GEK-105490

Innovation™ Series
Medium Voltage AC Drives

2300 V, 18-Pulse Non-regenerative Drive

User's Manual (Preliminary Copy)

Innovation™ Series
Low Voltage AC Drives

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2300 V, 18-Pulse Non-Regenerative Drive

User's Manual (Preliminary Copy)

Printed in the United States of America.

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.

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.

WARNING

This equipment contains a potential hazard of electric shock or burn. Only personnel who are adequately trained and thoroughly familiar with the equipment and the instructions should install, operate, or maintain this equipment.

Isolation of test equipment from the equipment under test presents potential electrical hazards. If the test equipment cannot be grounded to the equipment under test, the test equipment's case must be shielded to prevent contact by personnel.

To minimize hazard of electrical shock or burn, approved grounding practices and procedures must be strictly followed.

WARNING

To prevent personal injury or equipment damage caused by equipment malfunction, only adequately trained personnel should modify any programmable machine.

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1 Equipment Overview

This manual describes the 2300 V, non-regenerative model of GE's Innovation™ Series medium voltage ac drives. The purpose of the manual is to assist the user in operating and maintaining this drive.

Section 1 introduces drive features and defines the manual contents. Its purpose is to present a general product overview for the reader, as follows:

Section 2, Drive Diagnostic Interface. Describes the door-mounted operator interface used to set, monitor, and maintain the drive locally.

Section 3, Preventive Maintenance. Provides guidelines for keeping the drive in good running condition.

Section 4, Faults and Troubleshooting. Lists and defines drive fault messages, with troubleshooting suggestions if the fault occurs.

Section 5, Component Replacement. Provides guidelines for replacing components during repair.

Section 6, Drive Parts Lists. Contains parts lists of the drive's electronic and wiring components.

Appendix A, Warranty and Renewal Parts. Contains information on how to identify and obtain warranty and spare parts.

Appendix B, Drive Parameters. Provides flow diagrams of drive parameters.

Appendix C, Assembly Drawings/Parts List. Contains drawings that show the drive's assembly structure and identifies the parts of the assembly.

Refer to the *Table of Contents* for the organization of these sections.

1-1. Introduction to the Drive

The Innovation Series medium voltage ac drive is an IGBT-based, 3-level, pulse-width modulated (PWM) inverter. It is designed for high performance and efficiency in the variable speed control of a 2300 V ac induction motor.

The drive combines state-of-the-art hardware components and microprocessor-based control circuitry. Managed by powerful application software and menu-based tuneup tools with protectives, the drive delivers the optimal ac output as needed by a customer's application.

Drive features include:

- Heatpipe/fan combination for space-efficient, maximum rated cooling
- Medium voltage IGBTs (insulated gate bipolar transistors) in a proven bridge configuration
- Laminated bus to eliminate need for snubbers
- Liquid-filled capacitors
- 18-pulse input to enhance power quality
- 3-level inverter for a "cleaner" output waveform
- Protective hardware coupled with continuous software-controlled fault monitoring
- Door-mounted operator control unit with both digital and graphical display
- Menu-driven monitoring and tuneup tools with fault display/help functions
- Optional PC-based configuration tools

1-2. Hardware Overview

The 2300 V non-regenerative drive is physically arranged into a lineup of three enclosures:

- Source (rectifier) cabinet
- Load (inverter) cabinet
- Control cabinet

Figure 1-1 illustrates this drive lineup. Figure 1-2 shows the drive hardware structure, including the main components of the three units.

The drive's **source unit** is fed by a separate 18-pulse transformer and switchgear configuration that steps down a 4160 V input from the customer power source. Cable entry can be either at the top or bottom of the unit.

The **load unit**, positioned between the source and control units, receives input from each. It produces controlled ac output to the motor, with an option for either a top or bottom power cable exit.

The **control unit** contains the microprocessor-based assemblies and the operator interface devices. Included is the door-mounted Drive Display Interface (DDI) through which the user implements tuneup and monitor functions.

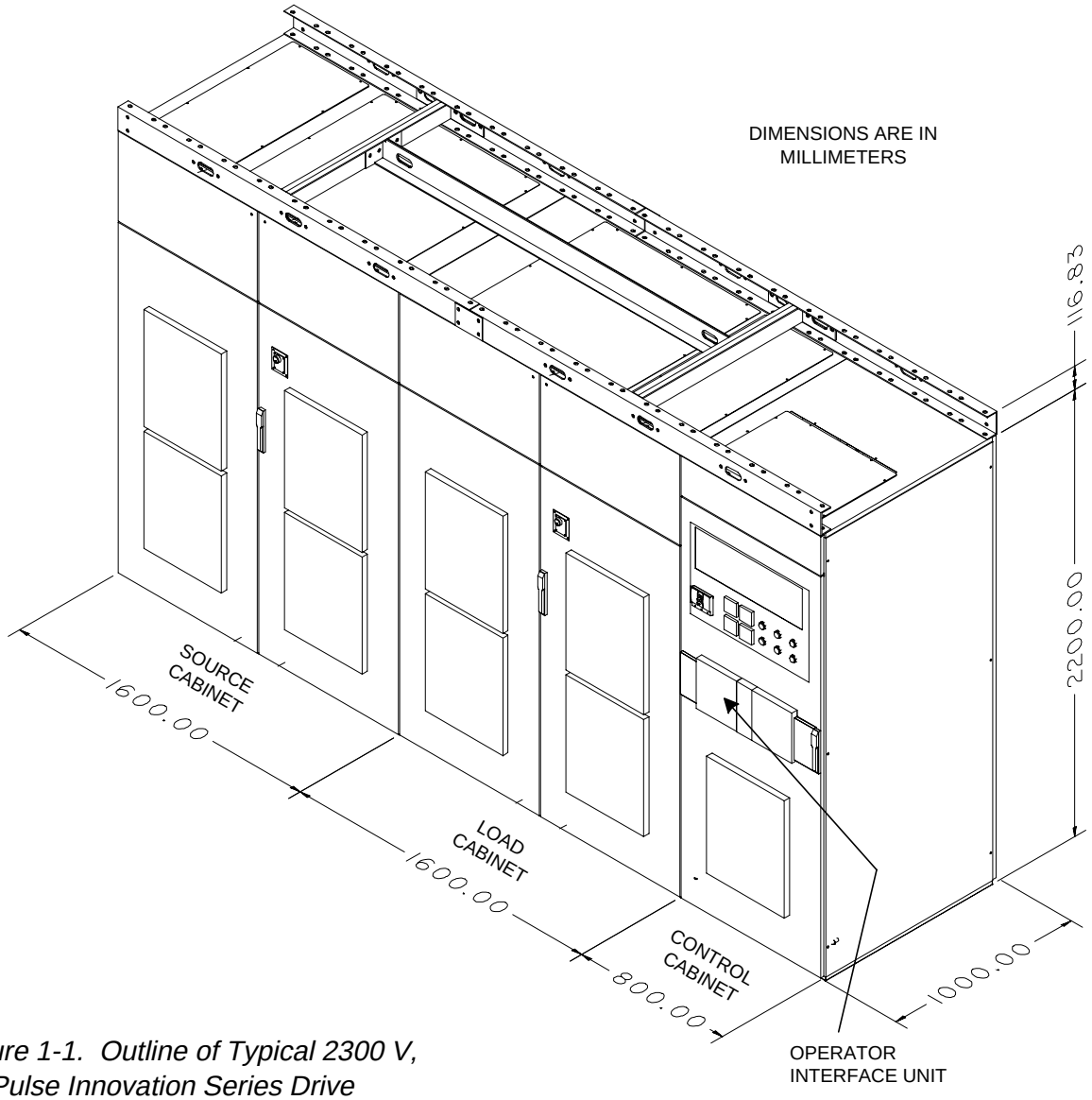


Figure 1-1. Outline of Typical 2300 V, 18-Pulse Innovation Series Drive

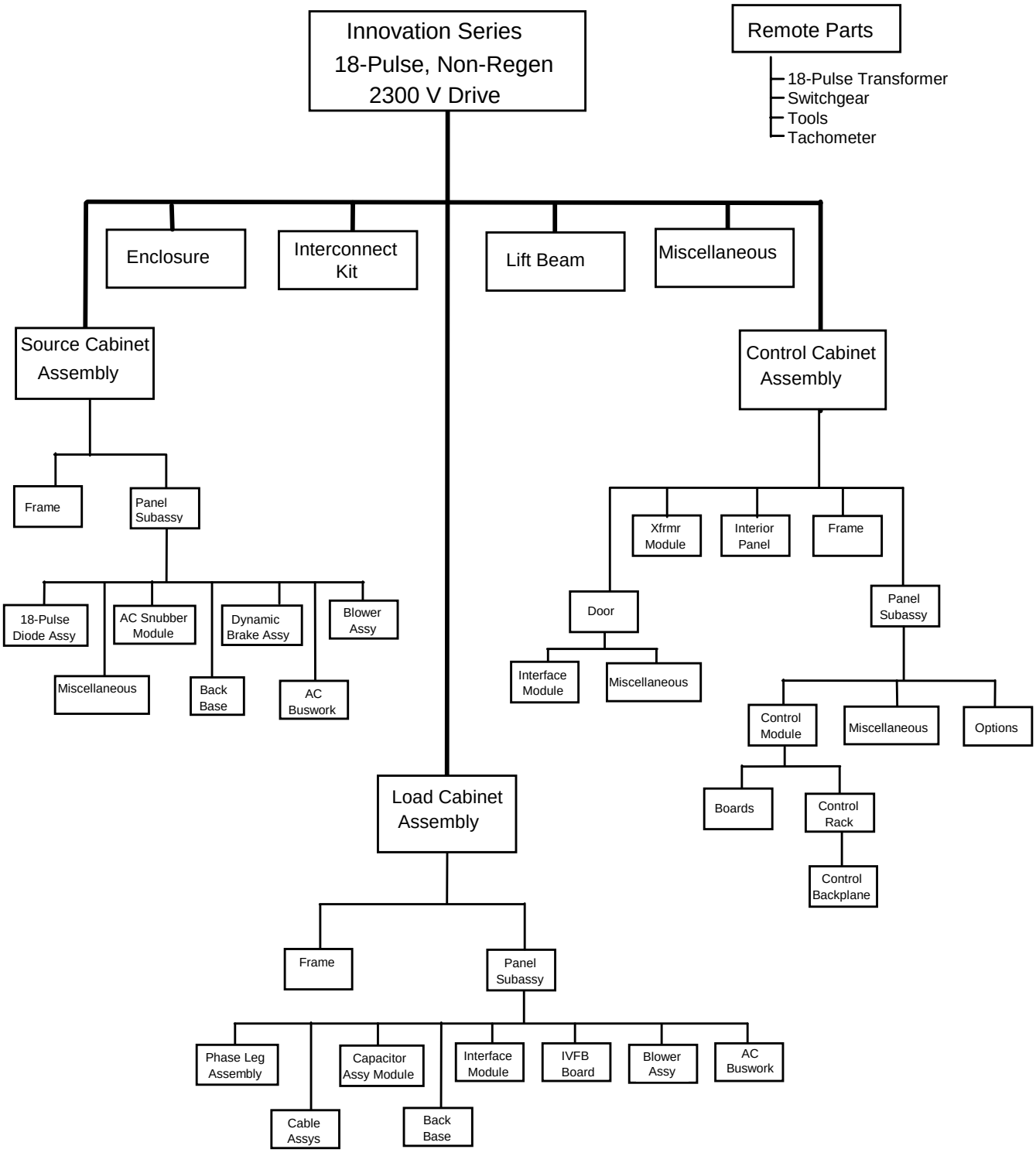


Figure 1-2. Overview of Drive Hardware Structure

1-3. Software Overview

The drive application program consists of functional software modules (building blocks). These combine to perform per system requirements. Block definitions and configuration parameters (see Appendix B) are stored in EEPROM. Variables are stored in RAM.

Tuneup and diagnostic software is transparent to the user. Operator control is provided as menu-driven selections on the door-mounted interface unit (DDI, see Section 2). The drive continually monitors performance and outputs the results on the DDI display as animated meters, icons, and digital values. Additional menus allow the operator to examine and reset any detected faults.

An optional Windows-based configuration, tuneup, and monitoring software package is available for use on a connected personal computer (PC). This *Control System Toolbox* provides online help functions, including parameter diagrams. Refer to the toolbox manual, GEH-6333, for details.

1-4. Technical Characteristics

Parameter	Requirement
Rating:	
3000 hp continuous	700 A, no overload
2500 hp continuous	600 A, with 150% overload for 60 sec.
2100 hp continuous	500 A, with 200% overload for 60 sec.
Power Input:	
Voltage variation	±10%
Frequency	50 – 60 Hz with no derating
Power quality	IEEE-519
Displacement power factor	> 95%
Power Output:	
Voltage	0 – 2300 V
Current	700 A continuous with no overload at rated load
Frequency	0 – 200 Hz
Current THD	4% or less
Inverter type	Voltage source, 3-level, neutral point clamped
Modulation	PWM, space vector, 3-level
Bridge type	Diode line converter, IGBT inverter
Bridge isolation	NEMA, IEC-146-1-1
Bridge isolation from control	Fiber-optic
Environment:	
Operating temperature (ambient)	0 to 40 °C (32 °F to 104 °F) at rated load, 50 °C (122 °F) with derating
Humidity	5 – 95% relative, non-condensing
Altitude	Normal operation: 0 – 1000 m Extended operation: 1000 – 3000 m with a 6% per 1000 m derating Shipping: Maintain pressure of 70 to 106 kPa
Cooling	Heatpipe, air heat exchanger; Forced convection via blower
Enclosure	NEMA Type 1 (IP20), general purpose, vented
Storage temperature	-25 °C to 70 °C (13 °F – 158 °F), ambient
Lifetime	20 years with proper application
Maintainability (Medium time to repair)	Controls = 10 minutes Power electronics = 30 minutes
Vibration	0.075 mm peak acceleration 10 – 57 Hz 1.0 g 57 – 150 Hz, tested per IEC 68.2.6 Test F Sub C
Acoustic noise	< 78 db
EMI/RFI	Emissions and Immunity per EN55011, ENV50140, EN61000
Clearances	IEEE-347A, IEC-146, CE, NEMA for Medium Voltage, CSA/UL
Standards:	CSA/UL and CE

1-5. Technical Assistance

For assistance, contact:

General Electric Company
Product Service Engineering
1501 Roanoke Blvd.
Salem, VA 24153-6492 USA
Phone: 001-540-387-7595
Fax: 001-540-387-8606

1-6. Related Documents

The following publications also apply to the your Innovation Series drives and may assist in understanding the system:

- ☐ GEI-100256, *Receiving, Handling, and Storage of Innovation Series Equipment*
- ☐ GEK-105487, *Innovation Series Medium Voltage AC Drives, Installation Instructions*
- ☐ GEH-6333, *Control System Toolbox*

Additionally, the following documents provide requisition-specific information about the customer's equipment.

- ☐ System drawings, including outlines, layouts, and elementary diagrams
- ☐ Renewal Parts listing (see Appendix A)

Note

If differences between the general product documentation and the requisition-specific documentation exist, the requisition documentation should be considered the more exact representation of a customer's equipment or system configuration.

GE Industrial Control Systems supplies the applicable documents to its customers to support the equipment provided in a requisition system.

The contract documents define the terms of the document distribution.

Notes:

2 Drive Diagnostic Interface

Section 2 of this manual provides information to help the user understand how operate the Drive Diagnostic Interface (DDI). It is organized as follows:

2-1. Introduction

(Refer to Figure 2-1.) Innovation Series drives include a door-mounted operator control unit, the DDI. This feature provides a simple, easily accessed means for a user to set, monitor, and maintain the drive locally.

The operator can use the DDI to perform the following common tasks:

- Monitor speed/current
- Start/Stop functions
- Adjust a configuration parameter
- Reset a fault condition

Each drive has its own DDI for local control.

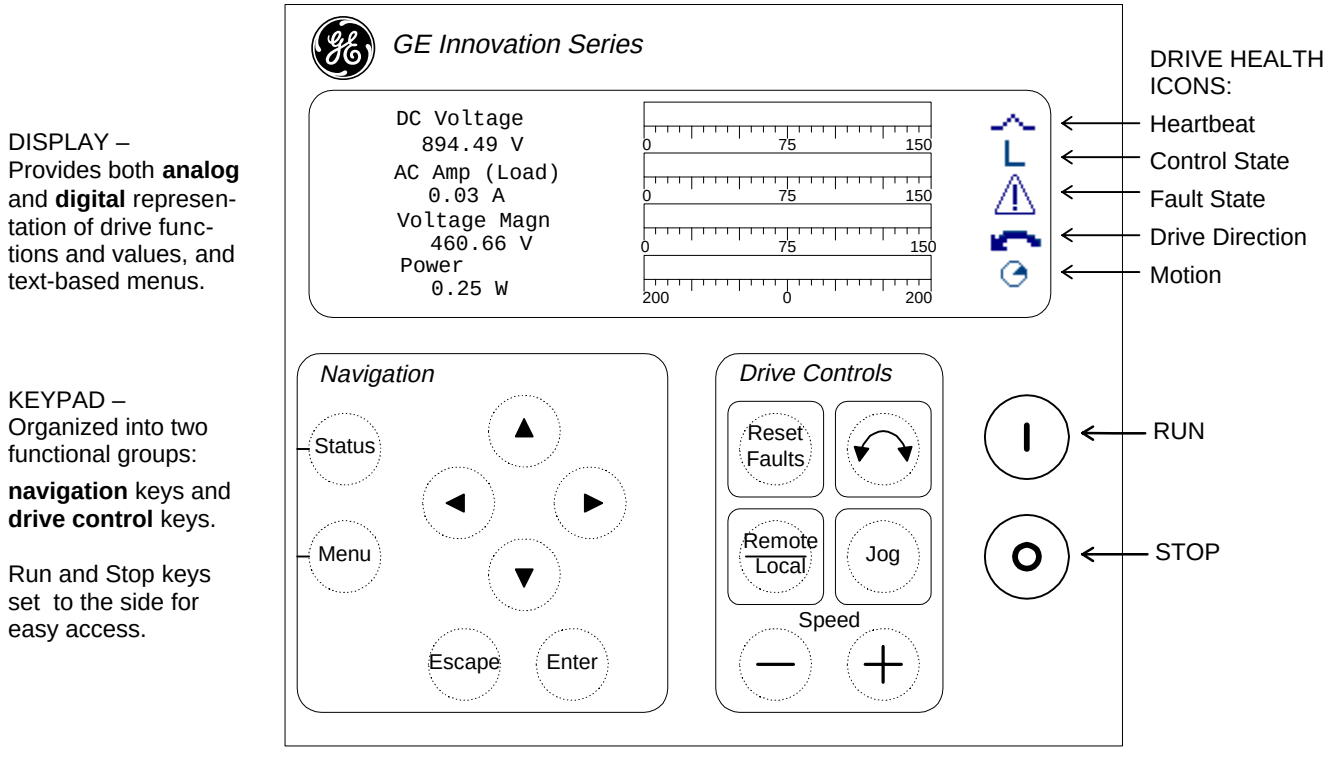


Figure 2-1. DDI As Seen From Front of Drive

2-2. Using the Keypad

The keypad enables a user to access drive values and to control the drive. The keys are membrane type pushbuttons that perform their operation when pressed and released.

