GE Industrial Control Systems

IGBT Drive/Source Bridge Interface Board IS200BICLH_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 Control 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, 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.

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Functional Description

The IS200BICLH_A Bridge Interface Board (BICL) provides an interface between the Innovation Series™ Drive main control board and the Bridge Personality Interface boards (IS200BPIA, IS200BPIB, or IS200SCNV). This board also provides a panel and system fault string interface, bridge and ambient temperature monitoring, and a fan pulse width modulated (PWM) speed control interface. Bridge control, fault string, temperature monitoring, and fan control connections are made through the (P1) connector. The main control board and logic power supply connections are made through the (P2) connector. The BICL board is designed to be mounted in a VME type rack. See Table 1 for board specifications and Figure 1 for a block diagram of the board.

Control logic on this board is implemented in an electronically programmable logic device (EPLD) that is configured from the central processing unit (CPU) of the main control board on power-up or a hard reset. At the present time there are two EPLD configurations. The BICLEPLD configuration is required to interface with a BPIA or BPIB card and the SCNVEPLD configuration for the SCNV card. The following is a list of major functions for each configuration.

BICLEPLD:

- Three-Phase upper/lower IGBT driver PWM/deadband control
- Bridge phase shunt and IGBT desaturation fault latching
- Panel and system interlock fault monitoring

- Bridge shutdown on a fault.
- MA and MB contactor control
- Fan speed PWM control
- A/D converter address decoding
- Clock division and logic synchronization

SCNVEPLD:

- Three-Phase SCR gate firing pattern generators
- Dynamic Braking (DB) IGBT driver PWM control
- DB IGBT desaturation and temperature fault latching
- DB voltage feedback VCO counter
- Panel and system interlock fault monitoring
- Bridge shutdown on a fault
- MA and MB contactor control
- Fan speed PWM control
  - A/D converter address decoding
  - Clock division and logic synchronization

Table 1. BICL Board Specifications

RTD Temperature AD inputs	
Input Quantity	4
Input Resolution	10 Bits
Transfer Function	0 – 5 V = A/D 0 – Full Scale
Full Scale Error	< 1% typical
MA and MB Pilot Contacts	
MA Form C	0.6 Amp @ 125 V ac 0.6 Amp @ 110 V dc 2.0 Amp @ 30 V dc
MB Form A	0.6 Amp @ 125 V ac 0.6 Amp @ 110 V dc 2.0 Amp @ 30 V dc
Local/System Fault String Inputs	
Voltage	24 or 115 V ac/dc
Loading	20 milliamp maximum
MA Sense Input	
Voltage	24 – 115 V ac/dc
Loading	4 – 10 milliamp peak
Fan PWM Speed Output	
Type	Isolated Open Collector
Voltage	60 V dc
Sink Current	10 milliamp
Power Requirements	
+5 V dc	1.5 watts maximum
+15 V dc	0.25 watts maximum
–15 V dc	0.25 watts maximum
Isolated +24 V dc	1.0 watts maximum

Fault String Inputs

There are two fault sting inputs to the BICL board. One input is dedicated to the panel series string of interlock contacts and the other is dedicated to the system string. These inputs have three terminals (24 V, 115 V and Common). Typical connections are between the common and one of the voltage terminals. The inputs are isolated, so one string can be operated at 24 V while the other is operated at 115 V. One of the specified voltages must be applied to both inputs for normal operation.

The states of the inputs are reported back to the control. Both inputs are also hardware ANDed to provide a master enable for the MA and MB contactor pilot relays. Dropping out either or both of these inputs while the drive is running will sequence a controlled shutdown.

MA and MB Contactor Pilot And Sense Input

The MA contactor pilot relay has two functions, providing a set of Form C contacts to control the main contactor and control of the bridge IGBT gate driver power. To pick up this relay, the BICDABL and NMAC lines must be low and the fault string must be satisfied. An MA sense input is provided and should be used with an interlock on the main contactor to inhibit bridge firing if the main contactor does not pick up when commanded to. This pilot is dropped out on a WD fault.

To pick up the MB contactor pilot relay, the BICD board's ABL and NMBC lines must be low and the fault string must be satisfied. No dedicated sense input is provided for the MB contactor. This pilot is also dropped out on a WD fault.

