
TP26	VBON	SCR #4 Overvoltage - ∅A	R
TP27	VBONB	SCR#4 Overvoltage - Mid	R
TP28	VBOG4G	SCR#4 Overvoltage -Gate	R
TP29	ACOMH	P15H/N15H Return	P
TP30	OBCOK	MOV B & C Fuses OK	P
TP31	IFBK	Current Feedback, F-V Converter	R
TP32	P5REF	Precision +5 V dc Reference	P
TP33	FIFB	Current VCO Output	P
TP34	FTOC	Timed Overcurrent VCO	P
TP35	TPWB	Board Temperature	R
TP36	P2 REF	+5volt Temperature Reference	R
TP37	TAMB	Bridge Ambient Temperature	P
TP38	ANF	Ext. Analog Input VCO	P
TP39	OMSK	0 = Firing Mask Changed	P
TP40	NZFM	0 = Firing Mask Zero	P
TP41	OABOK	MOV A & B Fuses OK	P
TP42	GVOLTS	Ground Fault Signal Input	P
TP43	AN1	External Analog Input Signal	P

*Type = Shape of testpoint, R = Ring (Loop) and P = Vertical Post

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 5 explains the structure of the part number.

The board's functional acronym, shown in Figure 5, normally is based on the **board description**, or name. For example, the *EXIA* board is described as the *Field Exciter Interface Board*.

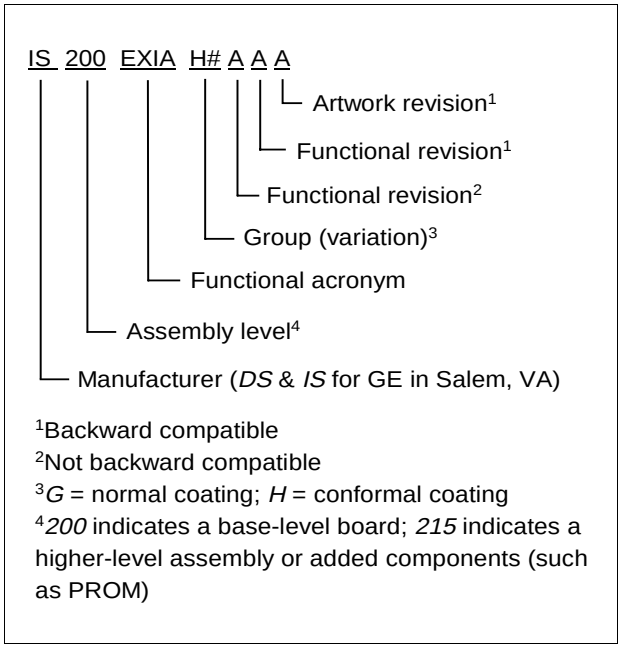

Figure 5. Board Part Number Conventions

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:

GE Industrial Systems
Product Service Engineering
1501 Roanoke Blvd.
Salem, VA 24153-6492 USA
Phone: +1-540-387-7595
Fax: +1-540-387-8606
("+" indicates the international access code required when calling from outside of the USA.)

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
- 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 boards based on availability and design enhancements. However, GE Industrial Systems ensures backward compatibility of replacement boards.

Firmware

Each new EXIA board is not shipped with the applicable firmware installed. The firmware is on the DSPX and installed in the field with the EXIA board.

How to Replace the Board

Handling Precautions

CAUTION

To prevent component damage caused by static electricity, treat all boards with static sensitive handling techniques.

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.

Replacement Procedures

WARNING

To prevent electric shock, turn off power to the board, and 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.

Remove the EXIA board as follows:

1. Make sure that the drive in which the board resides has been de-energized.

2. Open the drive's cabinet door, and using equipment designed for high voltages, test any electrical circuits **before touching them** to ensure that power is off.

3. Carefully disconnect all cables from the EXIA board to be replaced as follows:

   - Verify cables are labeled with the correct connector name (as marked on the board) to simplify reconnection.
   - For ribbon cables, grasp each side of the cable connector that mates with the board connector and gently pull the cable connector loose.
   - For cables with pull-tabs, carefully pull the tab.

   CAUTION

   Avoid dropping mounting hardware into the unit, which could cause damage.

4. Remove the 10 mounting screws securing the board to the plastic stand-offs.

Install the new (replacement) EXIA board as follows:

1. Verify that the adjustable hardware settings on the new board are set the same as on the board that was removed.

2. Orient the board in the same position as the board that was removed.

3. Install the EXIA board onto the plastic stand-offs with the 10 screws that were removed in step 4 (above). Tighten the screws fully to secure in the board in place.

4. Reconnect all electrical connections that were disconnected in step 3 (above).

Notes:

GE Industrial Systems

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General Electric Company
1501 Roanoke Blvd.
Salem, VA 24153-6492 USA