As shown in Figure 2-1, the DDI keypad is arranged into functional groups of keys, as labeled: *Navigation* and *Drive Contro*ls.

Navigation keys are used to:

- Select the type of display (Status or Menu, see section 2-3)
- Move through and select the DDI's menu items, including fault options (see section 2-4)
- Select and modify parameters items (see section 2-5)

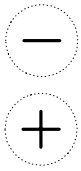
Drive control keys enable a user to locally manage the drive.

Table 2-1 defines these keys and their functions. (In the column labeled *Active*, an *L* indicates *local* and an *R* indicates *remote*.)

Table 2-1. Key Functions

Key	Active	Function
Navigation Keys:		
Status	L/R	Takes user to status screen where four parameters are shown in digital numbers or bar-graph form. A set of "health" icons (see section 2-3.1) provides additional drive status information.
Menu	L/R	If pressed while in a Menu screen (see section 2-3), takes the user to the Main Menu. When pressed while in a Status screen, takes user to last menu screen
▲ ▼	L/R	Menu Navigation: Used to highlight (reverse video) an item in a menu of options. Entry of Numeric Parameter: Used to index through numbers (0-9, ., -) when editing a parameter. Entry of Option Parameter: Used to index through 1 – n choices. Section 2-4.2. defines *numeric* and *option* parameters.
◄ ►	L/R	Menu Navigation: Right arrow selects an item in a menu of options. Left arrow takes user to next level up in menu tree. Entry of Numeric Parameter: Used to select a digit when editing a parameter. Entry of Option Parameter: Not functional.
Escape	L/R	Menu Navigation: Takes user to next level up in menu tree. Entry of Parameter: Takes user back to list of parameters.
Enter	L/R	Drive Menu Navigation: Takes user to next level down in menu tree. Entry of Parameter: Accepts editing of parameter.

Table 2-1. Key Functions – Continued

Key	Active	Drive Function
Drive Control Keys:		
Reset Faults	L/R	Resets faults.
	L	Inverter drives: Toggles direction of drive for Run and Jog commands. The currently selected direction is shown with an icon (see section 2-3.1.4). Source drives: No function.
Remote / Local	L/R	Toggles mode of the drive between local and remote. The currently selected mode is shown in the right side of the display with an R (Remote) or L (Local).
Jog	L	Inverter drives: Jogs drive in the selected direction at the configured jog speed. Source drives: No function.
	L	Inverter drives: Increments/Decrements the Local Speed Reference associated with the DDI Run/Stop commands. Source drives: No function.
	L	Local Run command from the DDI. The drive must be in Local mode to execute the Run command. An error screen displays if pressed while running in Remote mode.
	L/R	Local Stop command from the DDI. The drive can be stopped in Local or Remote mode.

2-3. Reading the Display

The DDI uses both text, symbols (icons), and animated graphics to present drive status and configuration data. There are two selectable types of display screens:

- The **Status screen** uses animated meters (bar graphs) with associated text to display drive performance data for four parameters (see Figure 2-2). This is the default screen that displays after drive startup (following an initialization screen).
- The **Menu screen** lists and provides access to menu-based functions for adjusting parameters and resetting faults (see Figure 2-3).

With either type of display screen, the righthand side contains active icons that continually represent the drive "health" (whether it is functioning correctly) and running state.

The operator chooses the desired screen by pressing either Status or Menu in the keypad's Navigation section (see Figure 2-1).

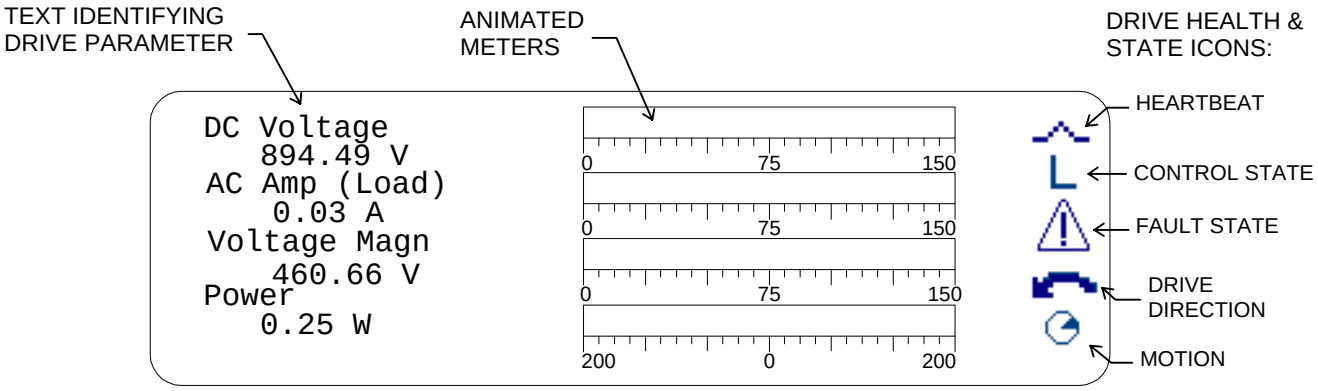


Figure 2-2. Sample of the Status Screen Display

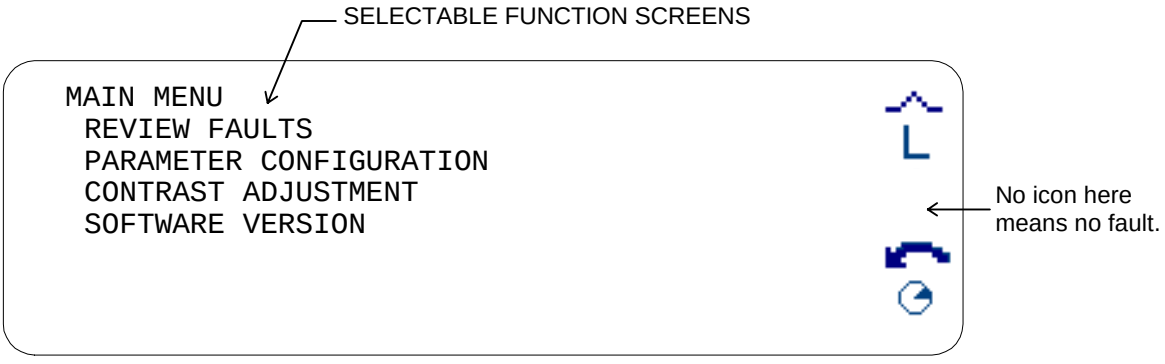


Figure 2-3. Sample of the Main Menu Screen Display

2-3.1. Drive Health/State Icons

These icons are displayed on the righthand side of every screen. There are five positions, with each representing a specific functional group, as follows (see Figure 2-2):

- Heartbeat
- Control state
- Fault state
- Drive direction
- Motion

The icon at each position can change, depending on the drive's health or state. These groups and their icons are described below.

2-3.1.1. Heartbeat. The "heartbeat" icon is a **data link OK** indicator. It is as an animated line whose center raises and lowers (see Figure 2-4) to show that the link is "alive" (okay).

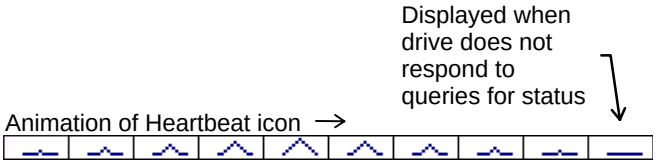


Figure 2-4. Icon for Heartbeat and Data Link OK

2-3.1.2. Control State. This indicator is one of the alphabetic symbols shown below in Figure 2-5. The drive must be in the local mode (*L* displayed) to enable starting from the DDI.

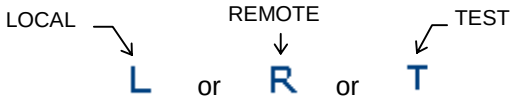


Figure 2-5. Control State Icons

2-3.1.3. Fault State. An icon in this position indicates that an error has been detected in the drive. This error can be an overridden parameter, alarm state, or trip state (see Table 2-2). Alarms and trips can be cleared using the menus (as described in section 2-4.1).

Table 2-2. Drive Fault State Indicators

Icon Display	Drive Status	Displayed when the drive has the following fault conditions: Trip	Alarm	Overrid. Param.
None	Drive OK	No	No	No
Ov	Abnormal	No	No	Yes
⚠	Alarm state	No	Yes	No
Flashing ⚠	Trip fault	Yes	No	No

2-3.1.4. Drive Direction. This icon indicates the direction of motion currently selected (see Figure 2-6). This does not necessarily match the direction of motion as viewed from motor shaft.

Figure 2-6. Drive Direction Icons

2-3.1.5. Motion. The icon in this position is one of three indicators (see Figure 2-7).

Note that the **Drive Ready/Not Ready** icons are mimics of the Start key. A diagonal line through the symbol means that the drive is not ready to run.

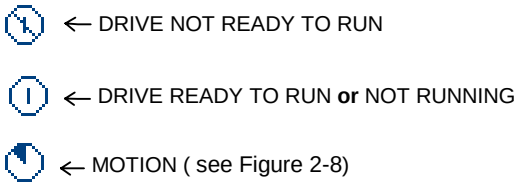


Figure 2-7. Motion Icons

When the drive is running (speed feedback is not zero), the **animated motion** icon appears in this position. It rotates (see Figure 2-8) in the direction selected with the direction arrow key (described in Table 2-1).

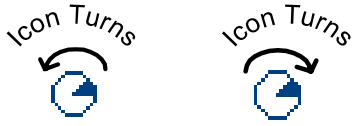


Figure 2-8. Animation of the Motion Icon

2-3.2. Animated Meters

The animated meters of the Status screen display (see Figure 2-2) are bar graphs. Table 2-3 defines characteristics of the bar graphs for the four types of parameters displayed.

(Refer to Figure 2-9.) A variable shown as a bar graph is **over range** when it is either greater than + 100% or less than –100%. The over range mark is shown with a vertical bar through the bar graph at the +100% and the –100% marks.

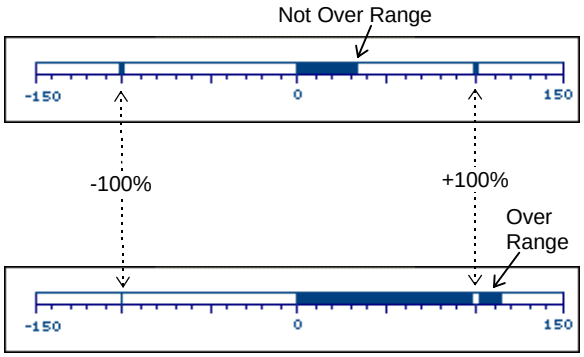


Figure 2-9. Sample Bar Graph Displays

Table 2-3. Bar Graph Display Characteristics

Bargraph Parameter	Numeric Display	Units in Bargraph
DC Voltage	Magnitude of dc bus voltage (VDC_Fil)	Percent of dc per unit volts (VDC_PU)
AC Amp (Load)	Magnitude of ac line current (I_Mag_Fil)	Percent of source top rated current (I_PU)
Voltage Magn	Magnitude of ac line voltage (Line_Mag_Fil)	Percent of ac line top rated voltage (V_PU)
Power	Dc bus power (DC_Bus_Pwr)	Percent of top rated dc bus power (Pwr_PU)

2-4. Menu Selections

Figure 2-10 shows the four selectable items on the DDI's Main Menu display. Each selection leads to other menu screens, where an operator can review and modify data, as needed.

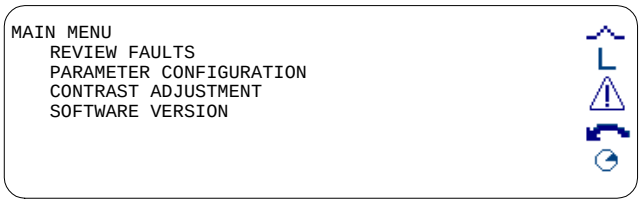


Figure 2-10. Selections on Main Menu Display

To access the options under any menu:

1. Use the up or down arrow keys to highlight the desired menu item.
2. Press the Enter or right arrow key to select this item.

To return to the previous menu screen, press the Escape key, left arrow key, or follow onscreen instructions.

2-4.1. Review Faults

The DDI displays a Fault State icon (see Table 2-2) to indicate if the drive is running correctly. When either a **trip** or an **alarm** fault occurs, the operator can view information and clear the fault, as described below.

1. To access a list of the drive's faults:
   a. Go to the Main Menu:
      – If already in a menu screen, press the Menu key on the keypad.
      – If in a Status screen, press the Menu key once or twice.
   b. Select the *Review Faults* menu item.

      This brings up the Fault Display screen (see Figure 2-11).

Note

Faults are displayed in order of occurrence, with the most recent fault at the top.

2. To see **detail** on a particular fault, select that fault on the Fault Display screen (highlight the item then press the Enter key or right arrow key).

   This brings up the Fault Detail screen (see Figure 2-11).

3. Faults can be **reset** (cleared) either of two ways:
   a. In the Fault Display screen, select the *Reset Faults Now* menu item (highlight and press the Enter key or right arrow key).

   Or

   b. On the keypad, press the Reset Faults key.

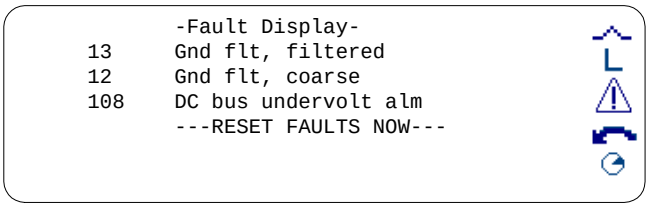


Figure 2-11. Sample Fault Display Screen

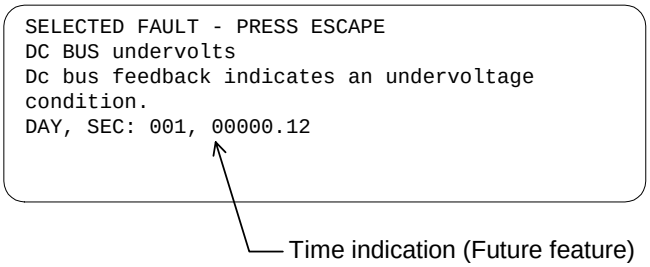


Figure 2-12. Sample Fault Detail Screen

2-4.2. Parameter Configuration

There are two types of parameters that an operator can edit and set using the menus:

- **Option parameters** display a list of items (options) for an operator to select. For example, *True/False* is an option parameter.
- **Numeric parameters** display a list of valid digits that the operator selects to create a number.

Appendix B provides diagrams of available drive parameters.

To edit a parameter from the DDI:

1. Go to the Main Menu (shown in Figure 2-10):
   a. If in another Menu screen, press the Menu key on the keypad.
   b. If in a Status screen, press the Menu key twice.
2. Use the down arrow key to highlight the *Parameter Configuration* menu item.

   This brings up the drive Parameter screen (see Figure 2-13), which lists the parameters and their current settings.

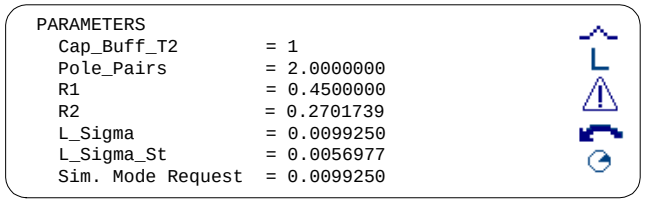


Figure 2-13. Sample Drive Parameter Screen

3. Use the up/down arrow keys to index through the list to the parameter you want to change.
4 To select the parameter for editing, press the Enter key (or right arrow key).

   This brings up that parameter's configuration screen (see Figures 2-13 and 2-14). The *New Value* line is highlighted.

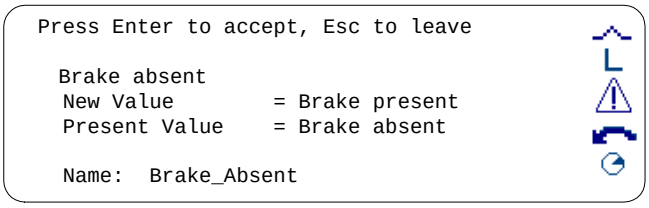


Figure 2-14. Sample Option Parameter Screen

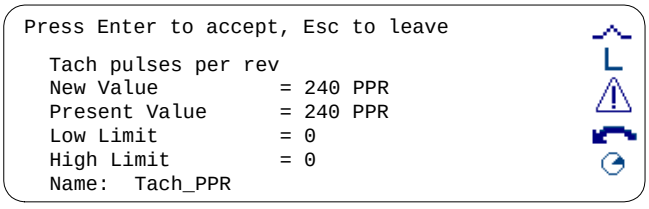


Figure 2-15. Sample Numeric Parameter Screen

5. If the selection is an **option** parameter:
   a. Highlight the option using the down arrow key.
   b. Press the Enter key to accept the parameter entry.