Contactor and Bridge Control

The hardware configuration assures that if a fault string is broken while the drive is running, bridge firing will be disabled before the MA or MB contactors drop out. Sequencing of the contactors and IGBT gate driver power should be done in software using the NMAC, NMBC, NDRPC and BICDABL control outputs and the MASEN, LOCFLT, SYSFLT and Bridge feedback fault lines. The BICDABL line should be asserted high during power-up or hard reset configuration of the BICLEPLD. Taking this line High will assure the MA and MB contactors will not pick up until commanded to do so.

A watchdog circuit monitors the 20 Mhz clock signal (CLK0) to the EPLD. If the 20 Mhz clock is not present, bridge firing will be disabled and the MA and MB contactors will drop out. If a clock failure occurs while the bridge is firing, power to the IGBT drivers will be removed within 30 microseconds. Four additional watchdogs are also implemented in the EPLD.

RTD Analog Temperature Inputs

There are four resistance thermal detector (RTD) sensor inputs into the BICL board. Terminal 1 is connected to the 5 V supply and terminal 2 is connected to a 20 K load to ACOM. The voltage developed at terminal 2 is scaled, filtered, buffered, and then fed to the input of the analog to digital converter (ADC). A 10-bit four-channel ADC is used for the analog to digital conversion. There are two modes to access temperatures from the RTD, single and dual mode.

Fan Speed PWM Output

The fan speed PWM output is an isolated open collector transistor with a resistor in series with the collector. The transistor is ON when the PWM line from the ELPD is taken high. When the transistor is OFF the fan will be OFF. The ON duty cycle of the PWM waveform will increase the speed of the fan. The longer the PWM output is high the higher the fan's speed.

Serial Board Identification

A serial 1024-bit memory device is present on the board. This memory is programmed with board identification and revision information.