   If the selection is a **numeric** parameter:
   a. Using the up/down arrow keys to index through the valid digits (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, ., -).
   b. Enter the new number one digit at a time by pressing the Enter key (or right arrow key) to make each digit entry.
6. Press the Escape key to get back to list of drive parameters.

2-4.3. Contrast Adjustment Screen

To adjust the contrast of the DDI screen, select *Contrast Adjustment* from the Main Menu screen (see Figure 2-10). This brings up a another screen with instructions (see Figure 2-16).

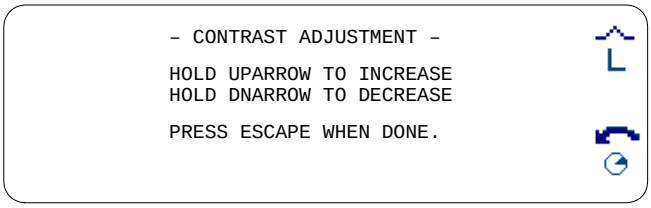


Figure 2-16. Sample Contrast Adjustment Screen

2-4.4. Software Version Screen

To check the version of software being run, select *Software Version* from the Main Menu screen (see Figure 2-10). This brings up a screen with the information (see Figure 2-17).

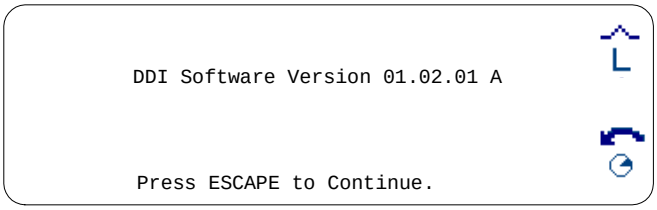


Figure 2-17. Sample Software Version Screen

3 Preventive Maintenance

Section 3 of this manual defines practices and procedures that help keep the drive in good running condition. This information is organized as follows:

WARNING

This equipment contains a potential hazard of electric shock or burn. Only adequately trained persons who are thoroughly familiar with the equipment and the instructions should maintain this equipment.

To prevent electric shock while servicing the equipment, personnel must understand and follow all safety requirements for working around dangerous voltages.

3-1. Introduction

Periodic preventive maintenance extends equipment operating life and minimizes downtime. This involves specific power-on and more intensive power-off checks, when permitted. With both checks, necessary repairs should be undertaken when needed.

3-2. Maintenance Schedule

For maximum benefit, preventive maintenance needs to be performed at **scheduled intervals** by a qualified technician. The required frequency for each procedure depends on:

- How much the equipment is used
- Ambient environmental conditions (refer to Section 1 for environmental specifications)

The schedule should include an inspection of wiring and components before re-applying power after an overcurrent trip.

3-3. Maintenance Record

GE recommends that the customer keep a detailed record of maintenance (such as a log book) for every drive. This record serves two purposes:

- It verifies that all equipment is routinely checked
- It aids troubleshooting and prevention of equipment failure by providing a history of equipment maintenance and problems

3-4. Tools/Materials Needed

The tools and materials listed below may be needed when performing preventive maintenance on the drive:

- ☐ High quality tools, including screwdrivers and pliers, designed specifically for working with electrical wiring systems
- ☐ Socket set
- ☐ Hex wrench
- ☐ Torque wrench
- ☐ Electrical tape
- ☐ Fine file
- ☐ Clean dry cloth
- ☐ Soft-bristled brush (such as a paintbrush)

- ☐ Mild solution of distilled water and household or laboratory detergent (see section 3-6.6, step 4)
- ☐ Isopropyl alcohol
- ☐ Insulation resistance tester
- ☐ High voltage detector (such as a tic tracer using an insulated pole of appropriate length)
- ☐ Source of dry, low-pressure compressed air
- ☐ Vacuum cleaner with non-metallic nozzle and finely woven, high efficiency filter
- ☐ Fuse puller
- ☐ Replacement components, if required, including fuses, wiring, cabling, and door filters

3-5. Power-On Checks

The following preventive maintenance procedures need to be conducted with power on within the **control cabinet, only**.

WARNING

With power applied, dangerous voltages exist in the equipment circuitry.

1. While the equipment is running, open the control cabinet door. The fan should be located underneath the board rack.
2. **Without touching any circuitry**, look to see that the fan is still running.
3. If it is not, **turn off power** to the equipment, then replace the fan. (The fan is held in place by four screws.)

3-6. Power-Off Checks

Power-off checks involve cleaning the equipment and checking for wear and damage through visual inspection and functional tests.

3-6.1. Before Starting Maintenance

WARNING

Power must be de-energized before performing any adjustments, servicing, or other act requiring physical contact with the electrical components or wiring.

Before starting, the equipment must be prepared as follows:

1. De-energized
2. Tagged and locked out
3. Discharged (the dc link has a minimum discharge time of 5 minutes)
4. Tested for zero voltage (using an approved tester for the voltage level being measured)
5. Safety grounded

Do not deviate from these conditions. If safety requirements cannot be met completely, or if you do not understand them, **do not work on the equipment**.

3-6.2. Dust Removal

CAUTION

Build up of dust on electrical components and wiring can damage components and cause mis-operation.

Build-up of dust on components can increase operating temperature, reducing their normal “life”. On standoff insulators, it can collect enough moisture to produce a current path from bus bars to chassis ground.

Dust (especially metallic dust) on wire surfaces can cause “tracking” between connector pins. Tracking is usually capacitive in nature and involves a build-up of electrical charge along the wire surface. This can cause intermittent problems that are hard to find.

Check for and remove accumulated dust as follows:

1. Clean bus bars and standoff insulators with a clean dry cloth – **do not use any solvents**.
2. Using a fine-filtered vacuum cleaner with a non-metallic nozzle, remove dust and dirt from wiring and electrical components.

Note

Make sure that the air source is directed so that dust and foreign matter is removed rather than relocated.

CAUTION

Do not use *high-pressure* compressed air, which may damage components.

3. Inspect cabinet air filters, if equipped. Shake or vacuum filters clean, or replace, as required.

3-6.3. Loose Connections

Vibration during equipment operation can loosen mechanical and electrical connections and cause intermittent equipment failure. Additionally, dust and moisture in loose connections can cause loss of low-level signals at terminal boards and also thermal runaway at bus connections.

1. Check all hardware and electrical connections, and tighten if needed.
2. Tighten or replace any loosened crimp-style lugs.
3. Tighten or replace all loose or missing hardware.
4. Inspect printed wiring boards for correct seating, and check that any plugs, wiring, and bus connectors are tight.

CAUTION

To prevent component damage caused by static electricity, treat all boards with static sensitive handling techniques. Use a grounding strap when handling boards or components.

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

3-6.4. Damaged Insulation

Wires and cables with damaged insulation are dangerous when carrying electricity. They can also intermittently short, causing equipment and functional failure.

1. Check all wires and cables for fraying, chipping, nicks, wear, or rodent damage.
2. Check all wires and cables for signs of overheating or carbonization.
3. Repair minor **low voltage** insulation damage with a good grade of electrical tape. If a damaged cable carries **high voltages**, replace the cable.
4. Replace any cables or wires that have more than mild damage.

3-6.5. Contactors and Relays

1. If possible, manually trip the device to ensure that it works properly.
2. Inspect contacts on open (as opposed to sealed) contactors and relays. Discoloration and rough contact surfaces are normal.
3. If beads have formed because of severe arcing:
   a. Dress the contact faces with a fine file. **Do not** use emery cloth or sandpaper.
   b. Identify and correct the cause of arcing.
   c. Refer to the component's publication for detailed instructions on maintenance, repair, and replacement procedures.

3-6.6. Printed Wiring Boards

If boards in a module are dirty:

1. Vacuum to remove dust from around the board connections before and after unplugging.
2. Remove the boards per the instructions in Section 5-2. Be sure to observe the personal and equipment safety instructions.
3. Vacuum to remove dust from the board and connections. A soft-bristled brush may be used to loosen dirt.

4. If excessively dirty, boards may need to be washed, as follows:

   a. Use a soft-bristled brush to scrub the board in a lukewarm (37.7 °C, 100 °F), mild solution of distilled water and household or laboratory detergent.

      Harsh chemicals and solutions will damage the board. Do not use solvents containing ammonia, aldehydes, alkalis, aromatic hydrocarbons, or ketones.

   b. Rinse thoroughly by dipping the board several times in fresh, lukewarm, distilled water. **Do not soak the board**.

   c. Dry the board by shaking off excess water, immersing and agitating the board in isopropyl alcohol, then air drying for a few hours.

3-7. Short-Circuit Damage

If a short-circuit occurs, overcurrent protective devices on the circuit should cut off power to the equipment. This normally prevents electrical damage, except at the point of the short. However, the heat produced by an electrical arc can carbonize some organic insulating materials, which then lose insulating qualities.

After repairing the cause of the short **and before re-applying power**:

1. Inspect the system thoroughly for damage to conductors, insulation, or equipment. Replace, if found.
2. Check insulation resistance.
3. Inspect the overcurrent protection devices for damage to insulation and contacts (see sections 3-6.4 and 3-6.5). Replace or repair, as needed.
4. Check and replace any open fuses.

4 Faults and Troubleshooting

Section 4 of this manual lists and defines the relevant fault messages for the inverter drive, with troubleshooting suggestions. It is organized as follows:

Table 4-1 is a list of the faults with possible causes.

4-1. Introduction

The drive software includes selftest diagnostics to aid in troubleshooting. When these tests detect an unfavorable condition, they output fault indications to a display. An operator can then examine the fault and clear it, as applicable.

4-2. Types of Faults

There are currently two types of fault conditions supported for the drive:

- **Trip faults** indicate a more serious condition that needs to be corrected. Therefore, it trips the drive. The condition should be corrected before the drive is restarted.
- **Alarm faults** report conditions that should be noted, but that are not serious enough to shut down or trip the drive. Some alarm faults can clear themselves if the condition subsides on its own. Otherwise, the drive must be stopped for an operator to clear this type of fault.

4-3. Fault Indication

The drive notifies an operator that a fault condition has occurred by displaying an indicator on the two operator interfaces: the local Drive Diagnostic Interface (DDI), and a connected PC running the drive configuration tools.

On the DDI, a fault symbol appears in the right side of the display:

Not flashing (on steady) indicates an alarm.

Flashing indicates a fault.

The operator can then use the keypad to access the fault/alarm description, and to clear the fault (see Chapter 2 for details).

The **drive configuration tools** use a Windows®-based PC display. The word *Alarm* or *Trip* appears in the lower right corner of the screen when a fault occurs. The operator can access a description and clear the fault using the tool functions. (Manual GEH-6333 describes these tools and this feature.)

4-4. Fault Descriptions

A fault is identified by an assigned **number** and abbreviated **description**. Both of these are displayed when an operator examines a fault using the DDI or configuration tools. Figure 4-1 shows a sample display.

Table 4-1 lists the drive faults and their probable cause.

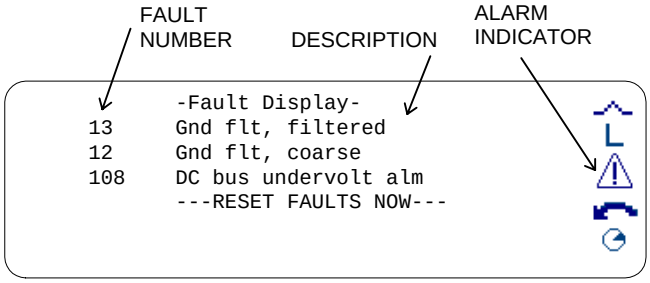


Figure 4-1. Example of DDI Fault Display Screen

Table 4-1. Fault Code Description

No.	Display Description	Type	Cause
1	Illegal call	Trip	Bad/Illegal sequencer call to a task. The appropriate Seq_Req bit must be set before a task is called. [For developers only.]
2	Illegal seq state	Trip	Illegal sequencer state. Seq_St has been set to an illegal value.
3	Cont failed to close	Trip	*Possible Causes:* Contactor feedback not connected. MA_Dly_Tm is set too short. MA_Fbk_Enb is set, & no feedback connected.
4	Local flt	Trip	Local permissive ckt open on Run command or Standby command. E-stop circuit is open. Check ATB for connections to terminals 8, 10, and 12 and Jmpr J2.
5	Trip flt req by tool	Trip	Tip fault generated from executing the monitor "uf" command.
6	Run during init	Trip	Run or standby command was issued during drive initialization. Command was ignored.
7	Over Speed	Trip	Speed feedback (rpm) exceeded the Overspeed threshold (Ovr_Spd_Thr). Motor speed is too high or The Ovr_Spd_Thr is set too low.
8	Timed overcurrent	Trip	One of the phase currents has exceeded the allowed threshold longer than the allowed time.
9	EE flash corrupted	Trip	The memory containing the device parameters was found to be bad during initialization. The device should not be run.
10	Run w flux decay	Trip	The command flux is higher than 2% of rated flux when drive starts. Attempt to restart drive quickly after bridge is turned off.
11	EE erase failed	Alarm	Preparation of memory for next parameter save operation has failed. Next parameter save operation is expected to be invalid.
12	Gnd flt, coarse	Trip	Filtered sum of A,B,C phase currents is greater than fast ground fault trip thres h-old.
13	Gnd flt, filtered	Trip	Discriminated magnitude of A,B,C phase currents is greater than discriminated ground fault trip threshold.
14	Gnd flt alarm	Alarm	Discriminated magnitude of A,B,C phase currents is greater than discriminated ground fault alarm level.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
18	Tune up failed	Trip	Auto Tuneup failed to start. Autotune task not scheduled. Message stack not initialized.
19	Motor data invalid	Trip	Motor Control Rule Calc failed. Flux sat curve not monotonic. L sigma curve not monotonic. Rated flux did not converge.
20	TOC pending	Alarm	One of the phase currents has exceeded the allowed threshold longer than the allowed time. Reduce current to avoid a trip.
21	System flt	Trip	System permissive ckt open on Run command or Standby command. E-stop circuit is open. Check ATB for connections to terminals 14, 16, and 18.
22	Run before MA closed	Trip	Contactor A was not found to be closed when a Run command was issued.
23	Flying restart disabl	Trip	The drive is required to be stopped if the drive is not in Flying Restart mode.
24	Pwr-Dip timer expire	Trip	The dc bus voltage dropped below Pd_Act_Lvl and stayed below Pd_Rcy_Lvl for longer than Pd_Tm.
28	R1 Init. Saturation	Trip	Resistance of Stator and Cable, measured during preflux, is out of bound. The motor control will not use this measurement. R1_Alrm_Enb available to mask.
29	R2 meas in limit	Trip	Online R2 adaption output saturation. Saturation levels are 80% and -40%. Check Sat curve, motor thermal model, and ambient rotor resistance param eters.
30	Tach loss	Trip	Tach feedback - estimated speed is filtered and compared to Tac_Err_Thr2 for fault triggering. Fault mask Tac_Los_Flt.
31	Tachless mode active	Alarm	Dynamic switch to tachless mode. Tach feedback - estimated speed is filtered and compared to Tac_Err_Thr2 for fault triggering. Fault mask Tac_Los_Alrm.
32	IOC phase A	Trip	Hardware detection of IOC or di/dt condition on power converter phase.
33	IOC phase B		
34	IOC phase C		
36	BICM card clock fail	Trip	This alarm occurs when FPGA logic on the BICM board cannot detect the pre s-ence of either one of its clock signals. One of the clocks it is looking for is generated by a crystal on the BICM itself and the other is transmitted via the rack backplane from DSPX. *Primary Causes:* Board or connector failure. *Possible Board Failures:* BICM, DSPX, CABP (Backplane) *Keypad Help:* BICM is reporting that one of its clock lines is not working.
37	Rack pwr supply lost	Trip	This alarm occurs when logic on the BICM board cannot detect the presence of one of the power supplies being generated by RAPA or RAPB. The power supplies monitored include P5, P15, N15 and I24. These supplies are distributed via the backplane to control boards including BICM. I24 is also brought to ATBA for use in customer I/O. *Primary Causes:* Short across one of the monitored power supplies Power supply module failure *Possible Board Failures:* BICM, RAPA or RAPB, CABP (Backplane) *Keypad Help:* BICM is reporting that one of its power supplies is not working.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
38	DC bus imbalance	Trip	This fault occurs when the magnitude of the upper and lower half of the dc bus circuits in the bridge differ by more than 10% of nominal. A typical Nominal dc bus voltage would be 3500V so a difference of around 350V would trigger this fault. *Keypad Help:* Software detected that the difference between the upper and lower dc bus voltages was greater than 10% of Nominal
39	DC pos bus over volt	Trip	Hardware detection of overvoltage on the positive dc bus *Keypad Help:* Hardware detection of overvoltage on the indicated dc bus.
40	DC neg bus over volt	Trip	Hardware detection of overvoltage on the lower dc bus *Keypad Help:* Hardware detection of overvoltage on the indicated dc bus.
41	DC overvoltage	Trip	DC bus feedback indicates an overvoltage condition.
42	DC under voltage	Trip	DC bus feedback indicates an undervoltage condition.
43	LPPA gnd alarm	Alarm	Lp_Gnd_A_Fil exceeds level of Lp_Alm_On. Turns off when below Lp_Alm_Off. Can inhibit by setting Lp_Alm_Off.
44	LPPA gnd flt	Trip	Lp_Gnd_A_Fil exceeds level of Lp_Alm_Thrs. Can inhibit by setting Lp_Alm_Off.
45	LPPA fuse blown	Alarm	LPPA module detects that the MOV fuse has blown. Can inhibit by setting Lppa_Inh.
46	X stop	Trip	X stop circuit is open and is configured as Trip fault.
47	Run req & xstop open	Trip	X stop circuit is open and a run request was issued.
48	BICM card temp low	Trip	This fault occurs when the sensor mounted on BICM measures a temperature which is less than the undertemperature threshold specified by the threshold parameter. *Primary Causes:* The heatsink thermal sensor input is not present.The undertemperature threshold is set incorrectly. Ambient temperature is too low. Airflow to the rack is blocked *Possible Board Failures:* BICM *Keypad Help:* Indicated sensor feedback reads below threshold.
49	HtSink DB temp low	Trip	This fault occurs when the measured heatsink temperature, is less than the undertemperature threshold specified by the threshold parameter. The main purpose of this fault is to detect the absence of a thermal sensor input from the heatsink. *Primary Causes:* The heatsink thermal sensor input is not present. The undertemperature threshold is set incorrectly. No power to TFBA board or TFBA board failure. *Possible Board Failures:* BICM, TFBA, CPFP *Possible Wiring Faults:* Thermal sensor input to TFBA is missing or damaged *Keypad Help:* Indicated RTD feedback reads below threshold.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
50	HtSink DS temp low	Trip	This fault occurs when the measured heatsink temperature, is less than the undertemperature threshold specified by the threshold parameter. The main purpose of this fault is to detect the absence of the thermal sensor input from the heatsink. *Primary Causes:* The heatsink thermal sensor input is not present. The undertemperature threshold is set incorrectly. No power to TFBA board or TFBA board failure. *Possible Board Failures:* BICM, TFBA, CPFP *Possible Wiring Faults:* Thermal sensor input to TFBA is missing or damaged *Keypad Help:* Indicated sensor feedback reads below threshold.
51	HtSink A temp low	Trip	Indicated sensor feedback reads below threshold.
52	HtSink B temp low		
53	HtSink C temp low		
54	Ambient temp low	Trip	Indicated RTD feedback reads below threshold.
55	AC line fuse blown	Trip	There is indication that one of the fuses feeding the diode source assembly has opened. *Primary Causes:* Loss of I24 supply on CTBC feeding this string . Shorted diode in source bridge. *Keypad Help:* AC Source line fuse is blown or +24V power supply fail
56	DB resistor overload	Trip	Thermal modeling of the dynamic braking resistor assembly indicates the package has exceeded it's rating. *Primary Causes:* Incorrect configuration of DB thermal model. DB resistor package has not been sized correctly for application. *Keypad Help:* DB resistor exceeded thermal rating
57	DB resistor hot	Alarm	Thermal modeling of the dynamic braking resistor assembly indicates the package is nearing it's rating. *Primary Causes:* Incorrect configuration of DB thermal model. DB resistor package is marginal for application.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
58	HtSink DB sensor bad	Alarm	The main purpose of this fault is to detect the absence of a thermal sensor input from the heatsink or the failure of the sensor itself. This alarm occurs when the measured heatsink temperature is less than the measured ambient temperature by an amount that exceeds the value of parameter **sensor detect trip lvl**. The fault clears when the measured heatsink temperature is greater than the measured ambient temperature. *Primary Causes:* The heatsink thermal sensor input is not present. The heatsink thermal device alarm threshold **sensor detect trip lvl** is set incorrectly. The heatsink thermal sensor is defective *Possible Board Failures:* BICM *Possible Wiring Faults:* Measured heatsink temperature is less than ambient by an amount exceeding RTD alarm level. *Keypad Help:* Measured heatsink temperature is less than ambient by an amount exceeding RTD alarm level.
59	HtSink DS sensor bad	Alarm	This alarm occurs when the measured heatsink temperature is less than the measured ambient temperature by an amount that exceeds the value of parameter **sensor detect trip lvl**. The fault clears when the measured heatsink temperature is greater than the measured ambient temperature. The main purpose of this fault is to detect the absence of a thermal sensor input from the heatsink or the failure of the sensor itself. *Primary Causes:* The heatsink thermal sensor input is not present. The heatsink thermal device alarm threshold **sensor detect trip lvl** is set incorrectly. The heatsink thermal sensor is defective *Possible Board Failures:* BICM *Possible Wiring Faults:* Measured heatsink temperature is less than ambient by an amount exceeding alarm level. *Keypad Help:* Measured heatsink temperature is less than ambient by an amount exceeding alarm level.
60	HtSink A sensor bad	Alarm	Measured heatsink temperature is less than ambient by an amount exceeding alarm level.
61	HtSink B sensor bad		
62	HtSink C sensor bad		