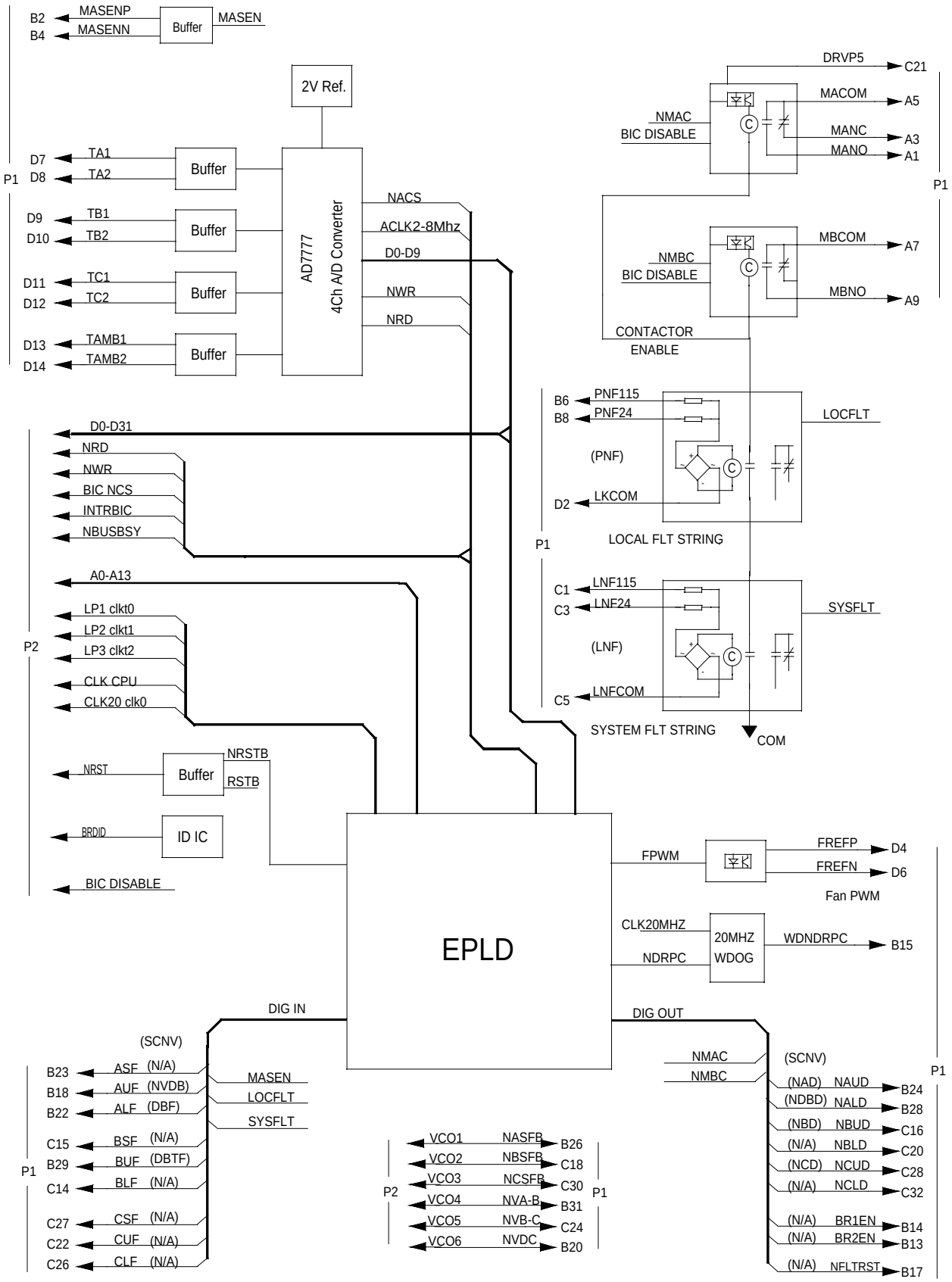


Figure 1. BICL Board Block Diagram

Application Data

The BICL board plugs into in a VME type rack via the P1 and P2 connectors. There are no other connections to the BICL board. Refer to Table 2 for P1 pin signal descriptions and to Table 3 for P2 pin signal descriptions.

Note

The pin signal descriptions differ in some instances when the BICL board is used with a BPIA or BPIB board from when the board is used with an SCNV board. Table 2 and Table 3 define pin signals for both applications.

The BICL board does not include any adjustable hardware, testpoints, LED indicators, or fuses. See Figure 2 for a board faceplate illustration and Figure 3 for a board layout diagram.