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
63	BICM card overtemp	Trip	This fault occurs when the RTD mounted on BICM measures a temperature which is more than the over temperature threshold specified by the threshold parameter. *Primary Causes:* The over temperature threshold is set incorrectly. Ambient temperature is high. Lack of airflow to control rack. *Possible Board Failures:* BICM
64	HtSink DB over temp	Trip	Measured heatsink temperature is above overtemperature threshold.
65	HtSink DS over temp	Trip	This fault occurs when the temperature measured on the indicated heatsink exceeds the designed maximum temperature. The bridge trips at this point to protect the IGBTs from thermal damage. *Primary Causes:* Airflow to the heatsink is not sufficient. Blower is not operating correctly. *Possible Board Failures:* BICM *Keypad Help:* Measured heatsink temperature is above overtemperature threshold.
66	HtSink A over temp	Trip	Measured heatsink temperature is above overtemperature threshold.
67	HtSink B over temp		
68	HtSink C over temp		
69	BICM card hot	Alarm	The RTD mounted on BICM measures a temperature which is near the over temperature threshold specified by the threshold parameter. *Primary Causes:* The over temperature threshold is set incorrectly. Ambient temperature is marginal. Lack of airflow to control rack. *Possible Board Failures:* BICM
70	HtSink DB temp hot	Alarm	Measured heatsink temperature is above overtemperature alarm level.
71	HtSink DS temp hot		
72	HtSink A temp hot		
73	HtSink B temp hot		
74	HtSink C temp hot		
75	Switchgear not ready	Alarm	The permissive string to close the main switch gear is not present. This permissive string ends at BTBH(8) and includes customer contacts used to open the main. The primary purpose of this fault is to prevent charging of the dc bus until the switch gear is ready to close. *Primary Causes:* Switch gear not racked in. Customer switch gear permissive not met

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
76	HtSink DB rise high	Alarm	*Keypad Help:* Measured heatsink temperature is greater than ambient by an amount exceeding heatsink rise alarm level.
77	HtSink DS rise high	Alarm	Measured heatsink temperature is greater than ambient by an amount exceeding heatsink rise alarm level.
78	HtSink A rise high		
79	HtSink B rise high		
80	HtSink C rise high		
81	HtSink temp imbalanc	Alarm	Two measured heatsink temperatures differ by an amount exceeding heatsink imbalance alarm level.
82	HtSink blower failed	Trip	The drive is in a run mode and the cooling fans are not running. *Primary Causes:* Blower motor overload or failure *Keypad Help:* Either the source or load bridge blower motor starter is open.
83	Run perm lost	Alarm	Run permissive circuit is open and a run request was issued.
84	Cont A req while flt	Alarm	External application layer performed a bad task call to Contactor A.
85	Flux req while flt	Alarm	External application layer performed a bad task call to flux routine.
86	AC line overvoltage	Trip	High ac source voltage has tripped the drive. *Primary Causes:* Main transformer taps set incorrectly. Line voltages to high Fault threshold incorrectly set
87	AC line voltage high	Alarm	High ac source voltage is threatening to trip the drive *Primary Causes:* Main transformer taps set incorrectly. Line voltages too high. Alarm threshold incorrectly set.
88	AC line under volt	Trip	Low ac source voltage has tripped the drive. *Primary Causes:* Main transformer taps set incorrectly. Line voltages too low. Fault threshold incorrectly set.
89	AC line volts low	Alarm	Low ac source voltage is threatening to trip the drive *Primary Causes:* Main transformer taps set incorrectly. Line voltages too low. Alarm threshold incorrectly set.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
90	AC line over freq	Trip	High ac source frequency has tripped the drive. *Primary Causes:* Line frequency too high
91	AC line freq high	Alarm	High ac source frequency is threatening to trip the drive *Primary Causes:* Line frequency too high.
92	AC line under freq	Trip	Low ac source frequency has tripped the drive. *Primary Causes:* Line frequency too low.
93	AC line freq low	Alarm	Low ac source frequency is threatening to trip the drive *Primary Causes:* Line frequency too low.
94	Stat charger timeout	Trip	The static charger is unable to completely charge the dc bus. Normal charge operation terminates when the dc bus reaches 90% of its nominal level. At this point the charger is turned off and the switch gear is closed. If after around 70 seconds of charging the dc bus does not reach this threshold then this fault is generated and the charging sequence is aborted. *Primary Causes:* Static charger failure. Dc bus capacitor leaking.
95	Static charger failed	Trip	The dc bus charging procedure was aborted because the static charger reported a fault during its operation. *Primary Causes:* Static Charger failure.
96	SWGR fail to close	Trip	The drive tripped because the ac line switch gear would not close when commanded or opened unexpectedly. *Primary Causes:* Switchgear defective. Switchgear opened via external command.
97	Vdc <200v after 5sec	Trip	When charging with the static charger the dc bus failed to ready 200 Vdc within 5 seconds. The charge sequence has been aborted. *Primary Causes:* Static Charger failure. Dc Bus shorted. Dc Feedback not working.
100	Phase A cur offset	Trip	Calculated phase current offset is greater than phase current offset limit.
101	Phase B cur offset		
102	Phase C cur offset		
103	A-B voltage offset	Trip	Calculated A-B line-line voltage offset is greater than line-line voltage offset limit.
104	B-C voltage offset	Trip	Calculated B-C line-line voltage offset is greater than line-line voltage offset limit.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
105	Pulse test config	Trip	Pulse test pulse pattern and timer configuration is invalid.
106	Ckt board list fail	Trip	Board electronic ID read procedure failed during initialization.
107	Voltage offset	Trip	Voltage offset was invalid when the drive was started.
108	DC bus undervolt alm	Trip	Dc link voltage is less than undervoltage level with drive stopped.
109	Task 1 exec overrun	Alarm	No keypad help defined.
110	Task 2 exec overrun		
111	Task 3 exec overrun		
112	ADL msg stack fail	Alarm	Message stack memory allocation operation failed.
113	Invalid Board Set	Trip	The device has identified improper or missing boards in its rack. Check board seating, board type and revision.
114	Ain1 Low Alarm	Alarm	Analog Input 1 low level detected. The level of Ain_1 is below the threshold level of Ain_1_Thr.
115	Ain1 Low Trip	Trip	
116	Ain2 Low Alarm	Alarm	Analog Input 2 low level detected. The level of Ain_2 is below the threshold level of Ain_2_Thr.
117	Ain2 Low Trip	Trip	
121	IGDM DB1 card flt	Trip	This is a hardware-generated fault. It occurs when the bridge control has lost communications with the indicated IGDM module. This communication occurs via fiber-optic cable between the FOSA and the indicated IGDM. During normal operation the IGDM transmits continuous light back to FOSA. Any loss of this signal triggers this fault. Several unrelated situations can cause the light to stop transmitting. *Primary Causes:* CPFP power supply failure IGDM failure DSAT fault on the corresponding IGBT was detected. *Possible Board Failures:* IGDM, CPFP, FOSA, BICM *Possible Wiring Faults:* Fiber-optic connection between FOSA and IGDM Power distribution wiring from CPFP. *Keypad Help:* Fiber-optic communications with the indicated IGDM module has been lost. This indicates a DSAT fault on the IGBT or that the IGDM board itself has failed.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
122	IGDM DB2 card flt	Trip	Fiber-optic communications with the indicated IGDM module has been lost. This indicates a DSAT fault on the IGBT or that the IGDM board itself has failed.
123	IGDM AS1 card flt		
124	IGDM AS2 card flt		
125	IGDM AS3 card flt		
126	IGDM AS4 card flt		
127	IGDM BS1 card flt		
128	IGDM BS2 card Flt		
129	IGDM BS3 card Flt		
130	IGDM BS4 card Flt		
131	IGDM CS1 card Flt		
132	IGDM CS2 card Flt		
133	IGDM CS3 card Flt		
134	IGDM CS4 card Flt		
135	AC line transient	Alarm	A phase imbalance or loss of line condition exists on the ac line feeding the drive. *Primary Causes:* Interruption of power feed to drive.
136	AC line watchdog	Trip	A phase imbalance or loss of line condition has persisted on the ac line feeding the drive and the phase imbalance timer has expired. *Primary Causes:* Interruption of power feed to drive.
137	AC line rev phs seq	Trip	One or more of the ac line voltages feeding the diode source assembly are out of phase sequence. *Primary Causes:* Incorrect cabling of main conductors from power transformer Incorrect cabling on power transformer primary.
137	Invalid IPN	Trip	Invalid IPN. The Part Number that has been entered is not a valid combination of fields. Please check the nameplate and re-enter the number.
138	AC line vfb offset	Trip	The voltage feedback offset being calculated for line voltage feedbacks is above the allowable threshold. The system integrates the voltages seen on the ac input terminals. The results of this integration should be near zero since the input waveform is a sine wave. If the input line-line voltages integrate to a non-zero value above a predefined threshold this fault is generated. *Primary Causes:* Bad VCO Circuit. Incorrect sensor wiring. Large dc current component through transformer. *Possible Board Failures:* VATF-SRC *Possible Wiring Faults:* Check wiring of VATF-SRC sensor inputs to phase leg.

Table 4-1. Fault Code Description – Continued

No.	Display Description	Type	Cause
139	AC line PLL failed	Trip	This fault occurs when the source PLL has not locked to an ac waveform when is was expected to. Once the switch gear is closed by the charging sequence the PLL is expected to lock within 1.0 second. *Primary Causes:* No voltage feedback on VATF-SRC Incorrect sensor wiring. Main breaker not closing correctly. *Possible Board Failures:* VATF-SRC *Possible Wiring Faults:* Check wiring of VATF-SRC sensor inputs to phase leg.
140	Trnsfrmr ovrtemp flt	Trip	Detection of transformer overtemperature condition.
141	Trnsfrmr ovrtemp alm	Alarm	
142	Motor overtemp fault	Trip	Detection of motor overtemperature condition.
143	Motor overtemp alarm	Alarm	

5 Component Replacement

Section 5 of this manual provides guidelines for replacing components during repair. It is organized as follows:

WARNING

This equipment contains a potential hazard of electric shock or burn. Only adequately trained persons who are thoroughly familiar with the equipment and the instructions should maintain this equipment.

To prevent electric shock while servicing the equipment, personnel must understand and follow all safety requirements for working around dangerous voltages.

5-1. Before Starting

WARNING

Power must be de-energized before performing any adjustments, servicing, or other act requiring physical contact with the electrical components or wiring.

Before starting, the equipment must be prepared as follows:

1. De-energized
2. Tagged and locked out
3. Discharged (the dc link has a minimum discharge time of 5 minutes)
4. Tested for zero voltage (using an approved tester for the voltage level being measured)
5. Safety grounded

Do not deviate from these conditions. If safety requirements cannot be met completely, or if you do not understand them, **do not work on the equipment**.

5-2. Replacing Printed Wiring Boards

Because of upgrades, boards of different revision levels may not contain identical hardware. However, GE ensures backward compatibility of replacement boards.

5-2.1. 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.

5-2.2. 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.

Removal:

1. Prepare the drive as defined in section 5-1.
2. Open the drive's cabinet door. Test any electrical circuits **before touching them** to ensure that power is off.
3. Carefully disconnect all cables, as follows:

CAUTION

To prevent damage to cable and wire connections, hold only the connector, not the cable, when pulling them.

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

- For a cable with a pull tab, carefully pull the tab.
- For a screw terminal connector, loosen the screw at the top of each terminal and gently pull each wire free.
- For a fiber-optic connector, press and hold the latch on the mating cable connector while pulling.

4. Carefully remove the board, as follows:
   - Some boards are mounted on standoffs with screws. Remove the screws to release the board.
   - For boards mounted within a rack, 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.) The board can then be unseated by raising the ejector tab.

Installation:

1. On the replacement (new) board, set all jumpers, pots, and switches in the exact position as those on the board being replaced.

   If a board revision has added or eliminated a configurable component, or readjustment is needed, refer to the individual board publication.
2. If the board contains onboard software, refer to the individual board publication for instructions.
3. To install a board into a rack:
   a. Slide the board into the correct slot in the rack.

CAUTION

Boards that mount in the rack are mechanically keyed so that they can only be installed into the correct slot. Do not attempt to defeat or override these interlocks. Doing so will damage the electronics.

   b. Begin seating the board by firmly pressing the top and bottom of the board at the same time with your thumbs.
   c. 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.
4. To install a board that is seated with standoffs:
   a. Place the board onto the standoff in the same orientation as the board that had been removed.
   b. Secure the boards by replacing and tightening the screws that had been removed.
5. Reconnect all cables, making sure that they are properly seated at both ends.

5-3. Replacing IGBT Modules

If an IGBT fails, all four IGBT power modules for that phase should be replaced. Additionally, the IGDM board (IS200IGDM) in the affected phase was probably damaged during the failure, so must be replaced, too.

In the 2300 V drive, each phase consists of a singular heat exchanger assembly with four IGBT modules and one clamp diode module (see Figure 5-1). All four IGBTs should be replaced as a matched set (the white letter on the face of the IGBT module … I, J, K, L, M…must be the same for all four devices).

Note

At a minimum, the IGBTs for the two devices in the "upper" positions of the heat exchanger should be replaced as a matched set of two, and the IGBTs for the two devices in the "lower" positions should be replaced as a matched set of two.

The following procedures describe steps to remove the IGBT modules from the heat exchanger assembly and install new ones.