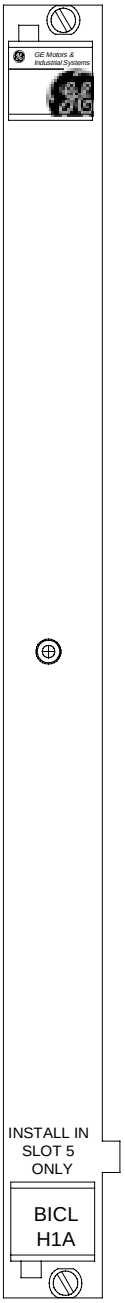


Figure 2. BICL Board Faceplate

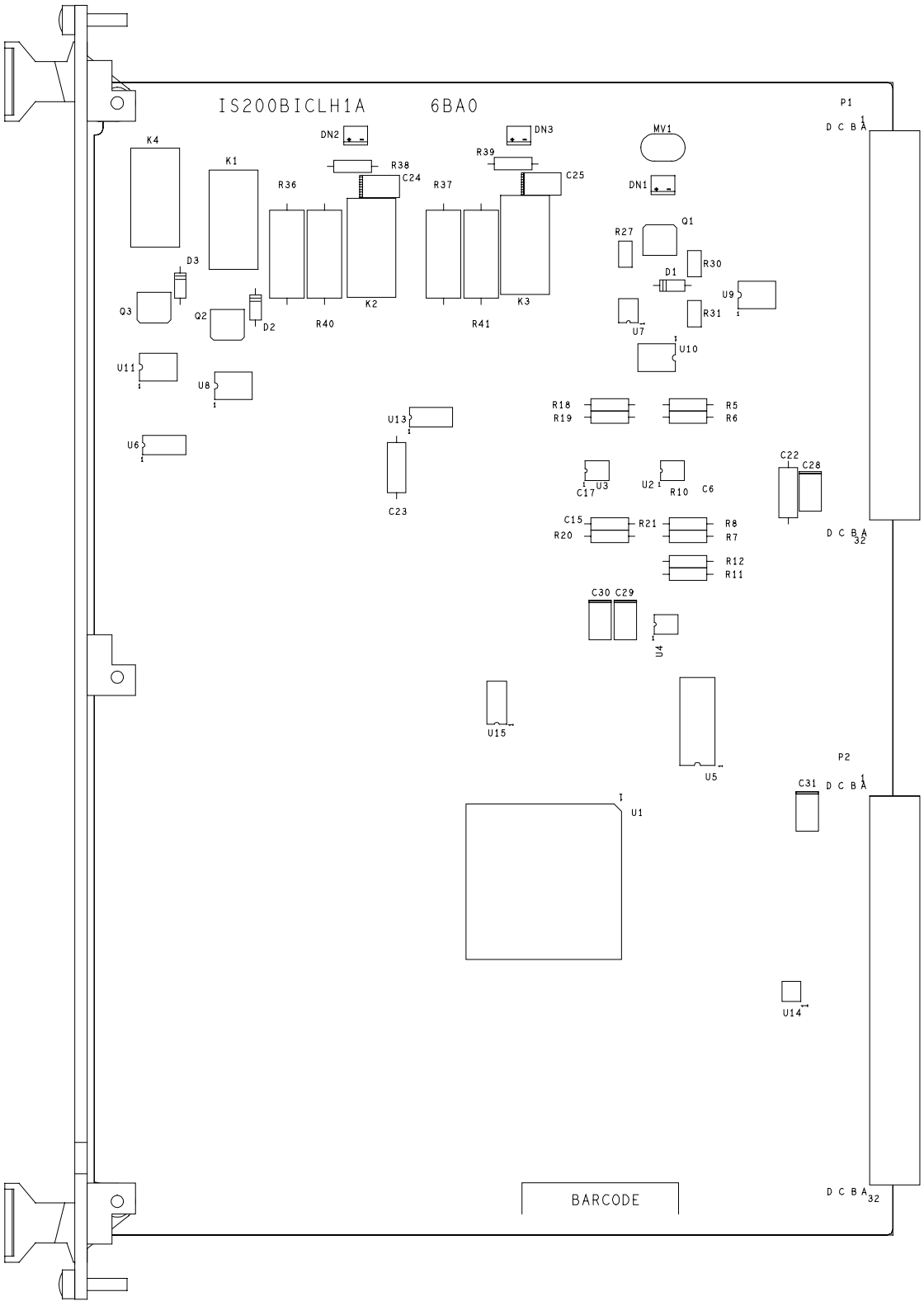


Figure 3. BICL Board Layout Diagram

Table 2A. P1 Bridge Control Connector (BPIA, BPIB or SCNV Applications)

P1 Pin	Nomenclature	Description
A1	MANO	A Contactor Pilot NO Contact
A2	NC	No Connect, Voltage Clearance
A3	MANC	A Contactor Pilot NC Contact
A4	NC	No Connect, Voltage Clearance
A5	MACOM	A Contactor Pilot COM Contact
A6	NC	No Connect, Voltage Clearance
A7	MBCOM	B Contactor Pilot COM Contact
A8	NC	No Connect, Voltage Clearance
A9	MBNO	B Contactor Pilot NO Contact
A10	NC	No Connect, Voltage Clearance
A11	NC	No Connect, PWM 3
A12	NC	No Connect, PWM 3
A13	NC	No Connect, PWM 3
A14	NC	No Connect, PWM 3
A15	P5	+5 V Supply
A16	P5	+5 V Supply
A17	NC	No Connect, PWM 3
A18	NC	No Connect, PWM 3
A19	NC	No Connect, PWM 3
A20	NC	No Connect, PWM 3
A21	NC	No Connect, PWM 3
A22	NC	No Connect, PWM 3
A23	P5	+5 V Supply
A24	P5	+5 V Supply
A25	NC	No Connect PWM 3
A26	NC	No Connect PWM 3
A27	NC	No Connect PWM 3
A28	NC	No Connect PWM 3
A29	NC	No Connect PWM 3
A30	NC	No Connect PWM 3
A31	P5	+5 V Supply
A32	P5	+5 V Supply

Table 2B. P1 Bridge Control Connector (BPIA or BPIB Applications Only)