Removal:

1. Remove cables to the three IGDM boards as follows:

Note

Refer to section 5-2 for general board handling guidelines, including precautions to prevent board and cable damage.

   a. Inspect the cable connections to verify that the cables are labeled with the appropriate connector names. (This will simplify reconnection.)

   b. Remove the cabling to the IGDM.

   c. Secure the cables out of the way.

2. Remove the two 5/16 kepnuts from the ac bus.

3. Remove the IGBT laminated bus by loosening the 28 captive bolts from the IGBT and clamp diode modules and the 6 captive bolts from the capacitor laminated bus.

CAUTION

Care must be taken when handling these buses. If epoxy coating is chipped or scratched, buses must be replaced.

4. Remove the IGDM board by loosening the four slotted screws on the board. (These screws are captive in the board, and should not be removed.

5. Remove the IGBTs from the heat exchanger by removing the 14-20 bolts, lock washers, and flat washers from the eight IGBTs.

Replacement:

1. Clean the heat exchanger mounting surface of dirt and old thermal grease.

Note

Make sure that IGBTs are installed as matched sets as detailed at the beginning of this section.

2. Apply a thin film (6 mils thick) of Dow Corning 340 Silicone Grease (or equivalent) to the back of each new IGBT module.

3. Orient each IGBT module in the same position as the old IGBT module and start the eight ¼-20 bolts, lock washers, and flat washers.

4. Temporarily tighten the mounting bolts in diagonally opposite corners (using the pattern supplied with the IGBT module).

5. Then tighten these same bolts to 44 in-lbs torque in the opposite of step 4 (using the same pattern as step 4).

6. Visually inspect the IGBT buses for chips, scratches, or cracks in the epoxy coating. Also look for mechanical deformation or other damage. If buses are marred or damaged, replace them before proceeding to step 8.

7. Place the IGBT bus back into place over the IGBT and clamp diode modules.

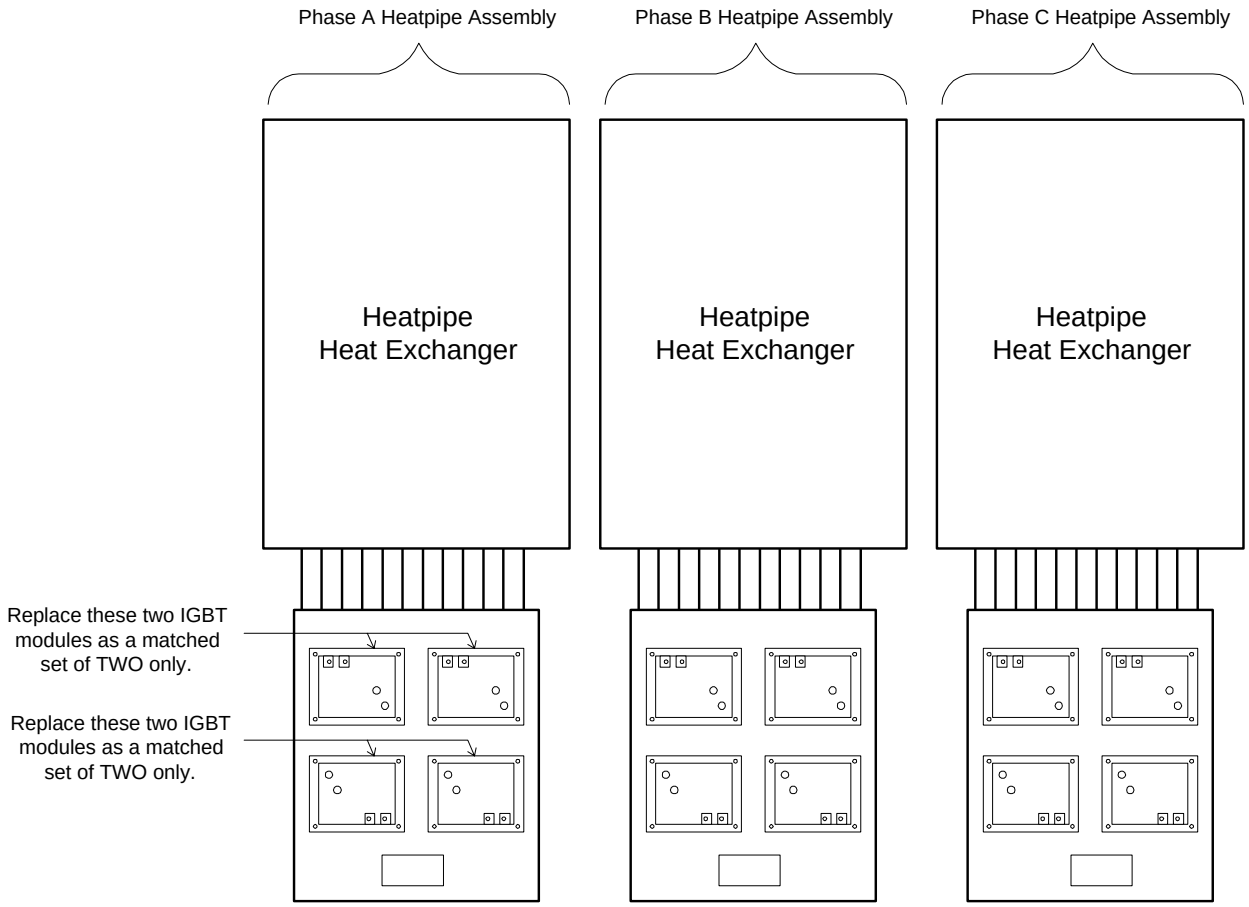


Figure 5-1. IGBT Module Location in 2300 V Drive Heat Exchanger Assembly

8. Make sure that the 28 captive bolts for the IGBT and clamp diode modules and the 6 captive bolts for the capacitor laminated bus are in the correct position.
9. Torque these bolts to 95 in-lbs.
10. Install the two 5/16 kepnuts onto the ac bus.
11. Install each of the IGDM boards with the four captive screws.

Note

In most instances of IGBT module failure, the IGDM board in the affected phase is also damaged and must be replaced.

12. Torque to 13 in-lbs.
13. Install the cabling to the IGDM board (the label for each cable connection should match the connector name on the board).
14. Verify proper orientation of the connectors before installation. (Cable connections are mechanically keyed.)
15. Visually inspect buses, cable connections, and bolted connections for correct installation.
16. Check that no tools, debris, or hardware is left in the drive before energizing it.

6 Drive Parts Lists

Section 6 of this manual provides parts lists of the drive's electronic and wiring components. These lists do not include sheet metal, braces, and other items not typically replaced, nor common hardware items, such as screws.

This section is presented as follows:

Table Title

Figures 6-1 through 6-3 show the structure of the source, load, and control cabinets. The parts tables are organized according to that structure.

Appendix A provides information for ordering warranty and replacement parts.

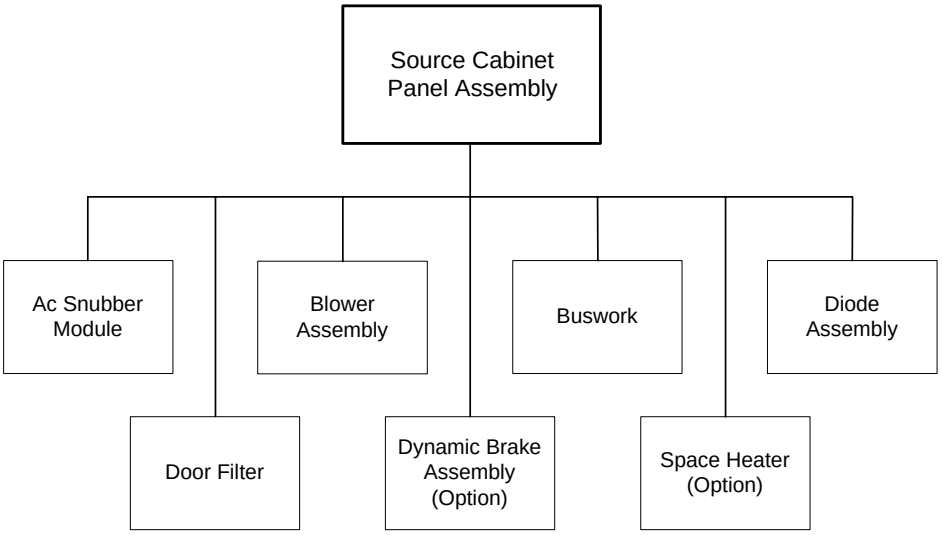


Figure 6-1. Parts List Structure, Source Cabinet

Table 6-1. Parts List for Source Cabinet

Assembly Name	Part Description	Part (Catalog) No.	Qty.
Ac Snubber Module (Filter)	Snubber module with DB	DSM3SNBRA1002M001	1
	Snubber module without DB	DSM3SNBRA1002M002	1
	VATF voltage attenuator	IS200VATFG1AZZ	2
	Capacitor, filter 3 μF, 1500 W	68A7184P6A	9
	Fuses, filter, 5A, 1500 V, PH1 – 3	PDFP1000A5V1.5Q	9
	Harness, snubber wires	336A3594AE G01	1
	MOV, 575 V, 770 J	PDDT1000V571DA	9
	Resistor, 7Ω, 500 W	323A2439P11	9
	Switch, micro, fuse, PH1 – 3	PDFPMICROSWITCH	9

Table 6-1. Parts List for Source Cabinet – Continued

Assembly Name	Part Description	Part (Catalog) No.	Qty.
Blower Assembly	Blower assembly	173C9255EFG02	1
Buswork	Bus, ac conn to linefuse, lower	173C9255JNP5	3
	Bus, ac conn to linefuse, middle	173C9255JNP4	3
	Bus, ac conn to linefuse, upper	173C9255FLP15	3
	Bus, DB conn, pos. 1	173C9255FLP20	1
	Bus, DB conn, pos. 2	173C9255FLP22	2
	Bus, DB conn, pos. 3	173C9255FLP23	2
	Bus, DB conn, neg. 1	173C9255FLP21	1
	Bus, dc conn, neg.	173C9255JGP1	1
	Bus, dc conn, neg. 2	173C9255FLP19	1
	Bus, dc conn, pos.	173C9255FLP17	1
	Bus, dc conn, pos. 2	173C9255FLP18	1
Diode Assembly, 18-Pulse	Bus, ac phase 1, (MID) pos. (+1)	173C9255ERP1	3
	Bus, ac phase 2, (LT/TOP) neg. (0)	173C9255ESP1	3
	Bus, ac phase 3, (RT/BOT) neg. (-1)	173C9255ETP1	3
	Diode, 3600 V, 1500 A, source	PDDP1002Q36Q15	18
	Fuses; ac incoming (1000 A, 1000 V)	323A2433P14	9
	Harness, ac line fuse	336A3594AE G03	1
	Harness, VATF-SRC/TFBA – DM	336A3594AD G32	1
	Harness, VATF-SRC/bus fiber-optic	336A3594AD G05	1
	Heat exchanger, large	173C9255BXG01	2
	Heat exchanger, small	173C9255BZG01	2
	Phase leg assemblies, diode	EUP#DD1200S33K1	1
	RTD, resistance thermal device	336A3584AA G03	2
Door Filter	Filter, door	RSP#91927619	4
Dynamic Brake Assembly (Option)	Board, TFBA Temperature Feedback	IS200TFBAH1AZZ	1
	Board, IGDM IGBT Gate Driver	IS200IGDMH1AZZ	2
	Harnessing, DB assm- IGDMs	336A3594AD G22	1
	Harnessing, DB – IGDM/VATF/TFBA	336A3594AD G31	1
	Harnessing, DB assm – CPFP/IGDM	336A3594AD G21	1
	Harnessing, DB assm, fiber-optic	336A3594AD G28	1
	Harnessing, DB assm, fiber-optic	336A3594AD G30	1
	Harnessing, DB assm – VATF to bus	336A3594AD G29	1
	Heatpipe assembly	173C9255DYG01	1
	Laminated bus	173C9255AMP4	1
	RTD, resistance thermal device	336A3584AE G02	2
	Transistor, IGBT – DBS 1, S2	EUP#FZ1200R33KF1	2
Space Heater (Option)	Heater, space	SS1152	1

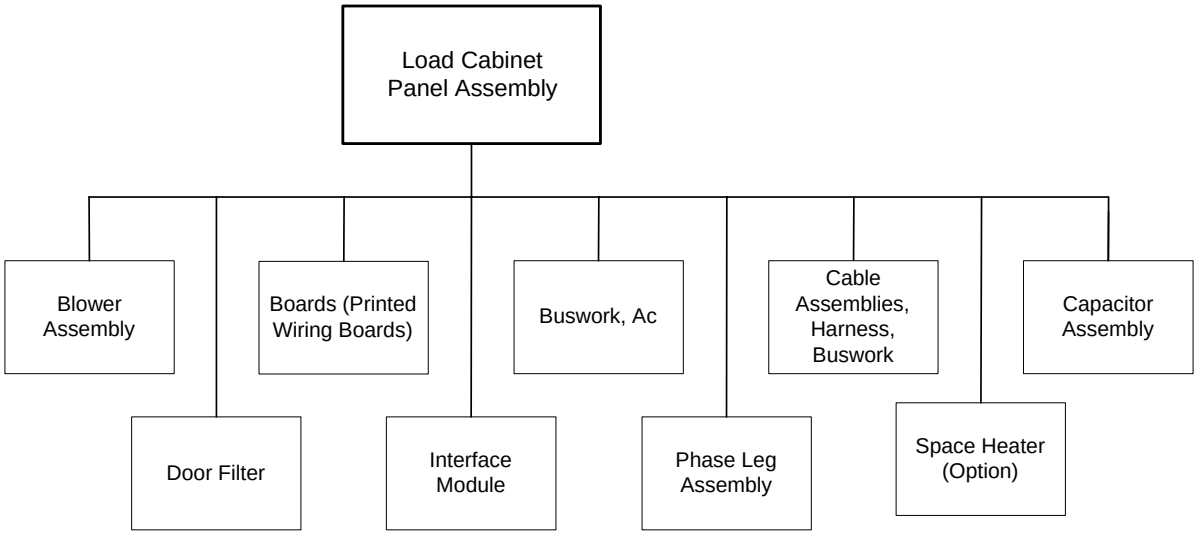


Figure 6-2. Parts List Structure, Load Cabinet

Table 6-2. Parts List for Load Cabinet

Assembly Name	Part Description	Part No.	Qty.
Blower Assembly	Blower assembly	173C9255EFG02	1
Board (Printed Wiring Boards)	Board, IVFB Current Feedback	IS200IVFBG1A	1
	Board, IVSH Shield for IVFB board	IS200IVSHG1A	1
Buswork, Ac	Board, SHCA shunt	DS200SHCAG1BZZ	3
	Bus, phase A to shunt	173C9255BEP1	1
	Bus, phase A vertical out	173C9255BQP1	1
	Bus, phase A extension	173C9255JQP1	1
	Bus, phase A shunt bus	173C9255BMP1	1
	Bus, phase B to shunt	173C9255BFP1	1
	Bus, phase B vertical out	173C9255BRP1	1
	Bus, phase shunt to out	173C9255BNP1	2
	Bus, phase C to shunt	173C9255BGP1	1
	Bus, phase C vertical out	173C9255BSP1	1

Table 6-2. Parts List for Load Cabinet – Continued

Assembly Name	Part Description	Part No.	Qty.
Cable Assemblies, Harness, & Buswork	BICM	336A3594AE G12	1
	Load – control to door	336A3594AE G08	1
	Load – control to load	336A3594AE G11	1
	Load – control to panel	336A3594AE G07	1
	Load – control to source	336A3594AE G10	1
	Door	336A3594AE G09	1
	Door panel	336A3594AE G17	1
	CPFP/VATF/SCTL/IGDM	336A3594AD G01	1
	Load – ground/bleeder circuits	336A3594AE G04	1
	Load – IVFB/shunts	336A3594AD G07	1
	Load – SCTL/bus	336A3594AD G19	1
	Load – VATF/bus	336A3594AD G23	1
	Load – VATF/IVFB	336A3594AD G02	1
	Load – LTB/BICM	336A3594AE G15	1
Capacitor Assembly	DSM3CAPSA1002M001	DSM3CAPSA1002M001	1
	Capacitor, dc link, 2000 V, 2160 μF	PDC01000Q20Q21.6	6
	Capacitor, MCAP1, .1 μF	68A7184P31	1
	Laminated bus	173C9255AMP2	1
	Laminated bus	173C9255EGP2	1
	Resistor, bleeder (BRES1–6), 27 kΩ	323A2439P13	6
	Resistor, ground (MRES1–3), 10 kΩ	323A2439P8	3
	Resistor, ground (MRES5, -6), 20 kΩ	PDRP100M20N500W	2
Door Filter	Filter, Door	RSP#91927619	4
Interface Module	Board, CPFB Gating Power Distrib.	IS200CPFPG1AZZ	1
	Fuse, CPFP board (4A, 250 V)	323A2396P18	3
	Board, SCTL Static Charger	IS200SCTLG1AZZ	1
	Fuse, SCTL board (120 V dc, 1.5 A)	104X109AD__076	1
	Board, SCTT static charger transfm.	IS200SCTTG1AZZ	1
	Board, VATF Voltage Attenuator	IS200VATFG1AZZ	2
	Capacitor, ground	97F8698	1
	DIN-rail, relay	238B4952P09	1
	Relay, 24 V dc fuse failure	MCRA040ATJ	3
	Suppresser, relay	BSLR2K	3

Table 6-2. Parts List for Load Cabinet – Continued

Assembly Name	Part Description	Part No.	Qty.
Phase Leg Assembly	Phase leg A, heat exchanger core	DSM3HTEXA1002M001	1
	Phase leg B – C, heat exchanger core	DSM3HTEXA1001M001	2
	Board, IGDM gate driver	IS200IGDMH1AZZ	12
	Board, TFBA temperature feedback	IS200TFBAH1AZZ	3
	Diode, clamp, IGBT Ph. A – C (one of the listed, per option)	EUP#DD1200S33K1, or PRX#RM1200HD-66S	3 3
	Transistor, IGBT, 3300 V, 1200 A (one of the listed, per option)	EUP#FZ1200R33KF1, or PRX#CM1200HA-66S	3 3
	Heat exchanger	173C9255EEG01	3
	Laminated bus	173C9255AMP1	3
	Shunt (one of the following, per option):		
	300 A, shunt A, B, C	259B246BSP300	3
	500 A, shunt A, B, C	259B246BSP50	3
	600 A, shunt A, B, C	259B246BSP600	3
	800 A, shunt A, B, C	259B246BSP800	3
	1000 A, shunt A, B, C	259B246BSP1000	3
	Thermistor (RTD), T2, Ph. A – C	336A3584AA G01	3
Space Heater (Option)	Heater, space	SS152	1

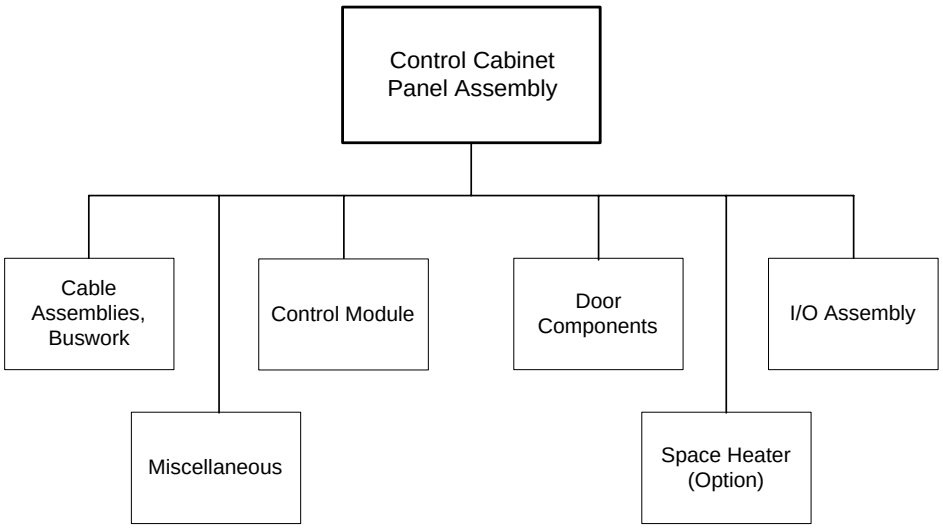


Figure 6-3. Parts List Structure, Control Cabinet

Table 6-3. Parts List for Control Cabinet

Assembly Name	Part Description	Part No.	Qty.
Cable Assemblies, Buswork	CABP, J6 to ATBA, 62 in. length	336A4932AR G02	1
	CABP, J7 to ATBA, 62 in. length	336A4932AS G02	1
	CABP, J8 to meter	336A4932AQ G01	1
	CABP, J9 to Toolport	336A6405G1	1
	CCOM bus	36A358020EB001	1
	Control sidewall	336A3594AE G12	1
	Control sidewall/door	336A3594AE G08	1
	Control to load	336A3594AE G11	1
	Control sidewall	336A3594AE G07	1
	Control to source	336A3594AE G10	1
	Control door	336A3594AE G09	1
	Control panel to sidewall	336A3594AEG06	1
	Control door to panel	336A3594AE G17	1
	Control, GDPA/CPT/BICM	336A3594AD G11	1
	Control, panel (no autotransformer)	336A3594AE G15	1
	Control, panel (with autotransformer)	336A3594AE G16	1
	Control, panel wires	336A3594AE G05	1
	Control, BICM	336A3594AE G14	1
	Control, BICM	336A3594AE G13	1

Table 6-3. Parts List for Control Cabinet – Continued

Assembly Name	Part Description	Part No.	Qty.
	Control, GDPA/CPFP	336A3594AD G26	1
	Fiber-optic-FOSA/TFBA (Simplex)	336A3594AD G10	1
	Fiber-optic-FOSA/TFBA (Simplex)	336A3594AD G25	1
	Fiber-optic-IGDM/FOSA (Duplex)	336A3594AD G09	1
	Fiber-optic-IVFB/FOSA (Duplex)	336A3594AD G08	1
	Fiber-optic-SCTL/FOSA (Duplex)	336A3594AD G20	1
	Fiber-optic-VATF/FOSA (Duplex)	336A3594AD G06	1
	Fiber-optic-VATF/FOSA	336A3594AD G24	1
	Harness – spaceheater	336A4932BD G01	1
	Ride-thru (option)	336A3594AE G18	1
Control Module	Control board module	DSMCARDA1001M001	1
	Rack with CAPB backplane board	173C8536ALG2	1
	Fan assembly, rack	104X215CA__003	1
	Board, BAIA Application I/O	IS200BAIAH1AZZ	1
	Board, BICM Bridge Interface	IS200BICMH1AZZ	1
	Board, DSPX Processor	IS200DSPXH1AZZ	1
	Board, FOSA Fiber-optic Interface	IS200FOSAG1AZZ	1
	Board, RAPA Rack Power Supply	IS200RAPAG1AZZ	1
Door Components	Cable, CAPB-J20 to keypad(10 Ft)	336A6406P1	1
	Circuit breaker, disconnect ,CB1, 15 A	TEC36015WL	1
	Contact, NC-SS1	CR104PXC01	2
	Contact, NO-SS1	CR104PXC1	1
	Filter, door	RSP#91927619	1
	Keypad assembly (Operator Interface)	IS2020DDIAG1AZ	1
	Keypad cover	173C9226KGP1	1
	Light, green-L1	CR104PLG82G	1
	Light, red-L2	CR104PLG82R	1
	Light, amber-L3	CR104PLG32M	1
	Pushbutton, red PB1	CR104PBG92R1	1
	Pushbutton, black-PB2	CR104PBG10B1	1
	Switch, selector-SS1	CR104PSG35B	1

Table 6-3. Parts List for Control Cabinet – Continued

Assembly Name	Part Name	Part No.	Qty.
I/O Assembly	Contact, 4 NO, SCP	SSH#CS3P40	1
	Contactor for SCP	104X105CD 001	1
	Board, CTBC terminal board I/O	IS200CTBCG1A	1
	Relays, 24 V D-SS, CP, SP	MCRC040ATD	3
	Suppressor, 24 V dc relay	MP0CAE3	3
	Suppressor, SCP	SSH#CRC3-280	1
	TB & I/O assembly, left sidewall	173C9249ABG01	1
	TB & I/O assembly, right sidewall	323A5743AXG01	1
Miscellaneous	Board, ACLA, Application Control (opt)	IS215ACLAH1AZZ	1
	Board, GDPA Power Supply	DS200GDPAG1AZZ	1
	2PTB, “NO AUTOFXMR” (option)	323A5743AZG01	1
	Capacitor, ride-thru/GDPA: CRT1,2 (opt)	104X122AA 371	2
	DIN-rail, starters	238B4952P09	1
	Fuse, GDPA Board (120 V dc, 1.5 A)	104X109AD__076	1
	Fuses, CPT1FU1,2 (5 A, 600 V)	BMC#LPJ5SP	2
	Jumper-TB (starters)	WTI#106268	6
	Light, convenience, 110 V (option)	RIT#PS4109-110	1
	Light, convenience, 220 V (option)	RIT#PS4109-220	1
	Lockout, lineswitch	173C8998AA G01	1
	Relay, 110 V ac, MXA/SNTRIP	MCRA040ATJ	2
	Res, PRECH – ride-thru: RPCRT (opt)	68A7958P100F	1
	Resistor, ride-thru bleeder: RBRT1 (opt)	104X123AG 028	1
	Starters	PDAS10ISPA32G12	2
	Suppressor, 110 V ac, MXA/SNTRIP	MP0AAE2	2
	Switch, lineswitch-LSW1	104X203DB 003	1
	Transformer, auto (option)	PDTI100AUTOXFMR	1
	Transformer, CPT1	9T58K0073	1
Space Heater (Option)	Heater, space	SS152	1

A Warranty and Renewal Parts

Appendix A of this manual provides information to help the user identify and obtain replacement parts. It is organized as follows:

A-1. Introduction

When ordering a replacement part for a GE drive, the customer needs 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.

To minimize system downtime if repair is needed, GE recommends that the customer keep a set of **spare parts** onhand. The *Renewal Parts Quotation* (see section A-2.1) lists recommended spares.

A-2. Identifying the Part

A drive component, or part, is identified by its assigned **part number** and **description**. The part number is normally found on a nameplate on the component. The description is included in the parts tables in Chapter 6 and in the system renewal parts list.

A-2.1. Renewal Parts List

The *Renewal Parts Quotation* is a separate document that lists the parts of a **complete system.** This list applies specifically to the equipment furnished on a customer's particular application (requisition) at the time of shipment. It includes:

- Part numbers and descriptions
- Quantity used
- Recommended spares to keep onhand
- Normal delivery cycle for obtaining each part

GE provides the *Renewal Parts Quotation* with the drive's custom instructions. If this document is missing, contact the nearest GE sales office or service representative to obtain a replacement copy. You need to provide the following information (see Figure A-4) to correctly identify the system:

☐ Requisition number

☐ Material List number

☐ Item number

A-2.2. Part Number Structure

A GE part number is structured so that different portions of the number identify the **type of equipment** and **location of manufacture**. A part falls into one of four categories:

- Order-specific assemblies – Major assemblies or items that make up a specific drive; constructed from common assemblies
- Common assemblies – Subassemblies used in many GE drive products, not just a specific drive
- Components – Individual parts that make up assemblies
- Printed wiring boards

These categories and the makeup of their part numbers are defined below.

A-2.2.1. Order-Specific Assemblies. These parts make up the particular drive. Other items obtained specifically for the order may also use a similar part number structure, which provides information about the equipment (see Figure A-1).

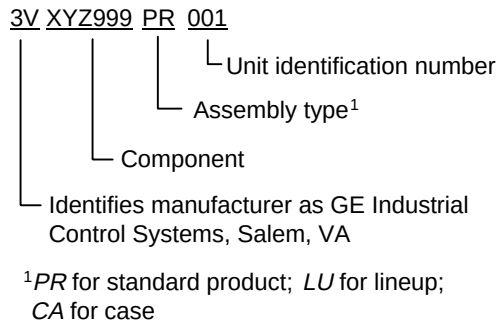


Figure A-1. Sample Part Number for Order-Specific Assembly

A-2.2.2. Common Assemblies. Common assemblies are subassemblies used as components of order-specific assemblies. Common assemblies are not designed for a particular drive, but provide a function used in other GE products.

A common assembly part number consists of the number *36* followed by an alphanumeric character. It may contain up to 14 characters.

For example, *36C774524AAG48* is the part number for a drive cable.

A-2.2.3. Components. Components are the **basic parts** that make up assemblies. They represent the lowest discrete level of a system. Component part numbers consist of a combination of alphanumeric characters that define the class and specific item. Figure A-2 shows a sample.

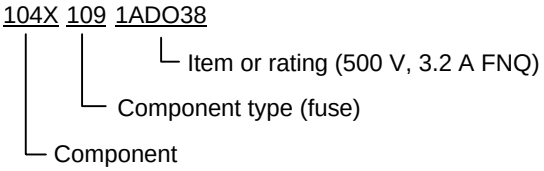


Figure A-2. Sample Part Number for Component

A-2.2.4. Printed Wiring Boards. A printed wiring board is identified by an alphanumeric part (catalog) number stamped near its edge. Figure A-3 describes the structure of a board's part 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 compatibility of replacement boards

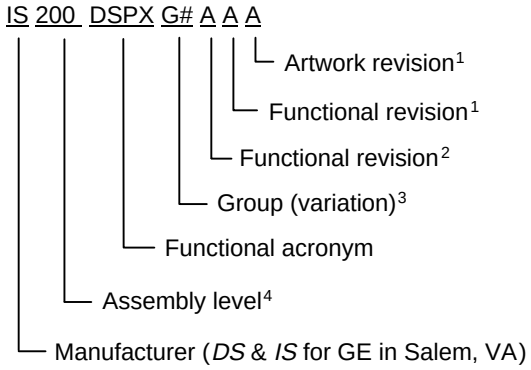


Figure A-3. Sample Board Part Number

A-3. 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.

A-4. How to Order Parts

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

General Electric Company
Product Service Engineering
1501 Roanoke Blvd.
Salem, VA 24153-6492 USA
Phone: 001-540-387-7595
Fax: 001-540-387-8606

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 number

A-4.1. Understanding the Drive Nameplate

(Refer to Figure A-4.) The drive's nameplate, located on the back of the door, provides information that specifically identifies the drive or cabinet's components and configuration. This is important when ordering parts or documents, or contacting GE for assistance.

The **material list (ML) number** (also called *catalog number*) is a unique number structured to provide information about the equipment (see Figure A-5). The ML number links the equipment to its requisition, drawings, components, materials, specification item, and shipping documents.

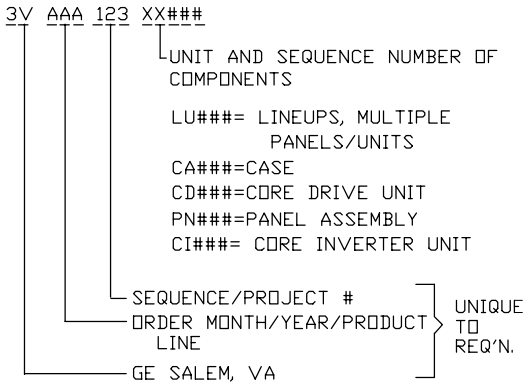


Figure A-5. Sample Drive ML (Catalog) Number

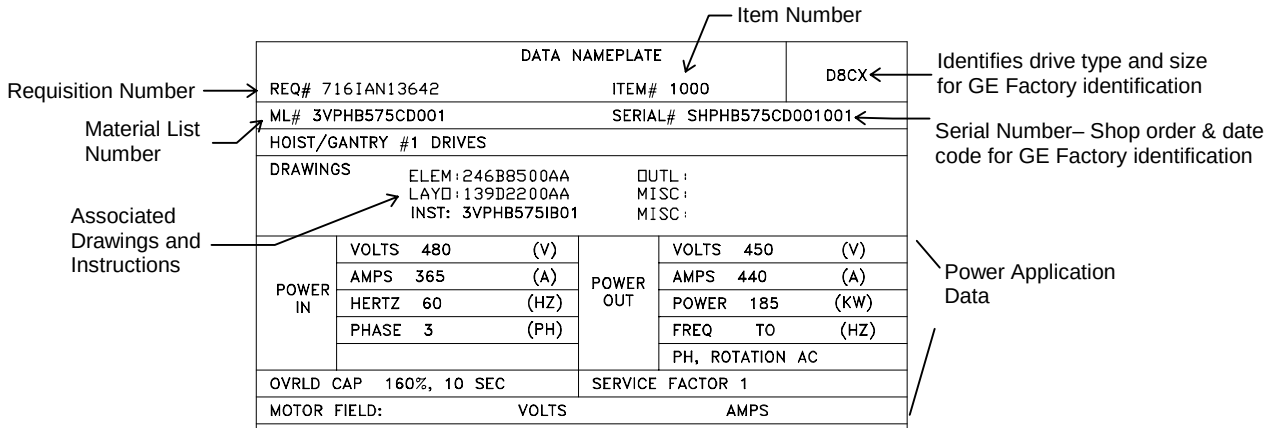


Figure A-4. Typical Drive Nameplate

Notes:

B Drive Parameters

Appendix B of this manual provides flow diagrams for the drive parameters, as follows:

B-1. Introduction

The drawings in this section reflect a typical 2300 V, non-regenerative drive configuration. They are included as a guide for the user. For specific and exact information on the parameters for a specific system, refer to the requisition documentation.

Section 2 of this manual provides instructions on using the door-mounted Drive Diagnostic Interface (DDI) for viewing and changing parameter values.

WARNING

To prevent personal injury or equipment damage caused by equipment malfunction, only adequately trained personnel should modify any programmable machine.

Notes:

C Parts/Assembly Drawings

Appendix C of this manual is intended to help the user in two ways:

- Provide a visual guide for parts replacement (see Section 5)
- Help identify the drive parts (see Section 6)

Note

Only "preliminary" drawings were available at the time this manual was issued. Therefore, the drawings in this appendix are not a complete set. They are currently intended to be used only as a guide, since they do not contain either verified or final information.

Future revisions of this manual are intended to correct this deficiency.

Appendix C is organized as follows:

Appendix A contains information for ordering warranty and renewal parts.

C-1. Introduction

The drawings in this section are exploded-view type drawings that show how the drive is assembled. Each part of the assembly is identified with a numbered callout. These numbers are tied to a table that provides a **part number** and **description** for each callout.

Note

The parts tables for these drawings were not available to include in this "Preliminary" issue of the drive manual.

These drawings use the following conventions for callouts:

CTQ – Critical to quality.

Optional work – Work content for this operation is optional per requisition.

Standard work – Work content for this operation is standard for all requisitions.

Verify work – Work that must be checked after this operation is complete.