P1 Pin	Nomenclature	Description
B1	NC	No Connect, Voltage Clearance
B2	MASENP	A Contactor Sense, 24 – 115 V ac/dc Input
B3	NC	No Connect, Voltage Clearance
B4	MASENN	A Contactor Sense, 24 – 115 V ac/dc Input
B5	NC	No Connect, Voltage Clearance
B6	PNF115	Local Panel Fault String, 115 V ac/dc Input
B7	NC	No Connect, Voltage Clearance
B8	PNF24	Local Panel Fault String, 24 V ac/dc Input
B9	NC	No Connect, Voltage Clearance
B10	NC	No Connect
B11	NC	No Connect
B12	NC	No Connect
B13	BR2EN	Bridge 2 Enable; High = Enable
B14	BR1EN	Bridge 1 Enable; High = Enable
B15	WDNDRPC	Watchdog driver power control; Low = Power ON
B16	DCOM	Digital Common
B17	NFLTRST	Bridge fault reset; Low = Reset (BPIB)
B18	AUF	Phase A Upper Desaturation/UV fault; Hi = Fault
B19	DCOM	Digital Common
B20	NVDC	Link V DC VCO; 0 – 1198 V dc = 0 – 2 MHz
B21	DCOM	Digital Common
B22	ALF	Phase A Lower Desaturation/UV fault; Hi = Fault
B23	ASF	Phase A Shunt fault; Hi = Fault
B24	NAUD	Phase A Upper driver; Low = ON
B25	DCOM	Digital Common
B26	NASFB	IA VCO; 1Mhz ±200 mv = ±800 kHz.
B27	DCOM	Digital Common
B28	NALD	Phase A Lower driver; Low = ON
B29	BUF	Phase B Upper Desaturation/UV fault; Hi = Fault
B30	DCOM	Digital Common
B31	NVAB	VA – VB VCO; 976.8 kHz ±959.58 Hz/1 V
B32	DCOM	Digital Common

Table 2C. P1 Bridge Control Connector (SCNV Applications Only)

P1 Pin	Nomenclature	Description
B1	NC	No Connect, Voltage Clearance
B2	MASENP	A Contactor Sense, 24 – 115 V ac/dc Input
B3	NC	No Connect, Voltage Clearance
B4	MASENN	A Contactor Sense, 24 – 115 V ac/dc Input
B5	NC	No Connect, Voltage Clearance
B6	PNF115	Local Panel Fault String, 115 V ac/dc Input
B7	NC	No Connect, Voltage Clearance
B8	PNF24	Local Panel Fault String, 24 V ac/dc Input
B9	NC	No Connect, Voltage Clearance
B10	NC	No Connect
B11	NC	No Connect
B12	NC	No Connect
B13	NC	No Connect
B14	NC	No Connect
B15	WDNDRPC	Watchdog driver power control; Low = power ON
B16	DCOM	Digital Common
B17	NC	No Connect
B18	NVDB	DB Collector – Emitter voltage VCO feedback input
B19	DCOM	Digital Common
B20	NVDC	Link V DC VCO; 0 – 1198 V dc = 0 – 2 MHz
B21	DCOM	Digital Common
B22	DBF	DB IGBT Desaturation/UV fault; Hi = Fault
B23	NC	No Connect
B24	NAD	Phase A SCR gate control output; Low = ON
B25	DCOM	Digital Common
B26	NASFB	IA VCO; 1 MHz ±200 mv = ±800 kHz.
B27	DCOM	Digital Common
B28	NDBD	DB IGBT driver control; Low = ON
B29	DBTF	DB Temperature fault; Hi = Fault
B30	DCOM	Digital Common
B31	NVAB	VA – VB VCO; 976.8 kHz ±959.58 Hz/1 V
B32	DCOM	Digital Common

Table 2D. P1 Bridge Control Connector (BPIA or BPIB Applications Only)