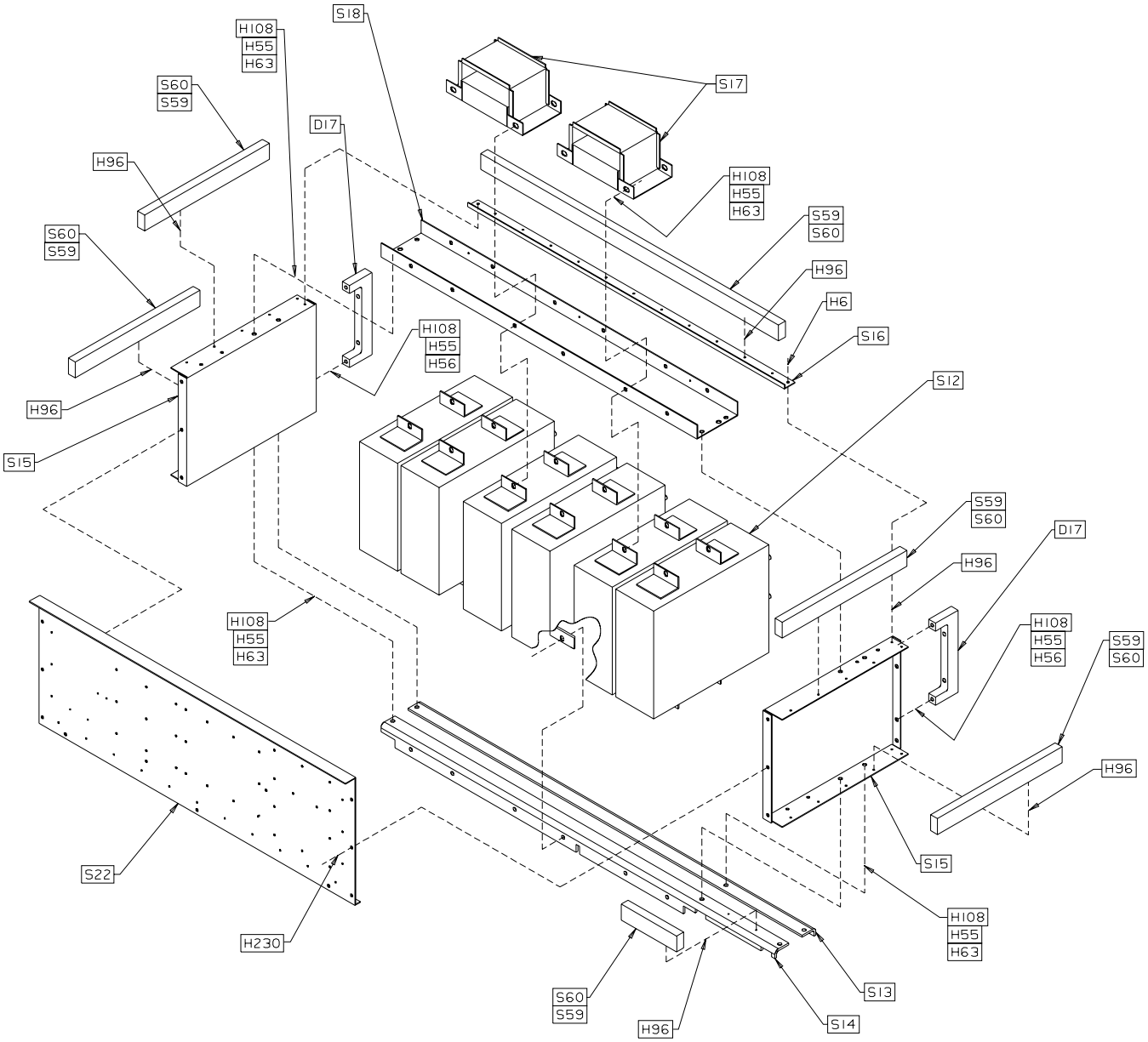


Figure C-1. DC Link Capacitor Assembly

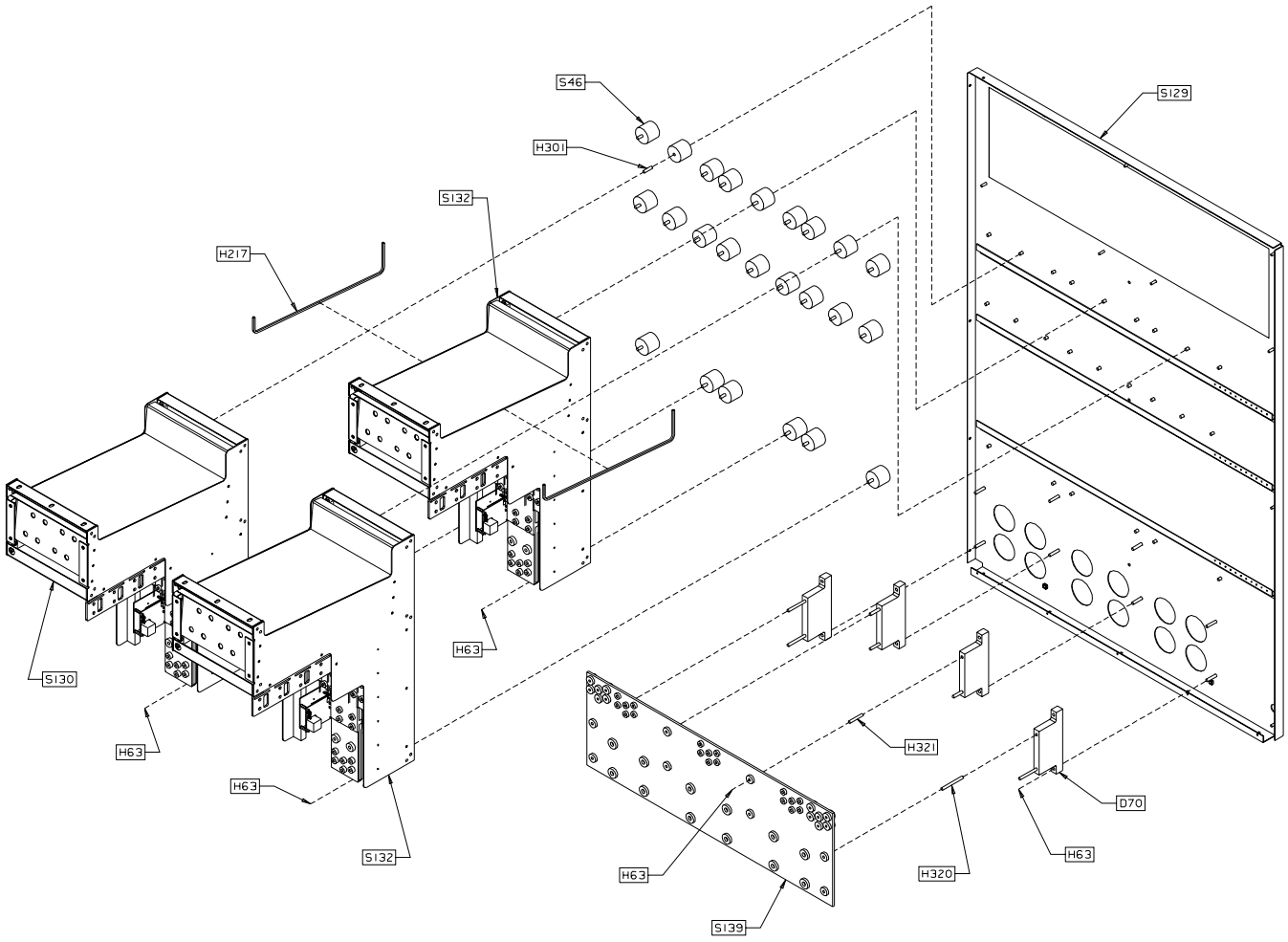


Figure C-2. Back Panel Assembly, Load Cabinet

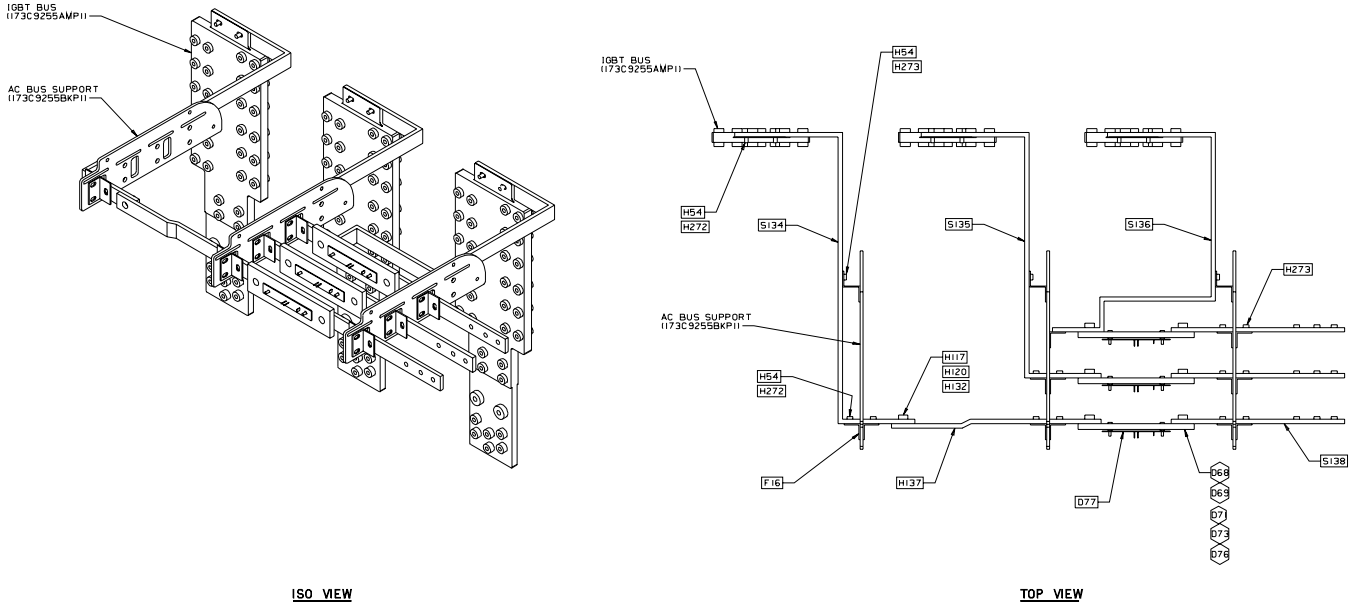


Figure C-3. Back Panel Assembly Showing IGBT Bus, Load Cabinet

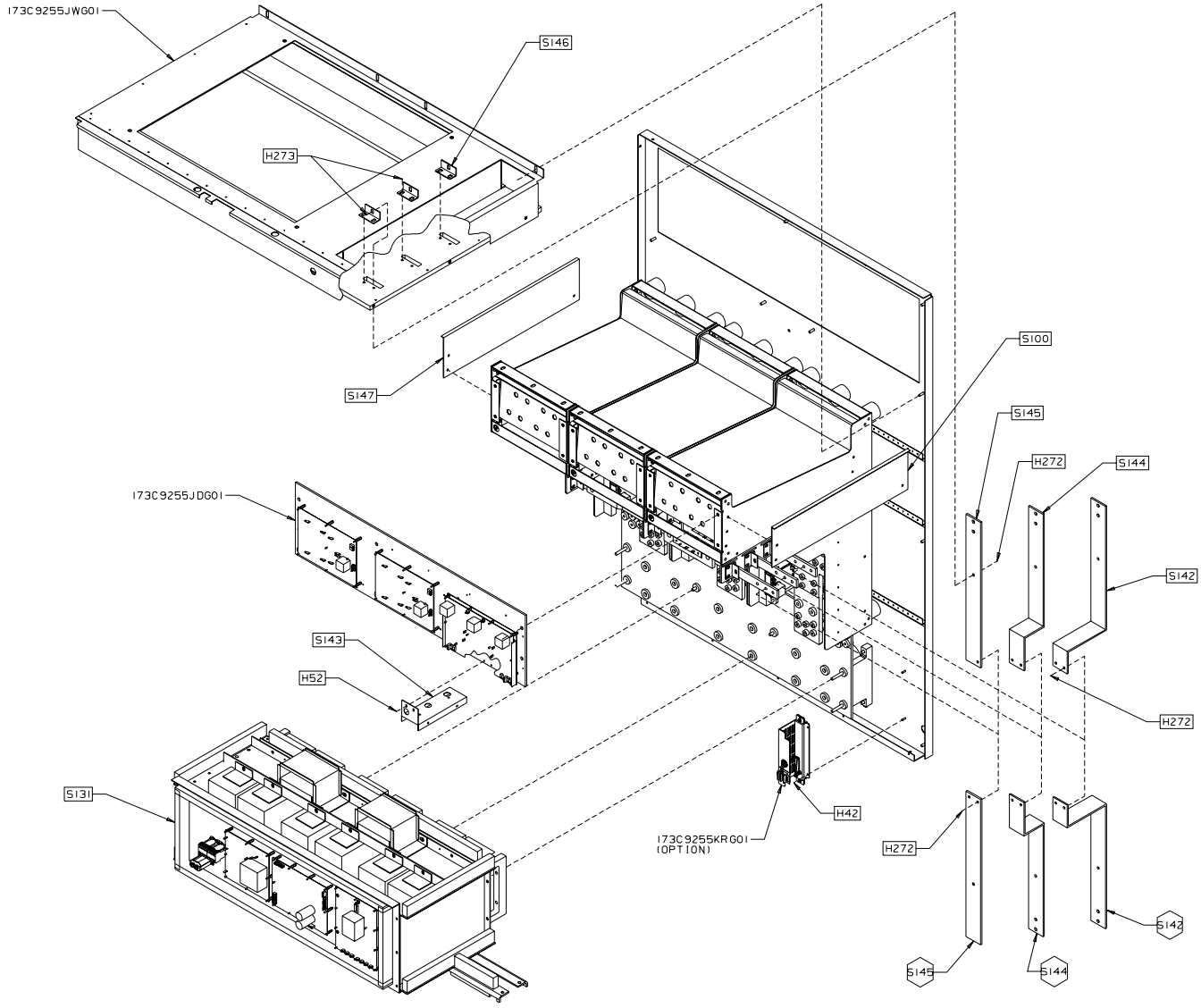


Figure C-4. Back Panel Assembly, Load Cabinet

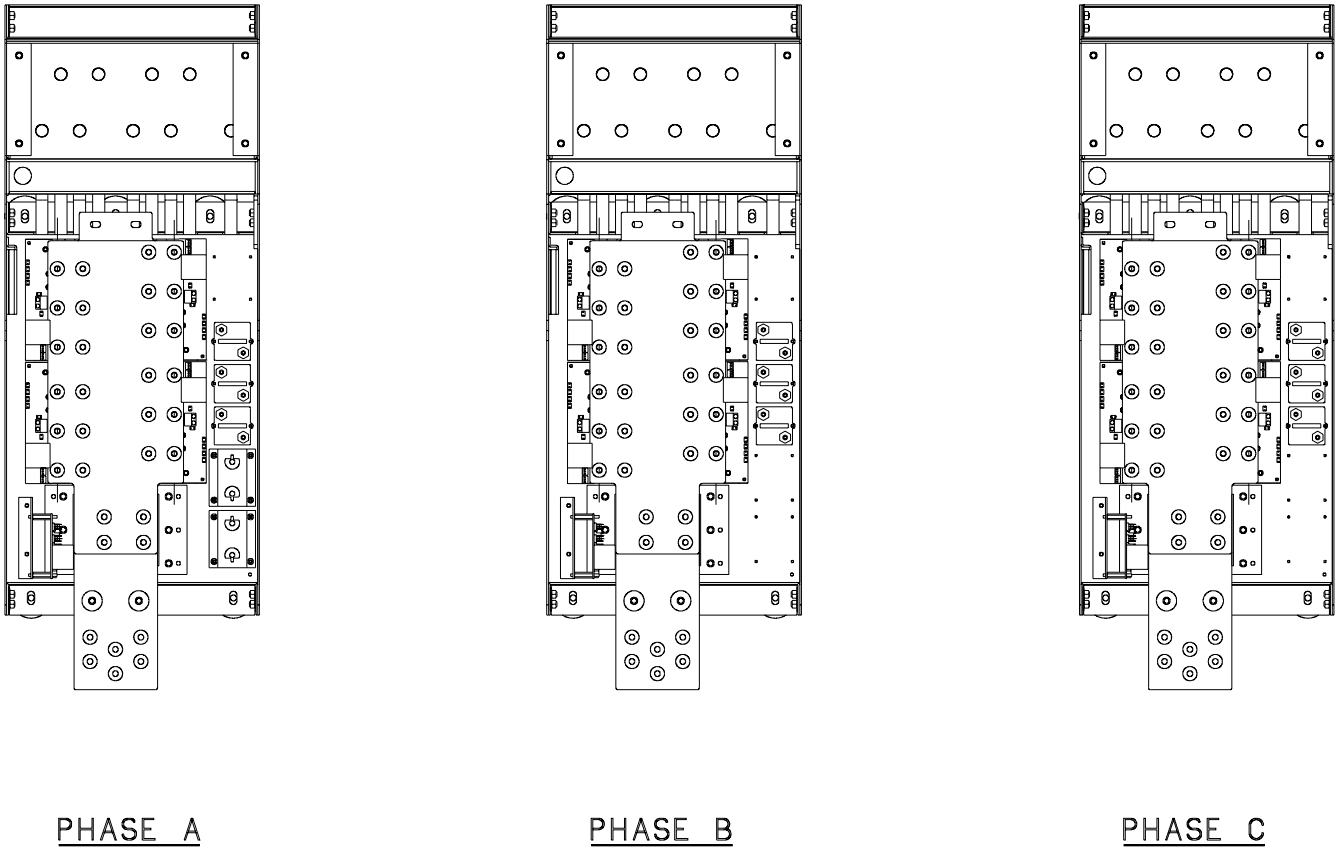


Figure C-5. Phase Leg Assembly, Phase A, Phase B, and Phase C

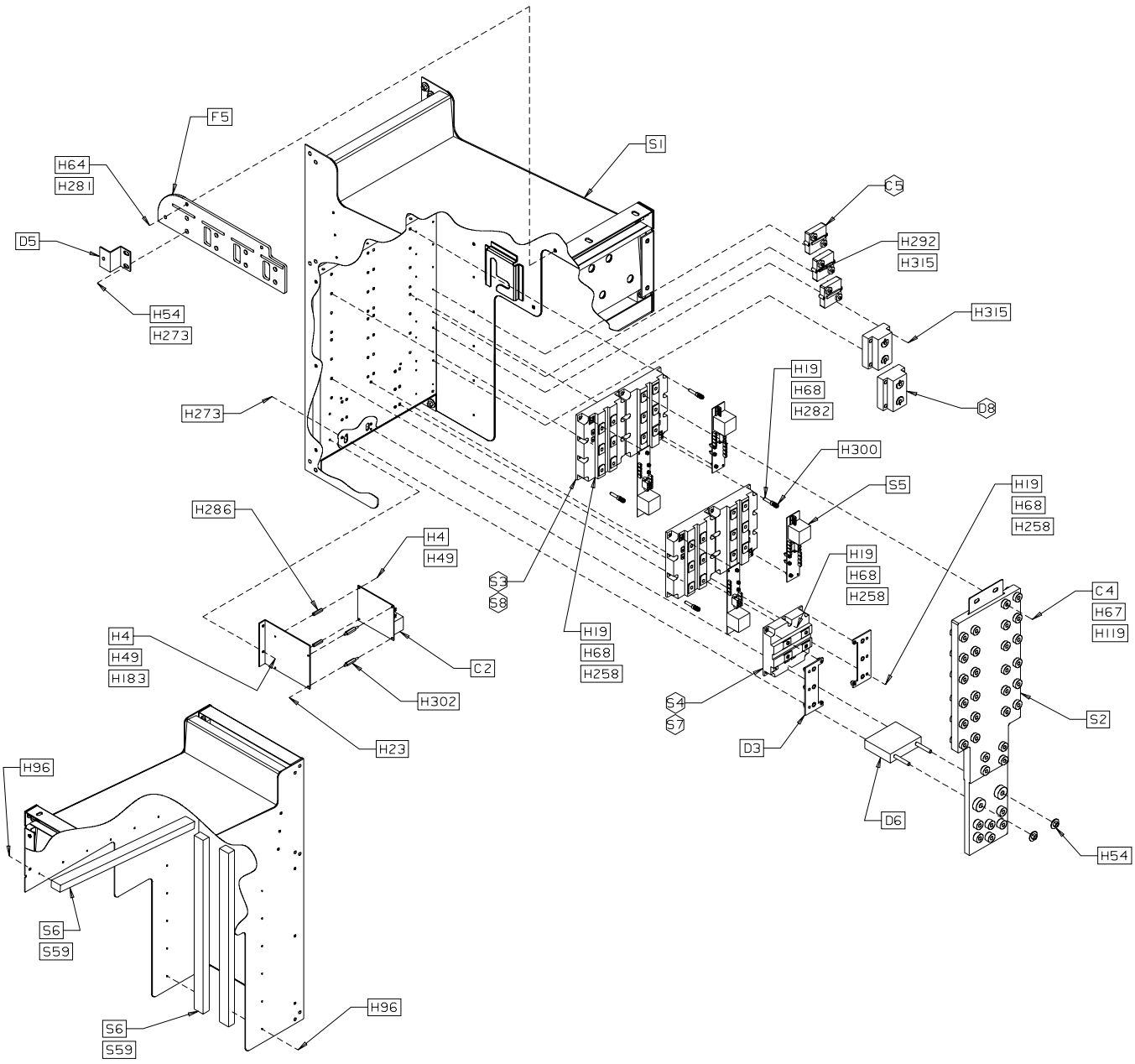


Figure C-6. Phase Leg Assembly

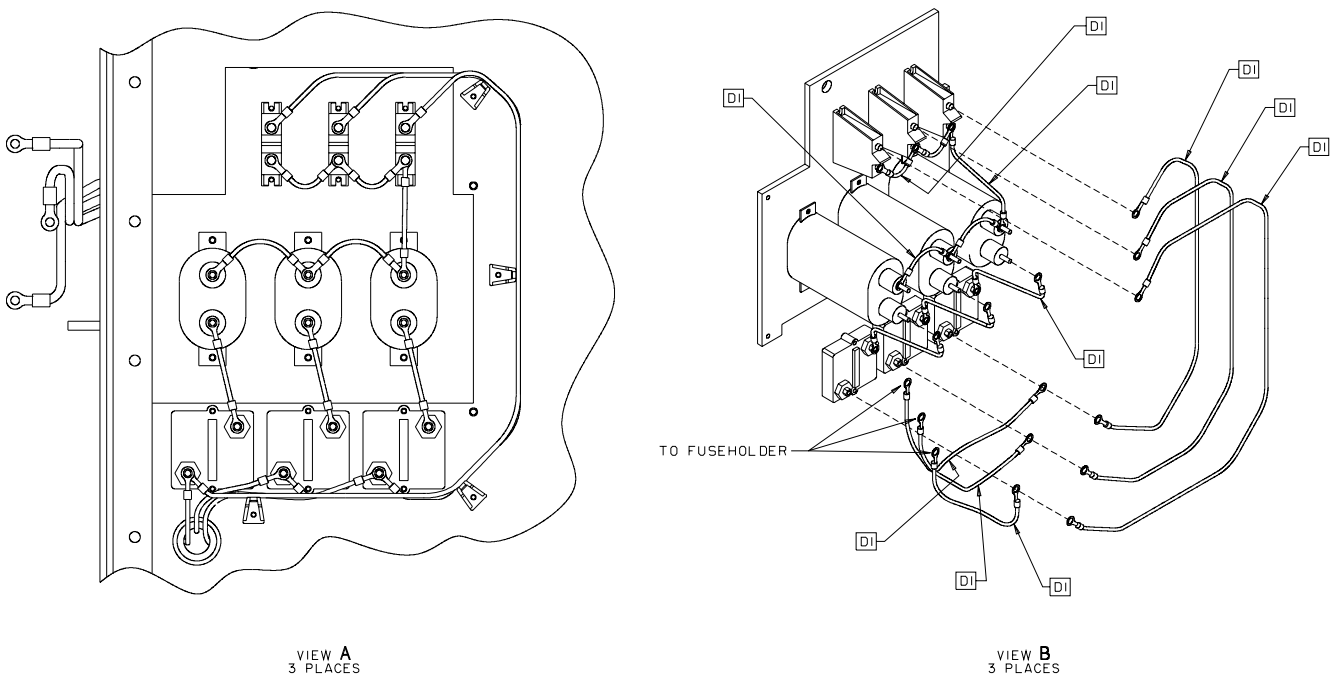


Figure C-7. Snubber Assembly, Wire Connections

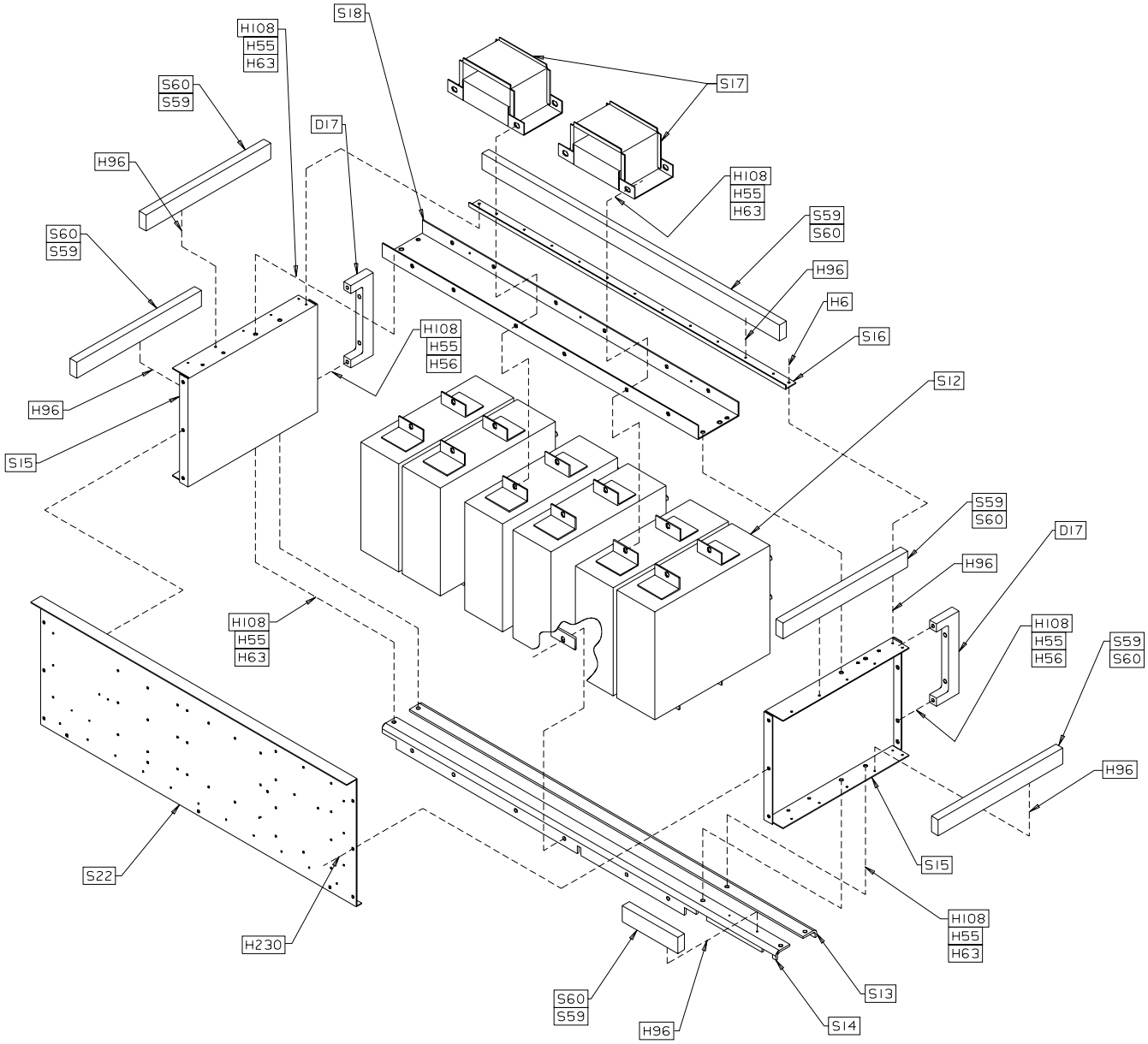


Figure C-8. Snubber Assembly, Rear View

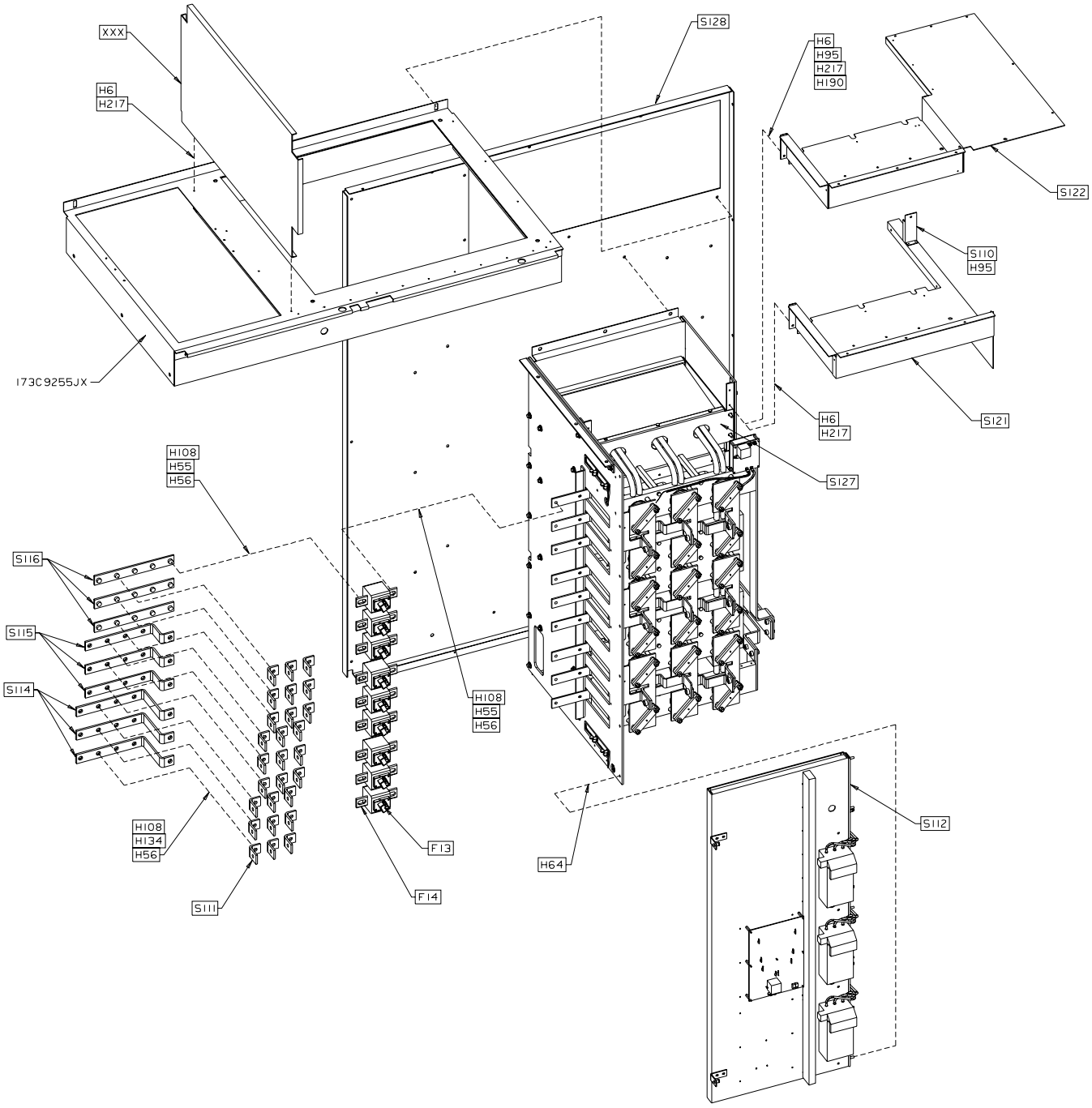


Figure C-9. Panel Assembly, Source Cabinet

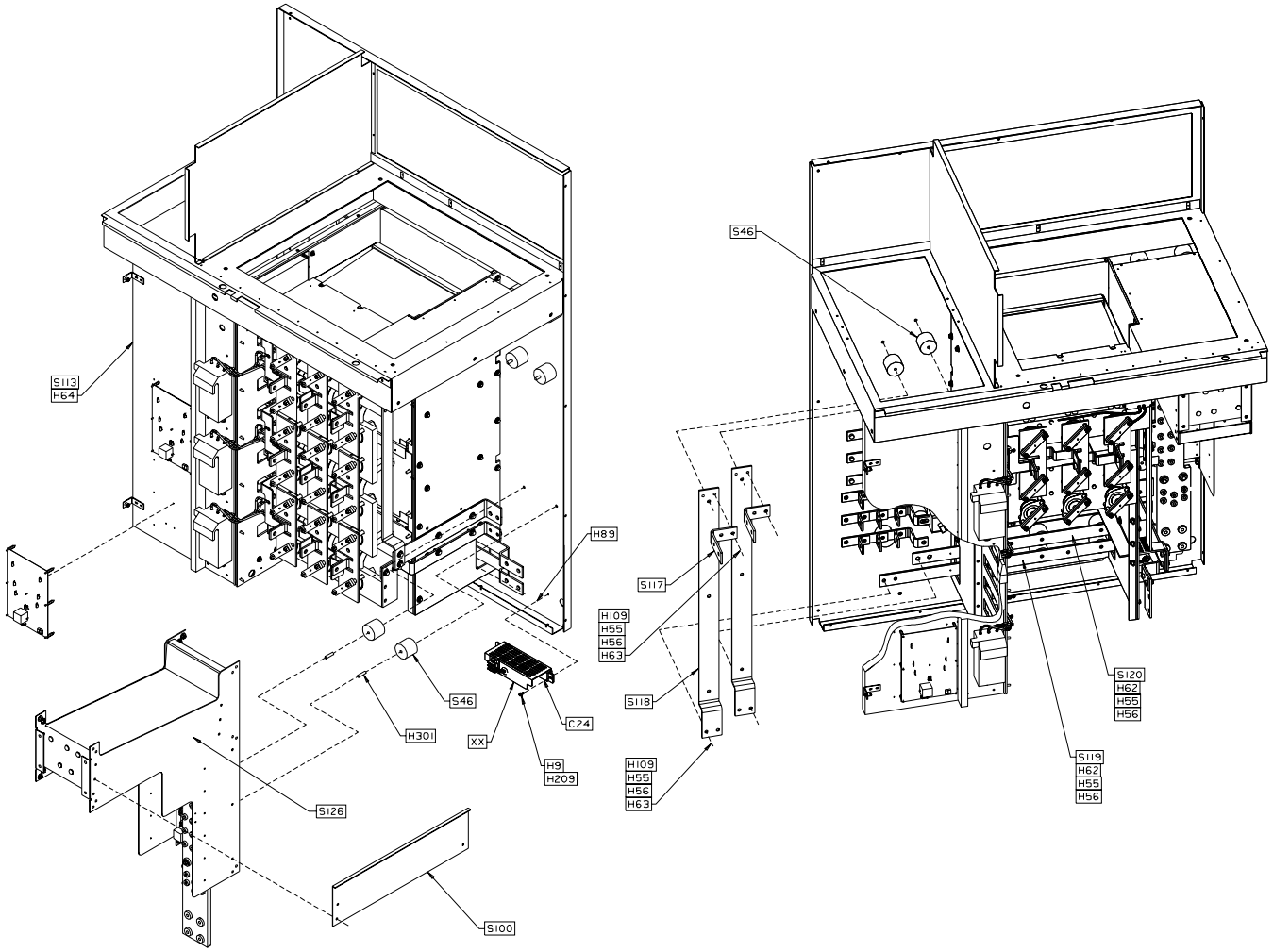


Figure C-10. Panel Assembly, Source Cabinet

Notes:

Reader Comments

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To:

GE Industrial Systems
Documentation Design, Rm. 291
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Salem, VA 24153-6492 USA

Fax: 1-540-387-8615
(GE Internal DC 8-278-8651)

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Clarity	O	O	O	O	_____
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