P1 Pin	Nomenclature	Description
C1	LNF115	System Line Fault String, 115 V ac/dc Input
C2	NC	No Connect, Voltage Clearance
C3	LNF24	System Line Fault String, 24 V ac/dc Input
C4	NC	No Connect, Voltage Clearance
C5	LNFCOM	System Line Fault String, COM ac/dc Input
C6	NC	No Connect, Voltage Clearance
C7	NC	No Connect
C8	NC	No Connect
C9	NC	No Connect
C10	NC	No Connect
C11	NC	No Connect
C12	NC	No Connect
C13	NC	No Connect
C14	BLF	Phase B Lower Desaturation/UV fault; Hi = Fault
C15	BSF	Phase B Shunt fault; Hi = Fault
C16	NBUD	Phase B Upper driver; Low = ON
C17	DCOM	Digital Common
C18	NBSFB	IB VCO; 1 MHz ±200 mv = ±800 kHz.
C19	NC	No Connect
C20	NBLD	Phase B Lower driver; Low = ON
C21	DRVP5	Driver Switched 5 V power output
C22	CUF	Phase C Upper Desaturation/UV fault; Hi = Fault
C23	DCOM	Digital Common
C24	NVBC	VB – VC VCO; 976.8 kHz ±959.58 Hz/1 V
C25	DCOM	Digital Common
C26	CLF	Phase C Lower Desaturation/UV fault; Hi = Fault
C27	CSF	Phase C Shunt fault; Hi = Fault
C28	NCUD	Phase C Upper driver; Low = ON
C29	DCOM	Digital Common
C30	NCSFB	IC VCO; 1 MHz ±200 mv = ±800 kHz.
C31	DCOM	Digital Common
C32	NCLD	Phase C Lower driver; Low = ON

Table 2E. P1 Bridge Control Connector (SCNV Applications Only)

P1 Pin	Nomenclature	Description
C1	LNF115	System Line FLT String, 115 V ac/dc Input
C2	NC	No Connect, Voltage Clearance
C3	LNF24	System Line FLT String, 24 V ac/dc Input
C4	NC	No Connect, Voltage Clearance
C5	LNFCOM	System Line FLT String, COM ac/dc Input
C6	NC	No Connect, Voltage Clearance
C7	NC	No Connect
C8	NC	No Connect
C9	NC	No Connect
C10	NC	No Connect
C11	NC	No Connect
C12	NC	No Connect
C13	NC	No Connect
C14	NC	No Connect
C15	NC	No Connect
C16	NBD	Phase B SCR gate control output; Low = ON
C17	DCOM	Digital Common
C18	NBSFB	IB VCO; 1 MHz ±200 mv = ±800 kHz
C19	NC	No Connect
C20	NC	No Connect
C21	DRVP5	Driver Switched 5 V power output
C22	NC	No Connect
C23	DCOM	Digital Common
C24	NVBC	VB – VC VCO; 976.8 kHz ±959.58 Hz/1 V
C25	DCOM	Digital Common
C26	NC	No Connect
C27	NC	No Connect
C28	NCD	Phase C SCR gate control output; Low = ON
C29	DCOM	Digital Common
C30	NCSFB	IC VCO; 1 MHz ±200 mv = ±800 kHz
C31	DCOM	Digital Common
C32	NC	No Connect

Table 2F. P1 Bridge Control Connector (BPIA, BPIB, or SCNV Applications)

P1 Pin	Nomenclature	Description
D1	NC	No Connect, Voltage Clearance
D2	LKCOM	Local Panel Fault String COM LKPL ac/dc Input
D3	NC	No Connect, Voltage Clearance
D4	FREFP	Fan Speed PWM OC Positive Output
D5	NC	No Connect, Voltage Clearance
D6	FREFN	Fan Speed PWM OC Negative Output
D7	TA1	A Phase RTD Temperature Sensor Input 1
D8	TA2	A Phase RTD Temperature Sensor Input 2
D9	TB1	B Phase RTD Temperature Sensor Input 1
D10	TB2	B Phase RTD Temperature Sensor Input 2
D11	TC1	C Phase RTD Temperature Sensor Input 1
D12	TC2	C Phase RTD Temperature Sensor Input 2
D13	TAMB1	Ambient RTD Temperature Sensor Input 1
D14	TAMB1	Ambient RTD Temperature Sensor Input 2
D15	NC	No Connect PWM3
D16	NC	No Connect PWM3
D17	NC	No Connect PWM3
D18	NC	No Connect PWM3
D19	NC	No Connect PWM3
D20	NC	No Connect PWM3
D21	NC	No Connect PWM3
D22	NC	No Connect PWM3
D23	NC	No Connect PWM3
D24	NC	No Connect PWM3
D25	NC	No Connect PWM3
D26	NC	No Connect PWM3
D27	NC	No Connect PWM3
D28	IP24	Isolated 24 V dc
D29	I24COM	Isolated 24 V Common
D30	NC	No Connect PWM3
D31	NC	No Connect
D32	NC	No Connect

Table 3A. P2 Address, Data, and Control Connector (BPIA, BPIB, or SCNV Applications)

P2 Pin	Nomenclature	Description
A1	P5	+5 V Supply
A2	D0	Data Line 0
A3	D4	Data Line 4
A4	DCOM	Digital Common
A5	D8	Data Line 8
A6	D12	Data Line 12
A7	D16	Data Line 16
A8	D20	Data Line 20
A9	D24	Data Line 24
A10	D28	Data Line 28
A11	A0	Address Line 0
A12	DCOM	Digital Common
A13	A4	Address Line 4
A14	A8	Address Line 8
A15	A12	Address Line 12
A16	NCSBIC	BIC Card Chip Select Line; Low = Select
A17	NC	No Connect
A18	NC	No Connect
A19	NC	No Connect
A20	DCOM	Digital Common
A21	NRST	PSEN Line; Low = Reset
A22	P15	+15 V Supply
A23	NC	No Connect
A24	NC	No Connect
A25	NC	No Connect
A26	NASFB	VCO 1 Pass Through from P1-B26
A27	NVBC	VCO 5 Pass Through from P1-C24
A28	DCOM	Digital Common
A29	NC	No Connect
A30	NC	No Connect
A31	NC	No Connect
A32	P5	+5 V Supply

Table 3B. P2 Address, Data, and Control Connector (BPIA, BPIB, or SCNV Applications)

P2 Pin	Nomenclature	Description
B1	P5	+5 V Supply
B2	D1	Data Line 1
B3	D5	Data Line 5
B4	D9	Data Line 9
B5	D13	Data Line 13
B6	D17	Data Line 17
B7	D21	Data Line 21
B8	DCOM	Digital Common
B9	D25	Data Line 25
B10	D29	Data Line 29
B11	A1	Address Line 1
B12	A5	Address Line 5
B13	A9	Address Line 9
B14	DCOM	Digital Common
B15	A13	Address Line 13
B16	NC	No Connect
B17	CLKCPU	CLK from CPU
B18	DCOM	Digital Common
B19	LDPLS1	Load Pulse 1
B20	LDPLS2	Load Pulse 2
B21	ACOM	Analog Common
B22	NC	No Connect
B23	NC	No Connect
B24	DCOM	Digital Common
B25	CLK20MHZ	20 MHz CLK Input
B26	NBSFB	VCO 2 Pass Through from P1-C18
B27	NVDC	VCO 6 Pass Through from P1-B20
B28	NC	No Connect
B29	NC	No Connect
B30	NC	No Connect
B31	NC	No Connect
B32	P5	+5 V Supply

Table 3C. P2 Address, Data, and Control Connector (BPIA, BPIB, or SCNV Applications)

P2 Pin	Nomenclature	Description
C1	P5	+5 V Supply
C2	D2	Data Line 2
C3	D6	Data Line 6
C4	D10	Data Line 10
C5	D14	Data Line 14
C6	D18	Data Line 18
C7	D22	Data Line 22
C8	DCOM	Digital Common
C9	D26	Data Line 26
C10	D30	Data Line 30
C11	A2	Address Line 2
C12	A6	Address Line 6
C13	A10	Address Line 10
C14	DCOM	Digital Common
C15	NRD	Data Read Line; Low to Read
C16	INTRBIC	Interrupt Line
C17	NC	No Connect
C18	DCOM	Digital Common
C19	LDPLS3	Load Pulse 3
C20	NC	No Connect
C21	ACOM	Analog Common
C22	NC	No Connect
C23	NC	No Connect
C24	DCOM	Digital Common
C25	NC	No Connect
C26	NCSFB	VCO 3 Pass Through from P1-C30
C27	NC	No Connect
C28	NC	No Connect
C29	NC	No Connect
C30	NC	No Connect
C31	NC	No Connect
C32	P5	+5 V Supply

Table 3D. P2 Address, Data, and Control Connector (BPIA, BPIB, or SCNV Applications)

P2 Pin	Nomenclature	Description
D1	P5	+5 V Supply
D2	D3	Data Line 3
D3	D7	Data Line 7
D4	DCOM	Digital Common
D5	D11	Data Line 11
D6	D15	Data Line 15
D7	D19	Data Line 19
D8	D23	Data Line 23
D9	D27	Data Line 27
D10	D31	Data Line 31
D11	A3	Address Line 3
D12	DCOM	Digital Common
D13	A7	Address Line 7
D14	A11	Address Line 11
D15	NWR	Data Write Line; Low to Write
D16	NBUSBSY	Buss Busy Line
D17	NC	No Connect
D18	NC	No Connect
D19	BRDID	Serial Board ID Line
D20	DCOM	Digital Common
D21	BICDABL	BIC Disable Line; High = Disable
D22	N15	-15V Supply
D23	NC	No Connect
D24	NC	No Connect
D25	NC	No Connect
D26	NVAB	VCO 4 Pass Through from P1-B31
D27	NC	No Connect
D28	DCOM	Digital Common
D29	NC	No Connect
D30	NC	No Connect
D31	NC	No Connect
D32	P5	+5 V Supply

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 4 explains the structure of the part number.

The board's functional acronym, shown in Figure 3, normally is based on the **board description**, or name. For example, the *BICL* board is described as the *IGBT Drive/Source Bridge Interface* board.

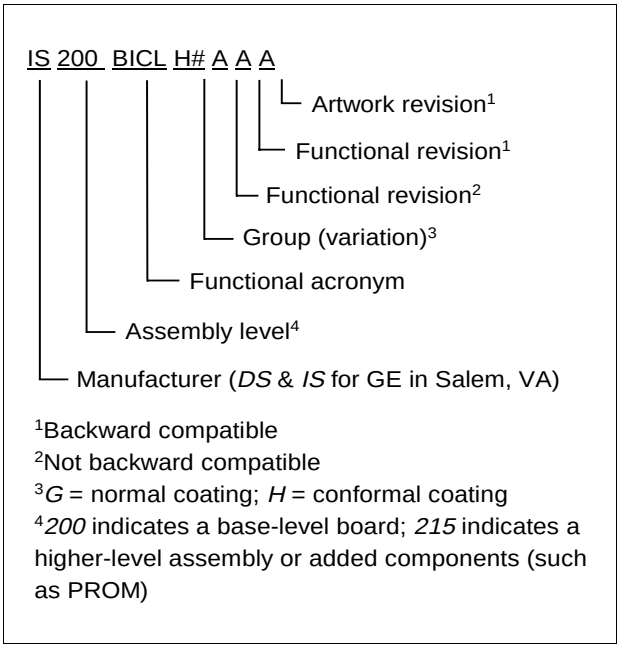


Figure 4. Board Part Number Conventions

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 Control 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 Control Systems ensures backward compatibility of replacement boards.

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 antistatic bags. Use the following guidelines when handling boards:

1. Store boards in antistatic bags or boxes.
2. Use a grounding strap when handling boards or board components.

Replacement Procedures

WARNING

To prevent electric shock, turn off power to the board, 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 board from the VME rack as follows:

1. Make sure that the drive in which the board resides has been deenergized.
2. Open the drive's cabinet door. Using equipment designed for high voltages, test any electrical circuits **before touching them** to ensure that power is off.
3. Carefully remove the board from the rack, as follows:
   a. Loosen the screws at the top and bottom of the board, near the board ejector tabs. (The screws are captive in the board front and should not be removed.)
   b. Unseat the board by raising the ejector tab.
   c. Using both hands, gently pull the board from the VMEbus rack.

Install the new (replacement) board in the rack as follows:

1. Slide the board into the **correct slot** in the rack.

CAUTION

Because VME boards are keyed for specific rack slots, inserting the BICL into the wrong slot can damage the electronics.

2. Begin seating the board by firmly pressing the top and bottom of the board at the same time with your thumbs.
3. Finish seating the board in the slot by starting and then tightening the screws at the top and bottom of the board. **Tighten the screws evenly** to ensure that the board is seated squarely.



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